## 9.3 UTRA FDD CPICH RSCP

### 9.3.1 E-UTRAN FDD - UTRA FDD CPICH RSCP absolute accuracy

#### 9.3.1.1 Test purpose

To verify that the CPICH RSCP absolute measurement accuracy is within the specified limits.

#### 9.3.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward that support UTRA FDD.

#### 9.3.1.3 Minimum conformance requirements

The accuracy requirements shall be the same as the inter-frequency measurement accuracy requirements for FDD CPICH RSCP.

In RRC\_CONNECTED state the accuracy requirements shall meet the absolute accuracy requirements in table 9.3.1.3‑1.

Table 9.3.1.3-1: UTRAN FDD CPICH\_RSCP absolute accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | |
| Normal condition | Extreme condition | Io range | | |
| UTRA operating bands | Minimum Io | Maximum Io |
| dB | dB |  | dBm/3.84 MHz | dBm/3.84 MHz |
| ±6 | ±9 | Band I, IV, VI, X XI, XIX and XXI | -94 | -70 |
| Band IX | -93 | -70 |
| Band II, V and VII | -92 | -70 |
| Band III, VIII, XII, XIII, XIV , XX and XXII | -91 | -70 |
| Band XXV, XXVI Note 1 | -90.5 | -70 |
| ±8 | ±11 | Note 2 | -70 | -50 |
| NOTE 1: For Band XXVI, the condition has the minimum Io of -92 dBm/3.84 MHz when the carrier frequency of the assigned UTRA channel is within 869-894 MHz for the UE which supports both Band V and Band XXVI operating frequencies.  NOTE 2: The same bands apply for this requirement as for the corresponding highest accuracy requirement. | | | | |

If the UE, in RRC\_CONNECTED state, needs measurement gaps to perform UTRAN FDD measurements, the UTRAN FDD measurement procedure and measurement gap pattern stated in 3GPP TS 36.133 [4] clause 8.1.2.4.1 shall apply.

The reporting range and mapping specified for FDD CPICH RSCP is defined in Table 9.3.1.3-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.3.1.3-2: CPICH RSCP measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| CPICH\_RSCP\_LEV\_-05 | CPICH RSCP <-120 | dBm |
| CPICH\_RSCP\_LEV\_-04 | -120 ≤ CPICH RSCP < -119 | dBm |
| CPICH\_RSCP\_LEV\_-03 | -119 ≤ CPICH RSCP < -118 | dBm |
| … | … | … |
| CPICH\_RSCP\_LEV\_89 | -27 ≤ CPICH RSCP < -26 | dBm |
| CPICH\_RSCP\_LEV\_90 | -26 ≤ CPICH RSCP < -25 | dBm |
| CPICH\_RSCP\_LEV\_91 | -25 ≤ CPICH RSCP | dBm |

The normative reference for this requirement is 3GPP TS 25.133 [21] clauses 9.1.1.2 and 9.1.1.3 and 3GPP TS 36.133 [4] clauses 9.2.1 and A.9.3.1.

#### 9.3.1.4 Test description

##### 9.3.1.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.22 for UE with 2Rx RF band and Annex A, Figure A.86 for 4Rx capable UE without any 2Rx RF bands.

2. The general test parameter settings are set up according to Table 9.3.1.4.1-1.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 9.3.1.4.3.

5. Cell 1 is the serving E-UTRAN FDD cell and Cell 2 is the target UTRAN FDD cell. Cell 1 is the cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

Table 9.3.1.4.1-1: General test parameters for UTRAN FDD CPICH RSCP absolute measurement accuracy test in E-UTRAN FDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| PDSCH parameters |  | DL Reference Measurement Channel R.0 FDD | As specified in clause A.1.1 |
| PCFICH/PDCCH/PHICH parameters |  | DL Reference Measurement Channel R.6 FDD | As specified in clause A.2.1 |
| E-UTRAN RF Channel Number |  | 1 | One E-UTRAN FDD carrier frequency is used. |
| UTRAN RF Channel Number |  | 1 | One UTRAN FDD carrier frequency is used. |
| E-UTRAN Channel Bandwidth (BWchannel) | MHz | 10 |  |
| Active cell |  | Cell 1 | E-UTRAN cell 1 on RF channel number 1 |
| Neighbour cells |  | Cell 2 | UTRAN cell 2 on RF channel number 1 |
| Gap Pattern Id |  | 0 | As specified in 3GPP TS 36.133 clause 8.1.2.1. |
| Inter-RAT (UTRAN FDD) measurement quantity |  | CPICH RSCP |  |
| Monitored UTRA FDD cell list size |  | 12 | UTRA cells on UTRA RF channel 1 provided in the cell list. |
| CP length |  | Normal |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| DRX |  | OFF | OFF |

##### 9.3.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Set the parameters according to Tables 9.3.1.5-1 and 9.3.1.5-2 for Test 1. Propagation conditions are set according to Annex B clause B.1.1.

3. SS shall transmit a RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit a RRCConnectionReconfigurationComplete message.

5. UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, SS shall check CPICH\_RSCP reported values of Cell 2 in periodical MeasurementReport messages according to Table 9.3.1.5-3 as appropriate for Test 1. If the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one.

7. SS shall check the MeasurementReport message transmitted by the UE until the confidence level according to Tables G.2.3-1 in Annex G.2 is achieved.

8. Set the parameters according to Tables 9.3.1.5-1 and 9.3.1.5-2 for Test 2. While RF parameters are being changed any MeasurementReport messages send from the UE shall be ignored by the SS. SS shall wait for an additional 1s and still ignore any MeasurementReport messages send from the UE. Then, step 6 and 7 above are repeated as appropriate for Test 2.

##### 9.3.1.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.3.1.4.3-1: *MeasConfig- DEFAULT:* Additional E-UTRAN FDD - UTRA FDD CPICH RSCP absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 4.6.6, Table 4.6.6-1 MeasConfig-DEFAULT: | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig-DEFAULT ::= SEQUENCE { |  |  |  |
| measObjectToRemoveList | Not present |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE { | 2 entry |  |  |
| MeasObjectToAddMod SEQUENCE { |  |  |  |
| measObjectId | IdMeasObject-f1 |  |  |
| measObject CHOICE { |  |  |  |
| measObject EUTRA | MeasObjectEUTRA-GENERIC(f1) | E-UTRA Cell |  |
| } |  |  |  |
| } |  |  |  |
| MeasObjectToAddMod SEQUENCE { |  |  |  |
| measObjectId | IdMeasObject-f2 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectUTRA | MeasObjectUTRA-GENERIC(f2) | UTRA Cell |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToRemoveList | Not present |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry |  |  |
| reportConfigId | idReportConfig-P |  |  |
| reportConfig | ReportConfigInterRAT-PERIODICAL |  |  |
| } |  |  |  |
| measIdToRemoveList | Not present |  |  |
| measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) of SEQUENCE { | 1 entry |  |  |
| measId | 1 |  |  |
| measObjectId | IdMeasObject-f2 |  |  |
| reportConfigId | idReportConfig-P |  |  |
| } |  |  |  |
| quantityConfig | QuantityConfig-DEFAULT |  |  |
| measGapConfig | MeasGapConfig-GP1 |  |  |
| s-Measure | Not present |  |  |
| preRegistrationInfoHRPD | Not present |  |  |
| speedStatePars | Not present |  |  |
| } |  |  |  |

Table 9.3.1.4.3-2: *MeasResults*: Additional E-UTRAN FDD - UTRA FDD CPICH RSCP absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 |  |  |
| measResultServCell |  |  |  |
| rsrpResult | INTEGER(0..97) |  |  |
| rsrqResult | INTEGER(0..34) |  |  |
| } |  |  |  |
| measResultNeighCells CHOICE { |  |  |  |
| measResultListUTRA | MeasResultListUTRA |  |  |
| } |  |  |  |
| } |  |  |  |

Table 9.3.1.4.3-3: *MeasResultListUTRA*: Additional E-UTRAN FDD - UTRA FDD CPICH RSCP absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResultsListUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { |  |  |  |
| physCellId CHOICE { |  |  |  |
| fdd | PhysCellIdUTRA-FDD |  |  |
| tdd | Not Present |  |  |
| } |  |  |  |
| measResult SEQUENCE { |  |  |  |
| utra-RSCP | Set according to specific test INTEGER (-5..91) |  |  |
| } |  |  |  |
| } |  |  |  |

Table 9.3.1.4.3-4: *QuantityConfig-DEFAULT*: Additional E-UTRAN FDD - UTRA FDD CPICH RSCP absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 4.6.6, Table 4.6.6-3A: QuantityConfig-DEFAULT | | | |
| Information Element | Value/remark | Comment | Condition |
| QuantityConfig-DEFAULT ::= SEQUENCE { |  |  |  |
| quantityConfigEUTRA SEQUENCE { |  |  |  |
| filterCoefficientRSRP | fc0 |  |  |
| filterCoefficientRSRQ | fc0 |  |  |
| } |  |  |  |
| quantityConfigUTRA SEQUENCE { |  |  |  |
| measQuantityUTRA-FDD | cpich-RSCP |  |  |
| filterCoefficient | fc0 |  |  |
| } |  |  |  |

#### 9.3.1.5 Test requirement

The test parameters are given in Tables 9.3.1.4.1-1, 9.3.1.5-1 and 9.3.1.5-2 as below. Table 9.3.1.5-2 and 9.3.1.5-3 define the primary level settings including test tolerances for all tests.

Table 9.3.1.5-1: E-UTRAN FDD cell specific test parameters for UTRAN FDD CPICH RSCP absolute measurement accuracy test in E-UTRAN FDD

| Parameter | Unit | Test 1 | Test 2 |
| --- | --- | --- | --- |
| E-UTRAN RF Channel Number |  | 1 | |
| BWchannel | MHz | 10 | |
| OCNG Patterns defined in D.1.1 (OP.1 FDD) |  | OP.1 FDD | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Note 2 | dBm/15 kHz | -98 | |
| RSRP Note 3 | dBm/15 kHz | -94 | |
|  | dB | 4 | |
| SCH\_RP Note 3 | dBm/15 kHz | -94 | |
|  | dB | 4 | |
| Propagation Condition |  | AWGN | |
| NOTE 1: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

Table 9.3.1.5-2: UTRAN FDD cell specific test parameters for UTRAN FDD CPICH RSCP absolute measurement accuracy test in E-UTRAN FDD

| Parameter | | Unit | Test 1 | Test 2 |
| --- | --- | --- | --- | --- |
| **Cell 2** | **Cell 2** |
| CPICH\_Ec/Ior | | dB | -10 | -10 |
| PCCPCH\_Ec/Ior | | dB | -12 | -12 |
| SCH\_Ec/Ior | | dB | -12 | -12 |
| PICH\_Ec/Ior | | dB | -15 | -15 |
| DPCH\_Ec/Ior | | dB | - | - |
| OCNS\_Ec/Ior | | dB | -0.94 | -0.94 |
| Ioc | Band I, IV, VI, X, XI, XIX, XXI | dBm/3.84 MHz | -60.75 | -93.76 |
| Band II, V, VII | -91.76 |
| Band XXV, XXVI | -90.26 (Note 3) |
| Band III, VIII, XII, XIII, XIV, XX, XXII | -90.76 |
| Band IX (Note 2) | -92.76 |
| Îor/Ioc | | dB | 9.54 | -9.19 |
| CPICH RSCP, Note 1 | Band I, IV, VI, X, XI, XIX, XXI | dBm | -61.21 | -112.95 |
| Band II, V, VII | -110.95 |
| Band XXV, XXVI | -109.45 (Note 3) |
| Band III, VIII, XII, XIII, XIV, XX, XXII | -109.95 |
| Band IX (Note 2) | -111.95 |
| Io, Note 1 | Band I, IV, VI, X, XI, XIX, XXI | dBm/3.84 MHz | -50.75 | -93.27 |
| Band II, V, VII | -91.27 |
| Band XXV, XXVI | -89.77 (Note 3) |
| Band III, VIII, XII, XIII, XIV, XX, XXII | -90.27 |
| Band IX (Note 2) | -92.27 |
| Propagation condition | | - | AWGN | AWGN |
| NOTE 1: CPICH RSCP and Iolevels have been calculated from other parameters for information purposes. They are not settable parameters themselves.  NOTE 2: For the UE which supports both Band III and Band IX operating frequencies, the measurement performance requirements for Band III shall apply to the multi-band UE.  NOTE 3: The test parameter is modified by -1.5 dB when the carrier frequency of the assigned UTRA channel is within 869-894 MHz for the UE which supports both Band V and Band XXVI operating frequencies. | | | | |
| Tests shall be done sequentially. Test 1 shall be done first. After test 1 has been executed test parameters for test 2 shall be set within 5 seconds so that UE does not loose the Cell 2 in between the tests. | | | | |

Each UTRAN FDD CPICH RSCP absolute measurement accuracy test shall meet the reported values test requirements in table 9.3.1.5-3.

Table 9.3.1.5-3: UTRAN FDD CPICH RSCP absolute measurement accuracy requirements for the reported values

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Test 1 | Test 2 | | | | |
|  | All bands | Band I, IV, VI, X, XI, XIX, XXI | Band II, V, VII | Band XXV, XXVI (Note 2) | Band III, VIII, XII, XIII, XIV, XX, XXII | Band IX (Note 1) |
| **Normal Conditions** | | | | | | |
| Lowest reported value (Cell 2) | CPICH\_RSCP\_46 | CPICH\_RSCP\_-04 | CPICH\_RSCP\_-02 | CPICH\_RSCP\_-01 | CPICH\_RSCP\_-01 | CPICH\_RSCP\_-03 |
| Highest reported value (Cell 2) | CPICH\_RSCP\_63 | CPICH\_RSCP\_9 | CPICH\_RSCP\_11 | CPICH\_RSCP\_13 | CPICH\_RSCP\_12 | CPICH\_RSCP\_10 |
| Extreme Conditions | | | | | | |
| Lowest reported value (Cell 2) | CPICH\_RSCP\_43 | CPICH\_RSCP\_-05 | CPICH\_RSCP\_-05 | CPICH\_RSCP\_-04 | CPICH\_RSCP\_-04 | CPICH\_RSCP\_-05 |
| Highest reported value (Cell 2) | CPICH\_RSCP\_66 | CPICH\_RSCP\_12 | CPICH\_RSCP\_14 | CPICH\_RSCP\_16 | CPICH\_RSCP\_15 | CPICH\_RSCP\_13 |
| NOTE 1: For a multiband UE supporting both Band III and Band IX, for Band IX apply the test requirements of Band III. (Reference Table 9.3.1.5-2, Note 2).  NOTE 2: For a multiband UE supporting both Band V and Band XXVI, for Band XXVI when the carrier frequency of the assigned UTRA channel in is within 869-894 MHz apply the test requirements of Band V. (Reference Table 9.3.1.5-2, Note 3). | | | | | | |

### 9.3.2 E-UTRAN TDD - UTRA FDD CPICH RSCP absolute accuracy

#### 9.3.2.1 Test purpose

To verify that the E-UTRAN TDD - UTRA FDD CPICH RSCP absolute measurement accuracy is within the specified limits.

#### 9.3.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward that support UTRA FDD.

#### 9.3.2.3 Minimum conformance requirements

The accuracy requirements shall be the same as the inter-frequency measurement accuracy requirements for FDD CPICH RSCP.

In RRC\_CONNECTED state the accuracy requirements shall meet the absolute accuracy requirements in table 9.3.2.3-1.

Table 9.3.2.3-1: UTRAN FDD CPICH\_RSCP absolute accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | |
| Normal condition | Extreme condition | Io range | | |
| UTRA operating bands | Minimum Io | Maximum Io |
| dB | dB |  | dBm/3.84 MHz | dBm/3.84 MHz |
| ±6 | ±9 | Band I, IV, VI, X XI, XIX and XXI | -94 | -70 |
| Band IX | -93 | -70 |
| Band II, V and VII | -92 | -70 |
| Band III, VIII, XII, XIII, XIV , XX and XXII | -91 | -70 |
| Band XXV, XXVI Note 1 | -90.5 | -70 |
| ±8 | ±11 | Note 2 | -70 | -50 |
| NOTE 1: For Band XXVI, the condition has the minimum Io of -92 dBm/3.84 MHz when the carrier frequency of the assigned UTRA channel is within 869-894 MHz for the UE which supports both Band V and Band XXVI operating frequencies.  NOTE 2: The same bands apply for this requirement as for the corresponding highest accuracy requirement. | | | | |

If the UE, in RRC\_CONNECTED state, needs measurement gaps to perform UTRAN FDD measurements, the UTRAN FDD measurement procedure and measurement gap pattern stated in 3GPP TS 36.133 [4] clause 8.1.2.4.1 shall apply.

The reporting range and mapping specified for FDD CPICH RSCP is defined in Table 9.3.2.3-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.3.2.3-2: CPICH RSCP measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| CPICH\_RSCP\_LEV\_-05 | CPICH RSCP <-120 | dBm |
| CPICH\_RSCP\_LEV\_-04 | -120 ≤ CPICH RSCP < -119 | dBm |
| CPICH\_RSCP\_LEV\_-03 | -119 ≤ CPICH RSCP < -118 | dBm |
| … | … | … |
| CPICH\_RSCP\_LEV\_89 | -27 ≤ CPICH RSCP < -26 | dBm |
| CPICH\_RSCP\_LEV\_90 | -26 ≤ CPICH RSCP < -25 | dBm |
| CPICH\_RSCP\_LEV\_91 | -25 ≤ CPICH RSCP | dBm |

The normative reference for this requirement is 3GPP TS 25.133 [21] clauses 9.1.1.2 and 9.1.1.3 and 3GPP TS 36.133 [4] clauses 9.2.1 and A.9.3.2.

#### 9.3.2.4 Test description

##### 9.3.2.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.22 for UE with 2Rx RF band and Annex A, Figure A.86 for 4Rx capable UE without any 2Rx RF bands.

2. The general test parameter settings are set up according to Table 9.3.2.4.1-1.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 9.3.2.4.3.

5. Cell 1 is the serving E-UTRAN TDD cell and Cell 2 is the target UTRAN FDD cell. Cell 1 is the cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

Table 9.3.2.4.1-1: General test parameters for UTRAN FDD CPICH RSCP absolute measurement accuracy test in E-UTRAN TDD

| Parameter | Unit | Value | Comment |
| --- | --- | --- | --- |
| PDSCH parameters |  | DL Reference Measurement Channel R.0 TDD | As specified in clause A.1.2 |
| PCFICH/PDCCH/PHICH parameters |  | DL Reference Measurement Channel R.6 TDD | As specified in clause A.2.1 |
| E-UTRAN RF Channel Number |  | 1 | One E-UTRAN TDD carrier frequency is used. |
| UTRAN RF Channel Number |  | 1 | One UTRAN FDD carrier frequency is used. |
| E-UTRAN Channel Bandwidth (BWchannel) | MHz | 10 |  |
| Active cell |  | Cell 1 | E-UTRAN cell 1 on RF channel number 1 |
| Neighbour cells |  | Cell 2 | UTRAN cell 2 on RF channel number 1 |
| Gap Pattern Id |  | 1 | As specified in 3GPP TS 36.133 clause 8.1.2.1. |
| Inter-RAT (UTRAN FDD) measurement quantity |  | CPICH RSCP |  |
| Monitored UTRA FDD cell list size |  | 12 | UTRA cells on UTRA RF channel 1 provided in the cell list. |
| CP length |  | Normal |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| DRX |  | OFF | OFF |

##### 9.3.2.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Set the parameters according to Table 9.3.2.5-1 and 9.3.2.5-2 for Test 1. Propagation conditions are set according to Annex B clause B.1.1.

3. SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, SS shall check CPICH\_RSCP reported values of Cell 2 in periodical MeasurementReport messages according to Table 9.3.2.5-3 as appropriate for Test 1. If the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one.

7. SS shall check the MeasurementReport message transmitted by the UE until the confidence level according to Tables G.2.3-1 in Annex G.2 is achieved.

8. Set the parameters according to Tables 9.3.2.5-1and 9.3.2.5-2 for Test 2. While RF parameters are being changed any MeasurementReport messages send from the UE shall be ignored by the SS. SS shall wait for an additional 1s and still ignore any MeasurementReport messages send from the UE. Then, step 6 and 7 above are repeated as appropriate for Test 2.

##### 9.3.2.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] values 4.6 with the following exceptions:

Table 9.3.2.4.3-1: *MeasConfig- DEFAULT:* Additional E-UTRAN TDD - UTRA FDD CPICH RSCP absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 4.6.6, Table 4.6.6-1 MeasConfig-DEFAULT: | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig-DEFAULT ::= SEQUENCE { |  |  |  |
| measObjectToRemoveList | Not present |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE { | 2 entry |  |  |
| MeasObjectToAddMod SEQUENCE { |  |  |  |
| measObjectId | IdMeasObject-f1 |  |  |
| measObject CHOICE { |  |  |  |
| measObject EUTRA | MeasObjectEUTRA-GENERIC(f1) | E-UTRA Cell |  |
| } |  |  |  |
| } |  |  |  |
| MeasObjectToAddMod SEQUENCE { |  |  |  |
| measObjectId | IdMeasObject-f8 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectUTRA | MeasObjectUTRA-GENERIC(f8) | UTRA Cell |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToRemoveList | Not present |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId) )OF SEQUENCE { | 1 entry |  |  |
| reportConfigId | idReportConfig-P |  |  |
| reportConfig | ReportConfigInterRAT-PERIODICAL |  |  |
| } |  |  |  |
| measIdToRemoveList | Not present |  |  |
| measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) of SEQUENCE { | 1 entry |  |  |
| measId | 1 |  |  |
| measObjectId | IdMeasObject-f8 |  |  |
| reportConfigId | idReportConfig-P |  |  |
| } |  |  |  |
| quantityConfig | QuantityConfig-DEFAULT |  |  |
| measGapConfig | MeasGapConfig-GP2 |  |  |
| s-Measure | Not present |  |  |
| preRegistrationInfoHRPD | Not present |  |  |
| speedStatePars | Not present |  |  |
| } |  |  |  |

Table 9.3.2.4.3-2: *MeasResults*: Additional E-UTRAN TDD - UTRA FDD CPICH RSCP absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 |  |  |
| measResultServCell |  |  |  |
| rsrpResult | INTEGER(0..97) |  |  |
| rsrqResult | INTEGER(0..34) |  |  |
| } |  |  |  |
| measResultNeighCells CHOICE { |  |  |  |
| measResultListUTRA | MeasResultListUTRA |  |  |
| } |  |  |  |
| } |  |  |  |

Table 9.3.2.4.3-3: MeasResultListUTRA: Additional E-UTRAN TDD - UTRA FDD CPICH RSCP absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResultsLIstEUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { |  |  |  |
| physCellId CHOICE { |  |  |  |
| fdd | PhysCellIdUTRA-FDD |  |  |
| tdd | Not Present |  |  |
| } |  |  |  |
| measResult SEQUENCE { |  |  |  |
| utra-RSCP | According to specific test |  |  |
| } |  |  |  |
| } |  |  |  |

#### 9.3.2.5 Test requirement

The test parameters are given in Tables 9.3.2.4.1-1, 9.3.2.5-1 and 9.3.2.5-2 as below. Table 9.3.2.5-2 and 9.3.2.5-3 define the primary level settings including test tolerances for all tests.

Each UTRAN FDD CPICH RSCP absolute measurement accuracy test shall meet the reported values test requirements in table 9.3.2.5-3.

Table 9.3.2.5-1: E-UTRAN TDD cell specific test parameters for UTRAN FDD CPICH RSCP absolute measurement accuracy test in E-UTRAN TDD

| Parameter | Unit | Test 1 | Test 2 |
| --- | --- | --- | --- |
| E-UTRAN RF Channel Number |  | 1 | |
| BWchannel | MHz | 10 | |
| Special subframe configurationNote1 |  | 6 | |
| Uplink-downlink configurationNote1 |  | 1 | |
| OCNG Patterns defined in D.2.1 (OP.1 TDD) |  | OP.1 TDD | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 2 | dB |
| OCNG\_RBNote 2 | dB |
| Note 3 | dBm/15 kHz | -98 | |
| RSRP Note 4 | dBm/15 kHz | -94 | |
|  | dB | 4 | |
| SCH\_RP Note 4 | dBm/15 kHz | -94 | |
|  | dB | 4 | |
| Propagation Condition |  | AWGN | |
| NOTE 1: For special subframe and uplink-downlink configurations see Tables 4.2-1 and 4.2-2 in 3GPP TS 36.211.  NOTE 2: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 4: RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

Table 9.3.2.5-2: UTRAN FDD cell specific test parameters for UTRAN FDD CPICH RSCP absolute measurement accuracy test in E-UTRAN TDD

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | Test 2 |
| **Cell 2** | **Cell 2** |
| CPICH\_Ec/Ior | | dB | -10 | -10 |
| PCCPCH\_Ec/Ior | | dB | -12 | -12 |
| SCH\_Ec/Ior | | dB | -12 | -12 |
| PICH\_Ec/Ior | | dB | -15 | -15 |
| DPCH\_Ec/Ior | | dB | - | - |
| OCNS\_Ec/Ior | | dB | -0.94 | -0.94 |
| Ioc | Band I, IV, VI, X, XI, XIX, XXI | dBm/3.84 MHz | -60.75 | -93.76 |
| Band II, V, VII | -91.76 |
| Band XXV, XXVI | -90.26 (Note 3) |
| Band III, VIII, XII, XIII, XIV, XXII | -90.76 |
| Band IX (Note 2) | -92.76 |
| Îor/Ioc | | dB | 9.54 | -9.19 |
| CPICH RSCP, Note 1 | Band I, IV, VI, X, XI, XIX, XXI | dBm | -61.21 | -112.95 |
| Band II, V, VII | -110.95 |
| Band XXV, XXVI | -109.45 (Note 3) |
| Band III, VIII, XII, XIII, XIV, XXII | -109.95 |
| Band IX (Note 2) | -111.95 |
| Io, Note 1 | Band I, IV, VI, X, XI, XIX, XXI | dBm/3.84 MHz | -50.75 | -93.27 |
| Band II, V, VII | -91.27 |
| Band XXV, XXVI | -89.77 (Note 3) |
| Band III, VIII, XII, XIII, XIV, XXII | -90.27 |
| Band IX (Note 2) | -92.27 |
| Propagation condition | | - | AWGN | AWGN |
| NOTE 1: CPICH RSCP and Iolevels have been calculated from other parameters for information purposes. They are not settable parameters themselves.  NOTE 2: For the UE which supports both Band III and Band IX operating frequencies, the measurement performance requirements for Band III shall apply to the multi-band UE.  NOTE 3: The test parameter is modified by -1.5 dB when the carrier frequency of the assigned UTRA channel is within 869-894 MHz for the UE which supports both Band V and Band XXVI operating frequencies. | | | | |
| Tests shall be done sequentially. Test 1 shall be done first. After test 1 has been executed test parameters for test 2 shall be set within 5 seconds so that UE does not loose the Cell 2 in between the tests. | | | | |

Table 9.3.2.5-3: UTRAN FDD CPICH RSCP absolute measurement accuracy requirements for the reported values

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Test 1 | Test 2 | | | | |
|  | **All bands** | **Band I, IV, VI, X, XI, XIX, XXI** | **Band II, V, VII** | **Band XXV, XXVI** | **Band III, VIII, XII, XIII, XIV, XX, XXII** | **Band IX** |
| **Normal Conditions** | | | | | | |
| Lowest reported value (Cell 2) | CPICH\_RSCP\_46 | CPICH\_RSCP\_-04 | CPICH\_RSCP\_-02 | CPICH\_RSCP\_-01 | CPICH\_RSCP\_-01 | CPICH\_RSCP\_-03 |
| Highest reported value (Cell 2) | CPICH\_RSCP\_63 | CPICH\_RSCP\_9 | CPICH\_RSCP\_11 | CPICH\_RSCP\_13 | CPICH\_RSCP\_12 | CPICH\_RSCP\_10 |
| **Extreme Conditions** | | | | | | |
| Lowest reported value (Cell 2) | CPICH\_RSCP\_43 | CPICH\_RSCP\_-05 | CPICH\_RSCP\_-05 | CPICH\_RSCP\_-04 | CPICH\_RSCP\_-04 | CPICH\_RSCP\_-05 |
| Highest reported value (Cell 2) | CPICH\_RSCP\_66 | CPICH\_RSCP\_12 | CPICH\_RSCP\_14 | CPICH\_RSCP\_16 | CPICH\_RSCP\_15 | CPICH\_RSCP\_13 |

### 9.3.3 E-UTRAN FDD - UTRA FDD CPICH RSCP absolute accuracy for 5MHz bandwidth

#### 9.3.3.1 Test purpose

To verify that the CPICH RSCP absolute measurement accuracy is within the specified limits for bands within band group FDD\_N.

#### 9.3.3.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward that support E-UTRA bands within band group FDD\_N and UTRA FDD.

#### 9.3.3.3 Minimum conformance requirements

The requirements in this clause are valid for terminals supporting this capability.

The measurement period for RRC\_CONNECTED state is specified in 3GPP TS 36.133 [4] clauses 8.1.2.4.1 and 8.1.2.4.2.

In RRC\_CONNECTED state the accuracy requirements shall meet the absolute accuracy requirements in 3GPP TS 36.133 [4] table 9.3.3.3-1, under the following conditions:

- CPICH Ec/Io condition for a detectable cell is as specified in 3GPP TS 36.133 [4] clauses 8.1.2.4.1, 8.1.2.4.2, 8.1.2.4.7, 8.1.2.4.8;

- SCH\_Ec/Io condition for a detectable cell is as specified in 3GPP TS 36.133 [4] clauses 8.1.2.4.1, 8.1.2.4.2, 8.1.2.4.7, 8.1.2.4.8.

Table 9.3.3.3-1: UTRAN FDD CPICH\_RSCP absolute accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | |
| Normal condition | Extreme condition | Io range | | |
| UTRA operating bands | Minimum Io | Maximum Io |
| dB | dB |  | dBm/3.84 MHz | dBm/3.84 MHz |
| ±6 | ±9 | Band I, IV, VI, X XI, XIX and XXI | -94 | -70 |
| Band IX | -93 | -70 |
| Band II, V and VII | -92 | -70 |
| Band III, VIII, XII, XIII, XIV , XX and XXII | -91 | -70 |
| Band XXV, XXVI Note 1 | -90.5 | -70 |
| ±8 | ±11 | Note 2 | -70 | -50 |
| NOTE 1: For Band XXVI, the condition has the minimum Io of -92 dBm/3.84 MHz when the carrier frequency of the assigned UTRA channel is within 869-894 MHz for the UE which supports both Band V and Band XXVI operating frequencies.  NOTE 2: The same bands apply for this requirement as for the corresponding highest accuracy requirement. | | | | |

If the UE, in RRC\_CONNECTED state, needs measurement gaps to perform UTRAN FDD measurements, the relevant UTRAN FDD measurement procedure and measurement gap pattern stated in 3GPP TS 36.133 [4] clause 8.1.2.4 shall apply.

The reporting range and mapping specified for FDD CPICH RSCP is defined in Table 9.3.3.3-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.3.3.3-2: CPICH RSCP measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| CPICH\_RSCP\_LEV\_-05 | CPICH RSCP <-120 | dBm |
| CPICH\_RSCP\_LEV\_-04 | -120 ≤ CPICH RSCP < -119 | dBm |
| CPICH\_RSCP\_LEV\_-03 | -119 ≤ CPICH RSCP < -118 | dBm |
| … | … | … |
| CPICH\_RSCP\_LEV\_89 | -27 ≤ CPICH RSCP < -26 | dBm |
| CPICH\_RSCP\_LEV\_90 | -26 ≤ CPICH RSCP < -25 | dBm |
| CPICH\_RSCP\_LEV\_91 | -25 ≤ CPICH RSCP | dBm |

The normative reference for this requirement is 3GPP TS 25.133 [21] clause 9.1.1.3 and 3GPP TS 36.133 [4] clauses 9.2.1 and A.9.3.3.

#### 9.3.3.4 Test description

##### 9.3.3.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 5MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.22.

2. The general test parameter settings are set up according to Table 9.3.3.4.1-1.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 9.3.3.4.3.

5. Cell 1 is the serving E-UTRAN FDD cell and Cell 2 is the target UTRAN FDD cell. Cell 1 is the cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

Table 9.3.3.4.1-1: General test parameters for UTRAN FDD CPICH RSCP absolute measurement accuracy test in E-UTRAN FDD for 5MHz bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| PDSCH parameters |  | DL Reference Measurement Channel R.5 FDD | As specified in clause A.1.1 |
| PCFICH/PDCCH/PHICH parameters |  | DL Reference Measurement Channel R.11 FDD | As specified in clause A.2.1 |
| E-UTRAN Channel Bandwidth (BWchannel) | MHz | 5 |  |
| NOTE 1: See Table 9.3.1.4.1-1 for other general test parameters. | | | |

##### 9.3.3.4.2 Test procedure

Same test procedure as defined in clause 9.3.1.4.2 with the following exceptions:

- Instead of Table 9.3.1.5-1 🡪 use Table 9.3.3.5-1.

##### 9.3.3.4.3 Message contents

Same message contents as defined in clause 9.3.1.4.3.

#### 9.3.3.5 Test requirement

The test parameters are given in Tables 9.3.3.4.1-1, 9.3.3.5-1 and 9.3.1.5-2 as below. Table 9.3.1.5-2 and 9.3.1.5-3 define the primary level settings including test tolerances for all tests.

Table 9.3.3.5-1: E-UTRAN FDD cell specific test parameters for UTRAN FDD CPICH RSCP absolute measurement accuracy test in E-UTRAN FDD for 5MHz bandwidth

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | Test 2 |
| E-UTRAN RF Channel Number | |  | 1 | |
| BW**channel** | | MHz | 5 | |
| OCNG Patterns defined in D.1.15 (OP.15 FDD) | |  | OP.15 FDD | |
| PBCH\_RA | | dB | 0 | |
| PBCH\_RB | | dB |
| PSS\_RA | | dB |
| SSS\_RA | | dB |
| PCFICH\_RB | | dB |
| PHICH\_RA | | dB |
| PHICH\_RB | | dB |
| PDCCH\_RA | | dB |
| PDCCH\_RB | | dB |
| PDSCH\_RA | | dB |
| PDSCH\_RB | | dB |
| OCNG\_RANote 1 | | dB |
| OCNG\_RBNote 1 | | dB |
| Note 2 | Bands FDD\_N | dBm/15 kHz | -98 | |
| RSRP Note 3 | Bands FDD\_N | dBm/15 kHz | -94 | |
|  | | dB | 4 | |
| SCH\_RP Note 3 | Bands FDD\_N | dBm/15 kHz | -94 | |
|  | | dB | 4 | |
| IoNote3 | Bands FDD\_N | dBm/4.5 MHz | -67.8 | |
| Propagation Condition | |  | AWGN | |
| NOTE 1: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

## 9.4 UTRAN FDD CPICH Ec/No

### 9.4.1 E-UTRAN FDD - UTRA FDD CPICH Ec/No absolute accuracy

#### 9.4.1.1 Test purpose

To verify that the E-UTRAN FDD - UTRA FDD CPICH Ec/No absolute measurement accuracy is within the specified limits.

#### 9.4.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward that support UTRA FDD.

#### 9.4.1.3 Minimum conformance requirements

The accuracy requirements shall be the same as the inter-frequency measurement accuracy requirements for FDD CPICH Ec/No

The accuracy requirements in table 9.4.1.3-1 are valid under the following conditions:

CPICH\_RSCP|dBm ≥ -114 dBm for Bands I, IV, VI, X, XI, XIX and XXI

CPICH\_RSCP|dBm ≥ -113 dBm for Band IX,

CPICH\_RSCP|dBm ≥ -112 dBm for Bands II, V and VII,

CPICH\_RSCP|dBm ≥ -111 dBm for Band III, VIII, XII, XIII, XIV, XX and XXII

CPICH\_RSCP|dBm ≥ -110.5 dBm for Band XXV.



Table 9.4.1.3-1: UTRA FDD CPICH\_Ec/Io absolute accuracy

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Accuracy [dB] | | Conditions | | | | |
| Normal condition | Extreme condition | Band I, IV VI, X, XI, XIX and XXI | Band II, V and VII | Band XXV and XXVI | Band III, VIII, XII, XIII, XIV, XX and XXII | Band IX |
| Io [dBm/3,84 MHz] | Io [dBm/3,84 MHz] | Io [dBm/3,84 MHz] | Io [dBm/3,84 MHz] | Io [dBm/3,84 MHz] |
| CPICH\_Ec/Io | dB | ± 1.5 for ‑14 ≤ CPICH Ec/Io  ± 2 for ‑16 ≤ CPICH Ec/Io < -14  ± 3 for ‑20 ≤ CPICH Ec/Io < -16 | ± 3 | -94...-50 | -92…-50 | -90.5…-50  (Note 1) | -91…-50 | -93...-50 |
| NOTE: The condition is -92…-50 dBm/3.84 MHz when the carrier frequency of the assigned UTRA channel is within 869-894 MHz for the UE which supports both Band V and Band XXVI operating frequencies. | | | | | | | | |

If the UE, in RRC\_CONNECTED state, needs measurement gaps to perform UTRAN FDD measurements, the UTRAN FDD measurement procedure and measurement gap pattern stated in 3GPP TS 36.133 [4] clause 8.1.2.4.1 shall apply.

The reporting range is for *CPICH Ec/Io* is from -24 ...0 dB.

In table 9.4.1.3-2 the mapping of measured quantity is defined.

The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.4.1.3-2: UTRA FDD CPICH\_Ec/Io measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| CPICH\_Ec/No\_00 | CPICH Ec/Io < ‑24 | dB |
| CPICH\_Ec/No\_01 | -24 ≤ CPICH Ec/Io < ‑23.5 | dB |
| CPICH\_Ec/No\_02 | -23.5 ≤ CPICH Ec/Io < ‑23 | dB |
| … | … | … |
| CPICH\_Ec/No\_47 | -1 ≤ CPICH Ec/Io < -0.5 | dB |
| CPICH\_Ec/No\_48 | -0.5 ≤ CPICH Ec/Io < 0 | dB |
| CPICH\_Ec/No\_49 | 0 ≤ CPICH Ec/Io | dB |

The normative reference for this requirement is 3GPP TS 25.133 [21] clauses 9.1.2.2.1 and 9.1.2.3 and 3GPP TS 36.133 [4] clause 9.2.3 and A.9.4.1.

#### 9.4.1.4 Test description

##### 9.4.1.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.22 for UE with 2Rx RF band and Annex A, Figure A.86 for 4Rx capable UE without any 2Rx RF bands.

2. Propagation conditions are set according to Annex B clause B.0.

3. Message contents are defined in clause 9.4.1.4.3.

4. Cell 1 is the serving cell and Cell 2 is the target cell. Cell 1 is the cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

##### 9.4.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Set the parameters according to Tables 9.4.1.5-2 and 9.4.1.5-3 for Test 1. Propagation conditions are set according to Annex B clause B.1.1.

3. SS shall transmit a RRCConnectionReconfiguration message on cell1.

4. The UE shall transmit a RRCConnectionReconfigurationComplete message.

5. UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, SS shall check UTRA FDD CPICH Ec/Io reported values of Cell 2 in periodical MeasurementReport messages according to Table 9.4.1.5-4 as appropriate for Test 1. If the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one.

7. SS shall check the MeasurementReport message transmitted by the UE until the confidence level according to Tables G.2.3-1 in Annex G.2 is achieved.

8. If Test 2 not done, set the parameters according to Tables 9.4.1.5-2 and 9.4.1.5-3 for Test 2. While RF parameters are being changed any MeasurementReport messages send from the UE shall be ignored by the SS. SS shall wait for an additional 1s and still ignore any MeasurementReport messages send from the UE. Then, step 6 and 7 above are repeated as appropriate for Test 2.

9. If Test 3 not done, set the parameters according to Tables 9.4.1.5-2 and 9.4.1.5-3 for Test 3. While RF parameters are being changed any MeasurementReport messages send from the UE shall be ignored by the SS. SS shall wait for an additional 1s and still ignore any MeasurementReport messages send from the UE. Then, step 6 and 7 above are repeated as appropriate for Test 3.

##### 9.4.1.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.1.4.3-1: CPICH\_Ec/Io measurement configuration

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 |

Table 9.4.1.4.3-2: *MeasConfig- DEFAULT:* CPICH\_Ec/Io measurement configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 4.6.6, Table 4.6.6-1 MeasConfig-DEFAULT: | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig-DEFAULT ::= SEQUENCE { |  |  |  |
| measObjectToRemoveList | Not present |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE { | 2 entry |  |  |
| MeasObjectToAddMod SEQUENCE { |  |  |  |
| measObjectId | IdMeasObject-f1 |  |  |
| measObject CHOICE { |  |  |  |
| measObject EUTRA | MeasObjectEUTRA-GENERIC(f1) | E-UTRA Cell |  |
| } |  |  |  |
| } |  |  |  |
| MeasObjectToAddMod SEQUENCE { |  |  |  |
| measObjectId | IdMeasObject-f2 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectUTRA | MeasObjectUTRA-GENERIC(f2) | UTRA Cell |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToRemoveList | Not present |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId) )OF SEQUENCE { | 1 entry |  |  |
| reportConfigId | idReportConfig-P |  |  |
| reportConfig | ReportConfigInterRAT-PERIODICAL |  |  |
| } |  |  |  |
| measIdToRemoveList | Not present |  |  |
| measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) of SEQUENCE { | 1 entry |  |  |
| measId | 1 |  |  |
| measObjectId | IdMeasObject-f2 |  |  |
| reportConfigId | idReportConfig-P |  |  |
| } |  |  |  |
| quantityConfig | QuantityConfig-DEFAULT |  |  |
| measGapConfig | MeasGapConfig-GP1 |  |  |
| s-Measure | Not present |  |  |
| preRegistrationInfoHRPD | Not present |  |  |
| speedStatePars | Not present |  |  |
| } |  |  |  |

Table 9.4.1.4.3-3: *MeasResults*: CPICH\_Ec/Io measurement configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 |  |  |
| measResultServCell |  |  |  |
| rsrpResult | INTEGER(0..97) |  |  |
| rsrqResult | INTEGER(0..34) |  |  |
| } |  |  |  |
| measResultNeighCells CHOICE { |  |  |  |
| measResultListUTRA | MeasResultListUTRA |  |  |
| } |  |  |  |
| } |  |  |  |

Table 9.4.1.4.3-4: MeasResultListUTRA: CPICH\_Ec/Io measurement configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResultsListUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { |  |  |  |
| physCellId CHOICE { |  |  |  |
| fdd | PhysCellIdUTRA-FDD |  |  |
| tdd | Not Present |  |  |
| } |  |  |  |
| measResult SEQUENCE { |  |  |  |
| utra-EcN0 | According to specific test |  |  |
| } |  |  |  |
| } |  |  |  |

#### 9.4.1.5 Test requirement

The test parameters are given in Tables 9.4.1.5-1, 9.4.1.5-2 and 9.4.1.5-3 as below. Table, 9.4.1.5-2 and 9.4.1.5-3 define the primary level settings including test tolerances for all tests.

Table 9.4.1.5-1: General test parameters for UTRAN FDD CPICH Ec/No absolute measurement accuracy test in E-UTRAN FDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| PDSCH parameters |  | DL Reference Measurement Channel R.0 FDD | As specified in clause A.1.1 |
| PCFICH/PDCCH/PHICH parameters |  | DL Reference Measurement Channel R.6 FDD | As specified in clause A.2.1 |
| E-UTRAN RF Channel Number |  | 1 | One E-UTRAN FDD carrier frequency is used. |
| UTRAN RF Channel Number |  | 1 | One UTRAN FDD carrier frequency is used. |
| E-UTRAN Channel Bandwidth (BWchannel) | MHz | 10 |  |
| Active cell |  | Cell 1 | E-UTRAN cell 1 on RF channel number 1 |
| Neighbour cells |  | Cell 2 | UTRAN cell 2 on RF channel number 1 |
| Gap Pattern Id |  | 0 | As specified in 3GPP TS 36.133 [4] clause 8.1.2.1. |
| Inter-RAT (UTRAN FDD) measurement quantity |  | CPICH Ec/N0 |  |
| Monitored UTRA FDD cell list size |  | 12 | UTRA cells on UTRA RF channel 1 provided in the cell list. |
| CP length |  | Normal |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| DRX |  | OFF | OFF |

Table 9.4.1.5-2: E-UTRAN FDD cell specific test parameters for UTRAN FDD CPICH Ec/No absolute measurement accuracy test in E-UTRAN FDD

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | Test 2 | Test 3 |
| E-UTRAN RF Channel Number |  | 1 | | |
| BWchannel | MHz | 10 | | |
| OCNG Patterns defined in D.1.1 (OP.1 FDD) |  | OP.1 FDD | | |
| PBCH\_RA | dB | 0 | | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Note 2 | dBm/15 kHz | -98 | | |
| RSRP Note 3 | dBm/15 kHz | -94 | | |
|  | dB | 4 | | |
| SCH\_RP Note 3 | dBm/15 kHz | -94 | | |
|  | dB | 4 | | |
| Propagation Condition |  | AWGN | | |
| NOTE 1: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

Table 9.4.1.5-3: UTRAN FDD cell specific test parameters for UTRAN FDD CPICH Ec/No absolute measurement accuracy test in E-UTRAN FDD

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
| Cell 2 | Cell 2 | Cell 2 |
| CPICH\_Ec/Ior | | dB | -10 | -10 | -10 |
| PCCPCH\_Ec/Ior | | dB | -12 | -12 | -12 |
| SCH\_Ec/Ior | | dB | -12 | -12 | -12 |
| PICH\_Ec/Ior | | dB | -15 | -15 | -15 |
| DPCH\_Ec/Ior | | dB | - | - | - |
| OCNS\_Ec/Ior | | dB | -0.94 | -0.94 | -0.94 |
| Ioc | Band I, IV, VI, X, XI, XIX, XXI | dBm/ 3.84 MHz | -53.12 | -87.27 | -93.76 |
| Band II, V, VII | -91.76 |
| Band XXV, XXVI | -90.26 (Note 3) |
| Band III, VIII, XII, XIII, XIV, XX, XXII | -90.76 |
| Band IX (Note 2) | -92.76 |
| Îor/Ioc | | dB | -1.45 | -4.4 | -9.14 |
| CPICH Ec/Io, Note 1 | | dBm | -13.8 | -15.75 | -19.64 |
| Io, Note 1 | Band I, IV, VI, X, XI, XIX, XXI | dBm/ 3.84 MHz | -50.77 | -85.92 | -93.26 |
| Band II, V, VII | -91.26 |
| Band XXV, XXVI | -89.76 (Note 3) |
| Band III, VIII, XII, XIII, XIV, XX, XXII | -90.26 |
| Band IX (Note 2) | -92.26 |
| Propagation condition | | - | AWGN | AWGN | AWGN |
| NOTE 1: CPICH Ec/Io and Iolevels have been calculated from other parameters for information purposes. They are not settable parameters themselves.  NOTE 2: For the UE which supports both Band III and Band IX operating frequencies, the measurement performance requirements for Band III shall apply to the multi-band UE.  NOTE 3: The test parameter is modified by -1.5 dB when the carrier frequency of the assigned UTRA channel is within 869-894 MHz for the UE which supports both Band V and Band XXVI operating frequencies. | | | | | |
| Tests shall be done sequentially. Test 1 shall be done first. After test 1 has been executed test parameters for tests 2 and 3 shall be set within 5 seconds so that UE does not lose the Cell 2 in between the tests. | | | | | |

Each UTRAN FDD CPICH Ec/No absolute measurement accuracy test shall meet the reported values test requirements in table 9.4.1.5-4.

Table 9.4.1.5-4: UTRAN FDD CPICH Ec/No absolute measurement accuracy requirements for the reported values

|  |  |  |  |
| --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 |
| Normal Conditions | | | |
| Lowest reported value | CPICH\_Ec/No\_17 | CPICH\_Ec/No\_13 | CPICH\_Ec/No\_0 |
| Highest reported value | CPICH\_Ec/No\_24 | CPICH\_Ec/No\_22 | CPICH\_Ec/No\_16 |
| Extreme Conditions | | | |
| Lowest reported value | CPICH\_Ec/No\_14 | CPICH\_Ec/No\_11 | CPICH\_Ec/No\_0 |
| Highest reported value | CPICH\_Ec/No\_27 | CPICH\_Ec/No\_24 | CPICH\_Ec/No\_16 |

### 9.4.2 E-UTRAN TDD - UTRA FDD CPICH Ec/No absolute accuracy

#### 9.4.2.1 Test purpose

To verify that the E-UTRAN TDD - UTRA FDD CPICH Ec/No absolute measurement accuracy is within the specified limits.

#### 9.4.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward that support UTRA FDD.

#### 9.4.2.3 Minimum conformance requirements

The accuracy requirements shall be the same as the inter-frequency measurement accuracy requirements for FDD CPICH Ec/No.

The accuracy requirements in table 9.4.2.3-1 are valid under the following conditions:

CPICH\_RSCP|dBm ≥ -114 dBm for Bands I, IV, VI, X, XI, XIX and XXI,

CPICH\_RSCP|dBm ≥ -113 dBm for Band IX

CPICH\_RSCP|dBm ≥ -112 dBm for Bands II, V and VII,

CPICH\_RSCP|dBm ≥ -111 dBm for Band III, VIII, XII, XIII, XIV and XX,

CPICH\_RSCP|dBm ≥ -110.5 dBm for Band XXV.



Table 9.4.2.3-1: UTRAN FDD CPICH\_Ec/Io absolute accuracy

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Accuracy [dB] | | Conditions | | | | |
| Normal condition | Extreme condition | Band I, IV, VI, X, XI, XIX and XXI | Band II, V and VII | Band XXV and XXVI | Band III, VIII, XII, XIII, XIV, XX and XXII | Band IX |
| Io [dBm/3,84 MHz] | Io [dBm/3,84 MHz] | Io [dBm/3,84 MHz] | Io [dBm/3,84 MHz] | Io [dBm/3,84 MHz] |
| CPICH\_Ec/Io | dB | ± 1.5 for ‑14  ≤  CPICH Ec/Io  ± 2 for ‑16  ≤  CPICH Ec/Io  <  -14  ± 3 for ‑20  ≤  CPICH Ec/Io  <  -16 | ± 3 | -94...-50 | -92…-50 | -90.5...-50  (Note) | -91…-50 | -93...-50 |
| NOTE: The condition is -92…-50 dBm/3.84 MHz when the carrier frequency of the assigned UTRA channel is within 869-894 MHz for the UE which supports both Band V and Band XXVI operating frequencies. | | | | | | | | |

If the UE, in RRC\_CONNECTED state, needs measurement gaps to perform UTRAN FDD measurements, the UTRAN FDD measurement procedure and measurement gap pattern stated in 3GPP TS 36.133 [4] clause 8.1.2.4.1 shall apply.

The reporting range is for *CPICH Ec/Io* is from -24 ...0 dB.

In table 9.4.2.3-2 the mapping of measured quantity is defined. The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.4.2.3-2: UTRAN FDD CPICH\_Ec/Io measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| CPICH\_Ec/No\_00 | CPICH Ec/Io < ‑24 | dB |
| CPICH\_Ec/No\_01 | -24 ≤ CPICH Ec/Io < ‑23.5 | dB |
| CPICH\_Ec/No\_02 | -23.5 ≤ CPICH Ec/Io < ‑23 | dB |
| … | … | … |
| CPICH\_Ec/No\_47 | -1 ≤ CPICH Ec/Io < -0.5 | dB |
| CPICH\_Ec/No\_48 | -0.5 ≤ CPICH Ec/Io < 0 | dB |
| CPICH\_Ec/No\_49 | 0 ≤ CPICH Ec/Io | dB |

The normative reference for this requirement is 3GPP TS 25.133 [21] clauses 9.1.2.2.1 and 9.1.2.3 and 3GPP TS 36.133 [4] clauses 9.2.3 and A.9.4.2.

#### 9.4.2.4 Test description

##### 9.4.2.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.22 for UE with 2Rx RF band and Annex A, Figure A.86 for 4Rx capable UE without any 2Rx RF bands.

2. The general test parameter settings are set up according to Table 9.4.2.4.1-1.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 9.4.2.4.3.

5. Cell 1 is the serving E-UTRAN TDD cell and Cell 2 is the target UTRAN FDD cell. Cell 1 is the cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

Table 9.4.2.4.1-1: General test parameters for UTRAN FDD CPICH Ec/No absolute measurement accuracy test in E-UTRAN TDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| PDSCH parameters |  | DL Reference Measurement Channel R.0 TDD | As specified in clause A.1.2 |
| PCFICH/PDCCH/PHICH parameters |  | DL Reference Measurement Channel R.6 TDD | As specified in clause A.2.2 |
| E-UTRAN RF Channel Number |  | 1 | One E-UTRAN TDD carrier frequency is used. |
| UTRAN RF Channel Number |  | 1 | One UTRAN FDD carrier frequency is used. |
| E-UTRAN Channel Bandwidth (BWchannel) | MHz | 10 |  |
| Active cell |  | Cell 1 | E-UTRAN cell 1 on RF channel number 1 |
| Neighbour cells |  | Cell 2 | UTRAN cell 2 on RF channel number 1 |
| Gap Pattern Id |  | 0 | As specified in 3GPP TS 36.133 clause 8.1.2.1. |
| Inter-RAT (UTRAN FDD) measurement quantity |  | CPICH Ec/N0 |  |
| Monitored UTRA FDD cell list size |  | 12 | UTRA cells on UTRA RF channel 1 provided in the cell list. |
| CP length |  | Normal |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| DRX |  | OFF | OFF |

##### 9.4.2.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Set the parameters according to Tables 9.4.2.5-1 and 9.4.2.5-2 as appropriate for Test 1. Propagation conditions are set according to Annex B clause B.1.1.

3. SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, SS shall check CPICH\_Ec/Io reported values of Cell 2 in periodical MeasurementReport messages according to Table 9.4.2.5-3 as appropriate for Test 1. If the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one.

7. SS shall check the MeasurementReport message transmitted by the UE until the confidence level according to Tables G.2.3-1 in Annex G.2 is achieved.

8. If Test 2 not done, set the parameters according to Tables 9.4.2.5-1 and 9.4.2.5-2 for Test 2. While RF parameters are being changed any MeasurementReport messages send from the UE shall be ignored by the SS. SS shall wait for an additional 1s and still ignore any MeasurementReport messages send from the UE. Then, step 6 and 7 above are repeated as appropriate for Test 2.

9. If Test 3 not done, set the parameters according to Tables 9.4.2.5-1 and 9.4.2.5-2 for Test 3. While RF parameters are being changed any MeasurementReport messages send from the UE shall be ignored by the SS. SS shall wait for an additional 1s and still ignore any MeasurementReport messages send from the UE. Then, step 6 and 7 above are repeated as appropriate for Test 3.

##### 9.4.2.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] values 4.6 with the following exceptions:

Table 9.4.2.4.3-1: *MeasConfig- DEFAULT:* Additional E-UTRAN TDD - UTRA FDD CPICH Ec/No absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 4.6.6, Table 4.6.6-1 MeasConfig-DEFAULT: | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig-DEFAULT ::= SEQUENCE { |  |  |  |
| measObjectToRemoveList | Not present |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE { | 2 entry |  |  |
| MeasObjectToAddMod SEQUENCE { |  |  |  |
| measObjectId | IdMeasObject-f1 |  |  |
| measObject CHOICE { |  |  |  |
| measObject EUTRA | MeasObjectEUTRA-GENERIC(f1) | E-UTRA Cell |  |
| } |  |  |  |
| } |  |  |  |
| MeasObjectToAddMod SEQUENCE { |  |  |  |
| measObjectId | IdMeasObject-f8 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectUTRA | MeasObjectUTRA-GENERIC(f8) | UTRA Cell |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToRemoveList | Not present |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId) )OF SEQUENCE { | 1 entry |  |  |
| reportConfigId | idReportConfig-P |  |  |
| reportConfig | ReportConfigInterRAT-PERIODICAL |  |  |
| } |  |  |  |
| measIdToRemoveList | Not present |  |  |
| measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) of SEQUENCE { | 1 entry |  |  |
| measId | 1 |  |  |
| measObjectId | IdMeasObject-f8 |  |  |
| reportConfigId | idReportConfig-P |  |  |
| } |  |  |  |
| quantityConfig | QuantityConfig-DEFAULT |  |  |
| measGapConfig | MeasGapConfig-GP1 |  |  |
| s-Measure | Not present |  |  |
| preRegistrationInfoHRPD | Not present |  |  |
| speedStatePars | Not present |  |  |
| } |  |  |  |

Table 9.4.2.4.3-2: *MeasResults*: Additional E-UTRAN TDD - UTRA FDD CPICH Ec/No absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 |  |  |
| measResultServCell |  |  |  |
| rsrpResult | INTEGER(0..97) |  |  |
| rsrqResult | INTEGER(0..34) |  |  |
| } |  |  |  |
| measResultNeighCells CHOICE { |  |  |  |
| measResultListUTRA | MeasResultListUTRA |  |  |
| } |  |  |  |
| } |  |  |  |

Table 9.4.2.4.3-3: MeasResultListUTRA: Additional E-UTRAN TDD - UTRA FDD CPICH Ec/No absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResultsLIstEUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { |  |  |  |
| physCellId CHOICE { |  |  |  |
| fdd | PhysCellIdUTRA-FDD |  |  |
| tdd | Not Present |  |  |
| } |  |  |  |
| measResult SEQUENCE { |  |  |  |
| utra-EcN0 | According to specific test |  |  |
| } |  |  |  |
| } |  |  |  |

#### 9.4.2.5 Test requirement

The test parameters are given in Tables 9.4.2.4.1-1, 9.4.2.5-1 and 9.4.2.5-2 as below. Table 9.4.2.5-1 and 9.4.2.5-2 define the primary level settings including test tolerances for all tests.

Each UTRAN FDD CPICH Ec/No absolute measurement accuracy test shall meet the reported values test requirements in table 9.4.2.5-3.

Table 9.4.2.5-1: E-UTRAN TDD cell specific test parameters for UTRAN FDD CPICH Ec/No absolute measurement accuracy test in E-UTRAN TDD

| Parameter | Unit | Test 1 | Test 2 | Test 3 |
| --- | --- | --- | --- | --- |
| E-UTRAN RF Channel Number |  | 1 | | |
| BWchannel | MHz | 10 | | |
| Special subframe configurationNote1 |  | 6 | | |
| Uplink-downlink configurationNote1 |  | 1 | | |
| OCNG Patterns defined in D.2.1 (OP.1 TDD) |  | OP.1 TDD | | |
| PBCH\_RA | dB | 0 | | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 2 | dB |
| OCNG\_RBNote 2 | dB |
| Note 3 | dBm/15 kHz | -98 | | |
| RSRP Note 4 | dBm/15 kHz | -94 | | |
|  | dB | 4 | | |
| SCH\_RP Note 4 | dBm/15 kHz | -94 | | |
|  | dB | 4 | | |
| Propagation Condition |  | AWGN | | |
| NOTE 1: For special subframe and uplink-downlink configurations see Tables 4.2-1 and 4.2-2 in 3GPP TS 36.211.  NOTE 2: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 4: RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

Table 9.4.2.5-2: UTRAN FDD cell specific test parameters for UTRAN FDD CPICH Ec/No absolute measurement accuracy test in E-UTRAN TDD

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
| Cell 2 | Cell 2 | Cell 2 |
| CPICH\_Ec/Ior | | dB | -10 | -10 | -10 |
| PCCPCH\_Ec/Ior | | dB | -12 | -12 | -12 |
| SCH\_Ec/Ior | | dB | -12 | -12 | -12 |
| PICH\_Ec/Ior | | dB | -15 | -15 | -15 |
| DPCH\_Ec/Ior | | dB | - | - | - |
| OCNS\_Ec/Ior | | dB | -0.94 | -0.94 | -0.94 |
| Ioc | Band I, IV, VI, X, XIX | dBm/ 3.84 MHz | -53.12 | -87.27 | -93.76 |
| Band II, V, VII, XI | -91.76 |
| Band XXV, XXVI | -90.26 (Note 3) |
| Band III, VIII, XII, XIII, XIV, XXII | -90.76 |
| Band IX (Note 2) | -92.76 |
| Îor/Ioc | | dB | -1.45 | -4.4 | -9.14 |
| CPICH Ec/Io, Note 1 | | dBm | -13.8 | -15.75 | -19.64 |
| Io, Note 1 | Band I, IV, VI, X, XIX | dBm/ 3.84 MHz | -50.77 | -85.92 | -93.26 |
| Band II, V, VII, XI | -91.26 |
| Band XXV, XXVI | -89.76 (Note 3) |
| Band III, VIII, XII, XIII, XIV, XXII | -90.26 |
| Band IX (Note 2) | -92.26 |
| Propagation condition | | - | AWGN | AWGN | AWGN |
| NOTE 1: CPICH Ec/Io and Iolevels have been calculated from other parameters for information purposes. They are not settable parameters themselves.  NOTE 2: For the UE which supports both Band III and Band IX operating frequencies, the measurement performance requirements for Band III shall apply to the multi-band UE.  NOTE 3: The test parameter is modified by -1.5 dB when the carrier frequency of the assigned UTRA channel is within 869-894 MHz for the UE which supports both Band V and Band XXVI operating frequencies. | | | | | |
| Tests shall be done sequentially. Test 1 shall be done first. After test 1 has been executed test parameters for tests 2 and 3 shall be set within 5 seconds so that UE does not loose the Cell 2 in between the tests. | | | | | |

Table 9.4.2.5-3: UTRAN FDD CPICH Ec/No absolute measurement accuracy requirements for the reported values

|  |  |  |  |
| --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 |
| Normal Conditions | | | |
| Lowest reported value | CPICH\_Ec/No\_17 | CPICH\_Ec/No\_13 | CPICH\_Ec/No\_0 |
| Highest reported value | CPICH\_Ec/No\_24 | CPICH\_Ec/No\_22 | CPICH\_Ec/No\_16 |
| Extreme Conditions | | | |
| Lowest reported value | CPICH\_Ec/No\_14 | CPICH\_Ec/No\_11 | CPICH\_Ec/No\_0 |
| Highest reported value | CPICH\_Ec/No\_27 | CPICH\_Ec/No\_24 | CPICH\_Ec/No\_16 |

### 9.4.3 E-UTRAN FDD - UTRA FDD CPICH Ec/No absolute accuracy for 5MHz bandwidth

#### 9.4.3.1 Test purpose

To verify that the E-UTRAN FDD - UTRA FDD CPICH Ec/No absolute measurement accuracy is within the specified limits for bands within band group FDD\_N.

#### 9.4.3.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward that support E-UTRA bands within band group FDD\_N and UTRA FDD.

#### 9.4.3.3 Minimum conformance requirements

The measurement period for RRC\_CONNECTED state is specified in 3GPP TS 36.133 [4] clauses 8.1.2.4.1 and 8.1.2.4.2.

In RRC\_CONNECTED state the accuracy requirements shall be the same as the inter-frequency measurement accuracy requirements for FDD CPICH Ec/No in 3GPP TS 25.133 [18].

If the UE, in RRC\_CONNECTED state, needs measurement gaps to perform UTRAN FDD measurements, the UTRAN FDD measurement procedure and measurement gap pattern stated in 3GPP TS 36.133 [4] clause 8.1.2.4.1 shall apply.

The reporting range is for *CPICH Ec/Io* is from -24 ...0 dB.

In table 9.4.3.3-2 the mapping of measured quantity is defined.

The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.4.3.3-2: UTRA FDD CPICH\_Ec/Io measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| CPICH\_Ec/No\_00 | CPICH Ec/Io < ‑24 | dB |
| CPICH\_Ec/No\_01 | -24 ≤ CPICH Ec/Io < ‑23.5 | dB |
| CPICH\_Ec/No\_02 | -23.5 ≤ CPICH Ec/Io < ‑23 | dB |
| … | … | … |
| CPICH\_Ec/No\_47 | -1 ≤ CPICH Ec/Io < -0.5 | dB |
| CPICH\_Ec/No\_48 | -0.5 ≤ CPICH Ec/Io < 0 | dB |
| CPICH\_Ec/No\_49 | 0 ≤ CPICH Ec/Io | dB |

The normative reference for this requirement is 3GPP TS 25.133 [21] clauses 9.1.2.2.1 and 9.1.2.3 and 3GPP TS 36.133 [4] clause 9.2.3 and A.9.4.3.

#### 9.4.3.4 Test description

##### 9.4.3.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 5MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.22.

2. The general test parameter settings are set up according to Table 9.4.3.4.1-1.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 9.4.3.4.3.

5. Cell 1 is the serving cell and Cell 2 is the target cell. Cell 1 is the cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

Table 9.4.3.4.1-1: General test parameters for UTRAN FDD CPICH Ec/No absolute measurement accuracy test in E-UTRAN FDD for 5MHz bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| PDSCH parameters |  | DL Reference Measurement Channel R.5 FDD | As specified in clause A.1.1 |
| PCFICH/PDCCH/PHICH parameters |  | DL Reference Measurement Channel R.11 FDD | As specified in clause A.2.1 |
| E-UTRAN Channel Bandwidth (BWchannel) | MHz | 5 |  |
| NOTE: See Table 9.4.1.5-1 for other general test parameters. | | | |

##### 9.4.3.4.2 Test procedure

Same test procedure as defined in clause 9.4.1.4.2 with the following exceptions:

- Instead of Table 9.4.1.5-2 🡪 use Table 9.4.3.5-1.

##### 9.4.3.4.3 Message contents

Same message contents as defined in clause 9.4.1.4.3.

#### 9.4.3.5 Test requirement

The test parameters are given in Tables 9.4.1.4.1-1, 9.4.3.5-1 and 9.4.1.5-3. Tables 9.4.3.5-1 and 9.4.1.5-3 define the primary level settings including test tolerances for all tests.

Table 9.4.1.5-4 defines the UTRAN FDD CPICH Ec/No absolute measurement accuracy requirements for the reported values.

Table 9.4.3.5-1: E-UTRAN FDD cell specific test parameters for UTRAN FDD CPICH Ec/No absolute measurement accuracy test in E-UTRAN FDD for 5MHz bandwidth

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
| E-UTRAN RF Channel Number | |  | 1 | | |
| BWchannel | | MHz | 5 | | |
| OCNG Patterns defined in A.3.2.1.15 (OP.15 FDD) | |  | OP.15 FDD | | |
| PBCH\_RA | | dB | 0 | | |
| PBCH\_RB | | dB |
| PSS\_RA | | dB |
| SSS\_RA | | dB |
| PCFICH\_RB | | dB |
| PHICH\_RA | | dB |
| PHICH\_RB | | dB |
| PDCCH\_RA | | dB |
| PDCCH\_RB | | dB |
| PDSCH\_RA | | dB |
| PDSCH\_RB | | dB |
| OCNG\_RANote 1 | | dB |
| OCNG\_RBNote 1 | | dB |
| Note 2 | Bands FDD\_N | dBm/15 kHz | -98 | | |
| RSRP Note 3 | Bands FDD\_N | dBm/15 kHz | -94 | | |
|  | | dB | 4 | | |
| SCH\_RP Note 3 | Bands FDD\_N | dBm/15 kHz | -94 | | |
|  | | dB | 4 | | |
| IoNote3 | Bands FDD\_N | dBm/4.5 MHz | -67.8 | | |
| Propagation Condition | |  | AWGN | | |
| NOTE 1: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

## 9.5 UTRAN TDD P-CCPCH RSCP

### 9.5.1 E-UTRAN FDD - UTRA TDD P-CCPCH RSCP absolute accuracy

#### 9.5.1.1 Test purpose

To verify that the UTRAN TDD P-CCPCH RSCP absolute measurement accuracy is within the specified limits.

#### 9.5.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward that support UTRA TDD. Applicability requires support for FGI bit 39.

This test applies to all types of E-UTRA TDD UE release 9 and forward that support UTRA TDD and not supporting UTRA FDD. Applicability requires support for FGI bit 22.

#### 9.5.1.3 Minimum conformance requirements

In RRC\_CONNECTED state the accuracy requirements shall be the same as the inter-frequency measurement accuracy requirements for URAN TDD P-CCPCH RSCP in 3GPP TS 25.123 [22].

The accuracy requirements in table 9.5.1.3-1 are valid under the following conditions:

P-CCPCH RSCP ≥ -102 dBm

P-CCPCH Ec/Io > -8 dB

DwPCH\_Ec/Io > -5 dB

Table 9.5.1.3-1: UTRAN TDD P-CCPCH absolute accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Accuracy [dB] | | Conditions |
| Normal condition | Extreme condition | Io [dBm/ 1.28 MHz] |
| P-CCPCH\_RSCP | dBm | ± 6 | ± 9 | -94...-70 |
| dBm | ± 8 | ± 11 | -70...-50 |

If the UE, in RRC\_CONNECTED state, needs measurement gaps to perform UTRAN TDD measurements, the UTRAN TDD measurement procedure and measurement gap pattern stated in 3GPP TS 36.133 [4] clause 8.1.2.4.3 shall apply.

The reporting range is for URAN TDD P-CCPCH RSCP is from -115 …-25 dBm.

In table 9.5.1.3-2 the mapping of measured quantity is defined.

The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.5.1.3-2: UTRAN TDD P-CCPCH absolute accuracy measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| P-CCPCH RSCP\_LEV\_-05 | P-CCPCH RSCP <-120 | dBm |
| P-CCPCH RSCP\_LEV\_-04 | -120 ≤ P-CCPCH RSCP < -119 | dBm |
| P-CCPCH RSCP\_LEV\_-03 | -119 ≤ P-CCPCH RSCP < -118 | dBm |
| … | … | … |
| PCCPCH\_RSCP\_LEV\_89 | -27 ≤ PCCPCH RSCP< -26 | dBm |
| PCCPCH\_RSCP\_LEV\_90 | -26 ≤ PCCPCH RSCP< -25 | dBm |
| PCCPCH\_RSCP\_LEV\_91 | -25 ≤ PCCPCH RSCP | dBm |

The normative reference for this requirement is 3GPP TS 25.123 [22] clause 9.1.1.1.1.2, clause 9.1.1.1.3 and 3GPP TS 36.133 [4] clause 9.3.1 and A.9.5.1.

#### 9.5.1.4 Test description

##### 9.5.1.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.22 for UE with 2Rx RF band and Annex A, Figure A.86 for 4Rx capable UE without any 2Rx RF bands.

2. The general test parameter settings are set up according to Table 9.5.1.4.1-1.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 9.5.1.4.3.

5. Cell 1 is the serving E-UTRAN FDD cell and Cell 2 is the target UTRAN TDD cell. Cell 1 is the cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

Table 9.5.1.4.1-1: General test parameters for UTRAN TDD P-CCPCH RSCP absolute measurement accuracy test in E-UTRAN FDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| PDSCH parameters |  | DL Reference Measurement Channel R.0 FDD | As specified in clause A.1.1 |
| PCFICH/PDCCH/PHICH parameters |  | DL Reference Measurement Channel R.6 FDD | As specified in clause A.2.1 |
| E-UTRAN RF Channel Number |  | 1 | One E-UTRAN FDD carrier frequency is used. |
| UTRAN RF Channel Number |  | 2 | One UTRAN TDD carrier frequency is used. |
| E-UTRAN Channel Bandwidth (BWchannel) | MHz | 10 |  |
| Active cell |  | Cell 1 | E-UTRA FDD cell1 on RF channel number 1 |
| Neighbour cell |  | Cell 2 | 1.28Mcps UTRA TDD Cell2 on RF channel number 2 |
| Gap Pattern Id |  | 1 | As specified in 3GPP TS 36.133 [4] clause 8.1.2.1. |
| CP length of cell 1 |  | Normal |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| DRX |  | OFF |  |
| Inter-RAT (UTRAN TDD) measurement quantity |  | P-CCPCH RSCP |  |

##### 9.5.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Set the parameters according to Table 9.5.1.5-1 as appropriate. Propagation conditions are set according to Annex B clause B.1.1.

3. SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, SS shall check P-CCPCH RSCP reported values of Cell 2 in periodical MeasurementReport messages according to Table 9.5.1.5-3. If the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one.

7. SS shall check the MeasurementReport message transmitted by the UE until the confidence level according to Tables G.2.3-1 in Annex G.2 is achieved.

8. Repeat step 1-7 for each sub-test in Table 9.5.1.5-1 as appropriate.

##### 9.5.1.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.5.1.4.3-1: Common Exception messages for E-UTRAN FDD - UTRA TDD P-CCPCH RSCP absolute accuracy test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1 Table H.3.1-7 |

Table 9.5.1.4.3-2: *MeasConfig- DEFAULT:* Additional E-UTRAN FDD - UTRA TDD P-CCPCH RSCP absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 4.6.6, Table 4.6.6-1 MeasConfig-DEFAULT: | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig-DEFAULT ::= SEQUENCE { |  |  |  |
| measObjectToRemoveList | Not present |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE { | 2 entry |  |  |
| MeasObjectToAddMod SEQUENCE { |  |  |  |
| measObjectId | IdMeasObject-f1 |  |  |
| measObject CHOICE { |  |  |  |
| measObject EUTRA | MeasObjectEUTRA-GENERIC(f1) | E-UTRA Cell |  |
| } |  |  |  |
| } |  |  |  |
| MeasObjectToAddMod SEQUENCE { |  |  |  |
| measObjectId | IdMeasObject-f2 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectUTRA | MeasObjectUTRA-GENERIC(f2) | UTRA Cell |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToRemoveList | Not present |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId) )OF SEQUENCE { | 1 entry |  |  |
| reportConfigId | idReportConfig-P |  |  |
| reportConfig | ReportConfigInterRAT-PERIODICAL |  |  |
| } |  |  |  |
| measIdToRemoveList | Not present |  |  |
| measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) of SEQUENCE { | 1 entry |  |  |
| measId | 1 |  |  |
| measObjectId | IdMeasObject-f2 |  |  |
| reportConfigId | idReportConfig-P |  |  |
| } |  |  |  |
| quantityConfig SEQUENCE { |  |  |  |
| quantityConfigUTRA SEQUENCE { |  |  | UTRAN |
| measQuantityUTRA-TDD | pccpch-RSCP |  |  |
| } |  |  |  |
| } |  |  |  |
| measGapConfig | MeasGapConfig-GP2 |  |  |
| s-Measure | Not present |  |  |
| preRegistrationInfoHRPD | Not present |  |  |
| speedStatePars | Not present |  |  |
| } |  |  |  |

Table 9.5.1.4.3-3: *MeasResults*: Additional E-UTRAN FDD - UTRA TDD P-CCPCH RSCP absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 |  |  |
| measResultServCell |  |  |  |
| rsrpResult | INTEGER(0..97) |  |  |
| rsrqResult | INTEGER(0..34) |  |  |
| } |  |  |  |
| measResultNeighCells CHOICE { |  |  |  |
| measResultListUTRA | MeasResultListUTRA |  |  |
| } |  |  |  |
| } |  |  |  |

Table 9.5.1.4.3-4: MeasResultListUTRA: Additional E-UTRAN FDD - UTRA TDD P-CCPCH RSCP absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResultsListUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { |  |  |  |
| physCellId CHOICE { |  |  |  |
| fdd | Not Present |  |  |
| tdd | PhysCellIdUTRA-TDD |  |  |
| } |  |  |  |
| measResult SEQUENCE { |  |  |  |
| utra-RSCP | Set according to specific test INTEGER (-5..91) |  |  |
| } |  |  |  |
| } |  |  |  |

#### 9.5.1.5 Test requirement

The test parameters are given in Tables 9.5.1.4.1-1, 9.5.1.5-1 and 9.5.1.5-2 as below. Table 9.5.1.5-2 and 9.5.1.5-3 define the primary level settings including test tolerances for all tests.

Table 9.5.1.5-1: E-UTRAN FDD cell specific test parameters for UTRAN TDD P-CCPCH RSCP absolute measurement accuracy test in E-UTRAN TDD

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | Test 2 | Test 3 |
| E-UTRA RF Channel Number |  | 1 | | |
| BWchannel | MHz | 10 | | |
| OCNG Patterns defined in D.1.1 (OP.1 FDD) |  | OP.1 FDD | | |
| PBCH\_RA | dB | 0 | | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote1 |
| OCNG\_RBNote1 |
| Note2 | dBm/15 kHz | -98 | | |
|  | dB | 4 | | |
| RSRPNote3 | dBm/15 kHz | -94 | | |
| IoNote3 | dBm/9 MHz | -64.76 | | |
|  | dB | 4 | | |
| Propagation condition | - | AWGN | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | |

Table 9.5.1.5-2: UTRAN TDD cell specific test parameters for UTRAN TDD P-CCPCH RSCP absolute measurement accuracy test in E-UTRAN FDD

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
| DL timeslot number |  | 0 | DwPTS | 0 | DwPTS | 0 | DwPTS |
| UTRA RF Channel number Note2 |  | Channel 2 | | Channel 2 | | Channel 2 | |
| PCCPCH\_Ec/Ior | dB | -3 |  | -3 |  | -3 |  |
| DwPCH\_Ec/Ior | dB |  | 0 |  | 0 |  | 0 |
| OCNS\_Ec/Ior | dB | -3 |  | -3 |  | -3 |  |
| Ioc | dBm/1.28MHz | -54.9 | | -75.2 | | -96.8 | |
| Îor/Ioc | dB | 2 | | 5 | | 0 | |
| PCCPCH RSCP Note1 | dBm | -55.9 |  | -73.2 |  | -99.2 |  |
| Io Note1 | dBm/1.28MHz | -50.78 | | -69.01 | | -93.19 | |
| Propagation condition |  | AWGN | | | | | |
| NOTE 1: PCCPCH RSCP and Io levels have been calculated from other parameters for information purposes. They are not settable parameters themselves.  NOTE 2: In the case of multi-frequency network of 1.28 Mcps TDD, the UTRA RF Channel Number can be set for the primary frequency in this test. | | | | | | | |

Each UTRAN TDD P-CCPCH RSCP absolute measurement accuracy test shall meet the reported values test requirements in table 9.5.1.5-3.

Table 9.5.1.5-3: UTRAN TDD P-CCPCH RSCP absolute measurement accuracy requirements for the reported values

|  |  |  |  |
| --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | P-CCPCH RSCP\_LEV\_51 | P-CCPCH RSCP\_LEV 34 | P-CCPCH RSCP\_LEV 10 |
| Highest reported value (Cell 2) | P-CCPCH RSCP\_LEV\_68 | P-CCPCH RSCP\_LEV 51 | P-CCPCH RSCP\_LEV 23 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | P-CCPCH RSCP\_LEV\_48 | P-CCPCH RSCP\_LEV 31 | P-CCPCH RSCP\_LEV 07 |
| Highest reported value (Cell 2) | P-CCPCH RSCP\_LEV\_71 | P-CCPCH RSCP\_LEV 54 | P-CCPCH RSCP\_LEV 26 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 9.5.2 E-UTRAN TDD - UTRA TDD P-CCPCH RSCP absolute accuracy

#### 9.5.2.1 Test purpose

To verify that the UTRAN TDD P-CCPCH RSCP absolute measurement accuracy is within the specified limits.

#### 9.5.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward that support UTRA TDD. Applicability requires support for FGI bit 39.

This test applies to all types of E-UTRA TDD UE release 9 and forward that support UTRA TDD and not supporting UTRA FDD. Applicability requires support for FGI bit 22.

#### 9.5.2.3 Minimum conformance requirements

In RRC\_CONNECTED state the accuracy requirements shall be the same as the inter-frequency measurement accuracy requirements for URAN TDD P-CCPCH RSCP in 3GPP TS 25.123 [22].

The accuracy requirements in table 9.5.2.3-1 are valid under the following conditions:

P-CCPCH RSCP ≥ -102 dBm

P-CCPCH Ec/Io > -8 dB

DwPCH\_Ec/Io > -5 dB

Table 9.5.2.3-1: UTRAN TDD P-CCPCH absolute accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Accuracy [dB] | | Conditions |
| Normal condition | Extreme condition | Io [dBm/ 1.28 MHz] |
| P-CCPCH\_RSCP | dBm | ± 6 | ± 9 | -94...-70 |
| dBm | ± 8 | ± 11 | -70...-50 |

If the UE, in RRC\_CONNECTED state, needs measurement gaps to perform UTRAN TDD measurements, the UTRAN TDD measurement procedure and measurement gap pattern stated in 3GPP TS 36.133 [4] clause 8.1.2.4.3 shall apply.

The reporting range is for URAN TDD P-CCPCH RSCP is from -115 …-25 dBm.

In table 9.5.2.3-2 the mapping of measured quantity is defined.

The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.5.2.3-2: UTRAN TDD P-CCPCH absolute accuracy measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| PCCPCH\_RSCP\_LEV -05 | P-CCPCH RSCP <-120 | dBm |
| PCCPCH\_RSCP\_LEV -04 | -120 ≤ P-CCPCH RSCP < -119 | dBm |
| PCCPCH\_RSCP\_LEV -03 | -119 ≤ P-CCPCH RSCP < -118 | dBm |
| … | … | … |
| PCCPCH\_RSCP\_LEV\_89 | -27 ≤ PCCPCH RSCP< -26 | dBm |
| PCCPCH\_RSCP\_LEV\_90 | -26 ≤ PCCPCH RSCP< -25 | dBm |
| PCCPCH\_RSCP\_LEV\_91 | -25 ≤ PCCPCH RSCP | dBm |

The normative reference for this requirement is 3GPP TS 25.123 [22] clause 9.1.1.1.1.2, clause 9.1.1.1.3 and 3GPP TS 36.133 [4] clause 9.3.1 and A.9.5.2.

#### 9.5.2.4 Test description

##### 9.5.2.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.22 for UE with 2Rx RF band and Annex A, Figure A.86 for 4Rx capable UE without any 2Rx RF bands.

2. The general test parameter settings are set up according to Table 9.5.2.4.1-1.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 9.5.2.4.3.

5. Cell 1 is the serving E-UTRAN TDD cell and Cell 2 is the target UTRAN TDD cell. Cell 1 is the cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

Table 9.5.2.4.1-1: General test parameters for UTRAN TDD P-CCPCH RSCP absolute measurement accuracy test in E-UTRAN TDD

| Parameter | Unit | Value | Comment |
| --- | --- | --- | --- |
| PDSCH parameters |  | DL Reference Measurement Channel R.0 TDD | As specified in clause A.1.2 |
| PCFICH/PDCCH/PHICH parameters |  | DL Reference Measurement Channel R.6 TDD | As specified in clause A.2.2 |
| E-UTRAN RF Channel Number |  | 1 | One E-UTRAN TDD carrier frequency is used. |
| UTRAN RF Channel Number |  | 2 | One UTRAN TDD carrier frequency is used. |
| E-UTRAN Channel Bandwidth (BWchannel) | MHz | 10 |  |
| Active cell |  | Cell 1 | E-UTRA TDD cell1 on RF channel number 1 |
| Neighbour cell |  | Cell 2 | 1.28Mcps UTRA TDD Cell2 on RF channel number 2 |
| Gap Pattern Id |  | 1 | As specified in 3GPP TS 36.133 [4] clause 8.1.2.1. |
| Uplink-downlink configuration of cell 1 |  | 1 | As specified in table 4.2.2 in 3GPP TS 36.211 [9] |
| Special subframe configuration of cell 1 |  | 6 | As specified in table 4.2.1 in 3GPP TS 36.211 [9] |
| CP length of cell 1 |  | Normal |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| DRX |  | OFF |  |
| Time offset between cells | ms | 3 | Asynchronous cells |
| Inter-RAT (UTRAN TDD) measurement quantity |  | P-CCPCH RSCP |  |

##### 9.5.2.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Set the parameters according to Table 9.5.2.5-1 as appropriate. Propagation conditions are set according to Annex B clause B.1.1.

3. SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, SS shall check P-CCPCH RSCP reported values of Cell 2 in periodical MeasurementReport messages according to Table 9.5.2.5-3 If the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one..

7. SS shall check the MeasurementReport message transmitted by the UE until the confidence level according to Tables G.2.3-1 in Annex G.2 is achieved.

8. Repeat step 1-7 for each sub-test in Table 9.5.2.5-1 as appropriate.

##### 9.5.2.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.5.2.4.3-1: Common Exception messages for E-UTRAN TDD - UTRA TDD P-CCPCH RSCP absolute accuracy test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1 Table H.3.1-7 |

Table 9.5.2.4.3-2: *MeasConfig- DEFAULT:* Additional E-UTRAN TDD - UTRA TDD P-CCPCH RSCP absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 4.6.6, Table 4.6.6-1 MeasConfig-DEFAULT: | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasConfig-DEFAULT ::= SEQUENCE { |  |  |  |
| measObjectToRemoveList | Not present |  |  |
| measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE { | 2 entry |  |  |
| MeasObjectToAddMod SEQUENCE { |  |  |  |
| measObjectId | IdMeasObject-f1 |  |  |
| measObject CHOICE { |  |  |  |
| measObject EUTRA | MeasObjectEUTRA-GENERIC(f1) | E-UTRA Cell |  |
| } |  |  |  |
| } |  |  |  |
| MeasObjectToAddMod SEQUENCE { |  |  |  |
| measObjectId | IdMeasObject-f2 |  |  |
| measObject CHOICE { |  |  |  |
| measObjectUTRA | MeasObjectUTRA-GENERIC(f2) | UTRA Cell |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| reportConfigToRemoveList | Not present |  |  |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId) )OF SEQUENCE { | 1 entry |  |  |
| reportConfigId | idReportConfig-P |  |  |
| reportConfig | ReportConfigInterRAT-PERIODICAL |  |  |
| } |  |  |  |
| measIdToRemoveList | Not present |  |  |
| measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) of SEQUENCE { | 1 entry |  |  |
| measId | 1 |  |  |
| measObjectId | IdMeasObject-f2 |  |  |
| reportConfigId | idReportConfig-P |  |  |
| } |  |  |  |
| quantityConfig SEQUENCE { |  |  |  |
| quantityConfigUTRA SEQUENCE { |  |  | UTRAN |
| measQuantityUTRA-TDD | pccpch-RSCP |  |  |
| } |  |  |  |
| } |  |  |  |
| measGapConfig | MeasGapConfig-GP2 |  |  |
| s-Measure | Not present |  |  |
| preRegistrationInfoHRPD | Not present |  |  |
| speedStatePars | Not present |  |  |
| } |  |  |  |

Table 9.5.2.4.3-3: *MeasResults*: Additional E-UTRAN TDD - UTRA TDD P-CCPCH RSCP absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 |  |  |
| measResultServCell |  |  |  |
| rsrpResult | INTEGER(0..97) |  |  |
| rsrqResult | INTEGER(0..34) |  |  |
| } |  |  |  |
| measResultNeighCells CHOICE { |  |  |  |
| measResultListUTRA | MeasResultListUTRA |  |  |
| } |  |  |  |
| } |  |  |  |

Table 9.5.2.4.3-4: MeasResultListUTRA: Additional E-UTRAN TDD - UTRA TDD P-CCPCH RSCP absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResultsListUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { |  |  |  |
| physCellId CHOICE { |  |  |  |
| fdd | Not Present |  |  |
| tdd | PhysCellIdUTRA-TDD |  |  |
| } |  |  |  |
| measResult SEQUENCE { |  |  |  |
| utra-RSCP | Set according to specific test INTEGER (-5..91) |  |  |
| } |  |  |  |
| } |  |  |  |

#### 9.5.2.5 Test requirement

The test parameters are given in Tables 9.5.2.4.1-1, 9.5.2.5-1 and 9.5.2.5-2 as below. Table 9.5.2.5-2 and 9.5.2.5-3 define the primary level settings including test tolerances for all tests.

Table 9.5.2.5-1: E-UTRAN TDD cell specific test parameters for UTRAN TDD P-CCPCH RSCP absolute measurement accuracy test in E-UTRAN TDD

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | Test 2 | Test 3 |
| E-UTRA RF Channel Number |  | 1 | | |
| BWchannel | MHz | 10 | | |
| OCNG Patterns defined in D.2.1 (OP.1 TDD) |  | OP.1 TDD | | |
| PBCH\_RA | dB | 0 | | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote1 |
| OCNG\_RBNote1 |
| Note2 | dBm/15 kHz | -98 | | |
|  | dB | 4 | | |
| RSRPNote3 | dBm/15 kHz | -94 | | |
| IoNote3 | dBm/9 MHz | -64.76 | | |
|  | dB | 4 | | |
| Propagation condition | - | AWGN | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | |

Table 9.5.2.5-2: UTRAN TDD cell specific test parameters for UTRAN TDD P-CCPCH RSCP absolute measurement accuracy test in E-UTRAN TDD

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
| DL timeslot number |  | 0 | DwPTS | 0 | DwPTS | 0 | DwPTS |
| UTRA RF Channel number Note2 |  | Channel 2 | | Channel 2 | | Channel 2 | |
| PCCPCH\_Ec/Ior | dB | -3 |  | -3 |  | -3 |  |
| DwPCH\_Ec/Ior | dB |  | 0 |  | 0 |  | 0 |
| OCNS\_Ec/Ior | dB | -3 |  | -3 |  | -3 |  |
| Ioc | dBm/1.28MHz | -54.9 | | -75.2 | | -96.2 | |
| Îor/Ioc | dB | 2 | | 5 | | 0 | |
| PCCPCH RSCP Note1 | dBm | -55.9 |  | -73.2 |  | -99.2 |  |
| Io Note1 | dBm/1.28MHz | -50.78 | | -69.01 | | -93.19 | |
| Propagation condition |  | AWGN | | | | | |
| NOTE 1: PCCPCH RSCP and Io levels have been calculated from other parameters for information purposes. They are not settable parameters themselves.  NOTE 2: In the case of multi-frequency network of 1.28 Mcps TDD, the UTRA RF Channel Number can be set for the primary frequency in this test. | | | | | | | |

Each UTRAN TDD P-CCPCH RSCP absolute measurement accuracy test shall meet the reported values test requirements in table 9.5.2.5-3.

Table 9.5.2.5-3: UTRAN TDD P-CCPCH RSCP absolute measurement accuracy requirements  
for the reported values

|  |  |  |  |
| --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | P-CCPCH RSCP\_LEV\_51 | P-CCPCH RSCP\_LEV 34 | P-CCPCH RSCP\_LEV 10 |
| Highest reported value (Cell 2) | P-CCPCH RSCP\_LEV\_68 | P-CCPCH RSCP\_LEV 51 | P-CCPCH RSCP\_LEV 23 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | P-CCPCH RSCP\_LEV\_48 | P-CCPCH RSCP\_LEV 31 | P-CCPCH RSCP\_LEV 07 |
| Highest reported value (Cell 2) | P-CCPCH RSCP\_LEV\_71 | P-CCPCH RSCP\_LEV 54 | P-CCPCH RSCP\_LEV 26 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 9.6 GSM carrier RSSI

### 9.6.1 GSM RSSI accuracy for E-UTRAN FDD

#### 9.6.1.1 Test purpose

To verify that the GSM RSSI measurement accuracy is within the specified limits.

#### 9.6.1.2 Test applicability

This test applies all the types of E-UTRA FDD UE release 9 and forward that support GSM. Applicability requires support for FGI bits 16 and 23.

#### 9.6.1.3 Minimum conformance requirements

**Absolute accuracy**

The R.M.S received signal level at the receiver input shall be measured by the MS and the BSS over the full range of ‑110 dBm to ‑48 dBm with an absolute accuracy of ±4 dB from ‑110 dBm to ‑70 dBm under normal conditions and ±6 dB over the full range under both normal and extreme conditions. The R.M.S received signal level at the receiver input shall be measured by the MS above -48 dBm up to -38 dBm with an absolute accuracy of ± 9 dB under both normal and extreme conditions.

This requirement is summarized in Table 9.6.1.3-1.

Table 9.6.1.3-1: GSM RXLEV absolute accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Accuracy [dB] | | Conditions |
| Normal condition | Extreme condition | Input level dBm |
| RXLEV | dBm | ± 4 | ± 6 | -110…-70 |
| dBm | ± 6 | ± 6 | -70…-48 |
| dBm | ± 9 | ± 9 | -48..-38 |

The reporting range and mapping for RXLEV is summarized in Table 9.6.1.3-2.

Table 9.6.1.3-2: GSM RSSI measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| RXLEV\_00 | RXLEV < -110 | dBm |
| RXLEV\_01 | -110 ≤ RXLEV < -109 | dBm |
| RXLEV\_02 | -109 ≤ RXLEV < -108 | dBm |
| … | … | … |
| RXLEV\_61 | -50≤ RXLEV < -49 | dBm |
| RXLEV\_62 | -49 ≤ RXLEV < -48 | dBm |
| RXLEV\_63 | -48 ≤ RXLEV | dBm |

**Relative accuracy**

The relative accuracy shall be as follows:

If signals of level x1 and x2 dBm are received (where x1 ≤ x2) and levels y1 and y2 dBm respectively are measured, if x2 ‑ x1 < 20 dB and x1 is not below the reference sensitivity level, then y1 and y2 shall be such that:

(x2 ‑ x1) ‑ a ≤ y2 ‑ y1 ≤ (x2 ‑ x1 + b) if the measurements are on the same or on different RF channel within the same frequency band;

and

(x2 ‑ x1 ) ‑ c ≤ y2 ‑ y1 ≤( x2 ‑ x1 + d) if the measurements are on different frequency bands:

a, b, c and d are in dB and depend on the value of x1 as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | a | b | c | d |
| x1 ≥ s+14, x2< -48 dBm | 2 | 2 | 4 | 4 |
| s+14 > x1 ≥ s+1 | 3 | 2 | 5 | 4 |
| s+1 > x1 | 4 | 2 | 6 | 4 |
|  |  |  |  |  |

For single band MS and measurements between ARFCN in the same band for a multiband MS:

s = reference sensitivity level as specified in Table 9.6.1.3-3 (normative reference 3GPP TS 45.005 [16] Table 6.2-1a)

For measurements between ARFCN in different bands:

s = the reference sensitivity level as specified in Table 9.6.1.3-3 (normative reference 3GPP TS 45.005 [16] Table 6.2-1a) for the band including x1.

Table 9.6.1.3-3: Reference sensitivity level for MS

|  |  |  |
| --- | --- | --- |
| GSM 400 MS | for GSM 400 small MS | ‑102 dBm |
| for other GSM 400 MS | ‑104 dBm |
| GSM 900 MS | for GSM 900 small MS | ‑102 dBm |
| for other GSM 900 MS | ‑104 dBm |
| GSM 850 MS | for GSM 850 small MS | ‑102 dBm |
| for other GSM 850 MS | ‑104 dBm |
| GSM 700 MS | for GSM 700 small MS | ‑102 dBm |
| for other GSM 700 MS | ‑104 dBm |
| DCS 1 800 MS | for DCS 1 800 class 1 or class 2 MS | ‑100 / ‑102 dBm \* |
| for DCS 1 800 class 3 MS | ‑102 dBm |
| PCS 1 900 MS | for PCS 1 900 class 1 or class 2 MS | ‑102 dBm |
| for other PCS 1 900 MS | ‑104 dBm |
| NOTE: For DCS 1 800 class 1 and class 2 MS, the 102 dBm level shall apply for the reference sensitivity performance as specified in table 1 for the normal conditions defined in 3GPP TS 45.005 [16] Annex D and 100 dBm level shall be used to determine all other MS performances. | | |

The normative reference for this requirement is:

For E-UTRA: 3GPP TS 36.133 [4] clause 9.4.1 and A.9.6.1

For GSM: TS 45.008 [15] clause 8.1.2 and 8.1.4 and 3GPP TS 45.005 [16].

#### 9.6.1.4 Test description

##### 9.6.1.4.1 Initial conditions

Test Environment: Normal, TL/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.14 for UE with 2Rx RF band and Annex A, Figure A.78 (without using the faders) for 4Rx capable UE without any 2Rx RF bands.

2. The general test parameter settings are set up according to Table 9.6.1.4.1-1.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 9.6.1.4.3.

5. There is one E-UTRA FDD cell (Cell 1) and two GSM cells (Cell 2 and Cell 3) specified in each test. Cell 1 is the cell used for call setup with the power level set according to Annex C.0 and C.1 for this test. Cell 2 (BCCH1) and Cell 3 (BCCH other than BCCH1 according to sub-test) are measured and reported by the UE.

Table 9.6.1.4.1-1: General GSM Carrier RSSI test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| PDSCH parameters  (E-UTRAN FDD) |  | DL Reference Measurement Channel R.0 FDD | As specified in clause A.1.1. |
| PCFICH/PDCCH/PHICH parameters  (E-UTRAN FDD) |  | DL Reference Measurement Channel R.6 FDD | As specified in clause A.2.1. |
| Active cell | - | Cell 1 |  |
| DRX | - | OFF |  |
| Gap pattern Id |  | 1 | As specified in 3GPP TS 36.133 [4] clause 8.1.2.1. |
| Filtering coefficient | - | 0 | L3 filtering is not used. |
| Inter-RAT measurement quantity |  | GSM Carrier RSSI |  |
| Monitored cell list size |  | 6 GSM neighbours including ARFCN 1 | Included in the Measurement control information |

##### 9.6.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Set the parameters according to Table 9.6.1.5-1, 9.6 1.5-2 and 9.6 1.5-3 as appropriate. Propagation conditions for the E-UTRA cell are set according to Annex B clause B.1. For sub-test 4 and sub-test 12 GERAN cell is initialized to -95dBm.

3. SS shall transmit an RRCConnectionReconfiguration message.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. UE shall transmit periodically MeasurementReport messages.

6. Only for sub-tests 4 and 12, SS waits for 10s for initial measurement report by UE and ignores measurement reports received at this stage. If SS receives the measurement reports, then adjust the power levels of Cell 2 according to Table 9.6.1.5-2. SS ignores measurement reports for 1 reportInterval cycle (1024ms) and continues with step 7, else fail the UE for the relevant subtest and skip to Step.9

7. SS shall check the reported GSM RSSI values in periodical MeasurementReport messages. The reported RSSI value for Cell 2 is compared to the actual RSSI value according to Table 9.6.1.5-4. This counts as a Pass or Fail for the event "Absolute". Also the reported RSSI value for Cell 3 is compared to the reported RSSI value for Cell 2 for each MeasurementReport message according to Table 9.6.1.5-5. This counts as a Pass or Fail for the event "Relative".   
If the UE fails to report the measurement value for Cell 2, the number of failed iterations for the event "Absolute" is increased by one.  
If the UE fails to report the measurement value for any of Cell 2 or Cell 3, the number of failed iterations for the event "Relative" is increased by one.

8. The SS shall check the periodical MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved for each of the events "Absolute" and "Relative". Each event is evaluated only until the confidence level is achieved. Different events may require different times for a verdict.

9. Repeat step 1-9 for each sub-test in Table 9.6.1.5-2 as appropriate.

##### 9.6.1.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] values 4.6 with the following exceptions:

Table 9.6.1.4.3-1: Common Exception messages for GSM RSSI measurement accuracy test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-7 Table H.3.1-11 |

Table 9.6.1.4.3-2: MeasuredResults: Additional GSM RSSI measurement accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 | Identifies the measurement id for the reporting being performed |  |
| measResultServCell SEQUENCE { |  |  |  |
| rsrpResult | RSRP-Range | Set according to specific test |  |
| rsrqResult | RSRQ-Range | Set according to specific test |  |
| } |  |  |  |
| measResultNeighCells CHOICE { |  |  |  |
| MeasResultListGERAN | MeasResultListGERAN |  |  |
| } |  |  |  |
| } |  |  |  |

Table 9.6.1.4.3-3: MeasResultListGERAN: Additional GSM measurement accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | **Condition** |
| MeasResultListGERAN::= SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { |  |  |  |
| carrierFreq | CarrierFreqGERAN |  |  |
| physCellId | physCellId GERAN |  |  |
| Cgi-Info | Not present |  |  |
| measResult SEQUENCE { |  |  |  |
| Rssi | INTEGER (0..63) | Set according to specific test |  |
| } |  |  |  |
| } |  |  |  |

Table 9.6.1.4.3-4: ReportConfigInterRAT-PERIODICAL: Additional GSM measurement accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 4.6.6, Table 4.6.6-9 ReportConfigInterRAT-PERIODICAL | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigInterRAT-PERIODICAL ::= SEQUENCE { |  |  |  |
| maxReportCells | 6 |  |  |
| } |  |  |  |

#### 9.6.1.5 Test requirement

Tables 9.6.1.5-1, 9.6.1.5-2 and 9.6.1.5-3 define the primary level settings including test tolerances for all tests.

The GSM RSSI measurement accuracy test for the reported values shall meet the requirements in Table 9.6.1.5-4 and Table 9.6.1.5-5.

Table 9.6.1.5-1: E-UTRAN FDD Cell specific test parameters for GSM Carrier RSSI accuracy test in E-UTRAN FDD

| Parameter | Unit | Tests 1-12 |
| --- | --- | --- |
| E-UTRAN RF Channel Number |  | 1 |
| BWchannel | MHz | 10 |
| OCNG Patterns defined in D.1.1 (OP.1 FDD) |  | OP.1 FDD |
| PBCH\_RA | dB | 0 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Note 2 | dBm/15 kHz | -98 |
| RSRP Note 3 | dBm/15 kHz | -94 |
|  | dB | 4 |
| SCH\_RP Note 3 | dBm/15 kHz | -94 |
|  | dB | 4 |
| PropagationCondition |  | AWGN |
| NOTE 1: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |

Table 9.6.1.5-2: BCCH signal levels at receiver input in dBm

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sub-test | BCCH1 | BCCH2 | BCCH3 | BCCH4 | BCCH5 | BCCH6 |
| 1 | -38.7 | -38.5 | NA | NA | NA | NA |
| 2 | -48.7 | -50.0 | NA | NA | NA | NA |
| 3 | -70.7 | -70.5 | NA | NA | NA | NA |
| 4 | -109.3 | -109.5 | NA | NA | NA | NA |
| 5 | -57.5 | NA | -54.5 | NA | NA | NA |
| 6 | -64.5 | NA | -59.5 | NA | NA | NA |
| 7 | -71.5 | NA | NA | -64.5 | NA | NA |
| 8 | -78.5 | NA | NA | -69.5 | NA | NA |
| 9 | -85.5 | NA | NA | NA | -74.5 | NA |
| 10 | -92.5 | NA | NA | NA | -79.5 | NA |
| 11 | -99.5 | NA | NA | NA | NA | -84.5 |
| 12 | -106.5 | NA | NA | NA | NA | -89.5 |

Table 9.6.1.5-3: ARFCN numbers for GSM cells

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| GSM band | BCCH1 | BCCH2 | BCCH3 | BCCH4 | BCCH5 | BCCH6 |
| GSM 450 | 276 | 293 | 264 | 269 | 281 | 288 |
| GSM 480 | 323 | 340 | 311 | 316 | 328 | 335 |
| GSM 750 | 475 | 511 | 440 | 455 | 485 | 500 |
| GSM 850 | 189 | 251 | 150 | 170 | 210 | 230 |
| GSM 900 | 62 | 124 | 20 | 40 | 80 | 100 |
| DCS 1800 | 700 | 885 | 585 | 660 | 790 | 835 |
| PCS 1900 | 700 | 805 | 585 | 660 | 790 | 550 |
| NOTE: As defined in clause 3A.1, the test shall run without frequency overlapping between E-UTRA and GSM cells. The ARFCN numbers defined here, can be updated accordingly (even E-UTRA band specific) to avoid possible overlapping. | | | | | | |

Table 9.6.1.5-4: GSM Carrier RSSI absolute accuracy requirements for the reported values

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sub-test | Normal Condition | | Extreme condition | |
|  | Lowest reported value for BCCH1 | Highest reported value for BCCH1 | Lowest reported value for BCCH1 | Highest reported value for BCCH1 |
| 1 | RXLEV\_62 | RXLEV\_63 | RXLEV\_62 | RXLEV\_63 |
| 2 | RXLEV\_55 | RXLEV\_63 | RXLEV\_55 | RXLEV\_63 |
| 3 | RXLEV\_35 | RXLEV\_45 | RXLEV\_33 | RXLEV\_47 |
| 4 | RXLEV\_00 | RXLEV\_06 | RXLEV\_00 | RXLEV\_08 |
| 5 | RXLEV\_46 | RXLEV\_60 | RXLEV\_46 | RXLEV\_60 |
| 6 | RXLEV\_39 | RXLEV\_53 | RXLEV\_39 | RXLEV\_53 |
| 7 | RXLEV\_34 | RXLEV\_44 | RXLEV\_32 | RXLEV\_46 |
| 8 | RXLEV\_27 | RXLEV\_37 | RXLEV\_25 | RXLEV\_39 |
| 9 | RXLEV\_20 | RXLEV\_30 | RXLEV\_18 | RXLEV\_32 |
| 10 | RXLEV\_13 | RXLEV\_23 | RXLEV\_11 | RXLEV\_25 |
| 11 | RXLEV\_06 | RXLEV\_16 | RXLEV\_04 | RXLEV\_18 |
| 12 | RXLEV\_00 | RXLEV\_09 | RXLEV\_00 | RXLEV\_11 |
| NOTE: It is not mandatory for the UE to report BCCH1 in sub-test 12. In case of no BCCH1 report in sub-test 12, the absolute accuracy for sub-test 12 is not tested. | | | | |

Table 9.6.1.5-5: GSM Carrier RSSI Relative accuracy requirements for the reported values

| Sub-test | Normal & Extreme condition | |
| --- | --- | --- |
|  | Lowest reported value for BCCH2 | Highest reported value for BCCH2 |
| 1 | N/A (Note3) | N/A(Note3) |
| 2 | RXLEV = x-6 | RXLEV = x+3 |
| 3 | RXLEV = x-4 | RXLEV = x+5 |
| 4 | N/A (Note3) | N/A (Note3) |
|  | Lowest reported value for BCCH3 | Highest reported value for BCCH3 |
| 5 | RXLEV = x-2 | RXLEV = x+8 |
| 6 | RXLEV = x+1 | RXLEV = x+10 |
|  | Lowest reported value for BCCH4 | Highest reported value for BCCH4 |
| 7 | RXLEV = x+3 | RXLEV = x+12 |
| 8 | RXLEV = x+5 | RXLEV = x+14 |
|  | Lowest reported value for BCCH5 | Highest reported value for BCCH5 |
| 9 | RXLEV = x+7 | RXLEV = x+16 |
| 10 | RXLEV = x+8 | RXLEV = x+18 |
|  | Lowest reported value for BCCH6 | Highest reported value for BCCH6 |
| 11 | RXLEV = x+10 | RXLEV = x+20 |
| 12 | N/A (Note3) | N/A (Note3) |
| NOTE 1: x is the reported value RXLEV for BCCH1.  NOTE 2: It is not mandatory for the UE to report BCCH1 in sub-test 12. In case of no BCCH1 report in sub-test 12, the relative accuracy for sub-test 12 is not tested.  NOTE 3: Sub-tests 1, 4 and 12 are not applicable for relative accuracy as they would be testing the UE outside the side conditions. | | |

For the test to pass, the ratio of successful reported values in each sub-test for absolute and relative accuracy shall be more than 90% with a confidence level of 95%.

### 9.6.2 GSM RSSI accuracy for E-UTRAN TDD

#### 9.6.2.1 Test purpose

To verify that the GSM RSSI measurement accuracy is within the specified limits.

#### 9.6.2.2 Test applicability

This test applies all the types of E-UTRA TDD UE release 9 and forward that support GSM. Applicability requires support for FGI bit 16 and 23.

#### 9.6.2.3 Minimum conformance requirements

**Absolute accuracy**

The R.M.S received signal level at the receiver input shall be measured by the MS and the BSS over the full range of ‑110 dBm to ‑48 dBm with an absolute accuracy of ±4 dB from ‑110 dBm to ‑70 dBm under normal conditions and ±6 dB over the full range under both normal and extreme conditions. The R.M.S received signal level at the receiver input shall be measured by the MS above -48 dBm up to -38 dBm with an absolute accuracy of ± 9 dB under both normal and extreme conditions.

This requirement is summarized in Table 9.6.2.3-1.

Table 9.6.2.3-1: GSM RXLEV absolute accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Accuracy [dB] | | Conditions |
| Normal condition | Extreme condition | Input level dBm |
| RXLEV | dBm | ± 4 | ± 6 | -110…-70 |
| dBm | ± 6 | ± 6 | -70…-48 |
| dBm | ± 9 | ± 9 | -48..-38 |

The reporting range and mapping for RXLEV is summarized in Table 9.6.2.3-2.

Table 9.6.2.3-2: GSM RSSI measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| RXLEV\_00 | RXLEV < -110 | dBm |
| RXLEV\_01 | -110 ≤ RXLEV < -109 | dBm |
| RXLEV\_02 | -109 ≤ RXLEV < -108 | dBm |
| … | … | … |
| RXLEV\_61 | -50 ≤ RXLEV < -49 | dBm |
| RXLEV\_62 | -49 ≤ RXLEV < -48 | dBm |
| RXLEV\_63 | -48 ≤ RXLEV | dBm |

**Relative accuracy**

The relative accuracy shall be as follows:

If signals of level x1 and x2 dBm are received (where x1 ≤ x2) and levels y1 and y2 dBm respectively are measured, if x2 ‑ x1 < 20 dB and x1 is not below the reference sensitivity level, then y1 and y2 shall be such that:

(x2 ‑ x1) ‑ a ≤ y2 ‑ y1 ≤ (x2 ‑ x1 + b) if the measurements are on the same or on different RF channel within the same frequency band;

and

(x2 ‑ x1 ) ‑ c ≤ y2 ‑ y1 ≤( x2 ‑ x1 + d) if the measurements are on different frequency bands:

a, b, c and d are in dB and depend on the value of x1 as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | a | b | c | d |
| x1 ≥ s+14, x2< -48 dBm | 2 | 2 | 4 | 4 |
| s+14 > x1 ≥ s+1 | 3 | 2 | 5 | 4 |
| s+1 > x1 | 4 | 2 | 6 | 4 |
|  |  |  |  |  |

For single band MS and measurements between ARFCN in the same band for a multiband MS:

s = reference sensitivity level as specified in Table 9.6.2.3-3 (normative reference 3GPP TS 45.005 [16] Table 6.2-1a)

For measurements between ARFCN in different bands:

s = the reference sensitivity level as specified in Table 9.6.2.3-3 (normative reference 3GPP TS 45.005 [16] Table 6.2-1a) for the band including x1.

Table 9.6.2.3-3: Reference sensitivity level for MS

|  |  |  |
| --- | --- | --- |
| GSM 400 MS | for GSM 400 small MS | ‑102 dBm |
| for other GSM 400 MS | ‑104 dBm |
| GSM 900 MS | for GSM 900 small MS | ‑102 dBm |
| for other GSM 900 MS | ‑104 dBm |
| GSM 850 MS | for GSM 850 small MS | ‑102 dBm |
| for other GSM 850 MS | ‑104 dBm |
| GSM 700 MS | for GSM 700 small MS | ‑102 dBm |
| for other GSM 700 MS | ‑104 dBm |
| DCS 1 800 MS | for DCS 1 800 class 1 or class 2 MS | ‑100 / ‑102 dBm \* |
| for DCS 1 800 class 3 MS | ‑102 dBm |
| PCS 1 900 MS | for PCS 1 900 class 1 or class 2 MS | ‑102 dBm |
| for other PCS 1 900 MS | ‑104 dBm |
| NOTE: For DCS 1 800 class 1 and class 2 MS, the 102 dBm level shall apply for the reference sensitivity performance as specified in table 1 for the normal conditions defined in 3GPP TS 45.005 [16] Annex D and 100 dBm level shall be used to determine all other MS performances. | | |

The normative reference for this requirement is:

For E-UTRA: 3GPP TS 36.133 [4] clause 9.4.1 and A.9.6.2

For GSM: TS 45.008 [15] clause 8.1.2 and 8.1.4 and 3GPP TS 45.005 [16].

#### 9.6.2.4 Test description

##### 9.6.2.4.1 Initial conditions

Test Environment: Normal, TL/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.14 for UE with 2Rx RF band and Annex A, Figure A.78 (without using the faders) for 4Rx capable UE without any 2Rx RF bands.

2. The general test parameter settings are set up according to Table 9.6.2.4.1-1.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 9.6.2.4.3.

5. There is one E-UTRA TDD cell (Cell 1) and two GSM cells (Cell 2 and Cell 3) specified in each test. Cell 1 is the cell used for call setup with the power level set according to Annexes C.0 and C.1 for this test. Cell 2 (BCCH1) and Cell 3 (BCCH other than BCCH1 according to sub-test) are measured and reported by the UE.

Table 9.6.2.4.1-1: General GSM Carrier RSSI test parameters

| Parameter | Unit | Value | Comment |
| --- | --- | --- | --- |
| PDSCH parameters  (E-UTRAN TDD) |  | DL Reference Measurement Channel R.0 TDD | As specified in clause A.1.2. |
| PCFICH/PDCCH/PHICH parameters  (E-UTRAN TDD) |  | DL Reference Measurement Channel R.6 TDD | As specified in clause A.2.2. |
| Active cell | - | Cell 1 |  |
| DRX | - | OFF |  |
| Uplink-downlink configuration of cell 1 |  | 1 | As specified in table 4.2.2 in 3GPP TS 36.211 [9] |
| Special subframe configuration of cell 1 |  | 6 | As specified in table 4.2.1 in 3GPP TS 36.211 [9] |
| Gap pattern Id |  | 1 | As specified in 3GPP TS 36.133 [4] clause 8.1.2.1. |
| Filtering coefficient | - | 0 | L3 filtering is not used. |
| Inter-RAT measurement quantity |  | GSM Carrier RSSI |  |
| Monitored cell list size |  | 6 GSM neighbours including ARFCN 1 | Included in the Measurement control information |

##### 9.6.2.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Set the parameters according to Table 9.6.2.5-1, 9.6 2.5-2 and 9.6 2.5-3 as appropriate. Propagation conditions for the E-UTRA cell are set according to Annex B clause B.1. For sub-test 4 and sub-test 12 GERAN cell is initialized to -95dBm.

3. SS shall transmit an RRCConnectionReconfiguration message.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. UE shall transmit periodically MeasurementReport messages.

6. Only for sub-tests 4 and 12, SS waits for 10s for initial measurement report by UE and ignores measurement reports received at this stage. If SS receives the measurement reports, then adjust the power levels of Cell 2 according to Table 9.6.2.5-2. SS ignores measurement reports for 1 reportInterval cycle (1024ms) and continues with step 7, else fails the UE for the relevant sub-test and skip to Step.9.

7. SS shall check the reported GSM RSSI value in periodical MeasurementReport messages. The reported RSSI value for Cell 2 is compared to the actual RSSI value according to Table 9.6.2.5-4. This counts as a Pass or Fail for the event "Absolute". Also the reported RSSI value for Cell 3 is compared to the reported RSSI value for Cell 2 for each MeasurementReport message according to Table 9.6.2.5-5. This counts as a Pass or Fail for the event "Relative".   
If the UE fails to report the measurement value for Cell 2, the number of failed iterations for the event "Absolute" is increased by one.  
If the UE fails to report the measurement value for any of Cell 2 or Cell 3, the number of failed iterations for the event "Relative" is increased by one.

8. The SS shall check the periodical MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved for each of the events "Absolute" and "Relative". Each event is evaluated only until the confidence level is achieved. Different events may require different times for a verdict.

9. Repeat step 1-9 for each sub-test in Table 9.6.2.5-2 as appropriate.

##### 9.6.2.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] values 4.6 with the following exceptions:

Table 9.6.2.4.3-1: Common Exception messages for GSM RSSI measurement accuracy test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.1-7 Table H.3.1-11 |

Table 9.6.2.4.3-2: MeasuredResults: Additional GSM RSSI measurement accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 | Identifies the measurement id for the reporting being performed |  |
| measResultServCell SEQUENCE { |  |  |  |
| rsrpResult | RSRP-Range | Set according to specific test |  |
| rsrqResult | RSRQ-Range | Set according to specific test |  |
| } |  |  |  |
| measResultNeighCells CHOICE { |  |  |  |
| MeasResultListGERAN | MeasResultListGERAN |  |  |
| } |  |  |  |
| } |  |  |  |

Table 9.6.2.4.3-3: MeasResultListGERAN: Additional GSM measurement accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | **Condition** |
| MeasResultListGERAN::= SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { |  |  |  |
| carrierFreq | CarrierFreqGERAN |  |  |
| physCellId | physCellId GERAN |  |  |
| Cgi-Info | Not present |  |  |
| measResult SEQUENCE { |  |  |  |
| Rssi | INTEGER (0..63) | Set according to specific test |  |
| } |  |  |  |
| } |  |  |  |

Table 9.6.2.4.3-4: ReportConfigInterRAT-PERIODICAL: Additional GSM measurement accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 4.6.6, Table 4.6.6-9 ReportConfigInterRAT-PERIODICAL | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigInterRAT-PERIODICAL ::= SEQUENCE { |  |  |  |
| maxReportCells | 6 |  |  |
| } |  |  |  |

#### 9.6.2.5 Test requirement

Tables 9.6.2.5-1, 9.6.2.5-2 and 9.6.2.5-3 define the primary level settings including test tolerances for all tests.

The GSM RSSI measurement accuracy test for the reported values shall meet the requirements in Table 9.6.2.5-4 and Table 9.6.2.5-5.

Table 9.6.2.5-1: E-UTRAN TDD Cell specific test parameters for GSM Carrier RSSI accuracy test in E-UTRAN TDD

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Tests 1 - 12 |
| E-UTRAN RF Channel Number |  | 1 |
| BWchannel | MHz | 10 |
| OCNG Patterns defined in D.2.1 (OP.1 TDD) |  | OP.1 TDD |
| PBCH\_RA | dB | 0 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Note 2 | dBm/15 kHz | -98 |
| RSRP Note 3 | dBm/15 kHz | -94 |
|  | dB | 4 |
| SCH\_RP Note 3 | dBm/15 kHz | -94 |
|  | dB | 4 |
| **Propagation Condition** |  | AWGN |
| NOTE 1: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |

Table 9.6.2.5-2: BCCH signal levels at receiver input in dBm

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sub-test | BCCH1 | BCCH2 | BCCH3 | BCCH4 | BCCH5 | BCCH6 |
| 1 | -38.7 | -38.5 | NA | NA | NA | NA |
| 2 | -48.7 | -50.0 | NA | NA | NA | NA |
| 3 | -70.7 | -70.5 | NA | NA | NA | NA |
| 4 | -109.3 | -109.5 | NA | NA | NA | NA |
| 5 | -57.5 | NA | -54.5 | NA | NA | NA |
| 6 | -64.5 | NA | -59.5 | NA | NA | NA |
| 7 | -71.5 | NA | NA | -64.5 | NA | NA |
| 8 | -78.5 | NA | NA | -69.5 | NA | NA |
| 9 | -85.5 | NA | NA | NA | -74.5 | NA |
| 10 | -92.5 | NA | NA | NA | -79.5 | NA |
| 11 | -99.5 | NA | NA | NA | NA | -84.5 |
| 12 | -106.5 | NA | NA | NA | NA | -89.5 |

Table 9.6.2.5-3: ARFCN numbers for GSM cells

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| GSM band | BCCH1 | BCCH2 | BCCH3 | BCCH4 | BCCH5 | BCCH6 |
| GSM 450 | 276 | 293 | 264 | 269 | 281 | 288 |
| GSM 480 | 323 | 340 | 311 | 316 | 328 | 335 |
| GSM 750 | 475 | 511 | 440 | 455 | 485 | 500 |
| GSM 850 | 189 | 251 | 150 | 170 | 210 | 230 |
| GSM 900 | 62 | 124 | 20 | 40 | 80 | 100 |
| DCS 1800 | 700 | 885 | 585 | 660 | 790 | 835 |
| PCS 1900 | 700 | 805 | 585 | 660 | 790 | 550 |
| NOTE: As defined in clause 3A.1, the test shall run without frequency overlapping between E-UTRA and GSM cells. The ARFCN numbers defined here, can be updated accordingly (even E-UTRA band specific) to avoid possible overlapping. | | | | | | |

Table 9.6.2.5-4: GSM Carrier RSSI absolute accuracy requirements for the reported values

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sub-test | Normal condition | | Extreme condition | |
|  | Lowest reported value for BCCH1 | Highest reported value for BCCH1 | Lowest reported value for BCCH1 | Highest reported value for BCCH1 |
| 1 | RXLEV\_62 | RXLEV\_63 | RXLEV\_62 | RXLEV\_63 |
| 2 | RXLEV\_55 | RXLEV\_63 | RXLEV\_55 | RXLEV\_63 |
| 3 | RXLEV\_35 | RXLEV\_45 | RXLEV\_33 | RXLEV\_47 |
| 4 | RXLEV\_00 | RXLEV\_06 | RXLEV\_00 | RXLEV\_08 |
| 5 | RXLEV\_46 | RXLEV\_60 | RXLEV\_46 | RXLEV\_60 |
| 6 | RXLEV\_39 | RXLEV\_53 | RXLEV\_39 | RXLEV\_53 |
| 7 | RXLEV\_34 | RXLEV\_44 | RXLEV\_32 | RXLEV\_46 |
| 8 | RXLEV\_27 | RXLEV\_37 | RXLEV\_25 | RXLEV\_39 |
| 9 | RXLEV\_20 | RXLEV\_30 | RXLEV\_18 | RXLEV\_32 |
| 10 | RXLEV\_13 | RXLEV\_23 | RXLEV\_11 | RXLEV\_25 |
| 11 | RXLEV\_06 | RXLEV\_16 | RXLEV\_04 | RXLEV\_18 |
| 12 | RXLEV\_00 | RXLEV\_09 | RXLEV\_00 | RXLEV\_11 |
| NOTE: It is not mandatory for the UE to report BCCH1 in sub-test 12. In case of no BCCH1 report in sub-test 12, the absolute accuracy for sub-test 12 is not tested. | | | | |

Table 9.6.2.5-5: GSM Carrier RSSI Relative accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
| Sub-test | Normal & Extreme condition | |
|  | Lowest reported value for BCCH2 | Highest reported value for BCCH2 |
| 1 | N/A (Note3) | N/A (Note3) |
| 2 | RXLEV = x-6 | RXLEV = x+3 |
| 3 | RXLEV = x-4 | RXLEV = x+5 |
| 4 | N/A (Note3) | N/A (Note3) |
|  | Lowest reported value for BCCH3 | Highest reported value for BCCH3 |
| 5 | RXLEV = x-2 | RXLEV = x+8 |
| 6 | RXLEV = x+1 | RXLEV = x+10 |
|  | Lowest reported value for BCCH4 | Highest reported value for BCCH4 |
| 7 | RXLEV = x+3 | RXLEV = x+12 |
| 8 | RXLEV = x+5 | RXLEV = x+14 |
|  | Lowest reported value for BCCH5 | Highest reported value for BCCH5 |
| 9 | RXLEV = x+7 | RXLEV = x+16 |
| 10 | RXLEV = x+8 | RXLEV = x+18 |
|  | Lowest reported value for BCCH6 | Highest reported value for BCCH6 |
| 11 | RXLEV = x+10 | RXLEV = x+20 |
| 12 | N/A (Note3) | N/A (Note3) |
| NOTE 1: x is the reported value RXLEV for BCCH1.  NOTE 2: It is not mandatory for the UE to report BCCH1 in sub-test 12. In case of no BCCH1 report in sub-test 12, the relative accuracy for sub-test 12 is not tested.  NOTE 3: Sub-tests 1, 4 and 12 are not applicable for relative accuracy as they would be testing the UE outside the side conditions. | | |

For the test to pass, the ratio of successful reported values in each sub-test for absolute and relative accuracy shall be more than 90% with a confidence level of 95%.

## 9.7 UE Rx **-** Tx Time Difference

The UE Rx - Tx Time difference test cases can be found in 3GPP TS 37.571-1 [27].

## 9.8 RSTD

The RSTD test cases can be found in 3GPP TS 37.571-1 [27].

## 9.9 Serving Cell RSRP and RSRQ

### 9.9.1 FDD Serving Cell RSRP and RSRQ Accuracy

#### 9.9.1.1 FDD Intra Frequency Serving Cell Absolute RSRP Accuracy

##### 9.9.1.1.1 Test purpose

To verify the FDD intra-frequency serving cell absolute RSRP measurement accuracy is within the specified limit.

##### 9.9.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and release 11. Applicability requires support for FGI bit 16.

##### 9.9.1.1.3 Minimum conformance requirements

The serving cell absolute accuracy of RSRP is defined as the RSRP measured of the serving cell.

The accuracy requirements in table 9.9.1.1.3-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in 3GPP TS 36.101 Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to Annex I.3.1 for a corresponding Band.

Table 9.9.1.1.3-1: RSRP Intra frequency absolute accuracy

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | Ês/Iot | Io Note 1 range | | | |
| E-UTRA operating band groups Note 3 | Minimum Io | | Maximum Io |
| dB | dB | dB |  | dBm/15kHz Note 2 | dBm/BWChannel | dBm/BWChannel |
| ±6 | ±9 | ≥-6 dB | FDD\_A, TDD\_A | -121 | N/A | -70 |
| FDD\_C, TDD\_C | -120 | N/A | -70 |
| FDD\_D | -119.5 | N/A | -70 |
| FDD\_E, TDD\_E | -119 | N/A | -70 |
| FDD\_F | -118.5 | N/A | -70 |
| FDD\_G | -118 | N/A | -70 |
| FDD\_H | -117.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 dB | FDD\_A, FDD\_C, FDD\_D, FDD\_E, FDD\_F, FDD\_G, FDD\_H, TDD\_A, TDD\_C, TDD\_E | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The condition level is increased by ∆>0, when applicable, as described in Clauses I.4.2 and I.4.3.  NOTE 3: E-UTRA operating band groups are as defined in Clause 3.5. | | | | | | |

The reporting range of RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 9.9.1.1.3-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.9.1.1.3-2: RSRP measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| RSRP\_00 | RSRP < -140 | dBm |
| RSRP\_01 | -140 ≤ RSRP < -139 | dBm |
| RSRP\_02 | -139 ≤ RSRP < -138 | dBm |
| … | … | … |
| RSRP\_95 | -46 ≤ RSRP < -45 | dBm |
| RSRP\_96 | -45 ≤ RSRP < -44 | dBm |
| RSRP\_97 | -44 ≤ RSRP | dBm |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 9.1.2.1, clause 9.1.4 and A.9.9.1.

##### 9.9.1.1.4 Test description

9.9.1.1.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.18 for UE with 2Rx RF band and Annex A, Figure A.75 (without using the faders) for 4Rx capable UE without any 2Rx RF bands.

2. Propagation conditions are set according to Annex B clause B.0.

3. Message contents are defined in clause 9.9.1.1.4.3.

4. Cell 1 is the serving cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

9.9.1.1.4.2 Test procedure

1. Ensure that the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Set the parameters according to Table 9.9.1.1.5-1 as appropriate. Propagation conditions are set according to Annex B clause B.1.1.

3. SS shall transmit an RRCConnectionReconfiguration message on cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, SS shall check RSRP reported value in periodical MeasurementReport messages. The RSRP value of Cell 1 reported by the UE is compared to actual RSRP value according to Table 9.9.1.1.5-2.

7. SS shall check the MeasurementReport message transmitted by the UE until the confidence level according to Tables G.2.3-1 in Annex G.2 is achieved.

9.9.1.1.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.9.1.1.4.3-1: Common Exception messages for RSRP FDD Intra frequency absolute accuracy test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.5-1  Table H.3.5-3 |

Table 9.9.1.1.4.3-2: *MeasResults*: Additional RSRP FDD Intra frequency absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 | Identifies the measurement id for the reporting being performed |  |
| measResultServCell SEQUENCE { |  |  |  |
| rsrpResult |  | Set according to specific test |  |
| rsrqResult |  | Set according to specific test |  |
| } |  |  |  |
| } |  |  |  |

##### 9.9.1.1.5 Test requirement

Table 9.9.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each RSRP FDD intra-frequency absolute accuracy test shall meet the reported values test requirements in table 9.9.1.1.5-2.

Table 9.9.1.1.5-1: RSRP FDD Intra frequency absolute accuracy test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Test |
| Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| BWchannel | | MHz | 10 |
| Antenna Configuration | |  | 1x2 |
| Measurement bandwidth | |  | 22—27 |
| PDSCH Reference measurement channel defined in A.1.1-1 | |  | R.0 FDD |
| PDSCH allocation | |  | 13—36 |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.2.1-1 | |  | R.6 FDD |
| OCNG Patterns defined in D.1.1-1 (OP.1 FDD) | |  | OP.1 FDD |
| PBCH\_RA | | dB | 0 |
| PBCH\_RB | |
| PSS\_RA | |
| SSS\_RA | |
| PCFICH\_RB | |
| PHICH\_RA | |
| PHICH\_RB | |
| PDCCH\_RA | |
| PDCCH\_RB | |
| PDSCH\_RA | |
| PDSCH\_RB | |
| OCNG\_RANote1 | |
| OCNG\_RBNote1 | |
| Note2 | Bands FDD\_A | dBm/15 kHz | -120.4 |
| Bands FDD\_C | -119.4 |
| Bands FDD\_D | -118.9 |
| Bands FDD\_E, FDD\_F Note 5 | -118.4 |
| Bands FDD\_G Note 7 | -117.4 |
| Bands FDD\_H | -116.9 |
|  | | dB | -4 |
| RSRPNote3 | Bands FDD\_A | dBm/15 kHz | -124.4 |
| Bands FDD\_C | -123.4 |
| Bands FDD\_D | -122.9 |
| Bands FDD\_E, FDD\_F Note 5 | -122.4 |
| Bands FDD\_G Note 7 | -121.4 |
| Bands FDD\_H | -120.9 |
| RSRQNote3 | Bands FDD\_A | dB | -14.93 |
| Bands FDD\_C |
| Bands FDD\_D |
| Bands FDD\_E, FDD\_F Note 5 |
| Bands FDD\_G Note 7 |
| Bands FDD\_H |
| IoNote3 | Bands FDD\_A | dBm/9 MHz | -91.16 |
| Bands FDD\_C | -90.16 |
| Bands FDD\_D | -89.66 |
| Bands FDD\_E, FDD\_F Note 5 | -89.16 |
| Bands FDD\_G Note 7 | -88.16 |
| Bands FDD\_H | -87.66 |
|  | | dB | -4 |
| Propagation condition | | - | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP, RSRQ and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 5: For Band 26, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 865-894 MHz.  NOTE 6: E-UTRA operating band groups are as defined in Clause 3.5.  NOTE 7: Except Band 29 and Band 32. | | | |

Table 9.9.1.1.5-2: RSRP FDD Intra frequency absolute accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
| Normal Conditions | Test 1 | |
| Lowest reported value (Cell 1) | Bands FDD\_A | RSRP\_9 |
| Bands FDD\_C | RSRP\_10 |
| Bands FDD\_D | RSRP\_10 |
| Bands FDD\_E  Bands FDD\_F | RSRP\_11 |
| Bands FDD\_G | RSRP\_12 |
| Bands FDD\_H | RSRP\_12 |
| Highest reported value (Cell 1) | Bands FDD\_A | RSRP\_24 |
| Bands FDD\_C | RSRP\_25 |
| Bands FDD\_D | RSRP\_25 |
| Bands FDD\_E  Bands FDD\_F | RSRP\_26 |
| Bands FDD\_G | RSRP\_27 |
| Bands FDD\_H | RSRP\_27 |
| Extreme Conditions | Test 1 | |
| Lowest reported value (Cell 1) | Bands FDD\_A | RSRP\_6 |
| Bands FDD\_C | RSRP\_7 |
| Bands FDD\_D | RSRP\_7 |
| Bands FDD\_E  Bands FDD\_F | RSRP\_8 |
| Bands FDD\_G | RSRP\_9 |
| Bands FDD\_H | RSRP\_9 |
| Highest reported value (Cell 1) | Bands FDD\_A | RSRP\_27 |
| Bands FDD\_C | RSRP\_28 |
| Bands FDD\_D | RSRP\_28 |
| Bands FDD\_E  Bands FDD\_F | RSRP\_29 |
| Bands FDD\_G | RSRP\_30 |
| Bands FDD\_H | RSRP\_30 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 9.9.1.1\_1 FDD Intra Frequency Serving Cell Absolute RSRP Accuracy (Rel‑12 and forward)

##### 9.9.1.1\_1.1 Test purpose

Same test purpose as in clause 9.9.1.1.1.

##### 9.9.1.1\_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward. Applicability requires support for FGI bit 16.

##### 9.9.1.1\_1.3 Minimum conformance requirements

The serving cell absolute accuracy of RSRP is defined as the RSRP measured of the serving cell.

The accuracy requirements in table 9.9.1.1\_1.3-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in 3GPP TS 36.101 Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to Annex I.3.1 for a corresponding Band.

Table 9.9.1.1\_1.3-1: RSRP FDD Intra frequency absolute accuracy

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | Ês/Iot | Io Note 1 range | | | |
| E-UTRA operating band groups Note 3 | Minimum Io | | Maximum Io |
| dB | dB | dB |  | dBm/15kHz Note 2 | dBm/BWChannel | dBm/BWChannel |
| ±4.5 | ±9 | ≥-6 dB | FDD\_A, TDD\_A | -121 | N/A | -70 |
| FDD\_B1, FDD\_B2 | -120.5 | N/A | -70 |
| FDD\_C, TDD\_C | -120 | N/A | -70 |
| FDD\_D | -119.5 | N/A | -70 |
| FDD\_E, TDD\_E | -119 | N/A | -70 |
| FDD\_F | -118.5 | N/A | -70 |
| FDD\_G | -118 | N/A | -70 |
| FDD\_H | -117.5 | N/A | -70 |
| FDD\_N | -114.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 dB | FDD\_A, TDD\_A, FDD\_C, TDD\_C, FDD\_D, FDD\_E, TDD\_E, FDD\_F, FDD\_G, FDD\_H, FDD\_N | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The condition level is increased by ∆>0, when applicable, as described in Clauses I.4.2 and I.4.3.  NOTE 3: E-UTRA operating band groups are as defined in Clause 3.5. | | | | | | |

The reporting range of RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 9.9.1.1\_1.3-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.9.1.1\_1.3-2: RSRP measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| RSRP\_00 | RSRP < -140 | dBm |
| RSRP\_01 | -140 ≤ RSRP < -139 | dBm |
| RSRP\_02 | -139 ≤ RSRP < -138 | dBm |
| … | … | … |
| RSRP\_95 | -46 ≤ RSRP < -45 | dBm |
| RSRP\_96 | -45 ≤ RSRP < -44 | dBm |
| RSRP\_97 | -44 ≤ RSRP | dBm |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 9.1.2.1, clause 9.1.4 and A.9.9.1.

##### 9.9.1.1\_1.4 Test description

9.9.1.1\_1.4.1 Initial conditions

Same initial conditions as in clause 9.9.1.1.4.1 with the following exceptions:

- Instead of 9.9.1.1.4.3 🡪 use 9.9.1.1\_1.4.3.

9.9.1.1\_1.4.2 Test procedure

Same test procedure as in clause 9.9.1.1.4.2 with the following exceptions:

- Instead of Table 9.9.1.1.5-1 🡪 use Table 9.9.1.1\_1.5-1.

- Instead of Table 9.9.1.1.5-2 🡪 use Table 9.9.1.1\_1.5-2.

9.9.1.1\_1.4.3 Message contents

Same message contents as in clause 9.9.1.1.4.3.

##### 9.9.1.1\_1.5 Test requirement

Table 9.9.1.1\_1.5-1 defines the primary level settings including test tolerances for all tests.

Each RSRP FDD intra-frequency absolute accuracy test shall meet the reported values test requirements in table 9.9.1.1\_1.5-2.

Table 9.9.1.1\_1.5-1: RSRP FDD Intra frequency absolute accuracy test parameters

| Parameter | | Unit | Test |
| --- | --- | --- | --- |
| Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| BWchannel | | MHz | 10 |
| Measurement bandwidth | |  | 22—27 |
| PDSCH Reference measurement channel defined in A.3.1.1.1 | |  | R.0 FDD |
| PDSCH allocation | |  | 13—36 |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.3.1.2.1 | |  | R.6 FDD |
| OCNG Patterns defined in A.3.2.1.1 (OP.1 FDD) | |  | OP.1 FDD |
| PBCH\_RA | | dB | 0 |
| PBCH\_RB | |
| PSS\_RA | |
| SSS\_RA | |
| PCFICH\_RB | |
| PHICH\_RA | |
| PHICH\_RB | |
| PDCCH\_RA | |
| PDCCH\_RB | |
| PDSCH\_RA | |
| PDSCH\_RB | |
| OCNG\_RANote1 | |
| OCNG\_RBNote1 | |
| Note2 | Bands FDD\_A Note 8 | dBm/15 kHz | -120.4 |
| Bands FDD\_B1, FDD\_B2 | -119.9 |
| Bands FDD\_C | -119.4 |
| Bands FDD\_D | -118.9 |
| Bands FDD\_E, FDD\_F Note 5 | -118.4 |
| Bands FDD\_G Note 7 | -117.4 |
| Bands FDD\_H | -116.9 |
|  | | dB | -4 |
| RSRPNote3 | Bands FDD\_A Note 8 | dBm/15 kHz | -124.4 |
| Bands FDD\_B1, FDD\_B2 | -123.9 |
| Bands FDD\_C | -123.4 |
| Bands FDD\_D | -122.9 |
| Bands FDD\_E, FDD\_F Note 5 | -122.4 |
| Bands FDD\_G Note 7 | -121.4 |
| Bands FDD\_H | -120.9 |
| RSRQNote3 | Bands FDD\_A Note 8 | dB | -14.93 |
| Bands FDD\_B1, FDD\_B2 |
| Bands FDD\_C |
| Bands FDD\_D |
| Bands FDD\_E, FDD\_F Note 5 |
| Bands FDD\_G Note 7 |
| Bands FDD\_H |
| IoNote3 | Bands FDD\_A Note 8 | dBm/9 MHz | -91.16 |
| Bands FDD\_B1, FDD\_B2 | -90.66 |
| Bands FDD\_C | -90.16 |
| Bands FDD\_D | -89.66 |
| Bands FDD\_E, FDD\_F Note 5 | -89.16 |
| Bands FDD\_G Note 7 | -88.16 |
| Bands FDD\_H | -87.66 |
|  | | dB | -4 |
| Propagation condition | | - | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP, RSRQ and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 5: For Band 26, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 865-894 MHz.  NOTE 6: E-UTRA operating band groups are as defined in Clause 3.5.  NOTE 7: Except Band 29.  NOTE 8: Except Band 32. | | | |

Table 9.9.1.1\_1.5-2: RSRP FDD Intra frequency absolute accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
| Normal Conditions | Test 1 | |
| Lowest reported value (Cell 1) | Bands FDD\_A | RSRP\_10 |
| Bands FDD\_B1, FDD\_B2 | RSRP\_11 |
| Bands FDD\_C | RSRP\_11 |
| Bands FDD\_D | RSRP\_12 |
| Bands FDD\_E  Bands FDD\_F | RSRP\_12 |
| Bands FDD\_G | RSRP\_13 |
| Bands FDD\_H | RSRP\_14 |
| Highest reported value (Cell 1) | Bands FDD\_A | RSRP\_22 |
| Bands FDD\_B1, FDD\_B2 | RSRP\_23 |
| Bands FDD\_C | RSRP\_23 |
| Bands FDD\_D | RSRP\_24 |
| Bands FDD\_E  Bands FDD\_F | RSRP\_24 |
| Bands FDD\_G | RSRP\_25 |
| Bands FDD\_H | RSRP\_26 |
| **Extreme Conditions** | Test 1 | |
| Lowest reported value (Cell 1) | Bands FDD\_A | RSRP\_6 |
| Bands FDD\_B1, FDD\_B2 | RSRP\_6 |
| Bands FDD\_C | RSRP\_7 |
| Bands FDD\_D | RSRP\_7 |
| Bands FDD\_E  Bands FDD\_F | RSRP\_8 |
| Bands FDD\_G | RSRP\_9 |
| Bands FDD\_H | RSRP\_9 |
| Highest reported value (Cell 1) | Bands FDD\_A | RSRP\_27 |
| Bands FDD\_B1, FDD\_B2 | RSRP\_27 |
| Bands FDD\_C | RSRP\_28 |
| Bands FDD\_D | RSRP\_28 |
| Bands FDD\_E  Bands FDD\_F | RSRP\_29 |
| Bands FDD\_G | RSRP\_30 |
| Bands FDD\_H | RSRP\_30 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 9.9.1.2 FDD Intra Frequency Serving Cell Absolute RSRQ Accuracy

##### 9.9.1.2.1 Test purpose

To verify the FDD intra-frequency serving cell absolute RSRQ measurement accuracy is within the specified limit.

##### 9.9.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward. Applicability requires support for FGI bit 16.

##### 9.9.1.2.3 Minimum conformance requirements

The serving cell absolute accuracy of RSRQ is defined as the RSRQ measured of the serving cell.

The accuracy requirements in table 9.9.1.2.3-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in 3GPP TS 36.101 Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to Annex I.3.1 for a corresponding Band.

Table 9.9.1.2.3-1: RSRQ FDD intra frequency absolute accuracy

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | |
| Normal condition | Extreme condition | Ês/Iot | Io Note 1 range | | |
| E-UTRA operating band groups Note 4 | Minimum Io | Maximum Io |
| dB | dB | dB |  | dBm/15kHz Note 3 | dBm/BWChannel |
| ±2.5 | ±4 | ≥-3 dB | FDD\_A, TDD\_A | -121 | -50 |
| FDD\_C, TDD\_C | -120 | -50 |
| FDD\_D | -119.5 | -50 |
| FDD\_E, TDD\_E | -119 | -50 |
| FDD\_F | -118.5 | -50 |
| FDD\_G | -118 | -50 |
| FDD\_H | -117.5 | -50 |
| FDD\_N | -114.5 | -50 |
| ±3.5 | ±4 | ≥-6 dB | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: The condition level is increased by ∆>0, when applicable, as described in Clauses I.4.2 and I.4.3.  NOTE 4: E-UTRA operating band groups are as defined in Clause 3.5. | | | | | |

The reporting range of RSRQ is defined from -19.5 dB to -3 with 0.5 dB resolution.

The mapping of measured quantity is defined in Table 9.9.1.2.3-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.9.1.2.3-2: RSRQ FDD Intra frequency absolute accuracy measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| RSRQ\_00 | RSRQ < -19.5 | dB |
| RSRQ\_01 | -19.5 ≤ RSRQ < -19 | dB |
| RSRQ\_02 | -19 ≤ RSRQ < -18.5 | dB |
| … | … | … |
| RSRQ\_32 | -4 ≤ RSRQ < -3.5 | dB |
| RSRQ\_33 | -3.5 ≤ RSRQ < -3 | dB |
| RSRQ\_34 | -3 ≤ RSRQ | dB |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 9.1.5.1, 9.1.7 and A.9.9.1.

##### 9.9.1.2.4 Test description

9.9.1.2.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.18 for UE with 2Rx RF band and Annex A, Figure A.75 (without using the faders) for 4Rx capable UE without any 2Rx RF bands.

2. Propagation conditions are set according to Annex B clause B.0.

3. Message contents are defined in clause 9.9.1.2.4.3.

4. Cell 1 is the serving cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

9.9.1.2.4.2 Test procedure

The serving cell absolute accuracy of RSRQ is defined as the RSRQ measured from the serving cell 1.

1. Ensure the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Set the parameters according to Table 9.9.1.2.5-1 as appropriate. Propagation conditions are set according to Annex B clause B.1.1.

3. SS shall transmit an RRCConnectionReconfiguration message.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, SS shall check the RSRQ value in periodical MeasurementReport messages. The RSRQ value of serving Cell 1 reported by the UE is compared to the actual RSRQ according to Table 9.9.1.2.5-2.

7. The SS shall check MeasurementReport messages transmitted by the UE until the confidence level according to Tables G.2.3-1 in Annex G.2 is achieved.

9.9.1.2.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] values 4.6 with the following exceptions:

Table 9.9.1.2.4.3-1: Common Exception messages for RSRQ FDD intra frequency absolute accuracy test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.5-1  Table H.3.5-4 |

Table 9.9.1.2.4.3-2: *MeasResults*: Additional RSRQ FDD intra frequency absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 |  |  |
| meaResultServCell SEQUENCE { |  |  |  |
| rsrpResult |  | Set according to specific test |  |
| rsrqResult |  | Set according to specific test |  |
| } |  |  |  |
| } |  |  |  |

##### 9.9.1.2.5 Test requirement

Table 9.9.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each RSRQ FDD intra frequency absolute accuracy test shall meet the reported values test requirements in Table 9.9.1.2.5-2.

Table 9.9.1.2.5-1: Cell Specific Test requirement Parameters for RSRQ FDD intra frequency absolute accuracy

| Parameter | | Unit | Test |
| --- | --- | --- | --- |
| Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| BWchannel | | MHz | 10 |
| Antenna Configuration | |  | 1x2 |
| Measurement bandwidth | |  | 22—27 |
| PDSCH Reference measurement channel defined in A.1.1-1 | |  | R.0 FDD |
| PDSCH allocation | |  | 13—36 |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.2.1-1 | |  | R.6 FDD |
| OCNG Patterns defined in D.1.1-1 (OP.1 FDD) | |  | OP.1 FDD |
| PBCH\_RA | | dB | 0 |
| PBCH\_RB | |
| PSS\_RA | |
| SSS\_RA | |
| PCFICH\_RB | |
| PHICH\_RA | |
| PHICH\_RB | |
| PDCCH\_RA | |
| PDCCH\_RB | |
| PDSCH\_RA | |
| PDSCH\_RB | |
| OCNG\_RANote1 | |
| OCNG\_RBNote1 | |
| Note2 | Bands FDD\_A | dBm/15 kHz | -120.4 |
| Bands FDD\_C | -119.4 |
| Bands FDD\_D | -118.9 |
| Bands FDD\_E, FDD\_F Note 5 | -118.4 |
| Bands FDD\_G Note 7 | -117.4 |
| Bands FDD\_H | -116.9 |
|  | | dB | -4 |
| RSRPNote3 | Bands FDD\_A | dBm/15 kHz | -124.4 |
| Bands FDD\_C | -123.4 |
| Bands FDD\_D | -122.9 |
| Bands FDD\_E, FDD\_F Note 5 | -122.4 |
| Bands FDD\_G Note 7 | -121.4 |
| Bands FDD\_H | -120.9 |
| RSRQNote3 | Bands FDD\_A | dB | -16.25 |
| Bands FDD\_C |
| Bands FDD\_D |
| Bands FDD\_E, FDD\_F Note 5 |
| Bands FDD\_G Note 7 |
| Bands FDD\_H |
| IoNote3 | Bands FDD\_A | dBm/9 MHz | -91.16 |
| Bands FDD\_C | -90.16 |
| Bands FDD\_D | -89.66 |
| Bands FDD\_E, FDD\_F Note 5 | -89.16 |
| Bands FDD\_G Note 7 | -88.16 |
| Bands FDD\_H | -87.66 |
|  | | dB | -4 |
| Propagation condition | | - | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP, RSRQ and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 5: For Band 26, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 865-894 MHz.  NOTE 6: E-UTRA operating band groups are as defined in Clause 3.5.  NOTE 7: Except Band 29 and Band 32. | | | |

Table 9.9.1.2.5-2: RSRQ FDD Intra frequency absolute accuracy requirements for the reported values

|  |  |
| --- | --- |
|  | Test 1 |
|  | All bands |
| Normal Conditions | |
| Lowest reported value (Cell 1) | RSRQ\_00 |
| Highest reported value (Cell 1) | RSRQ\_15 |
| Extreme Conditions | |
| Lowest reported value (Cell 1) | RSRQ\_00 |
| Highest reported value (Cell 1) | RSRQ\_16 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 9.9.2 TDD Serving Cell RSRP and RSRQ Accuracy

#### 9.9.2.1 TDD Intra Frequency Serving Cell Absolute RSRP Accuracy

##### 9.9.2.1.1 Test purpose

To verify the TDD intra-frequency serving cell absolute RSRP measurement accuracy is within the specified limit.

##### 9.9.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and release 11. Applicability requires support for FGI bit 16.

##### 9.9.2.1.3 Minimum conformance requirements

The serving cell absolute accuracy of RSRP is defined as the RSRP measured of the serving cell.

The accuracy requirements in Table 9.9.2.1.3-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in 3GPP TS 36.101 Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to Annex I.3.1 for a corresponding Band.

Table 9.9.2.1.3-1: RSRP Intra frequency absolute accuracy

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | Ês/Iot | Io Note 1 range | | | |
| E-UTRA operating band groups Note 3 | Minimum Io | | Maximum Io |
| dB | dB | dB |  | dBm/15kHz Note 2 | dBm/BWChannel | dBm/BWChannel |
| ±6 | ±9 | ≥-6 dB | FDD\_A, TDD\_A | -121 | N/A | -70 |
| FDD\_C, TDD\_C | -120 | N/A | -70 |
| FDD\_D | -119.5 | N/A | -70 |
| FDD\_E, TDD\_E | -119 | N/A | -70 |
| FDD\_F | -118.5 | N/A | -70 |
| FDD\_G | -118 | N/A | -70 |
| FDD\_H | -117.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 dB | FDD\_A, FDD\_C, FDD\_D, FDD\_E, FDD\_F, FDD\_G, FDD\_H, TDD\_A, TDD\_C, TDD\_E | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The condition level is increased by ∆>0, when applicable, as described in Clauses I.4.2 and I.4.3.  NOTE 3: E-UTRA operating band groups are as defined in Clause 3.5. | | | | | | |

The reporting range of RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 9.9.2.1.3-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.9.2.1.3-2: RSRP measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| RSRP\_00 | RSRP < -140 | dBm |
| RSRP\_01 | -140 ≤ RSRP < -139 | dBm |
| RSRP\_02 | -139 ≤ RSRP < -138 | dBm |
| … | … | … |
| RSRP\_95 | -46 ≤ RSRP < -45 | dBm |
| RSRP\_96 | -45 ≤ RSRP < -44 | dBm |
| RSRP\_97 | -44 ≤ RSRP | dBm |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 9.1.2.1, clause 9.1.4 and A.9.9.2.

##### 9.9.2.1.4 Test description

9.9.2.1.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.18 for UE with 2Rx RF band and Annex A, Figure A.75 (without using the faders) for 4Rx capable UE without any 2Rx RF bands.

2. Propagation conditions are set according to Annex B clause B.0.

3. Message contents are defined in clause 9.9.2.1.4.3.

4. Cell 1 is the serving cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

9.9.2.1.4.2 Test procedure

1. Ensure that the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Set the parameters according to Table 9.9.2.1.5-1 as appropriate. Propagation conditions are set according to Annex B clause B.1.1.

3. SS shall transmit an RRCConnectionReconfiguration message on cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, SS shall check RSRP reported value in periodical MeasurementReport messages. The RSRP value of Cell 1 reported by the UE is compared to actual RSRP value according to Table 9.9.2.1.5-2.

7. SS shall check the MeasurementReport message transmitted by the UE until the confidence level according to Tables G.2.3-1 in Annex G.2 is achieved.

9.9.2.1.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] values 4.6 with the following exceptions:

Table 9.9.2.1.4.3-1: Common Exception message for RSRP TDD intra frequency absolute accuracy test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.5-1  Table H.3.5-3 |

Table 9.9.2.1.4.3-2: *MeasResults*: Additional RSRP TDD intra frequency absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 |  |  |
| measResultServCell SEQUENCE { |  |  |  |
| rsrpResult | INTEGER(0..97) |  |  |
| rsrqResult | INTEGER(0..34) |  |  |
| } |  |  |  |
| } |  |  |  |

##### 9.9.2.1.5 Test requirement

Table 9.9.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each RSRP TDD intra-frequency absolute accuracy test shall meet the reported values test requirements in table 9.9.2.1.5-2.

Table 9.9.2.1.5-1: RSRP TDD Intra frequency absolute accuracy test parameters

| Parameter | | Unit | Test |
| --- | --- | --- | --- |
| Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| BWchannel | | MHz | 10 |
| Antenna Configuration | |  | 1x2 |
| Special subframe configurationNote1 | |  | 6 |
| Uplink/downlink configurationNote1 | |  | 1 |
| Measurement bandwidth | |  | 22—27 |
| PDSCH Reference measurement channel defined in A.1.2-1 | |  | R.0 TDD |
| PDSCH allocation | |  | 13—36 |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.2.2-1 | |  | R.6 TDD |
| OCNG Patterns defined in D.2.1-1 (OP.1 TDD) | |  | OP.1 TDD |
| PBCH\_RA | | dB | 0 |
| PBCH\_RB | |
| PSS\_RA | |
| SSS\_RA | |
| PCFICH\_RB | |
| PHICH\_RA | |
| PHICH\_RB | |
| PDCCH\_RA | |
| PDCCH\_RB | |
| PDSCH\_RA | |
| PDSCH\_RB | |
| OCNG\_RANote2 | |
| OCNG\_RBNote2 | |
| Note3 | Bands TDD\_A | dBm/15 kHz | -120.4 |
| Bands TDD\_C | -119.4 |
| Bands TDD\_E | -118.4 |
|  | | dB | -4 |
| RSRPNote4 | Bands TDD\_A | dBm/15 kHz | -124.4 |
| Bands TDD\_C | -123.4 |
| Bands TDD\_E | -122.4 |
| RSRQNote4 | Bands TDD\_A | dB | -14.93 |
| Bands TDD\_C |
| Bands TDD\_E |
| IoNote4 | Bands TDD\_A | dBm/9 MHz | -91.16 |
| Bands TDD\_C | -90.16 |
| Bands TDD\_E | -89.16 |
|  | | dB | -4 |
| Propagation condition | | - | AWGN |
| NOTE 1: For special subframe and uplink-downlink configurations see Tables 4.2-1 and 4.2-2 in 3GPP TS 36.211.  NOTE 2: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 4: RSRP, RSRQ and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 5: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 6: E-UTRA operating band groups are as defined in Clause 3.5. | | | |

Table 9.9.2.1.5-2: RSRP TDD Intra frequency absolute accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
| Normal Conditions | Test 1 | |
| Lowest reported value (Cell 1) | Bands TDD\_A | RSRP\_9 |
| Bands TDD\_C | RSRP\_10 |
| Bands TDD\_E | RSRP\_11 |
| Highest reported value (Cell 1) | Bands TDD\_A | RSRP\_24 |
| Bands TDD\_C | RSRP\_25 |
| Bands TDD\_E | RSRP\_26 |
| Extreme Conditions | Test 1 | |
| Lowest reported value (Cell 1) | Bands TDD\_A | RSRP\_6 |
| Bands TDD\_C | RSRP\_7 |
| Bands TDD\_E | RSRP\_8 |
| Highest reported value (Cell 1) | Bands TDD\_A | RSRP\_27 |
| Bands TDD\_C | RSRP\_28 |
| Bands TDD\_E | RSRP\_29 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 9.9.2.1\_1 TDD Intra Frequency Serving Cell Absolute RSRP Accuracy (Rel‑12 and forward)

##### 9.9.2.1\_1.1 Test purpose

Same test purpose as in clause 9.9.2.1.1.

##### 9.9.2.1\_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward. Applicability requires support for FGI bit 16.

##### 9.9.2.1\_1.3 Minimum conformance requirements

The serving cell absolute accuracy of RSRP is defined as the RSRP measured of the serving cell.

The accuracy requirements in Table 9.9.2.1\_1.3-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in 3GPP TS 36.101 Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to Annex I.3.1 for a corresponding Band.

Table 9.9.2.1\_1.3-1: RSRP TDD Intra frequency absolute accuracy

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | Ês/Iot | Io Note 1 range | | | |
| E-UTRA operating band groups Note 3 | Minimum Io | | Maximum Io |
| dB | dB | dB |  | dBm/15kHz Note 2 | dBm/BWChannel | dBm/BWChannel |
| ±4.5 | ±9 | ≥-6 dB | FDD\_A, TDD\_A | -121 | N/A | -70 |
| FDD\_B1, FDD\_B2 | -120.5 | N/A | -70 |
| FDD\_C, TDD\_C | -120 | N/A | -70 |
| FDD\_D | -119.5 | N/A | -70 |
| FDD\_E, TDD\_E | -119 | N/A | -70 |
| FDD\_F | -118.5 | N/A | -70 |
| FDD\_G | -118 | N/A | -70 |
| FDD\_H | -117.5 | N/A | -70 |
| FDD\_N | -114.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 dB | FDD\_A, TDD\_A, FDD\_C, TDD\_C, FDD\_D, FDD\_E, TDD\_E, FDD\_F, FDD\_G, FDD\_H, FDD\_N | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The condition level is increased by ∆>0, when applicable, as described in Clauses I.4.2 and I.4.3.  NOTE 3: E-UTRA operating band groups are as defined in Clause 3.5. | | | | | | |

The reporting range of RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 9.9.2.1\_1.3-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.9.2.1\_1.3-2: RSRP measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| RSRP\_00 | RSRP < -140 | dBm |
| RSRP\_01 | -140 ≤ RSRP < -139 | dBm |
| RSRP\_02 | -139 ≤ RSRP < -138 | dBm |
| … | … | … |
| RSRP\_95 | -46 ≤ RSRP < -45 | dBm |
| RSRP\_96 | -45 ≤ RSRP < -44 | dBm |
| RSRP\_97 | -44 ≤ RSRP | dBm |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 9.1.2.1, clause 9.1.4 and A.9.9.2.

##### 9.9.2.1\_1.4 Test description

9.9.2.1\_1.4.1 Initial conditions

Same initial conditions as in clause 9.9.2.1.4.1 with the following exceptions:

- Instead of 9.9.2.1.4.3 🡪 use 9.9.2.1\_1.4.3.

9.9.2.1\_1.4.2 Test procedure

Same test procedure as in clause 9.9.1.1.4.2 with the following exceptions:

- Instead of Table 9.9.2.1.5-1 🡪 use Table 9.9.2.1\_1.5-1.

- Instead of Table 9.9.2.1.5-2 🡪 use Table 9.9.2.1\_1.5-2.

9.9.2.1\_1.4.3 Message contents

Same message contents as in clause 9.9.2.1.4.3.

##### 9.9.2.1\_1.5 Test requirement

Table 9.9.2.1\_1.5-1 defines the primary level settings including test tolerances for all tests.

Each RSRP TDD intra-frequency absolute accuracy test shall meet the reported values test requirements in table 9.9.2.1\_1.5-2.

Table 9.9.2.1\_1.5-1: RSRP TDD Intra frequency absolute accuracy test parameters

| Parameter | | Unit | Test |
| --- | --- | --- | --- |
| Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| BWchannel | | MHz | 10 |
| Antenna Configuration | |  | 1x2 |
| Special subframe configurationNote1 | |  | 6 |
| Uplink/downlink configurationNote1 | |  | 1 |
| Measurement bandwidth | |  | 22—27 |
| PDSCH Reference measurement channel defined in A.3.1.1.2 | |  | R.0 TDD |
| PDSCH allocation | |  | 13—36 |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.3.1.2.2 | |  | R.6 TDD |
| OCNG Patterns defined in A.3.2.2.1 (OP.1 TDD) | |  | OP.1 TDD |
| PBCH\_RA | | dB | 0 |
| PBCH\_RB | |
| PSS\_RA | |
| SSS\_RA | |
| PCFICH\_RB | |
| PHICH\_RA | |
| PHICH\_RB | |
| PDCCH\_RA | |
| PDCCH\_RB | |
| PDSCH\_RA | |
| PDSCH\_RB | |
| OCNG\_RANote2 | |
| OCNG\_RBNote2 | |
| Note3 | Bands TDD\_A | dBm/15 kHz | -120.4 |
| Bands TDD\_C | -119.4 |
| Bands TDD\_E | -118.4 |
|  | | dB | -4 |
| RSRPNote4 | Bands TDD\_A | dBm/15 kHz | -124.4 |
| Bands TDD\_C | -123.4 |
| Bands TDD\_E | -122.4 |
| RSRQNote4 | Bands TDD\_A | dB | -14.93 |
| Bands TDD\_C |
| Bands TDD\_E |
| IoNote4 | Bands TDD\_A | dBm/9 MHz | -91.16 |
| Bands TDD\_C | -90.16 |
| Bands TDD\_E | -89.16 |
|  | | dB | -4 |
| Propagation condition | | - | AWGN |
| NOTE 1: For special subframe and uplink-downlink configurations see Tables 4.2-1 and 4.2-2 in 3GPP TS 36.211.  NOTE 2: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 4: RSRP, RSRQ and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 5: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 6: E-UTRA operating band groups are as defined in Clause 3.5. | | | |

Table 9.9.2.1\_1.5-2: RSRP TDD Intra frequency absolute accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
| Normal Conditions | Test 1 | |
| Lowest reported value (Cell 1) | Bands TDD\_A | RSRP\_10 |
| Bands TDD\_C | RSRP\_11 |
| Bands TDD\_E | RSRP\_12 |
| Highest reported value (Cell 1) | Bands TDD\_A | RSRP\_22 |
| Bands TDD\_C | RSRP\_23 |
| Bands TDD\_E | RSRP\_24 |
| Extreme Conditions | Test 1 | |
| Lowest reported value (Cell 1) | Bands TDD\_A | RSRP\_6 |
| Bands TDD\_C | RSRP\_7 |
| Bands TDD\_E | RSRP\_8 |
| Highest reported value (Cell 1) | Bands TDD\_A | RSRP\_27 |
| Bands TDD\_C | RSRP\_28 |
| Bands TDD\_E | RSRP\_29 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 9.9.2.2 TDD Intra Frequency Serving Cell Absolute RSRQ Accuracy

##### 9.9.2.2.1 Test purpose

To verify the TDD intra-frequency serving cell absolute RSRQ measurement accuracy is within the specified limit.

##### 9.9.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit 16.

##### 9.9.2.2.3 Minimum conformance requirements

The serving cell absolute accuracy of RSRQ is defined as the RSRQ measured of the serving cell.

The accuracy requirements in table 9.9.2.2.3-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in 3GPP TS 36.101 Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to Annex I.3.1 for a corresponding Band.

Table 9.9.2.2.3-1: RSRQ TDD intra frequency absolute accuracy

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | |
| Normal condition | Extreme condition | Ês/Iot | Io Note 1 range | | |
| E-UTRA operating band groups Note 4 | Minimum Io | Maximum Io |
| dB | dB | dB |  | dBm/15kHz Note 3 | dBm/BWChannel |
| ±2.5 | ±4 | ≥-3 dB | FDD\_A, TDD\_A | -121 | -50 |
| FDD\_C, TDD\_C | -120 | -50 |
| FDD\_D | -119.5 | -50 |
| FDD\_E, TDD\_E | -119 | -50 |
| FDD\_F | -118.5 | -50 |
| FDD\_G | -118 | -50 |
| FDD\_H | -117.5 | -50 |
| FDD\_N | -114.5 | -50 |
| ±3.5 | ±4 | ≥-6 dB | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: The condition level is increased by ∆>0, when applicable, as described in Clauses I.4.2 and I.4.3.  NOTE 4: E-UTRA operating band groups are as defined in Clause 3.5. | | | | | |

The reporting range of RSRQ is defined from -19.5 dB to -3 with 0.5 dB resolution.

The mapping of measured quantity is defined in Table 9.9.2.2.3-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.9.2.2.3-2: RSRQ TDD Intra frequency absolute accuracy measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| RSRQ\_00 | RSRQ < -19.5 | dB |
| RSRQ\_01 | -19.5 ≤ RSRQ < -19 | dB |
| RSRQ\_02 | -19 ≤ RSRQ < -18.5 | dB |
| … | … | … |
| RSRQ\_32 | -4 ≤ RSRQ < -3.5 | dB |
| RSRQ\_33 | -3.5 ≤ RSRQ < -3 | dB |
| RSRQ\_34 | -3 ≤ RSRQ | dB |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 9.1.5.1, 9.1.7 and A.9.9.2.

##### 9.9.2.2.4 Test description

9.9.2.2.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.18 for UE with 2Rx RF band and Annex A, Figure A.75 (without using the faders) for 4Rx capable UE without any 2Rx RF bands.

2. Propagation conditions are set according to Annex B clause B.0.

3. Message contents are defined in clause 9.9.2.2.4.3.

4. Cell 1 is the serving cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

9.9.2.2.4.2 Test procedure

The serving cell absolute accuracy of RSRQ is defined as the RSRQ measured from the serving cell 1.

1. Ensure the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Set the parameters according to Table 9.9.2.2.5-1 as appropriate. Propagation conditions are set according to Annex B clause B.1.1.

3. SS shall transmit an RRCConnectionReconfiguration message.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, SS shall check the RSRQ value in periodical MeasurementReport messages. The RSRQ value of serving Cell 1 reported by the UE is compared to the actual RSRQ according to Table 9.9.2.2.5-2.

7. The SS shall check MeasurementReport messages transmitted by the UE until the confidence level according to Tables G.2.3-1 in Annex G.2 is achieved.

9.9.2.2.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] values 4.6 with the following exceptions:

Table 9.9.2.2.4.3-1: Common Exception messages for RSRQ TDD intra frequency absolute accuracy test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.5-1  Table H.3.5-4 |

Table 9.9.2.2.4.3-2: *MeasResults*: Additional RSRQ TDD intra frequency absolute accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 |  |  |
| meaResultServCell SEQUENCE { |  |  |  |
| rsrpResult |  | Set according to specific test |  |
| rsrqResult |  | Set according to specific test |  |
| } |  |  |  |
| } |  |  |  |

##### 9.9.2.2.5 Test requirement

Table 9.9.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each RSRQ TDD intra frequency absolute accuracy test shall meet the reported values test requirements in Table 9.9.2.2.5-2.

Table 9.9.2.2.5-1: Cell Specific Test requirement Parameters for RSRQ TDD intra frequency absolute accuracy

| Parameter | | Unit | Test |
| --- | --- | --- | --- |
| Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| BWchannel | | MHz | 10 |
| Antenna Configuration | |  | 1x2 |
| Special subframe configurationNote1 | |  | 6 |
| Uplink/downlink configurationNote1 | |  | 1 |
| Measurement bandwidth | |  | 22—27 |
| PDSCH Reference measurement channel defined in A.1.2-1 | |  | R.0 TDD |
| PDSCH allocation | |  | 13—36 |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.2.2-1 | |  | R.6 TDD |
| OCNG Patterns defined in D.2.1-1 (OP.1 TDD) | |  | OP.1 TDD |
| PBCH\_RA | | dB | 0 |
| PBCH\_RB | |
| PSS\_RA | |
| SSS\_RA | |
| PCFICH\_RB | |
| PHICH\_RA | |
| PHICH\_RB | |
| PDCCH\_RA | |
| PDCCH\_RB | |
| PDSCH\_RA | |
| PDSCH\_RB | |
| OCNG\_RANote2 | |
| OCNG\_RBNote2 | |
| Note3 | Bands TDD\_A | dBm/15 kHz | -120.4 |
| Bands TDD\_C | -119.4 |
| Bands TDD\_E | -118.4 |
|  | | dB | -4 |
| RSRPNote4 | Bands TDD\_A | dBm/15 kHz | -124.4 |
| Bands TDD\_C | -123.4 |
| Bands TDD\_E | -122.4 |
| RSRQNote4 | Bands TDD\_A | dB | -16.25 |
| Bands TDD\_C |
| Bands TDD\_E |
| IoNote4 | Bands TDD\_A | dBm/9 MHz | -91.16 |
| Bands TDD\_C | -90.16 |
| Bands TDD\_E | -89.16 |
|  | | dB | -4 |
| Propagation condition | | - | AWGN |
| NOTE 1: For special subframe and uplink-downlink configurations see Tables 4.2-1 and 4.2-2 in 3GPP TS 36.211.  NOTE 2: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 4: RSRP, RSRQ and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 5: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  NOTE 6: E-UTRA operating band groups are as defined in Clause 3.5. | | | |

Table 9.9.2.2.5-2: RSRQ TDD Intra frequency absolute accuracy requirements for the reported values

|  |  |
| --- | --- |
|  | Test 1 |
|  | All bands |
| Normal Conditions | |
| Lowest reported value (Cell 1) | RSRQ\_00 |
| Highest reported value (Cell 1) | RSRQ\_15 |
| Extreme Conditions | |
| Lowest reported value (Cell 1) | RSRQ\_00 |
| Highest reported value (Cell 1) | RSRQ\_16 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 9.10

## 9.11 RSSI Accuracy

### 9.11.1 FS3 average RSSI accuracy case (PCell using FDD)

#### 9.11.1.1 Test purpose

To verify that the average RSSI measurement accuracy is within the specified limits for all FS3 bands.

#### 9.11.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE from release 13 onwards supporting Downlink LAA and RSSI reporting. Applicability requires support for rssi-AndChannelOccupancyReporting-r13.

#### 9.11.1.3 Minimum conformance requirements

The absolute accuracy of RSSI measurements is defined as the RSSI measurements from a FS3 cell in CA operation with a serving FDD or TDD cell.

The accuracy requirements in table 9.11.1.3-1 are valid under the following conditions:

- All symbols duing each RSSI measurement duration are available for RSSI sampling within the same reporting interval.

Table 9.11.1.3-1: Intra-frequency RSSI accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | |
| Normal condition | Extreme condition | Io Note 1 range | | |
| E-UTRA operating band groups Note 4 | Minimum Io | Maximum Io |
| dB | dB |  | dBm/15kHz Note 3 | dBm/BWChannel |
| ±2.5 | ±5.5 | FS3\_G | -118 | -50 |
| ±4.5 | ±7.5 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: The condition level is increased by ∆>0, when applicable, as described in Clauses B.4.2 and B.4.3.  NOTE 4: E-UTRA operating band groups are as defined in Clause 3.5. | | | | |

The reporting range of RSSI measurement is defined from -100 dBm to -25 dBm with 1 dBm resolution.

The mapping of measured quantity is defined in Table 9.11.1.3-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 9.11.1.3-2: RSSI measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| RSSI\_00 | RSSI < ‑100 | dBm |
| RSSI\_01 | -100 ≤ RSSI < ‑99 | dBm |
| RSSI\_02 | -99 ≤ RSSI < ‑98 | dBm |
| … | … | … |
| RSSI\_74 | -27 ≤ RSSI < -26 | dBm |
| RSSI\_75 | -26 ≤ RSSI < -25 | dBm |
| RSSI\_76 | -25 ≤ RSSI | dBm |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 9.1.18.5 and A.9.11.1.

#### 9.11.1.4 Test description

##### 9.11.1.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1 for different CA bandwidth classes.

Channel Bandwidth to be tested: The largest aggregated bandwidth combination supported by the UE for the CA configuration under test as defined in 3GPP TS 36.521-1 [10] clause 5.4.2A. The allowed bandwidths for each cell are shown in Table 9.11.1.5-1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.45 for UE supporting only 2Rx RF bands on all CC and Annex A, Figure A.X2 (without faders on active cells and without using neighbours) for UE supporting 4Rx RF band on any of the CC.

2. Propagation conditions are set according to Annex B clause B.0.

3. Message contents are defined in clause 9.11.1.4.3.

4. Both cells in the test are in different bands. Cell 1 is the serving FDD cell and Cell 2 is the target FS3 cell. Cell 1 is the cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

##### 9.11.1.4.2 Test procedure

1. Ensure that the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Configure SCell according to Annex C.0, C.1 for all downlink physical channels.

3. The SS shall configure SCell (Cell 2) on the SCC as per 3GPP TS 36.508 [7] clause 5.2A.4.

4. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [11], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

5. Set the parameters according to Table 9.11.1.5-1 as appropriate. Propagation conditions are set according to Annex B clause B.1.1.

6. SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

7. The UE shall transmit RRCConnectionReconfigurationComplete message.

8. UE shall transmit periodically MeasurementReport messages.

9. After 10s wait from Step 6, SS shall check RSSI reported value in periodical MeasurementReport messages. The RSSI value reported by the UE is compared to the actual RSSI value according to Table 9.11.1.5-2. If the UE fails to report the measurement value, the number of failed iterations is increased by one.

10. The SS shall check MeasurementReport messages transmitted by the UE until the confidence level according to Tables G.2.3-1 in Annex G.2 is achieved.

##### 9.11.1.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.11.1.4.3-1: Common Exception messages for average RSSI accuracy test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1  Table H.3.9-1  Table H.3.9-2  Table H.3.9-3 |

Table 9.11.1.4.3-2: *MeasResults*: Additional average RSSI accuracy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 | Identifies the measurement id for the reporting being performed |  |
| measResultForRSSI-r13 SEQUENCE { |  |  |  |
| rssi-Result-r13 | RSSI-Range-r13 | Set according to specific test |  |
| } |  |  |  |
| } |  |  |  |

#### 9.11.1.5 Test requirement

Table 9.11.1.5-1 defines the primary level settings including test tolerances for all tests.

The average RSSI accuracy shall meet the reported values test requirements in table 9.11.1.5-2.

Table 9.11.1.5-1: Average RSSI accuracy Test Parameters

| Parameter | Unit | Test 1 | |
| --- | --- | --- | --- |
| Cell 1 | Cell 2 |
| E-UTRA RF Channel Number |  | 1 | 2 |
| BWchannel | MHz | 5  10  20 | 20 |
| Listen before talk model |  | Not applicable | Not used |
| Measurement bandwidth |  | 6 | |
| PDSCH Reference measurement channel defined in A.1 |  | 5MHz: R.5 FDD  10MHz: R.0 FDD  20MHz: R.4 FDD | R0.FS3 |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.2 |  | 5MHz: R.11 FDD  10MHz: R.6 FDD  20MHz: R.10 FDD | R0.FS3 |
| OCNG Patterns defined in D.1 |  | 5MHz: OP.15 FDD  10MHz: OP.1 FDD  20MHz: OP.11 FDD | OP.13 FDD |
| PBCH\_RA | dB | 0 | 0 |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote1 |
| OCNG\_RBNote1 |
| in subframes not corresponding to RSSI measurement time configuration (RMTC) | dBm/15 kHz | -106 | -106 |
| in subframes corresponding to RSSI measurement time configuration (RMTC) | dBm/15 kHz | -106 | -83 |
| in subframes not corresponding to RSSI measurement time configuration (RMTC) | dB | 2.5 | 2.5 |
| in subframes corresponding to RSSI measurement time configuration (RMTC) | dB | 2.5 | -Infinity |
| RSRP in subframes not corresponding to RSSI measurement time configuration (RMTC) | dBm/15 kHz | -103.5 | -103.5 |
| RSRP in subframes corresponding to RSSI measurement time configuration (RMTC) |  | -103.5 | -Infinity |
| Io in subframes corresponding to RSSI measurement time configuration (RMTC) | dBm/4.5 MHz  dBm/9 MHz  dBm/18 MHz | -76.79  -73.78  -70.77 | -52.21 |
| Io in subframes not corresponding to RSSI measurement time configuration (RMTC) | dBm/4.5 MHz  dBm/9 MHz  dBm/18 MHz | -76.79  -73.78  -70.77 | -70.77 |
| Propagation condition | - | AWGN | |

Table 9.11.1.5-2: Average RSSI accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
| Normal Conditions | Test 1 | |
| Lowest reported value (Freq 2) | Bands FS3\_G | RSSI\_44 |
| Highest reported value (Freq 2) | Bands FS3\_G | RSSI\_53 |
| Extreme Conditions | **Test 1** | |
| Lowest reported value (Freq 2) | Bands FS3\_G | RSSI\_41 |
| Highest reported value (Freq 2) | Bands FS3\_G | RSSI\_56 |
| NOTE 1: E-UTRA operating band groups are as defined in Clause 3.5. | | |

Table 9.11.1.5-3: Average RSSI RMTC and DMTC parameters

|  |  |
| --- | --- |
| measDuration-r13 | sym14 |
| rmtc-Period-r13 | ms40 |
| rmtc-SubframeOffset-r13 | 20 |
| ReportInterval | ms120 |
| dmtc-PeriodOffset-r12 | ms40-r12 value 0 |

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

### 9.11.2 FS3 average RSSI accuracy case (PCell using TDD)

#### 9.11.2.1 Test purpose

To verify that the average RSSI measurement accuracy is within the specified limits for all FS3 bands.

#### 9.11.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE from release 13 onwards supporting Downlink LAA and RSSI reporting. Applicability requires support for rssi-AndChannelOccupancyReporting-r13.

#### 9.11.2.3 Minimum conformance requirements

Same as in clause 9.11.1.3

#### 9.11.2.4 Test description

##### 9.11.2.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1 for different CA bandwidth classes.

Channel Bandwidth to be tested: The largest aggregated bandwidth combination supported by the UE for the CA configuration under test as defined in 3GPP TS 36.521-1 [10] clause 5.4.2A. The allowed bandwidths for each cell are shown in Table 9.11.2.5-1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.45 for UE supporting only 2Rx RF bands on all CC and Annex A, Figure A.X2 (without faders on active cells and without using neighbours) for UE supporting 4Rx RF band on any of the CC.

2. Propagation conditions are set according to Annex B clause B.0.

3. Message contents are defined in clause 9.11.2.4.3.

4. Both cells in the test are in different bands. Cell 1 is the serving TDD cell and Cell 2 is the target FS3 cell. Cell 1 is the cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

##### 9.11.2.4.2 Test procedure

Same as in clause 9.11.1.4.2

##### 9.11.2.4.3 Message contents

Same as in clause 9.11.1.4.3

#### 9.11.2.5 Test requirement

Table 9.11.2.5-1 defines the primary level settings including test tolerances for all tests.

The average RSSI accuracy shall meet the reported values test requirements in table 9.11.2.5-2.

Table 9.11.2.5-1: Average RSSI accuracy Test Parameters

| Parameter | Unit | Test 1 | |
| --- | --- | --- | --- |
| Cell 1 | Cell 2 |
| E-UTRA RF Channel Number |  | 1 | 2 |
| BWchannel | MHz | 5  10  20 | 20 |
| Listen before talk model |  | Not applicable | Not used |
| Measurement bandwidth |  | 6 | |
| PDSCH Reference measurement channel defined in A.1 |  | 5MHz: R.4 TDD  10MHz: R.0 TDD  20MHz: R.3 TDD | R0.FS3 |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.2 |  | 5MHz: R.11 TDD  10MHz: R.6 TDD  20MHz: R.10 TDD | R0.FS3 |
| OCNG Patterns defined in D.2 and D.1 |  | 5MHz: OP.9 TDD  10MHz: OP.1 TDD  20MHz: OP.7 TDD | OP.13 FDD |
| PBCH\_RA | dB | 0 | 0 |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote1 |
| OCNG\_RBNote1 |
| in subframes not corresponding to RSSI measurement time configuration (RMTC) | dBm/15 kHz | -106 | -106 |
| in subframes corresponding to RSSI measurement time configuration (RMTC) | dBm/15 kHz | -106 | -83 |
| in subframes not corresponding to RSSI measurement time configuration (RMTC) | dB | 2.5 | 2.5 |
| in subframes corresponding to RSSI measurement time configuration (RMTC) | dB | 2.5 | -Infinity |
| RSRP in subframes not corresponding to RSSI measurement time configuration (RMTC) | dBm/15 kHz | -103.5 | -103.5 |
| RSRP in subframes corresponding to RSSI measurement time configuration (RMTC) |  | -103.5 | -Infinity |
| Io in subframes corresponding to RSSI measurement time configuration (RMTC) | dBm/4.5 MHz  dBm/9 MHz  dBm/18 MHz | -76.79  -73.78  -70.77 | -52.21 |
| Io in subframes not corresponding to RSSI measurement time configuration (RMTC) | dBm/4.5 MHz  dBm/9 MHz  dBm/18 MHz | -76.79  -73.78  -70.77 | -70.77 |
| Propagation condition | - | AWGN | |

Table 9.11.2.5-2: Average RSSI accuracy requirements for the reported values

|  |  |  |
| --- | --- | --- |
| Normal Conditions | Test 1 | |
| Lowest reported value (Freq 2) | Bands FS3\_G | RSSI\_44 |
| Highest reported value (Freq 2) | Bands FS3\_G | RSSI\_53 |
| Extreme Conditions | **Test 1** | |
| Lowest reported value (Freq 2) | Bands FS3\_G | RSSI\_41 |
| Highest reported value (Freq 2) | Bands FS3\_G | RSSI\_56 |
| NOTE 1: E-UTRA operating band groups are as defined in Clause 3.5. | | |

Table 9.11.2.5-3: Average RSSI RMTC and DMTC parameters

|  |  |
| --- | --- |
| measDuration-r13 | sym14 |
| rmtc-Period-r13 | ms40 |
| rmtc-SubframeOffset-r13 | 20 |
| ReportInterval | ms120 |
| dmtc-PeriodOffset-r12 | ms40-r12 value 0 |

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

## 9.12 Channel Occupancy

### 9.12.1 FS3 channel occupancy test (PCell using FDD)

#### 9.12.1.1 Test purpose

To verify that the Channel Occupancy measurement is within the specified limits for all FS3 bands.

#### 9.12.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE from release 13 onwards supporting Downlink LAA and rssi-AndChannelOccupancyReporting-r13.

#### 9.12.1.3 Minimum conformance requirements

The absolute accuracy of RSSI measurements is defined as the RSSI measurements from a FS3 cell in CA operation with a serving FDD or TDD cell.

The accuracy requirements are valid under the following conditions:

- All symbols during each RSSI measurement duration are available for RSSI sampling within the same reporting interval,

- RSSI at the UE receiver meets the following condition with respect to the configured *channelOccupancyThreshold* [5]:

RSSI at the UE receiver is below *channelOccupancyThreshold*-, or

RSSI at the UE receiver is above *channelOccupancyThreshold*+,

where  is the applicable RSSI measurement accuracy value from the RSSI measurement accuracy requirements specified in 3GPP TS 36.133 [4] Clause 9.1.18.6.2.

The nominal reported *channelOccupancy s*hall be 33. At least 89% of channel occupancy reports made by the UE shall indicate this value

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 9.1.18.6 and A.9.12.1.

#### 9.12.1.4 Test description

##### 9.12.1.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1 for different CA bandwidth classes.

Channel Bandwidth to be tested: The largest aggregated bandwidth combination supported by the UE for the CA configuration under test as defined in 3GPP TS 36.521-1 [10] clause 5.4.2A. The allowed bandwidths for each cell are shown in Table 9.12.1.5-1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.45 for UE supporting only 2Rx RF bands on all CC and Annex A, Figure A.X2 (without faders on active cells and without using neighbours) for UE supporting 4Rx RF band on any of the CC.

2. Propagation conditions are set according to Annex B clause B.0.

3. Message contents are defined in clause 9.12.1.4.3.

4. Both cells in the test are in different bands. Cell 1 is the serving FDD cell and Cell 2 is the target FS3 cell. Cell 1 is the cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

##### 9.12.1.4.2 Test procedure

1. Ensure that the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 7.2A.3.

2. Configure SCell according to Annex C.0, C.1 for all downlink physical channels.

3. The SS shall configure SCell (Cell 2) on the SCC as per 3GPP TS 36.508 [7] clause 5.2A.4.

4. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [11], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

5. Set the parameters according to Table 9.12.1.5-1 as appropriate. Propagation conditions are set according to Annex B clause B.1.1.

6. SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

7. The UE shall transmit RRCConnectionReconfigurationComplete message.

8. UE shall transmit periodically MeasurementReport messages.

9. After 10s wait from Step 6, SS shall check channel occupancy reported value in periodical MeasurementReport messages. The channel occupancy reported by the UE is compared to the actual channel occupancy value defined in clause 9.12.1.5. If the UE fails to report the measurement value, the number of failed iterations is increased by one.

10. The SS shall check MeasurementReport messages transmitted by the UE until the confidence level according to Tables G.2.3-1 in Annex G.2 is achieved.

##### 9.12.1.4.3 Message contents

Same as clause 9.11.1.4.3 with the following exceptions:

Table 9.12.1.4.3-2: *MeasResults*: Additional Channel occupancy test requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.3.5 | | | |
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { |  |  |  |
| measId | 1 | Identifies the measurement id for the reporting being performed |  |
| measResultForRSSI-r13 SEQUENCE { |  |  |  |
| rssi-Result-r13 | RSSI-Range-r13 | Set according to specific test |  |
| channelOccupancy-r13 | INTEGER | Set according to specific test |  |
| } |  |  |  |
| } |  |  |  |

#### 9.12.1.5 Test requirement

Table 9.12.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 9.12.1.5-1: Channel occupancy Test Parameters

| Parameter | Unit | Test 1 | | |
| --- | --- | --- | --- | --- |
| Cell 1 | Cell 2 | |
| E-UTRA RF Channel Number |  | 1 | 2 | |
| BWchannel | MHz | 5  10  20 | 20 | |
| Listen before talk model |  | Not applicable | Not used | |
| Measurement bandwidth |  | 6 | | |
| PDSCH Reference measurement channel defined in A.1 |  | 5MHz: R.5 FDD  10MHz: R.0 FDD  20MHz: R.4 FDD | R0.FS3 | |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.2 |  | 5MHz: R.11 FDD  10MHz: R.6 FDD  20MHz: R.10 FDD | R0.FS3 | |
| OCNG Patterns defined in D.1 |  | 5MHz: OP.15 FDD  10MHz: OP.1 FDD  20MHz: OP.11 FDD | OP.13 FDD | |
| PBCH\_RA | dB | 0 | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote1 |
| OCNG\_RBNote1 |
| in subframes not corresponding to RSSI measurement time configuration (RMTC) | dBm/15 kHz | -106 | -106 | |
| in subframes corresponding to RSSI measurement time configuration (RMTC) where system frame number mod 12 = 2 (Note 2) | dBm/15 kHz | -106 | NC | -89.41 |
| EC | -86.41 |
| in subframes corresponding to RSSI measurement time configuration (RMTC) where system frame number mod 12 is not equal to 2 (Note 2) | dBm/15 kHz | -106 | NC | -98.17 |
| EC | -101.17 |
| in subframes not corresponding to RSSI measurement time configuration (RMTC) | dB | 2.5 | 2.5 | |
| in subframes corresponding to RSSI measurement time configuration (RMTC) | dB | 2.5 | -Infinity | |
| RSRP in subframes not corresponding to RSSI measurement time configuration (RMTC) | dBm/15 kHz | -103.5 | -103.5 | |
| RSRP in subframes corresponding to RSSI measurement time configuration (RMTC) |  | -103.5 | -Infinity | |
| Io in subframes corresponding to RSSI measurement time configuration (RMTC) where system frame number mod 12 = 2 (Note 2) | dBm/4.5 MHz  dBm/9 MHz  dBm/18 MHz | -76.79  -73.78  -70.77 | NC | -58.62 |
| EC | -55.62 |
| Io in subframes corresponding to RSSI measurement time configuration (RMTC) where system frame number mod 12 is not equal to 2 (Note 2) | dBm/4.5 MHz  dBm/9 MHz  dBm/18 MHz | -76.79  -73.78  -70.77 | NC | -67,38 |
| EC | -70,38 |
| Io in subframes not corresponding to RSSI measurement time configuration (RMTC) | dBm/4.5 MHz  dBm/9 MHz  dBm/18 MHz | -76.79  -73.78  -70.77 | -70.77 | |
| Propagation condition | - | AWGN | | |
| channelOccupancyThreshold | dBm | -63 | | |
| NOTE 1: NC and EC refer to Normal Conditions and Extreme Conditions.  NOTE 2: Accumulated system frame number is used to avoid a configuration not match test purpose in boundary of hyper frame numbers. | | | | |

Table 9.12.1.5-2: Channel occupancy RMTC and DMTC parameters

|  |  |
| --- | --- |
| measDuration-r13 | sym14 |
| rmtc-Period-r13 | ms40 |
| rmtc-SubframeOffset-r13 | 20 |
| ReportInterval | ms120 |
| dmtc-PeriodOffset-r12 | ms40-r12 value 0 |

The nominal reported *channelOccupancy s*hall be 33. For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

### 9.12.2 FS3 channel occupancy test (PCell using TDD)

#### 9.12.2.1 Test purpose

To verify that the Channel Occupancy measurement is within the specified limits for all FS3 bands.

#### 9.12.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE from release 13 onwards supporting Downlink LAA and rssi-AndChannelOccupancyReporting-r13.

#### 9.12.2.3 Minimum conformance requirements

Same as in clause 9.12.1.3

#### 9.12.2.4 Test description

##### 9.12.2.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1 for different CA bandwidth classes.

Channel Bandwidth to be tested: The largest aggregated bandwidth combination supported by the UE for the CA configuration under test as defined in 3GPP TS 36.521-1 [10] clause 5.4.2A. The allowed bandwidths for each cell are shown in Table 9.12.2.5-1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure A.45 for UE supporting only 2Rx RF bands on all CC and Annex A, Figure A.X2 (without faders on active cells and without using neighbours) for UE supporting 4Rx RF band on any of the CC.

2. Propagation conditions are set according to Annex B clause B.0.

3. Message contents are defined in clause 9.12.2.4.3.

4. Both cells in the test are in different bands. Cell 1 is the serving TDD cell and Cell 2 is the target FS3 cell. Cell 1 is the cell used for connection setup with the power levels set according to Annex C.0 and C.1 for this test.

##### 9.12.2.4.2 Test procedure

Same as in clause 9.12.1.4.2

##### 9.12.2.4.3 Message contents

Same as in clause 9.12.1.4.3

#### 9.12.2.5 Test requirement

Table 9.12.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 9.12.2.5-1: Channel occupancy Test Parameters

| Parameter | Unit | Test 1 | | |
| --- | --- | --- | --- | --- |
| Cell 1 | Cell 2 | |
| E-UTRA RF Channel Number |  | 1 | 2 | |
| BWchannel | MHz | 5  10  20 | 20 | |
| Listen before talk model |  | Not applicable | Not used | |
| Measurement bandwidth |  | 6 | | |
| PDSCH Reference measurement channel defined in A.1 |  | 5MHz: R.4 TDD  10MHz: R.0 TDD  20MHz: R.3 TDD | R0.FS3 | |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.2 |  | 5MHz: R.11 TDD  10MHz: R.6 TDD  20MHz: R.10 TDD | R0.FS3 | |
| OCNG Patterns defined in D.2 and D.1 |  | 5MHz: OP.9 TDD  10MHz: OP.1 TDD  20MHz: OP.7 TDD | OP.13 FDD | |
| PBCH\_RA | dB | 0 | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote1 |
| OCNG\_RBNote1 |
| in subframes not corresponding to RSSI measurement time configuration (RMTC) | dBm/15 kHz | -106 | -106 | |
| in subframes corresponding to RSSI measurement time configuration (RMTC) where system frame number mod 12 = 2 (Note 2) | dBm/15 kHz | -106 | NC | -89.41 |
| EC | -86.41 |
| in subframes corresponding to RSSI measurement time configuration (RMTC) where system frame number mod 12 is not equal to 2 (Note2) | dBm/15 kHz | -106 | NC | -98.17 |
| EC | -101.17 |
| in subframes not corresponding to RSSI measurement time configuration (RMT) | dB | 2.5 | 2.5 | |
| in subframes corresponding to RSSI measurement time configuration (RMTC | dB | 2.5 | -Infinity | |
| RSRP in subframes not corresponding to RSSI measurement time configuration (RMTC) | dBm/15 kHz | -103.5 | -103.5 | |
| RSRP in subframes corresponding to RSSI measurement time configuration (RMTC) |  | -103.5 | -Infinity | |
| Io in subframes corresponding to RSSI measurement time configuration (RMTC) where system frame number mod 12 = 2 (Note 2) | dBm/4.5 MHz  dBm/9 MHz  dBm/18 MHz | -76.79  -73.78  -70.77 | NC | -58.62 |
| EC | -55.62 |
| Io in subframes corresponding to RSSI measurement time configuration (RMTC) where system frame number mod 12 is not equal to 2 (Note) | dBm/4.5 MHz  dBm/9 MHz  dBm/18 MHz | -76.79  -73.78  -70.77 | NC | -67,38 |
| EC | -70,38 |
| Io in subframes not corresponding to RSSI measurement time configuration (RMTC) | dBm/4.5 MHz  dBm/9 MHz  dBm/18 MHz | -76.79  -73.78  -70.77 | -70.77 | |
| Propagation condition | - | AWGN | | |
| channelOccupancyThreshold | dBm | -63 | | |
| NOTE 1: NC and EC refer to Normal Conditions and Extreme Conditions.  NOTE 2: Accumulated system frame number is used to avoid a configuration not match test purpose in boundary of hyper frame numbers. | | | | |

Table 9.12.2.5-2: Channel occupancy RMTC and DMTC parameters

|  |  |
| --- | --- |
| measDuration-r13 | sym14 |
| rmtc-Period-r13 | ms40 |
| rmtc-SubframeOffset-r13 | 20 |
| ReportInterval | ms120 |
| dmtc-PeriodOffset-r12 | ms40-r12 value 0 |

The nominal reported *channelOccupancy s*hall be 33. For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

# 10 Proximity-based Services in Any Cell Selection

## 10.1 FFS

## 10.2 E-UTRAN FDD - Initiation/Cease of SLSS Transmission with ProSe Direct Communication

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- Message contents are TBD.

- Connection diagrams are TBD

- Annex E updates are pending.

### 10.2.1 Test purpose

To verify the ProSe UE's ability to initiate and cease SLSS transmissions during cell selection state and if the UE meets the maximum evaluation time.

### 10.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Communication.

### 10.2.3 Minimum conformance requirements

The SLSS transmission initiation delay is defined as the time from the beginning of time period T2 up to the moment when the UE initiates the SLSS transmission.

The SLSS transmission initiation delay shall be less than 0.84 s.

The SLSS transmission cease delay is defined as the time from the beginning of time period T3 up to the moment when the UE ceases the SLSS transmission.

The SLSS transmission cease delay shall be less than 0.84 s.

The rate of correct initiation/cease delay of SLSS transmissions observed during repeated tests shall be at least 90%.

NOTE: The initiation/cease delay of SLSS transmissions can be expressed as: Tevaluate,SLSS + SLSS period,

Where:

Tevaluate,SLSS is the evaluation time for initiate/cease of SLSS, and is 0.8 sec (clause 11.3.2) for the parameters in this test;

SLSS period is set as 40ms in this test.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 11.3, and A.10.2.

### 10.2.4 Test description

#### 10.2.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 5 MHz or 10 MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and faders and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure FFS.

2. The general test parameter settings are set up according to Table 10.2.4.1-1.

3. Propagation conditions are set according to Annex B clauses B.0.

4. Message contents are defined in clause 10.2.4.3.

5. There no active cells in this test case during the actual test loop, and SS is expected to simulate a reference UE, SyncRef UE 1. Cell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

Table 10.2.4.1-1: Test parameters for initiation/cease of SLSS transmissions test for E-UTRAN FDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| E-UTRA RF Channel Number |  | 1 |  |
| Channel Bandwidth (BWchannel) | MHz | 5 or 10 | According to principle defined in clause A.3.12.3 |
| Active cell |  | None |  |
| Active SyncRef UE |  | SyncRef UE 1 | Transmitting SLSS+MIB-SL on uplink of RF channel number 1 |
| ProSe Direct Communication preconfiguration |  | As specified in Table A.3.12.5-2  (Configuration #2) | IE values unless specified otherwise in this test. |
| syncTxThreshOoC | dBm/15 kHz | -95 |  |
| T1 | s | 3 |  |
| T2 | s | 5.24 |  |
| T3 | s | 5.24 |  |

Table 10.2.4.1-2: SyncRef UE specific test parameters for initiation/cease of SLSS transmissions test for E-UTRAN FDD

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | SyncRef UE 1 | | |
| T1 | T2 | T3 |
| E-UTRA RF Channel Number |  | 1 | | |
| BWchannelNote 4 | MHz | 5 or 10 | | |
| ProSe Direct Communication resource pool configuration |  | As specified in Table A.3.12.5-1  (Configuration #1)  Note resource pool is same as Configuration #2 used by ProSe UE. | | |
| syncOffsetIndicator |  | Set same as *syncOffsetIndicator1* inProSe Direct Communication preconfiguration | | |
| slssid |  | 30 | | |
| inCoverage |  | TRUE | | |
| networkControlledSyncTx |  | ON | | |
| Note1 | dBm/15 kHz | -96 | | |
|  | dB | 5.5 | -3.5 | 5.5 |
| S-RSRP Note2, Note3 | dBm/15 kHz | -90.5 | -99.5 | -90.5 |
| Propagation Condition |  | AWGN | | |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 2: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 3: SSSS Es/Iot is set the same as PSSS/PSBCH Es/Iot.  NOTE 4: This test is according to the principle defined in clause A.3.12.3. | | | | |

#### 10.2.4.2 Test procedure

There are no active cells in this test. There is one active SyncRef UE (SyncRef UE 1) in this test. The test system shall emulate SyncRef UE 1 to transmit SLSS and MIB-SL every synchronization period Prior to start of test, test system is required to ensure that the ProSe UE is synchronized to the SyncRef UE 1 and is transmitting SLSS + MIB-SL as derived from the SLSS + MIB-SL of SyncRef. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. During T1, the S-RSRP of SyncRef UE 1 is above *syncTxThreshOOC* and the UE is not expected to be transmitting SLSS. During T2, the S-RSRP of SyncRef UE 1 is lowered below *syncTxThreshOOC* and the UE is expected to initiate SLSS transmissions. During T3, the S-RSRP of SyncRef UE 1 is increased back to be above *syncTxThreshOOC* and the UE is expected to cease SLSS transmissions.

1. Ensure the UE is in State 4 according to 3GPP TS 36.508 [7] clause 4.5.4 and UE test loop Mode E is activated on a EUTRA cell.

2. EUTRA cell is powered down for the remaining duration of the test case. SS would ensure that it enables a SyncRefUE1 at this stage and the ProSe UE under test is synchronized to SyncRefUE1.

3. Set the parameters according to T1 in Table 10.2.5-1. Propagation conditions are set according to Annex B clauses B.1.1 and B.2.2. T1 starts.

4. During T1, SS checks if the UE is not transmitting SLSS.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.2.5-1.

6. UE is expected to initiate a SLSS transmissions inside 0.84 s from the start of T2. If the UE initiates SLSS transmission consider the loop to be pass, else the loop is considered as fail.

7. After the SS is able to measure the SLSS in step 6) or when T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 10.2.5-1

8. UE is expected to cease SLSS transmission inside 0.84s from the start of T3. If the UE ceases SLSS transmission consider the loop to be pass, else the loop is considered as fail.

9. After the RRC connection release, the SS switches off and on the UE and ensures the UE is in State 4 with test loop mode E activated according to 3GPP TS 36.508 [7] clause 4.5.4.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved for both the events.

#### 10.2.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 4.6 with FFS:

Table 10.2.4.3-1: Common Exception messages for E-UTRAN FDD-FDD intra frequency event triggered reporting under fading propagation conditions in asynchronous cells test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | FFS |

### 10.2.5 Test requirement

Tables 10.2.4.1-2 and 10.2.5-1 define the primary level settings including test tolerances for E-UTRAN FDD- Initiation/Cease of SLSS Transmission with ProSe Direct Discovery.

Table 10.2.5-1: SyncRef UE specific test parameters for initiation/cease of SLSS transmissions test for E-UTRAN FDD

| Parameter | Unit | SyncRef UE 1 | | |
| --- | --- | --- | --- | --- |
| T1 | T2 | T3 |
| E-UTRA RF Channel Number |  | 1 | | |
| BWchannelNote 4 | MHz | 5 or 10 | | |
| ProSe Direct Communication resource pool configuration |  | As specified in Table A.3.12.5-1  (Configuration #1)  Note resource pool is same as Configuration #2 used by ProSe UE. | | |
| syncOffsetIndicator |  | Set same as *syncOffsetIndicator1* inProSe Direct Communication preconfiguration | | |
| slssid |  | 30 | | |
| inCoverage |  | TRUE | | |
| networkControlledSyncTx |  | ON | | |
| Note1 | dBm/15 kHz | -96 | | |
|  | dB | 6.1 | -4.1 | 6.1 |
| S-RSRP Note2, Note3 | dBm/15 kHz | -89.9 | -100.1 | -89.9 |
| Propagation Condition |  | AWGN | | |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 2: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 3: SSSS Es/Iot is set the same as PSSS/PSBCH Es/Iot.  NOTE 4: This test is according to the principle defined in clause A.3.12.3. | | | | |

The SLSS transmission initiation delay is defined as the time from the beginning of time period T2 up to the moment when the UE initiates the SLSS transmission.

The SLSS transmission initiation delay shall be less than 0.84 s.

The SLSS transmission cease delay is defined as the time from the beginning of time period T3 up to the moment when the UE ceases the SLSS transmission.

The SLSS transmission cease delay shall be less than 0.84 s.

The rate of correct initiation/cease delay of SLSS transmissions observed during repeated tests shall be at least 90%.

NOTE: The initiation/cease delay of SLSS transmissions can be expressed as: Tevaluate,SLSS + SLSS period,

Where:

Tevaluate,SLSS is the evaluation time for initiate/cease of SLSS, and is 0.8 sec (clause 11.3.2) for the parameters in this test;

SLSS period is set as 40ms in this test.

## 10.3 FFS

## 10.4 E-UTRAN FDD - Initiation/Cease of SLSS Transmission with ProSe Direct Communication

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- Message contents are TBD.

- Connection diagrams are TBD

- Annex E updates are pending.

### 10.4.1 Test purpose

The purpose of this test is to verify cell identification delay requirement for a newly detectable cell on the downlink frequency associated with the pre-configured ProSe carrier frequency in Any Cell Selection.

### 10.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Communication.

### 10.4.3 Minimum conformance requirements

The cell selection delay to a newly detectable cell on the downlink associated with the preconfigured ProSe carrier is defined as the time from the beginning of T2 to the time UE camps on the cell and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST.

The cell selection delay to a newly detectable cell on the downlink associated with the preconfigured ProSe carrier shall be less than 7.68 s.

The cell selection delay can be expressed as Tbasic\_identify\_OoC\_ProSe Tx\_ON + TSI, where

- Tbasic\_identify\_OoC\_ProSe Tx\_ON = 6.4sec as specified in clause 11.4.2.2

- TSI = Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case

This gives a total of 7.68 sec.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 11.4, and A.10.4.

### 10.4.4 Test description

#### 10.4.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 5 MHz or 10 MHz as defined in 3GPP TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and faders and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A figure FFS.

2. The general test parameter settings are set up according to Table 10.4.4.1-2.

3. Propagation conditions are set according to Annex B clauses B.0.

4. Message contents are defined in clause 10.4.4.3.

5. There is one active cell (Cell 1) and active SyncRef UE (SyncRef UE 1) in this test. The test system shall emulate SyncRef UE 1 to transmit SLSS and MIB-SL every SLSS period (40ms).

Table 10.4.4.1-1: Test parameters for cell identification test on downlink frequency associated with ProSe frequency for E-UTRAN FDD (when UE is transmitting for ProSe)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial condition | Active synchronization source |  | Sync Ref UE 1 |  |
| Final condition | Active synchronization source |  | Cell1 |  |
| E-UTRA RF Channel Number | |  | 1 |  |
| Channel Bandwidth (BWchannel) | | MHz | 5 or 10 | According to principle defined in clause A.3.12.3 |
| Active cell | |  | Cell1 |  |
| Active SyncRef UEs | |  | SyncRef UE 1 | Transmitting SLSS+MIB-SL on uplink of RF channel number 1 |
| ProSe Direct Communication preconfiguration | |  | As specified in Table A.3.12.5-2  (Configuration #2) | IE values unless specified otherwise in this test. |
| syncTxThreshOoC | |  | 11 (+infinity) |  |
| T1 | | s | 2 |  |
| T2 | | s | 30 |  |

Table 10.4.4.1-2: Cell specific test parameters for cell identification test on downlink frequency associated with ProSe frequency for E-UTRAN FDD (when UE is transmitting for ProSe)

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | |
| T1 | T2 |
| E-UTRA RF Channel Number |  | 1 | |
| BWchannelNote 4 | MHz | 5 or 10 | |
| OCNG Patterns defined in A.3.2.1.2 Note 4 |  | 5 MHz: OP.16 FDD  10 MHz: OP.2 FDD | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote 1 |
| OCNG\_RBNote 1 |
| Note2 | dBm/15 kHz | -98 | |
|  | dB | -infinity | -3 |
| RSRP Note3 | dBm/15 kHz | -infinity | -101 |
| SCH\_RP Note3 | dBm/15 kHz | -infinity | -101 |
| Propagation Condition |  | AWGN | |
| NOTE 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: This test is according to the principle defined in clause A.3.12.3. | | | |

Table 10.4.4.1-3: SyncRef UE specific test parameters for cell identification test on downlink frequency associated with ProSe frequency for E-UTRAN FDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | SyncRef UE 1 | |
|  | T1 | T2 |
| E-UTRA RF Channel Number |  | 1 (Uplink) | |
| BWchannelNote 4 | MHz | 5 or 10 | |
| ProSe Direct Communication resource pool configuration |  | As specified in Table A.3.12.5-1  (Configuration #1) | |
| networkControlledSyncTx |  | ON | |
| slssid |  | 30 | |
| inCoverage (in MIB-SL) |  | TRUE | |
| syncOffsetIndicator |  | syncOffsetIndicator1 | |
| Note1 | dBm/15 kHz | -98 | |
|  | dB | 13 | |
| S-RSRP Note2, Note3 | dBm/15 kHz | -85 | |
| Propagation Condition |  | AWGN | |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 2: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 3: SSSS Es/Iot is set the same as PSSS/PSBCH Es/Iot.  NOTE 4: This test is according to the principle defined in clause A.3.12.3. | | | |

#### 10.4.4.2 Test procedure

There is one active cell (Cell 1) and active SyncRef UE (SyncRef UE 1) in this test. The test system shall emulate SyncRef UE 1 to transmit SLSS and MIB-SL every SLSS period (40ms). The test consists of two successive time periods, with time duration of T1 and T2 respectively. During T1, the cell is powered OFF and the ProSe UE is synchronized to SyncRef UE 1. During T2, the cell is powered ON and the ProSe UE will detect the cell and attempt to camp on the cell.

1 Ensure the UE is in State 4 according to 3GPP TS 36.508 [7] clause 4.5.4 and UE test loop Mode D is activated.

2. Set the parameters according to T1 in Table 10.4.5-1. Propagation conditions are set according to Annex B clauses B.1.1 and B.2.2.

3. At the start of T1, cell 1 is powered off and UE is expected to synchronize with SyncRefUE1.Also TE is expected to verify that UE is able to transmit SLSS + MIB-SL before the end of T1.

3. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.5-1.

4. UE is expected to initiate PRACH preambles inside 7.68 s from the start of T2. If the UE sends PRACH inside 7.68s consider the loop to be pass, else UE fails the iteration.

5. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

6. After the RRC connection release, the SS switches off and on the UE and ensures the UE is in State 4 with test loop mode 4 activated according to 3GPP TS 36.508 [7] clause 4.5.4.

7. Repeat step 2-6 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 10.4.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 4.6 with FFS:

Table 10.4.4.3-1: Common Exception messages for E-UTRAN FDD-FDD intra frequency event triggered reporting under fading propagation conditions in asynchronous cells test requirement

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions | FFS |

#### 10.4.5 Test requirement

Tables 10.4.4.1-1 and 10.4.5-1 define the primary level settings including test tolerances for E-UTRAN FDD- Initiation/Cease of SLSS Transmission with ProSe Direct Discovery.

Table 10.4.5-1: Cell specific test parameters for cell identification test on downlink frequency associated with ProSe frequency for E-UTRAN FDD (when UE is transmitting for ProSe)

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | |
| T1 | T2 |
| E-UTRA RF Channel Number |  | 1 | |
| BWchannelNote 4 | MHz | 5 or 10 | |
| OCNG Patterns defined in A.3.2.1.2 Note 4 |  | 5 MHz: OP.16 FDD  10 MHz: OP.2 FDD | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote 1 |
| OCNG\_RBNote 1 |
| Note2 | dBm/15 kHz | -98 | |
|  | dB | -infinity | -2.4 |
| RSRP Note3 | dBm/15 kHz | -infinity | -100.4 |
| SCH\_RP Note3 | dBm/15 kHz | -infinity | -100.4 |
| Propagation Condition |  | AWGN | |
| NOTE 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: This test is according to the principle defined in clause A.3.12.3. | | | |

Table 10.4.5-2: SyncRef UE specific test parameters for cell identification test on downlink frequency associated with ProSe frequency for E-UTRAN FDD

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | SyncRef UE 1 | |
|  | T1 | T2 |
| E-UTRA RF Channel Number |  | 1 (Uplink) | |
| BWchannelNote 4 | MHz | 5 or 10 | |
| ProSe Direct Communication resource pool configuration |  | As specified in Table A.3.12.5-1  (Configuration #1) | |
| networkControlledSyncTx |  | ON | |
| slssid |  | 30 | |
| inCoverage (in MIB-SL) |  | TRUE | |
| syncOffsetIndicator |  | syncOffsetIndicator1 | |
| Note1 | dBm/15 kHz | -98 | |
|  | dB | 13 | |
| S-RSRP Note2, Note3 | dBm/15 kHz | -85 | |
| Propagation Condition |  | AWGN | |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 2: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 3: SSSS Es/Iot is set the same as PSSS/PSBCH Es/Iot.  NOTE 4: This test is according to the principle defined in clause A.3.12.3. | | | |

The cell selection delay to a newly detectable cell on the downlink associated with the preconfigured ProSe carrier is defined as the time from the beginning of T2 to the time UE camps on the cell and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST.

The cell selection delay to a newly detectable cell on the downlink associated with the preconfigured ProSe carrier shall be less than 7.68 s.

The cell selection delay can be expressed as Tbasic\_identify\_OoC\_ProSe Tx\_ON + TSI, where

- Tbasic\_identify\_OoC\_ProSe Tx\_ON = 6.4sec as specified in clause 11.4.2.2

- TSI = Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case

This gives a total of 7.68 sec.

# 11 V2V Sidelink Communication for V2V Operation on Dedicated V2V Carrier

## 11.1 V2V UE Transmission Timing Accuracy Test

### 11.1.1 Test purpose

To verify the timing requirement for V2V sidelink transmissions by UE transmitting PSSCH and PSCCH.

### 11.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support V2X communication and is capable of V2X sidelink communication..

### 11.1.3 Minimum conformance requirements

For this test, the UE is triggered by the test loop function to transmit for V2V sidelink Communication.

There is one GNSS based synchronization source during the test. The test system can emulate and send the GNSS signal to the test UE.

The transmit timing accuracy is verified by the UE transmitting PSSCH and PSCCH.

UE is not expected to receive any configuration related to V2V sidelink communication from the serving cell.

The requirement are applicable when the reference timing used by the UE for V2V communication is derived from GNSS signals.

The sidelink transmissions takes place  before the subframe starting boundary derived from subclause 5.10.14 of 3GPP TS 36.331 [5], where  = 0 and . The transmission timing error for sidelink transmissions shall be less than or equal to ±Te where the timing error limit value Te is specified as 12\*Ts and 3GPP TS is the basic timing unit defined in 3GPP TS 36.211 [9].



The normative reference for this requirement is 3GPP TS 36.133 [4] clause 12.2 and A.11.1

### 11.1.4 Test description

#### 11.1.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in Table 11.1.4.1-1.

1. Connect the SS, the GNSS simulator and the AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A.92b.

2. The parameter settings for the V2V sidelink transmission over PC5 are pre-configured according to 3GPP TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 11.1.4.3.

3. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in 3GPP TS 36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. The V2X reference measurement channel is set according to Table 11.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 5A-V2X according to 3GPP TS 36.508 [7] clause 4.5.9.

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographicalarea #1. Wait for the UE to acquire the GNSS signal and start to transmit.

Table 11.1.4.1-1: Test Parameters for UE Transmit Timing Accuracy Tests for V2V

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1 |  |
| Channel Bandwidth (BWchannel) | MHz | 10 | Band 47 TDD |
| V2V SL Communication preconfiguration |  | Defined in Table A.3.21.2-1 |  |
| PSCCH Reference Measurement Channel |  | Defined in Table A.3.21.3-1 |  |
| PSSCH Reference Measurement Channel |  | Defined in Table A.3.21.3-2 |  |
| Propagation condition |  | AWGN |  |

#### 11.1.4.2 Test procedure

For this test, the UE is triggered by the test loop function to transmit for V2V sidelink Communication. The transmit timing accuracy is verified by the UE transmitting PSSCH and PSCCH. UE is not expected to receive any configuration related to V2V sidelink communication from the serving cell.

1. UE transmit V2X sidelink communication data over the PC5 inteface in according to SL-V2X-Preconfiguration and to schedule the V2X RMC for PSCCH and PSSCH according to Table 11.1.4.1-1.

2. After the UE is synchronized to the GNSS synchronization source, the test system shall verify that the UE PSSCH and PSCCH transmission timing offset is within the timing error specified in clause 11.1.5 with respect to the GNSS reference time in the GNSS simulator.

#### 11.1.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

Table 11.1.4.3-0: +CCUTLE (Initial condition)

|  |
| --- |
| Derivation Path: 3GPP TS 36.508 Table 4.7I-2: +CCUTLE, condition Close and Transmit |

Table 11.1.4.3-1: *SL-V2X-PreconfigFreqInfo-r14 configuration for PSSCH/PSCCH* for TX/RX resource pool

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20K | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| v2x-CommRxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry |  |  |
| SL-V2X-PreconfigCommPool-r14[1] SEQUENCE { | SL-V2X-PreconfigCommPool-r14-DEFAULT with following exceptions |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| Sl-subframe-r14 CHOICE { |  |  |  |
| Bl100-r14 | 11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry |  |  |
| SL-V2X-PreconfigCommPool-r14[1] SEQUENCE { | SL-V2X-PreconfigCommPool-r14-DEFAULT with following exceptions |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| Sl-subframe-r14 CHOICE { |  |  |  |
| Bl100-r14 | 10000000000000000000  10000000000000000000  10000000000000000000  10000000000000000000  10000000000000000000 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

### 11.1.5 Test requirement

Test Parameters for UE Transmit Timing Accuracy are specified in Table 11.1.4.1-1.

The reference point for the UE initial transmit timing control test requirement shall be the downlink timing minus.

The UE transmit timing offset for V2V sidelink transmission shall be less than or equal to ±Te where the timing error limit value Te is specified as 15\*Ts and 3GPP TS is the basic timing unit defined in 3GPP TS 36.211 [9]. The timing accuracy is verified by using PSSCH and PSCCH transmissions.

The following sequence of events shall be used to verify that the requirements are met:

- After the UE is synchronized to the GNSS synchronization source, the test system shall verify that the UE PSSCH and PSCCH transmission timing offset is within the specified timing error with respect to the GNSS reference time in the GNSS simulator.

## 11.2 Interruptions due to V2V sidelink communication

### 11.2.1 Test purpose

To verify interruptions due to V2V sidelink communication.

### 11.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support V2V Communication.

### 11.2.3 Minimum conformance requirements

This clause contains interruption requirements for the UE capable of V2V sidelink communication under the following additional conditions:

- the UE is pre-configured with parameters for enabling the UE to acquire timing synchronization

~~-~~ the UE has dedicated transmitter chain and dedicated receiver chain for the V2V operation

- the UE supports independent concurrent E-UTRAN operation in an E-UTRA band and stand-alone V2V sidelink operation.

The UE shall not cause any interruption on the serving cell when receiving or transmitting V2V sidelink communication signals.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 12.3 and A.11.2

### 11.2.4 Test description

#### 11.2.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in Table 11.2.4.1-1.

1. Connect the SS and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A.92b.

2. The parameter settings for the V2V sidelink transmission are pre-configured according to 3GPP TS 36.508 [7] subclause 6.8.2. Message content exceptions are defined in clause 11.2.4.3.

3. The V2X reference measurement channel is set according to Table 11.2.4.1-1.

4. Propagation conditions are set according to Annex B.0

Table 11.2.4.1-1: Test parameters for interruptions due to V2V slide link communication

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| E-UTRA RF Channel Number |  | 1, 2 | RF channel 1 is serving  RF channel 2 is non-serving |
| Channel Bandwidth (BWchannel) | MHz | 10 | On both Band 47 and E-UTRA band |
| Active cell |  | Cell 1 | Serving cell on RF channel number 1 |

Table 11.2.4.1-2: Slidelink communication configuration for interruptions due to V2V

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 2 | Band 47 |
| Channel Bandwidth (BWchannel) | MHz | 10 | According to principle defined in 3GPP TS 36.133 [4] clause A.3.12.3 |
| V2V slidelink communication resource pool configuration |  | As specified in Table A.3.21.3-1 | IE values unless specified otherwise in this test.  (Preconfigured) |
| PSCCH Reference Measurement Channel |  | CC.1 TDD | As specified in Table A.3.21.4.1-1 |
| PSSCH Reference Measurement Channel |  | CD.1 TDD | As specified in Table A.3.21.4.1-2 |

#### 11.2.4.2 Test procedure

In the test, the UE under test is configured with PCell on a serving frequency in the E-UTRA band, and is pre-configured with V2V sidelink communication resources for a non-serving frequency in Band 47. The test consists of one active serving cell (cell 1) on the serving RF channel 1, and there is no active cell on RF channel 2. There is no other UE in the test. UE is not expected to receive any configuration related to V2V sidelink communication from the serving cell.

1. Ensure the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 5.2A.2

2. Set the parameters according to RF channel 1 in Tables 11.2.5-1, as appropriate. Propagation conditions are set according to Annex B clause B.1.1.

3. Trigger the UE to active UE test loop mode (NOTE: The activation of UE test loop mode may be performed by MMI or AT command (+CATM).)

4. Trigger UE to close UE test loop mode E. (NOTE: Closing of UE test loop mode E may be performed by MMI or AT command (+CCUTLE))

5. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration

6. SS transmits PDSCH via PDCCH DCI format 1A for C\_RNTI to transmit the DL RMC according to Table 11.2.5-1 on PCell.

7. The test system shall verify that no interruption is caused to the ACK/NACKs on the serving cell on RF channel 1 during the test.

#### 11.2.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

Table 11.2.4.3-0: AT COMMAND: +CATM(Step 3)

|  |
| --- |
| Derivation Path: Table 4.7I-1: +CATM with condition Activation |

Table 11.2.4.3-1: +CCUTLE (Step 4)

|  |
| --- |
| Derivation Path: 3GPP TS 36.508 Table 4.7I-2: +CCUTLE, condition Close and Transmit |

### 11.2.5 Test requirement

Tables 11.2.4.1-1, 11.2.4.1-2, and 11.2.5-1 define the primary level settings including test tolerances for interruptions due to V2V sidelink communication test.

Table 11.2.5-1: Cell specific test parameters for interruptions due to V2V slidelink communication

| Parameter | Unit | Cell1 |
| --- | --- | --- |
| RF Channel Number |  | 1 |
| Serving/Non-serving |  | Serving |
| BWchannel Note 5 | MHz | 10 |
| Correlation Matrix and Antenna Configuration |  | 1x2 Low |
| drx-Configuration |  | None |
| PDCCH/PCFICH/PHICH Reference measurement channelNote1, Note 5 |  | R.6 FDD |
| PDSCH Reference measurement channel defined in A.3.1.1.1Note1, Note 5 |  | R.3 FDD |
| OCNG Pattern defined in A.3.2.1 |  | OP.10 FDD |
| PCFICH\_RB | dB | 0 |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PBCH\_RA | dB |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
|  | dB | 16 |
|  | dBm/15 kHz | -98 |
| RSRP Note4 | dBm/15 kHz | -82 |
| SCH\_RP Note 4 | dBm/15 kHz | -82 |
| Propagation condition |  | AWGN |
| NOTE 1: For the reference measurement channels, see clause A.3.1.  NOTE 2: For the OCNG pattern, see clause A.3.2.  NOTE 3: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 4: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 5: This test is according to the principle defined in clause A.3.12.3. | | |

The test system shall verify that no interruption is caused to the ACK/NACKs on the serving cell on RF channel 1 during the test.

# 12 V2X Communications

This clause contains timing accuracy requirements for the sidelink physical channels specified for V2X Sidelink Communication.

## 12.1 V2X UE Transmission Timing Accuracy Test

### 12.1.1 V2X UE Transmission Timing Accuracy Test for eNB as Timing Reference

#### 12.1.1.1 Test Purpose

The purpose of this test is to verify the timing requirements for V2X sidelink transmissions specified in clause 13.2.2, when the downlink timing of the serving cell (RRC\_IDLE) or PCell (RRC\_CONNECTED) on a non-V2X sidelink carrier is used as timing reference. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X sidelink communication.

#### 12.1.1.2 Applicability of requirements

The requirements in this clause are applicable to EUTRA Release 14 UEs supporting V2x communications, Band 47 and any EUTRA band.

#### 12.1.1.3 Minimum Conformance Requirements

For parameters specified in Tables 12.1.1.4.1-1 and 12.1.1.5.1-1, the timing accuracy for V2X sidelink transmission shall takes place  before the reception of the first detected path (in time) of the corresponding downlink frame from the reference cell, where  = 0 and. The timing accuracy is verified by using PSSCH transmissions.



#### 12.1.1.4 Test Description

##### 12.1.1.4.1 Initial Conditions

Resource pool configuration for PSCCH and PSSCH reference measurement channels are set according to Table 12.1.1.4.1-1-1 and Annex A.12 as appropriate.

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in Table 12.1.1.4.1-1.

1. Connect the SS and AWGN noise sources to the UE antenna connectors, connect the SS COM port to the UE COM port as shown in 3GPP TS 36.508 [7] Annex A.92b.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to 3GPP TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 12.1.1.4.3.

3. Void.

4. The V2X reference measurement channel is set according to Table 12.1.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 5A-V2X according to 3GPP TS 36.508 [7] clause 4.5.9.

Table 12.1.1.4.1-1: V2XSidelink Test Parameters for V2X UE Transmit Timing Accuracy Test for eNB as Timing Reference

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| E-UTRA RF Channel Number |  | 1 | Band 47 TDD |
| Channel Bandwidth (BWchannel) | MHz | 10 |  |
| V2X sidelink communication configuration |  | As specified in Table A.12.2-2  (Configuration #2) | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel |  | CC.1A | Defined in Table A.12.3-1 |
| PSSCH Reference Measurement Channel |  | CD.1A | Defined in Table A.12.3-2 |
| Propagation condition |  | AWGN |  |

Table 12.1.1.4.1-2: Void

##### 12.1.1.4.2 Test Procedure

For this test, the UE is triggered by the test loop function to transmit for V2X sidelink Communication. There is one active cell (PCell) in this test. The transmit timing accuracy is verified by the UE transmitting PSCCH.

1. UE transmits V2X sidelink communication data over the PC5 interface in according to SL-V2X-Preconfiguration and to schedule the V2X RMC for PSCCH and PSSCH according to Table 12.1.1.4.1-1.

2. After the UE is synchronized to the EUTRA, the test system shall verify that the UE PSCCH transmission timing offset is within ± 15×TS with respect to the downlink EUTRA signal.

##### 12.1.1.4.3 Message Contents

Message contents are according to 3GPP TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

Table 12.1.1.4.3-1: *SL-V2X-InterFreqUE-Config-r14-DEFAULT* for typeTxsync-r14

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20I | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-InterFreqUE-Config-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| typeTxSync-r14 | *Set according to the specific test configuration* | ENUMERATED {gnss, enb} |  |
| } |  |  |  |

Table 12.1.1.4.3-2: *SL-CommResourcePoolV2X-r14-DEFAULT for*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20C | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-CommResourcePoolV2X-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| BI100-r14 | 11111111  11111111  0000 |  |  |
| } |  |  |  |
| sizeSubchannel-r14 | n50 |  | BW10 |
| numSubchannel-r14 | n1 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| threshS-RSSI-CBR-r14 | NotPresent |  |  |
| restrictResourceReservationPeriod-r14 | NotPresent |  |  |
| } |  |  |  |

#### 12.1.1.5 Test Requirement

The reference point for the UE initial transmit timing control test requirement shall be the downlink timing minus place  where  = 0 and



The timing accuracy for V2V sidelink transmission shall be less than or equal to ±Te where the timing error limit value Te is specified as 15\*Ts and 3GPP TS is the basic timing unit defined in 3GPP TS 36.211 [9]. The timing accuracy is verified by using PSCCH transmissions.

Table 12.1.1.5.1-1: Cell Test parameters for V2X UE Transmit Timing Accuracy Test for eNB as Timing Reference

| Parameter | Unit | Value | Comment |
| --- | --- | --- | --- |
| E-UTRA RF Channel Number |  | 2 | FDD band |
| Channel Bandwidth (BWchannel) | MHz | 10 |  |
| Active cell |  | Cell 1 | E-UTRA FDD Cell1 on RF channel number 2 |
| CP length of Cell 1 |  | Normal |  |
| PDCCH/PCFICH/PHICH Reference measurement channelNote1 |  | R.6 FDD |  |
| OCNG PatternNote2 |  | OP.2 FDD |  |
| PBCH\_RA | dB | 0 |  |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| OCNG\_RANote3 |
| OCNG\_RBNote3 |
|  | dBm/15 kHz | -98 |  |
|  | dB | 3.3 |  |
| RSRP Note4 | dBm/15 kHz | -94.7 |  |
| SCH\_RP Note 4 | dBm/15 kHz | -94.7 |  |
| Propagation condition |  | AWGN |  |
| NOTE 1: For the reference measurement channels, see clause A.3.1.  NOTE 2: For the OCNG pattern, see clause A.3.2.  NOTE 3: OCNG shall be used such that Cell 1 is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 4: RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

### 12.1.2 V2X UE Transmission Timing Accuracy Test for SyncRef UE as Timing Reference

#### 12.1.2.1 Test Purpose

The purpose of this test is to verify the timing requirements for V2X sidelink transmissions specified in TS 36.133 [4] clause 13.2.3, when SyncRef UE is used as timing reference. For this test, the UE is triggered by the test loop function to transmit for V2X sidelink communication.

#### 12.1.2.2 Applicability of requirements

The requirements in this clause are applicable to all types of UE that support V2X Communication and Band 47 and SLSS transmission.

#### 12.1.2.3 Minimum Conformance Requirements

For parameters specified in Tables 12.1.2.5.1-1, the timing accuracy for V2X sidelink transmission shall takes place before the reception of the first detected path (in time) of the corresponding timing reference frame from the SyncRef UE, where  = 0 and . . The timing accuracy is verified by using PSSCH transmissions.



The transmission timing error for sidelink transmissions shall be less than or equal to ±Te where the timing error limit value Te is specified in Table 12.1.2.3-1.

Table 12.1.2.3-1: Te Timing Error Limit

|  |  |
| --- | --- |
| Sidelink Bandwidth (MHz) | Te |
| ≥1.4 | 24\*TS |
| Note: TS is the basic timing unit defined in TS 36.211 | |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 11.2, 13.2 and A.12.1.2.

#### 12.1.2.4 Test Description

##### 12.1.2.4.1 Initial Conditions

Resource pool configuration for PSCCH and PSSCH reference measurement channels are set according to Table 12.1.2.5.1-1-1 and Annex A.12 as appropriate.

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in Table 12.1.2.5.1-1.

1. Connect the SS and AWGN noise sources to the UE antenna connectors, connect the SS COM port to the UE COM port, as shown in 3GPP TS 36.508 [7] Annex A.92b.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to 3GPP TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 12.1.2.4.3.

3. Void

4. The V2X reference measurement channel is set according to Table 12.1.2.5.1-1.

5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in State 5A-V2X according to 3GPP TS 36.508 [7] clause 4.5.9.

Table 12.1.2.4.1-1: Void

##### 12.1.2.4.2 Test Procedure

For this test, the UE is triggered by the test loop function to transmit for V2X sidelink Communication. There is one active SyncRef UE in this test without either serving cell or GNSS signals. Before the test starts, the UE has been synchronized to the SyncRef UE. The transmit timing accuracy is verified by the UE transmitting PSSCH.

1. UE transmits V2X sidelink communication data over the PC5 interface according to SL-V2X-Preconfiguration and the V2X RMC for PSCCH and PSSCH according to Table 12.1.2.5.1-1.

2. After the UE is synchronized to the reference UE, the test system shall verify that the UE PSCCH transmission timing offset is within ± 27×TS with respect to the downlink EUTRA signal.

##### 12.1.2.4.3 Message Contents

Message contents are according to 3GPP TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

Table 12.1.2.4.3-1: SL-V2X-PreconfigFreqInfo-r14-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20K | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| v2x-CommPreconfigSync-r14 SEQUENCE { |  |  |  |
| syncOffsetIndicators-r14 SEQUENCE { | 0 |  |  |
| syncOffsetIndicator1-r14 | 0 | Indicates the offset of the first subframe of a resource pool within a SFN cycle |  |
| syncOffsetIndicator2-r14 | 2 | Indicates the offset of the first subframe of a resource pool within a SFN cycle |  |
| } |  |  |  |
| syncTxParametes-r14 | 31 |  |  |
| syncTxThreshOoc-r14 | 1 | -110dBm |  |
| filterCoefficient-r14 | fc0 |  |  |
| syncRefMinHyst-r14 | dB0 |  |  |
| syncRefDiffHyst-r14 | dB0 |  |  |
| } |  |  |  |
| v2x-CommRxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry |  |  |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14 |  |  |
| } |  |  |  |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { |  |  |  |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14 |  |  |
| } |  |  |  |
| v2x-ResourceSelectionConfig-r14 | SL-CommTxPoolSensingConfig-r14-DEFAULT |  |  |
| zoneConfig-r14 | Not present |  |  |
| syncPriority-r14 | enb |  |  |
| thresSL-TxPrioritization-r14 | Not present |  |  |
| offsetDFN-r14 | Not present |  |  |
| } |  |  |  |

Table 12.1.2.4.3-2: SL-V2X-PreconfigCommPool-r14 (Table 12.1.2.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20J | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-PreconfigCommPool-r14 ::= SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs100-r14 | 11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true | BOOLEAN |  |
| sizeSubchannel-r14 | n5 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| } |  |  |  |

Table 12.1.2.4.3-3: SL-V2X-InterFreqUE-Config-r14-DEFAULT (SyncRef UE)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20I | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-InterFreqUE-Config-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| v2x-CommRxPool-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPool-r14)) OF SL-CommResourcePoolV2X-r14 { |  |  |  |
| SL-CommResourcePoolV2X-r14[1] SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 11111111111111111111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-CommTxPoolNormal-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPool-r14)) OF SL-CommResourcePoolV2X-r14 { |  |  |  |
| SL-CommResourcePoolV2X-r14[1] SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 11111111111111110000 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| dataTxParameters-r14 SEQUENCE { |  |  |  |
| alpha-r12 | al0 |  |  |
| p0-r12 | 31 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-CommTxPoolExceptional-r14 SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 00000000000000001111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| dataTxParameters-r14 SEQUENCE { |  |  |  |
| alpha-r12 | al0 |  |  |
| p0-r12 | 31 |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-ResourceSelectionConfig-r14 SEQUENCE { |  |  |  |
| pssch-TxConfigList-r14 | SL-PSSCH-TxConfig-r14-DEFAULT |  |  |
| restrictResourceReservationPeriod-r14 SEQUENCE (SIZE (1..maxReservationPeriod-r14)) OF SL-RestrictResourceReservationPeriod-r14 { |  |  |  |
| SL-RestrictResourceReservationPeriod-r14[1] | v1 |  |  |
| } |  |  |  |
| probResourceKeep-r14 | v0 |  |  |
| } |  |  |  |
| } |  |  |  |

#### 12.1.2.5 Test Requirement

The reference point for the UE initial transmit timing control test requirement shall be the downlink timing minus place  where  = 0 and



The timing accuracy for V2V sidelink transmission shall be less than or equal to ±Te where the timing error limit value Te is specified as 27\*Ts and 3GPP TS is the basic timing unit defined in 3GPP TS 36.211 [9]. The timing accuracy is verified by using PSSCH transmissions.

Table 12.1.2.5.1-1: Test parameters for V2X UE Transmit Timing Accuracy Test for SyncRef UE as Timing Reference

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| E-UTRA RF Channel Number | |  | 1 | Band 47 TDD |
| Channel Bandwidth (BWchannel) | | MHz | 10 |  |
| Active cell | |  | None |  |
| Active SyncRef UE | |  | SyncRef UE 1 | Transmitting SLSS+MIB-SL on uplink of RF channel number 1 |
| V2X sidelink communication configuration | |  | As specified in Table A.12.2-2  (Configuration #1) | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel | |  | CC.1A | Defined in Table A.12.3-1 |
| PSSCH Reference Measurement Channel | |  | CD.1A | Defined in Table A.12.3-2 |
|  | | dBm/15 kHz | -98 |  |
| SyncRef UE 1 | syncCP-Len |  | Normal |  |
| syncOffsetIndicator |  | 3 |  |
| slssid |  | 30 |  |
| inCoverage |  | TRUE | In MIB-SL |
| networkControlledSyncTx |  | ON |  |
| V2X sidelink communication resource pool configuration |  | As specified in Table A.12.2-2  (Configuration #2) | IE values unless specified otherwise in this test; Note resource pool is same as Configuration #1 used by V2X UE. |
|  |  | 3.3 |  |
| S-RSRP Note1, Note 2 |  | -94.7 |  |
| Propagation condition | |  | AWGN |  |
| NOTE 1: S-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 2: SSSS Es/Iot is set the same as PSSS/PSBCH Es/Iot. | | | | |

## 12.2 Initiation/Cease of SLSS Transmission with V2X Sidelink Communication

### 12.2.1 Initiation/Cease of SLSS Transmission with V2X Sidelink Communication for eNB as Timing Reference

#### 12.2.1.1 Test purpose

To verify the V2X UE meets the requirements related to the maximum evaluation time allowed to initiate and cease SLSS transmissions defined in 3GPP TS 36.133 [4] clause 13.3.1.1, when the downlink timing of the serving cell (RRC\_IDLE) or PCell (RRC\_CONNECTED) on a non-V2X sidelink carrier is used as timing reference.

#### 12.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 14 and forward that support V2X Communication and SLSS transmission.

#### 12.2.1.3 Minimum conformance requirements

The requirements apply when the Serving cell / PCell is used as synchronization reference source and when the UE is

- out of coverage on the V2X sidelink carrier and in-coverage with a serving cell on a non-V2X sidelink carrier,

and when the conditions for SLSS transmissions specified in [5] are met; *networkControlledSyncTx* is not configured; and *syncTxThreshIC* is included in *SystemInformationBlockType21*. The UE shall be capable of measuring the RSRP of the cell used as synchronization reference source to evaluate to initiate/cease SLSS transmissions within Tevaluate,SLSS

where,

- Tevaluate,SLSS = 0.4 seconds when UE is not configured with DRX.

- Tevaluate,SLSS = as specified in Table 12.2.1.3-1 when UE is configured with DRX.

Table 12.2.1.3-1: Tevaluate,SLSS with V2X sidelink communication

|  |  |
| --- | --- |
| DRX cycle length [s] | Tevaluate,SLSS  [s] (number of DRX cycles) |
| ≤0.04 | 0.4 (Note 1) |
| 0.04<DRX-cycle≤2.56 | Note 2 (6) |
| NOTE 1: Number of DRX cycles depends upon the DRX cycle in use.  NOTE 2: Time depends upon the DRX cycles in use. | |

If higher layer filtering is configured, an additional delay in evaluation to initiate/cease SLSS transmissions can be expected.

For the cell as synchronization reference source:

- RSRP related side conditions given in 3GPP TS 36.133 [4] Clauses 9.1.2.1 and 9.1.2.2 and RSRQ related side conditions given in 3GPP TS 36.133 [4] Clause 9.1.5.1 for a corresponding Band are fulfilled,

- SCH\_RP and SCH Ês/Iot according to 3GPP TS 36.133 [4] clause B.2.1 for a corresponding Band are fulfilled.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 13.3.1.1 and A.12.2.1.

#### 12.2.1.4 Test description

##### 12.2.1.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10MHz for E-UTRA Cell, largest supported V2X channel bandwidth.

1. Connect the SS (node B and SS-V2X-UE emulator) and AWGN noise sources to the UE antenna connectors using TS 36.508 [7] Annex A, Figure A.93a as appropriate.

2. The E-UTRA Cell 1 is powered OFF. Ensure the UE is in State5A-V2X in Transmit Mode according to 3GPP TS 36.508 [7] clause 4.5.9.

3. Turn on the Cell 1. The general test parameter settings are set up according to Table 12.2.1.4.1-1.

4. Propagation conditions are set according to Annex B clauses B.0.

5. Message contents are defined in clause 12.2.1.4.3.

6. Cell1 is serving Cell on the E-UTRA RF channel 1, and is used for connection setup with the power levels set according to Annex C.0 and C.1.

7. Ensure the UE is in State 3A-RF-V2X on the E-UTRA RF channel 1 according to 3GPP TS 36.508 [7] clause 7.2A.3C.

Table 12.2.1.4.1-1: Test Parameters for Initiation/Cease of SLSS Transmissions Test for eNB as Timing Reference

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Active cell |  | Cell 1 | Serving cell on RF channel number 1 |
| Active SyncRef UE |  | SyncRef UE 1 | Transmitting SLSS+MIB-SL on RF channel number 2 (TDD carrier in Band 47) |
| V2X sidelink Communication configuration |  | As specified in 3GPP TS 36.133 [4] Table A.3.24.2-2 (Configuration #2) | IE values unless specified otherwise in this test. |
| networkControlledSyncTx |  | Not configured |  |
| syncTxThreshIC | dBm/15 kHz | -110 | In SIB21 |
| DRX |  | OFF |  |
| T1 | s | 3 |  |
| T2 | s | 5.24 |  |
| T3 | s | 5.24 |  |

##### 12.2.1.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two carriers, E-UTRA RF channel 1 is used for E-UTRA Cell 1, and E-UTRA RF channel 2 is used for V2X communication.

1. Set the parameters according to T1 in Table 12.2.1.5-1. Propagation conditions are set according to Annex B clauses B.1.1 and B.2.2. T1 starts.

2. When T1 expires, set the parameters according to T2 in Table 12.2.1.5-1. T2 starts.

3. If the SLSS transmission is received by the SS with an overall delay measured from the beginning of time period T2 less than 0.56s, the number of success for the event "Initiation" is increased by one. Otherwise, count a fail for the event "Initiation" and go to step 6.

4. When T2 expires, set the parameters according to T3 in Table 12.2.1.5-1. T3 starts.

5. If the last SLSS transmission is received by the SS with an overall delay measured from the beginning of time period T3 less than 0.56s, the number of success for the event "Cease" is increased by one. Otherwise, count a fail for the event "Cease".

6. When T3 expires, or a fail was counted for the event "Initiation" in step 3, the SS shall transmit a RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. Set Cell 1 physical cell identity = ((current cell 1 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

8. After the RRC connection release, the SS:

- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A-RF-V2X according to 3GPP TS 36.508 [7] clause 7.2A.3C; or

- switches off and on the UE and ensures the UE is in State 5A-V2X in Transmit Mode according to 3GPP TS 36.508 [7] clause 4.5.9, then in State 3A-RF-V2X according to 3GPP TS 36.508 [7] clause 7.2A.3C.

9. Repeat steps 1-8 until a test verdict has been achieved.

Each of the events "Initiation" and "Cease" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.  
If all events pass, the test passes. If one event fails, the test fails.

##### 12.2.1.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 4.6 with the following exceptions:

Table 12.2.1.4.3-1: Common Exception messagesfor Initiation/Cease of SLSS Transmissions

|  |  |
| --- | --- |
| Default Message Contents | |
| Common contents of system information blocks exceptions |  |
| Default RRC messages and information elements contents exceptions |  |

Table 12.2.1.4.3-2: *SL-InterFreqInfoV2X-r14-DEFAULT:* Initiation/Cease of SLSS Transmissions

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20E | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-InterFreqInfoV2X-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| v2x-SchedulingPool-r14 | Not present |  |  |
| v2x-UE-ConfigList-r14 SEQUENCE { |  |  |  |
| SL-V2X-InterFreqUE-Config-r14[1] SEQUENCE { |  |  |  |
| physCellIdList-r14 | Not present |  |  |
| typeTxSync-r14 | enb |  |  |
| v2x-SyncConfig-r14 SEQUENCE { | Not present |  |  |
| SL-SyncConfigNFreq-r13[1] SEQUENCE { |  |  |  |
| asyncParameters-r13 SEQUENCE { |  |  |  |
| syncCP-Len-r13 | normal |  |  |
| syncOffsetIndicator-r13 | 0 |  |  |
| slssid-r13 | 50 |  |  |
| } |  |  |  |
| txParameters-r13 SEQUENCE { |  |  |  |
| syncTxParameters-r13 |  |  |  |
| alpha-r12 | al0 |  |  |
| p0-r12 | 31 |  |  |
| } |  |  |  |
| syncTxThreshIC-r13 | 4 | -110dBm |  |
| syncInfoReserved-r13 | Not present |  |  |
| syncTxPeriodic-r13 | Not present |  |  |
| } |  |  |  |
| rxParameters-r13 | Not present |  |  |
| syncOffsetIndicator-v1430 | 0 |  |  |
| gnss-Sync-r14 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-CommRxPool-r14 SEQUENCE { |  |  |  |
| SL-CommResourcePoolV2X-r14[1] SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 11111111111111111111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | Not present |  |  |
| rxParametersNCell-r14 | Not present |  |  |
| dataTxParameters-r14 | Not present |  |  |
| zoneID-r14 | Not present |  |  |
| threshS-RSSI-CBR-r14 | Not present |  |  |
| poolReportId-r14 | Not present |  |  |
| cbr-pssch-TxConfigList-r14 | Not present |  |  |
| resourceSelectionConfigP2X-r14 | Not present |  |  |
| syncAllowed-r14 | Not present |  |  |
| restrictResourceReservationPeriod-r14 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-CommTxPoolNormal-r14 SEQUENCE { |  |  |  |
| SL-CommResourcePoolV2X-r14[1] SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 11111111111111110000 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | Not present |  |  |
| rxParametersNCell-r14 | Not present |  |  |
| dataTxParameters-r14 SEQUENCE{ |  |  |  |
| alpha-r12 | al0 |  |  |
| p0-r12 | 31 |  |  |
| } |  |  |  |
| zoneID-r14 | Not present |  |  |
| threshS-RSSI-CBR-r14 | Not present |  |  |
| poolReportId-r14 | Not present |  |  |
| cbr-pssch-TxConfigList-r14 | Not present |  |  |
| resourceSelectionConfigP2X-r14 | Not present |  |  |
| syncAllowed-r14 | Not present |  |  |
| restrictResourceReservationPeriod-r14 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| p2x-CommTxPoolNormal-r14 | Not present |  |  |
| v2x-CommTxPoolExceptional-r14 SEQUENCE{ |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 00000000000000001111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | Not present |  |  |
| rxParametersNCell-r14 | Not present |  |  |
| dataTxParameters-r14 SEQUENCE{ |  |  |  |
| alpha-r12 | al0 |  |  |
| p0-r12 | 31 |  |  |
| } |  |  |  |
| zoneID-r14 | Not present |  |  |
| threshS-RSSI-CBR-r14 | Not present |  |  |
| poolReportId-r14 | Not present |  |  |
| cbr-pssch-TxConfigList-r14 | Not present |  |  |
| resourceSelectionConfigP2X-r14 | Not present |  |  |
| syncAllowed-r14 | Not present |  |  |
| restrictResourceReservationPeriod-r14 | Not present |  |  |
| } |  |  |  |
| v2x-ResourceSelectionConfig-r14 | SL-CommTxPoolSensingConfig-r14-DEFAULT |  |  |
| pssch-TxConfigList-r14 | SL-PSSCH-TxConfig-r14-DEFAULT |  |  |
| thresPSSCH-RSRP-List-r14 SEQUENCE (SIZE (64)) OF SL-ThresPSSCH-RSRP-r14 { |  |  |  |
| SL-ThresPSSCH-RSRP-r14[n] | 1 | For n=1,2,…,64, where n denotes the index for the threshold used for sensing based UE autonomous resource selection |  |
| } |  |  |  |
| restrictResourceReservationPeriod-r14 SEQUENCE (SIZE (1..maxReservationPeriod-r14)) OF SL-RestrictResourceReservationPeriod-r14 { |  |  |  |
| SL-RestrictResourceReservationPeriod-r14[1] | v0dot2 |  |  |
| SL-RestrictResourceReservationPeriod-r14[2] | v0dot5 |  |  |
| SL-RestrictResourceReservationPeriod-r14[3] | v1 |  |  |
| SL-RestrictResourceReservationPeriod-r14[4] | v2 |  |  |
| SL-RestrictResourceReservationPeriod-r14[5] | v3 |  |  |
| SL-RestrictResourceReservationPeriod-r14[6] | v4 |  |  |
| SL-RestrictResourceReservationPeriod-r14[7] | v5 |  |  |
| SL-RestrictResourceReservationPeriod-r14[8] | v6 |  |  |
| SL-RestrictResourceReservationPeriod-r14[9] | v7 |  |  |
| SL-RestrictResourceReservationPeriod-r14[10] | v8 |  |  |
| SL-RestrictResourceReservationPeriod-r14[11] | v9 |  |  |
| SL-RestrictResourceReservationPeriod-r14[12] | v10 |  |  |
| } |  |  |  |
| probResourceKeep-r14 | v0 |  |  |
| p2x-SensingConfig-r14 | Not present |  |  |
| sl-ReselectAfter-r14 | Not present |  |  |
| } |  |  |  |
| zoneConfig-r14 | Not present |  |  |
| offsetDFN-r14 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

#### 12.2.1.5 Test requirement

Table 12.2.1.5-1 defines the primary level settings including test tolerances for Initiation/Cease of SLSS Transmissions Test for eNB as Timing Reference.

Table 12.2.1.5-1: Cell Test Parameters for Initiation/Cease of SLSS Transmissions Test for eNB as Timing Reference

| Parameter | Unit | Cell 1 | | |
| --- | --- | --- | --- | --- |
| T1 | T2 | T3 |
| E-UTRA RF Channel Number |  | 1 | | |
| BWchannel | MHz | 10 | | |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.3.1.2.1 |  | R.6 FDD | | |
| OCNG Patterns defined in A.3.2.1.2 |  | OP.2 FDD | | |
| PBCH\_RA | dB | 0 | | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote 1 |
| OCNG\_RBNote 1 |
| Note2 | dBm/15 kHz | -110 | | |
|  | dB | 5.6 | -5.6 | 5.6 |
| RSRP Note3 | dBm/15 kHz | -104.4 | -115.6 | -104.4 |
| SCH\_RP Note 3 | dBm/15 kHz | -104.4 | -115.6 | -104.4 |
| Io Note 3 | dBm/9 MHz | -75.56 | -81.16 | -75.56 |
| Propagation Condition |  | AWGN | | |
| NOTE 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

The SLSS transmission initiation delay is defined as the time from the beginning of time period T2 up to the moment when the UE initiates the SLSS transmission.

The SLSS transmission initiation delay shall be less than 0.56 s.

The SLSS transmission cease delay is defined as the time from the beginning of time period T3 up to the moment when the UE ceases the SLSS transmission.

The SLSS transmission cease delay shall be less than 0.56 s.

The rate of correct initiation/cease delay of SLSS transmissions observed during repeated tests shall be at least 90%.

NOTE: The initiation/cease delay of SLSS transmissions can be expressed as: Tevaluate,SLSS + SLSS period,

Where:

Tevaluate,SLSS is the evaluation time for initiate/cease of SLSS, and is 0.4 sec (clause 13.3.1.1) for the parameters in this test;

SLSS period is set as 160ms in this test.

All of the above test requirements shall be fulfilled in order for the of SLSS transmission initiation and cease delay to be counted as correct. The rate of correct observed SLSS transmission initiation and SLSS transmission cease delay during repeated tests shall be at least 90% with a confidence level of 95% for each of the events.

The statistical pass/ fail decisions are done separately for initiation and cease.

Decide the test pass, if initiation and cease are passed, otherwise fail the UE.

### 12.2.2 Initiation/Cease of SLSS Transmission with V2X Sidelink Communication for SyncRef UE as Timing Reference

#### 12.2.2.1 Test purpose

To verify the requirements related to the evaluation time allowed to initiate and cease SLSS transmissions defined in clause 13.3.1.3, when SyncRef UE is used as timing reference.

#### 12.2.2.2 Test applicability

This test applies to all types of UE that support V2X Communication and Band 47 and SLSS transmission.

#### 12.2.2.3 Minimum conformance requirements

The requirements apply when SyncRef UE is used as synchronization reference source and when the UE is

- in any cell selection state, or

- out of coverage on the V2X sidelink carrier and is associated with a serving cell on a non-V2X sidelink carrier,

and when the conditions for SLSS transmissions specified in [5] are met and when SyncRef UE is used as synchronization reference source and if *syncTxThreshOoC* is included in the preconfigured V2X parameters.

The UE shall be capable of measuring the S-RSRP of the selected SyncRef UE used as synchronization reference source and evaluate it to initiate/cease SLSS transmissions within Tevaluate,SLSS = 0.64 seconds.

If higher layer filtering for S-RSRP measurements is pre-configured, an additional delay in evaluation to initiate/cease SLSS transmissions can be expected.

For the selected SyncRef UE [5] used to derive transmission timing for V2X sidelink communication:

- S-RSRP related side conditions given in 3GPP TS 36.133 [4] Clause 13.4 for a corresponding Band are fulfilled,

- V2X SCH\_RP and SCH Ês/Iot according to 3GPP TS 36.133 [4] Annex B.6.4 for a corresponding Band are fulfilled.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 13.3.1.3 and A.12.2.2.

#### 12.2.2.4 Test description

##### 12.2.2.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to Annex E table E-1 and 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: largest supported V2X channel bandwidth.

1. Connect the SS (SS-V2X-UE emulator) and AWGN noise sources to the UE antenna connectors using TS 36.508 [7] Annex A, Figure A.92 as appropriate without GNSS simulator.

2. The parameter settings for V2X sidelink transmission over PC5 are pre-configured according to 3GPP TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 12.2.2.4.3.

3. Propagation conditions are set according to Annex B clauses B.0.

4. Ensure the UE is in State5A-V2X in Transmit Mode according to 3GPP TS 36.508 [7] clause 4.5.9.

Table 12.2.2.4.1-1: Test Parameters for Initiation/Cease of SLSS Transmissions Test for SyncRef UE as Timing Reference

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| E-UTRA RF Channel Number |  | 1 | TDD carrier in Band 47 is used. |
| Channel Bandwidth (BWchannel) | MHz | 10 |  |
| Active cell |  | None |  |
| Active SyncRef UE |  | SyncRef UE 1 | Transmitting SLSS+MIB-SL on RF channel number 1 |
| V2X sidelink Communication preconfiguration |  | As specified in Table A.3.24.2-1  (Configuration #1) | IE values unless specified otherwise in this test. |
| syncTxThreshOoC | dBm/15 kHz | -100 |  |
| T1 | s | 3 |  |
| T2 | s | 5.24 |  |
| T3 | s | 5.24 |  |

##### 12.2.2.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two carriers, E-UTRA RF channel 1 is used for E-UTRA Cell 1, and E-UTRA RF channel 2 is used for V2X communication.

1. Set the parameters according to T1 in Table 12.2.2.5-1. Propagation conditions are set according to Annex B clauses B.1.1 and B.2.2. Wait for 2s for UE to get synchronized to the SyncRef UE.

2. Set the parameters according to T2 in Table 12.2.2.5-1. Wait for 2s for UE to start transmission of SLSS derived from the SLSS+MIB-SL of SyncRef UE.

3. Set the parameters according to T1 in Table 12.2.2.5-1. T1 starts. The UE stops

4. When T1 expires, set the parameters according to T2 in Table 12.2.2.5-1. T2 starts.

5. If the SLSS transmission is received by the SS with an overall delay measured from the beginning of time period T2 less than 0.8s, the number of success for the event "Initiation" is increased by one. Otherwise, count a fail for the event "Initiation" and go to step 8.

6. When T2 expires, set the parameters according to T3 in Table 12.2.2.5-1. T3 starts.

7. If the last SLSS transmission is received by the SS with an overall delay measured from the beginning of time period T3 less than 0.8s, the number of success for the event "Cease" is increased by one. Otherwise, count a fail for the event "Cease".

8. Repeat steps 1-7 until a test verdict has been achieved.

Each of the events "Initiation" and "Cease" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.  
If all events pass, the test passes. If one event fails, the test fails.

##### 12.2.2.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 4.10 with the following exceptions:

Table 12.2.2.4.3-1: *SL-V2X-PreconfigFreqInfo-r14-DEFAULT:* Initiation/Cease of SLSS Transmissions

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20K | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| v2x-CommPreconfigSync-r14 SEQUENCE { |  |  |  |
| syncOffsetIndicators-r14 | 0 |  |  |
| syncTxParameters-r14 | 31 |  |  |
| syncTxThreshOoC-r14 | 2 | -100dBm |  |
| filterCoefficient-r14 | fc0 |  |  |
| syncRefMinHyst-r14 | dB0 |  |  |
| syncRefDiffHyst-r14 | dB0 |  |  |
| } |  |  |  |
| v2x-CommRxPoolList-r14 SEQUENCE { |  |  |  |
| SL-V2X-PreconfigCommPool-r14[1] SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs100-r14 | 11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n5 |  |  |
| numSubchannel-r14 | n10 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | Not present |  |  |
| dataTxParameters-r14 | Not present |  |  |
| zoneID-r14 | Not present |  |  |
| threshS-RSSI-CBR-r14 | Not present |  |  |
| cbr-pssch-TxConfigList-r14 | Not present |  |  |
| resourceSelectionConfigP2X-r14 | Not present |  |  |
| syncAllowed-r14 | Not present |  |  |
| restrictResourceReservationPeriod-r14 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-CommTxPoolList-r14 SEQUENCE { |  |  |  |
| SL-V2X-PreconfigCommPool-r14[1] SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs100-r14 | 11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n5 |  |  |
| numSubchannel-r14 | n10 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | Not present |  |  |
| dataTxParameters-r14 | Not present |  |  |
| alpha-r12 | al0 |  |  |
| p0-r12 | 31 |  |  |
| } |  |  |  |
| zoneID-r14 | Not present |  |  |
| threshS-RSSI-CBR-r14 | Not present |  |  |
| cbr-pssch-TxConfigList-r14 | Not present |  |  |
| resourceSelectionConfigP2X-r14 | Not present |  |  |
| syncAllowed-r14 | Not present |  |  |
| restrictResourceReservationPeriod-r14 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

#### 12.2.2.5 Test requirement

Table 12.2.2.5-1 defines the primary level settings including test tolerances for Initiation/Cease of SLSS Transmissions Test for eNB as Timing Reference.

Table 12.2.2.5-1: SyncRef UE Specific Test Parameters for Initiation/Cease of SLSS Transmissions Test for SyncRef UE as Timing Reference

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | SyncRef UE 1 | | |
| T1 | T2 | T3 |
| E-UTRA RF Channel Number |  | 1 | | |
| BWchannel | MHz | 10 | | |
| V2X sidelink Communication resource pool configuration |  | As specified in Table A.3.24.2-1  (Configuration #1)  Note resource pool is same as Configuration #1 used by V2X UE. | | |
| syncOffsetIndicator |  | Set same as *syncOffsetIndicator1* inV2X sidelink Communication preconfiguration | | |
| slssid |  | 30 | | |
| inCoverage |  | TRUE | | |
| networkControlledSyncTx |  | ON | | |
| Note1 | dBm/15 kHz | -102.6 | | |
| PSBCH | dB | 8.7 | -3.5 | 8.7 |
| S-RSRP Note2, Note3 | dBm/15 kHz | -93.9 | -106.1 | -93.9 |
| Io | dBm/9MHz | -74.78 | -82.42 | -74.78 |
| Propagation Condition |  | AWGN | | |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 2: S-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 3: SSSS Es/Noc and PSSS Es/Noc are set the same as PSBCH Es/Noc. | | | | |

The SLSS transmission initiation delay is defined as the time from the beginning of time period T2 up to the moment when the UE initiates the SLSS transmission.

The SLSS transmission initiation delay shall be less than 0.8 s.

The SLSS transmission cease delay is defined as the time from the beginning of time period T3 up to the moment when the UE ceases the SLSS transmission.

The SLSS transmission cease delay shall be less than 0.8 s.

The rate of correct initiation/cease delay of SLSS transmissions observed during repeated tests shall be at least 90%.

NOTE: The initiation/cease delay of SLSS transmissions can be expressed as: Tevaluate,SLSS + SLSS period,

Where:

Tevaluate,SLSS is the evaluation time for initiate/cease of SLSS, and is 0.64 sec (clause 13.3.1.3) for the parameters in this test;

SLSS period is set as 160ms in this test.

All of the above test requirements shall be fulfilled in order for the of SLSS transmission initiation and cease delay to be counted as correct. The rate of correct observed SLSS transmission initiation and SLSS transmission cease delay during repeated tests shall be at least 90% with a confidence level of 95% for each of the events.

The statistical pass/ fail decisions are done separately for initiation and cease.

Decide the test pass, if initiation and cease are passed, otherwise fail the UE.

## 12.3 V2X Synchronization Reference Selection/Reselection Tests

### 12.3.1 V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority

#### 12.3.1.1 Test Purpose

The purpose of this test is to verify the requirements related to SyncRef UE selection / reselection defined in 3GPP TS 36.133 [4] clause 13.4, when GNSS is configured as the highest priority. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

#### 12.3.1.2 Applicability of requirements

The requirements in this clause are applicable to EUTRA Release 14 UEs supporting V2X communications, Band 47 and any EUTRA band.

#### 12.3.1.3 Minimum Conformance Requirements

The requirements defined in clause TS 36.133 [4] 13.4 do not apply to the UEs that do not support transmission and reception of SLSS.

A V2X SyncRef UE is considered to be detectable when

- S-RSRP related side conditions given in 3GPP TS 36.133 [4] Clause 9.10.2 are fulfilled for a corresponding Band,

- V2X SCH\_RP and SCH Ês/Iot according to 3GPP TS 36.133 [4] Annex B.6.4 for a corresponding Band are fulfilled.

When GNSS synchronization reference source is configured as the highest priority and

- UE is synchronized to GNSS directly,

- UE shall not drop any V2X SLSS and data transmission for the purpose of selection/reselection to the SyncRef UE.

- UE is synchronized to a SyncRef UE that is synchronized to GNSS directly or in-directly,

- UE shall not drop any V2X data transmission for the purpose of selection/reselection to the SyncRef UE. The UE shall be able to identify newly detectable intra-frequency V2X SyncRef UE within Tdetect,SyncRef UE\_V2X seconds if the V2X SyncRef UE meets the selection / reselection criterion defined in 3GPP TS 36.331 [2]. Tdetect,SyncRef UE\_V2X is defined as 1.6 seconds at SCH Es/Iot ≥0 dB, provided that the UE is allowed to drop a maximum of 30% of its SLSS transmissions during Tdetect,SyncRef UE\_V2X for the purpose of selection / reselection to the SyncRef UE.

- in other case

- The UE shall be able to identify newly detectable intra-frequency V2X SyncRef UE within Tdetect,SyncRef UE\_V2X seconds if the SyncRef UE meets the selection / reselection criterion defined in 3GPP TS 36.331 [2]. Tdetect,SyncRef UE\_V2X is defined as 8 seconds at SCH Es/Iot ≥0 dB, provided that the UE is allowed to drop a maximum of 6% of its V2X data and SLSS transmissions during Tdetect,SyncRef UE\_V2X for the purpose of selection / reselection to the SyncRef UE. UE is allowed to drop up to 2 subframes of its V2X data reception per PSBCH monitoring occasion and overall drop rate shall not exceed 0.3% of its V2X data reception during Tdetect,SyncRef UE\_V2X for the purpose of selection / reselection to the SyncRef UE.

UE shall be capable of performing S-RSRP measurements for 3 identified intra-frequency V2X SyncRef UE with the measurement period of 320 ms. It is assumed that the V2X SyncRef UE do not drop or delay any SLSS transmission within the measurement period. Otherwise, the measurement period may be extended.

#### 12.3.1.4 Test Description

##### 12.3.1.4.1 Initial Conditions

Resource pool configuration for PSCCH and PSSCH reference measurement channels are set according to Table 12.3.1.4.1-1 and Annex A.12 as appropriate.

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in Table 12.3.1.4.1-1.

1. Connect the SS and AWGN noise sources to the UE antenna connectors, connect the SS COM port to the UE COM port as shown in 3GPP TS 36.508 [7] Annex A.92b.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to 3GPP TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 12.3.1.4.3.

3. The V2X reference measurement channel is set according to Table 12.3.1.4.1-1.

4. Propagation conditions are set according to Annex B.0.

5. There are one active cell (PCell) and two active SyncRef UEs (SyncRef UE 1 and SyncRef UE 2) in this test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

6. Ensure the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 5.2A.2C. In addition to the default system information messages, SystemInformationBlockType21 is broadcasted according to 3GPP TS 36.508 [7] Table 4.4.3.3-19.

Table 12.3.1.4.1-1: Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial condition | Active synchronization source |  | Cell 1 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 30 and in-coverage set as TRUE in MIB-SL. |
| T2 end condition | Active synchronization source |  | Sync Ref UE 1 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 168 and in-coverage set as FALSE in MIB-SL. |
| Final condition | Active synchronization source |  | Sync Ref UE 2 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 0 and in-coverage set as FALSE in MIB-SL. |
| Active SyncRef UEs | |  | SyncRef UE 1  SyncRef UE 2 | Transmitting SLSS+MIB-SL on RF channel number 1 (TDD carrier in Band 47) |
| Active cell | |  | Cell 1 | E-UTRA FDD Cell 1 on RF channel number 2 |
| Timing offset between SyncRef UE 1 and SyncRef UE 2 | | us | 3 | Synchronous |
| Frequency offset of SyncRef UE 1 | | ppm | 0 |  |
| Frequency offset of SyncRef UE 2 | | ppm | 5 |  |
| V2X sidelink Communication preconfiguration | |  | As specified in Table A.12.2-2  (Configuration #2) | IE values unless specified otherwise in this test. |
| syncPriority | |  | *gnss* |  |
| slssid | |  | *30* |  |
| syncTxThreshIC | |  | +infinity |  |
| T1 | | s | 24 |  |
| T2 | | s | 16 |  |
| T3 | | s | 3.2 |  |

##### 12.3.1.4.2 Test Procedure

For this test, the UE is triggered by the test loop function to transmit for V2X sidelink Communication. There are no GNSS signals in this test. There are one active cell (PCell) and two active SyncRef UEs (SyncRef UE 1 and SyncRef UE 2) in this test. The test system shall emulate SyncRef UE 1 and SyncRef UE 2 to transmit SLSS and MIB-SL every SLSS period.

1. Trigger UE to close UE test loop back mode E (Transmit Mode). Closing of UE test loop mode E may be performed by MMI or AT command (+CCUTLE).

2. Set the parameters according to T1 in Table 12.3.1.5-1 and 12.3.1.5-2. Propagation conditions are set according to Annex B clauses B.1. T1 starts.

3. During T1, UE is expected to transmit SLSS+MIB-SL with SLSS ID = 30 and in-coverage set as TRUE in MIB-SL. If the UE performs SLSS transmission with expected contents consider the loop to be pass, else the loop is considered as fail.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 12.3.1.5-1 and 12.3.1.5-2.

5. During T2, if

1) The V2X UE transmits SLSS+MIB-SL with SLSS ID = 168 and in-coverage set as FALSE in MIB-SL inside 8.8s from the start of T2; and

2) The V2X UE does not drop or delay more than 6% of its V2X data and SLSS transmissions during the duration of T2

consider the loop to be pass, else the loop is considered as fail.

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 12.3.1.5-1 and 12.3.1.5-2.

7. During T3, if

1) The V2X UE transmits SLSS+MIB-SL with SLSS ID = 0 and in-coverage set as FALSE in MIB-SL inside 2.4s from the start of T3; and

2) The V2X UE does not drop or delay more than 30% of its SLSS transmissions during the duration of T3

consider the loop to be pass, else the loop is considered as fail.

8. When T3 expires, the SS switches off and on the UE and ensures the UE is in 3A-RF with test loop mode E (Transmit Mode) activated according to 3GPP TS 36.508 [7] clause 5.2A.2C.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved for all the three events.

##### 12.3.1.4.3 Message Contents

Message contents are according to 3GPP TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

Table 12.3.1.4.3-1: SystemInformationBlockType21 (initial condition)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.4.3.3-19 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType21-r14 ::= SEQUENCE { |  |  |  |
| sl-V2X-ConfigCommon-r14 SEQUENCE { |  |  |  |
| typeTxSync-r14 | gnss | ENUMERATED {gnss, enb, ue, spare1} |  |
| } |  |  |  |
| } |  |  |  |

Table 12.3.1.4.3-2: SL-V2X-PreconfigFreqInfo-r14-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20K | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| v2x-CommPreconfigSync-r14 SEQUENCE { |  |  |  |
| syncOffsetIndicators-r14 SEQUENCE { | 0 |  |  |
| syncOffsetIndicator1-r14 | 1 | Indicates the offset of the first subframe of a resource pool within a SFN cycle |  |
| syncOffsetIndicator2-r14 | 2 | Indicates the offset of the first subframe of a resource pool within a SFN cycle |  |
| } |  |  |  |
| syncTxParametes-r14 |  |  |  |
| syncTxThreshOoc-r14 | 11 | +infinity |  |
| filterCoefficient-r14 |  |  |  |
| syncRefMinHyst-r14 |  |  |  |
| syncRefDiffHyst-r14 |  |  |  |
| } |  |  |  |
| v2x-CommRxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry |  |  |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14 |  |  |
| } |  |  |  |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { |  |  |  |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14 |  |  |
| } |  |  |  |
| v2x-ResourceSelectionConfig-r14 | SL-CommTxPoolSensingConfig-r14-DEFAULT |  |  |
| zoneConfig-r14 | Not present |  |  |
| syncPriority-r14 | enb |  |  |
| thresSL-TxPrioritization-r14 | Not present |  |  |
| offsetDFN-r14 | Not present |  |  |
| } |  |  |  |

Table 12.3.1.4.3-3: SL-V2X-PreconfigCommPool-r14 (Table 12.3.1.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20J | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-PreconfigCommPool-r14 ::= SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs100-r14 | 11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true | BOOLEAN |  |
| sizeSubchannel-r14 | n5 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| } |  |  |  |

Table 12.3.1.4.3-4: SL-V2X-InterFreqUE-Config-r14-DEFAULT (V2X UE and SyncRef UE 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20I | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-InterFreqUE-Config-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| v2x-CommRxPool-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPool-r14)) OF SL-CommResourcePoolV2X-r14 { |  |  |  |
| SL-CommResourcePoolV2X-r14[1] SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 11111111111111111111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-CommTxPoolNormal-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPool-r14)) OF SL-CommResourcePoolV2X-r14 { |  |  |  |
| SL-CommResourcePoolV2X-r14[1] SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 11111111111111110000 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| dataTxParameters-r14 SEQUENCE { |  |  |  |
| alpha-r12 | al0 |  |  |
| p0-r12 | 31 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-CommTxPoolExceptional-r14 SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 00000000000000001111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| dataTxParameters-r14 SEQUENCE { |  |  |  |
| alpha-r12 | al0 |  |  |
| p0-r12 | 31 |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-ResourceSelectionConfig-r14 SEQUENCE { |  |  |  |
| pssch-TxConfigList-r14 | SL-PSSCH-TxConfig-r14-DEFAULT |  |  |
| restrictResourceReservationPeriod-r14 SEQUENCE (SIZE (1..maxReservationPeriod-r14)) OF SL-RestrictResourceReservationPeriod-r14 { |  |  |  |
| SL-RestrictResourceReservationPeriod-r14[1] | v0dot2 |  |  |
| } |  |  |  |
| probResourceKeep-r14 | v0 |  |  |
| } |  |  |  |
| } |  |  |  |

#### 12.3.1.5 Test Requirement

Tables 12.3.1.5-1 and 12.3.1.5-2 define the primary level settings including test tolerances for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority test.

Table 12.3.1.5-1: SyncRef UE Specific Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | SyncRef UE 1 | | | SyncRef UE 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| E-UTRA RF Channel Number |  | 1 | | | | | |
| BWchannel | MHz | 5 or 10 | | | | | |
| V2X Sidelink Communication resource pool configuration |  | As specified in Table A.12.2-1  (Configuration #1) | | | As specified in Table A.12.2-2  (Configuration #2) | | |
| networkControlledSyncTx |  | N/A | | | ON | | |
| syncTxThreshOoC | dBm/15 kHz | +infinity | | | N/A | | |
| slssid |  | 0 | | | 0 | | |
| inCoverage (in MIB-SL) |  | FALSE | | | TRUE | | |
| syncOffsetIndicator |  | syncOffsetIndicator2 | | | syncOffsetIndicator1 | | |
| Note1 | dBm/15 kHz | -95 | | | | | |
|  | dB | -infinity | 0.3 | 0.3 | -infinity | -infinity | 3.5 |
|  | dB | -infinity | 0.3 | -4.8 | -infinity | -infinity | 0.34 |
| S-RSRP Note2, Note 3 | dBm/15 kHz | -infinity | -94.7 | -94.7 | -infinity | -infinity | -91.5 |
| Propagation Condition |  | AWGN | | | | | |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  NOTE 2: S-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 3: SSSS Es/Iot is set the same as PSSS/PSBCH Es/Iot. | | | | | | | |

Table 12.3.1.5-2: Cell Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority

| Parameter | Unit | Cell 1 | | |
| --- | --- | --- | --- | --- |
| T1 | T2 | T3 |
| E-UTRA RF Channel Number |  | 2 | | |
| BWchannel | MHz | 10 | | |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.2.1 |  | R.6 FDD | | |
| OCNG Patterns defined in D.1.2 |  | OP.2 FDD | | |
| PBCH\_RA | dB | 0 | | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote 1 |
| OCNG\_RBNote 1 |
| Note2 | dBm/15 kHz | -95 | | |
|  | dB | 4.5 | 4.5 | 4.5 |
| RSRP Note3 | dBm/15 kHz | -90.5 | -90.5 | -90.5 |
| SCH\_RP Note 3 | dBm/15 kHz | -90.5 | -90.5 | -90.5 |
| Propagation Condition |  | AWGN | | |
| NOTE 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  NOTE 3: RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

1) During T2, SyncRef UE selection delay is defined as the time from the beginning of T2 to the time UE is synchronized to SyncRef UE 1 and changes its SLSS transmissions timing and SLSS ID to follow SyncRef UE 1 as the synchronization source. For the test configuration, the SLSS ID will be changed to 168 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T2.

The SyncRef UE selection delay shall be less than 8.8sec. The SyncRef UE selection/reselection delay can be expressed as:

SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + SLSS period

Where

- Tdetect,SyncRef UE = 8sec (as specified in 3GPP TS 36.133 [4] clause 11.4)

- Tevaluate,SLSS = 0.64 (as specified in 3GPP TS 36.133 [4] clause 13.3.1.3)

- SLSS period = 160ms

This gives a total of 8.8seconds.

2) During T3, SyncRef UE reselection delay is defined as the time from the beginning of T3 to the time UE changes its synchronization source from SyncRef UE 1 to SyncRef UE 2, and changes its SLSS transmissions timing and SLSS ID to follow SyncRef UE 2 as the synchronization source. For the test configuration, the SLSS ID will still be 0 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T3.

The SyncRef UE reselection delay shall be less than 2.4sec. The SyncRef UE selection/reselection delay can be expressed as:

SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + SLSS period

Where

- Tdetect,SyncRef UE = 1.6sec (as specified in 3GPP TS 36.133 [4] clause 11.4)

- Tevaluate,SLSS = 0.64 (as specified in 3GPP TS 36.133 [4] clause 13.3.1.3)

- SLSS period = 160ms

This gives a total of 2.4seconds.

The test system will verify that the V2X UE does not drop or delay more than 6% of its V2X data and SLSS transmissions during the duration of T2, and does not drop or delay more than 30% of its SLSS transmissions during the duration of T3.

The rate of correct SyncRef UE selection / reselection observed during repeated tests shall be at least 90%.

### 12.3.2 V2X Synchronization Reference Selection/Reselection Tests for eNB configured as the highest priority

#### 12.3.2.1 Test Purpose

The purpose of this test is to verify the requirements related to SyncRef UE selection / reselection defined in 3GPP TS 36.133 [4] clause 11.4, when eNB is configured as the highest priority. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

#### 12.3.2.2 Applicability of requirements

The requirements in this clause are applicable to E-UTRA Release 14 UEs supporting V2X communications, Band 47 and any E-UTRA band.

#### 12.3.2.3 Minimum Conformance Requirements

The requirements defined in 3GPP TS 36.133 [4] clause 13.4 do not apply to the UEs that do not support transmission and reception of SLSS.

A V2X SyncRef UE is considered to be detectable when

- S-RSRP related side conditions given in 3GPP TS 36.133 [4] Clause 9.10.2 are fulfilled for a corresponding Band,

- V2X SCH\_RP and SCH Ês/Iot according to 3GPP TS 36.133 [4] Annex B.6.4 for a corresponding Band are fulfilled.

…

When serving cell/PCell synchronization reference source is configured as the highest priority,

- UE shall be able to identify newly detectable intra-frequency V2X SyncRef UE within Tdetect,SyncRef UE\_V2X seconds if the SyncRef UE meets the selection / reselection criterion defined in 3GPP TS 36.331 [2]. Tdetect,SyncRef UE\_V2X is defined as 8 seconds at SCH Es/Iot ≥ 0 dB, provided that the V2X UE is allowed to drop a maximum of 6% of its V2X data and SLSS transmissions for the purpose of selection / reselection to the SyncRef UE. UE is allowed to drop up to 2 subframes of its V2X data reception per PSBCH monitoring occasion and overall drop rate shall not exceed 0.3% of its V2X data reception during Tdetect,SyncRef UE\_V2X for the purpose of selection / reselection to the SyncRef UE.

UE shall be capable of performing S-RSRP measurements for 3 identified intra-frequency V2X SyncRef UE with the measurement period of 320 ms. It is assumed that the V2X SyncRef UE do not drop or delay any SLSS transmission within the measurement period. Otherwise, the measurement period may be extended.

When UE is synchronized to GNSS directly, before selection / reselection of the new synchronization reference source UE shall evaluate the GNSS synchronization source reliability for at least 20 seconds before changing the synchronization reference from GNSS to another synchronization reference source. UE shall be always synchronized to GNSS directly during the evaluation of GNSS synchronization source reliability.

#### 12.3.2.4 Test Description

##### 12.3.2.4.1 Initial Conditions

Resource pool configuration for PSCCH and PSSCH reference measurement channels are set according to Table 12.3.2.4.1-1 and Annex A.12 as appropriate.

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in Table 12.3.2.4.1-1.

1. Connect the SS, the GNSS simulator and AWGN noise sources to the UE antenna connectors, connect the SS COM port to the UE COM port as shown in 3GPP TS 36.508 [7] Annex A.92b.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to 3GPP TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 12.3.2.4.3.

3. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in 3GPP TS 36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. The V2X reference measurement channel is set according to Table 12.3.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 5A-V2X (transmit mode) according to 3GPP TS 36.508 [7] clause 4.5.9.

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographicalarea #1. Wait for the UE to acquire the GNSS signal and start to transmit.

Table 12.3.2.4.1-1: Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for eNB configured as the highest priority

| Parameter | | Unit | Value | Comment |
| --- | --- | --- | --- | --- |
| Initial condition | Active synchronization source |  | GNSS | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 0 and in-coverage set as TRUE in MIB-SL. |
| T2 end condition | Active synchronization source |  | Sync Ref UE 1 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 168+59 and in-coverage set as FALSE in MIB-SL. |
| Final condition | Active synchronization source |  | Sync Ref UE 2 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 30 and in-coverage set as FALSE in MIB-SL. |
| Active cell | |  | None |  |
| Active SyncRef UEs | |  | SyncRef UE 1  SyncRef UE 2 | Transmitting SLSS+MIB-SL on RF channel number 1 |
| Timing offset between SyncRef UE 1 and SyncRef UE 2 | | ms | 3 | Asynchronous |
| Frequency offset of SyncRef UE 1 | | ppm | 0 |  |
| Frequency offset of SyncRef UE 2 | | ppm | 5 |  |
| V2X sidelink Communication preconfiguration | |  | As specified in Table A.12.2-1  (Configuration #1) | IE values unless specified otherwise in this test. |
| syncPriority | |  | *enb* |  |
| syncTxThreshOoC | |  | 11 (+infinity) |  |
| T1 | | s | 24 |  |
| T2 | | s | 16 |  |
| T3 | | s | 16 |  |

##### 12.3.2.4.2 Test Procedure

For this test, the UE is triggered by the test loop function to transmit for V2X sidelink Communication. There are no active cells and GNSS is reliable during the whole test. . There are two active SyncRef UEs (SyncRef UE 1 and SyncRef UE 2) in this test. The test system shall emulate SyncRef UE 1 and SyncRef UE 2 to transmit SLSS and MIB-SL every SLSS period.

1. Set the parameters according to T1 in Table 12.3.2.5-1. Propagation conditions are set according to Annex B clauses B.1. T1 starts.

2. During T1, UE is expected to transmit SLSS+MIB-SL with SLSS ID = 0 and in-coverage set as TRUE in MIB-SL. If the UE performs SLSS transmission with expected contents consider the loop to be pass, else the loop is considered as fail.

3. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 12.3.2.5-1.

4. During T2, if

1) The V2X UE transmits SLSS+MIB-SL with SLSS ID = 168+59 and in-coverage set as FALSE in MIB-SL inside 8.8s from the start of T2; and

2) The V2X UE does not drop or delay more than 6% of its V2X data and SLSS transmissions during the duration of T2

consider the loop to be pass, else the loop is considered as fail.

5. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 12.3.2.5-1.

6. During T3, if

1) The V2X UE transmits SLSS+MIB-SL with SLSS ID = 30 and in-coverage set as FALSE in MIB-SL inside 2.4s from the start of T3; and

2) The V2X UE does not drop or delay more than 6% of its V2X data and SLSS transmissions during the duration of T3

consider the loop to be pass, else the loop is considered as fail.

7. When T3 expires, the SS switches off and on the UE and ensures the UE is in 5A-V2X (transmit mode) according to 3GPP TS 36.508 [7] clause 4.5.9.

8. Repeat step 1-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved for all the three events.

##### 12.3.2.4.3 Message Contents

Message contents are according to 3GPP TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

Table 12.3.2.4.3-1: SL-V2X-PreconfigFreqInfo-r14-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20K | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| v2x-CommPreconfigSync-r14 SEQUENCE { |  |  |  |
| syncOffsetIndicators-r14 SEQUENCE { | 0 |  |  |
| syncOffsetIndicator1-r14 | 0 | Indicates the offset of the first subframe of a resource pool within a SFN cycle |  |
| syncOffsetIndicator2-r14 | 2 | Indicates the offset of the first subframe of a resource pool within a SFN cycle |  |
| } |  |  |  |
| syncTxParametes-r14 |  |  |  |
| syncTxThreshOoc-r14 | 11 | +infinity |  |
| filterCoefficient-r14 |  |  |  |
| syncRefMinHyst-r14 |  |  |  |
| syncRefDiffHyst-r14 |  |  |  |
| } |  |  |  |
| v2x-CommRxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry |  |  |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14 |  |  |
| } |  |  |  |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { |  |  |  |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14 |  |  |
| } |  |  |  |
| v2x-ResourceSelectionConfig-r14 | SL-CommTxPoolSensingConfig-r14-DEFAULT |  |  |
| zoneConfig-r14 | Not present |  |  |
| syncPriority-r14 | enb |  |  |
| thresSL-TxPrioritization-r14 | Not present |  |  |
| offsetDFN-r14 | Not present |  |  |
| } |  |  |  |

Table 12.3.2.4.3-2: SL-V2X-PreconfigCommPool-r14 (Table 12.3.1.4.3-2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20J | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-PreconfigCommPool-r14 ::= SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs100-r14 | 11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true | BOOLEAN |  |
| sizeSubchannel-r14 | n5 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| } |  |  |  |

Table 12.3.2.4.3-3: SL-V2X-InterFreqUE-Config-r14-DEFAULT (SyncRef UE 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20I | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-InterFreqUE-Config-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| v2x-CommRxPool-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPool-r14)) OF SL-CommResourcePoolV2X-r14 { |  |  |  |
| SL-CommResourcePoolV2X-r14[1] SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 11111111111111111111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-CommTxPoolNormal-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPool-r14)) OF SL-CommResourcePoolV2X-r14 { |  |  |  |
| SL-CommResourcePoolV2X-r14[1] SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 11111111111111110000 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| dataTxParameters-r14 SEQUENCE { |  |  |  |
| alpha-r12 | al0 |  |  |
| p0-r12 | 31 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-CommTxPoolExceptional-r14 SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 00000000000000001111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| dataTxParameters-r14 SEQUENCE { |  |  |  |
| alpha-r12 | al0 |  |  |
| p0-r12 | 31 |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-ResourceSelectionConfig-r14 SEQUENCE { |  |  |  |
| pssch-TxConfigList-r14 | SL-PSSCH-TxConfig-r14-DEFAULT |  |  |
| restrictResourceReservationPeriod-r14 SEQUENCE (SIZE (1..maxReservationPeriod-r14)) OF SL-RestrictResourceReservationPeriod-r14 { |  |  |  |
| SL-RestrictResourceReservationPeriod-r14[1] | v0dot2 |  |  |
| } |  |  |  |
| probResourceKeep-r14 | v0 |  |  |
| } |  |  |  |
| } |  |  |  |

#### 12.3.2.5 Test Requirement

Tables 12.3.2.5-1 define the primary level settings including test tolerances for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority test.

Table 12.3.2.5-1: SyncRef UE Specific Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for eNB configured as the highest priority

| Parameter | Unit | SyncRef UE 1 | | | SyncRef UE 2 | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| T1 | T2 | T3 | T1 | T2 | T3 |
| E-UTRA RF Channel Number |  | 1 | | | | | |
| BWchannel | MHz | 5 or 10 | | | | | |
| V2X Sidelink Communication resource pool configuration |  | As specified in Table A.12.2-1  (Configuration #1) | | | As specified in Table A.12.2-2  (Configuration #2) | | |
| networkControlledSyncTx |  | N/A | | | ON | | |
| syncTxThreshOoC | dBm/15 kHz | +infinity | | | N/A | | |
| slssid |  | 59 | | | 30 | | |
| inCoverage (in MIB-SL) |  | FALSE | | | TRUE | | |
| syncOffsetIndicator |  | syncOffsetIndicator2 | | | syncOffsetIndicator1 | | |
| Note1 | dBm/15 kHz | -95 | | | | | |
|  | dB | -infinity | 0.3 | 0.3 | -infinity | -infinity | 3.5 |
|  | dB | -infinity | 0.3 | -4.8 | -infinity | -infinity | 0.34 |
| S-RSRP Note2, Note 3 | dBm/15 kHz | -infinity | -94.7 | -94.7 | -infinity | -infinity | -91.5 |
| Propagation Condition |  | AWGN | | | | | |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  NOTE 2: S-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 3: SSSS Es/Iot is set the same as PSSS/PSBCH Es/Iot. | | | | | | | |

1) During T2, SyncRef UE selection delay is defined as the time from the beginning of T2 to the time UE is synchronized to SyncRef UE 1 and changes its SLSS transmissions timing and SLSS ID to follow SyncRef UE 1 as the synchronization source. For the test configuration, the SLSS ID will be changed to 168+59 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T2.

The SyncRef UE selection delay shall be less than 8.8sec. The SyncRef UE selection/reselection delay can be expressed as:

SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + SLSS period

Where

- Tdetect,SyncRef UE = 8sec (as specified in 3GPP TS 36.133 [4] clause 11.4)

- Tevaluate,SLSS = 0.64 (as specified in 3GPP TS 36.133 [4] clause 13.3.1.3)

- SLSS period = 160ms

This gives a total of 8.8 seconds.

2) During T3, SyncRef UE reselection delay is defined as the time from the beginning of T3 to the time UE changes its synchronization source from SyncRef UE 1 to SyncRef UE 2, and changes its SLSS transmissions timing and SLSS ID to follow SyncRef UE 2 as the synchronization source. For the test configuration, the SLSS ID will be changed to 30 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T3.

The SyncRef UE reselection delay shall be less than 8.8sec. The SyncRef UE selection/reselection delay can be expressed as:

SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + SLSS period

Where

- Tdetect,SyncRef UE = 8sec (as specified in 3GPP TS 36.133 [4] clause 11.4)

- Tevaluate,SLSS = 0.64 (as specified in 3GPP TS 36.133 [4] clause 13.3.1.3)

- SLSS period = 160ms

This gives a total of 8.8 seconds.

The test system will verify that the V2X UE does not drop or delay more than 6% of its V2X data and SLSS transmissions during the duration of T2 and T3.

The rate of correct SyncRef UE selection / reselection observed during repeated tests shall be at least 90%.

## 12.4 Congestion Control Measurement Test for V2X UE

### 12.4.1 Test Purpose

To verify the V2X UE makes correct reporting of an event according to the congestion control measurement requirements in clause 13.6.

The purpose of this test is to verify that the V2X UE makes correct reporting of an event. This test will verify the congestion control measurement requirements in clause 13.6.

### 12.4.2 Test applicability

This test applies to all types of UE that support V2X Communication and Band 47 and Channel Busy Ratio measurement and reporting.

### 12.4.3 Minimum conformance requirements

The UE shall be capable of estimating the channel busy ratio for one or more transmission pools indicated by higher layers TS 36.331 [5], based on S-RSSI measurements provided by the physical layer.

When no sidelink transmissions occur, the UE physical layer shall perform a single-shot S-RSSI measurement for each sub-channel included in all the subframes configured as transmission pools.

The S-RSSI measurement performed according to this clause shall meet the S-RSSI measurement accuracy requirements defined in 3GPP TS 36.133 [4] Clause 9.10.4 & Table 12.4.3.1-1

Table 12.4.3.1-1: Intra-frequency S-RSSI absolute accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | |
| Normal condition | Extreme condition |  | | |
| E-UTRA V2X operating band groups Note 4 | Minimum Io | Maximum Io |
| dB | dB |  | dBm/15kHz Note 3 | dBm/BWChannel |
| ±2.5 | ±5.5 | TDD\_G | -118 | -50 |
| ±4.5 | ±7.5 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: The condition level is increased by ∆>0, when applicable, as described in Clauses B.4.2 and B.4.3.  NOTE 4: E-UTRA V2X operating band groups are as defined in Clause 3.5. | | | | |

The UE shall perform channel busy ratio (CBR) measurement based on S-RSSI measurements as described in 3GPP TS 36.214 [12].

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 13.6 and A.12.4

### 12.4.4 Test description

#### 12.4.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in Table 12.1.2.4.1-1.

1. Connect the SS and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A.92b.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to 3GPP TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 12.4.4.3.

3. Void

4. The V2X reference measurement channel is set according to Table 12.4.4.1-1.

5. Propagation conditions are set according to Annex B.0

6. There are one active cell (PCell) and 4 active SyncRef UEs in this test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

7. Ensure the UE is in State 3A-RF according to 3GPP TS 36.508 [7] clause 5.2A.2C. In addition to the default system information messages, SystemInformationBlockType21 is broadcasted according to 3GPP TS 36.508 [7] Table 4.4.3.3-19.

Table 12.4.4.1-1: General test parameters for Congestion Control Measurement Test for V2X UE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| E-UTRA RF Channel Number | |  | 1 | TDD carrier in Band 47 |
| Channel Bandwidth (BWchannel) | | MHz | 10 |  |
| V2X sidelink communication configuration | |  | As specified in Table TS 36.133 [4] A.3.24.2-2  (Configuration #2) | IE values unless specified otherwise in this test. |
| sl-Subframe-r14 included in SL-configV2X-TxPoolList | |  | 11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 36.213 [8]) |
| numSubchannel-r14 included in SL-configV2X-TxPoolList | |  | 1 | ENUMERATED {n1} |
| *threshS-RSSI-CBR* | |  | 21 | Corresponding -70dBm as defined in Clause 6.3.8 in 3GPP TS36.331 [5] |
| Number of Active Sidelink UEs every 100ms | |  | 4 | Active Sidelink UE i, where i = 0, 1, 2, 3 |
| Active Sidelink UEs | V2X sidelink Communication configuration |  | As specified in Table TS 36.133 [4] A.3.24.2-2  (Configuration #2) | IE values unless specified otherwise in this test. |
| sl-Subframe-r14 included in SL-configV2X-TxPoolList |  | 10000000000000000000  00000000000000000000  00000000000000000000  00000000000000000000  00000000000000000000 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 36.213 [8]) |
| numSubchannel-r14 included in SL-configV2X-TxPoolList |  | 1 | ENUMERATED {n1} |
| sl-OffsetIndicator-r14 |  | i | For Active Sidelink UE i, where i = 0, 1, 2, 3 |
| Timing offset between V2X UE and Active Sidelink UEs | | μs | 3 | Synchronous |
| v1-Threshold | |  | 2 | Corresponding 0.02 as defined in Clause 6.3.8 in 3GPP TS36.331 [5] |
| Hysteresis | |  | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| T1 | | s | 5 |  |
| T2 | | s | 5 |  |

#### 12.4.4.2 Test procedure

There are 4 active sidelink UEs in this test. The test system shall emulate the active sidelink UE to transmit PSCCH/PSSCH every 100ms. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During T1, all of active sidelink UEs are powered off. During T2, all of active sidelink UEs are powered on and transmit PSCCH/PSSCH every 100ms.

1. Set the parameters according to T1 in Table 12.4.5-1 and 12.4.5-2. Propagation conditions are set according to Annex B clauses B.1

2. SS shall transmit an RRCConnectionReconfiguration message with Event-V1 configured.

3. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

4. UE shall not send Event V1 triggered measurement report during T1.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 12.4.5-1.

6. UE shall transmit a MeasurementReport message triggered by Event V1 during T2.

7. If the UE sends Event V1 triggered measurement report during T1 or UE fails to report the CBR measurement result during T2, then the number of failure tests is increased by one. Or else the number of successful tests is increased by one.

8. SS shall transmit an RRCConnectionReconfiguration message with Event-V1 removed.

9. The UE shall transmit RRCConnectionReconfigurationComplete message.

10. Repeat step 1-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 12.4.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

Table 12.4.4.3-1: *SL-V2X-InterFreqUE-Config-r14-DEFAULT* for typeTxsync-r14

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20I | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-InterFreqUE-Config-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| typeTxSync-r14 | *gnss* | ENUMERATED {gnss, enb} |  |
| } |  |  |  |

Table 12.4.4.3-2: *SL-CommResourcePoolV2X-r14-DEFAULT for*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20C | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-CommResourcePoolV2X-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  | UE under test |
|  | i |  | Active sidelink UE i=0,1,2,3 |
| sl-Subframe-r14 CHOICE { |  |  |  |
| BI100-r14 | 11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111 |  |  |
| } |  |  |  |
| sizeSubchannel-r14 | n50 |  | BW10 |
| numSubchannel-r14 | n1 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| threshS-RSSI-CBR-r14 | 21 | -70dBm |  |
| restrictResourceReservationPeriod-r14 | 1111111111 |  |  |
| } |  |  |  |

Table 12.4.4.3-3: *SL-V2X-PreconfigFreqInfo-r14 configuration for PSSCH/PSCCH* for TX resource pool

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20K | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry |  |  |
| SL-V2X-PreconfigCommPool-r14[1] SEQUENCE { | SL-V2X-PreconfigCommPool-r14-DEFAULT with following exceptions |  |  |
| Bl100-r14 | 11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111 |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry |  |  |
| SL-V2X-PreconfigCommPool-r14[1] SEQUENCE { | SL-V2X-PreconfigCommPool-r14-DEFAULT with following exceptions |  |  |
| Bl100-r14 | 10000000000000000000  00000000000000000000  00000000000000000000  00000000000000000000  00000000000000000000 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 12.4.4.3-4: ReportConfigEUTRA-V1

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.6-13 | | | |
| Information Element | Value/remark | Comment | Condition |
| ReportConfigEUTRA-V1 ::= SEQUENCE { |  |  |  |
| triggerType CHOICE { |  |  |  |
| event SEQUENCE { |  |  |  |
| eventId CHOICE { |  |  |  |
| eventV1-r14 SEQUENCE { |  |  |  |
| v1-Threshold-r14 | 2 |  |  |
| } |  |  |  |
| } |  |  |  |
| hysteresis | 0 (0.00) |  |  |
| timeToTrigger | ms0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

### 12.4.5 Test requirement

Table 12.4.5-1 and 12.4.5-2 define the primary level settings including test tolerances for Congestion Control Measurement Test for V2X UE.

Table 12.4.5-1: Active sidelink UE specific test parameters for Congestion Control Measurement Test for V2X UE

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Active Sidelink UE *i* (*i* = 0, 1, 2, 3) | |
| T1 | T2 |
| E-UTRA RF Channel Number |  | 1 | |
| BWchannel | MHz | 10 | |
| PSCCH RMC (defined in A.3.24.3) |  | CC.1A TDD | |
| PSSCH RMC (defined in A.3.24.3) |  | CD.1A TDD | |
| Note1 | dBm/15 KHz | -106 | |
| PSCCH | dB | 4.89 | 14.89 |
| PSSCH | dB | 1.89 | 11.89 |
| PSSCH  Note2 | dB | 1.89 | 11.89 |
| PSSCH-RSRP Note 2 | dBm/15 KHz | -104.11 | -94.11 |
| S-RSSI1 Note 2 Note3 | dBm/1.08 MHz | -74.06 | -65.90 |
| S-RSSI2 Note 2 Note4 | dBm/1.08 MHz | -78.22 | -78.22 |
| Io1 Note 2 Note4 | dBm/9MHz | -74.06 | -65.90 |
| Io2 Note 2 Note6 | dBm/9MHz | -78.22 | -78.22 |
| Propagation Condition | - | AWGN | |
| NOTE 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 2: , PSSCH-RSRP, S-RSSI1, S-RSSI2, Io1 and Io2 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 3: S-RSSI1 is the S-RSSI level measured on the subframe# 0 - 3 with "SFN mod 10 = 0".  NOTE 4: S-RSSI2 is the S-RSSI level measured on the subframe# 4-9 with "SFN mod 10 = 0" and the subframe# 0-9 with "SFN mod 10 = 1,…, 9".  NOTE 5: Io1 is the Io level measured on the subframe# 0 - 3 with "SFN mod 10 = 0".  NOTE 6: Io2 is the Io level measured on the subframe# 4-9 with "SFN mod 10 = 0" and the subframe# 0-9 with "SFN mod 10 = 1,…, 9". | | | |

Table 12.4.5-2: Cell Test Parameters for Congestion Control Measurement Test for V2X UE

| Parameter | Unit | Cell 1 | |
| --- | --- | --- | --- |
| T1 | T2 |
| E-UTRA RF Channel Number |  | 2 | |
| BWchannel | MHz | 10 | |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.3.1.2.1 |  | R.6 FDD | |
| OCNG Patterns defined in A.3.2.1.2 |  | OP.2 FDD | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote 1 |
| OCNG\_RBNote 1 |
| Note2 | dBm/15 kHz | -95 | |
|  | dB | 4.5 | 4.5 |
| RSRP Note3 | dBm/15 kHz | -90.5 | -90.5 |
| SCH\_RP Note 3 | dBm/15 kHz | -90.5 | -90.5 |
| Propagation Condition |  |  | |
| NOTE 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  NOTE 3: RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

The UE shall not send event V1 triggered measurement reports during T1 and shall send event V1 triggered measurement reports during T2.

The rate of correct events observed during repeated tests shall be at least 98%.

## 12.5 Interruptions due to V2X Sidelink Communication

#### 12.5.1 Test Purpose

The purpose of this test is to verify the requirements related to interruptions due to V2X sidelink communication defined in 3GPP TS 36.133 [4] clause 13.7.1 under the following additional conditions:

- The UE is out of coverage on the V2X sidelink carrier and is associated with a serving cell on a non-V2X sidelink carrier

#### 12.5.2 Applicability of requirements

The requirements in this clause are applicable to EUTRA Release 14 UEs supporting V2X communications, Band 47 and any EUTRA band.

#### 12.5.3 Minimum Conformance Requirements

A UE capable of V2X sidelink communication may indicate its interest (initiation or termination) in V2X sidelink communication to the connected eNodeB using IE *SidelinkUEInformation* [2].

The UE is allowed an interruption of up to 1 subframe on the serving cell(s) during the RRC reconfiguration procedure that includes the V2X sidelink communication configuration message *sl-V2X-ConfigDedicated* [2] (setup and release). This interruption is for both uplink and downlink of the serving cell(s).

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 13.7 and A.12.5

#### 12.5.4 Test Description

##### 12.5.4.1 Initial Conditions

Resource pool configuration for PSCCH and PSSCH reference measurement channels are set according to Table 12.5.4.1-1 and Annex A.12 as appropriate.

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in Table 12.5.4.1-1.

1. Connect the SS and AWGN noise sources to the UE antenna connectors, connect the SS COM port to the UE COM port as shown in 3GPP TS 36.508 [7] Annex A.92b.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to 3GPP TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 12.5.4.3.

3. The V2X reference measurement channel is set according to Table 12.5.4.1-1.

4. Propagation conditions are set according to Annex B.0.

5. There is one active cell (PCell) on the serving RF channel 1, and there are no active cells on RF channel 2. On RF channel 2, the test consists of 8 active Sidelink UEs in this test transmitting V2X sidelink communication.

6. Ensure the UE is in State 2A-RF according to 3GPP TS 36.508 [7] clause 5.2A.1A. In addition to the default system information messages, SystemInformationBlockType21 is broadcasted according to 3GPP TS 36.508 [7] Table 4.4.3.3-19.

Table 12.5.4.1-1: Test Parameters for Interruptions due to V2X Sidelink Communication

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| E-UTRA RF Channel Number | - | 1, 2 | RF channel 1 is non-V2X sidelink carrier  RF channel 2 is V2X sidelink carrier |
| Channel Bandwidth (BWchannel) | MHz | 10 |  |
| Active cell | - | Cell 1 | PCell on RF channel number 1 |
| CP length of Cell 1 | - | Normal |  |
| T1 | s | 5.12 |  |
| T2 | s | Up to receiving RRC reconfiguration setup complete from the UE, or up to 2 second if UE does not transmit *SidelinkUEInformation* during this period. |  |
| T3 | s | 10 |  |

Table 12.5.4.1-2: Slidelink Communication Configuration for Interruptions due to V2X Sidelink Communication

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| E-UTRA RF Channel Number | | - | 2 | TDD carrier in Band 47 |
| Channel Bandwidth (BWchannel) | | MHz | 10 |  |
| V2X sidelink Communication configuration | | - | As specified in Table A.12.2-2 (Configuration #2) | IE values unless specified otherwise in this test. |
| Number of Active Sidelink UEs per sc-period | | - | 8 | Sidelink UE i = 0, .., 7 |
| Active Sidelink UEs | V2X sidelink Communication configuration | - | As specified in Table A.12.2-2 (Configuration #2) | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel | - | CC.1A TDD | As specified in Table A.12.3-1 |
| PSSCH Reference Measurement Channel | - | CD.1A TDD | As specified in Table A.12.3-2 |
| numSubchannel-r14 included in v2x-CommTxPoolNormal-r14 | - | 1 | ENUMERATED {n1} |
| startRB-Subchannel-r14 included in v2x-CommTxPoolNormal-r14 | - | i | For Sidelink UE i = 0, .., 7 |
| RSRP | dBm/15kHz | -98 |  |

##### 12.5.4.2 Test Procedure

For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication. On RF channel 2, the test consists of 8 active Sidelink UEs in this test transmitting V2X sidelink communication.

1. Set the parameters according to T1 in Table 12.5.5-1. Propagation conditions are set according to Annex B clauses B.1. T1 starts.

2. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 12.5.5-1. T2 starts.

3. SS shall transmit an RRCConnectionReconfiguration message.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. During T2,

- If the UE transmits *SidelinkUEInformation*, SS shall send *RRCConnectionReconfiguration* message with conditions SETUP and UE-SELECTED to the UE. UE shall respond with *RRCConnectionReconfigurationComplete* message. or

- If the UE does not transmit *SidelinkUEInformation* for up to 2 second,

T3 starts.

6. SS continuously transmits PDSCH via PDCCH DCI format 1A for C\_RNTI to transmit the DL RMC according to Table 12.5.5-1 on PCell.

7. The test system shall verify that no interruption is caused to the ACK/NACKs on the serving cell on RF channel 1 during T3.

##### 12.5.4.3 Message Contents

Message contents are according to 3GPP TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

Table 12.5.4.3-2: SL-V2X-InterFreqUE-Config-r14-DEFAULT (V2X UE and SyncRef UE 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20I | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-InterFreqUE-Config-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| v2x-CommRxPool-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPool-r14)) OF SL-CommResourcePoolV2X-r14 { |  |  |  |
| SL-CommResourcePoolV2X-r14[1] SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 11111111111111111111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | i |  | For Sidelink UE i=0,…,7 |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-CommTxPoolNormal-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPool-r14)) OF SL-CommResourcePoolV2X-r14 { |  |  |  |
| SL-CommResourcePoolV2X-r14[1] SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 11111111111111110000 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | i |  | For Sidelink UE i=0,…,7 |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| dataTxParameters-r14 SEQUENCE { |  |  |  |
| alpha-r12 | al0 |  |  |
| p0-r12 | 31 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-CommTxPoolExceptional-r14 SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  |  |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 00000000000000001111 |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true |  |  |
| sizeSubchannel-r14 | n50 |  |  |
| numSubchannel-r14 | n1 |  |  |
| startRB-Subchannel-r14 | 0 |  |  |
| startRB-PSCCH-Pool-r14 | 0 |  |  |
| dataTxParameters-r14 SEQUENCE { |  |  |  |
| alpha-r12 | al0 |  |  |
| p0-r12 | 31 |  |  |
| } |  |  |  |
| } |  |  |  |
| v2x-ResourceSelectionConfig-r14 SEQUENCE { |  |  |  |
| pssch-TxConfigList-r14 | SL-PSSCH-TxConfig-r14-DEFAULT |  |  |
| restrictResourceReservationPeriod-r14 SEQUENCE (SIZE (1..maxReservationPeriod-r14)) OF SL-RestrictResourceReservationPeriod-r14 { |  |  |  |
| SL-RestrictResourceReservationPeriod-r14[1] | v0dot2 |  |  |
| } |  |  |  |
| probResourceKeep-r14 | v0 |  |  |
| } |  |  |  |
| } |  |  |  |

Table 12.5.4.3-2: PCCH-Config-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-3 | | | |
| Information Element | Value/remark | Comment | Condition |
| PCCH-Config-DEFAULT::= SEQUENCE { |  |  |  |
| defaultPagingCycle | rf256 | Typical value in real network. |  |
| nB | OneThirtySecondT |  |  |
| } |  |  |  |

#### 12.5.5 Test Requirement

Tables 12.5.5-1 defines the primary level settings including test tolerances for interruptions due to V2X slidelink communication test.

Table 12.5.5-1: Cell specific test parameters for interruptions due to V2X slidelink communication

| Parameter | | Unit | Cell 1 | | |
| --- | --- | --- | --- | --- | --- |
| T1 | T2 | T3 |
| E-UTRA RF Channel Number | | - | 1 | | |
| BWchannel | | MHz | 10 | | |
| UE RRC state | | - | IDLE | CONNECTED | |
| Paging configuration | defaultPagingCycle | - | rf256 | N/A | |
| nB | - | T/32 |
| DRX | | - | N/A | OFF | |
| PDSCH Reference measurement channel defined in A.1.1Note1, Note 4 | | - | N/A | None | R.3 FDD |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.2.1Note1 | | - | R.6 FDD | | |
| OCNG Pattern | | - | OP.6 FDD | | OP.10 FDD |
| PBCH\_RA | | dB | 0 | | |
| PBCH\_RB | |
| PSS\_RA | |
| SSS\_RA | |
| PCFICH\_RB | |
| PHICH\_RA | |
| PHICH\_RB | |
| PDCCH\_RA | |
| PDCCH\_RB | |
| PDSCH\_RA | |
| PDSCH\_RB | |
| OCNG\_RANote 1 | |
| OCNG\_RBNote 1 | |
| Note2 | | dBm/15 kHz | -98 | | |
|  | | dB | 16 | | |
| RSRP Note3 | | dBm/15 kHz | -82 | | |
| SCH\_RP Note 3 | | dBm/15 kHz | -82 | | |
| Propagation Condition | | - | AWGN | | |
| Correlation Matrix and Antenna Configuration | | - | 1x2 Low | | |
| NOTE 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  NOTE 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

The UE shall be continuously scheduled on PCell on RF channel 1 during T3. During T3, 100% of all expected ACK/NACKs shall be transmitted by the V2X UE.

## 12.6 V2X UE Autonomous Resource Selection/Reselection Measurement Test

### 12.6.1 V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements

#### 12.6.1.1 Test Purpose

The purpose of this test is to verify the requirements related to autonomous resource selection / reselection for V2X UE in mode 4 defined in 3GPP TS 36.133 [4] clause 13.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

#### 12.6.1.2 Applicability of requirements

The requirements in this clause are applicable to EUTRA Release 14 UEs supporting V2X communications, Band 47 and any EUTRA band.

#### 12.6.1.3 Minimum Conformance Requirements

The UE physical layer shall be capable of performing the PSSCH-RSRP measurements [12] on the carrier operating V2X sidelink communication for determining the subset of resources to be excluded in PSSCH resource selection in sidelink transmission mode 4. The PSSCH-RSRP measurement period corresponds to one sub-frame and the measurement shall meet the PSSCH-RSRP measurement accuracy requirement in 3GPP TS 36.133 [4] Clause 9.10.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 13.5 and A.12.6.1

#### 12.6.1.4 Test Description

##### 12.6.1.4.1 Initial Conditions

Resource pool configuration for PSCCH and PSSCH reference measurement channels are set according to Table 12.6.1.4.1-1 and Annex A.12 as appropriate.

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in Table 12.6.1.4.1-1.

1. Connect the SS, the GNSS simulator and AWGN noise sources to the UE antenna connectors, connect the SS COM port to the UE COM port as shown in 3GPP TS 36.508 [7] Annex A.92b.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to 3GPP TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 12.6.1.4.3.

3. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in 3GPP TS 36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4 The V2X reference measurement channel is set according to Table 12.6.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the V2X UE under test is in State 5A-V2X (transmit mode) according to 3GPP TS 36.508 [7] clause 4.5.9

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographicalarea #1. Wait for the UE to acquire the GNSS signal and start to transmit.

Table 12.6.1.4.1-1: Test Parameters for V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements

| Parameter | | Unit | Value | Comment |
| --- | --- | --- | --- | --- |
| E-UTRA RF Channel Number | |  | 1 | TDD carrier in Band 47 |
| Channel Bandwidth (BWchannel) | | MHz | 10 |  |
| V2X sidelink communication pre-configuration | |  | As specified in Table A.12.2-1  (Configuration #1) | IE values unless specified otherwise in this test. |
| sl-Subframe-r14 included in SL-PreconfigV2X-TxPoolList | |  | 11111111111111111111 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 36.213 [8]) |
| numSubchannel-r14 included in SL-PreconfigV2X-TxPoolList | |  | 5 | Indicates the number of sub-channels for TX resource pool |
| minSubChannel-NumberPSSCH-r14 included in v2x-ResourceSelectionConfig-r14 | |  | 1 | Indicates the minimum number of sub-channels which may be used for transmissions on PSSCH |
| maxSubchannel-NumberPSSCH-r14 included in v2x-ResourceSelectionConfig-r14 | |  | 1 | Indicates the maximum number of sub-channels which may be used for transmissions on PSSCH |
| Number of Active Sidelink UEs | |  | 20 | Active Sidelink UE i = 0, .., 19 |
| *SL-ThresPSSCH-RSRP* | |  | 12 | Corresponding -106 dBm as defined in Clause 6.3.8 in 3GPP TS36.331 [5] |
| Active Sidelink UEs | V2X sidelink Communication preconfiguration |  | As specified in Table A.12.2.2-1  (Configuration #1) | IE values unless specified otherwise in this test. |
| sl-Subframe-r14 included in SL-PreconfigV2X-TxPoolList |  | 10000000000000000000 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 36.213 [8]) |
| numSubchannel-r14 included in SL-PreconfigV2X-TxPoolList |  | 1 | Indicates the number of sub-channels for TX resource pool |
| startRB-Subchannel-r14 included in SL-PreconfigV2X-TxPoolList |  | 5 | Indicates the lowest RB index of the subchannel with the lowest index. |
| startRB-PSCCH-Pool-r14 included in SL-PreconfigV2X-TxPoolList |  | 5 | Indicates the lowest RB index of the PSCCH pool. |
| sl-OffsetIndicator-r14 |  | i mod 20 | For Active Sidelink UE i, where i = 0, .., 19 |
| Timing offset among Active Sidelink UEs | | μs | ≤3 | Synchronous |

##### 12.6.1.4.2 Test Procedure

For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication. There are 20 active V2X sidelink UEs in this test. Both the UE under test and active V2X sidelink UEs select GNSS as synchronization reference source. The test system can emulate and send the GNSS signal to the test UE and active V2X sidelink UEs. The test system shall emulate the active V2X sidelink UEs to transmit PSCCH/PSSCH every 20ms.

1. Set the parameters according to T1 in Table 12.6.1.5-1. Propagation conditions are set according to Annex B clauses B.1. T1 starts.

2. During T1, record the rate of PSSCH transmissions on the resources on subchannel #1. When the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved, T1 expires. If the rate of PSSCH transmissions on the resources on subchannel #1 is less than 10% consider the loop to be pass, else the loop is considered as fail.

3. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 12.6.1.5-1.

4. During T2, record the rate of PSSCH transmissions on the resources on subchannel #1. When the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved, T2 expires. If the rate of PSSCH transmissions on the resources on subchannel #1 is more than 90% consider the loop to be pass, else the loop is considered as fail.

5. The test case is passed if step 2 and step 4 are both passed, else the test case is failed.

##### 12.6.1.4.3 Message Contents

Message contents are according to 3GPP TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

Table 12.6.1.4.3-2: SL-V2X-PreconfigFreqInfo-r14-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20K | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| v2x-CommRxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry |  |  |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14 |  |  |
| } |  |  |  |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { |  |  |  |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14 |  |  |
| } |  |  |  |
| v2x-ResourceSelectionConfig-r14 | SL-CommTxPoolSensingConfig-r14-DEFAULT |  |  |
| zoneConfig-r14 | Not present |  |  |
| syncPriority-r14 | enb |  |  |
| thresSL-TxPrioritization-r14 | Not present |  |  |
| offsetDFN-r14 | Not present |  |  |
| } |  |  |  |

Table 12.6.1.4.3-2: SL-V2X-PreconfigCommPool-r14 (Table 12.6.1.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20J | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-PreconfigCommPool-r14 ::= SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  | V2X UE under test |
|  | i mod 20 |  | Active Sidelink UE i, where i = 0, .., 19 |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 11111111111111111111 |  | V2X UE under test |
|  | 10000000000000000000 |  | Active V2X UEs |
|  |  |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true | BOOLEAN |  |
| sizeSubchannel-r14 | n5 |  |  |
| numSubchannel-r14 | n5 |  | V2X UE under test |
|  | n1 |  | Active V2X UEs |
| startRB-Subchannel-r14 | 0 |  | V2X UE under test |
|  | 5 |  | Active V2X UEs |
| startRB-PSCCH-Pool-r14 | 0 |  | V2X UE under test |
|  | 5 |  | Active V2X UEs |
| } |  |  |  |

Table 12.6.1.4.3-3: SL-CommTxPoolSensingConfig-r14 (Table 12.6.1.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20D | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-CommTxPoolSensingConfig-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| pssch-TxConfigList-r14 | SL-PSSCH-TxConfig-r14 |  |  |
| thresPSSCH-RSRP-List-r14 SEQUENCE (SIZE (64)) OF SL-ThresPSSCH-RSRP-r14 { |  |  |  |
| SL-ThresPSSCH-RSRP-r14[n] | 12 | -106dBm  For n=1,2,…,64, where n denotes the index for the threshold used for sensing based UE autonomous resource selection |  |
| } |  |  |  |
| probResourceKeep-r14 | v0 |  |  |
| p2x-SensingConfig-r14 | Not present |  |  |
| sl-ReselectAfter-r14 | Not present |  |  |
| } |  |  |  |

Table 12.6.1.4.3-4: SL-PSSCH-TxConfig-r14 (Table 12.6.1.4.3-3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20F | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-PSSCH-TxConfig-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| typeTxSync-r14 | gnss |  |  |
| parametersAboveThres-r14 SEQUENCE { |  |  |  |
| minSubChannel-NumberPSSCH-r14 | 1 |  |  |
| maxSubchannel-NumberPSSCH-r14 | 1 |  |  |
| } |  |  |  |
| parametersBelowThres-r14 SEQUENCE { |  |  |  |
| minSubChannel-NumberPSSCH-r14 | 1 |  |  |
| maxSubchannel-NumberPSSCH-r14 | 1 |  |  |
| } |  |  |  |
| } |  |  |  |

#### 12.6.1.5 Test Requirement

Tables 12.6.1.5-1 defines the primary level settings including test tolerances for V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements test.

Table 12.6.1.5-1: Active Sidelink UE Specific Test Parameters for V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements

| Parameter | Unit | Active Sidelink UE i  (i = 0, .., 19) | |
| --- | --- | --- | --- |
| T1 | T2 |
| E-UTRA RF Channel Number | - | 1 | |
| BWchannel Note 4 | MHz | 10 | |
| PSCCH RMC (defined in A.12.3) | - | CC.1A HD | |
| PSSCH RMC (defined in A.12.3) | - | CD.1B HD | |
| OCNG pattern defined in D.4 | - | VOP.1 HD | |
| Note1 | dBm/15 kHz | -103 | -113 |
| PSCCH | dB | 9.1 | 0.9 |
| PSSCH | dB | 6.1 | -2.1 |
| PSCCH  Note2 | dB | 9.1 | -0.9 |
| PSSCH  Note2 | dB | 6.1 | -2.1 |
| S-RSRP Note 2 | dB | -96.9 | -115.1 |
| S-RSSI1 Note 2 Note3 | dBm/0.9 MHz | -76.96 | -92.52 |
| S-RSSI2 Note 2 Note4 | dBm/0.9 MHz | -61.10 | -79.21 |
| S-RSSI3 Note 2 Note5 | dBm/0.9 MHz | -61.10 | -79.21 |
| Antenna Configuration | - | 1x2 | |
| Propagation Condition | - | AWGN | |
| NOTE 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  NOTE 2: Es/Iot, S-RSRP and S-RSSI levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 3: S-RSSI1 is the S-RSSI level measured on subchannel #1.  NOTE 4: S-RSSI2 is the S-RSSI level measured on subchannel #3.  NOTE 5: S-RSSI3 is the S-RSSI level measured on subchannel #0/2/4. | | | |

The test time T1 and T2 should be long enough. The rate of PSSCH transmissions on the resources on subchannel #1 shall be less than 10% during T1.The rate of PSSCH transmissions on the resources on subchannel #1 shall be more than 90% during T2.The rate of correct SyncRef UE selection / reselection observed during repeated tests shall be at least 90%.

### 12.6.2 V2X UE Autonomous Resource Selection/Reselection Tests for S-RSSI measurements

#### 12.6.2.1 Test Purpose

The purpose of this test is to verify the requirements related to autonomous resource selection / reselection for V2X UE in mode 4 defined in 3GPP TS 36.133 [4] clause 13.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

#### 12.6.2.2 Applicability of requirements

The requirements in this clause are applicable to EUTRA Release 14 UEs supporting V2X communications, Band 47 and any EUTRA band.

#### 12.6.2.3 Minimum Conformance Requirements

The UE physical layer shall be capable of performing the S-RSSI measurements [4] on the carrier operating V2X sidelink communication for determining the subset of resources to be excluded in PSSCH resource selection in sidelink transmission mode 4. The S-RSSI measurement period corresponds to 1 second and the filtered measurement shall meet the S-RSSI measurement accuracy requirement in 3GPP TS 36.133 [4] Clause 9.10.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 13.5 and A.12.6.2

#### 12.6.2.4 Test Description

##### 12.6.2.4.1 Initial Conditions

Resource pool configuration for PSCCH and PSSCH reference measurement channels are set according to Table 12.6.2.4.1-1 and Annex A.12 as appropriate.

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 4.1.

Frequencies to be tested: According to 3GPP TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10 MHz as defined in Table 12.6.2.4.1-1.

1. Connect the SS, the GNSS simulator and AWGN noise sources to the UE antenna connectors, connect the SS COM port to the UE COM port as shown in 3GPP TS 36.508 [7] Annex A.92b.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to 3GPP TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 12.6.2.4.3.

3. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in 3GPP TS 36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. The V2X reference measurement channel is set according to Table 12.6.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the V2X UE under test is in State 5A-V2X (transmit mode) according to 3GPP TS 36.508 [7] clause 4.5.9.

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographicalarea #1. Wait for the UE to acquire the GNSS signal and start to transmit.

Table 12.6.2.4.1-1: Test Parameters for V2X UE Autonomous Resource Selection/Reselection Tests for S-RSSI measurements

| Parameter | | Unit | Value | Comment |
| --- | --- | --- | --- | --- |
| E-UTRA RF Channel Number | |  | 1 | TDD carrier in Band 47 |
| Channel Bandwidth (BWchannel) | | MHz | 10 |  |
| V2X sidelink communication pre-configuration | |  | As specified in Table A.12.2-1  (Configuration #1) | IE values unless specified otherwise in this test. |
| sl-Subframe-r14 included in SL-PreconfigV2X-TxPoolList | |  | 11111111111111111111 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 36.213 [8]) |
| numSubchannel-r14 included in SL-PreconfigV2X-TxPoolList | |  | 5 | Indicates the number of sub-channels for TX resource pool |
| minSubChannel-NumberPSSCH-r14 included in v2x-ResourceSelectionConfig-r14 | |  | 1 | Indicates the minimum number of sub-channels which may be used for transmissions on PSSCH |
| maxSubchannel-NumberPSSCH-r14 included in v2x-ResourceSelectionConfig-r14 | |  | 1 | Indicates the maximum number of sub-channels which may be used for transmissions on PSSCH |
| Number of Active Sidelink UEs | |  | 20 | Sidelink UE i = 0, .., 19 |
| *SL-ThresPSSCH-RSRP* | |  | 66 | Corresponding infinity dBm as defined in Clause 6.3.8 in 3GPP TS36.331 [5] |
| Active Sidelink UEs | V2X sidelink communication preconfiguration |  | As specified in Table A.12.2-1  (Configuration #1) | IE values unless specified otherwise in this test. |
| sl-Subframe-r14 included in SL-PreconfigV2X-TxPoolList |  | 10000000000000000000 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 36.213 [8]) |
| numSubchannel-r14 included in SL-PreconfigV2X-TxPoolList |  | 1 | Indicates the number of sub-channels for TX resource pool |
| startRB-Subchannel-r14 included in SL-PreconfigV2X-TxPoolList |  | 5 | Indicates the lowest RB index of the subchannel with the lowest index. |
| startRB-PSCCH-Pool-r14 included in SL-PreconfigV2X-TxPoolList |  | 5 | Indicates the lowest RB index of the PSCCH pool. |
| sl-OffsetIndicator-r14 |  | i mod 20 | For Sidelink UE i, where i = 0, .., 19 |
| Timing offset among Active Sidelink UEs | | μs | ≤3 | Synchronous |

##### 12.6.2.4.2 Test Procedure

For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication. There are 20 active V2X sidelink UEs in this test. Both the UE under test and active V2X sidelink UEs select GNSS as synchronization reference source. The test system can emulate and send the GNSS signal to the test UE and active V2X sidelink UEs. The test system shall emulate the active V2X sidelink UEs to transmit PSCCH/PSSCH every 20ms.

1. Set the parameters according to Table 12.6.1.5-1. Propagation conditions are set according to Annex B clauses B.1.

2. Record the rate of PSSCH transmissions on the resources on subchannel #1 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved. If the rate of PSSCH transmissions on the resources on subchannel #1 is more than 80% consider the test case to be pass, else the test case is considered as fail.

##### 12.6.2.4.3 Message Contents

Message contents are according to 3GPP TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

Table 12.6.2.4.3-2: SL-V2X-PreconfigFreqInfo-r14-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20K | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| v2x-CommRxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry |  |  |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14 |  |  |
| } |  |  |  |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { |  |  |  |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14 |  |  |
| } |  |  |  |
| v2x-ResourceSelectionConfig-r14 | SL-CommTxPoolSensingConfig-r14-DEFAULT |  |  |
| zoneConfig-r14 | Not present |  |  |
| syncPriority-r14 | enb |  |  |
| thresSL-TxPrioritization-r14 | Not present |  |  |
| offsetDFN-r14 | Not present |  |  |
| } |  |  |  |

Table 12.6.2.4.3-2: SL-V2X-PreconfigCommPool-r14 (Table 12.6.1.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20J | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-V2X-PreconfigCommPool-r14 ::= SEQUENCE { |  |  |  |
| sl-OffsetIndicator-r14 | 0 |  | V2X UE under test |
|  | i mod 20 |  | Active Sidelink UE i, where i = 0, .., 19 |
| sl-Subframe-r14 CHOICE { |  |  |  |
| bs20-r14 | 11111111111111111111 |  | V2X UE under test |
|  | 10000000000000000000 |  | Active V2X UEs |
|  |  |  |  |
| } |  |  |  |
| adjacencyPSCCH-PSSCH-r14 | true | BOOLEAN |  |
| sizeSubchannel-r14 | n5 |  |  |
| numSubchannel-r14 | n5 |  | V2X UE under test |
|  | n1 |  | Active V2X UEs |
| startRB-Subchannel-r14 | 0 |  | V2X UE under test |
|  | 5 |  | Active V2X UEs |
| startRB-PSCCH-Pool-r14 | 0 |  | V2X UE under test |
|  | 5 |  | Active V2X UEs |
| } |  |  |  |

Table 12.6.2.4.3-3: SL-CommTxPoolSensingConfig-r14 (Table 12.6.1.4.3-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20D | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-CommTxPoolSensingConfig-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| pssch-TxConfigList-r14 | SL-PSSCH-TxConfig-r14 |  |  |
| thresPSSCH-RSRP-List-r14 SEQUENCE (SIZE (64)) OF SL-ThresPSSCH-RSRP-r14 { |  |  |  |
| SL-ThresPSSCH-RSRP-r14[n] | 66 | Infinity dBm.  For n=1,2,…,64, where n denotes the index for the threshold used for sensing based UE autonomous resource selection |  |
| } |  |  |  |
| probResourceKeep-r14 | v0 |  |  |
| p2x-SensingConfig-r14 | Not present |  |  |
| sl-ReselectAfter-r14 | Not present |  |  |
| } |  |  |  |

Table 12.6.2.4.3-4: SL-PSSCH-TxConfig-r14 (Table 12.6.1.4.3-3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 Table 4.6.3-20F | | | |
| Information Element | Value/remark | Comment | Condition |
| SL-PSSCH-TxConfig-r14-DEFAULT ::= SEQUENCE { |  |  |  |
| typeTxSync-r14 | gnss |  |  |
| parametersAboveThres-r14 SEQUENCE { |  |  |  |
| minSubChannel-NumberPSSCH-r14 | 1 |  |  |
| maxSubchannel-NumberPSSCH-r14 | 1 |  |  |
| } |  |  |  |
| parametersBelowThres-r14 SEQUENCE { |  |  |  |
| minSubChannel-NumberPSSCH-r14 | 1 |  |  |
| maxSubchannel-NumberPSSCH-r14 | 1 |  |  |
| } |  |  |  |
| } |  |  |  |

#### 12.6.2.5 Test Requirement

Tables 12.6.2.5-1 define the primary level settings including test tolerances for V2X UE Autonomous Resource Selection/Reselection Tests for S-RSSI measurements test.

Table 12.6.2.5-1: Active Sidelink UE Specific Test Parameters for V2X UE Autonomous Resource Selection/Reselection Tests for S-RSSI measurements

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Active Sidelink UE i  (i = 0, .., 19) |
| E-UTRA RF Channel Number | - | 1 |
| BWchannel Note 4 | MHz | 10 |
| PSCCH RMC (defined in A.12.3) | - | CC.1A HD |
| PSSCH RMC (defined in A.12.3) | - | CD.1B HD |
| OCNG pattern defined in D.4 | - | VOP.2 TDD |
| Note1 | dBm/15 kHz | -105 |
| PSCCH | dB | 5 |
| PSSCH | dB | 2 |
| PSCCH  Note2 | dB | 5 |
| PSSCH  Note2 | dB | 2 |
| S-RSRP Note 2 | dB | -103 |
| S-RSSI1 Note 2 Note3 | dBm/0.9 MHz | -82.15 |
| S-RSSI2 Note 2 Note4 | dBm/0.9 MHz | -76.71 |
| S-RSSI3 Note 2 Note5 | dBm/0.9 MHz | -67.18 |
| Antenna Configuration | - | 1x2 |
| Propagation Condition | - | AWGN |
| NOTE 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  NOTE 2: Es/Iot, S-RSRP and S-RSSI levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 3: S-RSSI1 is the S-RSSI level measured on subchannel #1.  NOTE 4: S-RSSI2 is the S-RSSI level measured on subchannel #3.  NOTE 5: S-RSSI3 is the S-RSSI level measured on subchannel #0/2/4. | | |

The test shall be run for a long enough amount of time. The rate of PSSCH transmissions on the resources on subchannel #1 shall be more than 80%.

# 13 E-UTRAN Standalone Tests for UE Category NB for Satellite Access

## 13.1 RRC\_IDLE state for satellite access

### 13.1.1 Cell re-selection for Satellite Access

#### 13.1.1.1 HD – FDD Intra frequency case for UE Category NB1 Standalone mode in normal coverage

##### 13.1.1.1.1 Test purpose

To verify that when the current and target cell operates on the same carrier frequency the Cat-NB1 UE is able to search and measure cells to meet the intra-frequency cell re-selection requirements.

##### 13.1.1.1.2 Test applicability

This test applies to all types of NB-IoT HD-FDD category NB1 UE supporting GSO or both from release 17 and forward.

##### 13.1.1.1.3 Minimum conformance requirements

The UE shall be able to identify new intra-frequency cells and perform NRSRP measurements of identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS36.304 within Ksatellite\*Tdetect,NB\_Intra\_NCwhen Treselection= 0. An intra frequency cell is considered to be detectable according to NRSRP, NRSRP Ês/Iot, NSCH\_RP and NSCH Ês/Iot defined in 3GPP TS 36.133 Annex B.1.4 for a corresponding Band.

The UE shall measure NRSRP at least every Ksatellite\*Tmeasure,NB\_Intra\_NC for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter NRSRP measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least Ksatellite\*Tmeasure,NB\_Intra-NC/2

The UE shall not consider an NB-IoT neighbour cell in cell reselection if it is indicated as not allowed in the measurement control system information of the serving NB-IoT cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined in 3GPP TS 36.304[6] within Ksatellite\*Tevaluate,NB\_intra-NC when Treselection = 0, provided that the cell is at least XdB better ranked, where ‘X’ is specified in 3GPP TS 36.133 Table 4.6A.2.4-3. When evaluating cells for reselection, the side conditions for NRSRP, NRSRP Ês/Iot, NSCH\_RP and NSCH Ês/Iot apply to both serving and non-serving NB-IoT intra-frequency cells.

The parameter Ksatellite is the scaling factor for measurements correspond to multiple NGSO satellites. Ksatellite = 1, if GSO satellite(s) is/are measured on the carrier. Ksatellite equals to the number NGSO satellites to be measured if NGSO satellites are monitored.

If Treselection timer has a non zero value and the intra-frequency cell is better ranked than the serving NB-IoT cell, the UE shall evaluate this intra-frequency cell for the Treselection time. If this cell remains better ranked within this duration, then the UE shall reselect that cell.

The UE shall evaluate the intra-frequency cell re-selection criteria as defined in 3GPP TS 36.304 [6] at least every DRX cycle. The DRX cycle length is 1.28 seconds.

The normative reference for this requirement is TS 36.133 [4] clause 4.6A.2 and A.13.1.1.1.

##### 13.1.1.1.4 Test description

13.1.1.1.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: Ncell bandwidth is as specified in Table 13.1.1.1.5-1.

1. Connect the SS and AWGN noise source to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A Figure A.93 using only UE main Tx/Rx antenna.

2. The parameter settings for the cells are set up according to Table 13.1.1.1.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. There are one NB-IoT carrier and two cells specified in the test. Ncell1 is standalone cell to Cell1 and Ncell2 is standalone cell to Cell2. Ncell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test.

5. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

6. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

7. Deactivate UE prediction of satellite trajectory through any preconfigured means.

. The UE shall be provided with the valid information about the SAN serving cells before the test

Table 13.1.1.1.4-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | GEO, HD-FDD duplex mode |

Table 13.1.1.1.4-2: General test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | Standalone |  |
| Satellite information | Config 1 |  | GEO |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | nCell2 |  |
| T2 end condition | Active cell |  | nCell2 |  |
| Neighbour cells |  | nCell1 |  |
| Final condition | Visited cell |  | nCell1 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| *s-IntraSearchP* | |  | 63 (126 dB) | to trigger intra-frequency measurement in this test |
| DRX cycle length | | s | 1.28 | The value shall be used for all cells in the test. |
| T1 | | s | >7 | During T1, nCell2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that nCell2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 60 | T2 is defined so that cell re-selection time is taken into account. Once the UE has reselected to nCell2 (within T2) T3 starts |
| T3 | | s | 15 | T3 is defined so that cell re-selection time is taken into account. |

13.1.1.1.4.2 Test procedure

The test scenario comprises of one NB-IoT carrier with 2 Ncells of different physical cell ID. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Only Ncell1 is already identified by the UE prior to the start of the test, i.e. Ncell 2 is not identified. Ncell 1 and Ncell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Ncell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on NPRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure according to 3GPP TS 36.508 [7] clause 8.1.5A.5"

1. Ensure the UE is in State 3A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5 in Ncell 1.

2. Set the parameters according to T1 in Table 13.1.1.1.5-1 and 13.1.1.1.5-2. Propagation conditions are set according to Annex B clause B.1.1. T1 starts.

3. Set Ncell2 physical cell identity = ((current Ncell 2 physical cell identity + 1) mod 14 + 2) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 13.1.1.1.5-1.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Ncell 2.

6. If the UE responds on the newly detectable cell, Ncell 2, during time duration T2 within 60 seconds from the beginning of time period T2, then count a success for the event "Re-select newly detected Ncell 2". Otherwise count a fail for the event "Re-select newly detected Ncell 2".

7. If the UE has re-selected Ncell 2 within T2, after the re-selection or when T2 expires, continue with step 8.  
Otherwise, if T2 expires and the UE has not yet re-selected Ncell 2, skip to step 12.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 13.1.1.1.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Ncell 1.

10. If the UE responds on the already detected cell, Ncell 1, during time duration T3 within 15 seconds from the beginning of time period T3, then count a success for the event "Re-select already detected Ncell 1". Otherwise count a fail for the event "Re-select already detected Ncell 1".

11. If the UE has re-selected Ncell 1 within T3, after the re-selection or when T3 expires, skip to step 13.  
Otherwise, if T3 expires and the UE has not yet re-selected Ncell 1, continue with step 12.

12. Switch off and on the UE and ensure the UE is in State 3A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5 in Ncell 1.

13. Repeat step 2-12 until a test verdict has been achieved.  
Each of the events "Re-select newly detected Ncell 2" and "Re-select already detected Ncell 1" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.  
If both events pass, the test passes. If one event fails, the test fails.

13.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.4.3, 8.1.5B and 8.1.6 using condition “standalone” with the following exception:.

Table 13.1.1.1.4.3-1: *SystemInformationBlockType3-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.4.3.3, Table 8.1.4.3.3-8: SystemInformationBlockType3-NB | | | |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType3-NB-r13 ::= SEQUENCE { |  |  |  |
| intraFreqCellReselectionInfo-r13 SEQUENCE { |  |  |  |
| q-RxLevMin-r13 | -70 (-140 dBm) |  |  |
| q-QualMin-r13 | Not present |  |  |
| p-Max-r13 | Not present |  |  |
| s-IntraSearchP-r13 | 63 (126dB) | nCell1, nCell2 |  |
| t-Reselection-r13 | 0 |  |  |
| } |  |  |  |

##### 13.1.1.1.5 Test requirement

Tables 13.1.1.1.5-1 defines the primary level settings including test tolerances for HD-FDD intra frequency cell re-selection test case.

Table 13.1.1.1.5-1: nCell 1, nCell 2 specific test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | nCell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| BWchannel | kHz | 200 | | | 200 | | |
| OCNG Pattern as defined in A.3 | **-** | NOP.3 FDD | | | NOP.3 FDD | | |
| NPBCH\_RA | dB | 0 | | | 0 | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | NRSRP | | | NRSRP | | |
|  | dBm/15 kHz | -98 | | | | | |
|  | dB | 17 | 13 | 17.45 | -infinity | 17.45 | 13 |
| Note2 | dB | 17 | -4.53 | 4.24 | -infinity | 4.24 | -4.53 |
| NRSRP Note2 | dBm/15 kHz | -81 | -85 | -80.55- | -infinity | -80.55 | -85 |
| Treselection | s | 0 | 0 | 0 | 0 | 0 | 0 |
| Propagation Condition |  | AWGN | | | AWGN | | |
| Antenna Configuration |  | 1x1 | | | 1x1 | | |
| Timing offset to nCell 1 | ms | - | | | 3 | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Ncell 2 and starts to send preambles on the NPRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Ncell 2.

The cell re-selection delay to a newly detectable cell shall be less than 59.32 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Ncell 1 and starts to send preambles on the NPRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Ncell 1.

The cell re-selection delay to an already detected cell shall be less than 14.82 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

The cell re-selection delay to a newly detectable cell can be expressed as: Tdetect,NB\_Intra\_NB-IoT-NC + TSI-NB, and to an already detected cell can be expressed as: Tevaluate, NB\_intra\_NB-IoT-NC + TSI-NB,

Where:

Tdetect,NB\_Intra\_NB-IoT-NC as specified in 3GPP TS 36.133 [4] Table 4.6A.2.2-1 in clause 4.6A.2.2.

Tevaluate, NB\_intra\_NB-IoT-NC as specified in 3GPP TS 36.133 [4] Table 4.6A.2.2-1 in clause 4.6A.2.2.

TSI-NB Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 8.32 s is assumed in this test case.

This gives a total of 59.32 s, allow 60 s for the cell re-selection delay to a newly detectable cell and 14.82 s, and allow 15s for the cell re-selection delay to an already detected cell in the test case.

#### 13.1.1.2 HD – FDD Intra frequency case for UE Category NB1 Standalone mode in normal coverage with serving cell RRM measurement relaxation

##### 13.1.1.2.1 Test purpose

To verify that when the current and target cell operates on the same carrier frequency the Cat-NB1 UE is able to search and measure cells to meet the intra-frequency cell re-selection requirements with serving cell RRM measurement relaxation.

##### 13.1.1.2.2 Test applicability

This test applies to all types of NB-IoT HD-FDD category NB1 UE supporting wake up signal, relaxed RRM measurements, GSO or both from release 17 and forward.

##### 13.1.1.2.3 Minimum conformance requirements

The cell re-selection delay to a newly detectable cell can be expressed as: Tevaluate, serv\_NB-NC + Tdetect,NB\_Intra\_NB-IoT-NC + TSI.

<TS 36.133 4.6A.2.1>

The UE shall measure the NRSRP and NRSRQ level of the serving NB-IoT cell and evaluate the cell selection criterion S defined in [1] for the serving NB-IoT cell at least every DRX cycle.

The UE shall filter the NRSRP and NRSRQ measurements of the NB-IoT serving cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by, at least DRX cycle/2.

If the UE is not configured with eDRX\_IDLE cycle and has evaluated according to Table 4.2.38.3-1 in Nserv\_NB-IoT-NC consecutive DRX cycles that the serving NB-IoT cell does not fulfil the cell selection criterion S, the UE shall initiate the measurements of all neighbour cells indicated by the serving NB-IoT cell, regardless of the measurement rules currently limiting UE measurement activities.

Table 13.1.1.2.3-1: Nserv\_NB-NC

|  |  |
| --- | --- |
| DRX cycle length [s] | Nserv\_NB-IoT-NC [number of DRX cycles] |
| 1.28 | 2 |
| 2.56 | 2 |
| 5.12 | 2 |
| 10.24 | 2 |

[TS 36.133 4.6A.2.1A]

The UE which supports *wakeUpSignal* [2] shall meet the requirement defined for the DRX cycle length of N\*DRX\_cycle in 4.6.2.1 in 3GPP TS 36.133 [4], provided the following conditions are met:

- WUS has been configured in the serving NB-IoT cell using WUS-Config-NB-r15 [2], and

- The serving cell measurement relaxation is signalled as n by the network using numDRX-CycleRelaxed-r15, and

- Serving cell S criteria is met with at least 2 dB margin.

- the relaxed monitoring criteria for neighbour cells in 3GPP TS 36.304 [1] clause 5.2.4.12.1 is fulfilled, and

where the relaxation factor N is given by Table 13.1.1.2.3-2. Otherwise the requirements defined for the configured DRX cycle length in Section 4.6.2.1A in 3GPP TS 36.133 [4] shall apply.

Table 13.1.1.2.3-2: The relaxation factor N for a UE not configured with eDRX IDLE cycle

|  |  |
| --- | --- |
| DRX cycle length [s] | Value |
| 1.28 | Min(n , 8) |
| 2.56 | Min(n , 4) |
| 5.12 | Min(n , 2) |
| 10.24 | 1 |
| NOTE: n is signalled by the network by using numDRX-CycleRelaxed-r15 defined in 3GPP TS 36.331 [2]. | |

[TS 36.133 4.6A.2.2]

The UE shall be able to identify new intra-frequency cells and perform NRSRP measurements of identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in 3GPP TS36.304 within Ksatellite\*Tdetect,NB\_Intra\_NCwhen Treselection= 0*.* An intra frequency cell is considered to be detectable according to NRSRP, NRSRP Ês/Iot, NSCH\_RP and NSCH Ês/Iot defined in Annex B.1.4 for a corresponding Band.

The UE shall measure NRSRP at least every Ksatellite\*Tmeasure,NB\_Intra\_NC for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter NRSRP measurements of each measured intra-frequency cell using at least [2] measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least Ksatellite\*Tmeasure,NB\_Intra-NC/2

The UE shall not consider an NB-IoT neighbour cell in cell reselection if it is indicated as not allowed in the measurement control system information of the serving NB-IoT cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined [1] within Ksatellite\*Tevaluate,NB\_intra-NC when Treselection = 0, provided that the cell is at least XdB better ranked, where 'X' is specified in Table 4.6.2.4-3. When evaluating cells for reselection, the side conditions for NRSRP, NRSRP Ês/Iot, NSCH\_RP and NSCH Ês/Iot apply to both serving and non-serving NB-IoT intra-frequency cells.

The parameter Ksatellite is the scaling factor for measurements correspond to multiple NGSO satellites. Ksatellite = 1, if GSO satellite(s) is/are measured on the carrier. Ksatellite equals to the number NGSO satellites to be measured if NGSO satellites are monitored.

If Treselection timer has a non-zero value and the intra-frequency cell is better ranked than the serving NB-IoT cell, the UE shall evaluate this intra-frequency cell for the Treselection time. If this cell remains better ranked within this duration, then the UE shall reselect that cell.

For UE not configured with eDRX\_IDLE cycle, Tdetect,NB\_Intra\_NC, Tmeasure,NB\_Intra\_NC and Tevaluate, NB\_intra\_NC are specified in Table 13.1.1.2.3-3.

Table 13.1.1.2.3-3: Tdetect,NB\_Intra\_NB-IoT-NC, Tmeasure,NB\_Intra\_NB-IoT-NC and Tevaluate, NB\_intra\_NB-IoT-NC

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NB\_Intra\_NC [s] (number of DRX cycles) | Tmeasure,NB\_Intra\_NB\_NC [s] (number of DRX cycles) | Tevaluate,NB\_intra\_NB\_NC  [s] (number of DRX cycles) |
| 1.28 | 51 (40) | 1.28 (1) | 6.5 (5) |
| 2.56 | 51 (20) | 2.56 (1) | 7.68 (3) |
| 5.12 | 102 (20) | 5.12 (1) | 10.24 (2) |
| 10.24 | 102 (10) | 10.24 (1) | 20.48 (2) |

The normative reference for this requirement is TS 36.133 [4] clause 4.6A.2.1, 4.6A.2.1A, 4.6A.2.2 and A.13.1.1.2.

##### 13.1.1.2.4 Test description

13.1.1.2.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: Ncell bandwidth is as specified in Table 13.1.1.2.5-1.

1. Connect the SS and AWGN noise source to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A Figure A.93 using only UE main Tx/Rx antenna.

2. The parameter settings for the cells are set up according to Table 13.1.1.2.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. There are one NB-IoT carrier and two cells specified in the test. Ncell1 is standalone cell to Cell1 and Ncell2 is istandalone cell to Cell2. Ncell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test.

The UE shall be provided with the valid information about the SAN serving cells before the test

Table 13.1.1.2.4-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | GEO, HD-FDD duplex mode |

Table 13.1.1.2.4-2: General test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | Standalone |  |
| Satellite information | Config 1 |  | GEO |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | nCell2 |  |
| T2 end condition | Active cell |  | nCell2 |  |
| Neighbour cells |  | nCell1 |  |
| Final condition | Visited cell |  | nCell1 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| *s-IntraSearchP* | |  | 63 (126 dB) | to trigger intra-frequency measurement in this test |
| SSearchDeltaP | | dB | 6 | Threshold for relaxed monitoring criterion as specified in 5.2.4.12.1 in [1] |
| Rmax | |  | 128 |  |
| maxDurationFactor | |  | one4th | WUS config. Wmax = 32 (=1/4\*Rmax) |
| numPOs | |  | n1 | WUS config. Single PO mapped to each WUS occasion |
| timeOffsetDRX | |  | ms40 | WUS config. Gap between the end of WUS duration to the associated PO |
| numDRX-CycleRelaxed | |  | 4 | Serving cell RRM measurement is relaxed by |
| DRX cycle length | | s | 1.28 | The value shall be used for all cells in the test. |
| T1 | | s | >30 | During T1, nCell2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that nCell2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 70 | T2 is defined so that cell re-selection time is taken into account. |

13.1.1.2.4.2 Test procedure

The test scenario comprises of one NB-IoT carrier with 2 Ncells of different physical cell ID. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Only Ncell1 is already identified by the UE prior to the start of the test, i.e. Ncell 2 is not identified. Ncell 1 and Ncell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Ncell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on NPRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure according to 3GPP TS 36.508 [7] clause 8.1.5A.5"

1. Ensure the UE is in State 3A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5 in Ncell 1.

2. Set the parameters according to T1 in Table 13.1.1.2.5-1. Propagation conditions are set according to Annex B clause B.1.1.

3. Wait for 5mins so that the relaxed monitoring criteria for neighbour cells in 3GPP TS 36.304 [1] clause 5.2.4.12.1 is fulfilled. T1 starts.

4. Set Ncell2 physical cell identity = ((current Ncell 2 physical cell identity + 1) mod 14 + 2) for one iteration of the test procedure loop.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 13.1.1.2.5-1.

6. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Ncell 2.

7. If the UE responds on the newly detectable cell, Ncell 2, during time duration T2 within 70 seconds from the beginning of time period T2, then count a success for the event "Re-select newly detected Ncell 2". Otherwise count a fail for the event "Re-select newly detected Ncell 2".

8. If the UE has re-selected Ncell 2 within T2, after the re-selection or when T2 expires, continue with step 10.  
Otherwise, if T2 expires and the UE has not yet re-selected Ncell 2, skip to step 9.

9. Switch off and on the UE and ensure the UE is in State 3A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5 in Ncell 1.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

13.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.4.3, 8.1.5B and 8.1.6 using condition “standalone” with the following exceptions:

Table 13.1.1.2.4.3-1: *SystemInformationBlockType22-NB*:  
HD-FDD Intra frequency cell reselection for Category NB1 UE for Ncell 1

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.4.3.3, Table 8.1.4.3.3-8: SystemInformationBlockType22-NB | | | |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType22-NB-r14 ::= SEQUENCE { |  |  |  |
| dl-ConfigList-r14 SEQUENCE (SIZE (1.. maxNonAnchorCarriers-NB-r14)) OF DL-ConfigCommon-NB-r14 SEQUENCE { |  |  |  |
| DL-ConfigCommon-NB-r14[1] SEQUENCE { |  |  |  |
| wus-Config-r15 SEQUENCE { |  |  |  |
| maxDurationFactor-r15 SEQUENCE { |  |  |  |
| maxDurationFactor-r15 | one4th |  |  |
| } |  |  |  |
| numPOs-r15 | n1 |  |  |
| numDRX-CyclesRelaxed-r15 | 4 |  |  |
| timeOffsetDRX-r15 | ms40 |  |  |
| timeOffset-eDRX-Short-r15 | ms240 |  |  |
| timeOffset-eDRX-Long-r15 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.1.1.2.4.3-2: *SystemInformationBlockType3-NB* for Ncell 1

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.4.3.3, Table 8.1.4.3.3-8: SystemInformationBlockType3-NB | | | |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType3-NB-r13 ::= SEQUENCE { |  |  |  |
| intraFreqCellReselectionInfo-r13 SEQUENCE { |  |  |  |
| q-RxLevMin-r13 | -70 (-140 dBm) |  |  |
| q-QualMin-r13 | Not present |  |  |
| p-Max-r13 | Not present |  |  |
| s-IntraSearchP-r13 | 63 (126dB) |  |  |
| t-Reselection-r13 | 0 |  |  |
| } |  |  |  |

##### 13.1.1.2.5 Test requirement

Tables 13.1.1.2.5-1 defines the primary level settings including test tolerances for HD-FDD intra frequency cell re-selection test case.

Table 13.1.1.2.5-1: nCell 1, nCell 2 specific test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | nCell 2 | |
| T1 | T2 | T1 | T2 |
| BWchannel | kHz | 200 | | 200 | |
| OCNG Pattern as defined in A.3 | **-** | NOP.3 FDD | | NOP.3 FDD | |
| NPBCH\_RA | dB | 0 | | 0 | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | NRSRP | | NRSRP | |
|  | dBm/15 kHz | -98+ | | | |
|  | dB | 17 | 7 | -infinity | 11.45 |
| Note2 | dB | 17 | -4.75 | -infinity | 3.66 |
| NRSRP Note2 | dBm/15 kHz | -81 | -91 | -infinity | -86.55 |
| Treselection | s | 0 | 0 | 0 | 0 |
| Propagation Condition |  | AWGN | | AWGN | |
| Antenna Configuration |  | 1x1 | | 1x1 | |
| Timing offset to nCell 1 | ms | - | | 3 | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

Before the beginning of T2, UE is under relaxed monitoring where the serving cell measurement is performed every 5.12 s and the infra-frequency measurement for the neighbour cells is relaxed according to subclause 5.2.4.12.0 in 3GPP TS 36.304 [1].

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on nCell 2 and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 2.

The cell re-selection delay to a newly detectable cell shall be less than 69.56 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on nCell 2 and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 2.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Tevaluate, serv\_NB-NC + Tdetect,NB\_Intra\_NB-IoT-NC + TSI.

Where:

Tdetect,NB\_Intra\_NB-IoT-NC See Table 4.6.2.2-1 in clause 4.6.2.2, based on the configured DRX cycle

Tevaluate, serv\_NB-NC See Table 4.6.2.2-1 in clause 4.6.2.2, based on the effective DRX cycle after relaxation; 10.24 s is assumed in this test case.

TSI Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 8.32 s is assumed in this test case.

This gives a total of 69.56 s, allow 70 s for the cell re-selection delay to a newly detectable in the test case.

For the test to pass, both events above shall pass.

The statistical pass/ fail decisions are done separately for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

#### 13.1.1.3 HD – FDD Intra frequency case for UE Category NB1 Standalone mode in normal coverage with UE specific DRX

##### 13.1.1.3.1 Test purpose

To verify that when the current and target cell operates on the same carrier frequency the Cat-NB1 UE is able to search and measure cells to meet the intra-frequency cell re-selection requirements.

##### 13.1.1.3.2 Test applicability

This test applies to all types of NB-IoT HD-FDD category NB1 UE supporting UE specific DRX, GSO or both from release 17 and forward.

##### 13.1.1.3.3 Minimum conformance requirements

The UE shall be able to identify new intra-frequency cells and perform NRSRP measurements of identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS36.304 within Ksatellite\*Tdetect,NB\_Intra\_NCwhen Treselection= 0. An intra frequency cell is considered to be detectable according to NRSRP, NRSRP Ês/Iot, NSCH\_RP and NSCH Ês/Iot defined in 3GPP TS 36.133 Annex B.1.4 for a corresponding Band.

The UE shall measure NRSRP at least every Ksatellite\*Tmeasure,NB\_Intra\_NC for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter NRSRP measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least Ksatellite \*Tmeasure,NB\_Intra-NC/2

The UE shall not consider an NB-IoT neighbour cell in cell reselection if it is indicated as not allowed in the measurement control system information of the serving NB-IoT cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined in 3GPP TS 36.304[6] within Ksatellite \*Tevaluate,NB\_intra-NC when Treselection = 0, provided that the cell is at least XdB better ranked, where ‘X’ is specified in 3GPP TS 36.133 Table 4.6A.2.4-3. When evaluating cells for reselection, the side conditions for NRSRP, NRSRP Ês/Iot, NSCH\_RP and NSCH Ês/Iot apply to both serving and non-serving NB-IoT intra-frequency cells.

The parameter Ksatellite is the scaling factor for measurements correspond to multiple NGSO satellites. Ksatellite = 1, if GSO satellite(s) is/are measured on the carrier. Ksatellite equals to the number NGSO satellites to be measured if NGSO satellites are monitored.

If Treselection timer has a non zero value and the intra-frequency cell is better ranked than the serving NB-IoT cell, the UE shall evaluate this intra-frequency cell for the Treselection time. If this cell remains better ranked within this duration, then the UE shall reselect that cell.

The UE shall evaluate the intra-frequency cell re-selection criteria as defined in 3GPP TS 36.304 [6] at least every DRX cycle.

The normative reference for this requirement is TS 36.133 [4] clause 4.6A.2 and A.13.1.1.3.

##### 13.1.1.3.4 Test description

13.1.1.3.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: Ncell bandwidth is as specified in Table 13.1.1.3.5-1.

1. Connect the SS and AWGN noise source to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A Figure A.93 using only UE main Tx/Rx antenna.

2. The parameter settings for the cells are set up according to Table 13.1.1.3.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. There are one NB-IoT carrier and two cells specified in the test. Ncell1 is standalone cell to Cell1 and Ncell2 is standalone cell to Cell2. Ncell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test.

5. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

6. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

7. Deactivate UE prediction of satellite trajectory through any preconfigured means

UE shall be provided with the valid information about the SAN serving cells before the test

Table 13.1.1.3.4-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | GEO, HD-FDD duplex mode |

Table 13.1.1.3.4-2: General test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | Comment |
| **Test 1** | **Test 2** |
| NB-IOT operational mode | |  | Standalone | |  |
| Satellite information | Config 1 |  | GEO | |  |
| Initial condition | Active cell |  | nCell1 | |  |
| Neighbour cells |  | nCell2 | |  |
| T2 end condition | Active cell |  | nCell2 | |  |
| Neighbour cells |  | nCell1 | |  |
| Final condition | Visited cell |  | nCell1 | |  |
| Access Barring Information | | - | Not Sent | | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | | Refer to A.3.18 |
| *s-IntraSearchP* | |  | 63 (126 dB) | | to trigger intra-frequency measurement in this test |
| DRX cycle length | | s | 0.32 | 0.64 | The value shall be used for all cells in the test. |
| T1 | | s | >7 | | During T1, nCell2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that nCell2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 35 | | T2 is defined so that cell re-selection time is taken into account. Once the UE has reselected to nCell2 (within T2) T3 starts |
| T3 | | s | 14 | | T3 is defined so that cell re-selection time is taken into account. |

13.1.1.3.4.2 Test procedure

The test scenario comprises of one NB-IoT carrier with 2 Ncells of different physical cell ID. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Only Ncell1 is already identified by the UE prior to the start of the test, i.e. Ncell 2 is not identified. Ncell 1 and Ncell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Ncell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on NPRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure according to 3GPP TS 36.508 [7] clause 8.1.5A.5"

1. Ensure the UE is in State 3A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5 in Ncell 1.

2. Set the parameters according to T1 in Table 13.1.1.3.5-1 and 13.1.1.3.5-2. Propagation conditions are set according to Annex B clause B.1.1. T1 starts.

3. Set Ncell2 physical cell identity = ((current Ncell 2 physical cell identity + 1) mod 14 + 2) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.2.18.5-1 and 4.2.18.5-2.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Ncell 2.

6. If the UE responds on the newly detectable cell, Ncell 2, during time duration T2 within 35 seconds from the beginning of time period T2, then count a success for the event "Re-select newly detected Ncell 2". Otherwise count a fail for the event "Re-select newly detected Ncell 2".

7. If the UE has re-selected Ncell 2 within T2, after the re-selection or when T2 expires, continue with step 8.  
Otherwise, if T2 expires and the UE has not yet re-selected Ncell 2, skip to step 12.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 13.1.1.3.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Ncell 1.

10. If the UE responds on the already detected cell, Ncell 1, during time duration T3 within 14 seconds from the beginning of time period T3, then count a success for the event "Re-select already detected Ncell 1". Otherwise count a fail for the event "Re-select already detected Ncell 1".

11. If the UE has re-selected Ncell 1 within T3, after the re-selection or when T3 expires, skip to step 13.  
Otherwise, if T3 expires and the UE has not yet re-selected Ncell 1, continue with step 12.

12. Switch off and on the UE and ensure the UE is in State 3A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5 in Ncell 1.

13. Repeat step 2-12 until a test verdict has been achieved.  
Each of the events "Re-select newly detected Ncell 2" and "Re-select already detected Ncell 1" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.  
If both events pass, the test passes. If one event fails, the test fails.

13.1.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.4.3, 8.1.5B and 8.1.6 using condition “standalone” with the following exceptions:

Table 13.1.1.3.4.3-1: SystemInformationBlockType2-NB:  
HD-FDD Intra frequency cell reselection for Category NB1 UE for Ncell 1 and Ncell2

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.4.3.3, Table 8.1.4.3.3-1: SystemInformationBlockType2-NB | | | |
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigCommonSIB-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| ue-SpecificDRX-CycleMin-r16 | rf32 |  | Test1 |
|  | rf64 |  | Test2 |
| } |  |  |  |

Table 13.1.1.3.4.3-2: ATTACH ACCEPT: HD-FDD Intra frequency cell reselection for Category NB1 UE for step 1

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 clause 4.7.2 Table 4.7.2-1 ATTACH ACCEPT | | | |
| Information Element | Value/remark | Comment | Condition |
| Negotiated DRX parameter in NB-S1 mode |  |  |  |
| NB-S1 mode DRX value | DRX cycle parameter T = 32 |  | Test1 |
|  | DRX cycle parameter T = 64 |  | Test2 |

Table 13.1.1.3.4.3-3: TRACKING AREA UPDATE ACCEPT: HD-FDD Intra frequency cell reselection for Category NB1 UE for for step 6 and step 10

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 clause 4.7.2 Table 4.7.2-24 TRACKING AREA UPDATE ACCEPT | | | |
| Information Element | Value/remark | Comment | Condition |
| Negotiated DRX parameter in NB-S1 mode |  |  |  |
| NB-S1 mode DRX value | DRX cycle parameter T = 32 |  | Test1 |
|  | DRX cycle parameter T = 64 |  | Test2 |

Table 13.1.1.3.4.3-4: ATTACH REQUEST : HD-FDD Intra frequency cell reselection for Category NB1 UE for for step 1

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508, Table 4.7.2-4 | | | |
| Information Element | Value/remark | Comment | Condition |
| DRX parameter in NB-S1 mode | '0000'B | DRX value not specified and use cell specific DRX value |  |

Table 13.1.1.3.4.3-5: TRACKING AREA UPDATE REQUEST : HD-FDD Intra frequency cell reselection for Category NB1 UE for for step 6 and step 10

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation path: 36.508 table 4.7.2-27 | | | |
| Information Element | Value/Remark | Comment | Condition |
| DRX parameter in NB-S1 mode | DRX cycle parameter T = 32 |  | Test1 |
|  | DRX cycle parameter T = 64 |  | Test2 |

Table 13.1.1.3.4.3-6: *SystemInformationBlockType3-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.4.3.3, Table 8.1.4.3.3-8: SystemInformationBlockType3-NB | | | |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType3-NB-r13 ::= SEQUENCE { |  |  |  |
| intraFreqCellReselectionInfo-r13 SEQUENCE { |  |  |  |
| q-RxLevMin-r13 | -70 (-140 dBm) |  |  |
| q-QualMin-r13 | Not present |  |  |
| p-Max-r13 | Not present |  |  |
| s-IntraSearchP-r13 | 63 (126dB) | nCell1, nCell2 |  |
| t-Reselection-r13 | 0 |  |  |
| } |  |  |  |

##### 13.1.1.3.5 Test requirement

Tables 13.1.1.3.5-1 defines the primary level settings including test tolerances for HD-FDD intra frequency cell re-selection with UE specific DRX test case.

Table 13.1.1.3.5-1: nCell 1, nCell 2 specific test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | **nCell 2** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| BWchannel | kHz | 180 | | | 180 | | |
| OCNG Pattern as defined in A.3 | - | NOP.3 FDD | | | NOP.3 FDD | | |
| NPBCH\_RA | dB | 0 | | | 0 | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | NRSRP | | | NRSRP | | |
|  | dBm/15 kHz | -98 | | | | | |
|  | dB | 17 | 13 | 17.45 | -infinity | 17.45 | 13 |
| Note2 | dB | 17 | -4.53 | 4.24 | -infinity | 4.24 | -4.53 |
| NRSRP Note2 | dBm/15 kHz | -81 | -85 | -80.55 | -infinity | -80.55 | -85 |
| Treselection | s | 0 | 0 | 0 | 0 | 0 | 0 |
| Propagation Condition |  | AWGN | | | AWGN | | |
| Antenna Configuration |  | 1x1 | | | 1x1 | | |
| Timing offset to nCell 1 | ms | - | | | 3 | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Ncell 2 and starts to send preambles on the NPRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Ncell 2.

The cell re-selection delay to a newly detectable cell shall be less than 34.32 s in test1 and test2.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Ncell 1 and starts to send preambles on the NPRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Ncell 1.

The cell re-selection delay to an already detected cell shall be less than 13.44s in test1 and test2.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

The cell re-selection delay to a newly detectable cell can be expressed as: Tdetect,NB\_Intra\_NB-IoT-NC + TSI-NB, and to an already detected cell can be expressed as: Tevaluate, NB\_intra\_NB-IoT-NC + TSI-NB,

Where:

Tdetect,NB\_Intra\_NB-IoT-NC as specified in 3GPP TS 36.133 [4] Table 4.6A.2.2-1 in clause 4.6A.2.2.

Tevaluate, NB\_intra\_NB-IoT-NC as specified in 3GPP TS 36.133 [4] Table 4.6A.2.2-1 in clause 4.6A.2.2.

TSI-NB Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 8.32 s is assumed in this test case.

This gives a total of 34.32 s, allow 35 s for the cell re-selection delay to a newly detectable cell and 13.44 s, and allow 14 s for the cell re-selection delay to an already detected cell in the test case.

For the test to pass, both events above shall pass.

The statistical pass/ fail decisions are done separately for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

## 13.3 RRC connection mobility control for satellite access

### 13.3.1

#### 13.3.1.1 HD-FDD Intra-frequency RRC Re-establishment for UE category NB1 in Standalone mode under normal coverage

##### 13.3.1.1.1 Test purpose

The purpose is to verify that the NB-IoT FDD intra-frequency RRC re-establishment delay is within the specified limits. These tests will verify the requirements for Cat-NB1 UE in TS36.133 [4] clause 6.5A.

##### 13.3.1.1.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

##### 13.3.1.1.3 Minimum conformance requirements

In RRC connected mode the UE shall be capable of sending *RRCConnectionReestablishmentRequest* message within Tre-establish\_delay\_NB-IoT seconds from the moment it detects a loss in RRC connection. The total RRC connection delay (Tre-establish\_delay\_NB-IoT) shall be less than:

Tre-establish\_delay\_NB-IoT = TUL\_grant + TUE\_re-establish\_delay\_NB-IoT

- TUL\_grant: It is the time required to acquire and process uplink grant from the target cell. The uplink grant is required to transmit *RRCConnectionReestablishmentRequest* message.

- The UE re-establishment delay (TUE\_re-establish\_delay\_NB-IoT) is specified in TS36.133 [4] clause 6.5A.2.1 for a UE in normal coverage.

These requirements are not applicable for UEs that only support the Control Plane CIoT EPS optimisation (see TS 24.301). Connection control in NB-IoT is defined in Clause 5.3.1.4 in TS 36.331 [5].

The UE re-establishment delay (TUE\_re-establish\_delay\_NB-IoT) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 36.331 [5] is detected by the UE to the time when the UE sends PRACH preamble to the target cell. The UE re-establishment delay (TUE\_re-establish\_delay\_NB-IoT) requirement shall be less than:

TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB1-NC + TSI\_NB1-NC + TPRACH\_NB-IoT

Tsearch\_NB1-NC: It is the time required by the UE to search the target cell:

If the target cell is known, then Tsearch\_NB1-NC = 0 ms. If the target cell is unknown and signal quality is sufficient for successful cell detection on the first attempt, then Tsearch\_NB1-NC = 80 ms. Otherwise, Tsearch\_NB1-NC = 1400 ms.

- TSI\_NB1-NC: It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 36.331 [5] for the target cell for a UE in normal coverage.

- TPRACH\_NB-IoT: The additional delay caused by the random access procedure. The actual value of TPRACH\_NB-IoT shall depend upon the NPRACH configuration used in the target cell and the number of repetition used by UE for sending random access to the target cell. There might be additional delay due to ramping procedure.

- NNB-Iot-freq: It is the total number of NB-IoT frequencies to be monitored for RRC re-establishment; NNB-Iot-freq = 1 if the target cell is known.

There is no requirement if the target cell does not contain the UE context.

##### 13.3.1.1.4 Test description

There are two cells in this test case,.nCell1 and nCell2 are NB-IoT cells with different physical cell ID on the same frequency carrier. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

The UE shall be provided with the valid information about the SAN serving cells before the test.

##### 13.3.1.1.4.1 Initial conditions

The test parameters are given in table 13.3.1.1.4.1-1.

Table 13.3.1.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GEO, HD-FDD duplex mode |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and TS 36.508 [7] clauses 8.1.4.2 and 8.1.3.1.

Channel Bandwidth to be tested: 200kHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connect the SS and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A, Figure A.45 using only main UE Tx/Rx antenna.

2. The general test parameter settings are set up according to Table 13.3.1.1.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.3.1.1.4.3.

5. There are two cells specified in this test. nCell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test. nCell 1 and nCell 2 are NB-IoT cells with different physical cell ID on the same frequency carrier.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

8. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.3.1.1.4.1-2: General test parameters for HD-FDD Intra-frequency RRC Re-establishment for UE category NB1 in Standalone mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IOT operational mode | |  | Standalone |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.10.3 |
| NPDCCH repetition level | |  | 16 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | Ms | 0 | Radio link failure timer; T310 is disabled |
| T311 | | Ms | 15000 | RRC re-establishment timer |
| DRX | |  | OFF |  |
| T1 | | S | 5 |  |
| T2 | | Ms | 400 |  |
| T3 | | S | 15 |  |

##### 13.3.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, nCell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

1. Ensure the UE is in State 2A-NB with UP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. nCell 1 is the active cell.
2. Set the parameters according to T1 in Table 13.3.1.5-1. Propagation conditions are set according to Annex B clause B.1.1. T1 starts.
3. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 13.3.1.1.5-1. T2 starts.
4. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 13.3.1.1.5-1. T3 starts.
5. If the UE starts to send NPRACH preambles to nCell 2 for sending the *RRCConnectionReestablishmentRequest-NB* message to nCell 2 within 10.6s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
6. Once the UE sends a prach in step 5, switch off the UE. Then ensure the UE is in State 2A-NB with UP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. nCell 1 is the active cell.
7. Repeat step 2-6 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

##### 13.3.1.1.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN”.

##### 13.3.1.1.5 Test requirement

Table 13.3.1.1.5-1: nCell 1, nCell 2 specific test parameters for HD-FDD Intra-frequency RRC Re-establishment for UE category NB1 in Standalone mode under normal coverage

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | **nCell 2** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| BWchannel | kHz | 200 | | | 200 | | |
| NPDSCH parameters |  | R.18 HD-FDD | | | R.18 HD-FDD | | |
| NPDCCH parameters |  | R.30 HD-FDD | | | R.30 HD-FDD | | |
| NOCNG Patterns |  | NOP.3 FDD | | | NOP.3 FDD | | |
| NPBCH\_RA | dB | 0 | | | 0 | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | -98 | | | | | |
|  | dB | 7+TT | -Infinity | -Infinity | -Infinity | 4+TT | 4+TT |
| Note2 | dB | 7+TT | -Infinity | -Infinity | -Infinity | 4+TT | 4+TT |
| NRSRP Note2 | dBm/15 kHz | -91+TT | -Infinity | -Infinity | -Infinity | -94+TT | -94+TT |
| Propagation Condition |  | AWGN | | | AWGN | | |
| Antenna Configuration |  | 1x1 | | | 1x1 | | |
| Timing offset to nCell 1 | ms | - | | | 3 | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NB-IoT FDD intra frequency cell shall be less than 10.6s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 1400 ms

- TSI\_NB-IoT = 8320 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT FDD cell.

- TPRACH\_NB-IoT = 80 ms; it is the additional delay caused by the random access procedure.

#### 13.3.1.2 HD-FDD Intra-frequency RRC Re-establishment for UE category NB1 in Standalone mode under enhanced coverage

##### 13.3.1.2.1 Test purpose

The purpose is to verify that the NB-IoT FDD intra-frequency RRC re-establishment delay is within the specified limits. These tests will verify the requirements for Cat-NB1 UE in TS36.133 [4] clause 6.5A.

##### 13.3.1.2.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

Applicability requires support for the User Plane CIoT EPS Optimization for RRCConnectionReestablishment.

##### 13.3.1.2.3 Minimum conformance requirements

In RRC connected mode the UE shall be capable of sending *RRCConnectionReestablishmentRequest* message within Tre-establish\_delay\_NB-IoT seconds from the moment it detects a loss in RRC connection. The total RRC connection delay (Tre-establish\_delay\_NB-IoT) shall be less than:

Tre-establish\_delay\_NB-IoT = TUL\_grant + TUE\_re-establish\_delay\_NB-IoT

- TUL\_grant: It is the time required to acquire and process uplink grant from the target cell. The uplink grant is required to transmit *RRCConnectionReestablishmentRequest* message.

- The UE re-establishment delay (TUE\_re-establish\_delay\_NB-IoT) is specified in TS36.133 [4] clause 6.5A.2.2 for a UE in enhanced coverage.

These requirements are not applicable for UEs that only support the Control Plane CIoT EPS optimisation (see TS 24.301). Connection control in NB-IoT is defined in Clause 5.3.1.4 in TS 36.331 [5].

The UE re-establishment delay (TUE\_re-establish\_delay\_NB-IoT) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 36.331 [5] is detected by the UE to the time when the UE sends PRACH preamble to the target cell. The UE re-establishment delay (TUE\_re-establish\_delay\_NB-IoT) requirement shall be less than:

TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB1-EC + TSI\_NB1-EC + TPRACH\_NB-IoT

- Tsearch\_NB1-EC: It is the time required by the UE to search the target cell:

- If the target cell is known, then Tsearch\_NB1-EC = 0 ms. If the target cell is unknown and signal quality is sufficient for successful cell detection on the first attempt, then Tsearch\_NB1-EC = [Ksatellite \*80] ms. Otherwise, Tsearch\_NB1-EC = [Ksatellite \*14800] ms. Where Ksatellite = 1, if GSO satellite(s) is/are measured on the carrier.

- TSI\_NB1-EC: It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 36.331 [2] for the target cell for a UE in enhanced coverage.

- TPRACH\_NB-IoT: The additional delay caused by the random access procedure. The actual value of TPRACH\_NB-IoT shall depend upon the NPRACH configuration used in the target cell and the number of repetition used by UE for sending random access to the target cell. There might be additional delay due to ramping procedure.

- NNB-Iot-freq: It is the total number of NB-IoT frequencies to be monitored for RRC re-establishment; NNB-Iot-freq = 1 if the target cell is known.

There is no requirement if the target cell does not contain the UE context.

Editor’s note: FFS to accommodate for the time needed between the UE acquires the NTN SIB of the target cell and the epoch time conveyed in this SIB is reached.



##### 13.3.1.2.4 Test description

There are two cells in this test case,.nCell1 and nCell2 are NB-IoT cells with different physical cell ID on the same frequency carrier. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

The UE shall be provided with the valid information about the SAN serving cells before the test.

13.3.1.2.4.1 Initial conditions

The test parameters are given in table 13.3.1.2.4.1-1.

Table 13.3.1.2.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GEO, HD-FDD duplex mode |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and TS 36.508 [7] clauses 8.1.4.2 and 8.1.3.1.

Channel Bandwidth to be tested: 200kHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connect the SS and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A, Figure A.45 using only main UE Tx/Rx antenna.

2. The general test parameter settings are set up according to Table 13.3.1.2.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.3.1.2.4.3.

5. There are two cells specified in this test. nCell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test. nCell 1 and nCell 2 are NB-IoT cells with different physical cell ID on the same frequency carrier.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

8. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.3.1.2.4-2: General test parameters for HD-FDD Intra-frequency RRC Re-establishment for UE category NB1 in Standalone mode under enhanced coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IOT operational mode | |  | Standalone |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.10.3 |
| NPDCCH repetition level | |  | 16 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | Ms | 0 | Radio link failure timer; T310 is disabled |
| T311 | | Ms | 60000 | RRC re-establishment timer |
| DRX | |  | OFF |  |
| T1 | | S | 5 |  |
| T2 | | Ms | 400 |  |
| T3 | | S | 60 |  |

13.3.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, nCell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

1. Ensure the UE is in State 2A-NB with UP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. nCell 1 is the active cell.
2. Set the parameters according to T1 in Table 13.3.1.2.5-1. Propagation conditions are set according to Annex B clause B.1.1. T1 starts.
3. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 13.3.1.2.5-1. T2 starts.
4. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 13.3.1.2.5-1. T3 starts.
5. If the UE starts to send NPRACH preambles to nCell 2 for sending the *RRCConnectionReestablishmentRequest-NB* message to nCell 2 within 58s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
6. Once the UE sends a prach in step 5, switch off the UE. Then ensure the UE is in State 2A-NB with UP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. nCell 1 is the active cell.
7. Repeat step 2-6 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

##### 13.3.1.2.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 6.1.15.4.3-1: *SystemInformationBlockType1-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.4.3.2-3 | | | |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType1-NB ::= SEQUENCE { |  |  |  |
| cellSelectionInfo-r13 SEQUENCE { |  |  |  |
| q-QualMin-r13 | -25 (-25dB) |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.3.1.2.5 Test requirement

Table 13.3.1.2.5-1: nCell 1, nCell 2 specific test parameters for HD-FDD Intra-frequency RRC Re-establishment for UE category NB1 in Standalone mode under enhanced coverage

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | **nCell 2** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| BWchannel | kHz | 200 | | | 200 | | |
| NPDSCH parameters |  | R.18 HD-FDD | | | R.18 HD-FDD | | |
| NPDCCH parameters |  | R.30 HD-FDD | | | R.30 HD-FDD | | |
| NOCNG Patterns |  | NOP.3 FDD | | | NOP.3 FDD | | |
| NPBCH\_RA | dB | 0 | | | 0 | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | -98 | | | | | |
|  | dB | 7+TT | -Infinity | -Infinity | -Infinity | -12.6+TT | -12.6+TT |
| Note2 | dB | 7+TT | -Infinity | -Infinity | -Infinity | -12.6+TT | -12.6+TT |
| NRSRP Note2 | dBm/15 kHz | -91+TT | -Infinity | -Infinity | -Infinity | -110.6+TT | -110.6+TT |
| Propagation Condition |  | AWGN | | | AWGN | | |
| Antenna Configuration |  | 1x1 | | | 1x1 | | |
| Timing offset to nCell 1 | ms | - | | | 3 | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NB-IoT FDD intra frequency cell shall be less than 58 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 14800 ms

- TSI\_NB-IoT = 41560 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT FDD cell.

- TPRACH\_NB-IoT = 1280 ms; it is the additional delay caused by the random access procedure.

### 13.3.2 Random Access for Satellite Access

This clause provides the list of Random Access test cases for category NB1 UEs when connecting to a NTN cell using satellite access. The list of supported test configurations is provided in Table 13.3.2-1.

**Table 13.3.2-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

#### 13.3.2.1 Contention Based Random Access Test for UE category NB1 UEs in Satellite Access - Standalone mode in normal coverage

##### 13.3.2.1.1 Test purpose

The purpose of this test is to verify whether the behavior of the random access procedure of a category NB1 UE in Normal Coverage is according to the requirements when connected to a NTN NB-IoT cell, whether the NPRACH power settings and timing are within specified limits, and whether the UE determines properly the enhanced coverage level based on the NRSRP measurement and the configured criterion in NRSRP-ThresholdsPrach[5]. This test will verify the requirements in 3GPP TS 36.133[4] Clause 6.6A.2, Clause 6.6A.3 and Clause 7.20A.2 in an AWGN model.

For this test a single NB-IoT cell is used. The test parameters are given in tables 13.3.2.1.5-1, 13.3.2.1.5-2 and 13.3.2.1.5-3. The UE shall perform timing pre-compensation before the initial NPRACH transmission using AT command-based test approach.

##### 13.3.2.1.2 Test applicability

This test case applies to all types of NB-IoT HD-FDD category NB1 UEs supporting GSO or NGSO or both from release 17 and forwards.

##### 13.3.2.1.3 Minimum conformance requirements

Contention based random access is triggered by not explicitly assigning a random access preamble via dedicated signalling in the downlink.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window. The RA response window shall be started at the point in time indicated by clause 5.1.4 in TS 36.321[11].

The UE shall re-transmit the msg3 upon the reception of a NACK on msg3 until the maximum number of re-transmissions defined by *maxNumPreambleAttemptCE* in the table 13.3.2.1.5-3 is reached.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

The UE shall send ACK if the Contention Resolution is successful.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

The UE shall select NPRACH resources and transmits or re- transmits NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 0. The rate of correct coverage enhancement level selection during repeated tests shall be at least 90%.

Note: Correct coverage enhancement level selection is a prerequisite for testing the other NPRACH requirements.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause A.13.3.2.1.

##### 13.3.2.1.4 Test description

13.3.2.1.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: Ncell bandwidth is as specified in Table 13.3.2.1.5-1.

1. Connect the SS and AWGN noise source to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A Figure A.18 using only UE main Tx/Rx antenna.

2. Propagation conditions are set according to Annex B clause B.0.

3. There is one NB-IoT cell specified in the test. Ncell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test.

4. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

5. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

6. Deactivate UE prediction of satellite trajectory through any preconfigured means.

13.3.2.1.4.2 Test procedure

The test scenario comprises of one NB-IoT carrier with 1 Ncell.

1. Ensure the UE is in State 3A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 in Ncell 1.

2. Set the parameters according to Tables 13.3.2.1.5-1 to 13.3.2.1.5-3 selecting values appropriate to the test condition of normal or extreme. Propagation conditions are set according to Annex B clause B.1.1.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when receiving random access response reception

4.1. In Test 1, the UE shall send the preamble to the SS. In response to the first 2 preamble transmission attempts (the preamble is transmitted 2 times in each attempt), the SS shall transmit a random access response not corresponding to the transmitted random access preamble.

4.2. The UE shall consider the random access response reception not successful then re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if all received random access response contain random access preamble identifiers that do not match the transmitted random access preamble.

4.3. The SS shall transmit a random access response containing a random access preamble identifier corresponding to the transmitted random access after 3 preamble transmission attempts have been received by the SS.

4.4. The UE shall consider this random access response reception successful and transmit the msg3.

4.5. Measure the power and timing of the first preamble transmission attempt. The power of the first preamble transmission attempt shall be -25 dBm with the accuracy specified in clause 6.3B.4 of TS 36.102. Measure the relative power and timing applied to additional preamble transmission attempts. The relative power of the last 2 preamble transmission attempts shall not exceed the values specified in clause 6.3B.4 of TS 36.102. The transmit timing of all NPRACH transmissions shall be within the accuracy specified in TS36.133 clause 7.20A.2. If the UE transmits or re- transmits NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 0, then for each preamble count a success for the event "CE selection". Otherwise count a fail for the event "CE selection". The power, relative power and timing are only measured if the coverage enhancement level selection was correct, and any results relating to a wrong selection are discarded.

5. Test 2: Correct behaviour when not receiving random access response reception

5.1. Repeat step 1-3.

5.2. In Test 2, the UE shall send the preamble to the SS. The SS shall not respond to the first 2 preamble transmission attempts (the preamble is transmitted 2 times in each attempt).

5.3. The UE shall consider the random access response reception not successful then re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if no random access response is received within the RA Response window. The RA response window shall be started at the point in time indicated by clause 5.1.4 in TS 36.321.

5.4. The SS shall transmit a random access response containing a random access preamble identifier corresponding to the transmitted random access after 3 preamble transmission attemps have been received by the SS.

5.5. The UE shall consider this random access response reception successful and transmit the msg3.

5.6. Measure the power and timing of the first preamble transmission attempt. The power of the first preamble transmission attempt shall be -25 dBm with the accuracy specified in clause 6.3B.4 of TS 36.102. Measure the relative power and timing applied to additional preamble transmission attempts. The relative power of the last 2 preamble transmission attempts shall not exceed the values specified in clause 6.3B.4 of TS 36.102. The transmit timing of all NPRACH transmissions shall be within the accuracy specified in TS36.133 clause 7.20A.2. If the UE transmits or re- transmits NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 0, then for each preamble count a success for the event "CE selection". Otherwise count a fail for the event "CE selection". The power, relative power and timing are only measured if the coverage enhancement level selection was correct, and any results relating to a wrong selection are discarded.

6. Test 3: Not applicable.

7. Test 4: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

7.1. Repeat step 1-3.

7.2. In Test 4, the UE shall send the preamble to the SS. If the UE transmits an NPRACH preamble using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 0, then count a success for the event "CE selection". Otherwise count a fail for the event "CE selection". The SS shall transmit a random access response containing a random access preamble identifier corresponding to the transmitted random access after the first preamble has been received by the SS.

7.3. The UE shall consider this random access response reception successful and transmit the msg3.

7.4. The SS shall send a message addressed to the Temporary C-RNTI with a UE contention resolution identity included in the MAC control element not matching the CCCH SDU transmitted in msg3 uplink message.

7.5. The UE shall consider the contention resolution not successful then re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires. If the UE transmits NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 0, then for each preamble count a success for the event "CE selection". Otherwise count a fail for the event "CE selection". The power is only measured if the coverage enhancement level selection was correct, and any results relating to a wrong selection are discarded.

8. Test 5: Correct behaviour when receiving a correct message over Temporary C-RNTI

8.1. In Test 5, the SS shall transmit a random access response containing a random access preamble identifier corresponding to the transmitted random access after the first preamble has been received by the SS. If the UE transmits an NPRACH preamble using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 0, then count a success for the event "CE selection". Otherwise count a fail for the event "CE selection".

8.2. The UE shall consider this random access response reception successful and transmit the msg3.

8.3. The SS shall send a message addressed to the Temporary C-RNTI with a UE contention resolution identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

8.4. The UE shall send ACK and consider the contention resolution successful and the random access procedure successfully completed.

9. Test 6: Correct behaviour when contention resolution timer expires

9.1. Repeat step 1-3.

9.2. In Test 6, the UE shall send the preamble to the SS. The SS shall transmit a random access response containing a random access preamble identifier corresponding to the transmitted random access after the first preamble has been received by the SS. If the UE transmits an NPRACH preamble using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 0, then count a success for the event "CE selection". Otherwise count a fail for the event "CE selection".

9.3. The UE shall consider this random access response reception successful and transmit the msg3.

9.4. The SS shall send an ACK for msg3 but not send msg4 allowing the contention resolution timer to expire.

9.5. The UE shall consider the contention resolution not successful then re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires. If the UE transmits an NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 0, then for each preamble count a success for the event "CE selection". Otherwise count a fail for the event "CE selection". The power is only measured if the coverage enhancement level selection was correct, and any results relating to a wrong selection are discarded.

9.6. The SS shall transmit a random access response containing a random access preamble identifier corresponding to the transmitted random access after the first preamble has been received by the SS.

9.7. The UE shall consider this random access response reception successful and transmit the msg3.

10. Void.

13.3.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.5B and 8.1.6 with following exceptions.

Table 13.3.2.1.4.3-1: RadioResourceConfigCommonSIB-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 clause 8.1.6.3-9 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigCommonSIB-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| nprach-Config-v1330 ::= SEQUENCE { |  |  |  |
| nprach-ParametersList-v1330 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-Parameters-NB-v1330 | 3 entries |  |  |
| NPRACH-Parameters-NB-v1330[1] ::= SEQUENCE { |  |  |  |
| nprach-NumCBRA-StartSubcarriers-r13 | n8 |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-v1330[2] ::= SEQUENCE { |  |  |  |
| nprach-NumCBRA-StartSubcarriers-r13 | n8 |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-v1330[3] ::= SEQUENCE { |  |  |  |
| nprach-NumCBRA-StartSubcarriers-r13 | n8 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.3.2.1.4.3-2: RACH-ConfigCommon-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.6.3-8 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| preambleTransMax-CE-r13 | n3 |  |  |
| powerRampingParameters-r13 SEQUENCE { |  |  |  |
| powerRampingStep | dB2 |  |  |
| preambleInitialReceivedTargetPower | dBm-112 |  |  |
| } |  |  |  |
| rach-InfoList-r13 (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF RACH-Info-NB-r13 { | 3 entries |  |  |
| RACH-Info-NB-r13[1] SEQUENCE { |  |  |  |
| ra-ResponseWindowSize-r13 | pp2 |  |  |
| mac-ContentionResolutionTimer-r13 | pp8 |  |  |
| } |  |  |  |
| RACH-Info-NB-r13[2] SEQUENCE { |  |  |  |
| ra-ResponseWindowSize-r13 | pp2 |  |  |
| mac-ContentionResolutionTimer-r13 | pp8 |  |  |
| } |  |  |  |
| RACH-Info-NB-r13[3] SEQUENCE { |  |  |  |
| ra-ResponseWindowSize-r13 | pp2 |  |  |
| mac-ContentionResolutionTimer-r13 | pp8 |  |  |
| } |  |  |  |
| } |  |  |  |
| powerRampingParameters-v1450 | Not present |  |  |
| } |  |  |  |

Table 13.3.2.1.4.3-3: NPRACH-ConfigSIB-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.6.3-5 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPRACH-ConfigSIB-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| nprach-CP-Length-r13 | us66dot7 |  |  |
| rsrp-ThresholdsPrachInfoList-r13 ::= SEQUENCE (SIZE(1)) OF RSRP-Range { | 2 entries |  |  |
| RSRP-Range[1] | 25 | -116dBm | Normal |
| RSRP-Range[2] | 40 | -101dBm |
| } |  |  |  |
| RSRP-Range[1] | 25 | -116dBm | Extreme |
| RSRP-Range[2] | 36 | -105dBm |
| nprach-ParametersList-r13 SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-Parameters-NB-r13 { | 3 entries |  |  |
| NPRACH-Parameters-NB-r13[1] ::= SEQUENCE { |  |  |  |
| nprach-Periodicity-r13 | ms40 |  |  |
| nprach-StartTime-r13 | ms8 |  |  |
| nprach-SubcarrierOffset-r13 | n0 |  |  |
| nprach-NumSubcarriers-r13 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r13 | zero |  |  |
| maxNumPreambleAttemptCE-r13 | n3 |  |  |
| numRepetitionsPerPreambleAttempt-r13 | n2 |  |  |
| npdcch-NumRepetitions-RA-r13 | r4 |  |  |
| npdcch-StartSF-CSS-RA-r13 | v1dot5 |  |  |
| npdcch-Offset-RA-r13 | zero |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-r13[2] ::= SEQUENCE { |  |  |  |
| nprach-Periodicity-r13 | ms240 |  |  |
| nprach-StartTime-r13 | ms64 |  |  |
| nprach-SubcarrierOffset-r13 | n0 |  |  |
| nprach-NumSubcarriers-r13 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r13 | zero |  |  |
| maxNumPreambleAttemptCE-r13 | n6 |  |  |
| numRepetitionsPerPreambleAttempt-r13 | n8 |  |  |
| npdcch-NumRepetitions-RA-r13 | r16 |  |  |
| npdcch-StartSF-CSS-RA-r13 | v1dot5 |  |  |
| npdcch-Offset-RA-r13 | zero |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-r13[3] ::= SEQUENCE { |  |  |  |
| nprach-Periodicity-r13 | ms1280 |  |  |
| nprach-StartTime-r13 | ms512 |  |  |
| nprach-SubcarrierOffset-r13 | n0 |  |  |
| nprach-NumSubcarriers-r13 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r13 | zero |  |  |
| maxNumPreambleAttemptCE-r13 | n10 |  |  |
| numRepetitionsPerPreambleAttempt-r13 | n64 |  |  |
| npdcch-NumRepetitions-RA-r13 | r128 |  |  |
| npdcch-StartSF-CSS-RA-r13 | v1dot5 |  |  |
| npdcch-Offset-RA-r13 | zero |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.3.2.1.4.3-4: NPDSCH-ConfigCommon-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.6.3-4 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPDSCH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| nrs-Power-r13 | -5 (dBm) |  |  |
| } |  |  |  |

13.3.2.1.5 Test requirement

The test parameters are given in tables 13.3.2.1.5-1, 13.3.2.1.5-2 and 13.3.2.1.5-3. The UE shall perform timing pre-compensation before the initial NPRACH transmission using [a configuration as described in Table 13.3.2.1.5-2]. Tables 13.3.2.1.5-4 and 13.3.2.1.5-5 define the absolute and relative power control requirements including test tolerances. Table 13.3.2.1.5-6 defines the uplink timing error limit including test tolerances.

Table 13.3.2.1.5-1: nCell specific test parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Normal Coverage

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comments** |
| NB-IOT operational mode |  | Standalone |  |
| BWchannel | kHz | 200 |  |
| NPDSCH parameters Note 2 |  | R.18 HD-FDD | As defined in TS36.133 A.3.1.5.3 |
| NPDCCH parameters Note 2 |  | R.30 HD-FDD | As defined in TS36.133 A.3.1.6.3 |
| NPBCH\_RA | dB | -3 |  |
| NPBCH\_RB | dB | -3 |  |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RA Note 1 | dB |
| NOCNG\_RB Note 1 | dB |
| DRX |  | OFF |
|  | dBm/15 kHz | -98 |  |
|  | dB | 3.1 |  |
| Note 3 | dB | 3.1 |  |
| NRSRP Note 3 | dBm/15 kHz | -94.9 |  |
| Io Note 3 | dBm/180 KHz | -82.38 |  |
| Propagation Condition | - | AWGN |  |
| Antenna Configuration |  | 1x1 |  |
| Note 1: NOCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: The NPDSCH and NPDCCH reference measurement channels are used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: Es/Iot, NRSRP and Io level has been derived from other parameters for information purpose. They are not settable parameters themselves. | | | |

Table 13.3.2.1.5-2: NTN specific test parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Normal Coverage

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Comment** |
| Configuration 1 | SCC1 | GSO Test Configuration |
| Configuration 2 | SCC2 | NGSO Test Configuration |

Table 13.3.2.1.5-3: NPRACH-Configuration parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Normal Coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Field** | **Value** | | | **Comment** |
| **Parameters not per NPRACH resource** | | | | |
| RSRP-ThresholdsNPRACH-InfoList | {40, 55} | | | Corresponding to {-116, -101} dBm as defined in TS36.133 Section 9.1.22.9 |
| {40, 51} | | | Extreme condition: Corresponding to {-116, -105} dBm as defined in 3GPP TS 36.331 Section 9.1.22.9 |
| nprach-CP-Length | us66dot7 | | |  |
| nrs-Power | -5 dBm/15 kHz | | | As defined in clause 6.7.3 in TS 36.331. |
| Backoff Parameter Index | 1 | | | As defined in table 7.2-2 in TS 36.321 |
| Configured UE transmitted power () | 23 dBm for power class 3,  20 dBm for power class 5 | | | As defined in clause 6.2B.4 in TS 36.102 |
| powerRampingStep | dB2 | | |  |
| preambleInitialReceivedTargetPower | dBm-112 | | |  |
| preambleTransMax-CE | n6 | | |  |
| **Parameters per NPRACH Resource** | | | | |
| ***NPRACH Resource*** | ***Level 0*** | ***Level 1*** | ***Level 2*** |  |
| nprach-Periodicity | ms40 | ms240 | ms1280 |  |
| nprach-StartTime | ms8 | ms64 | ms512 |  |
| nprach-SubcarrierOffset | n0 | n0 | n0 |  |
| nprach-NumSubcarriers | n12 | n12 | n12 |  |
| nprach-SubcarrierMSG3-RangeStart | zero | zero | zero |  |
| maxNumPreambleAttemptCE | n3 | n6 | n10 |  |
| numRepetitionsPerPreambleAttempt | n2 | n8 | n64 |  |
| npdcch-NumRepetitions-RA | r4 | r16 | r128 |  |
| npdcch-StartSF-CSS-RA | v1dot5 | v1dot5 | v1dot5 |  |
| npdcch-Offset-RA | zero | zero | Zero |  |
| nprach-NumCBRA-StartSubcarriers | n8 | n8 | n8 |  |
| ra-ResponseWindowSize (per NPRACH Resource) | pp2 | pp2 | pp2 |  |
| mac-ContentionResolutionTimer (per NPRACH Resource) | pp8 | pp8 | pp8 |  |
| Note 1: See TS36.133 Clause 6.7.3 in TS 36.331 for further information on the parameters in this table. | | | | |

Test 1: Correct behaviour when receiving random access response reception

- The power of the first preambles shall be -25 dBm to within the accuracy specified in Table 13.3.2.1.5-4.

- The relative power for preamble ramping step shall be 2 dB to within the accuracy specified in Table 13.3.2.1.5-5.

- The transmit timing of all NPRACH transmissions shall be within the accuracy specified in Table 13.3.2.1.5-6.

Test 2: Correct behaviour when not receiving random access response reception-

- The power of the first preambles shall be -25 dBm to within the accuracy specified in Table 13.3.2.1.5-4.

- The relative power for preamble ramping step shall be 2 dB to within the accuracy specified in Table 13.3.2.1.5-5.

- The transmit timing of all NPRACH transmissions shall be within the accuracy specified in Table 13.3.2.1.5-6.

Test 3: Correct behaviour when receiving a NACK on msg3

- The UE shall re-transmit the msg3 upon the reception of a NACK on msg3 until the maximum number of HARQ retransmission is reached.

Test 4: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires unless the received message includes a UE contention resolution identity MAC control element and the UE contention resolution identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

Test 5: Correct behaviour when receiving a correct message over Temporary C-RNTI

- The UE shall send ACK if the contention resolution is successful.

Test 6: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the back off time expires if the contention resolution timer expires.

Correct behaviour when UE selects NPRACH resources

- The rate of correct coverage enhancement level 0 selection events "CE selection" observed during repeated tests shall be at least 90% with a confidence level of 95%.

Decide the test pass, if all the the power, relative power and timing measurements pass and the CE selection events pass, otherwise fail the UE.

Table 13.3.2.1.5-4: Absolute power tolerance for HD-FDD contention based random access test for UE category NB1

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ±10.4 dB |
| Extreme | ±13.4 dB |

Table 13.3.2.1.5-5: Relative power tolerance for HD-FDD contention based random access test for UE category NB1

|  |  |
| --- | --- |
| Power step P  [dB] | NPRACH [dB] |
| ΔP = 0 | 2.2 |
| ΔP = 2 | ±2.7 |
| ΔP = 4 | ±4.2 |
| ΔP = 6 | ±4.7 |
| NOTE: For extreme conditions an additional ± 2.0 dB relaxation is allowed. | |

Table 13.3.2.1.5-6: Test requirements for Te Timing Error Limit for HD-FDD contention based random access test for UE category NB1

|  |  |
| --- | --- |
| Downlink Bandwidth (MHz) | Te\_ |
| 0.18 | 100\*TS |
| NOTE: TS is the basic timing unit defined in 3GPP TS 36.211 | |

#### 13.3.2.2 Contention Based Random Access Test for UE category NB1 UEs in Satellite Access - Standalone mode in Enhanced Coverage

##### 13.3.2.2.1 Test purpose

The purpose of this test is to verify whether the behavior of the random access procedure of a category NB1 UE in Enhanced Coverage is according to the requirements when connected to a NTN NB-IoT cell, whether the NPRACH power settings and timing are within specified limits, and whether the UE determines properly the enhanced coverage level based on the NRSRP measurement and the configured criterion in NRSRP-ThresholdsPrach[5]. This test will verify the requirements in TS36.133 Clause 6.6A.2, Clause 6.6A.3 and Clause 7.20A.2 in an AWGN model.

For this test a single NB-IoT cell is used. The test parameters are given in tables 13.3.2.1.5-1, 13.3.2.1.5-2 and 13.3.2.1.5-3. The UE shall perform timing pre-compensation before the initial NPRACH transmission using AT command-based test approach.

##### 13.3.2.2.2 Test applicability

This test case applies to all types of NB-IoT HD-FDD category NB1 UEs supporting GSO or NGSO or both from release 17 and forwards.

##### 13.3.2.2.3 Minimum conformance requirements

Contention based random access is triggered by not explicitly assigning a random access preamble via dedicated signalling in the downlink.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window. The RA response window shall be started at the point in time indicated by clause 5.1.4 in TS 36.321[11].

The UE shall re-transmit the msg3 upon the reception of a NACK on msg3 until the maximum number of re-transmissions defined by *maxNumPreambleAttemptCE* in the table 13.3.2.2.5-3 is reached.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

The UE shall send ACK if the Contention Resolution is successful.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

The UE shall select NPRACH resources and transmits or re- transmits NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 1. The rate of correct coverage enhancement level selection during repeated tests shall be at least 90%.

Note: Correct coverage enhancement level selection is a prerequisite for testing the other NPRACH requirements.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause A.13.3.2.2.

##### 13.3.2.2.4 Test description

13.3.2.2.4.1 Initial conditions

Test Environment: Normal,TL/VL, TL/VH, TH/VL, TH/VH; as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: Ncell bandwidth is as specified in Table 13.3.2.2.5-1.

1. Connect the SS and AWGN noise source to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A Figure A.18 using only UE main Tx/Rx antenna.

2. Propagation conditions are set according to Annex B clause B.0.

3. There is one NB-IoT cell specified in the test. Ncell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test.

4. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

5. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

6. Deactivate UE prediction of satellite trajectory through any preconfigured means.

13.3.2.2.4.2 Test procedure

The test scenario comprises of one NB-IoT carrier with 1 Ncell.

1. Ensure the UE is in State 3A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 in Ncell 1.

2. Set the parameters according to Tables 13.3.2.2.5-1 to 13.3.2.2.5-3 selecting values appropriate to the test condition of normal or extreme. Propagation conditions are set according to Annex B clause B.1.1.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when receiving random access response reception.

4.1. In Test 1, the UE shall send the preamble to the SS. In response to the first 4 preamble transmission attempts (the preamble is transmitted 8 times in each attempt), the SS shall transmit a random access response not corresponding to the transmitted random access preamble.

4.2. The UE shall consider the random access response reception not successful then re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if all received random access response contain random access preamble identifiers that do not match the transmitted random access preamble.

4.3. The SS shall transmit a random access response containing a random access preamble identifier corresponding to the transmitted random access after 5 preamble transmission attempts have been received by the SS.

4.4. The UE shall consider this random access response reception successful and transmit the msg3.

4.5. Measure the power and timing of the first preamble transmission attempt. The power of the first preamble transmission attempt shall be 23 dBm for power class 3, 20 dBm for power class 5 with the accuracy specified in clause 6.3B.4 of TS 36.102. Measure the relative power and timing applied to additional preamble transmission attempts. The relative power of the last 4 preamble transmission attempts shall not exceed the values specified in clause 6.3B.4 of TS 36.102. The transmit timing of all NPRACH transmissions shall be within the accuracy specified in TS36.133 clause 7.20A.2. If the UE transmits or re-transmits NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 1, then for each preamble count a success for the event "CE selection". Otherwise count a fail for the event "CE selection". The power, relative power and timing are only measured if the coverage enhancement level selection was correct, and any results relating to a wrong selection are discarded.

5. Test 2: Correct behaviour when not receiving random access response reception

5.1. Repeat step 1-3.

5.2. In Test 2, the UE shall send the preamble to the SS. The SS shall not respond to the first 4 preamble transmission attempts (the preamble is transmitted 8 times in each attempt).

5.3. The UE shall consider the random access response reception not successful then re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if no random access response is received within the RA Response window. The RA response window shall be started at the point in time indicated by clause 5.1.4 in TS 36.321.

5.4. The SS shall transmit a random access response containing a random access preamble identifier corresponding to the transmitted random access after 5 preamble transmission attemps have been received by the SS.

5.5. The UE shall consider this random access response reception successful and transmit the msg3.

5.6. Measure the power and timing of the first preamble transmission attempt. The power of the first preamble transmission attempt shall be 23 dBm for power class 3, 20 dBm for power class 5 with the accuracy specified in clause 6.3B.4 of TS 36.102. Measure the relative power and timing applied to additional preamble transmission attempts. The relative power of the last 4 preamble transmission attempts shall not exceed the values specified in clause 6.3B.4 of TS 36.102. The transmit timing of all NPRACH transmissions shall be within the accuracy specified in TS36.133 clause 7.20A.2. If the UE transmits or re-transmits NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 1, then for each preamble count a success for the event "CE selection". Otherwise count a fail for the event "CE selection". The power, relative power and timing are only measured if the coverage enhancement level selection was correct, and any results relating to a wrong selection are discarded.

6. Test 3: Not applicable.

7. Test 4: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

7.1. Repeat step 1-3.

7.2. In Test 4, the UE shall send the preamble to the SS. If the UE transmits an NPRACH preamble using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 1, then count a success for the event "CE selection". Otherwise count a fail for the event "CE selection". The SS shall transmit a random access response containing a random access preamble identifier corresponding to the transmitted random access after the first preamble has been received by the SS.

7.3. The UE shall consider this random access response reception successful and transmit the msg3.

7.4. The SS shall send a message addressed to the Temporary C-RNTI with a UE contention resolution identity included in the MAC control element not matching the CCCH SDU transmitted in msg3 uplink message.

7.5. The UE shall consider the contention resolution not successful then re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires. If the UE transmits NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 1, then for each preamble count a success for the event "CE selection". Otherwise count a fail for the event "CE selection". The power is only measured if the coverage enhancement level selection was correct, and any results relating to a wrong selection are discarded.

8. Test 5: Correct behaviour when receiving a correct message over Temporary C-RNTI

8.1. In Test 5, the SS shall transmit a random access response containing a random access preamble identifier corresponding to the transmitted random access after the first preamble has been received by the SS. If the UE transmits an NPRACH preamble using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 1, then count a success for the event "CE selection". Otherwise count a fail for the event "CE selection".

8.2. The UE shall consider this random access response reception successful and transmit the msg3.

8.3. The SS shall send a message addressed to the Temporary C-RNTI with a UE contention resolution identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

8.4. The UE shall send ACK and consider the contention resolution successful and the random access procedure successfully completed.

9. Test 6: Correct behaviour when contention resolution timer expires

9.1. Repeat step 1-3.

9.2. In Test 6, the UE shall send the preamble to the SS. The SS shall transmit a random access response containing a random access preamble identifier corresponding to the transmitted random access after the first preamble has been received by the SS. If the UE transmits an NPRACH preamble using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 1, then count a success for the event "CE selection". Otherwise count a fail for the event "CE selection".

9.3. The UE shall consider this random access response reception successful and transmit the msg3.

9.4. The SS shall send an ACK for msg3 but not send msg4 allowing the contention resolution timer to expire.

9.5. The UE shall consider the contention resolution not successful then re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires. If the UE transmits an NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 1, then for each preamble count a success for the event "CE selection". Otherwise count a fail for the event "CE selection". The power is only measured if the coverage enhancement level selection was correct, and any results relating to a wrong selection are discarded.

9.6. The SS shall transmit a random access response containing a random access preamble identifier corresponding to the transmitted random access after the first preamble has been received by the SS.

9.7. The UE shall consider this random access response reception successful and transmit the msg3.

10. Void.

13.3.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.5B and 8.1.6 with following exceptions.

Table 13.3.2.2.4.3-1: RadioResourceConfigCommonSIB-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 clause 8.1.6.3-9 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigCommonSIB-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| nprach-Config-v1330 ::= SEQUENCE { |  |  |  |
| nprach-ParametersList-v1330 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-Parameters-NB-v1330 | 3 entries |  |  |
| NPRACH-Parameters-NB-v1330[1] ::= SEQUENCE { |  |  |  |
| nprach-NumCBRA-StartSubcarriers-r13 | n8 |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-v1330[2] ::= SEQUENCE { |  |  |  |
| nprach-NumCBRA-StartSubcarriers-r13 | n8 |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-v1330[3] ::= SEQUENCE { |  |  |  |
| nprach-NumCBRA-StartSubcarriers-r13 | n8 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.3.2.2.4.3-2: RACH-ConfigCommon-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.6.3-8 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| preambleTransMax-CE-r13 | n6 |  |  |
| powerRampingParameters-r13 SEQUENCE { |  |  |  |
| powerRampingStep | dB2 |  |  |
| preambleInitialReceivedTargetPower | dBm-120 |  |  |
| } |  |  |  |
| rach-InfoList-r13 (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF RACH-Info-NB-r13 { | 3 entries |  |  |
| RACH-Info-NB-r13[1] SEQUENCE { |  |  |  |
| ra-ResponseWindowSize-r13 | pp2 |  |  |
| mac-ContentionResolutionTimer-r13 | pp8 |  |  |
| } |  |  |  |
| RACH-Info-NB-r13[2] SEQUENCE { |  |  |  |
| ra-ResponseWindowSize-r13 | pp2 |  |  |
| mac-ContentionResolutionTimer-r13 | pp8 |  |  |
| } |  |  |  |
| RACH-Info-NB-r13[3] SEQUENCE { |  |  |  |
| ra-ResponseWindowSize-r13 | pp2 |  |  |
| mac-ContentionResolutionTimer-r13 | pp8 |  |  |
| } |  |  |  |
| } |  |  |  |
| powerRampingParameters-v1450 | Not present |  |  |
| } |  |  |  |

Table 13.3.2.2.4.3-3: NPRACH-ConfigSIB-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.6.3-5 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPRACH-ConfigSIB-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| nprach-CP-Length-r13 | Us266dot7 |  |  |
| rsrp-ThresholdsPrachInfoList-r13 ::= SEQUENCE (SIZE(1)) OF RSRP-Range { | 2 entries |  |  |
| RSRP-Range[1] | 35 | -121dBm | Normal |
| RSRP-Range[2] | 56 | -100dBm |
| RSRP-Range[1] | 31 | -125dBm | Extreme |
| RSRP-Range[2] | 60 | -96dBm |
| } |  |  |  |
| nprach-ParametersList-r13 SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-Parameters-NB-r13 { | 3 entries |  |  |
| NPRACH-Parameters-NB-r13[1] ::= SEQUENCE { |  |  |  |
| nprach-Periodicity-r13 | ms40 |  |  |
| nprach-StartTime-r13 | ms8 |  |  |
| nprach-SubcarrierOffset-r13 | n0 |  |  |
| nprach-NumSubcarriers-r13 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r13 | zero |  |  |
| maxNumPreambleAttemptCE-r13 | n3 |  |  |
| numRepetitionsPerPreambleAttempt-r13 | n2 |  |  |
| npdcch-NumRepetitions-RA-r13 | r4 |  |  |
| npdcch-StartSF-CSS-RA-r13 | v1dot5 |  |  |
| npdcch-Offset-RA-r13 | zero |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-r13[2] ::= SEQUENCE { |  |  |  |
| nprach-Periodicity-r13 | ms240 |  |  |
| nprach-StartTime-r13 | ms64 |  |  |
| nprach-SubcarrierOffset-r13 | n0 |  |  |
| nprach-NumSubcarriers-r13 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r13 | zero |  |  |
| maxNumPreambleAttemptCE-r13 | n6 |  |  |
| numRepetitionsPerPreambleAttempt-r13 | n8 |  |  |
| npdcch-NumRepetitions-RA-r13 | r16 |  |  |
| npdcch-StartSF-CSS-RA-r13 | v1dot5 |  |  |
| npdcch-Offset-RA-r13 | zero |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-r13[3] ::= SEQUENCE { |  |  |  |
| nprach-Periodicity-r13 | ms1280 |  |  |
| nprach-StartTime-r13 | ms512 |  |  |
| nprach-SubcarrierOffset-r13 | n0 |  |  |
| nprach-NumSubcarriers-r13 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r13 | zero |  |  |
| maxNumPreambleAttemptCE-r13 | n10 |  |  |
| numRepetitionsPerPreambleAttempt-r13 | n64 |  |  |
| npdcch-NumRepetitions-RA-r13 | r128 |  |  |
| npdcch-StartSF-CSS-RA-r13 | v1dot5 |  |  |
| npdcch-Offset-RA-r13 | zero |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.3.2.2.4.3-4: NPDSCH-ConfigCommon-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.6.3-4 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPDSCH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| nrs-Power-r13 | -5 (dBm) |  |  |
| } |  |  |  |

##### 13.3.2.2.5 Test requirement

The test parameters are given in tables 13.3.2.2.5-1, 13.3.2.2.5-2 and 13.3.2.2.5-3. The UE shall perform timing pre-compensation before the initial NPRACH transmission using [a configuration as described in Table 13.3.2.2.5-2]. Tables 13.3.2.2.5-4 and 13.3.2.2.5-5 define the absolute and relative power control requirements including test tolerances. Table 13.3.2.2.5-6 defines the uplink timing error limit including test tolerances.

Table 13.3.2.2.5-1: nCell specific test parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Enhanced Coverage

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comments** |
| NB-IOT operational mode |  | Standalone |  |
| BWchannel | kHz | 200 |  |
| NPDSCH parameters Note 2 |  | R.18 HD-FDD | As defined in TS36.133 A.3.1.5.3 |
| NPDCCH parameters Note 2 |  | R.30 HD-FDD | As defined in TS36.133 A.3.1.6.3 |
| NPBCH\_RA | dB | -3 |  |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RA Note 1 | dB |
| NOCNG\_RB Note 1 | dB |
| DRX |  | OFF |  |
|  | dBm/15 kHz | -98 |  |
|  | dB | -12.5 |  |
| Note 3 | dB | -12.5 |  |
| NRSRP Note 3 | dBm/15 kHz | -110.5 |  |
| Io Note 3 | dBm/180KHz | -86.97 |  |
| Propagation Condition | - | AWGN |  |
| Antenna Configuration |  | 1x1 |  |
| Note 1: NOCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: The NPDSCH and NPDCCH reference measurement channels are used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: Es/Iot, NRSRP and Io level has been derived from other parameters for information purpose. They are not settable parameters themselves. | | | |

Table 13.3.2.2.5-2: NTN specific test parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Enhanced Coverage

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Comment** |
| Configuration 1 | SCC1 | GSO Test Configuration |
| Configuration 2 | SCC2 | NGSO Test Configuration |

Table 13.3.2.2.5-3: NPRACH-Configuration parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Enhanced Coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Field** | **Value** | | | | **Comment** |
| **Parameters not per NPRACH resource** | | | | | |
| RSRP-ThresholdsNPRACH-InfoList | {34, 57} | | | | Corresponding to {-122, -99} dBm as defined in TS36.133 Section 9.1.22.9 |
| {31, 60} | | | | Extreme condition: Corresponding to {-125, -96} dBm as defined in 3GPP TS 36.133 Section 9.1.22.9 |
| nprach-CP-Length | us266dot7 | | | |  |
| nrs-Power | -5 dBm/15 kHz | | | | As defined in clause 6.7.3 in TS 36.331. |
| Backoff Parameter Index | 1 | | | | As defined in table 7.2-2 in TS 36.321 |
| Configured UE transmitted power () | 23 dBm for power class 3,  20 dBm for power class 5 | | | | As defined in clause 6.2B.4 in TS 36.102 |
| powerRampingStep | dB2 | | | |  |
| preambleInitialReceivedTargetPower | dBm-120 | | | |  |
| preambleTransMax-CE | n6 | | | |  |
| **Parameters per NPRACH Resource** | | | | | |
| ***NPRACH Resource*** | ***Level 0*** | ***Level 1*** | ***Level 2*** |  | |
| nprach-Periodicity | ms40 | ms240 | ms1280 |  | |
| nprach-StartTime | ms8 | ms64 | ms512 |  | |
| nprach-SubcarrierOffset | n0 | n0 | n0 |  | |
| nprach-NumSubcarriers | n12 | n12 | n12 |  | |
| nprach-SubcarrierMSG3-RangeStart | zero | zero | zero |  | |
| maxNumPreambleAttemptCE | n3 | n6 | n10 |  | |
| numRepetitionsPerPreambleAttempt | n2 | n8 | n64 |  | |
| npdcch-NumRepetitions-RA | r4 | r16 | r128 |  | |
| npdcch-StartSF-CSS-RA | v1dot5 | v1dot5 | v1dot5 |  | |
| npdcch-Offset-RA | zero | zero | Zero |  | |
| nprach-NumCBRA-StartSubcarriers | n8 | n8 | n8 |  | |
| ra-ResponseWindowSize (per NPRACH Resource) | pp2 | pp2 | pp2 |  | |
| mac-ContentionResolutionTimer (per NPRACH Resource) | pp8 | pp8 | pp8 |  | |
| Note 1: See Clause 6.7.3 in TS 36.331 for further information on the parameters in this table. | | | | | |

Test 1: Correct behaviour when receiving random access response reception

- The power of the first preamble shall be 23 dBm for power class 3, 20 dBm for power class 5 within the accuracy specified in Table 13.3.2.2.5-4.

- The relative power for preamble ramping step shall be 2 dB to within the accuracy specified in Table 13.3.2.2.5-5.

- The transmit timing of all NPRACH transmissions shall be within the accuracy specified in Table 13.3.2.2.5-6.

Test 2: Correct behaviour when not receiving random access response reception

- The power of the first preamble shall be 23 dBm for power class 3, 20 dBm for power class 5 within the accuracy specified in Table 13.3.2.2.5-4.

- The relative power for preamble ramping step shall be 2 dB to within the accuracy specified in Table 13.3.2.2.5-5.

- The transmit timing of all NPRACH transmissions shall be within the accuracy specified in Table 13.3.2.2.5-6.

Test 3: Correct behaviour when receiving a NACK on msg3

- The UE shall re-transmit the msg3 upon the reception of a NACK on msg3 until the maximum number of HARQ retransmission is reached.

Test 4: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires unless the received message includes a UE contention resolution identity MAC control element and the UE contention resolution identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

Test 5: Correct behaviour when receiving a correct message over Temporary C-RNTI

- The UE shall send ACK if the contention resolution is successful.

Test 6: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the back off time expires if the contention resolution timer expires.

Correct behaviour when UE selects NPRACH resources

- The rate of correct coverage enhancement level 1 selection events "CE selection" observed during repeated tests shall be at least 90% with a confidence level of 95%.

Decide the test pass, if all the the power, relative power and timing measurements pass and the CE selection events pass, otherwise fail the UE.

Table 13.3.2.2.5-4: Absolute power tolerance for HD-FDD contention based random access test for UE category NB1

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 14.3 dB |
| Extreme | ±17.3 dB |

Table 13.3.2.2.5-5: Relative power tolerance for HD-FDD contention based random access test for UE category NB1

|  |  |
| --- | --- |
| Power step P  [dB] | NPRACH [dB] |
| ΔP = 0 | ±2.2 |
| ΔP = 2 | ±2.7 |
| ΔP = 4 | ±4.2 |
| ΔP = 6 | ±4.7 |
| NOTE: For extreme conditions an additional ± 2.0 dB relaxation is allowed. | |

Table 13.3.2.2.5-6: Test requirements for Te Timing Error Limit for HD-FDD contention based random access test for UE category NB1

|  |  |
| --- | --- |
| Downlink Bandwidth (MHz) | Te\_ |
| 0.18 | 100\*TS |
| NOTE: TS is the basic timing unit defined in 3GPP TS 36.211 | |

#### 13.3.2.3 Contention Based Random Access on Non-anchor Carrier Test for UE category NB1 UEs Standalone mode in Enhanced Coverage

##### 13.3.2.3.1 Test purpose

The purpose of this test is to verify whether the behavior of the random access procedure of a category NB1 UE in Enhanced Coverage is according to the requirements, whether the NPRACH power settings and timing are within specified limits, and whether the UE determines properly the enhanced coverage level based on the NRSRP measurement and the configured criterion in NRSRP-ThresholdsPrach [5]. This test will verify the requirements in TS36.133 Clause 6.6A.2, Clause 6.6A.3 and Clause 7.20A2 in an AWGN model.

For this test a single NB-IoT cell is used. The test parameters are given in tables 13.3.2.3.5-1, 13.3.2.3.5-2 and 13.3.2.3.5-3. The UE shall perform timing pre-compensation before the initial NPRACH transmission using AT command-based test approach.

##### 13.3.2.3.2 Test applicability

This test case applies to all types of NB-IoT HD-FDD category NB1 UEs supporting GSO or NGSO or both from release 17 and forwards.

Applicability requires support for sending NPRACH on non-anchor carrier.

##### 13.3.2.3.3 Minimum conformance requirements

Contention based random access is triggered by not explicitly assigning a random access preamble via dedicated signalling in the downlink.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window. The RA response window shall be started at the point in time indicated by clause 5.1.4 in TS 36.321[11].

The UE shall re-transmit the msg3 upon the reception of a NACK on msg3 until the maximum number of re-transmissions defined by *maxNumPreambleAttemptCE* in the table 13.3.2.3.5-3 is reached.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

The UE shall send ACK if the Contention Resolution is successful.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

The UE shall select NPRACH resources and transmits or re- transmits NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 1. The rate of correct coverage enhancement level selection during repeated tests shall be at least 90%.

Note: Correct coverage enhancement level selection is a prerequisite for testing the other NPRACH requirements.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause A.13.3.2.3.

##### 13.3.2.3.4 Test description

13.3.2.3.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: Ncell bandwidth is as specified in Table 13.3.2.3.5-1.

1. Connect the SS and AWGN noise source to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A Figure A.18 using only UE main Tx/Rx antenna.

2. Propagation conditions are set according to Annex B clause B.0.

3. There is one NB-IoT cell specified in the test. Ncell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test. In Ncell 1 one anchor carrier and one non-anchor carrier are configured.

4. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

5. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

6. Deactivate UE prediction of satellite trajectory through any preconfigured means.

13.3.2.3.4.2 Test procedure

The test scenario comprises of 2 NB-IoT carriers with 1 Ncell.

The test procedures are the same as test procedures defined in 13.3.2.2.4.2, with step 4 and forward performed on the non-anchor carrier.

13.3.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.5B and 8.1.6 with following exceptions.

Table 13.3.2.3.4.3-1: SystemInformationBlockType22-NB

| Derivation Path: 36.508 Table 8.1.4.3.3-8 | | | |
| --- | --- | --- | --- |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType22-NB-r14 ::= SEQUENCE { |  |  |  |
| ul-ConfigList-r14 SEQUENCE (SIZE (1.. maxNonAnchorCarriers-NB-r14)) OF UL-ConfigCommon-NB-r14 SEQUENCE { |  |  |  |
| UL-ConfigCommon-NB-r14[1] SEQUENCE { |  |  |  |
| nprach-ParametersList-r14 SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-Parameters-NB-r14 SEQUENCE { |  |  |  |
| NPRACH-Parameters-NB-r14[1] SEQUENCE { |  |  |  |
| nprach-Parameters-r14 SEQUENCE { |  |  |  |
| nprach-Periodicity-r14 | ms40 |  |  |
| nprach-StartTime-r14 | ms8 |  |  |
| nprach-SubcarrierOffset-r14 | n0 |  |  |
| nprach-NumSubcarriers-r14 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r14 | zero |  |  |
| npdcch-NumRepetitions-RA-r14 | r4 |  |  |
| npdcch-StartSF-CSS-RA-r14 | v1dot5 |  |  |
| npdcch-Offset-RA-r14 | zero |  |  |
| nprach-NumCBRA-StartSubcarriers-r14 | n8 |  |  |
| npdcch-CarrierIndex-r14 | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-r14[2] SEQUENCE { |  |  |  |
| nprach-Parameters-r14 SEQUENCE { |  |  |  |
| nprach-Periodicity-r14 | ms240 |  |  |
| nprach-StartTime-r14 | ms64 |  |  |
| nprach-SubcarrierOffset-r14 | n0 |  |  |
| nprach-NumSubcarriers-r14 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r14 | zero |  |  |
| npdcch-NumRepetitions-RA-r14 | r16 |  |  |
| npdcch-StartSF-CSS-RA-r14 | v1dot5 |  |  |
| npdcch-Offset-RA-r14 | zero |  |  |
| nprach-NumCBRA-StartSubcarriers-r14 | n20 |  |  |
| npdcch-CarrierIndex-r14 | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-r14[3] SEQUENCE { |  |  |  |
| nprach-Parameters-r14 SEQUENCE { |  |  |  |
| nprach-Periodicity-r14 | ms1280 |  |  |
| nprach-StartTime-r14 | ms512 |  |  |
| nprach-SubcarrierOffset-r14 | n0 |  |  |
| nprach-NumSubcarriers-r14 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r14 | zero |  |  |
| npdcch-NumRepetitions-RA-r14 | r128 |  |  |
| npdcch-StartSF-CSS-RA-r14 | v1dot5 |  |  |
| npdcch-Offset-RA-r14 | zero |  |  |
| nprach-NumCBRA-StartSubcarriers-r14 | n40 |  |  |
| npdcch-CarrierIndex-r14 | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| nprach-ProbabilityAnchorList-r14 SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-ProbabilityAnchor-NB-r14 SEQUENCE { |  |  |  |
| NPRACH-ProbabilityAnchor-NB-r14[1] SEQUENCE { |  |  |  |
| nprach-ProbabilityAnchor-r14 | zero |  |  |
| } |  |  |  |
| NPRACH-ProbabilityAnchor-NB-r14[2] SEQUENCE { |  |  |  |
| nprach-ProbabilityAnchor-r14 | zero |  |  |
| } |  |  |  |
| NPRACH-ProbabilityAnchor-NB-r14[3] SEQUENCE { |  |  |  |
| nprach-ProbabilityAnchor-r14 | zero |  |  |
| } |  |  |  |
| } |  |  |  |
| lateNonCriticalExtension | Not present |  |  |
| } |  |  |  |

Table 13.3.2.3.4.3-2: RadioResourceConfigCommonSIB-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 clause 8.1.6.3-9 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigCommonSIB-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| nprach-Config-v1330 ::= SEQUENCE { |  |  |  |
| nprach-ParametersList-v1330 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-Parameters-NB-v1330 | 3 entries |  |  |
| NPRACH-Parameters-NB-v1330[1] ::= SEQUENCE { |  |  |  |
| nprach-NumCBRA-StartSubcarriers-r13 | n8 |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-v1330[2] ::= SEQUENCE { |  |  |  |
| nprach-NumCBRA-StartSubcarriers-r13 | n8 |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-v1330[3] ::= SEQUENCE { |  |  |  |
| nprach-NumCBRA-StartSubcarriers-r13 | n8 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.3.2.2.4.3-3: RACH-ConfigCommon-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.6.3-8 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| preambleTransMax-CE-r13 | n6 |  |  |
| powerRampingParameters-r13 SEQUENCE { |  |  |  |
| powerRampingStep | dB2 |  |  |
| preambleInitialReceivedTargetPower | dBm-120 |  |  |
| } |  |  |  |
| rach-InfoList-r13 (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF RACH-Info-NB-r13 { | 3 entries |  |  |
| RACH-Info-NB-r13[1] SEQUENCE { |  |  |  |
| ra-ResponseWindowSize-r13 | pp2 |  |  |
| mac-ContentionResolutionTimer-r13 | pp8 |  |  |
| } |  |  |  |
| RACH-Info-NB-r13[2] SEQUENCE { |  |  |  |
| ra-ResponseWindowSize-r13 | pp2 |  |  |
| mac-ContentionResolutionTimer-r13 | pp8 |  |  |
| } |  |  |  |
| RACH-Info-NB-r13[3] SEQUENCE { |  |  |  |
| ra-ResponseWindowSize-r13 | pp2 |  |  |
| mac-ContentionResolutionTimer-r13 | pp8 |  |  |
| } |  |  |  |
| } |  |  |  |
| powerRampingParameters-v1450 | Not present |  |  |
| } |  |  |  |

Table 13.3.2.2.4.3-4: NPRACH-ConfigSIB-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.6.3-5 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPRACH-ConfigSIB-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| nprach-CP-Length-r13 | Us266dot7 |  |  |
| rsrp-ThresholdsPrachInfoList-r13 ::= SEQUENCE (SIZE(1)) OF RSRP-Range { | 2 entries |  |  |
| RSRP-Range[1] | 35 | -121dBm | Normal |
| RSRP-Range[2] | 56 | -100dBm |
| RSRP-Range[1] | 31 | -125dBm | Extreme |
| RSRP-Range[2] | 60 | -96dBm |
| } |  |  |  |
| nprach-ParametersList-r13 SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-Parameters-NB-r13 { | 3 entries |  |  |
| NPRACH-Parameters-NB-r13[1] ::= SEQUENCE { |  |  |  |
| nprach-Periodicity-r13 | ms40 |  |  |
| nprach-StartTime-r13 | ms8 |  |  |
| nprach-SubcarrierOffset-r13 | n0 |  |  |
| nprach-NumSubcarriers-r13 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r13 | zero |  |  |
| maxNumPreambleAttemptCE-r13 | n3 |  |  |
| numRepetitionsPerPreambleAttempt-r13 | n2 |  |  |
| npdcch-NumRepetitions-RA-r13 | r4 |  |  |
| npdcch-StartSF-CSS-RA-r13 | v1dot5 |  |  |
| npdcch-Offset-RA-r13 | zero |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-r13[2] ::= SEQUENCE { |  |  |  |
| nprach-Periodicity-r13 | ms240 |  |  |
| nprach-StartTime-r13 | ms64 |  |  |
| nprach-SubcarrierOffset-r13 | n0 |  |  |
| nprach-NumSubcarriers-r13 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r13 | zero |  |  |
| maxNumPreambleAttemptCE-r13 | n6 |  |  |
| numRepetitionsPerPreambleAttempt-r13 | n8 |  |  |
| npdcch-NumRepetitions-RA-r13 | r16 |  |  |
| npdcch-StartSF-CSS-RA-r13 | v1dot5 |  |  |
| npdcch-Offset-RA-r13 | zero |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-r13[3] ::= SEQUENCE { |  |  |  |
| nprach-Periodicity-r13 | ms1280 |  |  |
| nprach-StartTime-r13 | ms512 |  |  |
| nprach-SubcarrierOffset-r13 | n0 |  |  |
| nprach-NumSubcarriers-r13 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r13 | zero |  |  |
| maxNumPreambleAttemptCE-r13 | n10 |  |  |
| numRepetitionsPerPreambleAttempt-r13 | n64 |  |  |
| npdcch-NumRepetitions-RA-r13 | r128 |  |  |
| npdcch-StartSF-CSS-RA-r13 | v1dot5 |  |  |
| npdcch-Offset-RA-r13 | zero |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.3.2.2.4.3-5: NPDSCH-ConfigCommon-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.6.3-4 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPDSCH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| nrs-Power-r13 | -5 (dBm) |  |  |
| } |  |  |  |

##### 13.3.2.3.5 Test requirement

The test parameters are given in tables 13.3.2.3.5-1, 13.3.2.3.5-2 and 13.3.2.3.5-3. The UE shall perform timing pre-compensation before the initial NPRACH transmission using [aconfiguration as described in Table 13.3.2.3.5-2]. Tables 13.3.2.3.5-4 and 13.3.2.3.5-5 define the absolute and relative power control requirements including test tolerances. Table 13.3.2.3.5-6 defines the uplink timing error limit including test tolerances.

Table 13.3.2.3.5-1: nCell specific test parameters for HD-FDD contention based random access on non-achor carrier test for UE category NB1 Standalone mode in Enhanced Coverage

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comments** |
| NB-IOT operational mode |  | Standalone |  |
| BWchannel | kHz | 200 |  |
| NPDSCH parameters Note 2 |  | R.18 HD-FDD | As defined in TS36.133 A.3.1.5.3 |
| NPDCCH parameters Note 2 |  | R.30 HD-FDD | As defined in TS36.133 A.3.1.6.3 |
| NPBCH\_RA | dB | -3 |  |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RA Note 1 | dB |
| NOCNG\_RB Note 1 | dB |
| DRX |  | OFF |  |
|  | dBm/15 kHz | -98 |  |
|  | dB | -12.5 |  |
| Note 3 | dB | -12.5 |  |
| NRSRP Note 3 | dBm/15 kHz | -110.5 |  |
| Io Note 3 | dBm/180 KHz | -86.97 |  |
| Propagation Condition | - | AWGN |  |
| Antenna Configuration |  | 1x1 |  |
| Note 1: NOCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: The NPDSCH and NPDCCH reference measurement channels are used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: Es/Iot, NRSRP and Io level has been derived from other parameters for information purpose. They are not settable parameters themselves. | | | |

Table 13.3.2.3.5-2: NTN specific test parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Normal Coverage

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Comment** |
| Configuration 1 | SCC1 | GSO Test Configuration |
| Configuration 2 | SCC2 | NGSO Test Configuration |

Table 13.3.2.3.5-3: NPRACH-Configuration parameters for HD-FDD contention based random access on non-anchor carrier test for UE category NB1 Standalone mode in Enhanced Coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Field** | **Value** | | | | **Comment** |
| **Parameters not per NPRACH resource** | | | | | |
| RSRP-ThresholdsNPRACH-InfoList | {34, 57} | | | | Corresponding to {-122, -99} dBm as defined in TS36.133 Section 9.1.22.9 |
| {31, 60} | | | | Extreme condition: Corresponding to {-125, -96} dBm as defined in 3GPP TS 36.133 Section 9.1.22.9 |
| nprach-CP-Length | us266dot7 | | | |  |
| nrs-Power | -5 dBm/15 kHz | | | | As defined in clause 6.7.3 in TS 36.331. |
| Backoff Parameter Index | 1 | | | | As defined in table 7.2-2 in TS 36.321 |
| Configured UE transmitted power () | 23 dBm for power class 3,  20 dBm for power class 5 | | | | As defined in clause 6.2B.4 in TS 36.102 |
| powerRampingStep | dB2 | | | |  |
| preambleInitialReceivedTargetPower | dBm-120 | | | |  |
| preambleTransMax-CE | n6 | | | |  |
| **Parameters per NPRACH Resource** | | | | | |
| ***NPRACH Resource*** | ***Level 0*** | ***Level 1*** | ***Level 2*** |  | |
| nprach-ProbabilityAnchor | zero | zero | zero |  | |
| nprach-NumCBRA-StartSubcarriers | n8 | n8 | n8 |  | |
| nprach-Periodicity | ms40 | ms240 | ms1280 |  | |
| nprach-StartTime | ms8 | ms64 | ms512 |  | |
| nprach-SubcarrierOffset | n0 | n0 | n0 |  | |
| nprach-NumSubcarriers | n12 | n12 | n12 |  | |
| nprach-SubcarrierMSG3-RangeStart | zero | zero | zero |  | |
| maxNumPreambleAttemptCE | n3 | n6 | n10 |  | |
| numRepetitionsPerPreambleAttempt | n2 | n8 | n64 |  | |
| npdcch-NumRepetitions-RA | r4 | r16 | r128 |  | |
| npdcch-StartSF-CSS-RA | v1dot5 | v1dot5 | v1dot5 |  | |
| npdcch-Offset-RA | zero | zero | Zero |  | |
| ra-ResponseWindowSize (per NPRACH Resource) | pp2 | pp2 | pp2 |  | |
| mac-ContentionResolutionTimer (per NPRACH Resource) | pp8 | pp8 | pp8 |  | |
| Note 1: See Clause 6.7.3 in TS 36.331 for further information on the parameters in this table. | | | | | |

Test 1: Correct behaviour when receiving random access response reception

- The power of the first preamble shall be 23 dBm for power class 3, 20 dBm for power class 5 within the accuracy specified in Table 13.3.2.3.5-4.

- The relative power for preamble ramping step shall be 2 dB to within the accuracy specified in Table 13.3.2.3.5-5.

- The transmit timing of all NPRACH transmissions shall be within the accuracy specified in Table 13.3.2.3.5-6.

Test 2: Correct behaviour when not receiving random access response reception

- The power of the first preamble shall be 23 dBm for power class 3, 20 dBm for power class 5 within the accuracy specified in Table 13.3.2.3.5-4.

- The relative power for preamble ramping step shall be 2 dB to within the accuracy specified in Table 13.3.2.3.5-5.

- The transmit timing of all NPRACH transmissions shall be within the accuracy specified in Table 13.3.2.3.5-6.

Test 3: Correct behaviour when receiving a NACK on msg3

- The UE shall re-transmit the msg3 upon the reception of a NACK on msg3 until the maximum number of HARQ retransmission is reached.

Test 4: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires unless the received message includes a UE contention resolution identity MAC control element and the UE contention resolution identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

Test 5: Correct behaviour when receiving a correct message over Temporary C-RNTI

- The UE shall send ACK if the contention resolution is successful.

Test 6: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the back off time expires if the contention resolution timer expires.

Correct behaviour when UE selects NPRACH resources

- The rate of correct coverage enhancement level 1 selection events "CE selection" observed during repeated tests shall be at least 90% with a confidence level of 95%.

Decide the test pass, if all the the power, relative power and timing measurements pass and the CE selection events pass, otherwise fail the UE.

Table 13.3.2.3.5-4: Absolute power tolerance for HD-FDD contention based random access test for UE category NB1

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 14.3 dB |
| Extreme | ±17.3 dB |

Table 13.3.2.3.5-5: Relative power tolerance for HD-FDD contention based random access test for UE category NB1

|  |  |
| --- | --- |
| Power step P  [dB] | NPRACH [dB] |
| ΔP = 0 | ±2.7 |
| ΔP = 2 | ±2.7 |
| ΔP = 4 | ±4.2 |
| ΔP = 6 | ±4.7 |
| NOTE: For extreme conditions an additional ± 2.0 dB relaxation is allowed. | |

Table 13.3.2.3.5-6: Test requirements for Te Timing Error Limit for HD-FDD contention based random access test for UE category NB1

|  |  |
| --- | --- |
| Downlink Bandwidth (MHz) | Te\_ |
| 0.18 | 100\*TS + TT |
| NOTE: TS is the basic timing unit defined in 3GPP TS 36.211 | |

## 13.4 Timing and signalling characteristics for satellite access

### 13.4.1 UE transmit timing for satellite access

#### 13.4.1.1 E-UTRAN HD-FDD – UE Transmit Timing Accuracy Tests for Category NB1 UE Standalone mode under normal coverage for Satellite Access

Editor's Note: This test case is incomplete in following aspects:

Connection diagram is TBD.

##### 13.4.1.1.1 Test purpose

The purpose of this test is to verify that the Category NB1 UE under normal coverage is capable of following the frame timing change of the connected eNodeB and that the UE initial transmits timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in TS 36.133 [4] clause 7.20A.

##### 13.4.1.1.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

##### 13.4.1.1.3 Minimum conformance requirements

The UE initial transmission timing error shall be less than or equal to ±Te where the timing error limit value Te is specified in 3GPP TS 36.133 [4] clause 7.20A and shown in Table 13.4.1.1.3-1. This requirement applies when it is the first transmission in a DRX cycle or the first transmission in a repetition period (R>1) for NPUSCH and NPRACH, the first transmission after an uplink transmission gap in a repetition period (R>1) for NPUSCH and NPRACH transmission, or it is the transmission on PUR. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the serving NB-IoT cell minus . The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the serving NB-IoT cell. *N*TA\_Ref for NPRACH is defined as 0. (in *Ts* units) for other channels is the difference between UE transmission timing and the Downlink timing immediately after when the last timing advance in 3GPP TS 36.133 clause 7.22A was applied. *N*TA\_Ref for other channels is not changed until next timing advance is received.



Table 13.4.1.1.3-1: Te Timing Error Limit

|  |  |
| --- | --- |
| Downlink Bandwidth (MHz) | Te\_ |
| 0.18 | 97– TGNSS\_margin\*TS |
| Note 1: TS is the basic timing unit defined in 3GPP TS 36.211 [9] | |

TGNSS\_margin is the margin for the GNSS position definition error considered in the core requirement, which needs to be substracted for the test requirement, due to the usuage of AT commands in the test.   
TGNSS\_margin = [5.12]×TS

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for NPUSCH the UE shall, when no repetitions are configured on the uplink or the repetition period is R=1, be capable of changing the transmission timing according to the received downlink frame of the serving NB-IoT cell except when the timing advance in 3GPP TS 36.133 clause 7.22A is applied such that the UE transmission timing error shall be less than or equal to ±Te, where the timing error limit value Te is specified in table 13.4.1.1.3-1.

When no repetition period is configured, or the configured repetition period is R=1, all adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change, apart from a change of due to satellite position update and between the previous transmission and the current transmission, in one adjustment shall be 58.33\*TS seconds.



2) The minimum aggregate adjustment rate, apart from a change of due to satellite position update and between the previous transmission and the current transmission, shall be 7\*TS per 1second.



3) The maximum aggregate adjustment rate, apart from a change of due to satellite position update and between the previous transmission and the current transmission, shall be 58.33\*TS per 200ms.



when a repetition is configured on the uplink for which R>1, the UE shall not adjust the uplink transmission timing autonomously during an ongoing repetition period other than at initial transmission or at the start of a transmission segment boundary, as defined above.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 7.20A and A.13.4.1.1.

##### 13.4.1.1.4 Test description

There is one NB-IoT SAN cell (Ncell 1), which is the active cell in the test. The transmit timing is verified by the UE transmitting NPUSCH.

Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The UE shall be provided with the valid information about the SAN serving cells before the test.

13.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.1.1.4.1-1.

Table 13.4.1.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table Annex E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: 200 KHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connection diagram is TBD.

2. The general test parameter settings are set according to Table 13.4.1.1.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.4.1.1.4.3.

5. There is one cell specified in this test. Ncell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.4.1.1.4.1-2: General Test Parameters for E-UTRAN HD-FDD UE Transmit Timing Accuracy Tests for Category NB1 UE Standalone mode under normal coverage for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| **Test 1** |
| NB-IoT Operation mode | |  | Standalone |
| DRX | |  | OFF |
| Satellite information | Config 1 |  | SSC.1 |
| Config 2 |  | SSC.2 |
| NPRACH configuration | |  | NPRACH.R-1  As specified in A.10.3-1 |
| NPDCCH repetition level | |  | 1 |
| npdcch-StartSF-USS Note 1 | |  | v8 |
| npdcch-NumRepetitions-r13 Note 1 | |  | r1 |
| NPUSCH repetition level | |  | 1 |
| Note 1: For further information see clause 6.7.3.2 in TS 36.331 [5]. | | | |

13.4.1.1.4.2 Test procedure

The test consists of a single cell Ncell 1, the UE shall be fully synchronized to Ncell 1. The transmit timing accuracy is verified related to the downlink frame timing of Ncell 1. The downlink timing of Ncell 1 is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting NPUSCH used as a measurement reference facilitating the SS timing estimation.

1. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

2. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

3. Set the parameters according to Table 13.4.1.1.5-1. Propagation conditions are set according to Annex B clause B.1.

4. SS sends uplink scheduling information via NPDCCH DCI format N0 for C\_RNTI to schedule uplink subframes.

5. The UE shall transmit NPUSCH, and the SS shall measure the UE transmit timing offset (n×Ts).

6. Using the value of n measured in step 4, the SS calculates the adjustment of the downlink transmit timing for the Ncell 1:

- if n < 0, by +(144 - |n|)×TS compared to that in step 4.

- if n ≥ 0, by -(144 - |n|)×TS compared to that in step 4.

7. Before applying the downlink transmit timing adjustment, the SS sends NPDCCH including uplink grant, measures the timing of the resulting NPUSCH, and verifies that it is within the limits specified in Table 13.4.1.1.5-2 with respect to the first detected path (in time) of the corresponding downlink frame of NB-IoT cell 1. The SS also records the measured value for use in step 8.

8. Immediately after Step 6, the downlink timing adjustment is performed monotonically in multiple steps of |*∆T*| ≤ 9×TS per 256ms until the above required total timing change is achieved, during which no grant is transmitted for the UE.

9. Immediately after Step 7, the SS sends NPDCCH including uplink grant for NPUSCH transmission and immediately after receiving NPUSCH the test system repeatedly sends NPDCCH including uplink grant for NPUSCH transmission. The SS samples the UE Transmit Timing once per NPUSCH transmission. The SS shall check that the maximum time adjustment step size between the first NPUSCH transmission in step 8 and the NPUSCH transmission in step 6 is within Rule 1 as specified in clause 13.4.1.1.5. And using the first NPUSCH transmission in step 8 and subsequent NPUSCH transmissions, the SS shall check the difference in timing between one NPUSCH transmission to the next is within Rule 1 as specified in clause 13.4.1.1.5. To check that the minimum adjustment rate is within Rule 2 as specified in clause 13.4.1.1.5, the SS shall measure the change in NPUSCH transmission timing over a 1008ms sliding window, with step size 8ms. To check that the maximum adjustment rate is within Rule 3 as specified in clause 13.4.1.1.5, the SS shall measure the change in NPUSCH transmission timing over a 192ms sliding window, with step size 8ms. The three rules apply until the UE transmit timing offset is within the limits specified in Table 13.4.1.1.5-2 with respect to the first detected path (in time) of the corresponding downlink frame of Ncell 1.

10. The SS shall check that the UE transmit timing offset stays within the limits specified in Table 13.4.1.1.5-2 with respect to the first detected path (in time) of the corresponding downlink frame of Ncell 1.

11. Repeat steps 1-10 with ephemeris values for minimum Doppler, maximum positive Doppler and maximum negative Doppler replacing ephemeris in step 1 by corresponding tables in TS 36.508 [12] clause 8.4.6.2.2 for the type of satellite under test.

13.4.1.1.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 13.4.1.1.4.3-1: NPDCCH-ConfigDedicated-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.6.3, Table 8.1.6.3-3: NPDCCH-ConfigDedicated-NB-DEFAULT | | | |
| Information Element | Value/remark | Comment | Condition |
| NPDCCH-ConfigDedicated-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| npdcch-NumRepetitions-r13 | r1 | Set NPDCCH repetition to 1 |  |
| npdcch-StartSF-USS-r13 | V8 |  |  |
| npdcch-Offset-USS-r13 | zero |  |  |
| } |  |  |  |

##### 13.4.1.1.5 Test requirement

Table 13.4.1.1.5-1: Cell specific Test Parameters for E-UTRAN HD-FDD UE Transmit Timing Accuracy Tests for Category NB1 UE Standalone mode under normal coverage for Satellite Access

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| **Test 1** |
| RF Channel Number |  | 1 |
| BWchannel | kHz | 200 |
| NPDSCH parameter |  | R.18 HD-FDD |
| NPDCCH parameter |  | R.30 HD-FDD |
| NOCNG Patterns |  | NOP.3 FDD |
| NPBCH\_RA | dB | 0 |
| NPBCH\_RB |
| NPSS\_RA |
| NSSS\_RA |
| NPDCCH\_RA |
| NPDCCH\_RB |
| NPDSCH\_RA |
| NPDSCH\_RB |
| NOCNG\_RA Note1 |
| NOCNG\_RB Note1 |
|  | dBm/15 kHz | -88 |
|  | dB | 4.3 |
|  | dB | 4.3 |
| Antenna Configuration |  | 1x1 |
| Propagation condition | - | AWGN |
| Note 1 NOCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

The UE transmit timing offset shall be within the requirements in Table 13.4.1.1.5-2.

Table 13.4.1.1.5-2: Te Timing Error Limit

|  |  |
| --- | --- |
| **Downlink Bandwidth (MHz)** | **Te\_** |
| 0.18 | (97 – TGNSS\_margin +3)\*TS |
| NOTE 1: TS is the basic timing unit defined in 3GPP TS 36.211 [9] | |

The reference point for the UE initial transmit timing control test requirement shall be the downlink timing minus .



The UE shall be capable of changing the transmission timing according to the received downlink frame. When the transmission timing error between the UE and the reference cell exceeds ±Te the UE is required to adjust its timing to within ±Te.

All adjustments made to the UE uplink timing shall follow three rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be (58.33+0.5)\*TS seconds.

2) The minimum aggregate adjustment rate shall be (7-3.6)\*TS per (1+0.008) second.

3) The maximum aggregate adjustment rate shall be (58.33+1.1)\*TS per (200-8)ms.

#### 13.4.1.2 E-UTRAN HD-FDD – UE Transmit Timing Accuracy Tests for Category NB1 UE Standalone mode under enhanced coverage for Satellite Access

Editor's Note: This test case is incomplete in following aspects:- Connection diagram is TBD.

- How to get UE location is TBD.

##### 13.4.1.2.1 Test purpose

The purpose of this test is to verify that the Category NB1 UE under enhanced coverage is capable of following the frame timing change of the connected eNode B, that the UE initial transmit timing accuracy is within the specified limits and that the UE shall not adjust the uplink transmission timing autonomously during an ongoing repetition period other than at initial transmission. This test will verify the requirements in TS 36.133 [4] clause 7.20A.

##### 13.4.1.2.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

##### 13.4.1.2.3 Minimum conformance requirements

The UE initial transmission timing error shall be less than or equal to ±Te where the timing error limit value Te is specified in 3GPP TS 36.133 [4] clause 7.20A and shown in Table 13.4.1.2.3-1. This requirement applies when it is the first transmission in a DRX cycle or the first transmission in a repetition period (R>1) for NPUSCH and NPRACH, the first transmission after an uplink transmission gap in a repetition period (R>1) for NPUSCH and NPRACH transmission, or it is the transmission on PUR. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the serving NB-IoT cell minus . The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the serving NB-IoT cell. NTA\_Ref for NPRACH is defined as 0. (in Ts units) for other channels is the difference between UE transmission timing and the Downlink timing immediately after when the last timing advance in 3GPP TS 36.133 clause 7.22A was applied. NTA\_Ref for other channels is not changed until next timing advance is received.



Table 13.4.1.2.3-1: Te Timing Error Limit

|  |  |
| --- | --- |
| Downlink Bandwidth (MHz) | Te\_ |
| 0.18 | 97– TGNSS\_margin\*TS |
| Note 1: TS is the basic timing unit defined in 3GPP TS 36.211 [9] | |

TGNSS\_margin is the margin for the GNSS position definition error considered in the core requirement, which needs to be substracted for the test requirement, due to the usuage of AT commands in the test.   
TGNSS\_margin = [5.12]×TS

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for NPUSCH the UE shall, when no repetitions are configured on the uplink or the repetition period is R=1, be capable of changing the transmission timing according to the received downlink frame of the serving NB-IoT cell except when the timing advance in 3GPP TS 36.133 clause 7.22A is applied such that the UE transmission timing error shall be less than or equal to ±Te, where the timing error limit value Te is specified in table 13.4.1.2.3-1.

When no repetition period is configured, or the configured repetition period is R=1, all adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change, apart from a change of due to satellite position update and between the previous transmission and the current transmission, in one adjustment shall be 58.33\*TS seconds.



2) The minimum aggregate adjustment rate, apart from a change of due to satellite position update and between the previous transmission and the current transmission, shall be 7\*TS per 1second.



3) The maximum aggregate adjustment rate, apart from a change of due to satellite position update and between the previous transmission and the current transmission, shall be 58.33\*TS per 200ms.



when a repetition is configured on the uplink for which R>1, the UE shall not adjust the uplink transmission timing autonomously during an ongoing repetition period other than at initial transmission or at the start of a transmission segment boundary, as defined above.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 7.20A and A.13.4.1.2.

##### 13.4.1.2.4 Test description

There is one NB-IoT SAN cell (Ncell 1), which is the active cell in the test. The transmit timing is verified by the UE transmitting NPUSCH. The test consists of two subtests of Test 1 and Test 2 respectively.

During Test 1, DRX configuration is disabled. The UE transit timing offset shall be verified for the first transmission in a repetition period (R>1) for NPUSCH.

During Test 2, DRX configuration is enabled. In the on-duration part of every DRX cycle, the UE transmit timing offset shall be verified for the first transmission in a repetition period (R>1) for NPUSCH.Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The UE shall be provided with the valid information about the SAN serving cells before the test.

13.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.1.2.4.1-1.

Table 13.4.1.2.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table Annex E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: 200 KHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connection diagram is TBD.

2. The general test parameter settings are set according to Table 13.4.1.2.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.4.1.2.4.3.

5. There is one cell specified in this test. Ncell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.4.1.2.4.1-2: General Test Parameters for E-UTRAN HD-FDD UE Transmit Timing Accuracy Tests for Category NB1 UE Standalone mode under enhanced coverage for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | |
| **Test 1** | **Test 2** |
| NB-IoT Operation mode | |  | Standalone | Standalone |
| Satellite information | Config 1 |  | SSC.1 | SSC.1 |
| Config 2 |  | SSC.2 | SSC.2 |
| DRX | |  | OFF | ON |
| NPRACH configuration | |  | NPRACH.R-1  As specified in A.10.3-1 | |
| NPDCCH repetition level | |  | 32 | 32 |
| npdcch-StartSF-USS Note 2 | |  | v2 | v2 |
| npdcch-NumRepetitions-r13 Note 2 | |  | r32 | r32 |
| NPUSCH resource units | |  | 1 | 1 |
| NPUSCH repetition level | |  | 128 | 128 |
| NPUSCH subcarrier spacing | | kHz | 15 | 15 |
| NPUSCH number of subcarriers | |  | 1 | 1 |
| NPUSCH modulation | |  |  /4QPSK |  /4QPSK |
| NPUSCH Transport block size | | Bits | 40 | 40 |
| Note 1: DRX related parameters are defined in Table 13.4.1.2.5-2.  Note 2: For further information see clause 6.7.3.2 in 3GPP TS 36.331 [5]. | | | | |

13.4.1.2.4.2 Test procedure

The test consists of a single cell Ncell 1, the UE shall be fully synchronized to Ncell 1. The transmit timing accuracy is verified related to the downlink frame timing of Ncell 1. The downlink timing of Ncell 1 is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting NPUSCH used as a measurement reference facilitating the SS timing estimation.

1. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

2. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

3. Set Test 1 or Test 2 parameters according to Table 13.4.1.2.5-1 as appropriate. Propagation conditions are set according to Annex B clause B.1.

4. SS sends uplink scheduling information via NPDCCH DCI format N0 for C\_RNTI to schedule uplink subframes.

5. The UE shall transmit NPUSCH. The SS shall measure the UE transmit timing offset (n×Ts).

6. The SS verifies the transmission timing offset in a repetition period (R>1) for NPUSCH. If it’s the first transmission timing offset in the repetition period, the SS verifies that it’s within the limits specified in Table 13.4.1.2.5-3 with respect to the first detected path (in time) of the corresponding downlink frame of Ncell 1. If it’s not the first transmission timing offset in the repetition period, the SS verifies that the UE transmit timing offset doesn’t change. If UE adjusts the uplink transmission timing autonomously during an ongoing repetition period other than at initial transmission, this subtest fails, and goto step 9. For Test 2, in the on-duration part of every DRX cycle, the UE transmit timing offset in a repetition period (R>1) for NPUSCH shall be verified.

7. Using the value of n measured in step 4, the SS calculates the total adjustment value of the downlink transmit timing for the Ncell 1:

- if n < 0, by +(144 - |n|)×TS compared to that in step 4.

- if n ≥ 0, by -(144 - |n|)×TS compared to that in step 4.

8. After 16ms from the initial NPUSCH transmission in step 4, the test system adjusts the downlink transmit timing for the Ncell 1, using the value of n measured in step 4. The downlink timing adjustment is performed monotonically in multiple steps of |*∆T*| ≤ 9×TS per 256ms until the above required total timing change is achieved, during which no grant is transmitted for the UE.

9. The SS shall check that the UE first transmit timing offset in the repetition period (R>1) stays within the limits specified in Table 13.4.1.2.5-3 with respect to the first detected path (in time) of the corresponding downlink frame of Ncell 1. For Test 2, in the on-duration part of every DRX cycle, the UE transmit timing offset in a repetition period (R>1) for NPUSCH shall be verified.

10. The SS shall transmit RRCConnectionRelease-NB message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

11. After the RRC connection release, the SS:

- transmits in Ncell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5 (if the paging fails, switches off and on the UE and ensures the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5),

or

- switches off and on the UE and ensures the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

12. Repeat step 2-10 for each subtest in Table 13.4.1.2.5-1 as appropriate.

13. Repeat step 1-12 with ephemeris values for minimum Doppler, maximum positive Doppler and maximum negative Doppler replacing ephemeris in step 1 by corresponding tables in TS 36.508 [12] clause 8.4.6.2.2 for the type of satellite under test.

13.4.1.2.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 13.4.1.2.4.3-1: NPDCCH-ConfigDedicated-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.6.3, Table 8.1.6.3-3: NPDCCH-ConfigDedicated-NB-DEFAULT | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPDCCH-ConfigDedicated-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| npdcch-NumRepetitions-r13 | r32 | Set NPDCCH repetition to 32 |  |
| npdcch-StartSF-USS-r13 | V2 |  |  |
| npdcch-Offset-USS-r13 | zero |  |  |
| } |  |  |  |

Table 13.4.1.2.4.3-2: NB-IoT Physical layer parameters for DCI format N0

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.3.6, Table 8.1.3.6.1.1-1: NB-IoT Physical layer parameters for DCI format N0 | | | | |
| **Parameter** | **Value** | **Value in binary** | **Comment** | **Condition** |
| Repetition number | *7* | “111” | Set NPUSCH repetition to 128 |  |
| DCI subframe repetition number | 32 | “11” | Set NPDCCH repetition to 32 |  |

Table 13.4.1.2.4.3-3: *RRCConnectionSetup-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.6.1, Table 8.1.6.1-14: RRCConnectionSetup-NB | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionSetup-NB ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| c1 CHOICE { |  |  |  |
| rrcConnectionSetup-r13 SEQUENCE { |  |  |  |
| radioResourceConfigDedicated-r13{ |  |  |  |
| srb-ToAddModList-r13 SEQUENCE (SIZE (1)) OF SEQUENCE {} |  |  |  |
| mac-MainConfig CHOICE { | MAC-MainConfig-NB-SRB |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.4.1.2.4.3-4: MAC-MainConfig-NB-SRB

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.8.2, Table 8.1.8.2.1.5-1: MAC-MainConfig-NB-SRB | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-NB-SRB ::= SEQUENCE { |  |  |  |
| drx-Config-r13 CHOICE { |  |  |  |
| setup SEQUENCE { |  |  |  |
| onDurationTimer-r13 | pp1 |  |  |
| drx-InactivityTimer-r13 | pp0 |  |  |
| drx-RetransmissionTimer-r13 | pp0 |  |  |
| drx-Cycle-r13 | sf2048 |  |  |
| drx-StartOffset-r13 | 0 |  |  |
| drx-ULRetransmissionTimer-r13 | pp0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.4.1.2.5 Test requirement

Table 13.4.1.2.5-1: Cell specific Test Parameters for E-UTRAN HD-FDD UE Transmit Timing Accuracy Tests for Category NB1 UE Standalone mode under enhanced coverage for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | |
| **Test 1** | **Test 2** |
| RF Channel Number |  | 1 | 1 |
| BWchannel | kHz | 200 | 200 |
| NPDSCH parameter |  | R.18 HD-FDD | R.18 HD-FDD |
| NPDCCH parameter |  | R.30 HD-FDD | R.30 HD-FDD |
| NOCNG Patterns |  | NOP.3 FDD | NOP.3 FDD |
| NPBCH\_RA | dB | 0 | 0 |
| NPBCH\_RB |
| NPSS\_RA |
| NSSS\_RA |
| NPDCCH\_RA |
| NPDCCH\_RB |
| NPDSCH\_RA |
| NPDSCH\_RB |
| NOCNG\_RA Note1 |
| NOCNG\_RB Note1 |
|  | dBm/15 kHz | -88 | -88 |
|  | dB | -10.7 | -10.7 |
|  | dB | -10.7 | -10.7 |
| Antenna Configuration |  | 1x1 | 1x1 |
| Propagation condition | - | AWGN | AWGN |
| Note 1 NOCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table 13.4.1.2.5-2: drx-Configuration to be used in UE Transmit Timing Accuracy Test 2 for E-UTRAN HD-FDD Category NB1 UE Standalone mode under enhanced coverage for Satellite Access

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| **Test 2** |
| onDurationTimer | pp1 |  |
| drx-InactivityTimer | pp0 |  |
| drx-RetransmissionTimer | pp0 |  |
| longDRX-CycleStartOffset | sf2048 |  |
| shortDRX | disable |  |
| Note 1: For further information see clause 6.7.3 in TS 36.331 [5]. | | |

The UE transmit timing offset shall be within the requirements in Table 13.4.1.2.5-3.

Table 13.4.1.2.5-3: Te Timing Error Limit

|  |  |
| --- | --- |
| **Downlink Bandwidth (MHz)** | **Te\_** |
| 0.18 | (97 – TGNSS\_margin +3)\*TS |
| NOTE 1: TS is the basic timing unit defined in 3GPP TS 36.211 [9] | |

The reference point for the UE initial transmit timing control test requirement shall be the downlink timing minus .



The UE shall be capable of changing the transmission timing according to the received downlink frame. When the transmission timing error between the UE and the reference cell exceeds ±Te, the UE is required to adjust its timing to within ±Te.

If DRX configuration is enabled, the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

#### 13.4.1.3 E-UTRAN HD-FDD – UE Transmit Timing Accuracy Tests for Category NB1 UE Standalone mode under enhanced coverage with segment transmission in NGSO for Satellite Access

Editor's Note: This test case is incomplete in following aspects:

* initial conditions contains [].

##### 13.4.1.3.1 Test purpose

The purpose of this test is to verify that the Category NB1 UE, which is not supporting the capability of *ntn-SegmentedPrecompensationGaps-r17*, under enhanced coverage is capable of following the frame timing change of the connected eNode B, that the UE initial transmit timing accuracy is within the specified limits and that the UE shall not adjust the uplink transmission timing autonomously during an ongoing repetition period other than at initial transmission or at the start of a transmission segment boundary. This test will verify the requirements in TS 36.133 [4] clause 7.20A

##### 13.4.1.3.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NGSO.

##### 13.4.1.3.3 Minimum conformance requirements

The UE initial transmission timing error shall be less than or equal to ±Te where the timing error limit value Te is specified in 3GPP TS 36.133 [4] clause 7.20A and shown in Table 13.4.1.3.3-1. This requirement applies when it is the first transmission in a DRX cycle or the first transmission in a repetition period (R>1) for NPUSCH and NPRACH, the first transmission after an uplink transmission gap in a repetition period (R>1) for NPUSCH and NPRACH transmission, or it is the transmission on PUR. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the serving NB-IoT cell minus . The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the serving NB-IoT cell. *N*TA\_Ref for NPRACH is defined as 0. (in *Ts* units) for other channels is the difference between UE transmission timing and the Downlink timing immediately after when the last timing advance in 3GPP TS 36.133 clause 7.22A was applied. *N*TA\_Ref for other channels is not changed until next timing advance is received.



Table 13.4.1.3.3-1: Te Timing Error Limit

|  |  |
| --- | --- |
| Downlink Bandwidth (MHz) | Te\_ |
| 0.18 | 97– TGNSS\_margin\*TS |
| Note 1: TS is the basic timing unit defined in 3GPP TS 36.211 [9] | |

TGNSS\_margin is the margin for the GNSS position definition error considered in the core requirement, which needs to be substracted for the test requirement, due to the usuage of AT commands in the test.   
TGNSS\_margin = [5.12]×TS

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for NPUSCH the UE shall, when no repetitions are configured on the uplink or the repetition period is R=1, be capable of changing the transmission timing according to the received downlink frame of the serving NB-IoT cell except when the timing advance in 3GPP TS 36.133 clause 7.22A is applied such that the UE transmission timing error shall be less than or equal to ±Te, where the timing error limit value Te is specified in table 13.4.1.3.3-1.

When no repetition period is configured, or the configured repetition period is R=1, all adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change, apart from a change of due to satellite position update and between the previous transmission and the current transmission, in one adjustment shall be 58.33\*TS seconds.



2) The minimum aggregate adjustment rate, apart from a change of due to satellite position update and between the previous transmission and the current transmission, shall be 7\*TS per 1second.



3) The maximum aggregate adjustment rate, apart from a change of due to satellite position update and between the previous transmission and the current transmission, shall be 58.33\*TS per 200ms.



when a repetition is configured on the uplink for which R>1, the UE shall not adjust the uplink transmission timing autonomously during an ongoing repetition period other than at initial transmission or at the start of a transmission segment boundary, as defined above.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 7.20A and A.13.4.1.3.

##### 13.4.1.3.4 Test description

There is one NB-IoT SAN cell (Ncell 1), which is the active cell in the test. The transmit timing is verified by the UE transmitting NPUSCH. The UE shall be provided with the valid information about the SAN serving cells before the test.

13.4.1.3.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table Annex E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: 200 KHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connection diagram is TBD.

2. The general test parameter settings are set according to Table 13.4.1.3.4.1-1.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.4.1.3.4.3.

5. There is one cell specified in this test. Ncell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Deactivate UE prediction of satellite trajectory through any preconfigured means

Table 13.4.1.3.4.1-1: General Test Parameters for E-UTRAN HD-FDD UE Transmit Timing Accuracy Tests for Category NB1 UE Standalone mode under enhanced coverage with segment transmission in NGSO for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Commnet** |
| **Test 1** |  |
| NB-IoT Operation mode |  | Standalone |  |
| Satellite information |  | SSC.2 | For NGSO |
| DRX |  | OFF |  |
| NPRACH configuration |  | NPRACH.R-1  As specified in A.10.3-1 |  |
| NPDCCH repetition level |  | 32 |  |
| npdcch-StartSF-USS Note 2 |  | v2 |  |
| npdcch-NumRepetitions-r13 Note 2 |  | r32 |  |
| NPUSCH resource units |  | 1 |  |
| NPUSCH repetition level |  | 128 |  |
| NPUSCH subcarrier spacing | kHz | 15 |  |
| NPUSCH number of subcarriers |  | 1 |  |
| NPUSCH modulation |  |  /4QPSK |  |
| NPUSCH Transport block size | Bits | 40 |  |
| npusch-TxDuration | ms | 64 |  |
| Note 1: Void  Note 2: For further information see clause 6.7.3.2 in TS 36.331 [5]. | | | |

13.4.1.3.4.2 Test procedure

The test consists of a single cell Ncell 1, the UE shall be fully synchronized to Ncell 1. The transmit timing accuracy is verified related to the downlink frame timing of Ncell 1. The downlink timing of Ncell 1 is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting NPUSCH used as a measurement reference facilitating the SS timing estimation.

1. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

2. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

3. Set the parameters according to Table 13.4.1.3.5-1 as appropriate. Propagation conditions are set according to Annex B clause B.1.

4. SS sends uplink scheduling information via NPDCCH DCI format N0 for C\_RNTI to schedule uplink subframes.

5. The UE shall transmit NPUSCH. The SS shall measure the UE transmit timing offset (n×Ts).

6. The SS verifies NPUSCH transmission timing offset. If it’s the initial transmission or at the start of a transmission segment boundary, the SS verifies that it’s within the limits specified in Table 13.4.1.3.5-2 with respect to the first detected path (in time) of the corresponding downlink frame of Ncell 1. If it’s neither the initial transmission nor at the start of a transmission segment boundary, the SS verifies that the UE transmit timing offset doesn’t change. If UE adjusts the uplink transmission timing autonomously during an ongoing repetition period other than at initial transmission or at the start of a transmission segment boundary, this test fails.

7. Using the value of n measured in step 4, the SS calculates the total adjustment value of the downlink transmit timing for the Ncell 1:

- if n < 0, by +(144 - |n|)×TS compared to that in step 4.

- if n ≥ 0, by -(144 - |n|)×TS compared to that in step 4.

8. After 16ms from the initial NPUSCH transmission in step 4, the test system adjusts the downlink transmit timing for the Ncell 1, using the value of n measured in step 4. The downlink timing adjustment is performed monotonically in multiple steps of |*∆T*| ≤ 9×TS per 256ms until the above required total timing change is achieved, during which no grant is transmitted for the UE.

9. The SS shall check that the UE transmit timing offset at initial transmission or at the start of a transmission segment boundary, stays within the limits specified in Table 13.4.1.3.5-2 with respect to the first detected path (in time) of the corresponding downlink frame of Ncell 1.

10. Repeat steps 1-9 with ephemeris values for minimum Doppler, maximum positive Doppler and maximum negative Doppler replacing ephemeris in step 1 by corresponding tables in TS 36.508 [12] clause 8.4.6.2.2 for the type of satellite under test.

13.4.1.3.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 13.4.1.3.4.3-1: NPDCCH-ConfigDedicated-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.6.3, Table 8.1.6.3-3: NPDCCH-ConfigDedicated-NB-DEFAULT | | | |
| Information Element | Value/remark | Comment | Condition |
| NPDCCH-ConfigDedicated-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| npdcch-NumRepetitions-r13 | r32 | Set NPDCCH repetition to 32 |  |
| npdcch-StartSF-USS-r13 | V2 |  |  |
| npdcch-Offset-USS-r13 | zero |  |  |
| } |  |  |  |

Table 13.4.1.3.4.3-2: NB-IoT Physical layer parameters for DCI format N0

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.3.6, Table 8.1.3.6.1.1-1: NB-IoT Physical layer parameters for DCI format N0 | | | | |
| Parameter | Value | Value in binary | Comment | Condition |
| Repetition number | *7* | “111” | Set NPUSCH repetition to 128 |  |
| DCI subframe repetition number | 32 | “11” | Set NPDCCH repetition to 32 |  |

##### 13.4.1.3.5 Test requirement

Table 13.4.1.3.5-1: Cell specific Test Parameters for E-UTRAN HD-FDD UE Transmit Timing Accuracy Tests for Category NB1 UE Standalone mode under enhanced coverage with segment transmission in NGSO for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Commnet** |
| **Test 1** |  |
| RF Channel Number |  | 1 |  |
| BWchannel | kHz | 200 |  |
| NPDSCH parameter |  | R.18 HD-FDD |  |
| NPDCCH parameter |  | R.30 HD-FDD |  |
| NOCNG Patterns |  | NOP.3 FDD |  |
| NPBCH\_RA | dB | 0 |  |
| NPBCH\_RB |
| NPSS\_RA |
| NSSS\_RA |
| NPDCCH\_RA |
| NPDCCH\_RB |
| NPDSCH\_RA |
| NPDSCH\_RB |
| NOCNG\_RA Note1 |
| NOCNG\_RB Note1 |
|  | dBm/15 kHz | -88 |  |
|  | dB | -10.7 |  |
|  | dB | -10.7 |  |
| Antenna Configuration |  | 1x1 |  |
| Propagation condition | - | AWGN |  |
| Note 1 NOCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

The UE transmit timing offset shall be within the requirements in Table 13.4.1.3.5-2.

Table 13.4.1.3.5-2: Te Timing Error Limit

|  |  |
| --- | --- |
| Downlink Bandwidth (MHz) | Te\_ |
| 0.18 | (97– TGNSS\_margin+3)\*TS |
| NOTE 1: TS is the basic timing unit defined in 3GPP TS 36.211 [9] | |

The reference point for the UE initial transmit timing control test requirement shall be the downlink timing minus .



The UE shall be capable of changing the transmission timing according to the received downlink frame. When the transmission timing error between the UE and the reference cell exceeds ±Te, the UE is required to adjust its timing to within ±Te.

### 13.4.2 UE timing advance for satellite access

#### 13.4.2.1 HD-FDD UE Timing Advance Adjustment Accuracy Test for UE Category NB1 in Standalone Mode under Normal Coverage for Satellite Access

##### 13.4.2.1.1 Test purpose

The purpose of the test is to verify E-UTRAN Timing Advance adjustment accuracy requirements for UE category NB1 in normal coverage, defined in TS 36.133 [4] clause 7.22A.2.2, in an AWGN model.

##### 13.4.2.1.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

##### 13.4.2.1.3 Minimum conformance requirements

The timing advance is initiated from E-UTRAN with MAC message that implies and adjustment of the timing advance, see TS 36.321 [11] clause 5.2.

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to ±13.33\* TS seconds to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command is expressed in multiples of 16\* TS and is relative to the current uplink timing.

In case of random access response, an 11-bit timing advance command, *TA*, indicates *NTA* values by index values of *TA* = 0, 1, 2, ..., 1536, where an amount of the time alignment is given by *NTA* = *TA* ×16 according to 3GPP TS 36.213 [8] clause 16.1.2. *NTA* is defined in 3GPP TS 36.211 [9].

In other cases, a 6-bit timing advance command, *TA*, indicates adjustment of the current *NTA* value, *NTA,old*, to the new *NTA* value, *NTA,new*, by index values of *TA* = 0, 1, 2,..., 63, where *NTA,new* = *NTA,old* + (*TA* −31)×16 according to 3GPP TS 36.213 [8] clause 16.1.2. Here, adjustment of *NTA* value by a positive or a negative amount indicates advancing or delaying the uplink transmission timing by a given amount respectively.

For UE timers, the UE shall comply with the timer accuracies according to 3GPP TS 36.133 [4] table 7.21A.2-1. The requirements are only related to the actual timing measurements internally in the UE.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 7.22A and A.13.4.2.1.

##### 13.4.2.1.4 Test description

There is one NB-IoT SAN cell (Ncell 1), which is the active cell in the test. The test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time duration, timing advance commands are sent to the UE and the UE is scheduled in every uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

During time duration T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.5 in TS 36.321 [11]. The Timing Advance Command value shall be set to 31, which according to Clause 16.1.2 in TS 36.213 [8] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

During time duration T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table 13.4.2.1.4.1-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the NPUSCH sent from the UE.

As specified in TS 36.133 [4] clause 7.22A.2.1, the UE adjusts its uplink timing at sub-frame *n*+12 for a timing advance command received in sub-frame *n*, where sub-frame *n* refers to the last subframe in the repetition period in which the MAC control element containing timing advance command was received. In addition, the UE shall not apply a TA command during an uplink repetition period. The timing advance adjustment accuracy is verified via the uplink transmission of NPUSCH carrying ACK/NACK response to the NPDSCH carrying TA command. *k0* in ACK/NACK resource filed in DCI is set as 13.

Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The UE shall be provided with the valid information about the SAN serving cells before the test.

13.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.2.1.4.1-1.

Table 13.4.2.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table Annex E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: 200 KHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A, Figure A.18 using only main UE Tx/Rx antenna.

2. The general test parameter settings are set according to Table 13.4.2.1.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.4.2.1.4.3.

5. There is one cell specified in this test. Ncell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

8. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.4.2.1.4.1-2: General Test Parameters for HD-FDD UE Timing Advance Adjustment Accuracy Test for UE Category NB1 in Standalone Mode under Normal Coverage for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| CP Length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 |  |
| Config 2 |  | SSC.2 |  |
| Timing Advance Command (*TA*) value during T1 | |  | 31 | *NTA* = 0 for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 | |  | 39 | *NTA* = 128 |
| Number of repetitons | NPDCCH |  | 128 |  |
| NPDSCH |  | 128 |  |
| NPUSCH |  | 32 |  |
| DRX | |  | OFF |  |
| T1 | | s | 5 |  |
| T2 | | s | 5 |  |

13.4.2.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment.

1. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.
2. Set the parameters according to T1 in Tables 13.4.2.1.4.1-2. Propagation conditions are set according to Annex B clause B.1. T1 starts.
3. SS sends uplink scheduling information via NPDCCH DCI format N1 for C\_RNTI to schedule uplink subframes according to 3GPP TS 36.508 [7] clause 8.1.3.6, Table 8.1.3.6.1.2-2.
4. SS shall transmit one message with a timing advance command, TA. The timing advance command, TA, shall be set to 31 which indicate adjustment of the current NTA value. The timing advance adjustment during T1 shall be NTA = 0.
5. The UE shall transmit NPUSCH (NPUSCH Format 2 is used to carry ACK/NACK) and adjust its uplink timing at the beginning of sub-frame n+12 for a timing advance command TA received in sub-frame n. Sub-frame n is the last subframe in the repetition period of NPDSCH in which the timing advance command is received by the UE.
6. When T1 expires, the SS shall switch the timing advance command (TA) from T1 to T2 as specified in Table 13.4.2.1.5-1. T2 starts.
7. SS shall transmit a sequence of messages with timing advance command, TA. The timing advance command, TA, shall be set to 39 which indicate adjustment of the current NTA value. The timing advance adjustment during T2 shall be NTA = 128.
8. The UE shall transmit NPUSCH (NPUSCH Format 2 is used to carry ACK/NACK) and adjust its uplink timing at the beginning of sub-frame n+12 for a timing advance command TA received in sub-frame n. Sub-frame n is the last subframe in the repetition period of NPDSCH in which the timing advance command is received by the UE.
9. The result from the NPUSCH and adjustment of the timing advance in step 8) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to ±13.83 × TS to the signalled timing advance value compared to the timing of preceding uplink transmission.
10. If the UE adjust the timing of its transmission within a relative accuracy greater than or equal to ±13.83 × TS to the signalled timing advance value compared to the timing of preceding uplink transmission, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
11. The SS shall transmit RRCConnectionRelease-NB message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

12. After the RRC connection release, the SS:

- transmits in Ncell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5 (if the paging fails, switches off and on the UE and ensures the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5),

or

- switches off and on the UE and ensures the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

13.4.2.1.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 13.4.2.1.4.3-1: NPDCCH-ConfigDedicated-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.6.3, Table 8.1.6.3-3: NPDCCH-ConfigDedicated-NB-DEFAULT | | | |
| Information Element | Value/remark | Comment | Condition |
| NPDCCH-ConfigDedicated-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| npdcch-NumRepetitions-r13 | r128 |  |  |
| npdcch-StartSF-USS-r13 | V2 |  |  |
| npdcch-Offset-USS-r13 | zero |  |  |
| } |  |  |  |

Table 13.4.2.1.4.3-2: NB-IoT Physical layer parameters for DCI format N1

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Value in binary |
| Repetition number | NRep = 128 | “0111” |
| DCI subframe repetition number | R = 128 | “11” |

Table 13.4.2.1.4.3-3: NPUSCH-ConfigDedicated-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.7.3 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPUSCH-ConfigDedicated-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| ack-NACK-NumRepetitions-r13 | r32 |  |  |
| } |  |  |  |

##### 13.4.2.1.5 Test requirement

Table 13.4.2.1.5-1: Cell specific Test Parameters for HD-FDD UE Timing Advance Adjustment Accuracy Test for UE Category NB1 in Standalone Mode under Normal Coverage for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | |
| **T1** | **T2** |
| E-UTRA RF Channel Number |  | 1 | |
| BWchannel | KHz | 200 | |
| NPDSCH parameters:  DL Reference Measurement Channel defined in A.10.2.2-1 |  | R.18 HD-FDD | |
| NPDCCH parameters:  DL Reference Measurement Channel defined in A.10.1.2 |  | R.30 HD-FDD | |
| NOCNG Patterns defined in D.3.3-1 |  | NOP.3 FDD | |
| NPBCH\_RA | dB | 0 | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote1 | dB |
| NOCNG\_RBNote1 | dB |
| Timing Advance Command (*TA*) |  | 31 | 39 |
|  | dB | -12 | |
|  | dBm/15 KHz | -88 | |
|  | dB | -12 | |
| IoNote2 | dBm/ 180 KHz | -76.9 | |
| Antenna Configuration |  | 1x1 | |
| Propagation Condition |  | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Io level has been derived from other parameters for information purpose. It is not a settable parameter. | | | |

The UE shall apply the signalled Timing Advance value to the transmission timing at subframe *n*+12, where subframe *n* is the last subframe in the repetition period of NPDSCH in which the timing advance command is received by the UE.

The UE shall adjust the timing of its transmission with a relative accuracy better than or equal to ±13.83 × TS seconds to the signalled timing advance value compared to the timing of preceding uplink transmission. This requirement includes test tolerances.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

#### 13.4.2.2 HD-FDD UE Timing Advance Adjustment Accuracy Test for UE Category NB1 in Standalone Mode under Enhance Coverage for Satellite Access

##### 13.4.2.2.1 Test purpose

The purpose of the test is to verify E-UTRAN Timing Advance adjustment accuracy requirements for UE category NB1 in enhanced coverage, defined in TS 36.133 [4] clause 7.22A.2.2, in an AWGN model.

##### 13.4.2.2.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

##### 13.4.2.2.3 Minimum conformance requirements

The timing advance is initiated from E-UTRAN with MAC message that implies and adjustment of the timing advance, see TS 36.321 [11] clause 5.2.

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to ±13.33\* TS seconds to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command is expressed in multiples of 16\* TS and is relative to the current uplink timing.

In case of random access response, an 11-bit timing advance command, *TA*, indicates *NTA* values by index values of *TA* = 0, 1, 2, ..., 1536, where an amount of the time alignment is given by *NTA* = *TA* ×16 according to 3GPP TS 36.213 [8] clause 16.1.2. *NTA* is defined in 3GPP TS 36.211 [9].

In other cases, a 6-bit timing advance command, *TA*, indicates adjustment of the current *NTA* value, *NTA,old*, to the new *NTA* value, *NTA,new*, by index values of *TA* = 0, 1, 2,..., 63, where *NTA,new* = *NTA,old* + (*TA* −31)×16 according to 3GPP TS 36.213 [8] clause 16.1.2. Here, adjustment of *NTA* value by a positive or a negative amount indicates advancing or delaying the uplink transmission timing by a given amount respectively.

For UE timers, the UE shall comply with the timer accuracies according to 3GPP TS 36.133 [4] table 7.21A.2-1. The requirements are only related to the actual timing measurements internally in the UE.

The normative reference for this requirement is 3GPP TS 36.133 [4] clause 7.22A and A.13.4.2.2.

##### 13.4.2.2.4 Test description

There is one NB-IoT SAN cell (Ncell 1), which is the active cell in the test. The test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time duration, timing advance commands are sent to the UE and the UE is scheduled in every uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

During time duration T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.5 in TS 36.321 [11]. The Timing Advance Command value shall be set to 31, which according to Clause 16.1.2 in TS 36.213 [8] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

During time duration T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table 13.4.2.1.4.1-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the NPUSCH sent from the UE.

As specified in TS 36.133 [4] clause 7.22A.2.1, the UE adjusts its uplink timing at sub-frame *n*+12 for a timing advance command received in sub-frame *n*, where sub-frame *n* refers to the last subframe in the repetition period in which the MAC control element containing timing advance command was received. In addition, the UE shall not apply a TA command during an uplink repetition period. The timing advance adjustment accuracy is verified via the uplink transmission of NPUSCH carrying ACK/NACK response to the NPDSCH carrying TA command. *k0* in ACK/NACK resource filed in DCI is set as 13.

Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The UE shall be provided with the valid information about the SAN serving cells before the test.

13.4.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.2.2.4.1-1.

Table 13.4.2.2.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table Annex E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: 200 KHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A, Figure A.18 using only main UE Tx/Rx antenna.

2. The general test parameter settings are set according to Table 13.4.2.2.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.4.2.2.4.3.

5. There is one cell specified in this test. Ncell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

8. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.4.2.2.4.1-2: General Test Parameters for HD-FDD UE Timing Advance Adjustment Accuracy Test for UE Category NB1 in Standalone Mode under Enhance Coverage for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| CP Length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| Timing Advance Command (*TA*) value during T1 | |  | 31 | *NTA* = 0 for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 | |  | 39 | *NTA* = 128 |
| Number of repetitons | NPDCCH |  | 128 |  |
| NPDSCH |  | 128 |  |
| NPUSCH |  | 32 |  |
| DRX | |  | OFF |  |
| T1 | | s | 5 |  |
| T2 | | s | 5 |  |

13.4.2.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment.

1. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.
2. Set the parameters according to T1 in Tables 13.4.2.2.4.1-2. Propagation conditions are set according to Annex B clause B.1. T1 starts.
3. SS sends uplink scheduling information via NPDCCH DCI format N1 for C\_RNTI to schedule uplink subframes according to 3GPP TS 36.508 [7] clause 8.1.3.6, Table 8.1.3.6.1.2-2.
4. SS shall transmit one message with a timing advance command, TA. The timing advance command, TA, shall be set to 31 which indicate adjustment of the current NTA value. The timing advance adjustment during T1 shall be NTA = 0.
5. The UE shall transmit NPUSCH (NPUSCH Format 2 is used to carry ACK/NACK) and adjust its uplink timing at the beginning of sub-frame n+12 for a timing advance command TA received in sub-frame n. Sub-frame n is the last subframe in the repetition period of NPDSCH in which the timing advance command is received by the UE.
6. When T1 expires, the SS shall switch the timing advance command (TA) from T1 to T2 as specified in Table 13.4.2.2.5-1. T2 starts.
7. SS shall transmit a sequence of messages with timing advance command, TA. The timing advance command, TA, shall be set to 39 which indicate adjustment of the current NTA value. The timing advance adjustment during T2 shall be NTA = 128.
8. The UE shall transmit NPUSCH (NPUSCH Format 2 is used to carry ACK/NACK) and adjust its uplink timing at the beginning of sub-frame n+12 for a timing advance command TA received in sub-frame n. Sub-frame n is the last subframe in the repetition period of NPDSCH in which the timing advance command is received by the UE.
9. The result from the NPUSCH and adjustment of the timing advance in step 8) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to ±13.83 × TS to the signalled timing advance value compared to the timing of preceding uplink transmission.
10. If the UE adjust the timing of its transmission within a relative accuracy greater than or equal to ±13.83 × TS to the signalled timing advance value compared to the timing of preceding uplink transmission, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
11. The SS shall transmit RRCConnectionRelease-NB message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

12. After the RRC connection release, the SS:

- transmits in Ncell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5 (if the paging fails, switches off and on the UE and ensures the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5),

or

- switches off and on the UE and ensures the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

13.4.2.2.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 13.4.2.2.4.3-1: NPDCCH-ConfigDedicated-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.6.3, Table 8.1.6.3-3: NPDCCH-ConfigDedicated-NB-DEFAULT | | | |
| Information Element | Value/remark | Comment | Condition |
| NPDCCH-ConfigDedicated-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| npdcch-NumRepetitions-r13 | r128 |  |  |
| npdcch-StartSF-USS-r13 | V2 |  |  |
| npdcch-Offset-USS-r13 | zero |  |  |
| } |  |  |  |

Table 13.4.2.2.4.3-2: NB-IoT Physical layer parameters for DCI format N1

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Value in binary |
| Repetition number | NRep = 128 | “0111” |
| DCI subframe repetition number | R = 128 | “11” |

Table 13.4.2.2.4.3-3: NPUSCH-ConfigDedicated-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.331 clause 6.7.3 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPUSCH-ConfigDedicated-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| ack-NACK-NumRepetitions-r13 | r32 |  |  |
| } |  |  |  |

##### 13.4.2.2.5 Test requirement

Table 13.4.2.2.5-1: Cell specific Test Parameters for HD-FDD UE Timing Advance Adjustment Accuracy Test for UE Category NB1 in Standalone Mode under Enhance Coverage for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | |
| **T1** | **T2** |
| E-UTRA RF Channel Number |  | 1 | |
| BWchannel | KHz | 200 | |
| NPDSCH parameters:  DL Reference Measurement Channel defined in A.10.2.2-1 |  | R.18 HD-FDD | |
| NPDCCH parameters:  DL Reference Measurement Channel defined in A.10.1.2 |  | R.30 HD-FDD | |
| NOCNG Patterns defined in D.3.3-1 |  | NOP.3 FDD | |
| NPBCH\_RA | dB | 0 | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote1 | dB |
| NOCNG\_RBNote1 | dB |
| Timing Advance Command (*TA*) |  | 31 | 39 |
|  | dB | -12 | |
|  | dBm/15 KHz | -88 | |
|  | dB | -12 | |
| IoNote2 | dBm/ 180 KHz | -76.9 | |
| Antenna Configuration |  | 1x1 | |
| Propagation Condition |  | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Io level has been derived from other parameters for information purpose. It is not a settable parameter. | | | |

The UE shall apply the signalled Timing Advance value to the transmission timing at subframe *n*+12, where subframe *n* is the last subframe in the repetition period of NPDSCH in which the timing advance command is received by the UE.

The UE shall adjust the timing of its transmission with a relative accuracy better than or equal to ±13.83 × TS seconds to the signalled timing advance value compared to the timing of preceding uplink transmission. This requirement includes test tolerances.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

### 13.4.3 Radio Link Monitoring for satellite access

#### 13.4.3.1 HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE Category NB1 Standalone mode in Normal Coverage

##### 13.4.3.1.1 Test purpose

The purpose of this test is to verify that the HD-FDD category NB1 UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell. This test will partly verify the NB-IoT HD-FDD radio link monitoring requirements in TS 36.133 [4] clause 7.23A.

##### 13.4.3.1.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

##### 13.4.3.1.3 Minimum conformance requirements

When DRX is used for Category NB1 UEs, the Qout\_NB-IoT evaluation period (TEvaluate\_Qout\_DRX\_NB-IoT) and the Qin\_NB-IoT evaluation period (TEvaluate\_Qin\_DRX\_NB-IoT) is specified in Table 13.4.3.1.3-1 will be used.

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qout\_DRX\_NB-IoT [s] period becomes worse than the threshold Qout\_NB-IoT, Layer 1 of the UE shall send out-of-sync indication for the NB-IoT cell to the higher layers within TEvaluate\_Qout\_DRX\_NB-IoT [s] evaluation period. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 36.331 [5].

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qin\_DRX\_NB-IoT [s] period becomes better than the threshold Qin\_NB-IoT, Layer 1 of the UE shall send in-sync indications for the NB-IoT cell to the higher layers within TEvaluate\_Qin\_DRX\_NB-IoT [s] evaluation period. A L3 filter shall be applied to the in-sync indications as specified in TS 36.331 [5].

The out-of-sync and in-sync evaluations of the NB-IoT cell shall be performed as specified in clause 4.2.1 in TS 36.213 [8]. Two successive indications from Layer 1 shall be separated by at least max (10ms, DRX\_cycle\_length).

Upon start of T310 timer as specified in clause 5.3.11 in TS 36.331 [5], the UE shall monitor the link for recovery using the evaluation period and Layer 1 indication interval corresponding to the non-DRX mode until the expiry or stop of T310 timer.

The transmitter power of the UE shall be turned off within 40 ms after expiry of T310 timer as specified in clause 5.3.11 in TS 36.331 [5].

Table 13.4.3.1.3-1 Qout and Qin Evaluation Period in DRX for Category NB1 UE

|  |  |  |
| --- | --- | --- |
| **DRX cycle length (s)** | **TEvaluate\_Qout\_DRX\_NB-IoT and TEvaluate\_Qin\_DRX\_NB-IoT (s)** | |
| **DRX cycles for Rmax ≤ 64** | **DRX cycles for Rmax > 64** |
| 0.256 < DRX cycle ≤ 1.024 | Note 1 (20) | Note 1 (40) |
| 1.024 < DRX cycle ≤ 3.072 | Note 1 (10) | Note 1 (20) |
| 4.096 < DRX cycle ≤ 10.24 | Note 1 (5) | Note 1 (10) |
| Note 1: Evaluation period length in time depends on the length of the DRX cycle in use | | |

The normative reference for this requirement is 3GPP TS 36.133 [4] clauses 7.23A.2 and A.13.4.3.1.

##### 13.4.3.1.4 Test description

There is one NB-IoT SAN cell (Ncell 1), which is the active cell in the test. The test consists of four successive time periods with time duration of T1, T2, T3 and T4 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure 13.4.3.1.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync state. Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync requirements can be measured.

The test setup in each test during time durations T1, T2, T3 and T4 are as follows:

- Starting at point A, the SNR is decreased in small steps from SNR1 to SNR2 within dT

- At the start of the time duration T2, the UE is provided with a UL grant with NPDCCH

NOTE 1: The UE is expected to decode the NPDCCH and complete the UL transmission during T2 according to the UL grant. The UE shall not be provisioned with any more UL grants until the start of time period T4.

- Starting at point B, the SNR is decreased in small steps from SNR2 to SNR3 within dT

- During T3, the SNR is kept as SNR3

NOTE 2: The UE is expected to detect OOS and declare RLF during T3.

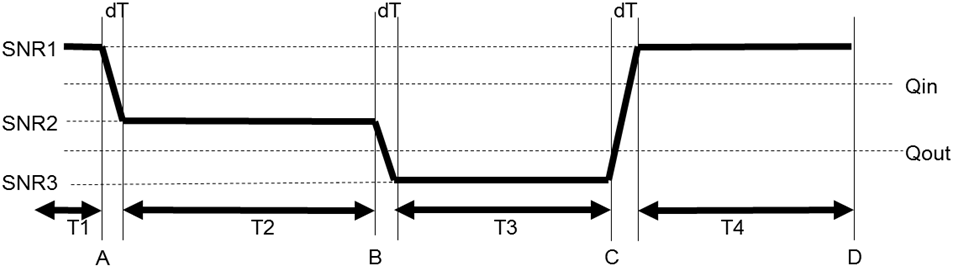
- Starting at point C, the SNR is increased in small steps from SNR3 to SNR1 with dT

- At the start of the time duration T4, the UE will be provided with another UL grant with NPDCCH

NOTE 3: The UE is not expected to decode the UL grant and conduct any UL transmission during T4, since the UE is expected to declare RLF during T3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e., UE tries to decode the NPDCCH and complete the UL transmission when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The UE shall be provided with the valid information about the SAN serving cells before the test.



**Figure 13.4.3.1.4-1: SNR variation for out-of-sync testing**

13.4.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.3.1.4.1-1.

Table 13.4.3.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and TS 36.508 [7] clauses 8.1.4.2 and 8.1.3.1.

Channel Bandwidth to be tested: 200kHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A, Figure A.18 using only main UE Tx/Rx antenna.

2. The general test parameter settings are set up according to Table 13.4.3.1.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.4.3.1.4.3.

5. There is one cell specified in this test. Ncell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

8. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.4.3.1.4.1-2: General test parameters for HD-FDD Radio Link Monitoring Test for out-of-sync in DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Deployment Mode | |  | Standalone |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| NPDCCH transmission parameters Rmax | |  | 8 | Other NPDCCH parameters are defined in “ out-of-sync” column in TS 36.133 [4] Table 7.23A.2-1 |
| DRX cycle | | ms | 256 | See Table 13.4.3.1.5-2 |
| Layer 3 filtering Note 2,3 | |  | Enabled | Counters:  N310 = 1  N311 = 1 |
| T310 timer Note 2,3 | | ms | 0 | T310 is disabled |
| T311 timer Note 2,3 | | ms | 1000 | T311 is enabled |
| T1 | | s | 5.12 |  |
| dT | | S | 0.8 |  |
| T2 | | s | 10.24 |  |
| dT | | S | 0.7 |  |
| T3 | | s | 5.12 |  |
| dT | | S | 1.4 |  |
| T4 | | s | 5.12 |  |
| Note 1: NPDCCH corresponding to the out of sync transmission parameters need not be included in the Reference Measurement Channel.  Note 2: N310, N311, T310 and T311 are defined in TS 36.331 [5].  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | |

13.4.3.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment.

1. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

2. Set the parameters according to T1 in Table 13.4.3.1.4.1-2. Propagation conditions are set according to Annex B clause B.1. T1 starts.

3. When T1 expires, the 1st time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.1.5-1.

4. When dT expires the SS shall keep the SNR value corresponding to T2 as specified in Table 13.4.3.1.4.1-2. T2 starts.

5. At the start of T2 the UE shall be provided with a UL grant on NPDCCH. The UE shall decode NPDCCH and complete the UL transmission, according to the UL grant, before T2 expires. If the UL transmission is not completed, the number of failed tests is increased by one. If so, restart test from step 1. No more UL grants are given until start of T4.

6. When T2 expires, the 2nd time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.1.5-1.

7. When dT expires the SS shall keep the SNR value corresponding to T3 as specified in Table 13.4.3.1.4.1-2. T3 starts.

8. During T3 the UE is expected to detect OOS and declare RLM.

9. When T3 expires, the 3rd time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.1.5-1.

10. When dT expires the SS shall keep the SNR value corresponding to T4 as specified in Table 13.4.3.1.4.1-2. T4 starts.

11. At the start of T4 the UE shall be provided with another UL grant on NPDCCH. If the SS detects uplink power equal to or higher than -48.5dBm in the On-duration part of every DRX cycle in the uplink subframe scheduled to transmit NPUSCH during the period T4 the number of failed tests is increased by one.

Otherwise, the number of successful tests is increased by one.

12. After T4 expires the UE is switched off and then on. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

13. Repeat steps 2-12 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

13.4.3.1.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 13.4.3.1.4.3-1: *SystemInformationBlockType2-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.4.3.3, Table 8.1.4.3.3-1 SystemInformationBlockType2-NB | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2-NB-r13 ::= SEQUENCE { |  |  |  |
| ue-TimersAndConstants-r13 SEQUENCE { |  |  |  |
| t310-r13 | ms0 |  |  |
| n310-r13 | n1 |  |  |
| t311-r13 | ms1000 |  |  |
| n311-r13 | n1 |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.4.3.1.4.3-2: *RRCConnectionSetup-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.6.1, Table 8.1.6.1-14: RRCConnectionSetup-NB | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionSetup-NB ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| c1 CHOICE { |  |  |  |
| rrcConnectionSetup-r13 SEQUENCE { |  |  |  |
| radioResourceConfigDedicated-r13{ |  |  |  |
| srb-ToAddModList-r13 SEQUENCE (SIZE (1)) OF SEQUENCE {} |  |  |  |
| mac-MainConfig CHOICE { | MAC-MainConfig-NB-SRB |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.4.3.1.4.3-3: MAC-MainConfig-NB-SRB

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.8.2, Table 8.1.8.2.1.5-1: MAC-MainConfig-NB-SRB | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-NB-SRB ::= SEQUENCE { |  |  |  |
| drx-Config-r13 CHOICE { |  |  |  |
| setup SEQUENCE { |  |  |  |
| onDurationTimer-r13 | pp1 |  |  |
| drx-InactivityTimer-r13 | pp0 |  |  |
| drx-RetransmissionTimer-r13 | pp0 |  |  |
| drx-Cycle-r13 | sf256 |  |  |
| drx-StartOffset-r13 | 0 |  |  |
| drx-ULRetransmissionTimer-r13 | pp0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.4.3.1.5 Test requirement

Table 13.4.3.1.5-1: nCell1 specific test parameters for HD-FDD Radio Link Monitoring Test for out-of-sync in DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** | **dT** | **T4** |
| BWchannel | kHz | 200 | | | | | | |
| OCNG Pattern as defined in D.3.3 Note 1 |  | NOP.3 FDD | | | | | | |
| NPDCCH parameters as defined in A.10.1.2 |  | R.30 HD-FDD | | | | | | |
| NPBCH\_RA | dB | 0 | | | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | -98 | | | | | | |
| SNR Note 4, 5 | dB | -2.8 | Note 6 | -8.8 | Note 7 | -14.4 | Note 8 | -2.8 |
| Propagation condition |  | AWGN | | | | | | |
| Antenna Configuration |  | 1x1 | | | | | | |
| Note 1: OCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Void  Note 3: Void  Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 5: The SNRs in time periods T1, T2, T3 and T4 are denoted as SNR1, SNR2, SNR3 and SNR1 respectively in figure 13.4.3.1.4-1.  Note 6: The Test system shall reduce its transmit power in steps of ((SNR2-SNR1) / (10\*dT)) dB every 100ms until SNR2 is achieved at the end of dT.  Note 7: The Test system shall reduce its transmit power in steps of ((SNR3-SNR2) / (10\*dT)) dB every 100ms until SNR3 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of ((SNR1-SNR3) / (10\*dT)) dB every 100ms until SNR1 is achieved at the end of dT. | | | | | | | | |

Table 13.4.3.1.5-2: DRX-Configuration for HD-FDD Radio Link Monitoring Test for out-of-sync in DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| onDurationTimer | pp1 | As specified in clause 6.7.3 in TS 36.331 [5] |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| drx-StartOffset | 0 |

Table 13.4.3.1.5-3: *TimeAlignmentTimer* -Configuration for HD-FDD Radio Link Monitoring Test for out-of-sync in DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 [5] |

The UE behaviours in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T2 according to the received UL grant.

- The UE shall not conduct any NPUSCH transmission during T4.

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

#### 13.4.3.2 HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE Category NB1 Standalone mode in Enhanced Coverage

##### 13.4.3.2.1 Test purpose

The purpose of this test is to verify that the HD-FDD category NB1 UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell. This test will partly verify the NB-IoT HD-FDD radio link monitoring requirements in TS 36.133 [4] clause 7.23A.

##### 13.4.3.2.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

##### 13.4.3.2.3 Minimum conformance requirements

When DRX is used for Category NB1 UEs, the Qout\_NB-IoT evaluation period (TEvaluate\_Qout\_DRX\_NB-IoT) and the Qin\_NB-IoT evaluation period (TEvaluate\_Qin\_DRX\_NB-IoT) is specified in Table 13.4.3.2.3-1 will be used.

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qout\_DRX\_NB-IoT [s] period becomes worse than the threshold Qout\_NB-IoT, Layer 1 of the UE shall send out-of-sync indication for the NB-IoT cell to the higher layers within TEvaluate\_Qout\_DRX\_NB-IoT [s] evaluation period. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 36.331 [5].

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qin\_DRX\_NB-IoT [s] period becomes better than the threshold Qin\_NB-IoT, Layer 1 of the UE shall send in-sync indications for the NB-IoT cell to the higher layers within TEvaluate\_Qin\_DRX\_NB-IoT [s] evaluation period. A L3 filter shall be applied to the in-sync indications as specified in TS 36.331 [5].

The out-of-sync and in-sync evaluations of the NB-IoT cell shall be performed as specified in clause 4.2.1 in TS 36.213 [8]. Two successive indications from Layer 1 shall be separated by at least max (10ms, DRX\_cycle\_length).

Upon start of T310 timer as specified in clause 5.3.11 in TS 36.331 [5], the UE shall monitor the link for recovery using the evaluation period and Layer 1 indication interval corresponding to the non-DRX mode until the expiry or stop of T310 timer.

The transmitter power of the UE shall be turned off within 40 ms after expiry of T310 timer as specified in clause 5.3.11 in TS 36.331 [5].

Table 13.4.3.2.3-1 Qout and Qin Evaluation Period in DRX for Category NB1 UE

|  |  |  |
| --- | --- | --- |
| **DRX cycle length (s)** | **TEvaluate\_Qout\_DRX\_NB-IoT and TEvaluate\_Qin\_DRX\_NB-IoT (s)** | |
| **DRX cycles for Rmax ≤ 64** | **DRX cycles for Rmax > 64** |
| 0.256 < DRX cycle ≤ 1.024 | Note 1 (20) | Note 1 (40) |
| 1.024 < DRX cycle ≤ 3.072 | Note 1 (10) | Note 1 (20) |
| 4.096 < DRX cycle ≤ 10.24 | Note 1 (5) | Note 1 (10) |
| Note 1: Evaluation period length in time depends on the length of the DRX cycle in use | | |

The normative reference for this requirement is 3GPP TS 36.133 [4] clauses 7.23A.2 and A.13.4.3.1.

##### 13.4.3.2.4 Test description

There is one NB-IoT SAN cell (Ncell 1), which is the active cell in the test. The test consists of four successive time periods with time duration of T1, T2, T3 and T4 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure 13.4.3.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync state. Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync requirements can be measured.

The test setup in each test during time durations T1, T2, T3 and T4 are as follows:

- Starting at point A, the SNR is decreased in small steps from SNR1 to SNR2 within dT

- At the start of the time duration T2, the UE is provided with a UL grant with NPDCCH

NOTE 1: The UE is expected to decode the NPDCCH and complete the UL transmission during T2 according to the UL grant. The UE shall not be provisioned with any more UL grants until the start of time period T4.

- Starting at point B, the SNR is decreased in small steps from SNR2 to SNR3 within dT

- During T3, the SNR is kept as SNR3

NOTE 2: The UE is expected to detect OOS and declare RLF during T3.

- Starting at point C, the SNR is increased in small steps from SNR3 to SNR1 with dT

- At the start of the time duration T4, the UE will be provided with another UL grant with NPDCCH

NOTE 3: The UE is not expected to decode the UL grant and conduct any UL transmission during T4, since the UE is expected to declare RLF during T3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e., UE tries to decode the NPDCCH and complete the UL transmission when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The UE shall be provided with the valid information about the SAN serving cells before the test.

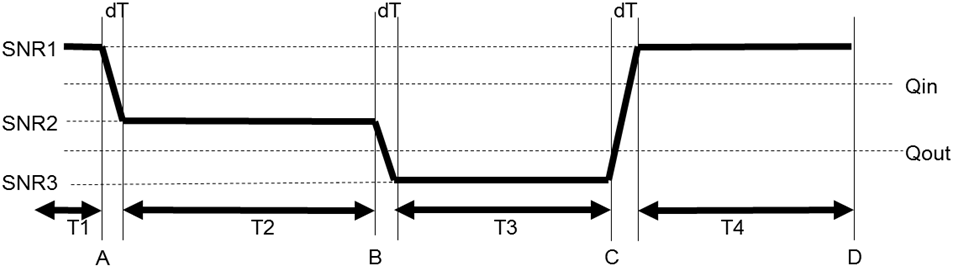


Figure 13.4.3.2.4-1: SNR variation for out-of-sync testing

13.4.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.3.2.4.1-1.

Table 13.4.3.2.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and TS 36.508 [7] clauses 8.1.4.2 and 8.1.3.1.

Channel Bandwidth to be tested: 200kHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A, Figure A.18 using only main UE Tx/Rx antenna.

2. The general test parameter settings are set up according to Table 13.4.3.2.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.4.3.2.4.3.

5. There is one cell specified in this test. Ncell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

8. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.4.3.2.4.1-2: General test parameters for HD-FDD Radio Link Monitoring Test for out-of-sync in DRX for UE Category NB1 Standalone mode in enhanced coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| Deployment Mode | |  | Standalone |  |
| NPDCCH transmission parameters Rmax | |  | 16 | Other NPDCCH parameters are defined in “ out-of-sync” column in TS 36.133 [4] Table 7.23A.2-1 |
| DRX cycle | | ms | 256 | See Table 13.4.3.2.5-2 |
| Layer 3 filtering Note 2,3 | |  | Enabled | Counters:  N310 = 1  N311 = 1 |
| T310 timer Note 2,3 | | ms | 0 | T310 is disabled |
| T311 timer Note 2,3 | | ms | 1000 | T311 is enabled |
| T1 | | s | 5.12 |  |
| dT | | s | 0.7 |  |
| T2 | | s | 10.24 |  |
| dT | | s | 0.8 |  |
| T3 | | s | 5.12 |  |
| dT | | s | 1.4 |  |
| T4 | | s | 5.12 |  |
| Note 1: NPDCCH corresponding to the out of sync transmission parameters need not be included in the Reference Measurement Channel.  Note 2: N310, N311, T310 and T311 are defined in TS 36.331 [5].  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | |

13.4.3.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment.

1. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

2. Set the parameters according to T1 in Table 13.4.3.2.4.1-2. Propagation conditions are set according to Annex B clause B.1. T1 starts.

3. When T1 expires, the 1st time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.2.5-1.

4. When dT expires the SS shall keep the SNR value corresponding to T2 as specified in Table 13.4.3.2.4.1-2. T2 starts.

5. At the start of T2 the UE shall be provided with a UL grant on NPDCCH. The UE shall decode NPDCCH and complete the UL transmission, according to the UL grant, before T2 expires. If the UL transmission is not completed, the number of failed tests is increased by one. If so, restart test from step 1. No more UL grants are given until start of T4.

6. When T2 expires, the 2nd time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.2.5-1.

7. When dT expires the SS shall keep the SNR value corresponding to T3 as specified in Table 13.4.3.2.4.1-2. T3 starts.

8. During T3 the UE is expected to detect OOS and declare RLM.

9. When T3 expires, the 3rd time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.2.5-1.

10. When dT expires the SS shall keep the SNR value corresponding to T4 as specified in Table 13.4.3.2.4.1-2. T4 starts.

11. At the start of T4 the UE shall be provided with another UL grant on NPDCCH. If the SS detects uplink power equal to or higher than -48.5dBm in the On-duration part of every DRX cycle in the uplink subframe scheduled to transmit NPUSCH during the period T4 the number of failed tests is increased by one.

Otherwise, the number of successful tests is increased by one.

12. After T4 expires the UE is switched off and then on. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

13. Repeat steps 2-12 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

13.4.3.2.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 13.4.3.2.4.3-1: *SystemInformationBlockType2-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.4.3.3, Table 8.1.4.3.3-1 SystemInformationBlockType2-NB | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2-NB-r13 ::= SEQUENCE { |  |  |  |
| ue-TimersAndConstants-r13 SEQUENCE { |  |  |  |
| t310-r13 | ms0 |  |  |
| n310-r13 | n1 |  |  |
| t311-r13 | ms1000 |  |  |
| n311-r13 | n1 |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.4.3.2.4.3-2: *RRCConnectionSetup-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.6.1, Table 8.1.6.1-14: RRCConnectionSetup-NB | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionSetup-NB ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| c1 CHOICE { |  |  |  |
| rrcConnectionSetup-r13 SEQUENCE { |  |  |  |
| radioResourceConfigDedicated-r13{ |  |  |  |
| srb-ToAddModList-r13 SEQUENCE (SIZE (1)) OF SEQUENCE {} |  |  |  |
| mac-MainConfig CHOICE { | MAC-MainConfig-NB-SRB |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.4.3.2.4.3-3: MAC-MainConfig-NB-SRB

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.8.2, Table 8.1.8.2.1.5-1: MAC-MainConfig-NB-SRB | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-NB-SRB ::= SEQUENCE { |  |  |  |
| drx-Config-r13 CHOICE { |  |  |  |
| setup SEQUENCE { |  |  |  |
| onDurationTimer-r13 | pp1 |  |  |
| drx-InactivityTimer-r13 | pp0 |  |  |
| drx-RetransmissionTimer-r13 | pp0 |  |  |
| drx-Cycle-r13 | sf256 |  |  |
| drx-StartOffset-r13 | 0 |  |  |
| drx-ULRetransmissionTimer-r13 | pp0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.4.3.2.5 Test requirement

Table 13.4.3.2.5-1: nCell1 specific test parameters for HD-FDD Radio Link Monitoring Test for out-of-sync in DRX for UE Category NB1 Standalone mode in enhanced coverage

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** | **dT** | **T4** |
| BWchannel | kHz | 200 | | | | | | |
| OCNG Pattern as defined in D.3.3 Note 1 |  | NOP.3 FDD | | | | | | |
| NPDCCH parameters as defined in A.10.1.2 |  | R.30 HD-FDD | | | | | | |
| NPBCH\_RA | dB | 0 | | | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | -98 | | | | | | |
| SNR Note 4, 5 | dB | -5.9 | Note 6 | -11.1 | Note 7 | -17.7 | Note 8 | -5.9 |
| Propagation condition |  | AWGN | | | | | | |
| Antenna Configuration |  | 1x1 | | | | | | |
| Note 1: OCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Void  Note 3: Void  Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 5: The SNRs in time periods T1, T2, T3 and T4 are denoted as SNR1, SNR2, SNR3 and SNR1 respectively in figure 13.4.3.2.4-1.  Note 6: The Test system shall reduce its transmit power in steps of ((SNR2-SNR1) / (10\*dT)) dB every 100ms until SNR2 is achieved at the end of dT.  Note 7: The Test system shall reduce its transmit power in steps of ((SNR3-SNR2) / (10\*dT)) dB every 100ms until SNR3 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of ((SNR1-SNR3) / (10\*dT)) dB every 100ms until SNR1 is achieved at the end of dT. | | | | | | | | |

Table 13.4.3.2.5-2: DRX-Configuration for HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 Standalone mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| onDurationTimer | pp1 | As specified in clause 6.7.3 in TS 36.331 [5] |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| drx-StartOffset | 0 |

Table 13.4.3.2.5-3: *TimeAlignmentTimer* -Configuration for HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 Standalone mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 [5] |

The UE behaviours in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T2 according to the received UL grant.

- The UE shall not conduct any NPUSCH transmission during T4.

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

#### 13.4.3.3 HD-FDD Radio Link Monitoring Test for In-sync with DRX for UE sCategory NB1 Standalone mode in Enhanced Coverage

##### 13.4.3.3.1 Test purpose

The purpose of this test is to verify that the HD-FDD category NB1 UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell. This test will partly verify the NB-IoT HD-FDD radio link monitoring requirements in TS 36.133 [4] clause 7.23A.

##### 13.4.3.3.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

##### 13.4.3.3.3 Minimum conformance requirements

When DRX is used for Category NB1 UEs, the Qout\_NB-IoT evaluation period (TEvaluate\_Qout\_DRX\_NB-IoT) and the Qin\_NB-IoT evaluation period (TEvaluate\_Qin\_DRX\_NB-IoT) is specified in Table 13.4.3.3.3-1 will be used.

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qout\_DRX\_NB-IoT [s] period becomes worse than the threshold Qout\_NB-IoT, Layer 1 of the UE shall send out-of-sync indication for the NB-IoT cell to the higher layers within TEvaluate\_Qout\_DRX\_NB-IoT [s] evaluation period. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 36.331 [5].

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qin\_DRX\_NB-IoT [s] period becomes better than the threshold Qin\_NB-IoT, Layer 1 of the UE shall send in-sync indications for the NB-IoT cell to the higher layers within TEvaluate\_Qin\_DRX\_NB-IoT [s] evaluation period. A L3 filter shall be applied to the in-sync indications as specified in TS 36.331 [5].

The out-of-sync and in-sync evaluations of the NB-IoT cell shall be performed as specified in clause 4.2.1 in TS 36.213 [8]. Two successive indications from Layer 1 shall be separated by at least max (10ms, DRX\_cycle\_length).

Upon start of T310 timer as specified in clause 5.3.11 in TS 36.331 [5], the UE shall monitor the link for recovery using the evaluation period and Layer 1 indication interval corresponding to the non-DRX mode until the expiry or stop of T310 timer.

The transmitter power of the UE shall be turned off within 40 ms after expiry of T310 timer as specified in clause 5.3.11 in TS 36.331 [5].

Table 13.4.3.3.3-1 Qout and Qin Evaluation Period in DRX for Category NB1 UE

|  |  |  |
| --- | --- | --- |
| **DRX cycle length (s)** | **TEvaluate\_Qout\_DRX\_NB-IoT and TEvaluate\_Qin\_DRX\_NB-IoT (s)** | |
| **DRX cycles for Rmax ≤ 64** | **DRX cycles for Rmax > 64** |
| 0.256 < DRX cycle ≤ 1.024 | Note 1 (20) | Note 1 (40) |
| 1.024 < DRX cycle ≤ 3.072 | Note 1 (10) | Note 1 (20) |
| 4.096 < DRX cycle ≤ 10.24 | Note 1 (5) | Note 1 (10) |
| Note 1: Evaluation period length in time depends on the length of the DRX cycle in use | | |

The normative reference for this requirement is 3GPP TS 36.133 [4] clauses 7.23A.2 and A.13.4.3.3.

##### 13.4.3.3.4 Test description

There is one NB-IoT SAN cell (Ncell 1), which is the active cell in the test. The test consists of three successive time periods with time duration of T1, T2 and T3 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure 13.4.3.3.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync and in-sync requirements can be measured.

The test setup in each test during time durations T1, T2 and T3 are as follows:

- During the period from time point A to time point B, the SNR is decreasing linearly from SNR1 to SNR2.

- During the period from time point C to time point D, the SNR is increasing linearly from SNR2 to SNR1.

- During the period T3, the test system shall send the UE a grant to transmit in uplink. UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. During the period from time point A to time point D, the UE shall not be provisioned with any UL grant.

- Thereafter UE switches back to downlink.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e., UE tries to decode the NPDCCH and complete the UL transmission when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

In each run of the test, the test equipment selects NPDCCH repetition level, and sends the RRC configuration to the UE. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

The UE shall be provided with the valid information about the SAN serving cells before the test.



Figure 13.4.3.3.4-1: SNR variation for in-sync testing

13.4.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.3.3.4.1-1.

Table 13.4.3.3.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and TS 36.508 [7] clauses 8.1.4.2 and 8.1.3.1.

Channel Bandwidth to be tested: 200kHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A, Figure A.18 using only main UE Tx/Rx antenna.

2. The general test parameter settings are set up according to Table 13.4.3.3.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.4.3.3.4.3.

5. There is one cell specified in this test. Ncell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

8. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.4.3.3.4.1-2: General test parameters for HD-FDD Radio Link Monitoring Test for in-sync with DRX for UE Category NB1 Standalone mode in enhanced coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| In sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [32] |
| Number of OFDM symbols for legacy control channels |  | 3 | In sync threshold Qin\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in TS 36.133 [4] clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 4 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to NRS EPRE |  | 0 |
| Out of sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212[32] |
| Number of OFDM symbols for legacy control channels |  | 3 | Out of sync threshold Qout\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in TS 36.133 [4] clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 16 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to RS EPRE | dB | 0 |
| DRX cycle | | ms | 256 | See Table 13.4.3.3.5-2 |
| Layer 3 filtering | |  | Enabled | Counters:  N310 = 1; N311 = 1 |
| T310 timer | | ms | 4000 | T310 is enabled |
| T311 timer | | ms | 1000 | T311 is enabled |
| T1 | | s | 4 |  |
| dT | | s | 1.4 |  |
| T2 | | s | 1.96 |  |
| dT | | s | 1.4 |  |
| T3 | | s | 4 |  |
| Note 1: NPDCCH corresponding to the in-sync and out of sync transmission parameters need not be included in the Reference Measurement Channel. | | | | |

13.4.3.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully be synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment.

1. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

2. Set the parameters according to T1 in Table 13.4.3.3.4.1-2. Propagation conditions are set according to Annex B clause B.1. T1 starts.

3. When T1 expires, the 1st time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.3.5-1.

4. When dT expires the SS shall keep the SNR value corresponding to T2 as specified in Table 13.4.3.3.4.1-2. T2 starts.

5. When T2 expires, the 2nd time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.3.5-1.

6. When dT expires the SS shall keep the SNR value corresponding to T3 as specified in Table 13.4.3.3.4.1-2. T3 starts.

7. During T3 the SS shall send the UE continuous grants to transmit on the uplink. The UE is expected to decode the uplink grant, switch to uplink, and complete the corresponding uplink transmission. If the SS detects uplink transmissions from the UE according to the subframes scheduled for NPUSCH transmission by the uplink grant, during the period from time point D until T3 expires, the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

13.4.3.3.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 13.4.3.3.4.3-1: SystemInformationBlockType2-NB

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.4.3.3, Table 8.1.4.3.3-1 SystemInformationBlockType2-NB1 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2-NB-r13 ::= SEQUENCE { |  |  |  |
| ue-TimersAndConstants-r13 SEQUENCE { |  |  |  |
| t310-r13 | ms4000 |  |  |
| n310-r13 | n1 |  |  |
| t311-r13 | ms1000 |  |  |
| n311-r13 | n1 |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.4.3.3.4.3-2: *RRCConnectionSetup-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.6.1, Table 8.1.6.1-14: RRCConnectionSetup-NB | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionSetup-NB ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| c1 CHOICE { |  |  |  |
| rrcConnectionSetup-r13 SEQUENCE { |  |  |  |
| radioResourceConfigDedicated-r13{ |  |  |  |
| srb-ToAddModList-r13 SEQUENCE (SIZE (1)) OF SEQUENCE {} |  |  |  |
| mac-MainConfig CHOICE { | MAC-MainConfig-NB-SRB |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.4.3.3.4.3-3: MAC-MainConfig-NB-SRB

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.8.2, Table 8.1.8.2.1.5-1: MAC-MainConfig-NB-SRB | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-NB-SRB ::= SEQUENCE { |  |  |  |
| drx-Config-r13 CHOICE { |  |  |  |
| setup SEQUENCE { |  |  |  |
| onDurationTimer-r13 | pp1 |  |  |
| drx-InactivityTimer-r13 | pp0 |  |  |
| drx-RetransmissionTimer-r13 | pp0 |  |  |
| drx-Cycle-r13 | sf256 |  |  |
| drx-StartOffset-r13 | 0 |  |  |
| drx-ULRetransmissionTimer-r13 | pp0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.4.3.3.5 Test requirement

Table 13.4.3.3.5-1: nCell1 specific test parameters for HD-FDD Radio Link Monitoring Test for in-sync with DRX for UE Category NB1 Standalone mode in enhanced coverage

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** |
| BWchannel | kHz | 200 | | | | |
| OCNG Pattern as defined in D.3.3 Note 1 |  | NOP.3 FDD | | | | |
| NPDCCH parameters defined in A.10.1.2 |  | R.30 HD-FDD | | | | |
| Ratio of NPDSCH to NRS EPRE | dB | 0 | | | | |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPBCH\_RA | dB |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NOCNG\_RANote1 | dB |
| NOCNG\_RBNote1 | dB |
|  | dBm/15 kHz | -98 | | | | |
| SNR Note 5, Note 6 | dB | -5.9 | Note 7 | -17.7 | Note 8 | -5.9 |
| Propagation condition |  | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | |
| Note 1: OCNG shall be used such that the resources in ncell1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CQI reporting are assigned to the UE prior to the start of time period T1.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 4: The signal contains NPDCCH for UEs other than the device under test as part of OCNG.  Note 5: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 6: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2, and SNR1 respectively in figure 13.4.3.3.4-1.  Note 7: The Test system shall reduce its transmit power in steps of (((SNR2-SNR1) / (10\*dT)) dB every 100ms till SNR2 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of (((SNR1-SNR2) / (10\*dT)) dB every 100ms till SNR1 is achieved at the end of dT. | | | | | | |

Table 13.4.3.3.5-2: DRX-Configuration for HD-FDD Radio Link Monitoring Test for in-sync with DRX for UE Category NB1 Standalone mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| onDurationTimer | pp1 | As specified in clause 6.7.3 in TS 36.331 [5] |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| drx-StartOffset | 0 |

Table 13.4.3.3.5-3: *TimeAlignmentTimer* -Configuration for HD-FDD Radio Link Monitoring Test for in-sync with DRX for UE Category NB1 Standalone mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 [5] |

The UE behaviours in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T3 according to the received UL grant.

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

#### 13.4.3.4 HD-FDD Radio Link Monitoring Test for In-sync with DRX for UE Category NB1 Standalone mode in Normal Coverage

##### 13.4.3.4.1 Test purpose

The purpose of this test is to verify that the HD-FDD category NB1 UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell. This test will partly verify the NB-IoT HD-FDD radio link monitoring requirements in TS 36.133 [4] clause 7.23A.

##### 13.4.3.4.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

##### 13.4.3.4.3 Minimum conformance requirements

When DRX is used for Category NB1 UEs, the Qout\_NB-IoT evaluation period (TEvaluate\_Qout\_DRX\_NB-IoT) and the Qin\_NB-IoT evaluation period (TEvaluate\_Qin\_DRX\_NB-IoT) is specified in Table 13.4.3.4.3-1 will be used.

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qout\_DRX\_NB-IoT [s] period becomes worse than the threshold Qout\_NB-IoT, Layer 1 of the UE shall send out-of-sync indication for the NB-IoT cell to the higher layers within TEvaluate\_Qout\_DRX\_NB-IoT [s] evaluation period. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 36.331 [5].

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qin\_DRX\_NB-IoT [s] period becomes better than the threshold Qin\_NB-IoT, Layer 1 of the UE shall send in-sync indications for the NB-IoT cell to the higher layers within TEvaluate\_Qin\_DRX\_NB-IoT [s] evaluation period. A L3 filter shall be applied to the in-sync indications as specified in TS 36.331 [5].

The out-of-sync and in-sync evaluations of the NB-IoT cell shall be performed as specified in clause 4.2.1 in TS 36.213 [8]. Two successive indications from Layer 1 shall be separated by at least max (10ms, DRX\_cycle\_length).

Upon start of T310 timer as specified in clause 5.3.11 in TS 36.331 [5], the UE shall monitor the link for recovery using the evaluation period and Layer 1 indication interval corresponding to the non-DRX mode until the expiry or stop of T310 timer.

The transmitter power of the UE shall be turned off within 40 ms after expiry of T310 timer as specified in clause 5.3.11 in TS 36.331 [5].

Table 13.4.3.4.3-1 Qout and Qin Evaluation Period in DRX for Category NB1 UE

|  |  |  |
| --- | --- | --- |
| **DRX cycle length (s)** | **TEvaluate\_Qout\_DRX\_NB-IoT and TEvaluate\_Qin\_DRX\_NB-IoT (s)** | |
| **DRX cycles for Rmax ≤ 64** | **DRX cycles for Rmax > 64** |
| 0.256 < DRX cycle ≤ 1.024 | Note 1 (20) | Note 1 (40) |
| 1.024 < DRX cycle ≤ 3.072 | Note 1 (10) | Note 1 (20) |
| 4.096 < DRX cycle ≤ 10.24 | Note 1 (5) | Note 1 (10) |
| Note 1: Evaluation period length in time depends on the length of the DRX cycle in use | | |

The normative reference for this requirement is 3GPP TS 36.133 [4] clauses 7.23A.2 and A.13.4.3.4.

##### 13.4.3.4.4 Test description

There is one NB-IoT SAN cell (Ncell 1), which is the active cell in the test. The test consists of three successive time periods with time duration of T1, T2 and T3 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure 13.4.3.4.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync and in-sync requirements can be measured.

The test setup in each test during time durations T1, T2 and T3 are as follows:

- During the period from time point A to time point B, the SNR is decreasing linearly from SNR1 to SNR2.

- During the period from time point C to time point D, the SNR is increasing linearly from SNR2 to SNR1.

- During the period T3, the test system shall send the UE a grant to transmit in uplink. UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. During the period from time point A to time point D, the UE shall not be provisioned with any UL grant.

- Thereafter UE switches back to downlink.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e., UE tries to decode the NPDCCH and complete the UL transmission when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

In each run of the test, the test equipment selects NPDCCH repetition level, and sends the RRC configuration to the UE. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

The UE shall be provided with the valid information about the SAN serving cells before the test.



Figure 13.4.3.4.4-1: SNR variation for in-sync testing

13.4.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.3.4.4.1-1.

Table 13.4.3.4.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and TS 36.508 [7] clauses 8.1.4.2 and 8.1.3.1.

Channel Bandwidth to be tested: 200kHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A, Figure A.18 using only main UE Tx/Rx antenna.

2. The general test parameter settings are set up according to Table 13.4.3.4.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.4.3.4.4.3.

5. There is one cell specified in this test. Ncell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

8. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.4.3.4.4.1-2: General test parameters for HD-FDD Radio Link Monitoring Test for in-sync with DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| In sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [32] |
| Number of OFDM symbols for legacy control channels |  | 3 | In sync threshold Qin\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in TS 36.133 [4] clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 2 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to NRS EPRE |  | 0 |
| Out of sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212[32] |
| Number of OFDM symbols for legacy control channels |  | 3 | Out of sync threshold Qout\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in TS 36.133 [4] clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 8 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to RS EPRE | dB | 0 |
| DRX cycle | | ms | 256 | See Table 13.4.3.4.5-2 |
| Layer 3 filtering | |  | Enabled | Counters:  N310 = 1; N311 = 1 |
| T310 timer | | ms | 4000 | T310 is enabled |
| T311 timer | | ms | 1000 | T311 is enabled |
| T1 | | s | 4 |  |
| dT | | s | 1.4 |  |
| T2 | | s | 1.96 |  |
| dT | | s | 1.4 |  |
| T3 | | s | 4 |  |
| Note 1: NPDCCH corresponding to the in-sync and out of sync transmission parameters need not be included in the Reference Measurement Channel. | | | | |

13.4.3.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully be synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment.

1. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

2. Set the parameters according to T1 in Table 13.4.3.4.4.1-2. Propagation conditions are set according to Annex B clause B.1. T1 starts.

3. When T1 expires, the 1st time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.4.5-1.

4. When dT expires the SS shall keep the SNR value corresponding to T2 as specified in Table 13.4.3.4.4.1-2. T2 starts.

5. When T2 expires, the 2nd time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.4.5-1.

6. When dT expires the SS shall keep the SNR value corresponding to T3 as specified in Table 13.4.3.4.4.1-2. T3 starts.

7. During T3 the SS shall send the UE continuous grants to transmit on the uplink. The UE is expected to decode the uplink grant, switch to uplink and complete the corresponding uplink transmission. If the SS detects uplink transmissions from the UE according to the subframes scheduled for NPUSCH transmission by the uplink grant, during the period from time point D until T3 expires, the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

13.4.3.4.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 13.4.3.4.4.3-1: *SystemInformationBlockType2-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.4.3.3, Table 8.1.4.3.3-1 SystemInformationBlockType2-NB1 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2-NB-r13 ::= SEQUENCE { |  |  |  |
| ue-TimersAndConstants-r13 SEQUENCE { |  |  |  |
| t310-r13 | ms4000 |  |  |
| n310-r13 | n1 |  |  |
| t311-r13 | ms1000 |  |  |
| n311-r13 | n1 |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.4.3.4.4.3-2: *RRCConnectionSetup-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.6.1, Table 8.1.6.1-14: RRCConnectionSetup-NB | | | |
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionSetup-NB ::= SEQUENCE { |  |  |  |
| criticalExtensions CHOICE { |  |  |  |
| c1 CHOICE { |  |  |  |
| rrcConnectionSetup-r13 SEQUENCE { |  |  |  |
| radioResourceConfigDedicated-r13{ |  |  |  |
| srb-ToAddModList-r13 SEQUENCE (SIZE (1)) OF SEQUENCE {} |  |  |  |
| mac-MainConfig CHOICE { | MAC-MainConfig-NB-SRB |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 13.4.3.4.4.3-3: MAC-MainConfig-NB-SRB

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.8.2, Table 8.1.8.2.1.5-1: MAC-MainConfig-NB-SRB | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-NB-SRB ::= SEQUENCE { |  |  |  |
| drx-Config-r13 CHOICE { |  |  |  |
| setup SEQUENCE { |  |  |  |
| onDurationTimer-r13 | pp1 |  |  |
| drx-InactivityTimer-r13 | pp0 |  |  |
| drx-RetransmissionTimer-r13 | pp0 |  |  |
| drx-Cycle-r13 | sf256 |  |  |
| drx-StartOffset-r13 | 0 |  |  |
| drx-ULRetransmissionTimer-r13 | pp0 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.4.3.4.5 Test requirement

Table 13.4.3.4.5-1: nCell1 specific test parameters for HD-FDD Radio Link Monitoring Test for in-sync with DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** |
| BWchannel | kHz | 200 | | | | |
| OCNG Pattern as defined in D.3.3 Note 1 |  | NOP.3 FDD | | | | |
| NPDCCH parameters defined in A.10.1.2 |  | R.30 HD-FDD | | | | |
| Ratio of NPDSCH to NRS EPRE | dB | 0 | | | | |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPBCH\_RA | dB |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NOCNG\_RANote1 | dB |
| NOCNG\_RBNote1 | dB |
|  | dBm/15 kHz | -98 | | | | |
| SNR Note 5, Note 6 | dB | -2.8 | Note 7 | -14.4 | Note 8 | -2.8 |
| Propagation condition |  | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | |
| Note 1: OCNG shall be used such that the resources in ncell1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CQI reporting are assigned to the UE prior to the start of time period T1.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 4: The signal contains NPDCCH for UEs other than the device under test as part of OCNG.  Note 5: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 6: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2, and SNR1 respectively in figure 13.4.3.4.4-1.  Note 7: The Test system shall reduce its transmit power in steps of (((SNR2-SNR1) / (10\*dT)) dB every 100ms till SNR2 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of (((SNR1-SNR2) / (10\*dT)) dB every 100ms till SNR1 is achieved at the end of dT. | | | | | | |

Table 13.4.3.4.5-2: DRX-Configuration for HD-FDD Radio Link Monitoring Test for in-sync with DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| onDurationTimer | pp1 | As specified in clause 6.7.3 in TS 36.331 [5] |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| drx-StartOffset | 0 |

Table 13.4.3.4.5-3: *TimeAlignmentTimer* -Configuration for HD-FDD Radio Link Monitoring Test for in-sync with DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 [5] |

The UE behaviours in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T3 according to the received UL grant.

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

#### 13.4.3.5 HD-FDD Radio Link Monitoring Test for In-sync without DRX for UE Category NB1 Standalone mode in Normal Coverage

##### 13.4.3.5.1 Test purpose

The purpose of this test is to verify that the HD-FDD category NB1 UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell. This test will partly verify the NB-IoT HD-FDD radio link monitoring requirements in TS 36.133 [4] clause 7.23A.

##### 13.4.3.5.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

##### 13.4.3.5.3 Minimum conformance requirements

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qout\_NB-IoT period becomes worse than the threshold Qout\_NB-IoT, Layer 1 of the UE shall send an out-of-sync indication for the NB-IoT cell to the higher layers within TEvaluate\_Qout\_NB-IoT evaluation period. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 36.331 [5].

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qin\_NB-IoT period becomes better than the threshold Qin\_NB-IoT, Layer 1 of the UE shall send an in-sync indication for the NB-IoT cell to the higher layers within TEvaluate\_Qin\_NB-IoT evaluation period. A L3 filter shall be applied to the in-sync indications as specified in TS 36.331 [5].

The out-of-sync and in-sync evaluations of the NB-IoT cell shall be performed as specified in clause 4.2.1 in TS 36.213 [8]. Two successive indications from Layer 1 shall be separated by at least 10ms.

The transmitter power of the UE shall be turned off within 40ms after expiry of T310 timer as specified in clause 5.3.11 in TS 36.331 [5]. The following table 13.4.3.5.3-1 defines the TEvaluate\_Qout\_NB-IoT and TEvaluate\_Qin\_NB-IoT.

Table 13.4.3.5.3-1 Qout and Qin Evaluation Period in non-DRX for Category NB1 UE

|  |  |  |
| --- | --- | --- |
| **Configured NPDCCH Rmax** | **TEvaluate\_Qout\_NB-IoT** | **TEvaluate\_Qin\_NB-IoT** |
| Rmax ≤ 64 | 400ms | 200ms |
| Rmax> 64 | 4000ms | 2000ms |

The normative reference for this requirement is 3GPP TS 36.133 [4] clauses 7.23A.2 and A.13.4.3.5.

##### 13.4.3.5.4 Test description

There is one NB-IoT SAN cell (Ncell 1), which is the active cell in the test. The test consists of three successive time periods with time duration of T1, T2 and T3 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure 13.4.3.5.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync and in-sync requirements can be measured. In the test, DRX configuration is disabled. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

The test setup in each test during time durations T1, T2 and T3 are as follows:

- During the period from time point A to time point B, the SNR is decreasing linearly from SNR1 to SNR2.

- During the period from time point C to time point D, the SNR is increasing linearly from SNR2 to SNR1.

- During the period T3, the test system shall send the UE a grant to transmit in uplink. UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. During the period from time point A to time point D, the UE shall not be provisioned with any UL grant.

- Thereafter UE switches back to downlink.

In each run of the test, the test equipment selects NPDCCH repetition level, and sends the RRC configuration to the UE. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

The UE shall be provided with the valid information about the SAN serving cells before the test.



Figure 13.4.3.5.4-1: SNR variation for in-sync testing

13.4.3.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.3.5.4.1-1.

**Table 13.4.3.5.4.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and TS 36.508 [7] clauses 8.1.4.2 and 8.1.3.1.

Channel Bandwidth to be tested: 200kHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A, Figure A.18 using only main UE Tx/Rx antenna.

2. The general test parameter settings are set up according to Table 13.4.3.5.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.4.3.5.4.3.

5. There is one cell specified in this test. Ncell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

8. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.4.3.5.4.1-2: General test parameters for HD-FDD Radio Link Monitoring Test for in-sync without DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| In sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [32] |
| Number of OFDM symbols for legacy control channels |  | 3 | In sync threshold Qin\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in TS 36.133 [4] clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 2 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to NRS EPRE |  | 0 |
| Out of sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [32] |
| Number of OFDM symbols for legacy control channels |  | 3 | Out of sync threshold Qout\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in TS 36.133 [4] clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 8 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to RS EPRE | dB | 0 |
| Layer 3 filtering | |  | Enabled | Counters:  N310 = 1; N311 = 1 |
| T310 timer | | ms | 4000 | T310 is enabled |
| T311 timer | | ms | 1000 | T311 is enabled |
| T1 | | s | 4 |  |
| dT | | s | 1.4 |  |
| T2 | | s | 1.96 |  |
| dT | | s | 1.4 |  |
| T3 | | s | 4 |  |
| Note 1: NPDCCH corresponding to the in-sync and out of sync transmission parameters need not be included in the Reference Measurement Channel. | | | | |

13.4.3.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully be synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment.

1. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

2. Set the parameters according to T1 in Table 13.4.3.5.4.1-2. Propagation conditions are set according to Annex B clause B.1. T1 starts.

3. When T1 expires, the 1st time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.5.5-1.

4. When dT expires the SS shall keep the SNR value corresponding to T2 as specified in Table 13.4.3.5.4.1-2. T2 starts.

5. When T2 expires, the 2nd time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.5.5-1.

6. When dT expires the SS shall keep the SNR value corresponding to T3 as specified in Table 13.4.3.5.4.1-2. T3 starts.

7. During T3 the SS shall send the UE continuous grants to transmit on the uplink. The UE is expected to decode the uplink grant, switch to uplink, and complete the corresponding uplink transmission. If the SS detects uplink transmissions from the UE according to the subframes scheduled for NPUSCH transmission by the uplink grant, during the period from time point D until T3 expires, the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

13.4.3.5.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 13.4.3.5.4.3-1: *SystemInformationBlockType2-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.4.3.3, Table 8.1.4.3.3-1 SystemInformationBlockType2-NB1 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2-NB-r13 ::= SEQUENCE { |  |  |  |
| ue-TimersAndConstants-r13 SEQUENCE { |  |  |  |
| t310-r13 | ms4000 |  |  |
| n310-r13 | n1 |  |  |
| t311-r13 | ms1000 |  |  |
| n311-r13 | n1 |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.4.3.5.5 Test requirement

Table 13.4.3.5.5-1: nCell1 specific test parameters for HD-FDD Radio Link Monitoring Test for in-sync without DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** |
| BWchannel | kHz | 200 | | | | |
| OCNG Pattern as defined in D.3.3 Note 1 |  | NOP.3 FDD | | | | |
| NPDCCH parameters defined in A.10.1.2 |  | R.30 HD-FDD | | | | |
| NPDSCH\_RA | dB | 0 | | | | |
| NPDSCH\_RB | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPBCH\_RA | dB |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
|  | dBm/15 kHz | -98 | | | | |
| SNR Note 5, Note 6 | dB | -2.8 | Note 7 | -14.4 | Note 8 | -2.8 |
| Propagation condition |  | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | |
| Note 1: OCNG shall be used such that the resources in ncell1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CQI reporting are assigned to the UE prior to the start of time period T1.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 4: The signal contains NPDCCH for UEs other than the device under test as part of OCNG.  Note 5: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 6: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2, and SNR1 respectively in figure 13.4.3.5.4-1.  Note 7: The Test system shall reduce its transmit power in steps of (((SNR2-SNR1) / (10\*dT)) dB every 100ms till SNR2 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of (((SNR1-SNR2) / (10\*dT)) dB every 100ms till SNR1 is achieved at the end of dT. | | | | | | |

Table 13.4.3.5.5-2: *TimeAlignmentTimer* -Configuration for HD-FDD Radio Link Monitoring Test for in-sync without DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 [5] |

The UE behaviours in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T3 according to the received UL grant.

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

#### 13.4.3.6 HD-FDD Radio Link Monitoring Test for In-sync without DRX for UE Category NB1 Standalone mode in Enhanced Coverage

##### 13.4.3.6.1 Test purpose

The purpose of this test is to verify that the HD-FDD category NB1 UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell. This test will partly verify the NB-IoT HD-FDD radio link monitoring requirements in TS 36.133 [4] clause 7.23A.

##### 13.4.3.6.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

##### 13.4.3.6.3 Minimum conformance requirements

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qout\_NB-IoT period becomes worse than the threshold Qout\_NB-IoT, Layer 1 of the UE shall send an out-of-sync indication for the NB-IoT cell to the higher layers within TEvaluate\_Qout\_NB-IoT evaluation period. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 36.331 [5].

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qin\_NB-IoT period becomes better than the threshold Qin\_NB-IoT, Layer 1 of the UE shall send an in-sync indication for the NB-IoT cell to the higher layers within TEvaluate\_Qin\_NB-IoT evaluation period. A L3 filter shall be applied to the in-sync indications as specified in TS 36.331 [5].

The out-of-sync and in-sync evaluations of the NB-IoT cell shall be performed as specified in clause 4.2.1 in TS 36.213 [8]. Two successive indications from Layer 1 shall be separated by at least 10ms.

The transmitter power of the UE shall be turned off within 40ms after expiry of T310 timer as specified in clause 5.3.11 in TS 36.331 [5]. The following table 13.4.3.6.3-1 defines the TEvaluate\_Qout\_NB-IoT and TEvaluate\_Qin\_NB-IoT.

Table 13.4.3.6.3-1: Qout and Qin Evaluation Period in non-DRX for Category NB1 UE

|  |  |  |
| --- | --- | --- |
| **Configured NPDCCH Rmax** | **TEvaluate\_Qout\_NB-IoT** | **TEvaluate\_Qin\_NB-IoT** |
| Rmax ≤ 64 | 400ms | 200ms |
| Rmax> 64 | 4000ms | 2000ms |

The normative reference for this requirement is 3GPP TS 36.133 [4] clauses 7.23A.2 and A.13.4.3.6.

##### 13.4.3.6.4 Test description

There is one NB-IoT SAN cell (Ncell 1), which is the active cell in the test. The test consists of three successive time periods with time duration of T1, T2 and T3 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure 13.4.3.6.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync and in-sync requirements can be measured. In the test, DRX configuration is disabled. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

The test setup in each test during time durations T1, T2 and T3 are as follows:

- During the period from time point A to time point B, the SNR is decreasing linearly from SNR1 to SNR2.

- During the period from time point C to time point D, the SNR is increasing linearly from SNR2 to SNR1.

- During the period T3, the test system shall send the UE a grant to transmit in uplink. UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. During the period from time point A to time point D, the UE shall not be provisioned with any UL grant.

- Thereafter UE switches back to downlink.

In each run of the test, the test equipment selects NPDCCH repetition level, and sends the RRC configuration to the UE. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

The UE shall be provided with the valid information about the SAN serving cells before the test.



Figure 13.4.3.6.4-1: SNR variation for in-sync testing

13.4.3.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.3.6.4.1-1.

Table 13.4.3.6.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and TS 36.508 [7] clauses 8.1.4.2 and 8.1.3.1.

Channel Bandwidth to be tested: 200kHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A, Figure A.18 using only main UE Tx/Rx antenna.

2. The general test parameter settings are set up according to Table 13.4.3.6.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.4.3.6.4.3.

5. There is one cell specified in this test. Ncell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

8. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.4.3.6.4.1-2: General test parameters for HD-FDD Radio Link Monitoring Test for in-sync without DRX for UE Category NB1 Standalone mode in enhanced coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| In sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [32] |
| Number of OFDM symbols for legacy control channels |  | 3 | In sync threshold Qin\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in TS 36.133 [4] clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 4 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to NRS EPRE |  | 0 |
| Out of sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212[32] |
| Number of OFDM symbols for legacy control channels |  | 3 | Out of sync threshold Qout\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in TS 36.133 [4] clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 16 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to RS EPRE | dB | 0 |
| Layer 3 filtering | |  | Enabled | Counters:  N310 = 1; N311 = 1 |
| T310 timer | | ms | 4000 | T310 is enabled |
| T311 timer | | ms | 1000 | T311 is enabled |
| T1 | | s | 4 |  |
| dT | | s | 1.4 |  |
| T2 | | s | 1.96 |  |
| dT | | s | 1.4 |  |
| T3 | | s | 4 |  |
| Note 1: NPDCCH corresponding to the in-sync and out of sync transmission parameters need not be included in the Reference Measurement Channel. | | | | |

13.4.3.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully be synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment.

1. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

2. Set the parameters according to T1 in Table 13.4.3.6.4.1-2. Propagation conditions are set according to Annex B clause B.1. T1 starts.

3. When T1 expires, the 1st time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.6.5-1.

4. When dT expires the SS shall keep the SNR value corresponding to T2 as specified in Table 13.4.3.6.4.1-2. T2 starts.

5. When T2 expires, the 2nd time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.6.5-1.

6. When dT expires the SS shall keep the SNR value corresponding to T3 as specified in Table 13.4.3.6.4.1-2. T3 starts.

7. During T3 the SS shall send the UE continuous grants to transmit on the uplink. The UE is expected to decode the uplink grant, switch to uplink and complete the corresponding uplink transmission. If the SS detects uplink transmissions from the UE according to the subframes scheduled for NPUSCH transmission by the uplink grant, during the period from time point D until T3 expires, the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

13.4.3.6.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 13.4.3.6.4.3-1: *SystemInformationBlockType2-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.4.3.3, Table 8.1.4.3.3-1 SystemInformationBlockType2-NB1 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2-NB-r13 ::= SEQUENCE { |  |  |  |
| ue-TimersAndConstants-r13 SEQUENCE { |  |  |  |
| t310-r13 | ms4000 |  |  |
| n310-r13 | n1 |  |  |
| t311-r13 | ms1000 |  |  |
| n311-r13 | n1 |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.4.3.6.5 Test requirement

Table 13.4.3.6.5-1: nCell1 specific test parameters for HD-FDD Radio Link Monitoring Test for in-sync without DRX for UE Category NB1 Standalone mode in enhanced coverage

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** |
| BWchannel | kHz | 200 | | | | |
| OCNG Pattern as defined in D.3.3 Note 1 |  | NOP.3 FDD | | | | |
| NPDCCH parameters defined in A.10.1.2 |  | R.30 HD-FDD | | | | |
| NPDSCH\_RA | dB | 0 | | | | |
| NPDSCH\_RB | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPBCH\_RA | dB |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
|  | dBm/15 kHz | -98 | | | | |
| SNR Note 5, Note 6 | dB | -5.9- | Note 7 | -17.7- | Note 8 | -5.9- |
| Propagation condition |  | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | |
| Note 1: OCNG shall be used such that the resources in ncell1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CQI reporting are assigned to the UE prior to the start of time period T1.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 4: The signal contains NPDCCH for UEs other than the device under test as part of OCNG.  Note 5: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 6: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2, and SNR1 respectively in figure 13.4.3.6.4-1.  Note 7: The Test system shall reduce its transmit power in steps of (((SNR2-SNR1) / (10\*dT)) dB every 100ms till SNR2 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of (((SNR1-SNR2) / (10\*dT)) dB every 100ms till SNR1 is achieved at the end of dT. | | | | | | |

Table 13.4.3.6.5-2: *TimeAlignmentTimer* -Configuration for HD-FDD Radio Link Monitoring Test for in-sync without DRX for UE Category NB1 Standalone mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 [5] |

The UE behaviours in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T3 according to the received UL grant.

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

#### 13.4.3.7 HD-FDD Radio Link Monitoring Test for Out-of-sync without DRX for UE Category NB1 Standalone mode in Normal Coverage

##### 13.4.3.7.1 Test purpose

The purpose of this test is to verify that the HD-FDD category NB1 UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell. This test will partly verify the NB-IoT HD-FDD radio link monitoring requirements in TS 36.133 [4] clause 7.23A.

##### 13.4.3.7.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

##### 13.4.3.7.3 Minimum conformance requirements

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qout\_NB-IoT period becomes worse than the threshold Qout\_NB-IoT, Layer 1 of the UE shall send an out-of-sync indication for the NB-IoT cell to the higher layers within TEvaluate\_Qout\_NB-IoT evaluation period. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 36.331 [5].

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qin\_NB-IoT period becomes better than the threshold Qin\_NB-IoT, Layer 1 of the UE shall send an in-sync indication for the NB-IoT cell to the higher layers within TEvaluate\_Qin\_NB-IoT evaluation period. A L3 filter shall be applied to the in-sync indications as specified in TS 36.331 [5].

The out-of-sync and in-sync evaluations of the NB-IoT cell shall be performed as specified in clause 4.2.1 in TS 36.213 [8]. Two successive indications from Layer 1 shall be separated by at least 10ms.

The transmitter power of the UE shall be turned off within 40ms after expiry of T310 timer as specified in clause 5.3.11 in TS 36.331 [5]. The following table 13.4.3.7.3-1 defines the TEvaluate\_Qout\_NB-IoT and TEvaluate\_Qin\_NB-IoT.

Table 13.4.3.7.3-1: Qout and Qin Evaluation Period in non-DRX for Category NB1 UE

|  |  |  |
| --- | --- | --- |
| **Configured NPDCCH Rmax** | **TEvaluate\_Qout\_NB-IoT** | **TEvaluate\_Qin\_NB-IoT** |
| Rmax ≤ 64 | 400ms | 200ms |
| Rmax> 64 | 4000ms | 2000ms |

The normative reference for this requirement is 3GPP TS 36.133 [4] clauses 7.23A.2 and A.13.4.3.7.

##### 13.4.3.7.4 Test description

There is one NB-IoT SAN cell (Ncell 1), which is the active cell in the test. The test consists of four successive time periods with time duration of T1, T2, T3 and T4 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure 13.4.3.7.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync state. Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync requirements can be measured. In the test, DRX configuration is disabled. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

The test setup in each test during time durations T1, T2, T3 and T4 are as follows:

- Starting at point A, the SNR is decreased in small steps from SNR1 to SNR2 within dT

- At the start of the time duration T2, the UE is provided with a UL grant with NPDCCH

NOTE 1: The UE is expected to decode the NPDCCH and complete the UL transmission during T2 according to the UL grant. The UE shall not be provisioned with any more UL grants until the start of time period T4.

- Starting at point B, the SNR is decreased in small steps from SNR2 to SNR3 within dT

- During T3, the SNR is kept as SNR3

NOTE 2: The UE is expected to detect OOS and declare RLF during T3.

- Starting at point C, the SNR is increased in small steps from SNR3 to SNR1 with dT

- At the start of the time duration T4, the UE will be provided with another UL grant with NPDCCH

NOTE 3: The UE is not expected to decode the UL grant and conduct any UL transmission during T4, since the UE is expected to declare RLF during T3.

The UE shall be provided with the valid information about the SAN serving cells before the test.

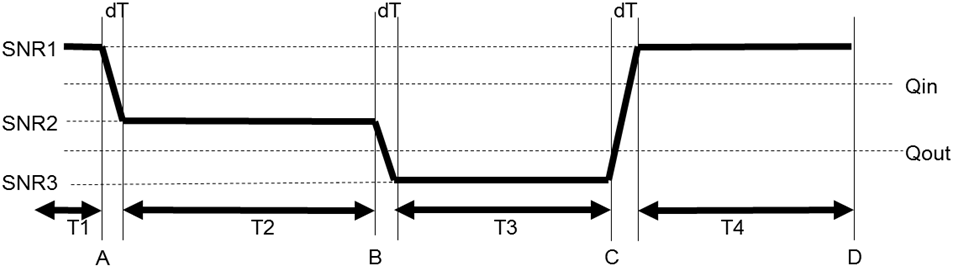


Figure 13.4.3.7.4-1: SNR variation for out-of-sync testing

13.4.3.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.3.7.4.1-1.

Table 13.4.3.7.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and TS 36.508 [7] clauses 8.1.4.2 and 8.1.3.1.

Channel Bandwidth to be tested: 200kHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A, Figure A.18 using only main UE Tx/Rx antenna.

2. The general test parameter settings are set up according to Table 13.4.3.7.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.4.3.7.4.3.

5. There is one cell specified in this test. Ncell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

8. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.4.3.7.4.1-2: General test parameters for HD-FDD Radio Link Monitoring Test for out-of-sync without DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | **Standalone** |  |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| NPDCCH repetition level Rmax | |  | 8 | Other NPDCCH parameters are defined in “ out-of-sync” column in TS 36.133 [4] Table 7.23A.2-1 |
| DRX | |  | OFF |  |
| Layer 3 filtering Note 2,3 | |  | Enabled | Counters:  N310 = 1  N311 = 1 |
| T310 timer Note 2,3 | | ms | 0 | T310 is disabled |
| T311 timer Note 2,3 | | ms | 3000 | T311 is enabled |
| T1 | | s | 2 |  |
| dT | | s | 0.8 |  |
| T2 | | s | 0.4 |  |
| dT | | s | 0.7 |  |
| T3 | | s | 0.5 |  |
| dT | | s | 1.4 |  |
| T4 | | s | 0.4 |  |
| Note 1: NPDCCH corresponding to the out of sync transmission parameters need not be included in the Reference Measurement Channel.  Note 2: N310, N311, T310 and T311 are defined in TS 36.331 [5].  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | |

13.4.3.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment.

1. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

2. Set the parameters according to T1 in Table 13.4.3.7.4.1-2. Propagation conditions are set according to Annex B clause B.1. T1 starts.

3. When T1 expires, the 1st time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.7.5-1.

4. When dT expires the SS shall keep the SNR value corresponding to T2 as specified in Table 13.4.3.7.4.1-2. T2 starts.

5. At the start of T2 the UE shall be provided with a UL grant on NPDCCH. The UE shall decode NPDCCH and complete the UL transmission, according to the UL grant, before T2 expires. If the UL transmission is not completed. the number of failed tests is increased by one. If so, restart test from step 1. No more UL grants are given until start of T4.

6. When T2 expires, the 2nd time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.7.5-1.

7. When dT expires the SS shall keep the SNR value corresponding to T3 as specified in Table 13.4.3.7.4.1-2. T3 starts.

8. During T3 the UE is expected to detect OOS and declare RLM.

9. When T3 expires, the 3rd time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.7.5-1.

10. When dT expires the SS shall keep the SNR value corresponding to T4 as specified in Table 13.4.3.7.4.1-2. T4 starts.

11. At the start of T4 the UE shall be provided with another UL grant on NPDCCH. If the SS detects uplink power equal to or higher than -48.5dBm in the uplink subframe scheduled to transmit NPUSCH during the period T4 the number of failed tests is increased by one.

Otherwise, the number of successful tests is increased by one.

12. After T4 expires the UE is switched off and then on. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

13. Repeat steps 2-12 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

13.4.3.7.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 13.4.3.7.4.3-1: *SystemInformationBlockType2-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.4.3.3, Table 8.1.4.3.3-1 SystemInformationBlockType2-NB1 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2-NB-r13 ::= SEQUENCE { |  |  |  |
| ue-TimersAndConstants-r13 SEQUENCE { |  |  |  |
| t310-r13 | ms0 |  |  |
| n310-r13 | n1 |  |  |
| t311-r13 | ms3000 |  |  |
| n311-r13 | n1 |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.4.3.7.5 Test requirement

Table 13.4.3.7.5-1: nCell1 specific test parameters for HD-FDD Radio Link Monitoring Test for out-of-sync without DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** | **dT** | **T4** |
| NB-IoT Channel Bandwidth (BWchannel) | kHz | 200 | | | | | | |
| OCNG Pattern as defined in D.3.3 Note 1 |  | NOP.3 FDD | | | | | | |
| NPDCCH parameters as defined in A.10.1.2 |  | R.30 HD-FDD | | | | | | |
| NPBCH\_RA | dB | 0 | | | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RA Note 1 | dB |
| OCNG\_RB Note 1 | dB |
|  | dBm/15 KHz | -98 | | | | | | |
| SNR Note 4,5 | - | -2.8 | Note 6 | -8.8 | Note 7 | -14.4 | Note 6 | -2.8 |
| Propagation Condition | - | AWGN | | | | | | |
| Antenna Configuration | - | 1x1 | | | | | | |
| Note 1: OCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Void  Note 3: Void  Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 5: The SNRs in time periods T1, T2, T3 and T4 are denoted as SNR1, SNR2, SNR3 and SNR1 respectively in figure 13.4.3.7.4-1.  Note 6: The Test system shall reduce its transmit power in steps of ((SNR2-SNR1) / (10\*dT)) dB every 100ms until SNR2 is achieved at the end of dT.  Note 7: The Test system shall reduce its transmit power in steps of ((SNR3-SNR2) / (10\*dT)) dB every 100ms until SNR3 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of ((SNR1-SNR3) / (10\*dT)) dB every 100ms until SNR1 is achieved at the end of dT. | | | | | | | | |

The UE behaviours in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T2 according to the received UL grant.

- The UE shall not conduct any NPUSCH transmission during T4.

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

#### 13.4.3.8 HD-FDD Radio Link Monitoring Test for Out-of-sync without DRX for UE Category NB1 Standalone mode in Enhanced Coverage

##### 13.4.3.8.1 Test purpose

The purpose of this test is to verify that the HD-FDD category NB1 UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell. This test will partly verify the NB-IoT HD-FDD radio link monitoring requirements in TS 36.133 [4] clause 7.23A.

##### 13.4.3.8.2 Test applicability

This test applies to all types of NB-IoT HD-FDD UE release 17 and forward of UE Category NB1 that supports NTN.

##### 13.4.3.8.3 Minimum conformance requirements

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qout\_NB-IoT period becomes worse than the threshold Qout\_NB-IoT, Layer 1 of the UE shall send an out-of-sync indication for the NB-IoT cell to the higher layers within TEvaluate\_Qout\_NB-IoT evaluation period. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 36.331 [5].

When the downlink radio link quality of the NB-IoT cell estimated over the last TEvaluate\_Qin\_NB-IoT period becomes better than the threshold Qin\_NB-IoT, Layer 1 of the UE shall send an in-sync indication for the NB-IoT cell to the higher layers within TEvaluate\_Qin\_NB-IoT evaluation period. A L3 filter shall be applied to the in-sync indications as specified in TS 36.331 [5].

The out-of-sync and in-sync evaluations of the NB-IoT cell shall be performed as specified in clause 4.2.1 in TS 36.213 [8]. Two successive indications from Layer 1 shall be separated by at least 10ms.

The transmitter power of the UE shall be turned off within 40ms after expiry of T310 timer as specified in clause 5.3.11 in TS 36.331 [5]. The following table 13.4.3.8.3-1 defines the TEvaluate\_Qout\_NB-IoT and TEvaluate\_Qin\_NB-IoT.

Table 13.4.3.8.3-1: Qout and Qin Evaluation Period in non-DRX for Category NB1 UE

|  |  |  |
| --- | --- | --- |
| **Configured NPDCCH Rmax** | **TEvaluate\_Qout\_NB-IoT** | **TEvaluate\_Qin\_NB-IoT** |
| Rmax ≤ 64 | 400ms | 200ms |
| Rmax> 64 | 4000ms | 2000ms |

The normative reference for this requirement is 3GPP TS 36.133 [4] clauses 7.23A.2 and A.13.4.3.8.

##### 13.4.3.8.4 Test description

There is one NB-IoT SAN cell (Ncell 1), which is the active cell in the test. The test consists of four successive time periods with time duration of T1, T2, T3 and T4 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure 13.4.3.8.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync state. Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync requirements can be measured. In the test, DRX configuration is disabled. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

The test setup in each test during time durations T1, T2, T3 and T4 are as follows:

- Starting at point A, the SNR is decreased in small steps from SNR1 to SNR2 within dT

- At the start of the time duration T2, the UE is provided with a UL grant with NPDCCH

NOTE 1: The UE is expected to decode the NPDCCH and complete the UL transmission during T2 according to the UL grant. The UE shall not be provisioned with any more UL grants until the start of time period T4.

- Starting at point B, the SNR is decreased in small steps from SNR2 to SNR3 within dT

- During T3, the SNR is kept as SNR3

NOTE 2: The UE is expected to detect OOS and declare RLF during T3.

- Starting at point C, the SNR is increased in small steps from SNR3 to SNR1 with dT

- At the start of the time duration T4, the UE will be provided with another UL grant with NPDCCH

NOTE 3: The UE is not expected to decode the UL grant and conduct any UL transmission during T4, since the UE is expected to declare RLF during T3.

The UE shall be provided with the valid information about the SAN serving cells before the test.

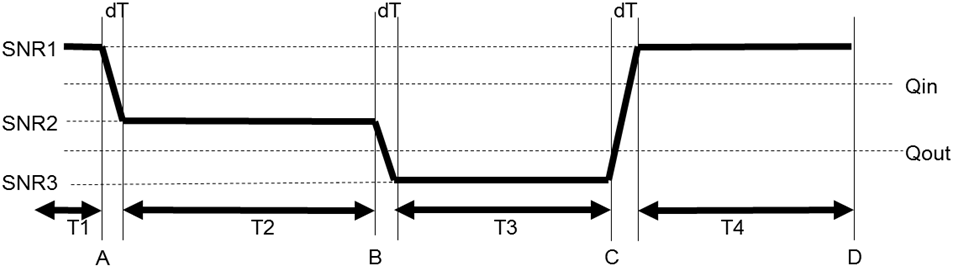


Figure 13.4.3.8.4-1: SNR variation for out-of-sync testing

13.4.3.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.3.8.4.1-1.

Table 13.4.3.8.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and TS 36.508 [7] clauses 8.1.4.2 and 8.1.3.1.

Channel Bandwidth to be tested: 200kHz as defined in 3GPP TS 36.508 [7] clause 8.1.3.1.

1. Connect the SS (node B emulator) and AWGN noise sources to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A, Figure A.18 using only main UE Tx/Rx antenna.

2. The general test parameter settings are set up according to Table 13.4.3.8.4.1-2.

3. Propagation conditions are set according to Annex B clause B.0.

4. Message contents are defined in clause 13.4.3.8.4.3.

5. There is one cell specified in this test. Ncell 1 is the cell used for connection setup with the power level set according to Annex C.0 and C.1 for this test.

6. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

7. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

8. Deactivate UE prediction of satellite trajectory through any preconfigured means.

Table 13.4.3.8.4.1-2: General test parameters for HD-FDD Radio Link Monitoring Test for out-of-sync without DRX for UE Category NB1 Standalone mode in enhanced coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| NB-IoT RF Channel Number | |  | 1 | One NB-IoT carrier frequency |
| NPDCCH repetition level Rmax | |  | 16 | Other NPDCCH parameters are defined in “ out-of-sync” column in TS 36.133 [4] Table 7.23A.2-1 |
| DRX | |  | OFF |  |
| Layer 3 filtering Note 2 | |  | Enabled | Counters:  N310 = 1  N311 = 1 |
| T310 timer Note 2 | | ms | 0 | T310 is disabled |
| T311 timer Note 2 | | ms | 3000 | T311 is enabled |
| T1 | | s | 2 |  |
| dT | | s | 0.7 |  |
| T2 | | s | 0.4 |  |
| dT | | s | 0.8 |  |
| T3 | | s | 0.5 |  |
| dT | | s | 1.4 |  |
| T4 | | s | 0.4 |  |
| Note 1: NPDCCH corresponding to the out of sync transmission parameters need not be included in the Reference Measurement Channel.  Note 2: N310, N311, T310 and T311 are defined in TS 36.331 [5].  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | |

13.4.3.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Ncell 1. The UE is scheduled in every possible uplink subframe to transmit NPUSCH, which is received by the test equipment.

1. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

2. Set the parameters according to T1 in Table 13.4.3.8.4.1-2. Propagation conditions are set according to Annex B clause B.1. T1 starts.

3. When T1 expires, the 1st time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.8.5-1.

4. When dT expires the SS shall keep the SNR value corresponding to T2 as specified in Table 13.4.3.8.4.1-2. T2 starts.

5. At the start of T2 the UE shall be provided with a UL grant on NPDCCH. The UE shall decode NPDCCH and complete the UL transmission, according to the UL grant, before T2 expires. If the UL transmission is not completed, the number of failed tests is increased by one. If so, restart test from step 1. No more UL grants are given until start of T4.

6. When T2 expires, the 2nd time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.8.5-1.

7. When dT expires the SS shall keep the SNR value corresponding to T3 as specified in Table 13.4.3.8.4.1-2. T3 starts.

8. During T3 the UE is expected to detect OOS and declare RLM.

9. When T3 expires, the 3rd time window dT starts. During dT the SS shall change the SNR towards the SNR value as specified in Table 13.4.3.8.5-1.

10. When dT expires the SS shall keep the SNR value corresponding to T4 as specified in Table 13.4.3.8.4.1-2. T4 starts.

11. At the start of T4 the UE shall be provided with another UL grant on NPDCCH. If the SS detects uplink power equal to or higher than -48.5dBm in the uplink subframe scheduled to transmit NPUSCH during the period T4 the number of failed tests is increased by one.

Otherwise, the number of successful tests is increased by one.

12. After T4 expires the UE is switched off and then on. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to 3GPP TS 36.508 [7] clause 8.1.5.

13. Repeat steps 2-12 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

13.4.3.8.4.3 Message contents

Message contents are according to 3GPP TS 36.508 [7] clause 8.1.6 and clause 8.1.4.3 using condition "Standalone" and “NTN” with the following exceptions:

Table 13.4.3.8.4.3-1: *SystemInformationBlockType2-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 3GPP TS 36.508 [7] clause 8.1.4.3.3, Table 8.1.4.3.3-1 SystemInformationBlockType2-NB1 | | | |
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2-NB-r13 ::= SEQUENCE { |  |  |  |
| ue-TimersAndConstants-r13 SEQUENCE { |  |  |  |
| t310-r13 | ms0 |  |  |
| n310-r13 | n1 |  |  |
| t311-r13 | ms3000 |  |  |
| n311-r13 | n1 |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.4.3.8.5 Test requirement

Table 13.4.3.8.5-1: nCell1 specific test parameters for HD-FDD Radio Link Monitoring Test for out-of-sync without DRX for UE Category NB1 Standalone mode in enhanced coverage

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** | **dT** | **T4** |
| BWchannel | kHz | 200 | | | | | | |
| OCNG Pattern as defined in D.3.3 Note 1 |  | NOP.3 FDD | | | | | | |
| NPDCCH parameters as defined in A.10.1.2 |  | R.30 HD-FDD | | | | | | |
| NPBCH\_RA | dB | 0 | | | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RA Note 1 | dB |
| OCNG\_RB Note 1 | dB |
|  | dBm/15 KHz | -98 | | | | | | |
| SNR Note 4,5 | - | -5.9 | Note 6 | -11.1 | Note 7 | -17.7 | Note 8 | -5.9 |
| Propagation Condition | - | AWGN | | | | | | |
| Antenna Configuration | - | 1x1 | | | | | | |
| Note 1: OCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Void  Note 3: Void  Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 5: The SNR in time periods T1, T2, T3 and T4 is denoted as SNR1, SNR2, SNR3 and SNR1 respectively in figure 13.4.3.8.4-1.  Note 6: The Test system shall reduce its transmit power in steps of ((SNR2-SNR1) / (10\*dT)) dB every 100ms until SNR2 is achieved at the end of dT.  Note 7: The Test system shall reduce its transmit power in steps of ((SNR3-SNR2) / (10\*dT)) dB every 100ms until SNR3 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of ((SNR1-SNR3) / (10\*dT)) dB every 100ms until SNR1 is achieved at the end of dT. | | | | | | | | |

The UE behaviours in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T2 according to the received UL grant.

- The UE shall not conduct any NPUSCH transmission during T4.

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 13.6 Measurement performance requirements for UE for satellite access

### 13.6.1 Void

### 13.6.2 Channel quality reporting accuracy for satellite access

#### 13.6.2.1 E-UTRAN HD-FDD Downlink channel quality reporting accuracy for UE Category NB1 Standalone mode under normal coverage

##### 13.6.2.1.1 Test purpose

The purpose of this test is to verify that the downlink channel quality reporting accuracy is within the specified limits. This test will verify the requirements in TS36.133[4] Section 9.1.22A.8for NB-IoT SAN PCell.

##### 13.6.2.1.2 Test applicability

This test case applies to all types of NB-IoT HD-FDD category NB1 UEs supporting GSO or NGSO or both from release 17 and forwards.

##### 13.6.2.1.3 Minimum conformance requirements

The requirements for accuracy of downlink channel quality reporting in this clause apply to the serving cell on the anchor carrier and non-anchor carrier for UE Category NB1.

The accuracy requirements in Table 13.6.2.1.3-1 are valid under the following conditions:

- Cell specific reference signals are transmitted either from one port.

- Conditions defined in TS 36.102 Clause 7.3B for reference sensitivity are fulfilled.

- NRSRP|dBm according to TS36.133 Annex B.3.25A for a corresponding Band.

Table 13.6.2.1.3-1: Downlink channel quality reporting accuracy for UE Category NB1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NPDCCH Repetition | Pm-Dsg (%) | Conditions | | | | |
| Ês/Iot | Io NOTE 2 range | | | |
| E-UTRA/NR operating band groups NOTE 3 | Minimum Io | | Maximum Io |
|  | dB |  | dBm/15kHz | dBm/BWChannel | dBm/BWChannel |
| R NOTE 1 | ≤1 | ≥ -6 dB | NFDD\_SAB\_ | -122.9 | N/A | -70 |
| R/4 NOTE 1 | >1 | ≥ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R NOTE 1 | ≤1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R/8 NOTE 1 | >1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| NOTE 1: R is the reported NPDCCH repetition level that UE has reported in CQI-NPDCCH-NB or CQI-NPDCCH-Short-NB.  NOTE 2: Io is assumed to have constant EPRE across the bandwidth.  NOTE 3: E-UTRA/NR operating band groups are as defined in TS36.133 Section 3.5. | | | | | | |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause A.13.6.2.1.

##### 13.6.2.1.4 Test description

13.6.2.1.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: Ncell bandwidth is as specified in Table 13.6.2.1.5-2.

1. Connect the SS and AWGN noise source to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A Figure A.18 using only UE main Tx/Rx antenna.

2. Propagation conditions are set according to Annex B clause B.0.

3. There is one NB-IoT cell specified in the test. Ncell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test.

4. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

5. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

6. Deactivate UE prediction of satellite trajectory through any preconfigured means.

The UE shall be provided with the valid information about the SAN serving cells before the test.

Table 13.6.2.1.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

13.6.2.1.4.2 Test procedure

The test scenario comprises of one NB-IoT carrier with 1 Ncell.

1. Ensure the UE is in State 3A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 in Ncell 1.

2. Set the parameters according to Tables 13.6.2.1.5-1 and 13.6.2.1.5-2. Propagation conditions are set according to Annex B clause B.1.1.

3. The UE shall transmit msg3 with the NPDCCH repetition number R report according to TS36.133 Table 9.1.22.15-1 after successful reception of the RAR.

4. The SS transmits NPDSCH via NPDCCH DCI format N1 according to the UE reported NPDCCH repetition number R. The SS sends downlink MAC padding bits on the DL RMC.

5. Measure the Pm-dsg for a duration of 4500 NPDCCH. SS counts the number of NACKs, ACKs and statDTXs on the UL NPUSCH. Pm-dsg is the ratio according to the formula (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is ≤ 1%, continue with step 6. Otherwise fail the UE.

6. The SS transmits NPDSCH via NPDCCH DCI format N1 according to NPDCCH repetition number R/4. The SS sends downlink MAC padding bits on the DL RMC.

7. Measure the Pm-dsg for a duration of 4500 NPDCCH. SS counts the number of NACKs, ACKs and statDTXs on the UL NPUSCH. Pm-dsg is the ratio according to the formula (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is > 1%, pass the UE. Otherwise fail the UE.

13.6.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.4, 8.1.5B and 8.1.6 with following exceptions.

Table 13.6.2.1.4.3-1: Common Exception messages for NB1 test requirements

|  |  |
| --- | --- |
| Default Message Contents | |
| NPDCCH standalone message contents | Table A.10.1.2-1 |
| NPDSCH standalone message contents | Table A.10.2.2-1 |

Table 13.6.2.1.4.3-2: NPUSCH-ConfigDedicated-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 clause Table 8.1.6.3-7 | | | |
| Information Element | Value/remark | Comment | Condition |
| NPUSCH-ConfigDedicated-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| ack-NACK-NumRepetitions-r13 | r1 | Default |  |
| npusch-AllSymbols-r13 | TRUE | Default |  |
| groupHoppingDisabled-r13 | Not present | Default |  |
| } |  |  |  |

Table 13.6.2.1.4.3-3: *SystemInformationBlockType2-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.4.3.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType2-NB-r13 ::= SEQUENCE { |  |  |  |
| lateNonCriticalExtension SEQUENCE { |  |  | FDD |
| cqi-Reporting-r14 | True |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.6.2.1.5 Test requirement

In this set of test cases all cells are on the same carrier frequency. The MSG3-based downlink channel quality reporting accuracy is tested by using the parameters in Tables 13.6.2.1.5-1 and 13.6.2.1.5-2. This test is divided into two parts. Firstly, UE should report the correct R value to ensure the pm-dsg under 1%. Secondly, the pm-dsg should larger than 1% when R/4 or R/8 is used.

Table 13.6.2.1.5-1: General Test Parameters for Downlink channel quality reporting accuracy test for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under normal coverage

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| NB-IoT operational mode | |  | Standalone |
| CP Length | |  | Normal |
| DRX | |  | OFF |
| NPRACH configuration | |  | As specified in TS36.133 A.3.18 |
| NPUSCH repetition level | |  | 1 |
| Satellite information | Config 1 | SSC.1 | GSO |
| Config 2 | SSC.2 | NGSO |

Table 13.6.2.1.5-2: nCell specific Test Parameters for Downlink channel quality reporting accuracy test for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under normal coverage

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
| BWchannel | kHz | 200 |
| NPDCCH parameter |  | R.30 HD-FDD |
| NPDCCH repetition level for RAR |  | 4 |
| NPBCH\_RB | dB | 0 |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
| Note2 | dBm/15 kHz | -98 |
| NRS | dB | -5.4 |
| Propagation condition |  | AWGN |
| Antenna Configuration |  | 1x1 |
| Scheduling delay in RAR (IDelay) Note3 |  | 0 |
| Channel quality IE Note4 |  | CQI-NPDCCH-NB |
| Note 1: OCNG shall be used such that active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: See section 16.3.3 in TS 36.213 [23].  Note 4: See TS 36.331 [2]. | | |

The pass/fail decision is as specified in the test procedure in clause 13.6.2.1.4.2.

#### 13.6.2.2 E-UTRAN HD-FDD Downlink channel quality reporting accuracy for UE Category NB1 Standalone mode under enhanced coverage

Editor’s Note: This clause is incomplete. The following aspects are either missing or not yet determined:

- MU/TT is TBD

##### 13.6.2.2.1 Test purpose

The purpose of this test is to verify that the downlink channel quality reporting accuracy is within the specified limits. This test will verify the requirements in TS36.133[4] Section 9.1.22A.8 for NB-IoT SAN PCell.

##### 13.6.2.2.2 Test applicability

This test case applies to all types of NB-IoT HD-FDD category NB1 UEs supporting GSO or NGSO or both from release 17 and forwards.

##### 13.6.2.2.3 Minimum conformance requirements

The requirements for accuracy of downlink channel quality reporting in this clause apply to the serving cell on the anchor carrier and non-anchor carrier for UE Category NB1.

The accuracy requirements in Table 13.6.2.2.3-1 are valid under the following conditions:

- Cell specific reference signals are transmitted either from one port.

- Conditions defined in TS 36.102 Clause 7.3B for reference sensitivity are fulfilled.

- NRSRP|dBm according to TS36.133 Annex B.3.25A for a corresponding Band.

Table 13.6.2.2.3-1: Downlink channel quality reporting accuracy for UE Category NB1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NPDCCH Repetition | Pm-Dsg (%) | Conditions | | | | |
| Ês/Iot | Io NOTE 2 range | | | |
| E-UTRA/NR operating band groups NOTE 3 | Minimum Io | | Maximum Io |
|  | dB |  | dBm/15kHz | dBm/BWChannel | dBm/BWChannel |
| R NOTE 1 | ≤1 | ≥ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R/4 NOTE 1 | >1 | ≥ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R NOTE 1 | ≤1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R/8 NOTE 1 | >1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| NOTE 1: R is the reported NPDCCH repetition level that UE has reported in CQI-NPDCCH-NB or CQI-NPDCCH-Short-NB.  NOTE 2: Io is assumed to have constant EPRE across the bandwidth.  NOTE 3: E-UTRA/NR operating band groups are as defined in TS36.133 Section 3.5. | | | | | | |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause A.13.6.2.2.

##### 13.6.2.2.4 Test description

13.6.2.2.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: Ncell bandwidth is as specified in Table 13.6.2.2.5-2.

1. Connect the SS and AWGN noise source to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A Figure A.18 using only UE main Tx/Rx antenna.

2. Propagation conditions are set according to Annex B clause B.0.

3. There is one NB-IoT cell specified in the test. Ncell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test.

4. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

5. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

6. Deactivate UE prediction of satellite trajectory through any preconfigured means.

The UE shall be provided with the valid information about the SAN serving cells before the test.

Table 13.6.2.2.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

13.6.2.2.4.2 Test procedure

The test scenario comprises of one NB-IoT carrier with 1 Ncell.

1. Ensure the UE is in State 3A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 in Ncell 1.

2. Set the parameters according to Tables 13.6.2.2.5-1 and 13.6.2.2.5-2. Propagation conditions are set according to Annex B clause B.1.1.

3. The UE shall transmit msg3 with the NPDCCH repetition number R report according to TS36.133 Table 9.1.22.15-1 after successful reception of the RAR.

4. The SS transmits NPDSCH via NPDCCH DCI format N1 according to the UE reported NPDCCH repetition number R. The SS sends downlink MAC padding bits on the DL RMC.

5. Measure the Pm-dsg for a duration of 4500 NPDCCH. SS counts the number of NACKs, ACKs and statDTXs on the UL NPUSCH. Pm-dsg is the ratio according to the formula (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is ≤ 1%, continue with step 6. Otherwise fail the UE.

6. The SS transmits NPDSCH via NPDCCH DCI format N1 according to NPDCCH repetition number R/8. The SS sends downlink MAC padding bits on the DL RMC.

7. Measure the Pm-dsg for a duration of 4500 NPDCCH. SS counts the number of NACKs, ACKs and statDTXs on the UL NPUSCH. Pm-dsg is the ratio according to the formula (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is > 1%, pass the UE. Otherwise fail the UE.

13.6.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.4, 8.1.5B and 8.1.6 with following exceptions.

Table 13.6.2.2.4.3-1: Common Exception messages for NB1 test requirements

|  |  |
| --- | --- |
| Default Message Contents | |
| NPDCCH standalone message contents | Table A.10.1.2-1 |
| NPDSCH standalone message contents | Table A.10.2.2-1 |

Table 13.6.2.2.4.3-2: NPUSCH-ConfigDedicated-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 clause Table 8.1.6.3-7 | | | |
| Information Element | Value/remark | Comment | Condition |
| NPUSCH-ConfigDedicated-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| ack-NACK-NumRepetitions-r13 | r1 | Default |  |
| npusch-AllSymbols-r13 | TRUE | Default |  |
| groupHoppingDisabled-r13 | Not present | Default |  |
| } |  |  |  |

Table 13.6.2.2.4.3-3: *SystemInformationBlockType2-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.4.3.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType2-NB-r13 ::= SEQUENCE { |  |  |  |
| lateNonCriticalExtension SEQUENCE { |  |  | FDD |
| cqi-Reporting-r14 | True |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.6.2.2.5 Test requirement

In this set of test cases all cells are on the same carrier frequency. The MSG3-based downlink channel quality reporting accuracy is tested by using the parameters in Tables 13.6.2.2.5-1 and 13.6.2.2.5-2. This test is divided into two parts. Firstly, UE should report the correct R value to ensure the pm-dsg under 1%. Secondly, the pm-dsg should larger than 1% when R/4 or R/8 is used.

Table 13.6.2.2.5-1: General Test Parameters for Downlink channel quality reporting accuracy test for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under enhanced coverage

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| NB-IoT operational mode | |  | Standalone |
| CP Length | |  | Normal |
| DRX | |  | OFF |
| NPRACH configuration | |  | As specified in TS36.133 A.3.18 |
| NPUSCH repetition level | |  | 1 |
| Satellite information | Config 1 | SSC.1 | GSO |
| Config 2 | SSC.2 | NGSO |

Table 13.6.2.2.5-2: nCell specific Test Parameters for Downlink channel quality reporting accuracy test for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under enhanced coverage

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
| BWchannel | kHz | 200 |
| NPDCCH parameter |  | R.30 HD-FDD |
| NPDCCH repetition level for RAR |  | 16 |
| NPBCH\_RB | dB | 0 |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
| Note2 | dBm/15 kHz | -98 |
| NRS | dB | -12 |
| Propagation condition |  | AWGN |
| Antenna Configuration |  | 1x1 |
| Scheduling delay in RAR (IDelay) Note3 |  | 0 |
| Channel quality IE Note4 |  | CQI-NPDCCH-NB |
| Note 1: OCNG shall be used such that active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: See section 16.3.3 in TS 36.213 [23].  Note 4: See TS 36.331 [2]. | | |

The pass/fail decision is as specified in the test procedure in clause 13.6.2.2.4.2.

#### 13.6.2.3 E-UTRAN HD-FDD Downlink channel quality reporting accuracy on non-anchor carrier for UE Category NB1 Standalone mode under normal coverage

##### 13.6.2.3.1 Test purpose

The purpose of this test is to verify that the downlink channel quality reporting accuracy on non-anchor carrier is within the specified limits. This test will verify the requirements in TS36.133[4] Section 9.1.22A.8 for NB-IoT SAN PCell.

##### 13.6.2.3.2 Test applicability

This test case applies to all types of NB-IoT HD-FDD category NB1 UEs supporting GSO or NGSO or both from release 17 and forwards.

Applicability requires support for sending DL channel quality reporting for a non-anchor carrier.

##### 13.6.2.3.3 Minimum conformance requirements

The requirements for accuracy of downlink channel quality reporting in this clause apply to the serving cell on the anchor carrier and non-anchor carrier for UE Category NB1.

The accuracy requirements in Table 13.6.2.3.3-1 are valid under the following conditions:

- Cell specific reference signals are transmitted either from one port.

- Conditions defined in TS 36.102 Clause 7.3B for reference sensitivity are fulfilled.

- NRSRP|dBm according to TS36.133 Annex B.3.25A for a corresponding Band.

Table 13.6.2.3.3-1: Downlink channel quality reporting accuracy for UE Category NB1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NPDCCH Repetition | Pm-Dsg (%) | Conditions | | | | |
| Ês/Iot | Io NOTE 2 range | | | |
| E-UTRA/NR operating band groups NOTE 3 | Minimum Io | | Maximum Io |
|  | dB |  | dBm/15kHz | dBm/BWChannel | dBm/BWChannel |
| R NOTE 1 | ≤1 | ≥ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R/4 NOTE 1 | >1 | ≥ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R NOTE 1 | ≤1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R/8 NOTE 1 | >1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| NOTE 1: R is the reported NPDCCH repetition level that UE has reported in CQI-NPDCCH-NB or CQI-NPDCCH-Short-NB.  NOTE 2: Io is assumed to have constant EPRE across the bandwidth.  NOTE 3: E-UTRA/NR operating band groups are as defined in TS36.133 Section 3.5. | | | | | | |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause A.13.6.2.3.

##### 13.6.2.3.4 Test description

13.6.2.3.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: Ncell bandwidth is as specified in Table 13.6.2.3.5-2.

1. Connect the SS and AWGN noise source to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A Figure A.18 using only UE main Tx/Rx antenna.

2. Propagation conditions are set according to Annex B clause B.0.

3. There is one NB-IoT cell specified in the test. Ncell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test. In Ncell 1 one anchor carrier and one non-anchor carrier are configured.

4. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

5. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

6. Deactivate UE prediction of satellite trajectory through any preconfigured means.

The UE shall be provided with the valid information about the SAN serving cells before the test.

Table 13.6.2.3.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

13.6.2.3.4.2 Test procedure

The test scenario comprises of 2 NB-IoT carriers with 1 Ncell.

The test procedures are the same as test procedures defined in 13.6.2.1.4.2 but performed on the non-anchor carrier.

13.6.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.4, 8.1.5B and 8.1.6 with following exceptions.

Table 13.6.2.3.4.3-1: Common Exception messages for NB1 test requirements

|  |  |
| --- | --- |
| Default Message Contents | |
| NPDCCH standalone message contents | Table A.10.1.2-1 |
| NPDSCH standalone message contents | Table A.10.2.2-1 |

Table 13.6.2.3.4.3-2: SystemInformationBlockType22-NB

| Derivation Path: 36.508 Table 8.1.4.3.3-8 | | | |
| --- | --- | --- | --- |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType22-NB-r14 ::= SEQUENCE { |  |  |  |
| ul-ConfigList-r14 SEQUENCE (SIZE (1.. maxNonAnchorCarriers-NB-r14)) OF UL-ConfigCommon-NB-r14 SEQUENCE { |  |  |  |
| UL-ConfigCommon-NB-r14[1] SEQUENCE { |  |  |  |
| nprach-ParametersList-r14 SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-Parameters-NB-r14 SEQUENCE { |  |  |  |
| NPRACH-Parameters-NB-r14[1] SEQUENCE { |  |  |  |
| nprach-Parameters-r14 SEQUENCE { |  |  |  |
| nprach-Periodicity-r14 | ms40 |  |  |
| nprach-StartTime-r14 | ms8 |  |  |
| nprach-SubcarrierOffset-r14 | n0 |  |  |
| nprach-NumSubcarriers-r14 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r14 | one |  |  |
| npdcch-NumRepetitions-RA-r14 | r4 |  |  |
| npdcch-StartSF-CSS-RA-r14 | v8 |  |  |
| npdcch-Offset-RA-r14 | zero |  |  |
| nprach-NumCBRA-StartSubcarriers-r14 | n8 |  |  |
| npdcch-CarrierIndex-r14 | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-r14[2] SEQUENCE { |  |  |  |
| nprach-Parameters-r14 SEQUENCE { |  |  |  |
| nprach-Periodicity-r14 | ms40 |  |  |
| nprach-StartTime-r14 | ms8 |  |  |
| nprach-SubcarrierOffset-r14 | n0 |  |  |
| nprach-NumSubcarriers-r14 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r14 | one |  |  |
| npdcch-NumRepetitions-RA-r14 | r8 |  |  |
| npdcch-StartSF-CSS-RA-r14 | v2 |  |  |
| npdcch-Offset-RA-r14 | zero |  |  |
| nprach-NumCBRA-StartSubcarriers-r14 | n8 |  |  |
| npdcch-CarrierIndex-r14 | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-r14[3] SEQUENCE { |  |  |  |
| nprach-Parameters-r14 SEQUENCE { |  |  |  |
| nprach-Periodicity-r14 | ms40 |  |  |
| nprach-StartTime-r14 | ms8 |  |  |
| nprach-SubcarrierOffset-r14 | n0 |  |  |
| nprach-NumSubcarriers-r14 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r14 | one |  |  |
| npdcch-NumRepetitions-RA-r14 | r32 |  |  |
| npdcch-StartSF-CSS-RA-r14 | v2 |  |  |
| npdcch-Offset-RA-r14 | zero |  |  |
| nprach-NumCBRA-StartSubcarriers-r14 | n8 |  |  |
| npdcch-CarrierIndex-r14 | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| nprach-ProbabilityAnchorList-r14 SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-ProbabilityAnchor-NB-r14 SEQUENCE { |  |  |  |
| NPRACH-ProbabilityAnchor-NB-r14[1] SEQUENCE { |  |  |  |
| nprach-ProbabilityAnchor-r14 | zero |  |  |
| } |  |  |  |
| NPRACH-ProbabilityAnchor-NB-r14[2] SEQUENCE { |  |  |  |
| nprach-ProbabilityAnchor-r14 | zero |  |  |
| } |  |  |  |
| NPRACH-ProbabilityAnchor-NB-r14[3] SEQUENCE { |  |  |  |
| nprach-ProbabilityAnchor-r14 | zero |  |  |
| } |  |  |  |
| } |  |  |  |
| lateNonCriticalExtension | Not present |  |  |
| } |  |  |  |

Table 13.6.2.3.4.3-3: NPUSCH-ConfigDedicated-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 clause Table 8.1.6.3-7 | | | |
| Information Element | Value/remark | Comment | Condition |
| NPUSCH-ConfigDedicated-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| ack-NACK-NumRepetitions-r13 | r1 | Default |  |
| npusch-AllSymbols-r13 | TRUE | Default |  |
| groupHoppingDisabled-r13 | Not present | Default |  |
| } |  |  |  |

Table 13.6.2.3.4.3-4: *SystemInformationBlockType2-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.4.3.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType2-NB-r13 ::= SEQUENCE { |  |  |  |
| lateNonCriticalExtension SEQUENCE { |  |  | FDD |
| cqi-Reporting-r14 | True |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.6.2.3.5 Test requirement

In this set of test cases all cells are on the same carrier frequency. The MSG3-based downlink channel quality reporting accuracy on non-anchor carrier is tested by using the parameters in Tables 13.6.2.3.5-1 and 13.6.2.3.5-2. This test is divided into two parts. Firstly, UE should report the correct R value to ensure the pm-dsg under 1%. Secondly, the pm-dsg should larger than 1% when R/4 or R/8 is used.

Table 13.6.2.3.5-1: General Test Parameters for Downlink channel quality reporting accuracy test on non-anchor carrier for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under normal coverage

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Value |
| NB-IoT operational mode | |  | Standalone |
| CP Length | |  | Normal |
| DRX | |  | OFF |
| NPRACH configuration | |  | As specified in TS36.133 A.3.18 |
| NPUSCH repetition level | |  | 1 |
| NPDCCH carrier index (npdcch-CarrierIndex-r14) | |  | 1 (Note 1) |
| Satellite information | Config 1 | SSC.1 | GSO |
| Config 2 | SSC.2 | NGSO |
| Note 1: Index of non-anchor carrier configured in SystemInformationBlockType22-NB (See TS 36.331 [2]). | | | |

Table 13.6.2.3.5-2: nCell specific Test Parameters for Downlink channel quality reporting accuracy test on non-anchor carrier for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under normal coverage

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
| BWchannel | kHz | 200 |
| NPDCCH parameter |  | R.30 HD-FDD |
| NPDCCH repetition level for RAR on non-anchor |  | 4 |
| NPBCH\_RB | dB | 0 |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
| Note2 | dBm/15 kHz | -98 |
| NRS | dB | -5.4 |
| Propagation condition |  | AWGN |
| Antenna Configuration |  | 1x1 |
| Scheduling delay in RAR (IDelay) Note3 |  | 0 |
| Channel quality IE Note4 |  | CQI-NPDCCH-NB |
| Note 1: OCNG shall be used such that active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: See section 16.3.3 in TS 36.213 [23].  Note 4: See TS 36.331 [2]. | | |

The pass/fail decision is as specified in the test procedure in clause 13.6.2.3.4.2.

#### 13.6.2.4 E-UTRAN HD-FDD Downlink channel quality reporting accuracy on non-anchor carrier for UE Category NB1 Standalone mode under enhanced coverage

##### 13.6.2.4.1 Test purpose

The purpose of this test is to verify that the downlink channel quality reporting accuracy on non-anchor carrier is within the specified limits. This test will verify the requirements in TS36.133[4] Section 13.6.2.4.1 for NB-IoT SAN PCell.

##### 13.6.2.4.2 Test applicability

This test case applies to all types of NB-IoT HD-FDD category NB1 UEs supporting GSO or NGSO or both from release 17 and forwards.

##### 13.6.2.4.3 Minimum conformance requirements

The requirements for accuracy of downlink channel quality reporting in this clause apply to the serving cell on the anchor carrier and non-anchor carrier for UE Category NB1.

The accuracy requirements in Table 13.6.2.4.3-1 are valid under the following conditions:

- Cell specific reference signals are transmitted either from one port.

- Conditions defined in TS 36.102 Clause 7.3B for reference sensitivity are fulfilled.

- NRSRP|dBm according to TS36.133 Annex B.3.25A for a corresponding Band.

Table 13.6.2.4.3-1: Downlink channel quality reporting accuracy for UE Category NB1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NPDCCH Repetition | Pm-Dsg (%) | Conditions | | | | |
| Ês/Iot | Io NOTE 2 range | | | |
| E-UTRA/NR operating band groups NOTE 3 | Minimum Io | | Maximum Io |
|  | dB |  | dBm/15kHz | dBm/BWChannel | dBm/BWChannel |
| R NOTE 1 | ≤1 | ≥ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R/4 NOTE 1 | >1 | ≥ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R NOTE 1 | ≤1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R/8 NOTE 1 | >1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| NOTE 1: R is the reported NPDCCH repetition level that UE has reported in CQI-NPDCCH-NB or CQI-NPDCCH-Short-NB.  NOTE 2: Io is assumed to have constant EPRE across the bandwidth.  NOTE 3: E-UTRA/NR operating band groups are as defined in TS36.133 Section 3.5. | | | | | | |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause A.13.6.2.4.

##### 13.6.2.4.4 Test description

13.6.2.4.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: Ncell bandwidth is as specified in Table 13.6.2.4.5-2.

1. Connect the SS and AWGN noise source to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A Figure A.18 using only UE main Tx/Rx antenna and without fading.

2. Propagation conditions are set according to Annex B clause B.0.

3. There is one NB-IoT cell specified in the test. Ncell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test. In Ncell 1 one anchor carrier and one non-anchor carrier are configured.

4. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

5. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

6. Deactivate UE prediction of satellite trajectory through any preconfigured means.

The UE shall be provided with the valid information about the SAN serving cells before the test.

Table 13.6.2.4.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

13.6.2.4.4.2 Test procedure

The test scenario comprises of 2 NB-IoT carriers with 1 Ncell.

The test procedures are the same as test procedures defined in 13.6.2.2.4.2 but performed on the non-anchor carrier.

13.6.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.4, 8.1.5B and 8.1.6 with following exceptions.

Table 13.6.2.3.4.3-1: Common Exception messages for NB1 test requirements

|  |  |
| --- | --- |
| Default Message Contents | |
| NPDCCH standalone message contents | Table A.10.1.2-1 |
| NPDSCH standalone message contents | Table A.10.2.2-1 |

Table 13.6.2.3.4.3-2: SystemInformationBlockType22-NB

| Derivation Path: 36.508 Table 8.1.4.3.3-8 | | | |
| --- | --- | --- | --- |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType22-NB-r14 ::= SEQUENCE { |  |  |  |
| ul-ConfigList-r14 SEQUENCE (SIZE (1.. maxNonAnchorCarriers-NB-r14)) OF UL-ConfigCommon-NB-r14 SEQUENCE { |  |  |  |
| UL-ConfigCommon-NB-r14[1] SEQUENCE { |  |  |  |
| nprach-ParametersList-r14 SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-Parameters-NB-r14 SEQUENCE { |  |  |  |
| NPRACH-Parameters-NB-r14[1] SEQUENCE { |  |  |  |
| nprach-Parameters-r14 SEQUENCE { |  |  |  |
| nprach-Periodicity-r14 | ms40 |  |  |
| nprach-StartTime-r14 | ms8 |  |  |
| nprach-SubcarrierOffset-r14 | n0 |  |  |
| nprach-NumSubcarriers-r14 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r14 | one |  |  |
| npdcch-NumRepetitions-RA-r14 | r1 |  |  |
| npdcch-StartSF-CSS-RA-r14 | v8 |  |  |
| npdcch-Offset-RA-r14 | zero |  |  |
| nprach-NumCBRA-StartSubcarriers-r14 | n8 |  |  |
| npdcch-CarrierIndex-r14 | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-r14[2] SEQUENCE { |  |  |  |
| nprach-Parameters-r14 SEQUENCE { |  |  |  |
| nprach-Periodicity-r14 | ms40 |  |  |
| nprach-StartTime-r14 | ms8 |  |  |
| nprach-SubcarrierOffset-r14 | n0 |  |  |
| nprach-NumSubcarriers-r14 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r14 | one |  |  |
| npdcch-NumRepetitions-RA-r14 | r16 |  |  |
| npdcch-StartSF-CSS-RA-r14 | v2 |  |  |
| npdcch-Offset-RA-r14 | zero |  |  |
| nprach-NumCBRA-StartSubcarriers-r14 | n8 |  |  |
| npdcch-CarrierIndex-r14 | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| NPRACH-Parameters-NB-r14[3] SEQUENCE { |  |  |  |
| nprach-Parameters-r14 SEQUENCE { |  |  |  |
| nprach-Periodicity-r14 | ms40 |  |  |
| nprach-StartTime-r14 | ms8 |  |  |
| nprach-SubcarrierOffset-r14 | n0 |  |  |
| nprach-NumSubcarriers-r14 | n12 |  |  |
| nprach-SubcarrierMSG3-RangeStart-r14 | one |  |  |
| npdcch-NumRepetitions-RA-r14 | r32 |  |  |
| npdcch-StartSF-CSS-RA-r14 | v2 |  |  |
| npdcch-Offset-RA-r14 | zero |  |  |
| nprach-NumCBRA-StartSubcarriers-r14 | n8 |  |  |
| npdcch-CarrierIndex-r14 | 1 |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| nprach-ProbabilityAnchorList-r14 SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-ProbabilityAnchor-NB-r14 SEQUENCE { |  |  |  |
| NPRACH-ProbabilityAnchor-NB-r14[1] SEQUENCE { |  |  |  |
| nprach-ProbabilityAnchor-r14 | zero |  |  |
| } |  |  |  |
| NPRACH-ProbabilityAnchor-NB-r14[2] SEQUENCE { |  |  |  |
| nprach-ProbabilityAnchor-r14 | zero |  |  |
| } |  |  |  |
| NPRACH-ProbabilityAnchor-NB-r14[3] SEQUENCE { |  |  |  |
| nprach-ProbabilityAnchor-r14 | zero |  |  |
| } |  |  |  |
| } |  |  |  |
| lateNonCriticalExtension | Not present |  |  |
| } |  |  |  |

Table 13.6.2.4.4.3-3: NPUSCH-ConfigDedicated-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 clause Table 8.1.6.3-7 | | | |
| Information Element | Value/remark | Comment | Condition |
| NPUSCH-ConfigDedicated-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| ack-NACK-NumRepetitions-r13 | r1 | Default |  |
| npusch-AllSymbols-r13 | TRUE | Default |  |
| groupHoppingDisabled-r13 | Not present | Default |  |
| } |  |  |  |

Table 13.6.2.4.4.3-4: *SystemInformationBlockType2-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 Table 8.1.4.3.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| SystemInformationBlockType2-NB-r13 ::= SEQUENCE { |  |  |  |
| lateNonCriticalExtension SEQUENCE { |  |  | FDD |
| cqi-Reporting-r14 | True |  |  |
| } |  |  |  |
| } |  |  |  |

##### 13.6.2.4.5 Test requirement

In this set of test cases all cells are on the same carrier frequency. The MSG3-based downlink channel quality reporting accuracy on non-anchor carrier is tested by using the parameters in Tables 13.6.2.4.5-1 and 13.6.2.4.5-2. This test is divided into two parts. Firstly, UE should report the correct R value to ensure the pm-dsg under 1%. Secondly, the pm-dsg should larger than 1% when R/4 or R/8 is used.

Table 13.6.2.4.5-1: General Test Parameters for Downlink channel quality reporting accuracy test on non-anchor carrier for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under enhanced coverage

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| NB-IoT operational mode | |  | Standalone |
| CP Length | |  | Normal |
| DRX | |  | OFF |
| NPRACH configuration | |  | As specified in A.3.18 |
| NPUSCH repetition level | |  | 1 |
| NPDCCH carrier index (npdcch-CarrierIndex-r14) | |  | 1 (Note 1) |
| Satellite information | Config 1 | SSC.1 | GSO |
| Config 2 | SSC.2 | NGSO |
| Note 1: Index of non-anchor carrier configured in SystemInformationBlockType22-NB (See TS 36.331 [2]). | | | |

Table 13.6.2.4.5-2: nCell specific Test Parameters for Downlink channel quality reporting accuracy test on non-anchor carrier for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under enhanced coverage

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
| BWchannel | kHz | 200 |
| NPDCCH parameter |  | R.30 HD-FDD |
| NPDCCH repetition level for RAR on non-anchor |  | 16 |
| NPBCH\_RB | dB | 0 |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
| Note2 | dBm/15 kHz | -98 |
| NRS | dB | -12 |
| Propagation condition |  | AWGN |
| Antenna Configuration |  | 1x1 |
| Scheduling delay in RAR (IDelay) Note3 |  | 0 |
| Channel quality IE Note4 |  | CQI-NPDCCH-NB |
| Note 1: OCNG shall be used such that active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: See section 16.3.3 in TS 36.213 [23].  Note 4: See TS 36.331 [2]. | | |

The pass/fail decision is as specified in the test procedure in clause 13.6.2.4.4.2.

#### 13.6.2.5 E-UTRAN HD-FDD Downlink channel quality reporting accuracy in RRC\_CONNECTED for UE Category NB1 Standalone mode under normal coverage

##### 13.6.2.5.1 Test purpose

The purpose of this test is to verify that the downlink channel quality reporting accuracy in connected mode is within the specified limits. This test will verify the requirements in TS36.133[4] Section 9.1.22A.8 for NB-IoT SAN PCell.

##### 13.6.2.5.2 Test applicability

This test case applies to all types of NB-IoT HD-FDD category NB1 UEs supporting GSO or NGSO or both from release 17 and forwards.

##### 13.6.2.5.3 Minimum conformance requirements

The requirements for accuracy of downlink channel quality reporting in this clause apply to the serving cell on the anchor carrier and non-anchor carrier for UE Category NB1.

The accuracy requirements in Table 13.6.2.5.3-1 are valid under the following conditions:

- Cell specific reference signals are transmitted either from one port.

- Conditions defined in TS 36.102 Clause 7.3B for reference sensitivity are fulfilled.

- NRSRP|dBm according to TS36.133 Annex B.3.25A for a corresponding Band.

Table 13.6.2.5.3-1: Downlink channel quality reporting accuracy for UE Category NB1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NPDCCH Repetition | Pm-Dsg (%) | Conditions | | | | |
| Ês/Iot | Io NOTE 2 range | | | |
| E-UTRA/NR operating band groups NOTE 3 | Minimum Io | | Maximum Io |
|  | dB |  | dBm/15kHz | dBm/BWChannel | dBm/BWChannel |
| R NOTE 1 | ≤1 | ≥ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R/4 NOTE 1 | >1 | ≥ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R NOTE 1 | ≤1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R/8 NOTE 1 | >1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| NOTE 1: R is the reported NPDCCH repetition level that UE has reported in CQI-NPDCCH-NB or CQI-NPDCCH-Short-NB.  NOTE 2: Io is assumed to have constant EPRE across the bandwidth.  NOTE 3: E-UTRA/NR operating band groups are as defined in TS36.133 Section 3.5. | | | | | | |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause A.13.6.2.5.

##### 13.6.2.5.4 Test description

13.6.2.5.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: Ncell bandwidth is as specified in Table 13.6.2.5.5-2.

1. Connect the SS and AWGN noise source to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A Figure A.18 using only UE main Tx/Rx antenna.

2. Propagation conditions are set according to Annex B clause B.0.

3. There is one NB-IoT cell specified in the test. Ncell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test.

4. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

5. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

6. Deactivate UE prediction of satellite trajectory through any preconfigured means.

The UE shall be provided with the valid information about the SAN serving cells before the test.

Table 13.6.2.5.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

13.6.2.5.4.2 Test procedure

The test scenario comprises of one NB-IoT carrier with 1 Ncell.

1. Ensure the UE is in State 2B-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 in Ncell 1.

2. Set the parameters according to Tables 13.6.2.5.5-1 and 13.6.2.5.5-2 T1. Propagation conditions are set according to Annex B clause B.1.1.

3. The SS triggers UE’s channel quality report measurement by the MAC-CE command as specified in TS36.321 clause 5.25.

4. Set the parameters according to Tables 13.6.2.5.5-1 and 13.6.2.5.5-2 T2. The SS start to transmit NPDCCH DCI format N0(NPDCCH repetition number=4) as specified in TS36.133 clause 8.14.4.

5. The reported NPDCCH repetition level shall be derived from the channel quality measured over the NPDCCH period which carries the uplink grant of channel quality report for measurement of DL channel quality of the configured carrier. The UE report the NPDCCH repetition number R by NPUSCH.

6. The SS transmits NPDSCH via NPDCCH DCI format N1 according to the UE reported NPDCCH repetition number R. The SS sends downlink MAC padding bits on the DL RMC.

7. Measure the Pm-dsg for a duration of 4500 NPDCCH. SS counts the number of NACKs, ACKs and statDTXs on the UL NPUSCH. Pm-dsg is the ratio according to the formula (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is ≤ 1%, continue with step 8. Otherwise fail the UE.

8. The SS transmits NPDSCH via NPDCCH DCI format N1 according to NPDCCH repetition number R/4. The SS sends downlink MAC padding bits on the DL RMC.

9. Measure the Pm-dsg for a duration of 4500 NPDCCH.SS counts the number of NACKs, ACKs and statDTXs on the UL NPUSCH. Pm-dsg is the ratio according to the formula (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is > 1%, pass the UE. Otherwise fail the UE.

13.6.2.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.5B and 8.1.6 with following exceptions.

Table 13.6.2.5.4.3-1: Common Exception messages for NB1 test requirements

|  |  |
| --- | --- |
| Default Message Contents | |
| NPDCCH standalone message contents | Table A.10.1.2-1 |
| NPDSCH standalone message contents | Table A.10.2.2-1 |

Table 13.6.2.5.4.3-2: NPUSCH-ConfigDedicated-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 clause Table 8.1.6.3-7 | | | |
| Information Element | Value/remark | Comment | Condition |
| NPUSCH-ConfigDedicated-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| ack-NACK-NumRepetitions-r13 | r1 | Default |  |
| npusch-AllSymbols-r13 | TRUE | Default |  |
| groupHoppingDisabled-r13 | Not present | Default |  |
| } |  |  |  |

##### 13.6.2.5.5 Test requirement

In this set of test cases all cells are on the same carrier frequency. The tests consist of two successive time periods of length T1 and T2, respectively, at different SNR levels. The start of T2 coincides with the start of the channel quality measurement period specified in section TS36.133 8.14.4. The MAC CE-based downlink channel quality reporting accuracy is tested by using the parameters in Tables 13.6.2.5.5-1 and 13.6.2.5.5-2. This test is divided into two parts. Firstly, UE should report the correct R value to ensure the pm-dsg under 1%. Secondly, the pm-dsg should larger than 1% when R/4 or R/8 is used.

Table 13.6.2.5.5-1: General Test Parameters for Downlink channel quality reporting accuracy test in RRC\_CONNECTED for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| CP Length | |  | Normal |  |
| DRX | |  | OFF |  |
| NPUSCH repetition level | |  | 1 |  |
| T1 | | s | 1 | Initialization period |
| T2 Note 1 | | s | - | Evaluation period |
| Satellite information | Config 1 | SSC.1 | GSO |  |
| Config 2 | SSC.2 | NGSO |  |
| Note 1: This time period starts at the beginning of the NPDCCH period that carries the uplink grant for the channel quality report (section 8.14.4 in TS36.133). | | | | |

Table 13.6.2.5.5-2: nCell specific Test Parameters for Downlink channel quality reporting accuracy test in RRC\_CONNECTED for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under normal coverage

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | |
| **T1** | **T2** |
| BWchannel | kHz | 200 | |
| NPDCCH parameter |  | R.30 HD-FDD | |
| NPDCCH repetition Note4 |  | 4 | |
| NPBCH\_RB | dB | 0 | |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
| Note2 | dBm/15 kHz | -98+TT | |
| NRS | dB | 3 | -5.4 |
| Propagation condition |  | AWGN | |
| Antenna Configuration |  | 1x1 | |
| Channel quality IE Note3 |  | CQI-NPDCCH-NB | |
| Note 1: OCNG shall be used such that active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: See TS 36.331 [2].  Note 4: The NPDCCH repetition level shall be adjusted during T2 based on the DL channel quality report so that the requirements in TS36.133 Table 9.1.22.16-1 can be verified. | | | |

The pass/fail decision is as specified in the test procedure in clause 13.6.2.5.4.2.

#### 13.6.2.6 E-UTRAN HD-FDD Downlink channel quality reporting accuracy in RRC\_CONNECTED for UE Category NB1 Standalone mode under enhanced coverage

##### 13.6.2.6.1 Test purpose

The purpose of this test is to verify that the downlink channel quality reporting accuracy in connected mode is within the specified limits. This test will verify the requirements in TS36.133[4] Section 9.1.22A.8for NB-IoT SAN PCell.

##### 13.6.2.6.2 Test applicability

This test case applies to all types of NB-IoT HD-FDD category NB1 UEs supporting GSO or NGSO or both from release 17 and forwards.

##### 13.6.2.6.3 Minimum conformance requirements

The requirements for accuracy of downlink channel quality reporting in this clause apply to the serving cell on the anchor carrier and non-anchor carrier for UE Category NB1.

The accuracy requirements in Table 13.6.2.6.3-1 are valid under the following conditions:

- Cell specific reference signals are transmitted either from one port.

- Conditions defined in TS 36.102 Clause 7.3B for reference sensitivity are fulfilled.

- NRSRP|dBm according to TS36.133 Annex B.3.25A for a corresponding Band.

Table 13.6.2.6.3-1: Downlink channel quality reporting accuracy for UE Category NB1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NPDCCH Repetition | Pm-Dsg (%) | Conditions | | | | |
| Ês/Iot | Io NOTE 2 range | | | |
| E-UTRA/NR operating band groups NOTE 3 | Minimum Io | | Maximum Io |
|  | dB |  | dBm/15kHz | dBm/BWChannel | dBm/BWChannel |
| R NOTE 1 | ≤1 | ≥ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R/4 NOTE 1 | >1 | ≥ -6 dB | NFDD\_SAB\_ | -122.9 | N/A | -70 |
| R NOTE 1 | ≤1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| R/8 NOTE 1 | >1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_SAB\_G | -122.9 | N/A | -70 |
| NOTE 1: R is the reported NPDCCH repetition level that UE has reported in CQI-NPDCCH-NB or CQI-NPDCCH-Short-NB.  NOTE 2: Io is assumed to have constant EPRE across the bandwidth.  NOTE 3: E-UTRA/NR operating band groups are as defined in TS36.133 Section 3.5. | | | | | | |

The normative reference for this requirement is 3GPP TS 36.133 [4] clause A.13.6.2.6.

##### 13.6.2.6.4 Test description

13.6.2.6.4.1 Initial conditions

Test Environment: Normal, as defined in 3GPP TS 36.508 [7] clause 8.1.1.

Frequencies to be tested: According to Annex E table E-4 and 3GPP TS 36.508 [7] clauses 8.1.3 and 8.1.4.2.

Channel Bandwidth to be tested: Ncell bandwidth is as specified in Table 13.6.2.6.5-2.

1. Connect the SS and AWGN noise source to the UE antenna connectors as shown in 3GPP TS 36.508 [7] Annex A Figure A.18 using only UE main Tx/Rx antenna.

2. Propagation conditions are set according to Annex B clause B.0.

3. There is one NB-IoT cell specified in the test. Ncell 1 is the cell used for registration with the power level set according to Annex C.0 and C.1 for this test.

4. UE location according to TS 36.508 [12] clause 8.4.6.1 is provided to the UE through any preconfigured means.

5. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 36.508 [12] clause 8.4.6.2.1 depending on the type of satellite under test. Test system shall send same SIB31-NB information during the duration of the test as defined in TS 36.508 [12] clause 8.4.6.3.1.

6. Deactivate UE prediction of satellite trajectory through any preconfigured means.

The UE shall be provided with the valid information about the SAN serving cells before the test.

Table 13.6.2.6.4.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

13.6.2.6.4.2 Test procedure

The test scenario comprises of one NB-IoT carrier with 1 Ncell.

The test procedures are the same as test procedures defined in 13.6.2.5.4.2 with R/8 in step 8.

13.6.2.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.5B and 8.1.6 with following exceptions.

Table 13.6.2.6.4.3-1: Common Exception messages for NB1 test requirements

|  |  |
| --- | --- |
| Default Message Contents | |
| NPDCCH standalone message contents | Table A.10.1.2-1 |
| NPDSCH standalone message contents | Table A.10.2.2-1 |

Table 13.6.2.6.4.3-2: NPUSCH-ConfigDedicated-NB-DEFAULT

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 36.508 clause Table 8.1.6.3-7 | | | |
| Information Element | Value/remark | Comment | Condition |
| NPUSCH-ConfigDedicated-NB-DEFAULT ::= SEQUENCE { |  |  |  |
| ack-NACK-NumRepetitions-r13 | r1 | Default |  |
| npusch-AllSymbols-r13 | TRUE | Default |  |
| groupHoppingDisabled-r13 | Not present | Default |  |
| } |  |  |  |

##### 13.6.2.6.5 Test requirement

In this set of test cases all cells are on the same carrier frequency. The tests consist of two successive time periods of length T1 and T2, respectively, at different SNR levels. The start of T2 coincides with the start of the channel quality measurement period specified in section TS36.133 8.14.4. The MAC CE-based downlink channel quality reporting accuracy is tested by using the parameters in Tables 13.6.2.6.5-1 and 13.6.2.6.5-2. This test is divided into two parts. Firstly, UE should report the correct R value to ensure the pm-dsg under 1%. Secondly, the pm-dsg should larger than 1% when R/4 or R/8 is used.

Table 13.6.2.6.5-1: General Test Parameters for Downlink channel quality reporting accuracy test in RRC\_CONNECTED for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under enhanced coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| CP Length | |  | Normal |  |
| DRX | |  | OFF |  |
| NPUSCH repetition level | |  | 1 |  |
| T1 | | s | 1 | Initialization period |
| T2 Note 1 | | s | - | Evaluation period |
| Satellite information | Config 1 | SSC.1 | GSO |  |
| Config 2 | SSC.2 | NGSO |  |
| Note 1: This time period starts at the beginning of the NPDCCH period that carries the uplink grant for the channel quality report (section 8.14.4). | | | | |

Table 13.6.2.6.5-2: nCell specific Test Parameters for Downlink channel quality reporting accuracy test in RRC\_CONNECTED for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under enhanced coverage

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | |
| **T1** | **T2** |
| BWchannel | kHz | 200 | |
| NPDCCH parameter |  | R.30 HD-FDD | |
| NPDCCH repetition Note4 |  | 16 | |
| NPBCH\_RB | dB | 0 | |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
| Note2 | dBm/15 kHz | -98+TT | |
| NRS | dB | 0 | -12 |
| Propagation condition |  | AWGN | |
| Antenna Configuration |  | 1x1 | |
| Channel quality IE Note3 |  | CQI-NPDCCH-NB | |
| Note 1: OCNG shall be used such that active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: See TS 36.331 [2].  Note 4: The NPDCCH repetition level shall be adjusted during T2 based on the DL channel quality report so that the requirements in Table 9.1.22.16-1 can be verified. | | | |

The pass/fail decision is as specified in the test procedure in clause 13.6.2.5.4.2.