**3GPP TSG-RAN WG4 Meeting #97-e *R4-2017308***

Online, 2 – 13 November, 2020

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.133** | **CR** | **xxx** | **rev** | **-** | **Current version:** | **16.7.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Test cases for LTE conditional handover | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | LTE\_feMob-Perf | | | | |  | ***Date:*** | | | 2020-10-23 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Add test cases for LTE conditional handover | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add test cases:  1. E-UTRAN FDD – FDD intra-F test cases  2. E-UTRAN FDD – FDD inter-F test cases  3. E-UTRAN TDD – TDD intra-F test cases  4. E-UTRAN TDD – TDD inter-F test cases  5. E-UTRAN FDD – TDD inter-F test cases  6. E-UTRAN TDD – FDD inter-F test cases | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Missing test cases for conditional HO delay requirements. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.5.1.x, A.5.1.x+1, A.5.1.x+2, A.5.1.x+3, A.5.1.x+4, A.5.1.x+5 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS/TR ... CR 36.521-3 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**< Start of change>**

A.5.1.x E-UTRAN FDD - FDD Intra frequency conditional handover

A.5.1.x.1 Test Purpose and Environment

This test is to verify the requirement for the FDD-FDD intra frequency conditional handover requirements specified in clause 5.1.2.6.

The test scenario comprises of 1 E-UTRA FDD carrier and 2 cells as given in tables A.5.1.x.1-1 and A.5.1.x.1-2. The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2.

E-UTRAN shall send an RRC message implying conditional handover to cell 2. The RRC message implying conditional handover shall be sent to the UE during period T1, at a time earlier than TRRC before the beginning of T2. At the start of T2, cell 2 becomes detectable and meets the handover condition.

**Table A.5.1.x.1-1: General test parameters for E-UTRAN FDD-FDD intra frequency conditional handover test case**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| PDSCH parameters | |  | DL Reference Measurement Channel R.0 FDD | As specified in clause A.3.1.1.1 |
| PCFICH/PDCCH/PHICH parameters | |  | DL Reference Measurement Channel R.6 FDD | As specified in clause A.3.1.2.1 |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| E-UTRA RF Channel Number | |  | 1 | Only one FDD carrier frequency is used. |
| Channel Bandwidth (BWchannel) | | MHz | 10 |  |
| A3-Offset | | dB | 0 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| DRX | |  | OFF |  |
| CP length | |  | Normal |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| PRACH configuration | |  | 4 | As specified in table 5.7.1-2 in TS 36.211 |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤2 |  |

**Table A.5.1.x.1-2: Cell specific test parameters for E-UTRAN FDD-FDD intra frequency conditional handover test case**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| E-UTRA RF Channel Number |  | 1 | | 1 | |
| BWchannel | MHz | 10 | | 10 | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1 FDD) and in A.3.2.1.2 (OP.2 FDD) |  | OP.1 FDD | OP.2 FDD | OP.2 FDD | OP.1 FDD |
| PBCH\_RA | dB | 0 | | 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 |
|  | dB | 8 | -3.3 | -Infinity | 2.36 |
| Note 2 | dBm/15 KHz | -98 | | | |
|  | dB | 8 | 8 | - Infinity | 11 |
| RSRP Note 3 | dBm/15 KHz | -90 | -90 | - Infinity | -87 |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

A.5.1.x.2 Test Requirements

TRRC + TEvent\_DU occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than Tmeasure + Tinterrupt + TCHO\_execution = 860 ms from the start of T2 and interruption during T2 shall not exceed 50ms.

The rate of correct conditional handovers observed during repeated tests shall be at least 90%.

NOTE: The conditional handover delay can be expressed as: TRRC + TDelayUncertainty + Tmeasure + TCHO\_execution + Tinterrupt, where:

TRRC = 15 ms and is specified in clause 11.2 in TS 36.331 [2].

Tmeasure = 800 ms in the test; Tmeasure is defined in clause 5.1.2.6.2 without TDelayUncertainty.

TCHO\_execution = 10 ms in the test; TCHO\_execution is defined in clause 5.1.2.6.3.

Tinterrupt = 50 ms in the test; Tinterrupt is defined in clause 5.1.2.6.4.

A.5.1.x+1 E-UTRAN TDD - TDD Intra frequency conditional handover

A.5.1.x+1.1 Test Purpose and Environment

This test is to verify the requirement for the TDD-TDD intra frequency conditional handover requirements specified in clause 5.1.2.9.

The test scenario comprises of 1 E-UTRA TDD carrier and 2 cells as given in tables A.5.1.x+1.1-1 and A.5.1.x+1.1-2. The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2.

E-UTRAN shall send an RRC message implying conditional handover to cell 2. The RRC message implying conditional handover shall be sent to the UE during period T1, at a time earlier than TRRC before the beginning of T2. At the start of T2, cell 2 becomes detectable and meets the handover condition.

**Table A.5.1.x+1.1-1: General test parameters for E-UTRAN TDD-TDD intra frequency conditional handover test case**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| PDSCH parameters | |  | DL Reference Measurement Channel R.0 TDD | As specified in clause A.3.1.1.2 |
| PCFICH/PDCCHPHICH parameters | |  | DL Reference Measurement Channel R.6 TDD | As specified in clause A.3.1.2.2 |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| E-UTRA RF Channel Number | |  | 1 | Only one TDD carrier frequency is used. |
| Channel Bandwidth (BWchannel) | | MHz | 10 |  |
| A3-Offset | | dB | 0 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| DRX | |  | OFF |  |
| CP length | |  | Normal |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Special subframe configuration | |  | 6 | As specified in table 4.2-1 in TS 36.211 |
| Uplink-downlink configuration | |  | 1 | As specified in table 4.2-2 in TS 36.211 |
| PRACH configuration index | |  | 53 | As specified in table 5.7.1-3 in TS 36.211 |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤2 |  |

**Table A.5.1.x+1.1-2: Cell specific test parameters for E-UTRAN TDD-TDD intra frequency conditional handover test case**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| E-UTRA RF Channel Number |  | 1 | | 1 | |
| BWchannel | MHz | 10 | | 10 | |
| OCNG Patterns defined in A.3.2.2.1 (OP.1 TDD) and in A.3.2.2.2 (OP.2 TDD) |  | OP.1 TDD | OP.2 TDD | OP.2 TDD | OP.1 TDD |
| PBCH\_RA | dB | 0 | | 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 |
|  | dB | 8 | -3.3 | -Infinity | 2.36 |
| Note 2 | dBm/15 KHz | -98 | | | |
|  | dB | 8 | 8 | -Infinity | 11 |
| RSRP Note 3 | dBm/15 KHz | -90 | -90 | - Infinity | -87 |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

A.5.1.x+1.2 Test Requirements

TRRC + TEvent\_DU occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than Tmeasure + Tinterrupt + TCHO\_execution = 860 ms from the start of T2 and interruption during T2 shall not exceed 50ms.

The rate of correct conditional handovers observed during repeated tests shall be at least 90%.

NOTE: The conditional handover delay can be expressed as: TRRC + TDelayUncertainty + Tmeasure + TCHO\_execution + Tinterrupt, where:

TRRC = 15 ms and is specified in clause 11.2 in TS 36.331 [2].

Tmeasure = 800 ms in the test; Tmeasure is defined in clause 5.1.2.6.2 without TDelayUncertainty.

TCHO\_execution = 10 ms in the test; TCHO\_execution is defined in clause 5.1.2.6.3.

Tinterrupt = 50 ms in the test; Tinterrupt is defined in clause 5.1.2.6.4.

A.5.1.x+2 E-UTRAN FDD - FDD Inter frequency conditional handover

A.5.1.x+2.1 Test Purpose and Environment

This test is to verify the requirement for the FDD-FDD inter-frequency conditional handover requirements specified in clause 5.1.2.6.

The test scenario comprises of two E-UTRA FDD carriers and one cell on each carrier as given in tables A.5.1.x+2.1-1 and A.5.1. x+2.1-2. The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 is configured before T2 begins to enable inter-frequency monitoring.

E-UTRAN shall send an RRC message implying conditional handover to cell 2. The RRC message implying conditional handover shall be sent to the UE during period T1, at a time earlier than TRRC before the beginning of T2. At the start of T2, cell 2 becomes detectable and meets the handover condition.

**Table A.5.1.x+2.1-1: General test parameters for E-UTRAN FDD-FDD Inter frequency conditional handover test case**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| PDSCH parameters | |  | DL Reference Measurement Channel R.0 FDD | As specified in clause A.3.1.1.1 |
| PCFICH/PDCCH/PHICH parameters | |  | DL Reference Measurement Channel R.6 FDD | As specified in clause A.3.1.2.1 |
| Initial conditions | Active cell |  | Cell 1 | Cell 1 is on RF channel number 1 |
| Neighbouring cell |  | Cell 2 | Cell 2 is on RF channel number 2 |
| Final condition | Active cell |  | Cell 2 |  |
| E-UTRA RF channel number | |  | 1, 2 | Two FDD carriers are used |
| Channel Bandwidth (BWchannel) | | MHz | 10 |  |
| A3-Offset | | dB | -4 |  |
| Hysteresis | | dB | 0 |  |
| TimeToTrigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| DRX | |  | OFF |  |
| PRACH configuration | |  | 4 | As specified in table 5.7.1-2 in TS 36.211 |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Gap pattern configuration Id | |  | 0 | As specified in Table 8.1.2.1-1 started before T2 starts |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤2 |  |

**Table A.5.1.x+2.1-2: Cell specific test parameters for E-UTRAN FDD-FDD Inter frequency conditional handover test case**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| E-UTRA RF Channel number |  | 1 | | 2 | |
| BWchannel | MHz | 10 | | 10 | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1 FDD) and in A.3.2.1.2 (OP.2 FDD) |  | OP.1 FDD | OP.2 FDD | OP.2 FDD | OP.1 FDD |
| PBCH\_RA | dB | 0 | | 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 |
|  | dB | 4 | 4 | -Infinity | 7 |
| Note 2 | dBm/15 kHz | -98 | | | |
|  | dB | 4 | 4 | -Infinity | 7 |
| RSRP Note 3 | dBm/15 KHz | -94 | -94 | -Infinity | -91 |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

A.5.1.x+2.2 Test Requirements

TRRC + TEvent\_DU occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than Tmeasure + Tinterrupt + TCHO\_execution = 3900 ms from the start of T2 and interruption during T2 shall not exceed 50ms.

The rate of correct conditional handovers observed during repeated tests shall be at least 90%.

NOTE: The conditional handover delay can be expressed as: TRRC + TDelayUncertainty + Tmeasure + TCHO\_execution + Tinterrupt, where:

TRRC = 15 ms and is specified in clause 11.2 in TS 36.331 [2].

Tmeasure = 3840 ms in the test; Tmeasure is defined in clause 5.1.2.6.2 without TDelayUncertainty.

TCHO\_execution = 10 ms in the test; TCHO\_execution is defined in clause 5.1.2.6.3.

Tinterrupt = 50 ms in the test; Tinterrupt is defined in clause 5.1.2.6.4.

A.5.1.x+3 E-UTRAN TDD - TDD Inter frequency conditional handover

A.5.1.x+3.1 Test Purpose and Environment

This test is to verify the requirement for the TDD-TDD inter-frequency conditional handover requirements specified in clause 5.1.2.9.

The test scenario comprises of two E-UTRA TDD carriers and one cell on each carrier as given in tables A.5.1.x+3.1-1 and A.5.1. x+3.1-2. The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 is configured before T2 begins to enable inter-frequency monitoring.

E-UTRAN shall send an RRC message implying conditional handover to cell 2. The RRC message implying conditional handover shall be sent to the UE during period T1, at a time earlier than TRRC before the beginning of T2. At the start of T2, cell 2 becomes detectable and meets the handover condition.

**Table A.5.1.x+3.1-1: General test parameters for E-UTRAN TDD-TDD Inter frequency conditional handover test case**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| PDSCH parameters | |  | DL Reference Measurement Channel R.0 TDD | As specified in clause A.3.1.1.2 |
| PCFICH/PDCCH/PHICH parameters | |  | DL Reference Measurement Channel R.6 TDD | As specified in clause A.3.1.2.2 |
| Initial conditions | Active cell |  | Cell 1 | Cell 1 is on RF channel number 1 |
| Neighbour cell |  | Cell 2 | Cell 2 is on RF channel number 2 |
| Final conditions | Active cell |  | Cell 2 |  |
| E-UTRA RF channel number | |  | 1, 2 | Two TDD carriers are used |
| Channel Bandwidth (BWchannel) | | MHz | 10 |  |
| A3-Offset | | dB | -4 |  |
| Hysteresis | | dB | 0 |  |
| Time to Trigger | | ms | 0 |  |
| Filter coefficient | |  | 0 |  |
| DRX | |  | OFF |  |
| CP length | |  | Normal |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Special subframe configuration | |  | 6 | As specified in table 4.2-1 in TS 36.211 |
| Uplink-downlink configuration | |  | 1 | As specified in table 4.2-2 in TS 36.211 |
| PRACH configuration | |  | 53 | As specified in table 5.7.1-3 in TS 36.211 |
| Gap pattern configuration Id | |  | 0 | As specified in Table 8.1.2.1-1 started before T2 starts |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤2 |  |

**Table A.5.1.x+3.1-2: Cell specific test parameters for E-UTRAN TDD-TDD Inter frequency conditional handover test case**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | | **Cell 2** | | | |
| **T1** | **T2** | **T1** | | **T2** | |
| E-UTRA RF Channel number |  | 1 | | 2 | | | |
| BWchannel | MHz | 10 | | 10 | | | |
| OCNG Patterns defined in A.3.2.2.1 (OP.1 TDD) and in A.3.2.2.2 (OP.2 TDD) |  | OP.1 TDD | OP.2 TDD | OP.2 TDD | OP.1 TDD | |
| PBCH\_RA | dB | 0 | | 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 |
|  | dB | 4 | 4 | -Infinity | | 7 | |
| Note 2 | dBm/15 kHz | -98 | | | | | |
|  | dB | 4 | 4 | -Infinity | 7 | |
| RSRP Note 3 | dBm/15 KHz | -94 | -94 | -infinity | | -91 | |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

A.5.1.x+3.2 Test Requirements

TRRC + TEvent\_DU occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than Tmeasure + Tinterrupt + TCHO\_execution = 3900 ms from the start of T2 and interruption during T2 shall not exceed 50ms.

The rate of correct conditional handovers observed during repeated tests shall be at least 90%.

NOTE: The conditional handover delay can be expressed as: TRRC + TDelayUncertainty + Tmeasure + TCHO\_execution + Tinterrupt, where:

TRRC = 15 ms and is specified in clause 11.2 in TS 36.331 [2].

Tmeasure = 3840 ms in the test; Tmeasure is defined in clause 5.1.2.6.2 without TDelayUncertainty.

TCHO\_execution = 10 ms in the test; TCHO\_execution is defined in clause 5.1.2.6.3.

Tinterrupt = 50 ms in the test; Tinterrupt is defined in clause 5.1.2.6.4.

A.5.1.x+4 E-UTRAN FDD - TDD Inter frequency conditional handover

A.5.1.x+4.1 Test Purpose and Environment

This test is to verify the requirement for the FDD-TDD inter-frequency conditional handover requirements specified in clause 5.1.2.7.

The test scenario comprises of one E-UTRA FDD cell and one E-UTRA TDD cell as given in tables A.5.1.x+4.1-1, A.5.1. x+4.1-2 and A.5.1. x+4.1-3. The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 is configured before T2 begins to enable inter-frequency monitoring.

E-UTRAN shall send an RRC message implying conditional handover to cell 2. The RRC message implying conditional handover shall be sent to the UE during period T1, at a time earlier than TRRC before the beginning of T2. At the start of T2, cell 2 becomes detectable and meets the handover condition.

**Table A.5.1.x+4.1-1: General test parameters for E-UTRAN FDD-TDD Inter frequency conditional handover test case**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Cell 1 PDSCH parameters | |  | DL Reference Measurement Channel R.0 FDD | As specified in clause A.3.1.1.1 |
| Cell 1 PCFICH/PDCCH/PHICH parameters | |  | DL Reference Measurement Channel R.6 FDD | As specified in clause A.3.1.2.1 |
| Cell 2 PDSCH parameters | |  | DL Reference Measurement Channel R.0 TDD | As specified in clause A.3.1.1.2 |
| Cell 2 PCFICH/PDCCH/PHICH parameters | |  | DL Reference Measurement Channel R.6 TDD | As specified in clause A.3.1.2.2 |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbour cell |  | Cell 2 |  |
| Final conditions | Active cell |  | Cell 2 |  |
| Cell 1 E-UTRA RF channel number | |  | 1 | One FDD carrier is used |
| Cell 2 E-UTRA RF channel number | |  | 2 | One TDD carrier is used |
| Channel Bandwidth (BWchannel) | | MHz | 10 |  |
| A3-Offset | | dB | -4 |  |
| Hysteresis | | dB | 0 |  |
| Time to Trigger | | ms | 0 |  |
| Filter coefficient | |  | 0 |  |
| DRX | |  | OFF |  |
| CP length | |  | Normal |  |
| E-UTRA TDD Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Special subframe configuration | |  | 6 | As specified in table 4.2-1 in TS 36.211. Applicable to cell 2. |
| Uplink-downlink configuration | |  | 1 | As specified in table 4.2-2 in TS 36.211. Applicable to cell 2 |
| E-UTRA TDD PRACH configuration | |  | 53 | As specified in table 5.7.1-3 in TS 36.211 |
| Gap pattern configuration Id | |  | 0 | As specified in Table 8.1.2.1-1 started before T2 starts |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤2 |  |

**Table A.5.1.x+4.1-2: Cell specific test parameters for E-UTRAN FDD (cell #1) in E-UTRAN FDD-TDD Inter frequency conditional handover test case**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | |
| **T1** | **T2** |
| E-UTRA RF Channel number |  | 1 | |
| BWchannel | MHz | 10 | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1 FDD) and in A.3.2.1.2 (OP.2 FDD) |  | OP.1 FDD | OP.2 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 |
|  | dB | 4 | 4 |
| Note 2 | dBm/15 kHz | -98 | |
|  | dB | 4 | 4 |
| RSRP Note 3 | dBm/15 KHz | -94 | -94 |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameter themselves. | | | |

**Table A.5.1.x+4.1-3: Cell specific test parameters for E-UTRAN TDD (cell #2) in E-UTRAN FDD-TDD Inter frequency conditional handover test case**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 2** | |
| **T1** | **T2** |
| E-UTRA RF Channel number |  | 2 | |
| BWchannel | MHz | 10 | |
| OCNG Patterns defined in A.3.2.2.1 (OP.1 TDD) and in A.3.2.2.2 (OP.2 TDD) |  | OP.2 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 |
|  | dB | -Infinity | 7 |
| Note 2 | dBm/15 kHz | -98 | |
|  | dB | -Infinity | 7 |
| RSRP Note 3 | dBm/15 KHz | -Infinity | -91 |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameter themselves. | | | |

A.5.1.x+4.2 Test Requirements

TRRC + TEvent\_DU occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than Tmeasure + Tinterrupt + TCHO\_execution = 3900 ms from the start of T2 and interruption during T2 shall not exceed 50ms.

The rate of correct conditional handovers observed during repeated tests shall be at least 90%.

NOTE: The conditional handover delay can be expressed as: TRRC + TDelayUncertainty + Tmeasure + TCHO\_execution + Tinterrupt, where:

TRRC = 15 ms and is specified in clause 11.2 in TS 36.331 [2].

Tmeasure = 3840 ms in the test; Tmeasure is defined in clause 5.1.2.6.2 without TDelayUncertainty.

TCHO\_execution = 10 ms in the test; TCHO\_execution is defined in clause 5.1.2.6.3.

Tinterrupt = 50 ms in the test; Tinterrupt is defined in clause 5.1.2.6.4.

A.5.1.x+5 E-UTRAN TDD - FDD Inter frequency conditional handover

A.5.1.x+5.1 Test Purpose and Environment

This test is to verify the requirement for the TDD-FDD inter-frequency conditional handover requirements specified in clause 5.1.2.8.

The test scenario comprises of one E-UTRA TDD cell and one E-UTRA FDD cell as given in tables A.5.1.x+5.1-1, A.5.1. x+5.1-2 and A.5.1. x+5.1-3. The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 is configured before T2 begins to enable inter-frequency monitoring.

E-UTRAN shall send an RRC message implying conditional handover to cell 2. The RRC message implying conditional handover shall be sent to the UE during period T1, at a time earlier than TRRC before the beginning of T2. At the start of T2, cell 2 becomes detectable and meets the handover condition.

**Table A.5.1.x+5.1-1: General test parameters for E-UTRAN TDD-FDD Inter frequency conditional handover test case**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Cell 1 PDSCH parameters | |  | DL Reference Measurement Channel R.0 TDD | As specified in clause A.3.1.1.2 |
| Cell 1 PCFICH/PDCCH/PHICH parameters | |  | DL Reference Measurement Channel R.6 TDD | As specified in clause A.3.1.2.2 |
| Cell 2 PDSCH parameters | |  | DL Reference Measurement Channel R.0 FDD | As specified in clause A.3.1.1.1 |
| Cell 2 PCFICH/PDCCH/PHICH parameters | |  | DL Reference Measurement Channel R.6 FDD | As specified in clause A.3.1.2.1 |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbour cell |  | Cell 2 |  |
| Final conditions | Active cell |  | Cell 2 |  |
| Cell 1 E-UTRA RF channel number | |  | 1 | One TDD carrier is used |
| Cell 2 E-UTRA RF channel number | |  | 2 | One FDD carrier is used |
| Channel Bandwidth (BWchannel) | | MHz | 10 |  |
| A3-Offset | | dB | -4 |  |
| Hysteresis | | dB | 0 |  |
| Time to Trigger | | ms | 0 |  |
| Filter coefficient | |  | 0 |  |
| DRX | |  | OFF |  |
| CP length | |  | Normal |  |
| E-UTRA FDD PRACH configuration | |  | 4 | As specified in table 5.7.1-2 in TS 36.211 |
| E-UTRA FDD Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Gap pattern configuration Id | |  | 0 | As specified in Table 8.1.2.1-1 started before T2 starts |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤2 |  |

**Table A.5.1.x+5.1-2: Cell specific test parameters for E-UTRAN TDD (cell #1) in E-UTRAN TDD-FDD Inter frequency conditional handover test case**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | |
| **T1** | **T2** |
| E-UTRA RF Channel number |  | 1 | |
| BWchannel | MHz | 10 | |
| OCNG Patterns defined in A.3.2.2.1 (OP.1 TDD) and in A.3.2.2.2 (OP.2 TDD) |  | OP.1 TDD | OP.2 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 |
|  | dB | 4 | 4 |
| Note 2 | dBm/15 kHz | -98 | |
|  | dB | 4 | 4 |
| RSRP Note 3 | dBm/15 KHz | -94 | -94 |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameter themselves. | | | |

**Table A.5.1.x+5.1-3: Cell specific test parameters for E-UTRAN FDD (cell #2) in E-UTRAN TDD-FDD Inter frequency conditional handover test case**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 2** | |
| **T1** | **T2** |
| E-UTRA RF Channel number |  | 2 | |
| BWchannel | MHz | 10 | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1 FDD) and in A.3.2.1.2 (OP.2 FDD) |  | OP.2 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 |
|  | dB | -Infinity | 7 |
| Note 2 | dBm/15 kHz | -98 | |
|  | dB | -Infinity | 7 |
| RSRP Note 3 | dBm/15 KHz | -Infinity | -91 |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameter themselves. | | | |

A.5.1.x+2.2 Test Requirements

TRRC + TEvent\_DU occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than Tmeasure + Tinterrupt + TCHO\_execution = 3900 ms from the start of T2 and interruption during T2 shall not exceed 50ms.

The rate of correct conditional handovers observed during repeated tests shall be at least 90%.

NOTE: The conditional handover delay can be expressed as: TRRC + TDelayUncertainty + Tmeasure + TCHO\_execution + Tinterrupt, where:

TRRC = 15 ms and is specified in clause 11.2 in TS 36.331 [2].

Tmeasure = 3840 ms in the test; Tmeasure is defined in clause 5.1.2.6.2 without TDelayUncertainty.

TCHO\_execution = 10 ms in the test; TCHO\_execution is defined in clause 5.1.2.6.3.

Tinterrupt = 50 ms in the test; Tinterrupt is defined in clause 5.1.2.6.4.

**< End of change>**