**3GPP TSG-RAN WG4 Meeting #102-e *R4-2207143***

**Electronic meeting, 21st February – 3rd March, 2022**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.133** | **CR** | **2280** | **rev** | **-** | **Current version:** | **16.10.0** |  |
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| *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:*** | Big CR to TS 38.133: Rel-16 WIs RRM maintenance Part 3 (Rel-16) | | | | | | | | | |
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| ***Source to WG:*** | MCC, OPPO | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
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| ***Work item code:*** | 5G\_V2X\_NRSL-Core, 5G\_V2X\_NRSL-Perf, NR\_RRM\_enh-Core, NR\_RRM\_enh-Perf, NR\_HST-Core, NR\_HST-Perf, NR\_RF\_FR2\_req\_enh-Core, NR\_2step\_RACH-Perf, NR\_unlic-Perf, NR\_Mob\_enh-Perf, LTE\_NR\_DC\_CA\_enh-Perf, NR\_UE\_pow\_sav-Core | | | | |  | ***Date:*** | | | 2022-03-07 |
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| ***Category:*** | **F** |  | | | | | ***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)* | |
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| ***Reason for change:*** | | This big CR merges the mutiple endorsed draft CRs. The reason for change in each endorsed draft CR is copied below.   1. R4-2206816 CR: Correction on Synchronization Reference Selection/Reselection SyncRefUE Frequency Offset Side Condition for NR-V2X   In 38.101-1, SL transmission frequency error requirement only applies to SL UEs synchronized to a reference source, but not to SL UEs without a reference source:  *The UE modulated carrier frequency for NR V2X sidelink transmissions in Table 5.2E.1-1, shall be accurate to within ±0.1 PPM observed over a period of 1 ms compared to the absolute frequency in case of using GNSS synchronization source. The same requirements applied over a period of 1 ms compared to the carrier frequency received from the gNB or V2X synchronization reference UE in case of using the gNB or V2X synchronization reference UE sidelink synchronization signals.*  Therefore, the frequency error from a SyncRef UE can be unbounded if it doesn’t synchronize to any source, and an SL UE can not search for SLSS in a unbounded frequency range. Therefore, adding a side condition on frequency error range for SLSS search requirement is necessary. We propose to apply the frequency error requirement in 38.101-1 as a side condition for Selection/Reselection to Intra-frequency SyncRef UE requirement.   1. R4-2203797 Draft CR on core part maintenance for TS38.133 R16   In TS36.133 LTE CGI reading requirement, it was specified that “If autonomous gaps are used for measurement with the purpose of ‘reportCGI’, **regardless of whether DRX or eDRX\_CONN is used or not**, or whether SCell(s) are configured or not, the UE shall be able to identify a new CGI of E-UTRA cell within: ”, however, this “regardless of whether DRX is used or not” is missing in the NR spec for LTE CGI reading requirement.   1. R4-2207093 Correction of mobility enhancement test cases\_R16   To correct following issues to mobility enhancement test cases:  A.7.3.3.1:   * Noc level for config 1 is wrong. Noc is given as -104.7dBm/15kHz and SSB SCS is 120kHz for config.1. So the Noc level for config 1 should be -104.7+10\*log10(120/15)= -95.7dBm/120kHz rather than -98.7dBm/120kHz. * For the same reason, Io is also underestimated by 3dB. Io during T1 and T2 should be -59.7 dBm/Ch BW and -54.2 dBm/Ch BW.   Effect of REFSENS is not considered when calculating Es/Iot.   1. R4-2204311 Draft CR to maintain measurement gap sharing in TS 38.133   When per-FR MG is configured, the gap sharing scheme should apply to measurements that fully overlapping with per-FR measurement gap.   1. R4-2205366 CR to introduce EMR TC#5 R16   In R4-2105841, it was agreed to introduce 5 TCs for EMR, but TC#5 has not been introduced yet.   1. R4-2204426 Corrections to HST requirements in R16   Corrections of signalling IE names for HST R16 measurement enhancement feature.   1. R4-2207094 DraftCR on correction to interruption requirements for IBM R16   For NE-DC mode, one E-UTRA SCell in SCG could be only in FR1, and one SCell in MCG can be either in FR1 or in FR2. When one E-UTRA SCell in SCG is activated/deactivated, the interruption length depends on whether E-UTRA SCell and the interruptted NR cell are in the same band or not.   1. R4-2207095 CR on inter-frequency measurement without MG R16   Current requirements for inter-frequency measurement are defined such that a non-CA-capable UE can indicate support *interFrequencyMeas-NoGap* but requires MG to perform the inter-frequency measurement even the SSB is within active BWP.  This means besides checking whether UE supports *interFrequencyMeas-NoGap* or not, NW also needs to check whether UE is CA capable or not. However, this effort does not provide any benefit to UE, i.e. a UE that requires MG to measure inter-frequency SSB within active BWP, no matter it is CA capable or not, can simply indicate it does not support *interFrequencyMeas-NoGap.*   1. R4-2205364 CR on CBW change requirements R16   CR R4-2006548 was agreed in RAN4#95-e, which introduces interruption requirements due to CBW change. However, changes in the CR for NE-DC and NR-DC were not implemented.   1. R4-2205644 Editorial correction to EN-DC interruption requirements   Interruption requirements due to BWP timer expiry is dupliced while the interruption requirements due to DCI based BWP switch is missing.   1. R4-2207096 Draft CR on number of serving carriers supported in FR2 for NR SA   Change#1:  As per band combinations and CA configurations (e.g., CA\_n257M) defined in TS 38.101-2, UE shall support up to 8 DL CC and 8 UL CC. In the exisitng specification, number of UL CC supported is up to 2. Which is not correct as per CA cofigurations supported in 38.101-2.  Change#2:  As per band combinations and CA configurations defined in 38.101-3 (e.g., for DL, DC\_3C\_n78A-n257M. For UL, DC\_1A\_n257M or DC\_1A\_n77A-n257I), total number of DL and UL carriers are to be updated as 9 and 8 respectively.   1. R4-2203528 Correction of 2-step RACH RRM performance requirements   Purpose of 2-step RACH should include verification of Msg PRACH and PUSCH not only PRACH   1. R4-2203574 Draft CR to maintain HST performance requirement   (1) A.4.6.4.5 and A.6.6.4.5  As per Test Case setting, CSI reporting has periodicity of 80 slots. DRX.8 (320ms periodicity) will not adhere with CSI report periodicity completely.  As per TS 38.321 cl.5.7, CSI on PUCCH will not be reported if DRX is not in Active Time.  <TS 38.321 cl.5.7>    Thus, DRX setting should be updated to DRX.3 (40ms periodicity) similar to non-HST equivalent TCs (RRM 4.6.4.2 and 6.6.4.2).  There is a typographical error at sub-clause A.4.6.4.5.  (2) A.6.1.2.5 and A.8.2.1.2  For Table A.6.1.2.5, NR Prach Configuration Index 77 is not applicable for RRM TDD-Config. Based from TS38.211 Table 6.3.3.2-3, PRACH will fall on SF#9. But for RRM, UL subframes only fall on SF#2, SF#3, SF#7, and SF#8. Also LTE Prach Config Index for LTE FDD (config4,5,6) seems to be not consistent with other NR-EUTRAN reselection.  For Table A.8.2.1.2, NR Prach Configuration Index 87 is not applicable for RRM TDD-Config. Based from TS38.211 Table 6.3.3.2-3, PRACH will fall on SF#9 but for RRM, UL subframes only fall on SF#2, SF#3, SF#7, and SF#8.  (3) A.8.4.2.9  DRX.6 is not applicable for this test case as it is only applicable for NR serving cell (not LTE serving cell). Most probable proper DRX setting for the test case is DRX.5.  Test Requirement measurement delay should be at most 4.8s + (2xTTIdcch)  Tidentify\_irat\_with\_index = Tpss/sss\_sync\_rat + Tssb\_measurement\_period\_irat + Tssb\_time\_index\_irat = 4800ms  Tpss/sss\_sync\_rat : from Table 8.1.2.4.21.1.1-1A in TS36.133  Tssb\_measurement\_period\_irat : from Table 8.1.2.4.21.1.1-3A in TS36.133  Tssb\_time\_index\_irat : from Table 8.1.2.4.21.1.1-5A in TS36.133  -If DRX.9 - DRX cycle = 40ms  --Tidentify\_irat\_with\_index = 600ms + 120ms + 320ms = 1040ms != 4800ms  -If DRX.5 - DRX cycle = 320ms  --Tidentify\_irat\_with\_index = 2560ms + 960ms + 1280ms = 4800ms   1. R4-2204369 CR for the number of ACK and NACK in CGI reading test case in NR SA for R16   For the CGI reading test case, UE shall report the cell global identifier within 200 ms from the start of T3. In this test case, the test requirement can be simplified as “Test requirement = 45 + 150 (Tidentify\_CGI,E-UTRAN) + 5 ms”, i.e., UE should be able to transmit the ACK/NACK to the network during the time period of 45 + 5 ms. Within 50 ms, the original number of ACK/NACK should depend on FDD/TDD pattern. Thus, the current number is incorrect.   * For the FDD mode, it would be easy to calculate the number of the ACK/NACK for 45 + 5 ms, i.e., the number of ACK/NACK will be calculated based on 50 ms.   + FDD @ 15kHz     - the data will not be transmitted within SMTC occasssion     - the ACK/NACK will be transmitted after 2 slots when UE receives data (as red arrow in the Fig).     - # of ACK/NACK: 50 – 3 (due to no data within SMTC) – 2 (Considering worst case, the ACK/NACK may not be transmitted in last two slot, and two times is because time period for 45 ms and 5 ms are separated) = **43**      * For the TDD mode, due to UL/DL pattern, it would be difficult to separately calculate the number of ACK/NACK for 45 and 5 ms. Thus, to simplify the calculation, the number of ACK/NACK will be calculated based on 45 ms, i.e., not to consider the remaining 5 ms.   + TDD @ 15kHz     - the data will not be transmitted within SMTC occasssion     - # of ACK/NACK: 18 (there are 18 DL slots within 45 ms) – 3 (no data within SMTC) – 1 (Considering worst case, the ACK/NACK may not be transmitted for the last slot containing data within 45 ms) = **14**      * + TDD @ 30kHz     - the data will not be transmitted within SMTC occasssion     - Considering worst case, the DL/UL pattern is shifted.     - # of ACK/NACK: 45 (there are 45 DL slots within 45 ms) – 23 (no data within SMTC) – 5 (Considering worst case, the ACK/NACK may not be transmitted for the last 5 slots containing data within 45 ms) = **34**      1. R4-2206818 Correction of NR Sidelink reference configurations\_R16   Reference configuration for NR sidelink communication given in A.3.21 needs to be corrected in following aspects:  Table A.3.21.2-1: SL-BWP configuration   * The wording " maxNrofRXPool-r16 = 1", " maxNrofTXPool-r16 = 1" are confusing since maxNrofRXPool-r16 = 16 according to 38.331. The intention here obviously should be "number of entries is 1". * Value of sl-TxPoolExceptional-r16 is wrongly written in comment column.   Table A.3.21.2-2: Resource pool configuration   * Configurations of sl-PSCCH-Config-r16, sl-PSSCH-Config-r16 and sl-PSFCH-Config-r16 are missing. sl-PSCCH-Config-r16, sl-PSSCH-Config-r16 should be set according to Table A.3.21.3-1 and Table A.3.21.3-2 respectively. And sl-PSFCH-Config-r16 should be set to not present according to Table A.3.21.3-2. * sl-SyncAllowed-r16 is a sequence of 3 flags according to 38.331 rather than enumeration of "gnss", "gnbEnb" and "ue". For sake of simplify we suggest set all three flags to true. Then this reference configuration of resource pool can be used under any kind of sync source. * Value of sl-SubchannelSize-r16, sl-MaxNumPerReserve should be "n10" and "n2" * Redudant curly braces should be removed from value of sl-RS-ForSensing and sl-SelectionWindow * sl-MCS-Table should be configured in sl-MinMaxMCS-List-r16 rather than SL-ResourcePool-r16. * sl-RxParametersNcell-r16 field is optional itself according to 38.331. It can be directly set to "Not present". * Value of sl-SensingWindow should be ms100; * sl-SelectionWindow-r16 should be configured for all 8 priority levels. * Resource reservation period field is not included in PSCCH RMC according to Table A.3.21.3-1. Which means that sl-MultiReserveResource should be explictly set to "Not present" according to 38.212 cl.8.3.1.1. Furthermore, including sl-ResourceReservePeriodList is meaningless since multi-reservation is not allowed. * Value of sl-ZoneConfigMCR-List-r16 is wrongly written in comment column.   Table A.3.21.2-3: UE autonomous resource selection configuration   * Value of sl-ProbResourceKeep-r16 should be " v0dot8"; * Value of sl-ReselectAfter-r16 should be "n1"; * Reference configuration of sl-PreemptionEnable-r16 should be given in Table A.3.21.2-2 rather than Table A.3.21.2-3 * Value of sl-MaxTxTransNumPSSCH-r16 in sl-ParametersAboveThres-r16 should be "1" rather than "both". * sl-TypeTxSync-r16 can be set to "not present" for simplfy.   Table A.3.21.3-1: PSCCH RMC  2nd stage SCI format should be set to "00" rather than "0" to indicate SCI format 2-A   1. R4-2207092 Correction of NR Sidelink test cases\_R16   NR sidelink TCs need to be corrected in following aspects:  Common Issues:   * band n38/n47 should be HD carrier rather than TDD carrier according to 38.101-1. * SCS for PC5 carrier is implied to be 30kHz in V2X test cases. However, it is not specified in serveral V2X test cases. And it is presented SyncRef UE test parameter tables in remain V2X TCs. Considering SCS is common for DUT and SyncRef UE. It would be better to specify SCS in general parameter tables. * "PSSSS" and "PSPSS" in Note of SyncRef UE specific parameter tables should be "S-SSS" and "S-PSS" respectively. * "SLSS+MIB-SL" can be replaced by "S-SSB" to keep consistent with RAN1 specs.   A.9.1.2.1   * Test loop mode E is used to trigger PSCCH/PSSCH transmission or reception. In this TC there is not need of SL communication. So TLE is not needed.   A.9.1.2.2   * Similar with A.9.1.2.1, TLE is not needed. * "Cell 1" in Table A.9.1.2.2.1-2 should be "SyncRef UE 1"; * DUT is required to send S-SSB with SLSSID = 30 (belong to id\_net) and inCoverage = false, i.e. DUT is assumed to be 1-hop sync to gNB. So its SyncRef UE should be directly sync to gNB (SLSSID = 30, inCoverage = true). So inCoverge should be set to TRUE in Table A.9.1.2.2.1-2.   A.9.1.3.1   * When UE has no external SyncRef it will randomly selects its SLSSID from id\_oon set according to 38.331 cl. 5.8.5.3. It's impossible to configure SLSSID to be used in pre-configuration. All related description and the SLSSID given in Table A.9.1.3.1.1-1 should be removed. * "syncTxThreshIC" in Table A.9.1.3.1.1-1 should be "syncTxThreshOoC" since this is a PC5-only TC. * "typeTxSync" in Table A.9.1.3.1.1-1 should be "sl-SyncPriority". * UE is expected to (re)select SyncRef UE #1/#2/#3 in T1/T2/T3 respectively.So we have SyncRef UE #3 should belong to higher priority group than SyncRef UE #2 and SyncRef UE #2 should belong to higher priority group than SyncRef UE #1. SyncRef UE #1 is assumed to be a UE directly sync-ed to gNB. So SyncRef UE #2 and SyncRef UE #3 can only be UE indirectly sync-ed to GNSS and UE directly sync-ed to GNSS respectively. However, the parameters given in A.9.1.3.1.1-2 implies SyncRef UE #2 and SyncRef UE #3 are 2-hop sync-ed to GNSS and indirectly sync-ed to GNSS. * Description in A.9.1.3.1.1-1 is paradoxical. For Initial condition the "UE" refers to SyncRef UE. But for T2 end condition and Final condition "UE" refers to DUT. We suggest all "UE" in these three columns should refer to DUT since they are "conditions" for DUT. * Es/Noc and Es/Iot of SyncRef UE 1 in T1 are contradicting. Considering there is only one SyncRef which is powered on. Es/Iot side condition can be satisfied when Es/Noc = 0dB. then there is no need to raise Es/Noc by 3dB * SyncRef UE #1, SyncRef UE #2 and SyncRef UE #3 will transmit SL SSB on sync resource #1, sync resource #2 and sync resource #1 respectively according to 38.331cl.5.8.5.3, which means no interference will be caused between SyncRef UE #1 and SyncRef UE #2. So the Es/Iot in T2 are incorrect. * It's unreasonable to set frequency offset = 5/10 PPM for SyncRef UE 2 and 3 since the frequency difference requirement defined in 38.101-1 is only ±0.1 PPM. We suggest set both of them to 0 PPM.   A.9.1.3.2   * Table A.9.1.3.2.1-1 is redundant since no cell is configured in this TC. * Similar with A.9.1.3.1, description and parameters in Table A.9.1.3.2.1-2 and Table A.9.1.3.2.1-3 are paradoxical. * Similar with A.9.1.3.1, SyncRef UE #1 and SyncRef UE #2 will transmit S-SSB on sync resource #2 and sync resource #1 respectively according to 38.331cl.5.8.5.3, which means no interference will be caused between SyncRef UE #1 and SyncRef UE #2. So the Es/Iot in T3 are incorrect. Furthermore, there is no need to raise Es/Noc of SyncRef UE 2 by 3dB. * Similar with A.9.1.3.1, frequency offset for SyncRef UE 2 is set to 0 PPM.   A.9.1.4.1   * SL MAC PDU can't trigger DUT to keep sending PSSCH. Test Loop Function is needed. * "SL-ThresPSSCH-RSRP " should be "SL-Thres-RSRP" * Typos.   A.9.1.4.2   * SL MAC PDU can't trigger DUT to keep sending PSSCH. Test Loop Function is needed. * "SL-ThresPSSCH-RSRP " should be "SL-Thres-RSRP" * Test requirement is incorrect. T3 should be 5 slots rather than 2ms according to 38.214 Table 8.1.4-2.   A.9.1.4.3   * Format error and typos.   A.9.1.5.1   * event triggered CBR measurement reporting only needs to be tested for con-current operation. * Table A.9.1.5.1.1-1 is only needed under con-current operation. * some test parameters are only needed under con-current operation. Some other test parameters are only needed under PC5-only operation. * Test parameters for Cell 1 is missing. * Synchonization source used in test is not specified. * To match test requirements, sl-CR-Limit-r16 should be changed to "10000 and 10", i.e. CR >0.001 for CBR range 0 to 0.02, and CR <=0.001 for CBR range 0.02 to 1.   Test requirement should be "no lager than" rather than "less than" CR-limit.   1. R4-2207039 Correction on measurement requirements in relaxed measurement   LS reply from RAN2[R2-2108877] identified an issue that when UE is configured with both lowMobilityEvaluation criterion and cellEdgeEvaluation criterion, and has also fulfilled both criteria, when Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, whether the change (1 hour -> 1 hour \* Nlayers) should also apply to. RAN4 think it is reasonable to accept this change. | | | | | | | | |
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| ***Summary of change:*** | | The summary of change in each endorsed draft CR is copied below.   1. R4-2206816 CR: Correction on Synchronization Reference Selection/Reselection SyncRefUE Frequency Offset Side Condition for NR-V2X   Amend the necessary side condition for Selection/Reselection to Intra-frequency SyncRef UE requirement.   1. R4-2203797 Draft CR on core part maintenance for TS38.133 R16   Add similar clarification from TS36.133 for LTE CGI reading requirement into TS38.133.   1. R4-2207093 Correction of mobility enhancement test cases\_R16   A.7.3.3.1:  Noc, Io, Es/Iot level are corrected.   1. R4-2204311 Draft CR to maintain measurement gap sharing in TS 38.133   Change per-UE measurement gap to per-FR1 or per-FR2 measurement gap.   1. R4-2205366 CR to introduce EMR TC#5 R16   Introduce EMR TC#5 as agreed in R4-2105841.   1. R4-2204426 Corrections to HST requirements in R16   Correct signalling IE name: from intraRAT-MeasurementEnhancement-r16 to intraNR-MeasurementEnhancement-r16.  Removal of brackets and editorial changes.   1. R4-2207094 DraftCR on correction to interruption requirements for IBM R16   Correcting the interruption requirements at SCell activation/deactivation in NE-DC mode.   1. R4-2207095 CR on inter-frequency measurement without MG R16   - Clause 9.1.5.2: Remove the case where a non-CA-capable UE can indicate support interFrequencyMeas-NoGap but requires MG  - Clause 9.1.5.1: Remove the limitation of inter-frequency measurement without MG to CA capable UE.  - Clause 9.3.1: Add a note that non-CA capable UE is not expected to indicate support inter-frequency measurement without MG.  - Some editorial correction on formatting   1. R4-2205364 CR on CBW change requirements R16   Add interruption requirements due to CBW change for NE-DC and NR-DC (same as in R4-2006548).   1. R4-2205644 Editorial correction to EN-DC interruption requirements   Duplicated text from interruptions due to BWP timer expiry is removed.  Interruption requirements from DCI based BWP switch is added from corresponding Rel-17 section.  Corresponding section in release 17 specification is correct, therefore no cat-A CR will be submitted.   1. R4-2207096 Draft CR on number of serving carriers supported in FR2 for NR SA   Change#1:  Number of serving carrier to be supported in FR2 is updated for NR SA  Change#2:  Number of serving carriers for EN-DC is updated   1. R4-2203528 Correction of 2-step RACH RRM performance requirements   Change of purpose of 2-step RA test cases to include MsgA PRACH and MsgA PUSCH   1. R4-2203574 Draft CR to maintain HST performance requirement   (1) Changed DRX setting from DRX.8🡪DRX.3 similar to non-HST equivalent TCs in Tables A.4.6.4.5.2-1 and A.6.6.4.5.2-1.  Changed typographical error of appendix heading A.4.6.4.2.3🡪A.4.6.4.5.3.  (2) Change NR Prach Configuration Index 77 🡪 102 in Table A.6.1.2.5.2-2 similar to all other RRM TCs  Change LTE Prach Configuration Index from 53 🡪 4 for LTE FDD configs in Table A.6.1.2.5.2-2 similar to other RRM TCs  Change NR Prach Configuration Index 87 🡪 102 in Table A.8.2.1.2.1-2 similar to all other RRM TCs  (3) Change DRX setting from DRX.6 🡪 DRX.5 in Table A.8.4.2.9.1-2   1. R4-2204369 CR for the number of ACK and NACK in CGI reading test case in NR SA for R16   Correct the number of ACK/NACK in the Note 2 in A.6.6.7.2.2 test requirement.  Change from 20/40 ACK/NACK to 43, 14 and 34 ACK/NACK for FDD 15 kHz, TDD 15 kHz and TDD 30 kHz, respectively,   1. R4-2206818 Correction of NR Sidelink reference configurations\_R16 2. Reference configuration for NR sidelink is updated. 3. Table A.3.21.2-1/2/3 are reformatted to improve readablity. 4. R4-2207092 Correction of NR Sidelink test cases\_R16   NR SL test cases are updated.   1. R4-2207039 Correction on measurement requirements in relaxed measurement   When UE is configured with both lowMobilityEvaluation criterion and cellEdgeEvaluation criterion, and has also fulfilled both criteria,   * When Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ,   + the UE shall search for, measure and evaluate inter-frequency layers of higher, equal or lower priority at least every 1 hour   + the UE shall search for, measure and evaluate inter-RAT E-UTRAN layers of higher or lower priority at least every 1 hour * When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, the UE shall search for inter-frequency /E-UTRA inter-RAT frequency layers of higher priority at least every K2\*Thigher\_priority\_search where   + Thigher\_priority\_search = (60 \* Nlayers) in clause 4.2.2.7 of 38.133,   + Nlayers is the total number of higher priority NR and E-UTRA carrier frequencies broadcasted in system information,   + K2 = 60. | | | | | | | | |
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| ***Consequences if not approved:*** | | The consequences if not approved for each endorsed draft CR are coppied below.   1. R4-2206816 CR: Correction on Synchronization Reference Selection/Reselection SyncRefUE Frequency Offset Side Condition for NR-V2X   Side conditions for Selection/Reselection to Intra-frequency SyncRef UE requirement are incomplete   1. R4-2203797 Draft CR on core part maintenance for TS38.133 R16   The clarification of “regardless of whether DRX is used or not” is missing in the NR spec for LTE CGI reading requirement.   1. R4-2207093 Correction of mobility enhancement test cases\_R16   Reference configuration is incorrect.   1. R4-2204311 Draft CR to maintain measurement gap sharing in TS 38.133   The gap sharing scheme for per-FR MG will be incorrect.   1. R4-2205366 CR to introduce EMR TC#5 R16   TC for EMR is not complete   1. R4-2204426 Corrections to HST requirements in R16   Incorrect specifications.   1. R4-2207094 DraftCR on correction to interruption requirements for IBM R16   The interruption requirements at SCell activation/deactivation in NE-DC mode are not properly defined.   1. R4-2207095 CR on inter-frequency measurement without MG R16   To determine whether UE needs MG or not, NW needs to check two separate capabilties: *interFrequencyMeas-NoGap* and whether UE is CA capable or not.   1. R4-2205364 CR on CBW change requirements R16   Interruption requirements due to CBW change for NE-DC and NR-DC are missing   1. R4-2205644 Editorial correction to EN-DC interruption requirements   Typos in specification and interruptions during DCI-based BWP switching is missing.   1. R4-2207096 Draft CR on number of serving carriers supported in FR2 for NR SA   Change#1:  Number of carriers supported by UE is not correct.  Change#2:  Number of carriers supported by UE is not correct.   1. R4-2203528 Correction of 2-step RACH RRM performance requirements   Unclear purpose of the RRM performance requirements.   1. R4-2203574 Draft CR to maintain HST performance requirement   Conformance Test cannot be correctly performed.   1. R4-2204369 CR for the number of ACK and NACK in CGI reading test case in NR SA for R16   Incorrect test cell configuration.   1. R4-2206818 Correction of NR Sidelink reference configurations\_R16   Reference configuration is incorrect.   1. R4-2207092 Correction of NR Sidelink test cases\_R16   Test cases are incorrect.   1. R4-2207039 Correction on measurement requirements in relaxed measurement   The specification is not correct. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 1. R4-2206816 CR: Correction on Synchronization Reference Selection/Reselection SyncRefUE Frequency Offset Side Condition for NR-V2X   B.4.3   1. R4-2203797 Draft CR on core part maintenance for TS38.133 R16   9.4.7.1   1. R4-2207093 Correction of mobility enhancement test cases\_R16   A.7.3.3.1   1. R4-2204311 Draft CR to maintain measurement gap sharing in TS 38.133   9.1.2.1 9.1.2.1a 9.1.2.1c   1. R4-2205366 CR to introduce EMR TC#5 R16   A.8.2.2.2 (new)   1. R4-2204426 Corrections to HST requirements in R16   4.2.2.3, 4.2.2.5, 9.2.5.1, 9.2.5.2, 9.2.6.2, 9.2.6.3, 9.4.1, 9.4.2.3, 9.4.3.3, 9.5.4.1, 9.5.4.2.   1. R4-2207094 DraftCR on correction to interruption requirements for IBM R16   8.2.3.2.4   1. R4-2207095 CR on inter-frequency measurement without MG R16   9.1.5.1, 9.1.5.2.   1. R4-2205364 CR on CBW change requirements R16   8.2.3.1, 8.2.3.2.16, 8.2.4.1, 8.2.4.2.14   1. R4-2205644 Editorial correction to EN-DC interruption requirements   8.2.1.2.7.   1. R4-2207096 Draft CR on number of serving carriers supported in FR2 for NR SA   3.6.2.1, 3.6.2.2   1. R4-2203528 Correction of 2-step RACH RRM performance requirements   A.4.3.2.2.4, A.6.3.2.2.3, A.6.3.2.2.4, A.7.3.2.2.3, A.7.3.2.2.4, A.10.1.1.1.4, A.11.2.2.2.3, A.11.2.2.2.4   1. R4-2203574 Draft CR to maintain HST performance requirement   A.4.6.4.5, A.6.1.2.5, A.6.6.4.5, A.8.2.1.2, A.8.4.2.9   1. R4-2204369 CR for the number of ACK and NACK in CGI reading test case in NR SA for R16   A.6.6.7.2.   1. R4-2206818 Correction of NR Sidelink reference configurations\_R16   A.3.21   1. R4-2207092 Correction of NR Sidelink test cases\_R16   A.9.1   1. R4-2207039 Correction on measurement requirements in relaxed measurement   4.2.2.10.4; 4.2.2.11.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | 1. R4-2205364 CR on CBW change requirements R16   This CR does not have Cat-A CR beucase the changes to NR-DC part are not applicable for Rel-17 due to new requirements for 71GHz. The changes to NE-DC are submitted in Rel-17 Cat-F CR R4-2205365. The changes to NR-DC are submitted in Rel-17 Cat-B CR R4-2204877. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

*<Start of change11>*

<Start of Change 11-1>

#### 3.6.2.1 Number of serving carriers for SA

Requirements for standalone NR with NR PCell are applicable for the UE configured with the following number of serving NR CCs:

- up to 10 NR DL CCs in total, with 1 UL (or 2 UL if SUL is configured) in PCell and up to 8 UL (or 9 UL if SUL is configured) in total for SCells.

- SUL may be configured together with one of the UL

<End of Change 11-1>

<Start of Change 11-2>

3.6.2.2 Number of serving carriers for EN-DC

Requirements for EN-DC operation of E-UTRA and NR with E-UTRA PCell and NR PSCell are applicable for the UE configured with the following number of serving NR CCs:

- up to 9 NR DL CCs in total, with 1 UL (or 2 UL if SUL is configured) in PSCell, up to 7 UL (or 8 UL if SUL is configured) in total for SCells in the FR of PSCell and up to 1 UL (or 2 UL if SUL is configured) in SCell in different FR with PSCell.

- SUL may be configured together with one of the UL

The applicable number of E-UTRA CC for EN-DC in the MCG for both UL and DL is specified in TS 36.133 [15].

<End of Change 11-2>

*<End of change11>*

*<Start of change17>*

<Start of Change 17-1>

##### 4.2.2.10.4 Measurements for UE fulfilling low mobility and not-at-cell edge criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and

- UE is configured with both *lowMobilityEvaluation* [2] criterion and *cellEdgeEvaluation* [2] criterion, and

- Has also fulfilled both criteria

In this case the UE is not required to meet Tdetect,NR\_Inter, Tmeasure,NR\_Inter and Tevaluate,NR\_Inter as defined in Table 4.2.2.4-1.

When Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ, the UE shall search for, measure and evaluate inter-frequency layers of higher, equal or lower priority at least every 1 hour.

When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, the UE shall search for inter-frequency layers of higher priority at least every K2\*Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.7 and K2=60.

<End of Change 17-1>

<Start of Change 17-2>

##### 4.2.2.11.4 Measurements for UE fulfilling low mobility and not-at-cell edge criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and

- UE is configured with both *lowMobilityEvaluation* [2] criterion and *cellEdgeEvaluation* [2] criterion, and

- has also fulfilled both criteria

In this case the UE is not required to meet Tdetect,EUTRAN , Tmeasure,EUTRAN and Tevaluate,EUTRAN as defined in Table 4.2.2.5-1.

When Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ, the UE shall search for, measure and evaluate inter-RAT E-UTRAN layers of higher or lower priority at least every 1 hour.

When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, the UE shall search for inter-RAT E-UTRAN of higher priority at least every K2\*Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.7 and K2=60.

<End of Change 17-2>

*<End of change17>*

*<Start of change6-1>*

4.2.2.3 Measurements of intra-frequency NR cells

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the 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 TS38.304 [1] within Tdetect,NR\_Intrawhen that Treselection= 0. An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every Tmeasure,NR\_Intra (see table 4.2.2.3-1 or table 4.2.2.3-2) for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ 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 Tmeasure,NR\_Intra/2.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving 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 TS38.304 [1] within Tevaluate,NR\_Intra when Treselection = 0as specified in table 4.2.2.3-1 or table 4.2.2.3-2 provided that:

when *rangeToBestCell* is not configured:

- the cell is at least 3dB better ranked in FR1 or 4.5dB better ranked in FR2.

when *rangeToBestCell* is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS38.304 [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.

- if there are multiple such cells, the cell has the highest rank among them.

- the cell is at least 3dB better ranked in FR1 or 4.5dB better ranked in FR2 if the current serving cell is among them.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If Treselection timer has a non zero value and the intra-frequency cell is satisfied with the reselection criteria which are defined in TS38.304 [1], the UE shall evaluate this intra-frequency cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

For UE not configured with *highSpeedMeasFlag-r16*, Tdetect,NR\_Intra, Tmeasure,NR\_Intra and Tevaluate, NR\_intra are specified in Table 4.2.2.3-1. For UE configured with *highSpeedMeasFlag-r16*, Tdetect,NR\_Intra, Tmeasure,NR\_Intra and Tevaluate, NR\_intra are specified in Table 4.2.2.3-2.

The requirements in Table 4.2.2.3-2 apply only when the UE supports *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16*. For UE not supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16*, the UE is not required to meet the requirements specified in Table 4.2.2.3-2.

**Table 4.2.2.3-1: Tdetect,NR\_Intra, Tmeasure,NR\_Intra and Tevaluate,NR\_Intra**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **DRX cycle length [s]** | **Scaling Factor (N1)** | | **Tdetect,NR\_Intra [s] (number of DRX cycles)** | **Tmeasure,NR\_Intra [s] (number of DRX cycles)** | **Tevaluate,NR\_Intra**  **[s] (number of DRX cycles)** |
|  | **FR1** | **FR2Note1** |  |  |  |
| 0.32 | 1 | 8 | 11.52 x N1 x M2 (36 x N1 x M2) | 1.28 x N1 x M2 (4 x N1 x M2) | 5.12 x N1 x M2 (16 x N1 x M2) |
| 0.64 |  | 5 | 17.92 x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 |  | 4 | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 |  | 3 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.  Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer Tdetect, NR\_intra is expected. | | | | | |

**Table 4.2.2.3-2: Tdetect,NR\_Intra, Tmeasure,NR\_Intra and Tevaluate,NR\_Intra for UE configured with *highSpeedMeasFlag-r16* (Frequency range FR1)**

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **Tdetect,NR\_Intra [s] (number of DRX cycles)** | **Tmeasure,NR\_Intra [s] (number of DRX cycles)** | **Tevaluate,NR\_Intra**  **[s] (number of DRX cycles)** |
|
| 0.32 | 2.56 x M2 (8 x M2) | 0.32 x M3 (1 x M3) | 0.96 x M4 (3 x M4) |
| 0.64 | 5.12 (8) | 0.64 (1) | 1.92 (3) |
| 1.28 | 8.96 (7) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: when SMTC < = 40 ms, M2 = M3 = M4 = 1; and when SMTC > 40 ms, M2 = 1.5, M3 = M4 = 2  Note 2: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16.* | | | |

*<End of change6-1>*

*<Start of change6-2>*

4.2.2.5 Measurements of inter-RAT E-UTRAN cells

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ then the UE shall search for inter-RAT E-UTRAN layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.

If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ then the UE shall search for and measure inter-RAT E-UTRAN layers of higher, lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority inter-RAT E-UTRAN layers shall be the same as that defined below for lower priority RATs.

The requirements in this clause apply for inter-RAT E-UTRAN FDD measurements and E-UTRA TDD measurements. When the measurement rules indicate that inter-RAT E-UTRAN cells are to be measured, the UE shall measure RSRP and RSRQ of detected E-UTRA cells in the neighbour frequency list at the minimum measurement rate specified in this clause.

The parameter NEUTRA\_carrier is the total number of configured E-UTRA carriers indicated to meet non high speed requirements in the neighbour frequency list. The parameter NEUTRA\_carrier\_HST is the total number of configured E-UTRA carriers indicated to meet high speed requirements in the neighbour frequency list. If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ, an inter-RAT E-UTRAN layer is indicated to meet high speed requirements if highSpeedMeasFlag-r16 is configured and the carrier to be measured is configured with highSpeedEUTRACarrier-r16 and UE supports the enhanced inter-RAT E-UTRAN measurement requirements. If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, UE is required to meet non high speed requirements no matter whether highSpeedMeasFlag-r16 or highSpeedEUTRACarrier-r16 is configured or not.

The parameter NEUTRA\_carrier for a UE configured with idle mode DC measurements (while T331 is running), is the combined number of configured E-UTRA carriers in the neighbour frequency list and E-UTRA carriers configured for idle mode DC measurements, excluding the configured E-UTRA carriers indicated to meet high speed requirements in the neighbour frequency list.

Note: combined total number means that if a carrier is an E-UTRA carrier indicated by the serving cell for mobility and additionally a carrier configured for idle mode CA measurements, it only counts as one carrier.

The UE shall filter RSRP and RSRQ measurements of each measured E-UTRA 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 half the minimum specified measurement period.

An inter-RAT E-UTRA cell is considered to be detectable provided the following conditions are fulfilled:

- the same conditions as for inter-frequency RSRP measurements specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band, and

- the same conditions as for inter-frequency RSRQ measurements specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band.

- SCH conditions specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band

The UE shall be able to evaluate whether a newly detectable inter-RAT E-UTRAN cell meets the reselection criteria defined in TS38.304 [1] within NEUTRA\_carrier\_HST \* Tdetect,EUTRAN\_HST + NEUTRA\_carrier \* Tdetect,EUTRAN when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ when Treselection = 0 provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

Cells which have been detected shall be measured at least every NEUTRA\_carrier\_HST \* Tmeasure,EUTRAN\_HST + NEUTRA\_carrier \* Tmeasure,EUTRAN when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ.

When higher priority cells are found by the higher priority search, they shall be measured at least every Tmeasure,EUTRAN. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell.

If the UE detects on an inter-RAT E-UTRAN carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall not consider an inter-RAT E-UTRA cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For a 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 an already identified inter-RAT E-UTRA cell has met reselection criterion defined in TS 38.304 [1] within NEUTRA\_carrier\_HST \* Tevaluate,EUTRAN\_HST + NEUTRA\_carrier \* T evaluate,EUTRAN when Treselection = 0as speficied in table 4.2.2.5-1 and 4.2.2.5-2 provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

If Treselection timer has a non zero value and the inter-RAT E-UTRA cell is satisfied with the reselection criteria which are defined in TS 38.304 [1], the UE shall evaluate this E-UTRA cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

**Table 4.2.2.5-1: Tdetect,EUTRAN, Tmeasure,EUTRAN, and Tevaluate,EUTRAN**

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **Tdetect,EUTRAN [s] (number of DRX cycles)** | **Tmeasure,EUTRAN [s] (number of DRX cycles)** | **Tevaluate,EUTRAN**  **[s] (number of DRX cycles)** |
| 0.32 | 11.52 (36) | 1.28 (4) | 5.12 (16) |
| 0.64 | 17.92 (28) | 1.28 (2) | 5.12 (8) |
| 1.28 | 32(25) | 1.28 (1) | 6.4 (5) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

**Table 4.2.2.5-2: Tdetect,EUTRAN\_HST, Tmeasure,EUTRAN\_HST, and Tevaluate,EUTRAN\_HST for UE configured with highSpeedMeasFlag-r16**

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **Tdetect,EURAN\_HST [s] (number of DRX cycles)** | **Tmeasure,EUTRAN\_HST [s] (number of DRX cycles)** | **Tevaluate,EUTRAN\_HST**  **[s] (number of DRX cycles)** |
|  |
| 0.32 | 4.16 (13) | 0.64 (2) | 0.96 (3) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 8.96 (7) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: When highSpeedMeasFlag-r16 is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*. | | | |

The requirements in Table 4.2.2.5-2 apply only when the UE supports *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*. For UE not supporting either *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*, the UE is not required to meet the requirements specified in Table 4.2.2.5-2.

*<End of change6-2>*

*<Start of change10>*

##### 8.2.1.2.7 Interruptions due to Active BWP switching Requirement

The requirements for DCI-based BWP switch, timer-based BWP switch or UL BWP switch triggered by consistent uplink CCA failures in this clause apply to the case that the BWP switch is performed on a single CC or multiple CCs.

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this clause apply for each BWP switch.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2, the UE is allowed to cause interruption of up to X slot to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.1.2.7-1. The starting time of interruption is only allowed within the BWP switching delay TBWPswitchDelay as defined in clause 8.6.2 when BWP switch occurs on a single CC. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay TMultipleBWPswitchDelay +Y as defined in clause 8.6.2A.1 when BWP switch occurs on multiple CCs. Interruptions are not allowed during BWP switch involving any other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [2] expires, UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.1.2.7-1. The starting time of interruption is only allowed within the BWP switching delay TBWPswitchDelay as defined in clause 8.6.2 when BWP switch occurs on a single CC. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay TMultipleBWPswitchDelay as defined in clause 8.6.2B.1 when BWP switch occurs on multiple CCs simultaneously or TMultipleBWPswitchDelayTotal as defined in clause 8.6.2B.2 when BWP switch occurs on multiple CCs over partially overlapping time period. Interruptions are not allowed during BWP switch involving any other parameter change.

When UE receives an RRC reconfiguration that only requests UE to switch its active BWP on one single CC, the UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.1.2.7-1. The interruption is only allowed within the delay TRRCprocessingDelay + TBWPswitchDelayRRC defined in clause 8.6.3 when BWP switch occurs on a single CC. The interruption is only allowed within the delay TRRCprocessingDelay + TBWPswitchDelayRRC + DRRC\*(N-1) as defined in clause 8.6.3A when BWP switch occurs on multiple CCs.

When UL BWP switch is triggered by consistent uplink CCA failures [7], the UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active UL BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2 if the UE is not capable of per-FR gap, or if the UL BWP switching involves SCS changing. When the UL BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing UL BWP switching. X is defined in Table 8.2.1.2.7-1. The starting time of interruption is only allowed within the UL BWP switching delay TBWPswitchDelay as defined in clause 8.6.2. Interruptions are not allowed during UL BWP switch involving other parameter change.

Table 8.2.1.2.7-1: interruption length X

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length X (slots) |
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |
| 2 | 0.25 | 3 |
| 3 | 0.125 | 5 |
| Note1: void | | |

Table 8.2.1.2.7-2: Parameters which cause interruption other than SCS

|  |  |
| --- | --- |
| Parameters | Comment |
| *locationAndBandwidth* | From TS 38.331 [2] |
| *nrofSRS-Ports* |  |
| *maxMIMO-Layers-r16* |  |

*<End of change10>*

*<Start of change9-1>*

#### 8.2.3.1 Introduction

This clause contains the requirements related to the interruptions on PCell and SCell, when

E-UTRA PSCell transitions between active and non-active during DRX, or

E-UTRA PSCell transitions from non-DRX to DRX, or

E-UTRA PSCell/SCell in SCG or SCell in MCG is added or released, or

E-UTRA PSCell/SCell in SCG or SCell(s) in MCG is activated or deactivated, or

measurements on SCC with deactivated SCell in either E-UTRA SCG or NR MCG or

PUSCH/PUCCH carrier configuration and deconfiguration in NR MCG, or

UL/DL BWP is switched on PCell or SCell in MCG, or

UE-specific CBW is changed on PCell or SCell in MCG, or

CGI reading of an NR neighbour cell with autonomous gaps, or

CGI reading of an E-UTRA neighbour cell with autonomous gaps.

NR SRS carrier based switching, or

E-UTRA SRS carrier based switching.

The requirements shall apply for NE-DC with an NR PCell.

This clause contains interruptions where victim cell is PCell or SCell belonging to MCG. Requirements for interruptions requirements when the victim cell is E-UTRA PSCell or E-UTRA SCell belonging to SCG are specified in TS 36.133 [15].

For a UE which does not support per-FR measurement gap, interruptions to the PCell, E-UTRA PSCell or activated MCG SCells may be caused by EUTRA PSCell, EUTRA SCells or SCells on any frequency range. For UE which support per-FR gap, interruptions to the PCell, E-UTRA PSCell or activated MCG SCells may be caused by EUTRA PSCell, EUTRA SCells or SCells on the same frequency range as the victim cell.

*<End of change9-1>*

*<Start of change7>*

8.2.3.2.4 Interruptions at SCell activation/deactivation

The requirements in this clause shall apply for the UE configured with E-UTRA PSCell and one SCell.

When one E-UTRA SCell in SCG is activated from deactivated or dormant state, or deactivated from activated or dormant state:

- the UE is allowed an interruption on any active serving cell in MCG:

- of up to X2 slots, if the active serving cell is not in the same band as any of the SCells being activated or deactivated, or

- of up to max{Y2 slots + TSMTC\_duration, 5ms} if the active serving cells are in the same band as any of the E-UTRA SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being activated or deactivated are available in the same slot, where TSMTC\_duration is the longest SMTC duration among all above active serving cells in MCG.

Where X2 and Y2 are specified in Table 8.2.3.2.4-1.

When one SCell in MCG is activated or deactivated:

- the UE is allowed an interruption on any serving cell in MCG:

- of up to X2 slots, if the active serving cell is not in the same band as any of the SCells being activated or deactivated, or

- of up to Y2 slots + TSMTC\_duration if the active serving cells are in the same band as any of the SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot, where, TSMTC\_duration is

- the longest SMTC duration among all above active serving cells in MCGand the SCell being activated when one SCell is activated;

- the longest SMTC duration among all above active serving cells in MCG when one SCell is deactivated.

Where X2 and Y2 are specified in Table 8.2.3.2.4-2.

**Table 8.2.3.2.4-1: Interruption length X2 and Y2 at E-UTRA SCell activation/deactivation**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **NR Slot length (ms)** | **Interruption length X2 (slots)** | | **Interruption length Y2 (slots)** | |
|  |  | **Sync** | **Async** | **Sync** | **Async** |
| 0 | 1 | 1 | 2 | 1 | 2 |
| 1 | 0.5 | 1 | 2 | 1 | 2 |
| 2 | 0.25 | 3 | | 2 | 3 |
| 3 | 0.125 | 5 | | N/A | N/A |

**Table 8.2.3.2.4-2: Interruption length X2 and Y2 at SCell activation/deactivation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **NR Slot length (ms) of victim cell** | **Interruption length X2 (slots)** | | **Interruption length Y2 (slots)** |
| 0 | 1 | 1 | | 1 |
| 1 | 0.5 | 1 | | 1 |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 2 | 2 |
|  |  | Either aggressor cell or victim cell is on FR1 | 3 |  |
| 3 | 0.125 | Aggressor cell is on FR2 | 4 | 4 |
|  |  | Aggressor cell is on FR1 | 5 |  |

*<End of change7>*

*<Start of change9-2>*

##### 8.2.3.2.16 Interruptions due to UE-specific CBW change

The requirements in clause 8.2.1.2.11 apply for this clause.

*<End of change9-2>*

*<Start of change9-3>*

#### 8.2.4.1 Introduction

This clause contains the requirements related to the interruptions on PCell, PSCell and activated SCell if configured, when

up to 1 SCell in FR1 and up to 7 SCell(s) in FR2 are configured, deconfigured, activated or deactivated or,

a supplementary UL carrier or an UL carrier is configured or de-configured, or

measurements on SCC with deactivated SCell in NR SCG, or

UL/DL BWP is switched on PCell, PSCell or SCell,

UE-specific CBW is changed on PCell, PSCell or SCell, or

transitions between active and non-active during DRX, or

transitions from non-DRX to DRX, or

CGI reading of an NR neighbour cell with autonomous gaps, or

CGI reading of an E-UTRA neighbour cell with autonomous gaps.

NR SRS carrier based switching.

Note: interruptions at SCell addition/release, activation/deactivation and during measurements on SCC may not be required by all UEs.

The interruptions shall not interrupt RRC signalling or ACK/NACKs related to RRC reconfiguration procedure [2] for SCell addition/release or MAC control signalling [17] for SCell activation/deactivation command.

The requirements shall apply for NR-DC with an NR PCell, PSCell or SCell.

For a UE which does not support per-FR measurement gap, interruptions to the PCell and activated SCell may be caused by SCells on any frequency range. For a UE which supports per-FR gaps, interruptions to PCell, PSCell and activated SCell may be caused by SCells on the same frequency range as the victim cell.

*<End of change9-3>*

*<Start of change9-4>*

##### 8.2.4.2.14 Interruptions due to UE-specific CBW change

The requirements in clause 8.2.1.2.11 apply for this clause.

*<End of change9-4>*

*<Start of change4>*

9.1.2.1 EN-DC: Measurement Gap Sharing

For E-UTRA-NR dual connectivity UE configured with per-UE measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on intra-frequency carriers for both SSB and CSI-RS based L3 measurement or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE requires measurement gaps to identify and measure cells on inter-frequency carriers or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-UE measurement gaps, E-UTRA gap-needed inter-frequency carriers and inter-RAT UTRAN carriers and/or inter-RAT GSM carriers.

For E-UTRA-NR dual connectivity UE configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE requires measurement gaps to identify and measure cells on FR1 inter-frequency carriers for both SSB and CSI-RS based L3 measurement or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR1 measurement gaps, E-UTRA gap-needed inter-frequency carriers, inter-RAT UTRAN carriers and/or inter-RAT GSM carriers.

For E-UTRA-NR dual connectivity UE configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE requires measurement gaps to identify and measure cells on FR2 inter-frequency carriers for both SSB and CSI-RS based L3 measurement, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR2 measurement gaps.

When network signals “01”, “10” or “11” with RRC parameter *MeasGapSharingScheme* [2][16]and the value of X is defined as in Table 9.1.2.1-1, and

- Kintra = 1 / X \* 100,

- Kinter = 1 / (100 – X) \* 100,

When network signals “00” indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.1.

**Table 9.1.2.1-1: Value of parameter X for EN-DC measurement gap sharing**

|  |  |
| --- | --- |
| ***measGapSharingScheme*** | **Value of X (%)** |
| ‘00’ | Equal splitting |
| ‘01’ | 25 |
| ‘10’ | 50 |
| ‘11’ | 75 |
| Note: It is left to UE implementation to determine which measurement gap sharing scheme in the table *to be applied*, when *MeasGapSharingScheme is absent and there is* no stored value in the field. | |

9.1.2.1a SA: Measurement Gap Sharing

For NR standalone UE without NR-DC operation and configured with per-UE measurement gap, measurement gap sharing shall be applies when UE requires measurement gaps to identify and measure cells on intra-frequency carriers or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE requires measurement gaps to identify and measure cells on inter-frequency carriers for both SSB and CSI-RS based L3 measurement, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-UE measurement gaps, and/or inter-RAT E-UTRAN carriers, and/or inter-RAT UTRAN carriers for SRVCC, and when UE is configured to measure positioning frequency layers.

For NR standalone UE without NR-DC operation and configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE requires measurement gaps to identify and measure cells on FR1 inter-frequency carriers for both SSB and CSI-RS based L3 measurement and/or inter-RAT E-UTRAN carriers, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR1 measurement gaps, and/or inter-RAT UTRAN carriers for SRVCC, and when UE is configured to measure positioning frequency layers in FR1.

For NR standalone UE without NR-DC operation and configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE requires measurement gaps to identify and measure cells on FR2 inter-frequency carriers for both SSB and CSI-RS based L3 measurement, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR2 measurement gaps, and when UE is configured to measure positioning frequency layers in FR2.

When network signals “01”, “10” or “11” with RRC parameter *MeasGapSharingScheme* [2] and the value of X is defined as in Table 9.1.2.1a-1, and

- Kintra = 1 / X \* 100,

- Kinter = 1 / (100 – X) \* 100,

When network signals “00” indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.2.

Table 9.1.2.1a-1: Value of parameter X for NR standalone measurement gap sharing

|  |  |
| --- | --- |
| *measGapSharingScheme* | Value of X (%) |
| ‘00’ | Equal splitting |
| ‘01’ | 25 |
| ‘10’ | 50 |
| ‘11’ | 75 |
| Note: It is left to UE implementation to determine which measurement gap sharing scheme in the table *to be applied*, when *MeasGapSharingScheme is absent and there is* no stored value in the field. | |

9.1.2.1c NR-DC: Measurement Gap Sharing

For UE with NR-DC operation and configured with per-UE measurement gap, measurement gap sharing shall be applies when UE required measurement gaps to identify and measure cells on intra-frequency carriers or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE requires measurement gaps to identify and measure cells on inter-frequency carriers for both SSB and CSI-RS based L3 measurement, and/or inter-RAT E-UTRAN carriers, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-UE measurement gaps, and/or inter-RAT UTRAN carriers for SRVCC, and when UE is configured to measure positioning frequency layers.

For UE with NR-DC operation and configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE requires measurement gaps to identify and measure cells on FR1 inter-frequency carriers for both SSB and CSI-RS based L3 measurement and/or inter-RAT E-UTRAN carriers, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR1 measurement gaps, and/or inter-RAT UTRAN carriers for SRVCC, and when UE is configured to measure positioning frequency layers in FR1.

For UE with NR-DC operation and configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE requires measurement gaps to identify and measure cells on FR2 inter-frequency carriers for both SSB and CSI-RS based L3 measurement, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR2 measurement gaps, and when UE is configured to measure positioning frequency layers in FR2.

When network signals “01”, “10” or “11” with RRC parameter *measGapSharingConfig* [2] and the value of X is defined as in Table 9.1.2.1c-1, and

- Kintra = 1 / X \* 100,

- Kinter = 1 / (100 – X) \* 100,

When network signals “00” indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2..4.

Table 9.1.2.1c-1: Value of parameter X for NR-DC measurement gap sharing

|  |  |
| --- | --- |
| *measGapSharingConfig* | Value of X (%) |
| ‘00’ | Equal splitting |
| ‘01’ | 25 |
| ‘10’ | 50 |
| ‘11’ | 75 |
| Note: It is left to UE implementation to determine which measurement gap sharing scheme in the table *to be applied*, when *MeasGapSharingScheme is absent and there is* no stored value in the field. | |

*<End of change4>*

*<Start of change8-1>*

9.1.5.1 Monitoring of multiple layers outside gaps

The carrier-specific scaling factor CSSFoutside\_gap,i for measurement object *i* derived in this chapter is applied to following measurement types:

- SSB-based intra-frequency measurement with no measurement gap in clause 9.2.5 and 9.2A.5, when none of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.

- SSB-based intra-frequency measurement with no measurement gap in clause 9.2.5 and 9.2A.5, when part of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.

- For a UE in E-UTRA-NR dual connectivity operation, NR SSB-based inter-RAT measurement object configured by the E-UTRAN PCell on an NR serving carrier

- the SSB is completely contained in the active BWP of the UE, and

- none or part of the SMTC occasions of this inter-RAT measurement object are overlapped by the measurement gap;

- CSI-RS based intra-frequency measurement in clause 9.10.2, when none of CSI-RS resources for L3 measurement of this intra-frequency measurement object are overlapped by the measurement gap.

- CSI-RS based intra-frequency measurement in clause 9.10.2, when all CSI-RS resources for L3 measurement of this intra-frequency measurement object are partially overlapped by the measurement gap.

- SSB-based inter-frequency measurement with no measurement gap in clause 9.3.9, when none of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement gap, if UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network.

- SSB-based inter-frequency measurement with no measurement gap in clause 9.3.9, when part of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement gap, if UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network.

- Intra-frequency RSSI and channel occupancy measurement with no measurement gap on a carrier subject to CCA when SMTC and RMTC are overlapping and RMTCs are not fully overlapped with measurement gap.

For a UE in E-UTRA-NR dual connectivity operation, if a measurement object configured by PSCell and an NR inter-RAT measurment object configured by E-UTRAN PCell are on the same serving carrier, they shall be counted as one intra-frequency measurement object, provided that they meet the measurement object merging conditions [in clause 9.1.3.2].

The number of frequency layers for SSB measurements shall include the total number of MOs with

- *ssb-ConfigMobility* configured, or

- *ssb-ConfigMobility* not configured but *csi-rs-ResourceConfigMobility* configured with *associatedSSB*.

If *ssbfrequency, smtc1, smtc2* and *ssbSubcarrierSpacing* are same in multiple MOs, the multiple MOs are counted as one SSB frequency layer.

If the higher layer signaling in TS 38.331 [2] of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, CSSFoutside\_gap,i and requirements derived from CSSFoutside\_gap,i are not specified.

The UE cell identification and measurement periods derived based on CSSFoutside\_gap,i in clauses 9.2.5.1, 9.2.5.2 and 9.10.2 may be extended for measurement objects of which the cell identification and measurement periods are overlapped with Tmeasure\_SFTD1 specified in clause 9.3.8 when no measurement gaps are provided.

The requirements in this clause apply provided that

- There are no PCell nor PSCell in FR2, or

- The SMTC on all CCs and inter-frequency layers without measurement gap in FR2 have the same offset, and one of following conditions is met

- If *smtc2* is configured on any FR2 CC,

- All CCs have the same configuration for *smtc1*, and

- All CCs configured with *smtc2* have the same configuration for *smtc2*

- If *smtc2* is not configured on any FR2 CC,

- The total number of different SMTC periodicities on all serving CCs and inter-frequency layers without measurement gap does not exceed 4

- The starting point of the first 5ms window for CSI-RS measurement as defined in clause 9.10.1 on all CCs in FR2 is same and one of following conditions is met

- If any CSI-RS resource is configured in the second 5ms window for CSI-RS measurement as defined in clause 9.10.1 on any FR2 CC,

- All CCs with CSI-RS resources only in the first 5ms window have the same CSI-RS resource periodcity, and

- All CCs with CSI-RS resources both in the first and the second 5ms window have the same CSI-RS resource periodcity

- If no CSI-RS resource is configured in the second 5ms window for CSI-RS measurement as defined in clause 9.10.1 on any FR2 CC,

- The total number of different CSI-RS resources periodicities on all serving CCs does not exceed 3

Note: Longer delays for cell identification and measurement periods derived based on CSSFoutside\_gap,i in clauses 9.2.5.1, 9.2.5.2, can be expected, if the UE is configured with more than 4 different SMTC periodicities on FR2 serving carriers. The longer delay applies for the FR2 intra-frequency measurement objects with the longest SMTC periodicity/periodicities.

9.1.5.1.1 EN-DC mode: carrier-specific scaling factor for SSB-based, CSI-RS based L3 measurements and RSSI and channel occupancy measurements performed outside gaps

For UE configured with the E-UTRA-NR dual connectivity operation, the carrier-specific scaling factor CSSFoutside\_gap,i for intra-frequency SSB-based measurements, inter-frequency SSB-based measurements performed outside measurements gaps, intra-frequency CSI-RS L3 measurement and RSSI/channel occupancy measurement with no measurement gap on a carrier subject to CCA when SMTC and RMTC are overlapping will be as specified in Table 9.1.5.1.1-1.

**Table 9.1.5.1.1-1: CSSFoutside\_gap,i scaling factor for EN-DC mode**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Scenario** | ***CSSF*outside\_gap,i for FR1 PSCC** | ***CSSF*outside\_gap,i for FR1 SCC** | ***CSSF*outside\_gap,i for FR2 PSCC** | ***CSSF*outside\_gap,i for FR2 SCC where neighbour cell measurement is required Note 2** | ***CSSF*outside\_gap,i for FR2 SCC where neighbour cell measurement is not required** | ***CSSF*outside\_gap,i for inter-frequency MO with no measurement gp** |
| **EN-DC with FR1 only CA** | 1+NPSCC\_CSIRS +NPSCC\_CCA\_RSSI/CO | NSCC\_SSB +Y+2x NSCC\_CSIRS+ NSCC\_CCA\_RSSI/CO | N/A | N/A | N/A | NSCC\_SSB +Y+2x NSCC\_CSIRS |
| **EN-DC with**  **FR2 only intra band CA** | N/A | N/A | 1+NPSCC\_CSIRS | N/A | NSCC\_SSB +Y+2x NSCC\_CSIRS | NSCC\_SSB +Y+2x NSCC\_CSIRS |
| **EN-DC with**  **FR2 only inter band CA** | N/A | N/A | 1+NPSCC\_CSIRS | 2x(1+ NSCC\_CSIRS\_FR2\_NCM) Note 3,5 | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) |
| **EN-DC with**  **FR1 +FR2 CA (FR1 PSCell) Note 1** | 1+NPSCC\_CSIRS | 2×( NSCC\_SSB +Y+2xNSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) | N/A | 2x(1+NSCC\_CSIRS\_FR2\_NCM) Note 3 | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) |
| **EN-DC with**  **FR1 +FR2 CA (FR2 PSCell) Note 1** | N/A | NSCC\_SSB +Y+2x NSCC\_CSIRS | 1+NPSCC\_CSIRS | N/A | NSCC\_SSB+Y+2x NSCC\_CSIRS | NSCC\_SSB+Y+2x NSCC\_CSIRS |
| Note 1: Only one NR FR1 operating band and one NR FR2 operating band are included for FR1+FR2 inter-band EN-DC.  Note 2: Selection of FR2 SCC where neighbour cell measurement is required follows clause 9.2.3.2.  Note 3: CSSFoutside\_gap,i =1 if only one SCell is configured and no inter-frequency MO without gap and only SSB based L3 measurement is configured on SCC; CSSFoutside\_gap,i =2 if only one SCell is configured and no inter-frequency MO without gap and either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement is configured on SCC.  Note 4: Y is the number of configured inter-frequency MOs without MG that are being measured outside of MG; otherwise, it is 0.  Note 5: Only two NR FR2 operating band are included for EN-DC with FR2 only inter-band CA  Note 6: NPSCC\_CSIRS=1 if PSCC is with either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement configured; otherwise, NPSCC\_CSIRS =0.  Note 7: NSCC\_CSIRS=Number of configured SCell(s) with either both SSB and CSI-RS based L3 measurement configured or only CSI-RS based L3 measurement configured  Note 8: NSCC\_CSIRS\_FR2\_NCM=1 if FR2 SCC, where neighbour cell measurement is required, is with either both SSB and CSI-RS configured or only CSI-RS measurement configured; otherwise, NSCC\_CSIRS\_FR2\_NCM=0.  Note 9: NSCC\_SSB=Number of configured SCell(s) with only SSB based L3 measurement configured  Note 10: NPSCC\_CCA\_RSSI/CO= 1 if PSCC is configured with RSSI/CO measurements without MG when RMTC and SMTC are overlapping; NSCC\_CCA\_RSSI/CO = Number of MOs for SCell(s) configured with RSSI/CO measurements without MG when RMTC and SMTC are overlapping. | | | | | | |

9.1.5.1.2 SA mode: carrier-specific scaling factor for SSB-based, CSI-RS based L3 measurements and RSSI and channel occupancy measurements performed outside gaps

For UE in SA operation mode, the carrier-specific scaling factor CSSFoutside\_gap,i for intra-frequency SSB-based measurements, inter-frequency SSB-based measurements performed outside measurements gaps, intra-frequency CSI-RS L3 measurement and RSSI/channel occupancy measurement with no measurement gap on a carrier subject to CCA when SMTC and RMTC are overlapping will be as specified in Table 9.1.5.1.2-1, which shall also be applied for a UE configured with NE-DC operation.

**Table 9.1.5.1.2-1: CSSFoutside\_gap,i scaling factor for SA mode**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Scenario** | ***CSSF*outside\_gap,i for FR1 PCC** | ***CSSF*outside\_gap,i for FR1 SCC** | ***CSSF*outside\_gap,i for FR2 PCC** | ***CSSF*outside\_gap,i for FR2 SCC where neighbour cell measurement is required** | ***CSSF* outside\_gap,i for FR2 SCC where neighbour cell measurement is not required** | ***CSSF*outside\_gap,i for inter-frequency MO with no measurement gap** |
| **FR1 only CA** | 1+NPCC\_CSIRS + NPCC\_CCA\_RSSI/CO | NSCC\_SSB +Y+2x NSCC\_CSIRS+ NSCC\_CCA\_RSSI/CO | N/A | N/A | N/A | NSCC\_SSB +Y+2x NSCC\_CSIRS |
| **FR2 only intra band CA** | N/A | N/A | 1+NPCC\_CSIRS | N/A | NSCC\_SSB +Y+2x NSCC\_CSIRS | NSCC\_SSB +Y+2x NSCC\_CSIRS |
| **FR2 only inter band CA** | N/A | N/A | 1 | 2\*(1+ NSCC\_CSIRS\_FR2\_NCM) Note 3,5 | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) |
| **FR1 +FR2 CA (FR1 PCell) Note 1** | 1+NPCC\_CSIRS | 2×( NSCC\_SSB +Y+2\* NSCC\_CSIRS -1-NSCC\_CSIRS FR2\_\_NCM) | N/A | 2x(1+ NSCC\_CSIRS\_FR2\_NCM) Note 3,5 | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) |
| Note 1: Only one FR1 operating band and one FR2 operating band are included for FR1+FR2 inter-band CA.  Note 2: Selection of FR2 SCC where neighbour cell measurement is required follows clause 9.2.3.2.  Note 3: CSSFoutside\_gap,i =1 if only one SCell is configured and no inter-frequency MO without gap and only SSB based L3 measurement is configured on SCC; CSSFoutside\_gap,i =2 if only one SCell is configured and no inter-frequency MO without gap and either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement is configured on SCC.  Note 4: Y is the number of configured inter-frequency MOs without MG that are being measured outside of MG; otherwise, it is 0.  Note 5: Only two NR FR2 operating bands are included for FR2 inter-band CA.  Note 6: NPCC\_CSIRS=1 if PCC is with either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement configured; otherwise, NPCC\_CSIRS =0.  Note 7: NSCC\_CSIRS=Number of configured SCell(s) with either both SSB and CSI-RS based L3 measurement configured or only CSI-RS based L3 measurement configured  Note 8: NSCC\_CSIRS\_FR2\_NCM=1 if FR2 SCC, where neighbour cell measurement is required, is with either both SSB and CSI-RS configured or only CSI-RS measurement configured; otherwise, NSCC\_CSIRS\_FR2\_NCM=0.  Note 9: NSCC\_SSB=Number of configured SCell(s) with only SSB based L3 measurement configured  Note 10: NPCC\_CCA\_RSSI/CO= 1 if PSCC is configured with RSSI/CO measurements without MG when RMTC and SMTC are overlapping; NSCC\_CCA\_RSSI/CO = Number of MOs for SCell(s) configured with RSSI/CO measurements without MG when RMTC and SMTC are overlapping. | | | | | | |

9.1.5.1.3 NR-DC mode: carrier-specific scaling factor for SSB-based and CSI-RS based L3 measurements performed outside gaps

For UE configured with NR-DC operation, the carrier-specific scaling factor CSSFoutside\_gap,i for intra-frequency SSB-based measurement, inter-frequency SSB-based measurements performed outside measurements gaps and intra-frequency CSI-RS based L3 measurement will be as specified in Table 9.1.5.1.3-1.

**Table 9.1.5.1.3-1: CSSFoutside\_gap,i scaling factor for NR-DC mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Scenario** | ***CSSF*outside\_gap,i for FR1 PCC** | ***CSSF*outside\_gap,i for FR1 SCC** | ***CSSF*outside\_gap,i for FR2 PSCC** | ***CSSF*outside\_gap,i for FR2 SCC where neighbour cell measurement is not required** | ***CSSF*outside\_gap,i for inter-frequency MO with no measurement gap** |
| **FR1 + FR2 NR-DC (FR1 PCell and FR2 PScell) Note 1** | 1+NPCC\_CSIRS | 2×( NSCC\_SSB +Y+2xNSCC\_CSIRS) | 2x(1+ NPSCC\_CSIRS) Note 2 | 2x(NSCC\_SSB +Y+2x NSCC\_CSIRS ) | 2x(NSCC\_SSB +Y+2x NSCC\_CSIRS ) |
| Note 1: NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG in FR1 and all serving cells in SCG in FR2.  Note 2: CSSFoutside\_gap,i =1 if no SCell is configured and no inter-frequency MO without gap and only SSB based L3 measurement is configured on PSCC; CSSFoutside\_gap,i =2 if no SCell is configured and no inter-frequency MO without gap and either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement is configured on PSCC.  Note 3: Y is the number of configured inter-frequency SSB based frequency layers without MG that are being measured outside of MG; otherwise, it is 0.  Note 4: NPCC\_CSIRS=1 if PCC is with either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement configured; otherwise, NPCC\_CSIRS =0.  Note 5: NPSCC\_CSIRS=1 if PSCC is with either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement configured; otherwise, NPSCC\_CSIRS =0.  Note 6: NSCC\_CSIRS=Number of configured SCell(s) with either both SSB and CSI-RS based L3 measurement configured or only CSI-RS based L3 measurement configured  Note 7: Void  Note 8: NSCC\_SSB=Number of configured SCell(s) with only SSB based L3 measurement configured | | | | | |

9.1.5.1.4 NE-DC mode: carrier-specific scaling factor for SSB-based and CSI-RS based measurements performed outside gaps

For UE configured with NE-DC operation, the carrier-specific scaling factor CSSFoutside\_gap,i for intra-frequency SSB-based measurement and inter-frequency SSB-based measurements performed outside measurements gaps and intra-frequency CSI-RS based L3 measurement will be as specified in Table 9.1.5.1.4-1.

**Table 9.1.5.1.4-1: CSSFoutside\_gap,i scaling factor for NE-DC mode**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Scenario** | ***CSSF*outside\_gap,i for FR1 PCC** | ***CSSF*outside\_gap,i for FR1 SCC** | ***CSSF*outside\_gap,i for FR2 PCC** | ***CSSF*outside\_gap,i for FR2 SCC where neighbour cell measurement is required** | ***CSSF*outside\_gap,i for FR2 SCC where neighbour cell measurement is not required** | ***CSSF*outside\_gap,i for inter-frequency MO with no measurement gap** |
| **NE-DC with FR1 only CA** | 1+NPCC\_CSIRS | NSCC\_SSB +Y+2x NSCC\_CSIRS | N/A | N/A | N/A | NSCC\_SSB +Y+2x NSCC\_CSIRS |
| **NE-DC with FR2 only intra band CA** | N/A | N/A | 1+NPCC\_CSIRS | N/A | NSCC\_SSB +Y+2x NSCC\_CSIRS | NSCC\_SSB +Y+2x NSCC\_CSIRS |
| **NE-DC with**  **FR2 only inter band CA** | N/A | N/A | 1+NPCC\_CSIRS | 2\*(1+ NSCC\_CSIRS\_FR2\_NCM) Note 3,5 | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) |
| **NE-DC with FR1 +FR2 CA (FR1 PCell) Note 1** | 1+NPCC\_CSIRS | 2×( NSCC\_SSB +Y+2\* NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) | N/A | 2x(1+ NSCC\_CSIRS\_FR2\_NCM) Note 3,5 | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) |
| Note 1: Only one FR1 operating band and one FR2 operating band are included for FR1+FR2 inter-band CA.  Note 2: Selection of FR2 SCC where neighbour cell measurement is required follows clause 9.2.3.2.  Note 3: CSSFoutside\_gap,i =1 if only one SCell is configured and no inter-frequency MO without gap and only SSB based L3 measurement is configured on SCC; CSSFoutside\_gap,i =2 if only one SCell is configured and no inter-frequency MO without gap and either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement is configured on SCC.  Note 4: Y is the number of configured inter-frequency MOs without MG that are being measured outside of MG.  Note 5: Only two NR FR2 operating band are included for NE-DC with FR2 only inter-band CA.  Note 6: NPCC\_CSIRS=1 if PCC is with either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement configured; otherwise, NPCC\_CSIRS =0.  Note 7: NSCC\_CSIRS=Number of configured SCell(s) with either both SSB and CSI-RS based L3 measurement configured or only CSI-RS based L3 measurement configured  Note 8: NSCC\_CSIRS\_FR2\_NCM=1 if FR2 SCC, where neighbour cell measurement is required, is with either both SSB and CSI-RS configured or only CSI-RS measurement configured; otherwise, NSCC\_CSIRS\_FR2\_NCM=0.  Note 9: NSCC\_SSB=Number of configured SCell(s) with only SSB based L3 measurement configured | | | | | | |

9.1.5.2 Monitoring of multiple layers within gaps

The carrier-specific scaling factor CSSFwithin\_gap,i for a measurement object *i* derived in this chapter is applied to following measurement types:

- SSB-based intra-frequency measurement object with no measurement gap in clause 9.2.5 and 9.2A.5, when all of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.

- SSB-based intra-frequency measurement object with measurement gap in clause 9.2.6 and 9.2A.6.

- CSI-RS based inter-frequency measurement in clause 9.10.3, when CSI-RS resources for L3 measurement of this inter-frequency measurement object are overlapped by the measurement gap.

- CSI-RS based inter-frequency measurement in clause 9.10.3, when CSI-RS resources for L3 measurement of this inter-frequency measurement object are partially overlapped by the measurement gap.

- SSB-based inter-frequency measurement object with measurement gap in clause 9.3.4.

- SSB-based inter-frequency measurement object without measurement gap for UE capable of *interFrequencyMeas-NoGap* in clause 9.3.9, when

- all of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement gap, or

- part of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement gap, but the flag *interFrequencyConfig-NoGap-r16* is not configured by the Network.

- Intra-frequency RSSI/CO measurement with measurement gap in clause 9.2A.7.

- Intra-frequency RSSI/CO measurement with no measurement gap in clause 9.2A.7 when all of the RMTC occasions of this intra-frequency RSSI/CO measurement are overlapped by the measurement gap

- Inter-frequency RSSI/CO measurement in clause 9.3A.8 and 9.3A.9.

- E-UTRA Inter-RAT measurement object in clauses 9.4.2 and 9.4.3.

- For a UE in E-UTRA-NR dual connectivity operation, NR SSB-based Inter-RAT measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.4) on an NR serving carrier

- the SSB is not completely contained in the active BWP of the UE, or

- all of the SMTC occasions of this inter-RAT measurement object are overlapped by the measurement gap;

- NR SSB-based Inter-RAT measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.4) on an NR non-serving carrier.

- E-UTRAN Inter-frequency measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.3) and by the E-UTRAN PSCell (TS 36.133 [15] clause 8.19.3).

- E-UTRAN Inter-frequency RSTD measurement configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.15).

- UTRA Inter-RAT measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clauses 8.17.5 to 8.17.12).

- GSM Inter-RAT measurements configured by the E-UTRAN PCell (TS 36.133 [15] clauses 8.17.13 and 8.17.14).

UE is expected to conduct the measurement of this measurement object *i* only within the measurement gaps.

If the higher layer signaling in TS 38.331 [2] of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, CSSFwithin\_gap,i and requirements derived from CSSFoutside\_gap,i are not specified.

Number of SSB layers should include SSB for mobility and that as associated SSB for CSI-RS mobility. The ssbfrequency is counted only once if the ssbfrequency for mobility and associated SSB are the same, or ssbfrequency and smtc in multiple MOs are the same.

SSB-based measurement and CSI-RS based measurement for mobility configured in the same measurement object are considered as different layers.

*<End of change8-1>*

*<Start of change6-3>*

9.2.5.1 Intrafrequency cell identification

The UE shall be able to identify a new detectable intra-frequency cell within Tidentify\_intra\_without\_index if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_with\_index. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within Tidentify\_intra\_without\_index. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

Tidentify\_intra\_with\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra + TSSB\_time\_index\_intra) ms

Where:

TPSS/SSS\_sync\_intra: it is the time period used in PSS/SSS detection given in table 9.2.5.1-1, 9.2.5.1-2, 9.2.5.1-4 (deactivated SCell) or 9.2.5.1-5 (deactivated SCell)

TSSB\_time\_index\_intra: it is the time period used to acquire the index of the SSB being measured given in table 9.2.5.1-3 or 9.2.5.1-6 (deactivated SCell)

T SSB\_measurement\_period\_intra: equal to a measurement period of SSB based measurement given in table 9.2.5.2-1, table 9.2.5.2-2 table 9.2.5.2-3 (deactivated SCell) or 9.2.5.2-4(deactivated SCell)

CSSFintra: it is a carrier specific scaling factor and is determined

according to CSSFoutside\_gap,i in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to CSSFwithin\_gap,i in clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intra-frequency SMTC is fully overlapping with measurement gaps.

if the high layer in TS 38.331 [2] signalling of *smtc2* is configured, the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

Mpss/sss\_sync\_w/o\_gaps : For a UE supporting FR2 power class 1, Mpss/sss\_sync\_w/o\_gaps =40. For a UE supporting power class 2, Mpss/sss\_sync\_w/o\_gaps =24. For a UE supporting FR2 power class 3, Mpss/sss\_sync\_w/o\_gaps =24. For a UE supporting FR2 power class 4, Mpss/sss\_sync\_w/o\_gaps =24

Mmeas\_period\_w/o\_gaps : For a UE supporting power class 1, Mmeas\_period\_w/o\_gaps =40. For a UE supporting FR2 power class 2, Mmeas\_period\_w/o\_gaps =24. For a UE supporting power class 3, Mmeas\_period\_w/o\_gaps =24. For a UE supporting power class 4, Mmeas\_period\_w/o\_gaps =24.

When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, Kp=1

When intra-frequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP. For calculation of Kp, if the high layer signalling (TS 38.331 [2]) of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, the SMTC periodicity corresponds to the value of higher layer parameter *smtc2*; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter *smtc1.*

If the higher layer signaling in TS38.331 [2] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index

For FR2,

Klayer1\_measurement=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same serving carrier which can be merged.and RSSI symbols are indicated by *SS-RSSI-Measurement*;

Klayer1\_measurement=1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

If MCG DRX is in use, cell identification requirements for intra-frequency measurement in MCG specified in Table 9.2.5.1-1, Table 9.2.5.1-2, Table 9.2.5.1-3, Table 9.2.5.1-4, Table 9.2.5.1-5 and Table 9.2.5.1-6 shall depend on the MCG DRX cycle. If SCG DRX is in use, cell identification requirements for intra-frequency measurement in SCG specified in Table 9.2.5.1-1, Table 9.2.5.1-2, Table 9.2.5.1-3, Table 9.2.5.1-4, Table 9.2.5.1-5 and Table 9.2.5.1-6 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

**Table 9.2.5.1-1: Time period for PSS/SSS detection, (Frequency range FR1)**

|  |  |
| --- | --- |
| **DRX cycle** | **TPSS/SSS\_sync\_intra** |
| No DRX | max( 600ms, ceil( 5 x Kp) x SMTC period )Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max( 600ms, ceil(M2 Note 2x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(5 x Kp) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified  NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1.  NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |

**Table 9.2.5.1-2: Time period for PSS/SSS detection, (Frequency range FR2)**

|  |  |
| --- | --- |
| **DRX cycle** | **TPSS/SSS\_sync\_intra** |
| No DRX | max(600ms, ceil(Mpss/sss\_sync\_w/o\_gaps x Kp x Klayer1\_measurement)x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5 x Mpss/sss\_sync\_w/o\_gaps x Kp x Klayer1\_measurement)x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(Mpss/sss\_sync\_w/o\_gaps x Kp x Klayer1\_measurement) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

**Table 9.2.5.1-3: Time period for time index detection (FR1)**

|  |  |
| --- | --- |
| **DRX cycle** | **TSSB\_time\_index\_intra** |
| No DRX | max(120ms, ceil( 3 x Kp )x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 Note 2 x 3 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | Ceil(3 x Kp) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified  NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1  NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |

**Table 9.2.5.1-4: Time period for PSS/SSS detection, deactivated SCell (FR1)**

|  |  |
| --- | --- |
| **DRX cycle** | **TPSS/SSS\_sync\_intra** |
| No DRX | Ceil(5 x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(5 x Kp) x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(5 x Kp) x max(measCycleSCell, DRX cycle) x CSSFintra |

**Table 9.2.5.1-5: Time period for PSS/SSS detection, deactivated SCell (FR2)**

|  |  |
| --- | --- |
| **DRX cycle** | **TPSS/SSS\_sync\_intra** |
| No DRX | Ceil(Mpss/sss\_sync\_w/o\_gaps x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(Mpss/sss\_sync\_w/o\_gaps x Kp) x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(Mpss/sss\_sync\_w/o\_gaps x Kp) x max(measCycleSCell, DRX cycle) x CSSFintra |

**Table 9.2.5.1-6: Time period for time index detection, deactivated SCell (FR1)**

|  |  |
| --- | --- |
| **DRX cycle** | **TSSB\_time\_index\_intra** |
| No DRX | Ceil(3 x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(3 x Kp) x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(3 x Kp)x max(measCycleSCell, DRX cycle) x CSSFintra |

**Table 9.2.5.1-7: Void**

**Table 9.2.5.1-8: Void**

*<End of change6-3>*

*<Start of change6-4>*

9.2.5.2 Measurement period

The measurement period for intra-frequency measurements without gaps is as shown in table 9.2.5.2-1, 9.2.5.2-2, 9.2.5.2-3 (deactivated SCell) or 9.2.5.2-4(deactivated SCell). When *highSpeedMeasFlag-r16* is configured, T SSB\_measurement\_period\_intra is specified in Table 9.2.5.2-5.

If the higher layer signaling in TS38.331 [2] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for TSSB\_measurement\_period\_intra

If MCG DRX is in use, measurement period requirements for intra-frequency measurement in MCG specified in Table 9.2.5.2-1, Table 9.2.5.2-2, Table 9.2.5.2-3 and Table 9.2.5.2-4 shall depend on the MCG DRX cycle. If SCG DRX is in use, measurement period requirements for intra-frequency measurement in SCG specified in Table 9.2.5.2-1, Table 9.2.5.2-2, Table 9.2.5.2-3 and Table 9.2.5.2-4 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

For FR2, a longer measurement period is allowed, if aperiodic CSI-RS resource is measured for L1-RSRP measurement on any FR2 serving frequency in the same band, and the CSI-RS resource is outside measurement gap and overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols. If *SSB-ToMeasure* or *SS-RSSI-Measurement* is configured, the SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same band which can be merged and the RSSI symbols are indicated by *SS-RSSI-Measurement*.

**Table 9.2.5.2-1: Measurement period for intra-frequency measurements without gaps (FR1)**

|  |  |
| --- | --- |
| **DRX cycle** | **T SSB\_measurement\_period\_intra** |
| No DRX | max(200ms, ceil( 5 x Kp) x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil( 5 x Kp ) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

**Table 9.2.5.2-2: Measurement period for intra-frequency measurements without gaps(FR2)**

|  |  |
| --- | --- |
| **DRX cycle** | **T SSB\_measurement\_period\_intra** |
| No DRX | max(400ms, ceil(Mmeas\_period\_w/o\_gaps x Kp x Klayer1\_measurement) x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5x Mmeas\_period\_w/o\_gaps x Kp x Klayer1\_measurement) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(Mmeas\_period\_w/o\_gaps xKp x Klayer1\_measurement ) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

**Table 9.2.5.2-3: Measurement period for intra-frequency measurements without gaps (deactivated SCell) (FR1)**

|  |  |
| --- | --- |
| **DRX cycle** | **T SSB\_measurement\_period\_intra** |
| No DRX | Ceil(5 x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(5 x Kp) x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(5 x Kp)x max(measCycleSCell, DRX cycle) x CSSFintra |

**Table 9.2.5.2-4: Measurement period for intra-frequency measurements without gaps (deactivated SCell) (FR2)**

|  |  |
| --- | --- |
| **DRX cycle** | **T SSB\_measurement\_period\_intra** |
| No DRX | Ceil(Mmeas\_period\_w/o\_gaps x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(Mmeas\_period\_w/o\_gaps x Kp) x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(Mmeas\_period\_w/o\_gaps x Kp) x max(measCycleSCell, DRX cycle) x CSSFintra |

**Table 9.2.5.2-5: T SSB\_measurement\_period\_intra When *highSpeedMeasFlag-r16* is configured (Frequency range FR1**

|  |  |
| --- | --- |
| **DRX cycle** | **T SSB\_measurement\_period\_intra** |
| No DRX Note 2 | max(200ms, ceil( 5 x Kp) x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 160ms | max(200ms, ceil(5 x M2 Note 2 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| 160ms < DRX cycle≤ 320ms | ceil(4 x M2 Note 2 x Kp) x DRX cycle x CSSFintra |
| DRX cycle>320ms | ceil( Y Note 3 x Kp ) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified  NOTE 2: M2 = 1.5 if SMTC period > 40 ms, otherwise M2=1  NOTE 3: Y=3 when SMTC period <= 40ms, Y=5 when SMTC period > 40ms  NOTE 4: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |

*<End of change6-4>*

*<Start of change6-5>*

9.2.6.2 Intra-frequency cell identification

The UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_with\_index. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within Tidentify\_intra\_without\_index. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

Tidentify\_intra\_without\_index = TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra ms

Tidentify\_intra\_with\_index = TPSS/SSS\_sync\_ntra + T SSB\_measurement\_period\_intra + TSSB\_time\_index\_intra ms

Where:

TPSS/SSS\_sync\_intra: it is the time period used in PSS/SSS detection given in table 9.2.6.2-1 or 9.2.6.2-2.

TSSB\_time\_index\_intra: it is the time period used to acquire the index of the SSB being measured given in table 9.2.6.2-3.

T SSB\_measurement\_period\_intra: equal to a measurement period of SSB based measurement given in table 9.2.6.3-1 or 9.2.6.3-2.

CSSFintra: it is a carrier specific scaling factor and is determined according to CSSFwithin\_gap,i in clause 9.1.5.2 for measurement conducted within measurement gaps.

Mpss/sss\_sync\_with\_gaps : For a UE supporting FR2 power class 1, Mpss/sss\_sync with\_gaps=40. For a UE supporting FR2 power class 2, Mpss/sss\_sync with\_gaps =24. For a UE supporting FR2 power class 3, Mpss/sss\_sync with\_gaps =24. For a UE supporting power class 4, Mpss/sss\_sync with\_gaps =24

Mmeas\_period\_ with\_gaps: For a UE supporting power class 1, Mmeas\_period\_ with\_gaps =40. For a UE supporting power class 2, Mmeas\_period\_ with\_gaps =24. For a UE supporting power class 3, Mmeas\_period\_ with\_gaps =24. For a UE supporting power class 4, Mmeas\_period with\_gaps =24.

If the higher layer signaling in TS 38.331 [2] of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index.

If MCG DRX is in use, cell identification requirements for intra-frequency measurement in MCG specified in Table 9.2.6.2-1, Table 9.2.6.2-2, and Table 9.2.6.2-3 shall depend on the MCG DRX cycle. If SCG DRX is in use, cell identification requirements for intra-frequency measurement in SCG specified in Table 9.2.6.2-1, Table 9.2.6.2-2, and Table 9.2.6.2-3 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

**Table 9.2.6.2-1: Time period for PSS/SSS detection (FR1)**

|  |  |
| --- | --- |
| **DRX cycle** | **TPSS/SSS\_sync\_intra** |
| No DRX | max(600ms, 5 x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(600ms, ceil(M2Note 1x 5) x max(MGRP, SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | 5 x max(MGRP, DRX cycle) x CSSFintra |
| NOTE 1: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1.  NOTE 2: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |

**Table 9.2.6.2-2: Time period for PSS/SSS detection (FR2)**

|  |  |
| --- | --- |
| **DRX cycle** | **TPSS/SSS\_sync\_intra** |
| No DRX | max(600ms, Mpss/sss\_sync\_with\_gaps x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x Mpss/sss\_sync\_with\_gaps) x max(MGRP, SMTC period, DRX cycle))x CSSFintra |
| DRX cycle>320ms | Mpss/sss\_sync\_with\_gaps x max(MGRP, DRX cycle) x CSSFintra |

**Table 9.2.6.2-3: Time period for time index detection (Frequency range FR1)**

|  |  |
| --- | --- |
| **DRX cycle** | **TSSB\_time\_index\_intra** |
| No DRX | max(120ms, 3 x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(120ms, ceil(M2Note 1x 3) x max(MGRP, SMTC period,DRX cycle) x CSSFintra) |
| DRX cycle>320ms | 3 x max(MGRP, DRX cycle) x CSSFintra |
| NOTE 1: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1.  NOTE 2: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |

**Table 9.2.6.2-7: Void**

**Table 9.2.6.2-8: Void**

*<End of change6-5>*

*<Start of change6-6>*

9.2.6.3 Intrafrequency Measurement Period

The measurement period for FR1 intrafrequency measurements with gaps is as shown in table 9.2.6.3-1.

The measurement period for FR2 intrafrequency measurements with gaps is as shown in table 9.2.6.3-2.

When *highSpeedMeasFlag-r16* is configured, T SSB\_measurement\_period\_intra is specified in Table 9.2.6.3-3.

If MCG DRX is in use, measurement period requirements for intra-frequency measurement in MCG specified in Table 9.2.6.3-1 and Table 9.2.6.3-2, shall depend on the MCG DRX cycle. If SCG DRX is in use, measurement period requirements for intra-frequency measurement in SCG specified in Table 9.2.6.3-1and Table 9.2.6.3-2, shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

For either an FR1 or FR2 serving cell, longer measurement period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

**Table 9.2.6.3-1: Measurement period for intra-frequency measurements with gaps(FR1)**

|  |  |
| --- | --- |
| **DRX cycle** | **T SSB\_measurement\_period\_intra** |
| No DRX | max(200ms, 5 x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5) x max(MGRP, SMTC period,DRX cycle))x CSSFintra |
| DRX cycle>320ms | 5 x max(MGRP, DRX cycle) x CSSFintra |

**Table 9.2.6.3-2: Measurement period for intra-frequency measurements with gaps(FR2)**

|  |  |
| --- | --- |
| **DRX cycle** | **T SSB\_measurement\_period\_intra** |
| No DRX | max(400ms, Mmeas\_period with\_gaps x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5 x Mmeas\_period with\_gaps) x max(MGRP, SMTC period, DRX cycle)) Note 1 x CSSFintra |
| DRX cycle>320ms | Mmeas\_period with\_gaps x max(MGRP, DRX cycle) x CSSFintra |

**Table 9.2.6.3-3: Measurement period When *highSpeedMeasFlag-r16* is configured (Frequency Range FR1)**

|  |  |
| --- | --- |
| **DRX cycle** | **T SSB\_measurement\_period\_intra** |
| No DRX | max(200ms, 5 x max(MGRP, SMTC period)) Note 1 x CSSFintra |
| DRX cycle≤ 160ms | max(200ms, ceil(M2Note 2 x 5) x max(MGRP, SMTC period,DRX cycle)) x CSSFintra |
| 160ms < DRX cycle≤ 320ms | max(200ms, ceil(M2Note 2 x 4) x max(MGRP, DRX cycle)) x CSSFintra |
| DRX cycle>320ms | Y Note 3 x max(MGRP, DRX cycle) x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified  NOTE 2: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1  NOTE 3: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40ms  NOTE 4: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |

*<End of change6-6>*

*<Start of change8-2>*

9.3.1 Introduction

A measurement is defined as an SSB based inter-frequency measurement provided it is not defined as an intra-frequency measurement according to clause 9.2.

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified inter-frequency cells if carrier frequency information is provided by PCell or PSCell, even if no explicit neighbour list with physical layer cell identities is provided.

A measurement is defined as an inter-frequency SSB based measurements without measurement gaps for UE capable of *interFrequencyMeas-NoGap* provided

- the UE supports *interFrequencyMeas-Nogap-r16* [15], and

- the SSB is completely contained in the active BWP of the UE.

For inter-frequency SSB based measurements without measurement gaps, UE may cause scheduling restriction as specified in clause 9.3.5.3.

Note: Non-CA capable UE is not expected to indicate support of *interFrequencyMeas-Nogap-r16* [15].

SSB based measurements are configured along with a measurement timing configuration (SMTC) per carrier, which provides periodicity, duration and offset information on a window of up to 5ms where the measurements on the configured inter-frequency carrier are to be performed. For inter-frequency connected mode measurements, one measurement window periodicity may be configured per inter-frequency measurement object.

When measurement gaps are needed, the UE is not expected to detect SSB on an inter-frequency measurement object which start earlier than the gap starting time + switching time, nor detect SSB which ends later than the gap end – switching time. When the inter-frequency cells are in FR2 and the per-FR gap is configured to the UE in EN-DC, SA NR, NE-DC and NR-DC, or the serving cells are in FR2, the inter-frequency cells are in FR2 and the per-UE gap is configured to the UE in SA NR and NR-DC, the switching time is 0.25ms. Otherwise the switching time is 0.5ms.

The requirements in this clause shall also apply, when the UE is configured to perform SRS carrier based switching and using measurement gaps.

Longer measurement period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

*<End of change8-2>*

*<Start of change6-7>*

9.4.1 Introduction

The requirements in this clause are specified for NR−E-UTRAN FDD and NR−E-UTRAN TDD measurements and are applicable without an explicit E-UTRAN neighbour cell list containing physical layer cell identities, for a UE:

- in RRC\_CONNECTED state, and

- configured

- with SA or NR-DC operation mode or configured in NE-DC operation mode by PCell with NR−E-UTRAN FDD or TDD measurement (RSRP, RSRQ, RS-SINR, RSTD, or E-CID RSRP and RSRQ) on E-UTRA non-serving frequency carrier, or

- with SA operation mode on NR carrier frequencies with CCA by PCell with NR−E-UTRAN FDD or TDD measurement (RSRP, RSRQ, RS-SINR) on E-UTRA non-serving frequency carrier, and

- configured with an appropriate measurement gap pattern according to Table 9.1.2-3.

When the UE is in NE-DC operation mode and an NR−E-UTRAN FDD or TDD measurement (RSRP, RSRQ, RS-SINR, or E-CID RSRP and RSRQ) configured by NR PCell is on a E-UTRA serving frequency carrier, then the corresponding E-UTRA intra-frequency measurements requirements specified in clause 8.19 of TS 36.133 [15] shall apply.

When *highSpeedMeasFlag-r16* is configured but UE does not support either *measurementEnhancement-r16 or* *interRAT-MeasurementEnhancement-r16*, the UE is not required to meet the requirements specified in Table 9.4.2.3-2 and Table 9.4.3.3-2.

*Editor’s note: the exact signalling names in the above brackets and in Table 9.4.2.3-2 and Table 9.4.3.3-2 are subject to RAN2 definitions and the brackets shall be replaced by the correct signalling names according to RAN2 specification.*

Parameter TInter1 used in inter-RAT requirements in clause 9.4 is specified in Table 9.4.1-1.

**Table 9.4.1-1: Minimum available time for inter-RAT measurements**

|  |  |  |  |
| --- | --- | --- | --- |
| **Gap Pattern Id** | **MeasurementGap Length (MGL, ms)** | **Measurement Gap Repetition Period**  **(MGRP, ms)** | **Minimum available time for inter-frequency and inter-RAT measurements during 480 ms period**  **(Tinter1, ms)** |
| 0 | 6 | 40 | 60 |
| 1 | 6 | 80 | 30 |
| 2 | 3 | 40 | 24Note 1 |
| 3 | 3 | 80 | 12Note 1 |
| 4 | 6 | 20 | 120 Note 1 |
| 6 | 4 | 20 | 72 Note 1,3,6 |
| 7 | 4 | 40 | 36 Note 1,4,6 |
| 8 | 4 | 80 | 18Note 1,5,6 |
| 10 | 3 | 20 | 48 Note 1 |
| NOTE 1: When determining UE requirements using Tinter1 for gap pattern IDs 2, 3, 4, 6, 7, 8, 10, Tinter1 = 60 for gap pattern IDs 2, 4, 6, 7, 10, and Tinter1 = 30 for gap pattern IDs 3 and 8 shall be used.  NOTE 2: Measurement gaps pattern configurations applicability is as specified in Table 9.1.2-1.  NOTE 3: When this gap pattern is used, the Tinter for E-UTRA inter-frequency measurements is 48 ms corresponding to the first 3 ms of the 4 ms gap.  NOTE 4: When this gap pattern is used, the Tinter for E-UTRA inter-frequency measurements is 24 ms corresponding to the first 3 ms of the 4 ms gap.  NOTE 5: When this gap pattern is used, the Tinter for E-UTRA inter-frequency measurements is 12 ms corresponding to the first 3 ms of the 4 ms gap.  NOTE 6: This gap pattern is applicable for E-UTRA inter-frequency measurements only if gap based NR measurements are also configured. | | | |

A UE configured with gap pattern ID 2, 3 or 10 shall be able to detect a target cell, provided that

- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell begins not earlier than 500 μs from the start of the measurement gap, and

- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell ends not later than 500 μs before the end of the measurement gap in case of FDD and not later than 750 μs before the end of measurement gap in case of TDD.

A UE configured with gap pattern ID 6, 7 or 8 shall be able to detect a target cell, provided that

- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell begins not earlier than 500 μs from the start of the measurement gap, and

- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell ends no later than 1500 μs before the end of the measurement gap in case of FDD and no later than 1750 μs before the end of measurement gap in case of TDD.

*<End of change6-7>*

*<Start of change6-8>*

9.4.2.3 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN FDD cell within TIdentify, E-UTRAN FDD specified in Table 9.4.2.3-1. When *highSpeedMeasFlag-r16* is configured and UE supports the enhanced inter-RAT E-UTRAN measurement requirements, the UE shall be able to identify a new detectable E-UTRAN FDD cell within TIdentify, E-UTRAN FDD specified in Table 9.4.2.3-2.

**Table 9.4.2.3-1: Requirement to identify a newly detectable E-UTRAN FDD cell**

|  |  |  |
| --- | --- | --- |
| **DRX cycle length (s)** | **TIdentify, E-UTRAN FDD (s) (DRX cycles)** | |
|  | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.2.2 apply | Non-DRX requirements in clause 9.4.2.2 apply |
| 0.256 | 5.12\* CSSFinterRAT (20\*CSSFinterRAT) | 7.68\* CSSFinterRAT (30\*CSSFinterRAT) |
| 0.32 | 6.4\* CSSFinterRAT (20\*CSSFinterRAT) | 7.68\* CSSFinterRAT (24\*CSSFinterRAT) |
| 0.32< DRX-cycle ≤10.24 | Note1 (20\*CSSFinterRAT) | Note1 (20\*CSSFinterRAT) |
| NOTE 1: The time depends on the DRX cycle length.  NOTE 2: CSSFinterRAT is as defined in clause 9.4.2.2. | | |

**Table 9.4.2.3-2: Requirement to identify a newly detectable E-UTRAN FDD cell when *highSpeedMeasFlag-r16* is configured**

|  |  |  |
| --- | --- | --- |
| **DRX cycle length (s)** | **TIdentify, E-UTRAN FDD (s) (DRX cycles)** | |
|  | **Gap period = 40 ms, 20 ms** | **Gap period = 80 ms** |
| ≤0.16 | Non-DRX requirements in clause 9.4.2.2 apply | Non-DRX requirements in clause 9.4.2.2 apply |
| 0.16<DRx cycle<=0.32 | Note 1(15\*CSSFinterRAT) |  |
| 0.32<DRx cycle <= 0.64 | Note 1(10\*CSSFinterRAT) |  |
| DRx cycle = 1.024 | Note 1(10\*CSSFinterRAT) | Note 1(10\*CSSFinterRAT) |
| DRx cycle = 1.28 | Note 1(8\*CSSFinterRAT) | Note 1(8\*CSSFinterRAT) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20\*CSSFinterRAT) | Note1 (20\*CSSFinterRAT) |
| NOTE 1: The time depends on the DRX cycle length.  NOTE 2: CSSFinterRAT is as defined in clause 9.4.2.2.  NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*. | | |

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN FDD cells per E-UTRA FDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA FDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period Tmeasure, E-UTRAN FDD specified in Table 9.4.2.3-2.

**Table 9.4.2.3-2: Requirement to measure E-UTRAN FDD cells**

|  |  |
| --- | --- |
| **DRX cycle length (s)** | **Tmeasure, E-UTRAN FDD (s) (DRX cycles)** |
| ≤0.08 | Non-DRX requirements in clause 9.4.2.2 apply |
| 0.08< DRX-cycle ≤10.24 | Note1 (5\* CSSFinterRAT) |
| NOTE 1: The time depends on the DRX cycle length.  NOTE 2: CSSFinterRAT is as defined in clause 9.4.2.2. | |

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2. The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3. The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

*<End of change6-8>*

*<Start of change6-9>*

9.4.3.3 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN TDD cell within TIdentify, E-UTRAN TDD specified in Table 9.4.3.3-1. When *highSpeedMeasFlag-r16* is configured and UE supports the enhanced inter-RAT E-UTRAN measurement requirements, the UE shall be able to identify a new detectable E-UTRAN TDD cell within TIdentify, E-UTRAN TDD specified in Table 9.4.3.3-2.

**Table 9.4.3.3-1: Requirement to identify a newly detectable E-UTRAN TDD cell**

|  |  |  |
| --- | --- | --- |
| **DRX cycle length (s)** | **TIdentify, E-UTRAN TDD (s) (DRX cycles)** | |
|  | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.256 | 5.12\* CSSFinterRAT (20\*CSSFinterRAT) | 7.68\* CSSFinterRAT (30\*CSSFinterRAT) |
| 0.32 | 6.4\* CSSFinterRAT (20\*CSSFinterRAT) | 7.68\* CSSFinterRAT (24\*CSSFinterRAT) |
| 0.32< DRX-cycle ≤10.24 | Note1 (20\*CSSFinterRAT) | Note1 (20\*CSSFinterRAT) |
| NOTE 1: The time depends on the DRX cycle length.  NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2. | | |

**Table 9.4.3.3-2: Requirement to identify a newly detectable E-UTRAN TDD cell when *highSpeedMeasFlag-r16* is configured**

|  |  |  |
| --- | --- | --- |
| **DRX cycle length (s)** | **TIdentify, E-UTRAN TDD (s) (DRX cycles)** | |
|  | **Gap period = 40 ms, 20 ms** | **Gap period = 80 ms** |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.16<DRx cycle<=0.32 | Note 1(15\*CSSFinterRAT) |  |
| 0.32<DRx cycle <= 0.64 | Note 1(10\*CSSFinterRAT) |  |
| DRx cycle = 1.024 | Note 1(10\*CSSFinterRAT) | Note 1(10\*CSSFinterRAT) |
| DRx cycle = 1.28 | Note 1(8\*CSSFinterRAT) | Note 1(8\*CSSFinterRAT) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20\*CSSFinterRAT) | Note1 (20\*CSSFinterRAT) |
| NOTE 1: The time depends on the DRX cycle length.  NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2.  NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16.* | | |

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN TDD cells per E-UTRA TDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA TDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period Tmeasure, E-UTRAN TDD specified in Table 9.4.3.3-2.

**Table 9.4.3.3-2: Requirement to measure E-UTRAN TDD cells**

|  |  |
| --- | --- |
| **DRX cycle length (s)** | **Tmeasure, E-UTRAN TDD (s) (DRX cycles)** |
| ≤0.08 | Non-DRX Requirements in clause 9.4.3.2 apply |
| 0.128 | For configuration 2 Note3, non-DRX requirements in clause 9.4.3.2 apply,  Otherwise: Note1 (5\*CSSFinterRAT) |
| 0.128<DRX-cycle≤10.24 | Note1 (5\*CSSFinterRAT) |
| NOTE 1: The time depends on the DRX cycle length.  NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2.  NOTE 3: See Table 9.4.3.2-1. | |

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3. The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

*<End of change6-9>*

*<Start of change2>*

9.4.7 NR – E-UTRAN measurements with autonomous gaps

9.4.7.1 CGI identification of an E-UTRA cell with autonomous gaps

The requirements in this clause apply when the UE is configured with standalone NR, NE-DC or NR-DC. The UE shall identify and report the CGI when requested by an NR PCell for the purpose ‘reportCGI’. The UE may make autonomous gaps in downlink reception and uplink transmission for receiving MIB and SIB1 message according to clause 5.5.3.1 in TS 38.331 [2]. If autonomous gaps are used for measurement with the purpose of ‘reportCGI’, regardless of whether DRX is used or not, or regardless of whether SCell(s) are configured or not, the UE shall be able to identify a new CGI of E-UTRA cell within = 150 ms. This is the maximum allowed time for the UE to identify a new CGI of an E-UTRA cell, provided that the E-UTRA cell has been already identified by the UE.

A cell shall be considered identifiable following conditions are fulfilled:

- RSRP related side conditions given in Clause 9.1 in [15] are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex B.2.2 in [15] for a corresponding Band

The MIB of an E-UTRA cell whose CGI is identified shall be considered decodable by the UE provided the PBCH demodulation requirements are met according to [25].

The requirement for identifying a new CGI of an E-UTRA cell within is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [2] is used.

*<End of change2>*

*<Start of change6-10>*

9.5.4.1 SSB based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of TL1-RSRP\_Measurement\_Period\_SSB.

The value of TL1-RSRP\_Measurement\_Period\_SSB is defined in Table 9.5.4.1-1 for FR1 and Table 9.5.4.1-2 for FR2, where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

- N= 8.

For FR1,

- P=, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

For FR2,

- P=, when SSB is not overlapped with measurement gap and SSB is partially overlapped with SMTC occasion (TSSB < TSMTCperiod).

- P is Psharing factor, when SSB is not overlapped with measurement gap and SSB is fully overlapped with SMTC period (TSSB = TSMTCperiod).

- P=, when SSB is partially overlapped with measurement gap and SSB is partially overlapped with SMTC occasion (TSSB < TSMTCperiod) and SMTC occasion is not overlapped with measurement gap and

- TSMTCperiod ≠ MGRP or

- TSMTCperiod = MGRP and TSSB < 0.5\*TSMTCperiod

- P is , when SSB is partially overlapped with measurement gap and SSB is partially overlapped with SMTC occasion (TSSB < TSMTCperiod) and SMTC occasion is not overlapped with measurement gap and TSMTCperiod = MGRP and TSSB = 0.5\*TSMTCperiod

- P=, when SSB is partially overlapped with measurement gap (TSSB <MGRP) and SSB is partially overlapped with SMTC occasion (TSSB < TSMTCperiod) and SMTC occasion is partially or fully overlapped with measurement gap.

- P is , when SSB is partially overlapped with measurement gap and SSB is fully overlapped with SMTC occasion (TSSB = TSMTCperiod) and SMTC occasion is partially overlapped with measurement gap (TSMTCperiod < MGRP)

- Psharing factor = 1, if the SSB configured for L1-RSRP measurement outside measurement gap is

- not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,

- not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured,

- Psharing factor = 3, otherwise.

Where:

- TSSB = ssb-periodicityServingCell

- TSMTCperiod = the configured SMTC period

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, TSMTCperiod corresponds to the value of higher layer parameter *smtc2*; Otherwise TSMTCperiod corresponds to the value of higher layer parameter *smtc1*. TSMTCperiod is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer L1 RSRP measurement period would be expected during the period Tidentify\_CGI,E-UTRAN when the UE is requested to decode an LTE CGI.

**Table 9.5.4.1-1: Measurement period TL1-RSRP\_Measurement\_Period\_SSB for FR1**

|  |  |
| --- | --- |
| **Configuration** | **TL1-RSRP\_Measurement\_Period\_SSB (ms)** |
| non-DRX | max(TReport, ceil(M\*P)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(K \*M\*P)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: K = 1 when TSSB ≤ 40 ms and *highSpeedMeasFlag-r16* are configured; otherwise K = 1.5.  Note 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16.* | |

**Table 9.5.4.1-2: Measurement period TL1-RSRP\_Measurement\_Period\_SSB for FR2**

|  |  |
| --- | --- |
| **Configuration** | **TL1-RSRP\_Measurement\_Period\_SSB (ms)** |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(1.5\*M\*P\*N)\*TDRX |
| Note: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting. | |

*<End of change6-10>*

*<Start of change6-11>*

9.5.4.2 CSI-RS based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of TL1-RSRP\_Measurement\_Period\_CSI-RS.

The value of TL1-RSRP\_Measurement\_Period\_CSI-RS is defined in Table 9.5.4.2-1 for FR1 and in Table 9.5.4.2-2 for FR2, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

- For aperiodic CSI-RS resources M=1

- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured with QCL-TypeD for all resources in the resource set.

- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided TCI state is provided with QCL-TypeD for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.19.2 and 10.1.20.2 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured with QCL-TypeD for all resources in the resource set.

For FR1,

- P=, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.

- P=, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion (TCSI-RS < MGRP)

- P=, when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod).

- P=Psharing factor, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod).

- P=1, when aperiodic CSI-RS resource is not overlapped with measurement gap

- P=, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with measurement gap and

- TSMTCperiod ≠ MGRP or

- TSMTCperiod = MGRP and TCSI-RS < 0.5\*TSMTCperiod

- P=, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with measurement gap and TSMTCperiod = MGRP and TCSI-RS = 0.5\*TSMTCperiod

- P=, when CSI-RS is partially overlapped with measurement gap (TCSI-RS < MGRP) and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is partially or fully overlapped with measurement gap.

- P=, when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod) and SMTC occasion is partially overlapped with measurement gap (TSMTCperiod < MGRP)

- Psharing factor = 1, if the CSI-RS configured for L1-RSRP measurement outside measurement gap is

- not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,

- not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured

- Psharing factor = 3, otherwise.

Where:

TSMTCperiod = the configured SMTC period.

TCSI-RS = the periodicity of CSI-RS configured for L1-RSRP measurement

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, TSMTCperiod corresponds to the value of higher layer parameter *smtc2*; Otherwise TSMTCperiod corresponds to the value of higher layer parameter *smtc1*. TSMTCperiod is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Note: The overlap between CSI-RS for L1-RSRP measurement and SMTC means that CSI-RS for L1-RSRP measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer L1 RSRP measurement period would be expected during the period Tidentify\_CGI,E-UTRAN when the UE is requested to decode an LTE CGI.

**Table 9.5.4.2-1: Measurement period TL1-RSRP\_Measurement\_Period\_CSI-RS for FR1**

|  |  |
| --- | --- |
| **Configuration** | **TL1-RSRP\_Measurement\_Period\_CSI-RS (ms)** |
| non-DRX | max(TReport, ceil(M\*P)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(K \*M\*P)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3.  Note 3: K = 1 when TCSI-RS ≤ 40 ms and *highSpeedMeasFlag-r16* are configured; otherwise K = 1.5.  Note 4: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16.* | |

**Table 9.5.4.2-2: Measurement period TL1-RSRP\_Measurement\_Period\_CSI-RS for FR2**

|  |  |
| --- | --- |
| **Configuration** | **TL1-RSRP\_Measurement\_Period\_CSI-RS (ms)** |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P\*N)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3. | |

*<End of change6-11>*

*<Start of change15>*

## A.3.21 V2X sidelink communication

### A.3.21.1 Introduction

This clause also defines the principle and the reference configurations that are applicable to test cases verifying RRM core requirements for V2X sidelink communication.

### A.3.21.2 Reference resource pool configurations for V2X Sidelink Communication

Table A.3.21.2-1: V2X sidelink SL-BWP configuration for NR



|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| SL-BWP-ConfigCommon-r16 |  |  |
| sl-BWP-Generic-r16 |  |  |
| sl-LengthSymbols-r16 | sym14 | All 14 symbols in a slot without S-SSB are used for sidelink |
| sl-StartSymbol-r16 | sym0 | Symbol #0 is the starting symbol used for sidelink in a slot without S-SSB |
| sl-BWP-PoolConfigCommon-r16 |  |  |
| sl-RxPool-r16 |  | Indicates the resource pool for reception on the configured BWP.  1 entry |
| SL-ResourcePool-r16[1] | Set according to Table A.3.21.2-2 | Entry 1 |
| sl-TxPoolSelectedNormal-r16 |  | Indicates the resources pool for mode 2 sidelink communication on the configured BWP.  1 entry |
| SL-ResourcePoolConfig-r16[1] |  | Entry 1 |
| sl-ResourcePool-r16 | Set according to Table A.3.21.2-2 |  |
| sl-TxPoolExceptional-r16 | Not present |  |

Table A.3.21.2-2: V2X sidelink resource pool configuration for NR



|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| SL-ResourcePool-r16 |  |  |
| sl-PSCCH-Config-r16 | Set according to Table A.3.21.3-1 |  |
| sl-PSSCH-Config-r16 | Set according to Table A.3.21.3-2 |  |
| sl-PSFCH-Config-r16 | Not present |  |
| sl-SyncAllowed-r16 |  | Indicates the allowed synchronization reference(s) which is (are) allowed to use the configured resource pool. |
| gnss-Sync-r16 | true |  |
| gnbEnb-Sync-r16 | true |  |
| ue-Sync-r16 | true |  |
| sl-SubchannelSize-r16 | n10 | Subchannel bandwidth is 10 RB |
| sl-StartRB-Subchannel-r16 | 0 | The offset of lowest RB index of the subchannel with the lowest index in the resource pool with respect to the lowest RB index of a SL BWP |
| sl-NumSubchannel-r16 | 1 | Number of subchannels in resource pool |
| sl-UE-SelectedConfigRP-r16 |  |  |
| sl-Thres-RSRP-List-r16 | Set according to the specific test configuration | Indicates a list of 64 thresholds, and the threshold should be selected based on the priority in the decoded SCI and the priority in the SCI to be transmitted. A resource is excluded if it is indicated or reserved by a decoded SCI and PSSCH RSRP in the associated data resource is above a threshold. |
| sl-MultiReserveResource-r16 | Not present |  |
| sl-MaxNumPerReserve-r16 | n2 | At most 2 PSCCH/PSSCH resources can be reserved by a single SCI. |
| sl-SensingWindow-r16 | ms100 | Length of resource sensing window specified in TS 38.214 [26] subclause 8.1.4. which is 100ms. |
| sl-SelectionWindowList-r16 |  | Parameter that determines the end of the selection window for each priority level  8 entries |
| SL-SelectionWindowConfig-r16[k,k=1..8] |  | entry k |
| sl-Priority-r16 | k | for priority level = k |
| sl-SelectionWindow-r16 | n20 | Length of resource selection window specified in TS 38.214 [26] subclause 8.1.4. which is 20∙2μslots, where µ=0,1,2,3 refers to SCS 15,30,60,120 kHz respectively |
| sl-ResourceReservePeriodList-r16 | Not present |  |
| sl-RS-ForSensing-r16 | pssch | PSSCH-RSRP measurement is used in the sensing operation. |
| sl-RxParametersNcell | Not present |  |
| sl-ZoneConfigMCR-List-r16 | Not present |  |
| sl-PreemptionEnable-r16 | enabled |  |
| sl-MinMaxMCS-List-r16 |  | 1 entry |
| SL-MinMaxMCS-Config-r16[1] |  | Entry 1 |
| sl-MCS-Table-r16 | qam64 | TS 38.214 [26] Table 5.1.3.1-1 is the MCS table used in the resource pool. |
| sl-TimeResource-r16 | 1111111111  1111111111 | Every slot in a period of 20 slots during a SFN or DFN cycle can be used for sidelink |

Table A.3.21.2-3: V2X sidelink UE autonomous resource selection configuration for NR



|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| SL-UE-SelectedConfig-r16 |  |  |
| sl-PSSCH-TxConfigList-r16 |  | 1 entry |
| SL-PSSCH-TxConfig-r16[1] |  | Entry 1 |
| sl-TypeTxSync-r16 | Not present | When this filed is absent, the configuration is applicable for all synchronization reference types. |
| sl-ThresUE-Speed-r16 | kmph200 | UE shall apply the parameters in sl-ParametersAboveThres-r16 if UE absolute speed is higher than 200 km/h, otherwise UE shall apply the parameters in sl-ParametersBelowThres-r16 |
| sl-ParametersAboveThres-r16 |  |  |
| sl-MinMCS-PSSCH-r16 | 0 | The minimum MCS index value can be used for PSSCH transmission. |
| sl-MaxMCS-PSSCH-r16 | 15 | The maximum MCS index value can be used for PSSCH transmission. |
| sl-MinSubChannelNumPSSCH-r16 | 1 | The minimum number of subchannels can be used for PSSCH transmission. |
| sl-MaxSubchannelNumPSSCH-r16 | 1 | The maximum number of subchannels can be used for PSSCH transmission. |
| sl-MaxTxTransNumPSSCH-r16 | 1 | The maximum transmission number for PSSCH (including new transmission and retransmission). |
| sl-MaxTxPower-r16 | Not present | Not applicable |
| sl-ParametersBelowThres-r16 |  |  |
| sl-MinMCS-PSSCH-r16 | 4 | Same as above |
| sl-MaxMCS-PSSCH-r16 | 25 | Same as above |
| sl-MinSubChannelNumPSSCH-r16 | 1 | Same as above |
| sl-MaxSubchannelNumPSSCH-r16 | 1 | Same as above |
| sl-MaxTxTransNumPSSCH-r16 | 1 | Same as above |
| sl-MaxTxPower-r16 | Not present | Same as above |
| sl-ProbResourceKeep-r16 | v0dot8 | The probability of UE keeping current resource is 80% when the resource reselection counter reaches 0 (see TS 38.321 [7]). |
| sl-ReselectAfter-r16 | n1 | Resource reselection is triggered after 1 sidelink transmission is skipped (see TS 38.321 [7]). |

### A.3.21.3 Reference measurement channels for V2X Sidelink Communication

Table A.3.21.3-1: PSCCH Reference Measurement Channels

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Value |
| Reference channel | |  | CC.1A HD |
| Channel bandwidth | | MHz | Note2 |
| Number of PSCCH symbols per slot | |  | 2 |
| Number of PSCCH RB | |  | 10 |
| Modulation | |  | QPSK |
| Information Bit Payload (without CRC) | | Bits | 26 |
| Information Bit | Number of DMRS ports |  | 0 (1 port) |
| Priority |  | As set by higher layers |
| Resource reservation period |  | N/A |
| Modulation and coding scheme |  | Set as the PSSCH MCS specified in the test |
| DMRS pattern |  | 0 (2 DMRS) |
| 2nd stage SCI format |  | 00 (SCI format 2-A) |
| Beta offset indicator |  | Set as specified in the test |
| Frequency resource assignment |  | Set as per PSSCH RB allocation specific in the test |
| Time resource assignment |  | Set as per PSSCH slot allocation specific in the test |
| Reserved bits |  | Set all these bits to 0 |
| Transport block CRC | | Bits | 24 |
| Binary Channel Bits (see Note 1) | | Bits | 360 |
| Note 1: Binary channel bits calculated under assumption of 2 CP-OFDM symbols per subframe.  Note 2: Channel bandwidth depends on test configuration. | | | |

Table A.3.21.3-2: PSSCH Reference Measurement Channels

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | CD.1A HD |
| Sidelink transmission mode |  | 2 |
| Channel bandwidth | MHz | Note1 |
| Allocated PSSCH resource blocks |  | 10 |
| Number of PSSCH symbols per slot |  | 10 |
| Modulation |  | QPSK |
| Target Code Rate |  | 1/3 |
| Information Bit Payload (Transport block size) | Bits | 672 |
| Transport block CRC | Bits | 24 |
| Number of PSSCH HARQ retransmissions |  | 0 |
| Binary Channel Bits | Bits | 2160 |
| Note 1: Channel bandwidth depends on test configuration.  Note 2: 2nd state SCI and PSFCH are not allocated per slot. | | |

*<End of change15>*

*<Start of Change12-1>*

##### A.4.3.2.2.4 2-step RA type non-contention based random access test in FR1 for PSCell in EN-DC

A.4.3.2.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.3 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell in FR1. Supported test parameters are shown in Table A.4.3.2.2.4.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.4.3.2.2.4.1-2.

*<End of Change12-1>*

*<Start of change13-1>*

#### A.4.6.4.5 SSB based L1-RSRP measurement when DRX is used for UE configured with *highSpeedMeasFlag-r16*

##### A.4.6.4.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement when UE is configured with *highSpeedMeasFlag-r16*. This test will partly verify the L1-RSRP measurement requirements for UE configured with *highSpeedMeasFlag-r16* in clause 9.5.4.1, with the testing configurations for NR cells in Table A.4.6.4.5.1-1.

Table A.4.6.4.5.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

##### A.4.6.4.5.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.4.5.2-1 and Table A.4.6.4.5.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.4.6.4.5.2-1: General test parameters for UE configured with *highSpeedMeasFlag-r16*

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
|  | 2,5 |  | TDD |
|  | 3,6 |  | TDD |
| TDD Configuration | 1,4 |  | N/A |
|  | 2,5 |  | TDDConf.1.1 |
|  | 3,6 |  | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
|  | 2,5 |  | 10: NRB,c = 52 |
|  | 3,6 |  | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
|  | 2,5 |  | SR.1.1 TDD |
|  | 3,6 |  | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
|  | 2,5 |  | CR.1.1 TDD |
|  | 3,6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
|  | 2,5 |  | CCR.1.1 TDD |
|  | 3,6 |  | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
|  | 2,5 |  | SSB.3 FR1 |
|  | 3,6 |  | SSB.4 FR1 |
| OCNG Patterns | 1~6 |  | OP.1 |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| DRX configuration | 1~6 |  | DRX.3 |
| reportConfigType | 1~6 |  | periodic |
| reportQuantity | 1~6 |  | ssb-Index-RSRP |
| Number of reported RS | 1~6 |  | 2 |
| L1-RSRP reporting period | 1~6 | slot | 80 |
| T1 | 1~6 | s | 5 |
| T2 | 1~6 | s | 2 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |
| Propagation condition | 1,2,4,5 |  | AWGN 1944 Hz |
|  | 3,6 |  | AWGN 3334 Hz |
| 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. | | | |

Table A.4.6.4.5.2-2: SSB specific test parameters for UE configured with *highSpeedMeasFlag-r16*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Note2 | 1~6 | dBm/15kHz | -94.65 | | | |
| Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | |
| 3,6 | -91.65 | | | |
|  | 1~6 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.65 |
| 3,6 | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.93 |
| 3,6 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1~6 | dB | 0 | 0 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  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: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.4.6.4.5.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than [1920ms] plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

*<End of change13-1>*

*<Start of change13-2>*

A.6.1.2.5 Cell reselection to lower priority E-UTRAN cell for UE configured with highSpeedMeasFlag-r16

A.6.1.2.5.1 Test Purpose and Environment

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements for UE configured with *highSpeedMeasFlag-r16* specified in clause 4.2.2.5 when the E-UTRAN cell is of lower priority.

A.6.1.2.5.2 Test Parameters

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.6.1.2.5.2-1, A.6.1.2.5.2-2, A.6.1.2.5.2-3 and A.6.1.2.5.2-4. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1. The E-UTRAN cell 2 is indicated by NR cell 1 as an HST cell.

**Table A.6.1.2.5.2-1: Supported test configurations**

|  |  |  |
| --- | --- | --- |
| **Configuration** | **Description of serving cell** | **Description of target cell** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

**Table A.6.1.2.5.2-2: General test parameters for NR to E-UTRAN cell re-selection test case**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
| Initial condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on cell 1 in the initial phase. |
| T1 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to cell 2 during T1. |
| Neighbour cells |  | 1, 2, 3, 4, 5, 6 | Cell1 |
| T2 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to cell 1 during T2 for iteration of the tests. |
| Neighbour cells |  | 1, 2, 3, 4, 5, 6 | Cell2 |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 0.32 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | |  | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | |  | 1, 2, 3 | 53 | As specified in table 5.7.1-2 in TS 36.211 [23] |
| 4, 5, 6 | 4 |
| T1 | | s | 1, 2, 3, 4, 5, 6 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

*<End of change13-2>*

*<Start of Change12-2>*

##### A.6.3.2.2.3 2-step RA type contention based random access test in FR1 for NR standalone

A.6.3.2.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.3 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1. Supported test parameters are shown in Table A.6.3.2.2.3.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.6.3.2.2.3.1-2.

*<End of Change12-2>*

*<Start of Change12-3>*

##### A.6.3.2.2.4 2-step RA type non-contention based test in FR1 for NR standalone

A.6.3.2.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.3 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1. Supported test parameters are shown in Table A.6.3.2.2.4.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.6.3.2.2.4.1-2.

*<End of Change12-3>*

*<Start of change13-3>*

#### A.6.6.4.5 SSB based L1-RSRP measurement when DRX is used for UE configured with *highSpeedMeasFlag-r16*

##### A.6.6.4.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement when UE is configured with *highSpeedMeasFlag-r16*. This test will partly verify the L1-RSRP measurement requirements for UE configured with *highSpeedMeasFlag-r16* in clause 9.5.4.1, with the testing configurations for NR cells in Table A.6.6.4.5.1-1.

Table A.6.6.4.5.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

##### A.6.6.4.5.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.5.2-1 and Table A.6.6.4.5.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.6.6.4.5.2-1: General test parameters for UE configured with *highSpeedMeasFlag-r16*

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~3 |  | freq1 |
| Duplex mode | 1 |  | FDD |
|  | 2 |  | TDD |
|  | 3 |  | TDD |
| TDD Configuration | 1 |  | N/A |
|  | 2 |  | TDDConf.1.1 |
|  | 3 |  | TDDConf.2.1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 |
|  | 2 |  | 10: NRB,c = 52 |
|  | 3 |  | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD |
|  | 2 |  | SR.1.1 TDD |
|  | 3 |  | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD |
|  | 2 |  | CR.1.1 TDD |
|  | 3 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD |
|  | 2 |  | CCR.1.1 TDD |
|  | 3 |  | CCR.2.1 TDD |
| SSB configuration | 1 |  | SSB.3 FR1 |
|  | 2 |  | SSB.3 FR1 |
|  | 3 |  | SSB.4 FR1 |
| OCNG Patterns | 1~3 |  | OP.1 |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~3 |  | SMTC.1 |
| TRS Configuration | 1 |  | TRS.1.1 FDD |
|  | 2 |  | TRS.1.1 TDD |
|  | 3 |  | TRS.1.2 TDD |
| DRX configuration | 1~3 |  | DRX.3 |
| reportConfigType | 1~3 |  | periodic |
| reportQuantity | 1~3 |  | ssb-Index-RSRP |
| Number of reported RS | 1~3 |  | 2 |
| L1-RSRP reporting period | 1~3 | slot | 80 |
| T1 | 1~3 | s | 5 |
| T2 | 1~3 | s | 2 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |
| Propagation condition | 1~2 |  | AWGN 1944 Hz |
|  | 3 |  | AWGN 3334 Hz |
| 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. | | | |

*<End of change13-3>*

*<Start of change14>*

##### A.6.6.7.2.2 Test Requirements

The UE shall transmit a measurement report containing the cell global identifier of cell 2 within 200 milliseconds from the start of T3.

Test requirement = RRC Procedure delay with additional margin + Tidentify\_CGI,E-UTRAN + reporting delay

= 15 + 30 + 150 + 2ms from the start of T3

= 197 ms, allow 200 ms.

- The UE shall be scheduled continuously throughout the test, and from the start of T3 until 200 ms at least the number of ACK/NACK specified in NOTE 2 shall be detected as being transmitted by the UE.

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

NOTE 1: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

NOTE 2: The overall ACK/NACK number is caused by two parts. Firstly, at least X ACK/NACK shall be sent during identifying the cell global identifier of cell 2, where X is defined in Table 8.2.2.2.15-1. Secondly, given that continuous DL data allocation, additional 43, 14 and 34 ACK/NACK shall be sent for FDD 15 kHz, TDD 15 kHz and TDD 30 kHz, respectively, from the start of T3 until 200 ms excludes 150 ms for identifying the cell global identifier of cell 2.

*<End of change14>*

*<Start of Change12-4>*

##### A.7.3.2.2.3 2-step RA type contention based random access test in FR2 for NR Standalone

A.7.3.2.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.3 and Clause 7.1.2 in an AWGN model.

For this test one cell is used, with the configuration of Cell 1 configured as PCell or SCell in FR2. Supported test parameters are shown in Table A.7.3.2.2.3.1-1. UE capable of SA with PCell or SCell in FR2 needs to be tested by using the parameters in Table A.7.3.2.2.3.1-2 and Table A.7.3.2.2.3.1-3.

*<End of Change12-4>*

*<Start of Change12-5>*

##### A.7.3.2.2.4 2-step RA type non-contention based random access test in FR2 for NR Standalone

A.7.3.2.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.3 and Clause 7.1.2 in an AWGN model.

For this test one cell is used, with the configuration of Cell 1 configured as PCell or SCell in FR2. Supported test parameters are shown in Table A.7.3.2.2.4.1-1. UE capable of SA with PCell or SCell in FR2 needs to be tested by using the parameters in Table A.7.3.2.2.4.1-2 and Table A.7.3.2.2.4.1-3.

*<End of Change12-5>*

*<Start of change3>*

#### A.7.3.3.1 Intra-frequency conditional handover from FR2 to FR2

##### A.7.3.3.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 intra frequency conditional handover requirements specified in clause 6.1.4.4.

##### A.7.3.3.1.2 Test Parameters

Supported test configurations are shown in table A.7.3.3.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.3.2.2-2, and A.7.3.3.2.2-3.

The test scenario comprises of two cells. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. NR shall configure a condition implying handover to cell 2 during T1, at a time earlier than TRRC before the beginning of T2. Starting T2, cell 2 becomes detectable.

Table A.7.3.3.1.2-1: Intra-frequency conditional handover from FR2 to FR2 test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.3.3.1.2-2: General test parameters for conditional Intra-frequency handover from FR2 to FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset for condition | | dBm | -1 | Trigger HO to cell which may be measured as -1dB relative to cell 1. Actual SS-RSRP is 5dB stronger. |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤2 |  |

Table A.7.3.3.1.2-3: Cell specific test parameters for NR FR2-FR2 conditional Intra frequency handover test case

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | | | Cell 2 | | |
|  | | |  | T1 | | T2 | | T1 | | T2 |
| NR RF Channel Number | | |  | 1 | | | | 1 | | |
| AoA setup | | |  | Setup 1 as defined in A.3.15 | | | | | | |
| Assumption for UE beamsNote 6 | | |  | Rough | | | | | | |
| Duplex mode | | |  | TDD | | | | | | |
| TDD configuration | | |  | TDDConf.3.1 | | | | | | |
| BWchannel | | | MHz | 100: NRB,c = 66 | | | | | | |
| BWP BW | | | MHz | 100: NRB,c = 66 | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | |  | SR3.1 TDD | | | | | | |
| CORESET Reference Channel | | |  | CR3.1 TDD | | | | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | | | |
| SMTC Configuration | | |  | SMTC pattern 1 | | | | | | |
| SSB Configuration | | |  | SSB.1 FR2 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PRACH configuration | | |  | FR2 PRACH configuration 1 | | | | | | |
| TRS configuration | | |  | TRS.2.1 TDD | | | | | | |
| TCI configuration | | |  | CSI-RS.Config.0 | | | | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | |  | | | |
| Note2 | | | dBm/15kHz | -104.7 | | | -104.7 | | | |
| Note2 | Config 1 | | dBm/SCS | -95.7 | | | -95.7 | | | |
| Note 8 | | | dB | 5.03 | -5.41 | | -Infinity | | 3.81 | |
|  | | | dB | 6 | 6 | | -Infinity | | 11 | |
| IoNote3 | Config 1 | | dBm/  BW | -59.7 | -54.2 | | -59.7 | | -54.2 | |
| 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: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 7: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for infomation purposes. They are not settable parameters themseleves.  Note 8: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated REFSENS requirement in TS 38.101-2 [19] clause 7.3.2, and an allowance of 1dB for UE multi-band relaxation factor ΔMBS specified in TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | | | | |

##### A.7.3.3.1.2.3 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 =1600+62+10=1672 ms (power class 1) or 1080+62+10 =1152 (PC2/3/4) 62 ms=1152 ms (power classes 2,3 and 4) from the start of T2 and the interruption during T2 shall not exceeed Tinterrupt=Tprocessing + TIU + T∆ + Tmargin =40+20+2 = 62ms excluding any transmissions which do not occur due to scheduling restrictions.

*<End of change3>*

*<Start of change13-4>*

#### A.8.2.1.2 E-UTRA Cell reselection to lower priority NR target Cell in FR1 for UE configured with highSpeedInterRAT-NR-r16

##### A.8.2.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the E-UTRAN to NR inter-RAT cell reselection requirements specified in clause 4.2.2.5.6 in 36.133 [15].

The test scenario comprises of 1 E-UTRA cell and 1 NR cell as given in tables A.8.2.1.2.1-1, A.8.2.1.2.1-2, A.8.2.1.2.1-3 and A.8.2.1.2.1-4. In SIB of the E-UTRA cell, highSpeedInterRAT-NR-r16 is configured and the carrier of NR cell is configured with highSpeedCarrierNR-r16. The test consists of two time periods, with time duration of T1 and T2 respectively. Both E-UTRA cell 1 and NR cell 2 are already identified by the UE prior to the start of the test. NR cell 2 is of lower priority than E-UTRA cell 1.

Table A.8.2.1.2.1-1: Supported test configurations for UE configured with highSpeedInterRAT-NR-r16

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.8.2.1.2.1-2: General test parameters in E-UTRA cell re-selection FR1 NR cell test case for UE configured with highSpeedInterRAT-NR-r16

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on cell 1 in the initial phase |
| T1 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to cell 2 during T1 |
|  | Neighbour cells |  | 1, 2, 3, 4, 5, 6 | Cell1 |
| T2 end condition | Active cell |  | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to cell 1 during T2 for iteration of the tests. |
|  | Neighbour cells |  | 1, 2, 3, 4, 5, 6 | Cell2 |
| RF Channel Number | |  | 1, 2, 3, 4, 5, 6 | 1, 2 | E-UTRAN radio channel (1) and NR radio channel (2) are used for this test |
| Time offset between cells | |  | 1, 4 | 3 ms | Asynchronous cells |
|  | | 2, 5 | 3 μs | Synchronous cells |
|  | | 3, 6 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 0.32 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | |  | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| T1 | | s | 1, 2, 3, 4, 5, 6 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

*<End of change13-4>*

*<Start of change5>*

#### A.8.2.2.2 E-UTRA – NR Early Measruement Reporting for NR in FR2

##### A.8.2.2.2.1 Test Purpose and Environment

This test is to verify the requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in clause 4.9.2.4 in TS 36.133 [15]. This test is also to verify the accuracy requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in clause 9.11.1A and 9.11.2A in TS 36.133 [15]. Supported test configurations are shown in Table A.8.2.2.2.1-1.

Table A.8.2.2.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

The test scenario comprises of 1 E-UTRA cell (Cell 1) and 1 NR cell (Cell 2). The the test parameters and applicability for the E-UTRAN cell are defined in Table A.8.2.2.2.1-4. The general test parameters and the cell specific test parameters for the NR cell are speficied in Table A.8.2.2.2.1-2 and Table A.8.2.2.2.1-3, respectively.

The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Prior to the start of the time duration T1, the UE shall be connected to Cell 1. During T1, Cell 2 shall be powered off. At the end of T1, the RRC connection to Cell 1 is released and UE is configured Idle mode DC measurement on the carrier frequency of Cell 2. Time duration T2 starts when the RRC connection is released, and during the T2 UE is in Idle mode. Cell 2 shall be powered on from the beginning of T2. At beginning of T3 the UE is paged for connection setup and requested by the network to send idle mode measurements.

Table A.8.2.2.2.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test** | **Value** | **Comment** |
|  |  | **configuration** |  |  |
| Active cell |  | 1, 2 | E-UTRAN Cell 1 |  |
| Neighbour cell |  | 1, 2 | NR Cell 2 |  |
| RF Channel Number |  | 1, 2 | 1: Cell 1  2: Cell 2 |  |
| DRX cycle length | s | 1, 2 | 1.28 |  |
| Time offset between Cell 1 and Cell 2 |  | 1, 2 | 3 μs |  |
| T1 | s | 1, 2 | 0.5 |  |
| T2 | s | 1, 2 | 128 |  |
| T3 | s | 1, 2 | 2 |  |
| T331 | s | 1, 2 | 300 |  |

Table A.8.2.2.2.1-3: Cell specific test parameters for NR cell 2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 2** | | |
|  |  |  | **T1** | **T2** | **T3** |
| TDD configuration |  | 1, 4 | TDDConf.3.1 | | |
| PDSCH Reference measurement channel |  | 1, 4 | SR.3.1 TDD | | |
| RMSI CORESET Reference Channel |  | 1, 4 | CR.3.1 TDD | | |
| RMC CORESET Reference Channel |  | 1, 4 | CCR.3.1 TDD | | |
| OCNG Patterns |  | 1, 2 | OP.1 | | |
| SMTC configuration |  | 1, 2 | SMTC.1 | | |
| SSB configuration |  | 1, 4 | SSB.1 FR2 | | |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | | |
|  | dB | 1, 4 | -infinity | 4 | 4 |
| Note2 | dBm/SCS | 1, 4 | -98 | | |
|  | dB | 1, 4 | -infinity | -4 | -4 |
| SS-RSRP Note3 | dBm/SCS | 1, 4 | -infinity | -102 | -102 |
| SS-RSRQ Note3 | dB | 1, 4 | -infinity | -16.25 | -16.25 |
| Io | dBm/95.04MHz | 1, 4 | -69.01 | -67.56 | -67.56 |
| Propagation Condition |  | 1, 2 | 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: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

Table A.8.2.2.2.1-4: Cell specific test parameters for E-UTRA cell 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | | |
|  |  | **T1** | **T2** | **T3** |
| E-UTRA RF Channel number |  | 1 | | |
| BWchannel | MHz | 10 | | |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2 |  | OP.2 TDD for test configuration 1, 2, 3;  OP.2 FDD for test configuration 4, 5, 6 | | |
| 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 |  | | |
| Qrxlevmin | dBm | -140 | | |
| Note 2 | dBm/15 kHz | -98 | | |
| RSRP Note 3 | dBm/15 KHz | -84 | -84 | -84 |
| RSRQ Note 3 | dB | -10.96 | -10.96 | -10.96 |
|  | dB | 14 | 14 | 14 |
|  | dB | 14 | 14 | 14 |
| TreselectionEUTRAN | S | 0 | | |
| SnonintrasearchP | dB | N/A | | |
| Threshx, highP | dB | 48 | | |
| Threshserving, lowP | dB | 44 | | |
| Threshx, lowP | dB | 50 | | |
| beamMeasConfigIdle |  | False | | |
| 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.8.2.2.2.2 Test Requirements

At the beginning of the time-period T2 the connection is released, and UE enters idle mode. During the time period T2 the UE is in Idle mode and Cell 2 is active. The UE shall not perform reselection. The UE shall perform Idle Mode DC measurement according to clause 4.9.2.4 in TS 36.133 [15]. UE shall be able to detect, acqure the SSB index and measure the SS-RSRP and SS-RSRQ from Cell 2 for Idle mode DC measurement during T2.

NOTE: The Idle mode DC measurement period for the test setup can be expressed as: Tdetect, NR.

Where:

Tdetect, NR See Table 4.2.2.5.6-1 in clause 4.2.2.5.6 in TS 36.133 [15]

This gives a total of 128 s, allow 128 s for the T2.

At the start of T3 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report. The UE shall send early measurement report to the PCell.

After receiving the requested early measurement report, the test equipment verifies the accuracy of measurement reported for serving Cell 1 and Cell 2 meets the requirements in Section 9.1.2B in TS 36.133 [15] and Section 9.1.3B, respectively and test ends.

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

*<End of change5>*

*<Start of change13-5>*

#### A.8.4.2.9 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection in DRX for UE configured with highSpeedInterRAT-NR-r16

##### A.8.4.2.9.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements when UE is configured with *highSpeedInterRAT-NR-r16*.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.9.1-1, A.8.4.2.9.1-2, A.8.4.2.9.1-3 and A.8.4.2.9.1-4.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.8.4.2.9.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR1 for UE configured with highSpeedInterRAT-NR-r16

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

Table A.8.4.2.9.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| E-UTRA RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1 | One E-UTRA carrier frequency is used. |
| NR RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1 | One FR1 NR carrier frequency is used. |
| Active cell |  | 1, 2, 3, 4, 5, 6 | E-UTRA cell 1 (PCell) | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | NR cell 2 | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id |  | 1, 2, 3, 4, 5, 6 | 0 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15]. |
| Measurement gap offset |  | 1, 2, 3, 4, 5, 6 | 39 | As specified in TS 36.331 [16]. |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | Note 1 | E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16] |
| b2-Threshold2NR | dBm | 1, 2, 3, 4, 5, 6 | Note 2 | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16] |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 |  |
| CP length |  | 1, 2, 3, 4, 5, 6 | Normal |  |
| TimeToTrigger | s | 1, 2, 3, 4, 5, 6 | 0 |  |
| Filter coefficient |  | 1, 2, 3, 4, 5, 6 | 0 | L3 filtering is not used |
| DRX |  | 1, 2, 3, 4, 5, 6 | DRX.5 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells |  | 1, 4 | 3ms | Asynchronous cells.  The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  |  | 2, 3, 5, 6 | 3μs | Synchronous cells. |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 |  |
| T2 | s | 1, 2, 3, 4, 5, 6 | 5 |  |
| Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.9.1-3  Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.9.1-4 | | | | |

*<End of change13-5>*

*<Start of change16>*

## A.9.1 V2X Tests in FR1

### A.9.1.1 Test for V2X UE Transmit Timing

#### A.9.1.1.1 Test for GNSS as Synchronization Reference Source

##### A.9.1.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the UE timing requirements as specified in clause 12.2.2, when the GNSS is used as timing reference. For this test, the UE is triggered by the test loop function to transmit for V2X sidelink communication.

Table A.9.1.1.1.1-1 defines test parameters for UE transmit timing accuracy tests for V2X. 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 test parameters for GNSS signals are defined in B.4.1.

Table A.9.1.1.1.1-1: V2X Sidelink Test Parameters for UE Transmit Timing Tests for GNSS as Timing Reference

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1 | HD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel) Note 1 | MHz | 20 (NRB,c = 50) or  40 (NRB,c = 100) |  |
| SCS | kHz | 30 |  |
| Active cell |  | None |  |
| Active SyncRef UE |  | None |  |
| V2X sidelink communication preconfiguration |  | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel |  | CC.1A HD | As specified in Table A.3.21.3-1 |
| PSSCH Reference Measurement Channel |  | CD.1A HD | As specified in Table A.3.21.3-2 |
| Propagation condition |  | AWGN |  |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | | | |

##### A.9.1.1.1.2 Test requirements

For parameters specified in Tables A.9.1.1.1-1, the timing accuracy for V2X sidelink transmission shall be within the limits defined in clause 12.2.2. The timing accuracy is verified by using PSSCH transmissions.

#### A.9.1.1.2 Test for SyncRef UE as Synchronization Reference Source

##### A.9.1.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the timing requirements for V2X sidelink transmissions specified in clause 12.2.5, 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.

Table A.9.1.1.2.1-1 defines test parameters for UE transmit timing accuracy tests for V2X sidelink Communication. There is one active SyncRef UE in this test without either serving cell and or GNSS signals. Before the test starts, the UE has been synchronized to the SyncRef UE. The transmit timing accuracy is verified by using the transmission timing of PSSCH transmissions.

Table A.9.1.1.2.1-1: General Test Parameters for V2X UE Transmit Timing Test for SyncRef UE as Timing Reference

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1 | HD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel) Note 3 | | MHz | 20 (NRB,c = 50) or  40 (NRB,c = 100) |  |
| SCS | | kHz | 30 |  |
| Active cell | |  | None |  |
| Active SyncRef UE | |  | SyncRef UE 1 | Transmitting S-SSB on RF channel number 1 |
| V2X sidelink communication preconfiguration | |  | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel | |  | CC.1A HD | As specified in Table A.3.21.3-1 |
| PSSCH Reference Measurement Channel | |  | CD.1A HD | As specified in Table A.3.21.3-2 |
| Note1,2 | | dBm/30kHz | -95 |  |
| SyncRef UE 1 | sl-SSB-TimeAllocation |  | sl-SSB-TimeAllocation1 |  |
| slssid |  | 30 |  |
| inCoverage |  | TRUE | In MIB-SL |
| networkControlledSyncTx |  | ON |  |
| V2X sidelink communication configuration |  | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
|  |  | 3 |  |
| PSBCH-RSRP Note1, Note 2 | dBm/30kHz | -92 |  |
| Propagation condition | |  | AWGN |  |
| Note 1: PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: S-PSS Es/Noc and S-SSS Es/Noc are set the same as PSBCH Es/Noc.  Note 3: The UE is only required to be tested in one of the supported test configurations. | | | | |

##### A.9.1.1.2.2 Test requirements

For parameters specified in Tables A.9.1.1.2.1-1, the timing accuracy for V2X sidelink transmission shall be within the limits defined in clause 12.2.5. The timing accuracy is verified by using PSSCH transmissions.

#### A.9.1.1.3 Test for FR1 NR Cell as Synchronization Reference Source

##### A.9.1.1.3.1 Test Purpose and Environment

The purpose of this test is to verify the timing requirements for V2X sidelink transmissions specified in clause 12.2.3, 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.

This test is applicable for V2X sidelink communication capable UEs that support NR Uu and sidelink operation.

Table A.9.1.1.3.1-1, A.9.1.1.3.1-2 and A.9.1.1.3.1-3 define test parameters for UE transmit timing accuracy tests for V2X sidelink Communication. There is one active cell (PCell) in this test. The transmit timing accuracy is verified by using the transmission timing of PSSCH transmissions.

Table A.9.1.1.3.1-1: Supported test configurations for FR1 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Table A.9.1.1.3.1-2: V2X Sidelink Test Parameters for V2X UE Transmit Timing Accuracy Test for gNB as Timing Reference

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1 | HD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel) Note 1 | MHz | 20 (NRB,c = 50) or  40 (NRB,c = 100) |  |
| SCS | kHz | 30 |  |
| Active cell |  | Cell 1 |  |
| Active SyncRef UE |  | None |  |
| V2X sidelink communication configuration |  | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel |  | CC.1A HD | As specified in Table A.3.21.3-1 |
| PSSCH Reference Measurement Channel |  | CD.1A HD | As specified in Table A.3.21.3-2 |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | | | |

Table A.9.1.1.3.1-3: Cell Test Parameters for V2X UE Transmit Timing Accuracy Test for gNB as Timing Reference

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 |
| RF Channel Number | |  | 2 |
| Duplex Mode | Config 1 |  | FDD |
| Config 2,3 |  | TDD |
| TDD configuration | Config 1 |  | Not Applicable |
| Config 2 |  | TDDConf.1.1 |
| Config 3 |  | TDDConf.2.1 |
| Channel Bandwidth (BWchannel) | Config 1,2 | MHz | 10: NRB,c = 52 |
| Config 3 | 40: NRB,c = 106 |
| Initial BWP Configuration | |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP Configuration | |  | DLBWP.1.1  ULBWP.1.1 |
| DRX Cycle | |  | N/A |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD |
| Config 2 |  | SR.1.1 TDD |
| Config 3 |  | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD |
| Config 2 |  | CR.1.1 TDD |
| Config 3 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.1.1 FDD |
| Config 2 |  | CCR.1.1 TDD |
| Config 3 |  | CCR.2.1 TDD |
| SSB configuration | Config 1,2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.2 FR1 |
| SMTC Configuration | |  | SMTC.2 |
| OCNG Patterns | |  | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | Config 1,2,3 | dBm/15 kHz | -98 |
| Note2 | Config 1,2 | dBm/SCS | -98 |
| Config 3 | -95 |
|  | | dB | 3 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -95 |
| Config 3 | -92 |
| Io Note 3 | Config 1,2 | dBm/9.36 MHz | -65.2 |
| Config 3 | dBm/38.1 MHz | -59.2 |
| 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: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

##### A.9.1.1.3.2 Test requirements

For parameters specified in Tables A.9.1.1.3.1-1 A.9.1.1.3.1-2 and A.9.1.1.3.1-3, the timing accuracy for V2X sidelink transmission shall be within the limits defined in clause 12.2.3. The timing accuracy is verified by using PSSCH transmissions.

### A.9.1.2 Test for Initiation/Cease of S-SSB Transmission with V2X Sidelink Communication

#### A.9.1.2.1 Test for FR1 NR Cell as synchronization reference source without gap under non-DRX

##### A.9.1.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the V2X UE meets the requirements related to the maximum evaluation time allowed to initiate and cease S-SSB transmissions defined in clause 12.3.1.1, when the reference timing used for sidelink transmissions is a NR serving cell in FR1 on a non-V2X sidelink carrier.

This test is applicable for V2X sidelink communication capable UEs that support NR Uu and sidelink operation.

Supported test configurations for FR1 NR cell are shown in Table A.9.1.2.1.1-1.

Table A.9.1.2.1.1-1: Supported Test Configurations for FR1 NR cell as synchronization reference source

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note 1: The UE is only required to pass in one of the supported test configurations in FR1.  Note 2: For NR SL, SL BW is one between 20MHz and 40MHz, and SL SCS is 30kHz. | |

The test parameters are given in Table A.9.1.2.1.1-2 and Table A.9.1.2.1.1-3 below. There is one active cell in this test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

During T1, the SS-RSRP of the PCell is above *syncTxThreshIC* and the UE is not expected to be transmitting S-SSB.

During T2, the SS-RSRP of the PCell is lowered below *syncTxThreshIC* and the UE is expected to initiate S-SSB transmissions.

During T3, the SS-RSRP of the PCell is increased back to be above *syncTxThreshIC* and the UE is expected to cease S-SSB transmissions.

Table A.9.1.2.1.1-2: Test Parameters for Initiation/Cease of S-SSB Transmission Test for FR1 NR cell as synchronization reference source

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| SCS | kHz | 30 |  |
| Active cell |  | Cell 1 | Serving cell on RF channel number 1 |
| Active SyncRef UE |  | None |  |
| Active V2X UE |  | V2X UE | Transmitting S-SSB on RF channel number 2 (HD carrier in Band n47 or n38) |
| V2X sidelink communication configuration |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test |
| networkControlledSyncTx |  | Not configured |  |
| syncTxThreshIC | dBm/SCS | -110 | In SIB12 |
| DRX |  | OFF |  |
| T1 | s | 3 |  |
| T2 | s | 5.24 |  |
| T3 | s | 5.24 |  |

Table A.9.1.2.1.1-3: FR1 NR Cell Specific Test Parameters for Initiation/Cease of S-SSB Transmission Test for FR1 NR cell as synchronization reference source

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell1 | | |
| T1 | T2 | T3 |
| NR RF Channel Number | |  | 1 | | |
| Duplex Mode | Config 1 |  | FDD | | |
| Config 2,3 |  | TDD | | |
| TDD configuration | Config 1 |  | Not applicable | | |
| Config 2 | TDDConf.1.1 | | |
| Config 3 | TDDConf.2.1 | | |
| Channel Bandwidth (BWchannel) | Config 1,2 | MHz | 10:NRB,c = 52 | | |
| Config 3 | 40:NRB,c = 106 | | |
| Initial BWP Configuration | |  | DLBWP.0.1  ULBWP.0.1 | | |
| Dedicated BWP Configuration | |  | DLBWP.1.1  ULBWP.1.1 | | |
| DRx Cycle | | ms | N/A | | |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD | | |
| Config 2 | SR.1.1 TDD | | |
| Config 3 | SR.2.1 TDD | | |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD | | |
| Config 2 | CR.1.1 TDD | | |
| Config 3 | CR.2.1 TDD | | |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.1.1 FDD | | |
| Config 2 | CCR.1.1 TDD | | |
| Config 3 | CCR.2.1 TDD | | |
| SSB configuration | Config 1,2 |  | SSB.1 FR1 | | |
| Config 3 | SSB.2 FR1 | | |
| SMTC Configuration | Config 1 |  | SMTC.2 | | |
| Config 2,3 | SMTC.1 | | |
| TRS configuration | Config 1 |  | TRS.1.1 FDD | | |
| Config 2 | TRS.1.1 TDD | | |
| Config 3 | TRS.1.2 TDD | | |
| OCNG Patterns | |  | OP.1 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | Config 1,2,3 | dBm/15 kHz | -110 | | |
| Config 1,2 | dBm /SCS | -110 | | |
| Config 3 | -107 | | |
|  | | dB | 4.5 | -4.5 | 4.5 |
|  | | dB | 4.5 | -4.5 | 4.5 |
| SS-RSRPNote3 | Config 1,2 | dBm /SCS | -105.5 | -114.5 | -105.5 |
| Config 3 | -102.5 | -111.5 | -102.5 |
| IoNote3 | Config 1,2 | dBm /9.36MHz | -76.2 | -80.7 | -76.2 |
| Config 3 | dBm/ 38.16MHz | -70.1 | -74.6 | -70.1 |
| 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: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | |

##### A.9.1.2.1.2 Test Requirements

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

The S-SSB transmission initiation delay shall be less than 0.56 s.

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

The S-SSB transmission cease delay shall be less than 0.56 s.

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

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

Where:

Tevaluate,SLSS = 0.4 sec (as specified in clause 12.3.1.1);

S-SSB period = 160ms.

#### A.9.1.2.2 Test for SyncRef UE as synchronization reference source

##### A.9.1.2.2.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to the evaluation time allowed to initiate and cease S-SSB transmissions defined in clause 12.3.1.4, when the reference timing used for sidelink transmissions is a SyncRef UE.

The test parameters are given in Table A.9.1.2.2.1-1 and Table A.9.1.2.2.1-2 below. There are neither active cells nor GNSS signals 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 S-SSB every synchronization period.

Prior to start of test, test system is required to ensure that the V2X UE is synchronized to the SyncRef UE 1 and is transmitting S-SSB as derived from the S-SSB of SyncRef UE 1 as per clause 5.8.5.3 of TS 38.331[2]. For the test configuration, the SLSSID used by the V2X UE shall be 30 with *inCoverage* IE in MIB-SL set as FALSE. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

During T1, the PSBCH-RSRP of SyncRef UE 1 is above *syncTxThreshOOC* and the UE is not expected to be transmitting S-SSB.

During T2, the PSBCH-RSRP of SyncRef UE 1 is lowered below *syncTxThreshOOC* and the UE is expected to initiate S-SSB transmissions.

During T3, the PSBCH-RSRP of SyncRef UE 1 is increased back to be above *syncTxThreshOOC* and the UE is expected to cease S-SSB transmissions.

Table A.9.1.2.2.1-1: Test Parameters for Initiation/Cease of S-SSB Transmission Test for SyncRef UE as synchronization reference source

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| SCS | kHz | 30 |  |
| Active cell |  | None |  |
| Active SyncRef UE |  | SyncRef UE 1 | Transmitting S-SSB on RF channel number 1(HD carrier in Band n47 or n38) |
| Active V2X UE |  | V2X UE | Transmitting S-SSB on RF channel number 1(HD carrier in Band n47 or n38) |
| V2X sidelink communication preconfiguration |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test |
| networkControlledSyncTx |  | Not configured |  |
| syncTxThreshOoC | dBm/30kHz | -97 |  |
| T1 | s | 3 |  |
| T2 | s | 5.24 |  |
| T3 | s | 5.24 |  |

Table A.9.1.2.2.1-2: SyncRef UE Specific Test Parameters for Initiation/Cease of S-SSB Transmission Test for SyncRef UE as synchronization reference source

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | SyncRef UE 1 | | |
| T1 | T2 | T3 |
| NR RF Channel Number |  | 1 | | |
| V2X SL communication resource pool configuration |  | As specified in Table A.3.21.2-2 | | |
| Channel Bandwidth (BWchannel) Note3 | MHz | 20(NRB,c = 50) or 40(NRB,c = 100) | | |
| SLSSID |  | 30 | | |
| inCoverage |  | TRUE | | |
| networkControlledSyncTx |  | ON | | |
| Note1 | dBm/30 kHz | -98 | | |
|  | dB | 5.5 | -3.5 | 5.5 |
| PSBCH | dB | 5.5 | -3.5 | 5.5 |
| PSBCH-RSRPNote2 | dBm/30 kHz | -92.5 | -101.5 | -92.5 |
| IoNote2 | dBm /3.96MHz | -70.2 | -75.2 | -70.2 |
| 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: PSBCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Io level is based on the allocated RBs for S-PSS/S-SSS/PSBCH symbols.  Note 3: The UE is only required to be tested in one of the supported test configurations.  Note 4: S-PSS Es/Noc and S-SSS Es/Noc are set the same as PSBCH Es/Noc. | | | | |

##### A.9.1.2.2.2 Test Requirements

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

The S-SSB transmission initiation delay shall be less than 0.8 s.

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

The S-SSB transmission cease delay shall be less than 0.8 s.

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

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

Where:

- Tevaluate,SLSS = 0.64 sec (as specified in clause 12.3.1.4);

- S-SSB period = 160ms.

### A.9.1.3 Test for V2X Synchronization Reference Selection/Reselection

#### A.9.1.3.1 Test for GNSS configured as the highest priority

##### A.9.1.3.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to SyncRef UE selection / reselection defined in clause 12.4, 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.

The test parameters are given in Table A.9.1.3.1.1-1and A.9.1.3.1.1-2 below. There are no GNSS signals in this test. There are three active SyncRef UEs (SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3) in this test. The test system shall emulate SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 to transmit S-SSB every S-SSB period.

The test system can verify the selection / reselection of SyncRef UE by monitoring the SLSS ID used by the V2X UE for its S-SSB transmissions. When the V2X UE is not synchronized to any SyncRef UE, then the V2X UE shall use the SLSS ID belonging to set id\_oon. When the V2X UE is synchronized to a SyncRef UE, the V2X UE shall derive its SLSS ID from the SLSS ID of the SyncRef UE as per clause 5.8.5.3 of TS 38.331[2].

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 are all powered off before starting the test. During T1, SyncRef UE 1 is powered ON and the V2X UE will select SyncRef UE 1 as synchronization source. During T2, SyncRef UE 2 is powered ON and the V2X UE will select SyncRef UE 2 as the synchronization source. During T3, SyncRef UE 3 is powered ON and the V2X UE will reselect to SyncRef UE 3 as the synchronization source.

Table A.9.1.3.1.1-1: Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| SCS | | kHz | 30 |  |
| Initial condition | Active synchronization source |  | Sync Ref UE 1 | DUT transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 30 and in-coverage set as FALSE in MIB-SL. |
| T2 end condition | Active synchronization source |  | Sync Ref UE 2 | DUT transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 336 and in-coverage set as FALSE in MIB-SL. |
| Final condition | Active synchronization source |  | Sync Ref UE 3 | UE transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 0 and in-coverage set as FALSE in MIB-SL. |
| Active SyncRef UEs | |  | SyncRef UE 1  SyncRef UE 2  SyncRef UE 3 | Transmitting S-SSB on RF channel number 1 (HD carrier in Band n47 or n38) |
| Timing offset among SyncRef UEs | | μs | CP/2 | Synchronous |
| Frequency offset of SyncRef UE 1,2,3 | | ppm | 0 |  |
| V2X sidelink Communication configuration | |  | As specified in Table A. 3.21.2-2 | IE values unless specified otherwise in this test. |
| sl-SyncPriority | |  | gnss |  |
| syncTxThreshOoC | |  | +infinity |  |
| T1 | | s | 24 |  |
| T2 | | s | 16 |  |
| T3 | | s | 3.2 |  |

Table A.9.1.3.1.1-2: 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 | | | SyncRef UE 3 | | |
| T1 | T2 | T3 | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number |  | 1(HD carrier in Band n47 or n38) | | | | | | | | |
| Channel Bandwidth (BWchannel)Note 4 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) | | | | | | | | |
| V2X Sidelink Communication resource pool configuration |  | As specified in Table A.3.21.2-2 | | | | | | | | |
| networkControlledSyncTx |  | ON | | | N/A | | | ON | | |
| syncTxThreshOoC | dBm/15 kHz | N/A | | | +infinity | | | N/A | | |
| SLSSID |  | 30 | | | 0 | | | 0 | | |
| inCoverage (in MIB-SL) |  | TRUE | | | FALSE | | | TRUE | | |
| Note1 | dBm/30 kHz | -95 | | | | | | | | |
|  | dB | 0 | 0 | 0 | -infinity | 0 | 0 | -infinity | -infinity | 3 |
|  | dB | 0 | 0 | -4.76 | -infinity | 0 | 0 | -infinity | -infinity | 0 |
| PSBCH-RSRPNote2, Note 3 | dBm/30 kHz | -95 | -95 | -95 | -infinity | -95 | -95 | -infinity | -infinity | -92 |
| 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: PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: S-PSS Es/Iot and S-SSS Es/Iot are set the same as PSBCH Es/Iot.  Note 4: The UE is only required to be tested in one of the supported test configurations. | | | | | | | | | | |

##### A.9.1.3.1.2 Test Requirements

During T1, SyncRef UE selection delay is defined as the time from the beginning of T1 to the time UE is synchronized to SyncRef UE 1, and changes its S-SSB 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 30 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T1.

The SyncRef UE selection delay shall be less than 8.8sec. The SyncRef UE selection delay can be expressed as:

SyncRef UE selection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + S-SSB period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64 sec (as specified in sub-clause 12.3)

- S-SSB period = 160ms

This gives a total of 8.8 seconds.

2) During T2, SyncRef UE reselection delay is defined as the time from the beginning of T2 to the time UE changes its synchronization source from SyncRef UE 1 to SyncRef UE 2 and changes its S-SSB 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 336 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE reselection delay from start of T2.

The SyncRef UE reselection delay shall be less than 8.8sec. The SyncRef UE reselection delay can be expressed as:

SyncRef UE reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + S-SSB period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64 (as specified in sub-clause 12.3)

- S-SSB period = 160ms

This gives a total of 8.8 seconds.

3) 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 2 to SyncRef UE 3, and changes its S-SSB transmissions timing and SLSS ID to follow SyncRef UE 3 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 reselection delay from start of T3.

The SyncRef UE reselection delay shall be less than 2.4sec. The SyncRef UE reselection delay can be expressed as:

SyncRef UE reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + S-SSB period

Where

- Tdetect,SyncRef UE = 1.6sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64 (as specified in sub-clause 12.3)

- S-SSB period = 160 ms

This gives a total of 2.4 seconds.

The test system will verify that the V2X UE does not drop or delay more than 6% of its V2X data and S-SSB transmissions during the duration of T2, and does not drop or delay more than 30% of its S-SSB transmissions during the duration of T3.

The rate of correct SyncRef UE selection / reselection observed during repeated tests shall be at least 90%.

#### A.9.1.3.2 Test for FR1 NR Cell configured as the highest priority

##### A.9.1.3.2.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to SyncRef UE selection / reselection defined in clause 12.4, when gNB 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.

This test is applicable for V2X sidelink communication capable UEs that support gNB as synchronization source and sidelink operation.

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Table A.9.1.3.2.1-1: Void



The test parameters are given in Table A.9.1.3.2.1-2 and A.9.1.3.2.1-3 below. There are no active cells and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. The test parameters for GNSS signals are defined in B.4.1. 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 S-SSB every S-SSB period.

The test system can verify the selection / reselection of SyncRef UE by monitoring the SLSS ID used by the V2X UE for its S-SSB transmissions. When the V2X UE is synchronized to a SyncRef UE, the V2X UE shall derive its SLSS ID from the SLSS ID of the SyncRef UE as per clause 5.8.5.3 of TS 38.331[2].

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. During T1, both SyncRef UE 1 and SyncRef UE 2 are powered off and the V2X UE will select GNSS as synchronization source. During T2, SyncRef UE 1 is powered ON and the V2X UE will select SyncRef UE 1 as the synchronization source. During T3, a higher priority SyncRef UE 2 is additionally powered ON and the V2X UE will reselect to the higher priority SyncRef UE 2 as the synchronization source.

Table A.9.1.3.2.1-2: Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for FR1 NR Cell configured as the highest priority

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| SCS | | kHz | 30 |  |
| Initial condition | Active synchronization source |  | GNSS | DUT transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 0 and in-coverage set as TRUE in MIB-SL. |
| T2 end condition | Active synchronization source |  | Sync Ref UE 1 | DUT transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 336+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 S-SSB 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 S-SSB on RF channel number 1 |
| Timing offset between SyncRef UE 1 and SyncRef UE 2 | | ms | 3 | Asynchronous |
| Frequency offset of SyncRef UE 1,2 | | ppm | 0 |  |
| V2X sidelink Communication preconfiguration | |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test. |
| syncPriority | |  | *gnb* |  |
| syncTxThreshOoC | |  | 13 (+infinity) |  |
| T1 | | s | 24 |  |
| T2 | | s | 16 |  |
| T3 | | s | 16 |  |

Table A.9.1.3.2.1-3: SyncRef UE Specific Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for FR1 NR Cell configured as the highest priority

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | SyncRef UE 1 | | | SyncRef UE 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number |  | 1(HD carrier in Band n47 or n38) | | | | | |
| Channel Bandwidth (BWchannel) Note 4 | MHz | 20(NRB,c = 50) or 40(NRB,c = 100) | | | | | |
| V2X Sidelink Communication resource pool configuration |  | As specified in Table A.3.21.2-2 | | | As specified in Table A.3.21.2-2 | | |
| networkControlledSyncTx |  | N/A | | | ON | | |
| syncTxThreshOoC | dBm/15 kHz | +infinity | | | N/A | | |
| SLSSID |  | 59 | | | 30 | | |
| inCoverage (in MIB-SL) |  | FALSE | | | TRUE | | |
| Note1 | dBm/30 kHz | -95 | | | | | |
|  | dB | -infinity | 0 | 0 | -infinity | -infinity | 3 |
|  | dB | -infinity | 0 | -4.76 | -infinity | -infinity | 0 |
| PSBCH-RSRP Note2, Note 3 | dBm/30 kHz | -infinity | -95 | -95 | -infinity | -infinity | -92 |
| 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: PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: S-PSS Es/Iot and S-SSS Es/Iot are set the same as PSBCH Es/Iot.  Note 4: The UE is only required to be tested in one of the supported test configurations. | | | | | | | |

##### A.9.1.3.2.2 Test Requirements

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 S-SSB 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 336+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 + S-SSB period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64sec (as specified in sub-clause 12.3)

- S-SSB 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 S-SSB 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 + S-SSB period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64 sec (as specified in sub-clause 12.3)

- S-SSB 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 S-SSB 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%.

### A.9.1.4 Test for L1 SL-RSRP Measurement

#### A.9.1.4.1 Test for V2X UE Autonomous Resource Selection/Reselection

##### A.9.1.4.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to autonomous resource selection / reselection for V2X UE in mode 2 defined in clause 12.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.9.1.4.1.1-1and A. 9.1.4.1.1-2 below. There are 50 active V2X sidelink UEs (UE0~UE49) 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 parameters for GNSS signals are defined in B.4.1. The test system shall emulate the active V2X sidelink UEs to transmit PSCCH/PSSCH every 5ms. At the beginning of whole test, the test equipment shall send one AT command to trigger the UE under test continuously transmits PSCCH/PSSCH.

The test consists of two duration T1 and T2. During T1, the signal from Test Equipement are configured such that

- the measured PSSCH-RSRP for 10 active V2X sidelink UEs(UE20~UE29) is above the measurement threshold, and the resources occupied by the 10 active V2X sidelink UEs are expected to be excluded in the resource selection procedure and,

- the measured PSSCH-RSRP for other 40 active V2X sidelink UEs(UE0~UE19, UE30~UE49) is below the measurement threshold, and the resources occupied by the 40 active V2X sidelink UEs are expected to be included in the resource selection procedure.

During T2, the signal from Test Equipement are configured such that

- the measured PSSCH-RSRP for the 10 active V2X sidelink UEs(UE20~UE29) is below the measurement threshold, and the resources occupied by the 10 active V2X sidelink UEs are expected to be included in the resource selection procedure and,

- the measured PSSCH-RSRP for other 40 active V2X sidelink UEs(UE0~UE19, UE30~UE49) is above the measurement threshold, and the resources occupied by the 40 active V2X sidelink UEs are expected to be excluded in the resource selection procedure.

Table A.9.1.4.1.1-1: Test Parameters for V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR RF Channel Number | |  | 1 | HD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel) Note 2 | | MHz | 20 (NRB,c = 50) or  40 (NRB,c = 100) |  |
| SCS | | kHz | 30 |  |
| V2X sidelink communication pre-configuration | |  | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool | |  | 1111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool | |  | 5 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize-r16 included in SL-ResourcePool | |  | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| Number of Active Sidelink UEs | |  | 50 | Active Sidelink UE i = 0, .., 49 |
| *SL-Thres-RSRP* | |  | 12 | Corresponding -106 dBm as defined in Section 6.3.5 in TS38.331[2]  Same for all priority level pairs. |
| Active Sidelink UEs (UE i = 0, .., 49) | V2X sidelink Communication preconfiguration |  | As specified in Table A.3.21.2-1  And A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | {1i}Note1 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool |  | floor(i/10)x10 | Indicates the lowest RB index of the subchannel with the lowest index.  UE 0~9 start RB=0;  UE 10~19 start RB=10;  UE 20~29 start RB=20;  UE 30~39 start RB=30;  UE 40~49 start RB=40; |
| sl-SubchannelSize-r16 included in SL-ResourcePool |  | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| Timing offset among Active Sidelink UEs | | μs | CP/2 | Synchronous |
| Note 1: {1i}is a sequence of nine 0’s with one 1 in (mod(i,10 )+1’th position.  Note 2: The UE is only required to be tested in one of the supported test configurations. | | | | |

Table A.9.1.4.1.1-2: 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, .., 49) | |
| T1 | T2 |
| NR RF Channel Number | - | 1 | |
| Channel Bandwidth (BWchannel)Note 5 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) | |
| PSCCH RMC (defined in A.3.21.3) | - | CC.1A HD | |
| PSSCH RMC (defined in A.3.21.3) | - | CD.1A HD | |
| Note1 | dBm/30 kHz | -111 | -121 |
| Note3 | dB | 10 | |
| Note2,3 | dB | 10 | |
| Note4 | dB | 0 | 20 |
| Note2,4 | dB | 0 | 20 |
| PSSCH-RSRP1 Note 2,3 | dBm/SCS | -101 | -111 |
| PSSCH -RSRP2 Note 2,4 | dBm/SCS | -111 | -101 |
| SL-RSSI1 Note 2,3 | dBm/3.6 MHz | -79.79 | -89.79 |
| SL-RSSI2 Note 2,4 | dBm/3.6 MHz | -87.20 | -80.17 |
| 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, PSSCH-RSRP and SL-RSSI levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: For UE 20 to 29, occupying subchannel #2  Note 4: For UE 0 to 19 and 30 to 49, occupying subchannel #0/1/3/4  Note 5: The UE is only required to be tested in one of the supported test configurations. | | | |

##### A.9.1.4.1.2 Test Requirements

The test time T1 and T2 should be long enough. The rate of PSSCH transmissions on the resources on subchannel #2 shall be less than 10% during T1. The rate of PSSCH transmission s on the resources on subchannel #2 shall be more than 90% during T2.

#### A.9.1.4.2 Test for V2X UE Resource Pre-emption

##### A.9.1.4.2.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to autonomous resource pre-emption for V2X UE in mode 2 defined in clause 12.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A. 9.1.4.2.1-1and A.12. 9.1.4.1-2 below. There is one active V2X sidelink UE in this test. Both the UE under test and the active V2X sidelink UE 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 parameters for GNSS signals are defined in B.4.1. At the beginning of whole test, the test equipment shall send one message with a SL-SCH MAC PDU as specified in Clause 6.1.6 in TS 38.321[7], in order to make sure that the UE under test needs continuously transmit PSCCH/PSSCH.

The test consists of two duration T1 and T2. During T1, the signal from Test Equipement are configured such that the active V2X sidelink UE is not transmitting. The UE under test shall transmit SL data and reserve future resources. The resource reservation is decoded by the active V2X sidelink UE. The point in time at which resource reservation from the UE under test is decoded by the active V2X sidelink UE defines the start of time period T2. During T2, the active V2X sidelink UE reserves the same resource as the UE under test with high priority data no later than slot n- Tpre-empt.

Table A. 9.1.4.2.1-1: Test Parameters for V2X UE Resource Pre-emption Tests for PSSCH-RSRP measurements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR RF Channel Number | |  | 1 | HD carrier in Band n47 and n38 |
| Channel Bandwidth (BWchannel) Note 1 | | MHz | 20 (NRB,c = 50) or  40 (NRB,c = 100) |  |
| SCS | | kHz | 30 |  |
| V2X sidelink communication pre-configuration | |  | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool in SL-ResourcePool in sl-TxPoolSelectedNormal-r16 | |  | 10000000000000000000 | Indicates the time resource of resource pool within *sl-Period*. (see TS 38.213 [3]) Note that this is for Tx pool. |
| sl-TimeResource-r16 included in SL-ResourcePool in sl-RxPool-r16 | |  | 11111111111111111111 | Indicates the time resource of resource pool within *sl-Period*. (see TS 38.213 [3]) Note that this is for Rx pool. |
| sl-NumSubchannel-r16 included in SL-ResourcePool | |  | 1 | Indicates the number of subchannels in the corresponding resource pool, which consists of contiguous PRBs only |
| sl-SubchannelSize-r16 included in SL-ResourcePool | |  | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool | |  | 10 | Indicates the lowest RB index of the subchannel with the lowest index. |
| Number of Active Sidelink UEs | |  | 1 |  |
| *SL-Thres-RSRP* | |  | 12 | Corresponding -106 dBm as defined in Section 6.3.8 in TS38.331[2] |
| Active Sidelink UEs | V2X sidelink Communication preconfiguration |  | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | 11111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool |  | 10 | Indicates the lowest RB index of the subchannel with the lowest index. |
| Sl-SubchannelSize-r16 included in SL-ResourcePool |  | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| Timing offset among Active Sidelink Ues | | μs | CP/2 | Synchronous |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | | | | |

Table A.9.1.4.2.1-2: Active Sidelink UE Specific Test Parameters for V2X UE Resource Pre-emption Tests for PSSCH-RSRP measurements

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Active Sidelink UE | |
| T1 | T2 |
| NR RF Channel Number | - | 1 | |
| Channel Bandwidth (BWchannel) Note 3 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) | |
| PSCCH RMC (defined in A.3.21.3) | - | CC.1A HD | |
| PSSCH RMC (defined in A.3.21.3) | - | CD.1A HD | |
| Note1 | dBm/30 kHz | N/A | -100 |
| PSCCH | dB | 5 |
| PSSCH | dB | 5 |
| PSCCH  Note2 | dB | 5 |
| PSSCH  Note2 | dB | 5 |
| PSSCH-RSRP Note 2 | dBm/30kHz | -95 |
| 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, PSSCH-RSRP have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: The UE is only required to be tested in one of the supported test configurations. | | | |

##### A.9.1.4.2.2 Test Requirements

The test time T1 and T2 should be long enough. The UE under test is required to trigger resource reselection and not to transmit on the reserved resource at slot n when the high priority reservation is transmitted by the active V2X sidelink UE before n-Tpre-empt, where

Tpre-empt = T3+Tproc,0

T3 = 5 slots and Tproc,0= 1 slot for FR1.

The rate of PSSCH transmissions on the resources at slot n shall be less than 10% during repeated tests.

#### A.9.1.4.3 Test for V2X UE Resource Re-evaluation

##### A.9.1.4.3.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to autonomous resource re-evaluation for V2X UE in mode 2 defined in clause 12.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.9.1.4.3.1-1, A.9.1.4.3.1-2 and A.9.1.4.3.1-3 below. There are 130 active V2X sidelink UEs in this test. The first 100 active V2X sidelink UEs are scheduled with 50ms periodicity. The last 30 active V2X sidelink Ues are aperiodic service UE with retransmission reservation period equaling 15ms.

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 parameters for GNSS signals are defined in B.4.1.

The test consists of three duration T0, T1, T2.

During T0, the signal from Test Equipement are configured. The resource occupied by the active V2X sidelink UEs is expected to be excluded in the resource selection procedure such that the measured PSSCH-RSRP is above the measurement threshold. The test equipment shall just configure the resource pool for the test UE without the MAC PDU for transmission channel configuration.

During T1, the signal from Test Equipement are configured. Some of the resource occupied by the active V2X sidelink Ues is expected to be excluded in the resource selection procedure such that the measured PSSCH-RSRP is above the measurement threshold and some of the resource occupied by the active V2X sidelink Ues is expected to be included in the resource selection procedure such that the measured PSSCH-RSRP is below the measurement threshold. The test system shall emulate the active V2X sidelink Ues to transmit PSCCH/PSSCH every 50ms according to the RSRP level specified in the Table A. 9.1.4.3.1-2, but UE #0~29 will be silent during T2

At the end of T1, where slot index mod 100 = 99, the test equipment shall send one message with a SL-SCH MAC PDU as specified in Clause 6.1.6 in TS 38.321[7], in order to make sure that the UE under test shall be scheduled to periodically transmit PSCCH/PSSCH.

During T2, the additional aperiodic active V2X sidelink UEs from Test Equipement are configured in the beginning 30 slots, and the resource occupied by these active V2X sidelink UEs is expected to be excluded in the resource re-evaluation procedure such that the measured PSSCH-RSRP is above the measurement threshold shown in Table A. 9.1.4.3.1-2. The test system shall emulate the active V2X sidelink UEs to transmit PSCCH/PSSCH with the maximum number of reserved PSCCH/PSSCH resources equalling n2 and time resource assignment interval as 15ms.

During T2, the test UE is expeted to reselect the resources and transmit the PSCCH/PSSCH in the newly re-evaluated resources.

Table A.9.1.4.3.1-1: Test Parameters for V2X UE Resource Selection Tests for Re-evaluation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR RF Channel Number | |  | 1 | HD carrier in Band n47 and n38 |
| Channel Bandwidth (BWchannel) Note 2 | | MHz | 20 (NRB,c = 50) or  40 (NRB,c = 100) |  |
| SCS | | kHz | 30 |  |
| V2X sidelink communication pre-configuration | |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool | |  | 11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool | |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize-r16 included in SL-ResourcePool | |  | 10 |  |
| sl-StartRB-Subchannel-r16 | |  | 0 |  |
| Number of Active Sidelink UEs | |  | 130 | Active Sidelink UE i = 0, .., 129 |
| SL-Thres-RSRP-r16 | |  | 17 | Corresponding -96 dBm as defined in Section 6.3.5 in TS38.331[2] |
| Active Sidelink UEs(UE i=0-99) | V2X sidelink Communication preconfiguration |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | {1i}Note1 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize-r16 included in SL-ResourcePool |  | 10 | Indicates the size of sub-channels for TX resource pool |
| sl-ResourceReservePeriod2-r16 | ms | 50 |  |
| Active Sidelink UEs(UE i= 100-129) | V2X sidelink Communication preconfiguration |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | {1i}Note1 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize included in SL-ResourcePool |  | 10 | Indicates the size of sub-channels for TX resource pool |
| sl-MultiReserveResource-r16 |  | enabled |  |
| sl-MaxNumPerReserve-r16 |  | n2 |  |
| sl-ResourceReservePeriod2-r16 |  | 0 | Unit:ms |
| Timing offset among Active Sidelink UEs | | μs | CP/2 | Synchronous |
| T0 | | s | 1 |  |
| T1 | | ms | 50 |  |
| T2 | | ms | 50 |  |
| Note 1: {1i} is a sequence of ninety-nine 0’s with one 1 in (mod(i,100)+1)’th position.  Note 2: The UE is only required to be tested in one of the supported test configurations. | | | | |

Table A.9.1.4.3.1-2: Active Sidelink UE Specific Test Parameters for V2X UE Resource Selection Tests for Re-evaluation (UE #0...99)

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Active Sidelink UE i  (i = 0, .., 99) | |
| T1 | T2 |
| NR RF Channel Number | - | 1 | |
| Channel Bandwidth (BWchannel) Note 7 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) | |
| PSCCH RMC (defined in A.3.21.3) | - | CC.1A HD | |
| PSSCH RMC (defined in A.3.21.3) | - | CD.1A HD | |
| Note1 | dBm/SCS | -103 | |
| PSSCH1  Note 3 | dB | 22 | 22 |
| PSSCH2  Note 4 | dB | 2 | 2 |
| PSSCH3  Note 5 | dB | 12 | -infinity |
| PSSCH4  Note 6 | dB | 12 | 12 |
| PSSCH1  Note2,3 | dB | 22 | 22 |
| PSSCH2  Note2,4 | dB | 2 | 2 |
| PSSCH3  Note2,5 | dB | 12 | -infinity |
| PSSCH4  Note2,6 | dB | 12 | 12 |
| PSSCH -RSRP1 Note 2, 3 | dBm/SCS | -81 | -81 |
| PSSCH -RSRP2 Note 2, 4 | dBm/SCS | -101 | -101 |
| PSSCH -RSRP3 Note 2, 5 | dBm/SCS | -91 | -infinity |
| PSSCH -RSRP4 Note 2, 6 | dBm/SCS | -91 | -91 |
| 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: , PSSCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: UE #50~64 and UE #85~99 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #50-64 and #85-99.  Note 4: UE #30~49 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #30-49.  Note 5: UE #0~29 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #0-29.  Note 6: UE #65~84 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #65-84.  Note 7: The UE is only required to be tested in one of the supported configurations. | | | |

Table A.9.1.4.3.1-3: Active Sidelink UE Specific Test Parameters for V2X UE Resource Selection Tests for Re-evaluation (UE #100…129)

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Active Sidelink UE i  (i = 100, .., 129) | |
| T1 | T2 |
| NR RF Channel Number | - | 1 | |
| Channel Bandwidth (BWchannel) Note 4 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) | |
| PSCCH RMC (defined in A.3.21.3) | - | CC.1A HD | |
| PSSCH RMC (defined in A.3.21.3) | - | CD.1 A HD | |
| Note1 | dBm/SCS | -103 | |
| PSSCH | dB | -infinity | 22 |
| PSSCH  Note2 | dB | -infinity | 22 |
| PSSCH-RSRP Note 2, Note 3 | dBm/SCS | -infinity | -81 |
| 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, PSSCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: UE #100~129 will occupy the subchannels on the slots with “#slot index mod 100”= #0-29 during T2.  Note 4: The UE is only required to be tested in one of the supported configurations. | | | |

##### A.9.1.4.3.2 Test Requirements

The rate of PSSCH transmissions on the resources of the subchannels which are occupied by UE #65-84 shall be more than 90% during T2.

### A.9.1.5 Test for Congestion Control Measurement

#### A.9.1.5.1 Test Purpose and Environment

The purpose of this test is to verify the congestion control measurement requirements in section 12.6. For UE supporting NR Uu and sidelink operation, this test will also verify that V2X UE makes correct reporting of an event.

The test parameters are given in Table A.9.1.5.1-1, Table A.9.1.5.1-2 , A.9.1.5.1-3 and A.9.1.5.1-4 below. There are 4 active V2X sidelink UEs in this test. The test system shall emulate the active sidelink UE to transmit PSCCH/PSSCH every 50ms. Additionally, For UE supporting NR Uu and sidelink operation, there is an active Cell (Cell 1) in this test. For UE only supporting NR sidelink, There are no active cell and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. The test parameters for GNSS signals are defined in B.4.1.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During T1, all of active V2X sidelink UEs are configured to transmit PSCCH/PSSCH with lower transmission power every 50ms. During T2, all of active V2X sidelink UEs are configured to transmit PSCCH/PSSCH with higher transmission power every 50ms.

For UE supporting NR Uu and sidelink operation, the UE under test and all active sidelink UEs select PCell as synchonization source In the measurement control information it is indicated to the V2X UE that event-triggered reporting with Event C1 is used.

For UE only supporting NR sidelink, the UE under test and all active sidelink UEs select GNSS as synchonization source. The UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

For UE supporting NR Uu and sidelink operation, Supported test configurations for FR1 NR cell are shown in Table A.9.1.5.1.1-1.

Table A.9.1.5.1.1-1: Supported Test Configurations for FR1 NR cell (only for UE supporting both NR Uu and sidelink operation)

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Table A.9.1.5.1-2: General test parameters for Congestion Control Measurement Test for V2X UE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR RF Channel Number | |  | 1 | HD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel)Note 2 | | MHz | 20 (NRB,c = 50) or  40 (NRB,c = 100) |  |
| SCS | | kHz | 30 |  |
| V2X sidelink communication configuration | |  | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool | |  | 11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool | |  | 1 | ENUMERATED {n1} |
| sl-SubchannelSize included in SL-ResourcePool | |  | 10 | ENUMERATED {n10} |
| sl-StartRB-Subchannel-r16 | |  | 0 |  |
| *threshS-RSSI-CBR* | |  | 19 | Corresponding -74dBm as defined in Section 6.3.8 in TS38.331[2] |
| Active Cell Note 3 | |  | Cell 1 |  |
| Number of Active Sidelink UEs every 50ms | |  | 4 | Active Sidelink UE i, where i = 0, 1, 2, 3 |
| Active Sidelink UEs (i = 0,1,2,3) | V2X sidelink Communication configuration |  | As specified in Table A.3.21.2-1  and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | {1i}Note1 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 |  |
| sl-SubchannelSize included in SL-ResourcePool |  | 10 |  |
| Timing offset between V2X UE and Active Sidelink UEs | | μs | CP/2 | Synchronous |
| c1-Threshold-r16Note 3 | |  | 2 | Corresponding 0.02 as defined in Section 6.3.2 in TS38.331[2] |
| sl-CBR-RangeConfigList-r16 Note 4 | |  | [2 100] | Two ranges are defined by this list: 0 to 0.02 and 0.02 to 1 |
| sl-CR-Limit-r16 Note 4 | |  | 10000 and 10 | Corresponding to the two CBR ranges: if CBR > 0.02, CR ≤ 0.001, otherwise CR > 0.001 |
| sl-Thres-RSRP-r16 Note 4 | |  | 12 | Configure threshold <-98.64dBm/30kHz to ensure not blocking transmission |
| Hysteresis | |  | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| T1 | | s | 5 |  |
| T2 | | s | 5 |  |
| Note 1: {1i}is a sequence of ninety nine 0’s with one 1 in i+1’th position.  Note 2: The UE is only required to be tested in one of the channel bandwidths.  Note 3: Only for UE supporting both Uu and sidelink operation.  Note 4: Only for UE supporting sidelink operation but not supporting Uu. | | | | |

Table A.9.1.5.1-3: 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 | |
| NR RF Channel Number |  | 1 | | |
| Channel Bandwidth (BWchannel) Note 7 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) | | |
| PSCCH RMC (defined in A.3.21.3) |  | CC.1A HD | | |
| PSSCH RMC (defined in A.3.21.3) |  | CD.1A HD | | |
| Note1 | dBm/30 kHz | -103 | | |
|  | dB | 4.35 | | 10.32 |
| PSSCH-RSRP Note 2 | dBm/30 kHz | -98.65 | | -92.68 |
| SL-RSSI1 Note 2,3 | dBm/3.6 MHz | -76.5 | | -71.5 |
| SL-RSSI2 Note 2,4 | dBm/3.6 MHz | -82.21 | | -82.21 |
| Io1 Note 2,5 | dBm/3.6 MHz | -76.5 | | -71.5 |
| Io2 Note 2,6 | dBm/3.6 MHz | -82.21 | | -82.21 |
| 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 Es/Noc, PSSCH-RSRP, SL-RSSI1, SL-RSSI2, Io1 and Io2 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SL-RSSI1 is the SL-RSSI level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.  Note 4: SL-RSSI2 is the SL-RSSI level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.  Note 5: Io1 is the Io level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.  Note 6: Io2 is the Io level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.  Note 7: The UE is only required to be tested in one of the supported test configurations. | | | | |

Table A.9.1.5.1-4: Cell Test Parameters for Congestion Control Measurement Test for V2X UE (only for UE supporting both NR Uu and sidelink operation)

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 |
| RF Channel Number | |  | 2 |
| Duplex Mode | Config 1 |  | FDD |
| Config 2,3 |  | TDD |
| TDD configuration | Config 1 |  | Not Applicable |
| Config 2 |  | TDDConf.1.1 |
| Config 3 |  | TDDConf.2.1 |
| Channel Bandwidth (BWchannel) | Config 1,2 | MHz | 10: NRB,c = 52 |
| Config 3 | 40: NRB,c = 106 |
| Initial BWP Configuration | |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP Configuration | |  | DLBWP.1.1  ULBWP.1.1 |
| DRX Cycle | |  | N/A |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD |
| Config 2 |  | SR.1.1 TDD |
| Config 3 |  | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD |
| Config 2 |  | CR.1.1 TDD |
| Config 3 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.1.1 FDD |
| Config 2 |  | CCR.1.1 TDD |
| Config 3 |  | CCR.2.1 TDD |
| SSB configuration | Config 1,2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.2 FR1 |
| SMTC Configuration | |  | SMTC.2 |
| OCNG Patterns | |  | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | Config 1,2,3 | dBm/15 kHz | -98 |
| Note2 | Config 1,2 | dBm/SCS | -98 |
| Config 3 | -95 |
|  | | dB | 3 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -95 |
| Config 3 | -92 |
| Io Note 3 | Config 1,2 | dBm/9.36 MHz | -65.2 |
| Config 3 | dBm/38.1 MHz | -59.2 |
| 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: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

#### A.9.1.5.2 Test Requirements

For UEs that support NR Uu and sidelink operation, the UEs shall not send event C1 triggered measurement reports during T1 and shall send event C1 triggered measurement reports during T2.

For UEs that support sidelink operation only, the UE channel occupancy ratio shall be larger than 0.001 during T1, and the UE channel occupancy ratio shall be no larger than 0.001 during T2.

The rate of correct events observed during repeated tests shall be at least 98%.

### A.9.1.6 Test for Interruption

#### A.9.1.6.1 Test for Interruption to WAN due to V2X Sidelink Communication

##### A.9.1.6.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to interruptions due to V2X sidelink communication defined in clause 12.7.1 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

This test is applicable for V2X sidelink communication capable UEs that support inter-band concurrent V2X sidelink operation.

For this test, the UE is triggered by the test loop function or the upper layers to monitor V2X sidelink communication.

The test parameters are given in Table A.9.1.6.1.1-1, Table A.9.1.6.1.1-2, Table A.9.1.6.1.1-3 and Table A.9.1.6.1.1-4. The test consists of 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. The UE under test and all active sidelink UEs select the active cell as synchonization source.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

During T1, the UE is in RRC\_IDLE and monitoring the V2X sidelink communication transmission from other active Sidelink UEs on the V2X sidelink communication resources.

During T2, the test system establishes a RRC connection with the UE. No PDSCH traffic is scheduled for UE, and the UE is expected to transmit *SidelinkUEInformationNR* indicating *sl-RxInterestedFreqList*. On reception of *SidelinkUEInformationNR*, thetest system shall send RRC reconfiguration message to the UE and wait for the UE to respond with RRC reconfiguration complete message before transitioning to T3. If the UE does not transmit *SidelinkUEInformationNR* for up to 2 second, the test system shall transition to T3.

During T3, the UE is scheduled with PDSCH traffic on PCell downlink. The test system will count the missed ACK/NACKs during T3 to verify the allowed interruptions during V2X sidelink communication (no missed ACK/NACKs are allowed).

Table A.9.1.6.1.1-1: Supported test configurations for FR1 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Table A.9.1.6.1.1-2: Test Parameters for Interruptions due to V2X Sidelink Communication

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number | - | 1, 2 | RF channel 1 is non-V2X sidelink carrier  RF channel 2 is V2X sidelink carrier |
| SCS | kHz | 30 |  |
| 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 *SidelinkUEInformationNR* during this period. |  |
| T3 | s | 10 |  |

Table A.9.1.6.1.1-3: Sidelink Communication Configuration for Interruptions due to V2X Sidelink Communication

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | | - | 2 | HD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel) Note 1 | | MHz | 20 (NRB,c = 50) or  40 (NRB,c = 100) |  |
| V2X sidelink Communication configuration | | - | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
| Number of Active Sidelink UEs | | - | 8 | Active Sidelink UE i = 0, .., 7 |
| Active Sidelink UEs (UE i = 0, .., 7) | V2X sidelink Communication configuration | - | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel | - | CC.1A HD | As specified in Table A.3.21.3-1 |
| PSSCH Reference Measurement Channel | - | CD.1A HD | As specified in Table A.3.21.3-2 |
| sl-NumSubchannel-r16 included in SL-ResourcePool | - | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool | - | i | Indicates the lowest RB index of the subchannel with the lowest index for active Sidelink UE i = 0, .., 7. |
| PSBCH-RSRP | dBm/30kHz | -95 |  |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | | | | |

Table A.9.1.6.1.1-4: Cell specific test parameters for interruptions due to V2X slidelink communication

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | | |
| T1 | T2 | T3 |
| RF Channel Number | |  | 1 | | |
| UE RRC state | |  | IDLE | CONNECTED | |
| Duplex Mode | Config 1 |  | FDD | | |
| Config 2,3 |  | TDD | | |
| TDD configuration | Config 1 |  | Not Applicable | | |
| Config 2 |  | TDDConf.1.1 | | |
| Config 3 |  | TDDConf.2.1 | | |
| Channel Bandwidth (BWchannel) | Config 1,2 | MHz | 10: NRB,c = 52 | | |
| Config 3 | 40: NRB,c = 106 | | |
| Initial BWP Configuration | |  | DLBWP.0.1  ULBWP.0.1 | | |
| Dedicated BWP Configuration | |  | DLBWP.1.1  ULBWP.1.1 | | |
| DRX Cycle | |  | N/A | | |
| PDSCH Reference measurement channel | Config 1 |  | N/A | None | SR.1.1 FDD |
| Config 2 |  | N/A | None | SR.1.1 TDD |
| Config 3 |  | N/A | None | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD | | |
| Config 2 |  | CR.1.1 TDD | | |
| Config 3 |  | CR.2.1 TDD | | |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.1.1 FDD | | |
| Config 2 |  | CCR.1.1 TDD | | |
| Config 3 |  | CCR.2.1 TDD | | |
| SSB configuration | Config 1,2 |  | SSB.1 FR1 | | |
| Config 3 |  | SSB.2 FR1 | | |
| SMTC Configuration | |  | SMTC.2 | | |
| OCNG Patterns | |  | OP.1 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | Config 1,2,3 | dBm/15 kHz | -98 | | |
| Note2 | Config 1,2 | dBm/SCS | -98 | | |
| Config 3 | -95 | | |
|  | | dB | 3 | | |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -95 | | |
| Config 3 | -92 | | |
| Io Note 3 | Config 1,2 | dBm/9.36 MHz | -65.3 | | |
| Config 3 | dBm/38.1 MHz | -59.2 | | |
| Antenna Configuration | |  | 1x2 | | |
| 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: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

##### A.9.1.6.1.2 Test Requirements

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.

*<End of change16>*

*<Start of Change12-6>*

##### A.10.1.1.1.4 2-step RA type non-contention based random access for NR PSCell with CCA

###### A.10.1.1.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in clause 6.2.2A.3 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell in FR1. Cell 1 is on a licensed band and cell 2 is subjected to CCA. Supported test parameters are shown in Table A.10.1.1.1.4.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.10.1.1.1.4.1-2.

*<End of Change12-6>*

*<Start of Change12-7>*

##### A.11.2.2.2.3 2-step RA type contention-based random access for NR PCell with CCA

###### A.11.2.2.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in Clause 6.2.2A.3 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1, which operates on a carrier frequency with CCA. Supported test parameters are shown in Table A.11.2.2.2.3.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.11.2.2.2.3.1-2.

*<End of Change12-7>*

*<Start of Change12-8>*

##### A.11.2.2.2.4 2-step RA type non-contention-based random access for NR PCell with CCA

###### A.11.2.2.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in Clause 6.2.2A.3 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1, which operates on a carrier frequency with CCA. Supported test parameters are shown in Table A.11.2.2.2.4.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.11.2.2.2.4.1-2.

*<End of Change12-8>*

*<Start of change1>*

## B.4.3 Conditions for Selection/Reselection to Intra-frequency SyncRef UE

This clause defines the S-SSB\_RP and S-SSB Ês/Iot applicable for a corresponding operating band.

The conditions for selection/reselection to intra-frequency SyncRef UE are defined in Table B.4.3-1 for FR1.

Table B.4.3-1: V2X synchronization measurements in FR1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | NR V2X operating band groups Note1 | Minimum S-SSB\_RP | | | S-SSB Ês/Iot |
| dBm/SCSS-SSB | | | dB |
| SCSS-SSB = 15kHz | SCSS-SSB = 30kHz | SCSS-SSB = 60kHz |
| NR\_TDD\_FR1\_B | -120.5 | -117.5 | -114.5 | ≥ 0 |
| NR\_TDD\_FR1\_J | -116.5 | -113.5 | -110.5 | ≥ 0 |
| NOTE 1: NR V2X operating band groups are as defined in Section 3.5 for the corresponding NR operating bands.  NOTE 2: The SyncRef UE transmission frequency shall be accurate to within ±5 PPM compared to the absolute frequency. | | | | | |

*<End of change1>*