**3GPP TSG-RAN4 Meeting #103-e *R4-2211335***

**Electronic Meeting, 9 – 20 May, 2022**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.133** | **CR** | **7162** | **rev** | **-** | **Current version:** | **17.5.0** |  |
|  | | | | | | | | |
| *For* [***HELP***](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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Big CR on TS 36.133 Maintenance (Rel-17) | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | MCC, Xiaomi | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NB\_IOTenh3-Core  LTE\_feMob-Core  LTE\_NR\_DC\_CA\_enh-Core  TEI14 | | | | |  | ***Date:*** | | | 2022-05-24 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **A** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This big CR merge the endorsed draft CRs, the change reason for each endorsed draft CR is copied below.  R4-2208934 Draft CR on adding NR bands groups for NB-IoT R17   * Category NB1 and NB2 are defined for operation in NR bands in Rel-16 according to TS 36.101 5.5F as follows:   + Category NB1 and NB2 are designed to operate in the NR operating bands n1, n2, n3, n5, n7, n8, n12, n14, n18, n20, n25, n28, n41, n65, n66, n70, n71, n74, n90. * The corresponding supporting in TS 36.133 bands groups is missing   R4-2208957 Clarification on asynchronous DAPS handover R17   * For FR1 DAPS hadover, the synchronous conditions are defined with adding 3 notes. In current specification, Notes 2/3 clairfies to leave enough time for UE performing DL-to-UL and UL-to-DL switching only from single cell perspective. However, the UE shall be allowed to switching time between both source cell and target cell. * Moreover the same issue was also solved in NR DAPS. It was endorsed in [R4-2113814].   R4-2209190 CR on beam level EMR requirements 36133 R17   * For beam level EMR on NR inter-RAT carriers, the overall time for UE to evaluate a newly detectable cell is the sum of the evaluation time defined in clause 4.2.2.5.6 and TSSB\_index defined in clause 4.9.2.4. The evaluation time is scaled with the number of carriers NNR\_carrier\_HST or NNR\_carrier, but TSSB\_index is not, which means UE is required to do parallel SSB index reading on all carriers.   R4-2210089 (mirror R17)Corrections on LTE V2X Resource Selection Test   * The available resource ratio after excluding above threshold RSRP and self transmission resources is 19% in T2 in 36.133 A.12.6.1 V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements. The minimum available resource percentage is 20%. A spec compliant UE may increase RSRP threshold to include more resources, and when the newly included resources are selected, the UE fails the test while executing spec compliant procedure with accurate measurement. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The summary of change for each endorsed draft CR is copied below.  R4-2208933 Draft CR on adding NR bands groups for NB-IoT R16   * Add supporting NR bands in bands groups for NB-IoT   R4-2208956 Clarification on asynchronous DAPS handover R16   * Correct note 2, 3 in Table 5.7.1-1. * Some editorial changes.   R4-2210968 CR on beam level EMR requirements 36133 R16   * Add the scaling factor to TSSB\_index to account for more than one carriers configured with beam level EMR.   R4-2210089 (mirror R17)Corrections on LTE V2X Resource Selection Test   * Configuration active SL UEs on subchannel #3 to follow subchannel #1 active SL UEs. The available resource becomes 38% and UE doesn’t have to raise RSRP threshold. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The consequences if not apporved for each endorsed draft CR are copied below.  R4-2208933 Draft CR on adding NR bands groups for NB-IoT R16   * The bands groups for NR bands are missing.   R4-2208956 Clarification on asynchronous DAPS handover R16   * The specification is incomplete.   R4-2210968 CR on beam level EMR requirements 36133 R16   * UE is required to do parallel SSB index reading on all carriers, which is not the intention.   R4-2210089 (mirror R17)Corrections on LTE V2X Resource Selection Test   * A spec compliant UE may increase RSRP threshold to include more resources, and when the newly included resources are selected, the UE fails the test while executing spec compliant procedure with accurate measurement. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | R4-2208933 Draft CR on adding NR bands groups for NB-IoT R16   * 3.5, 9.1.22, B.1.4, B.2.15-17, B.3.25   R4-2208956 Clarification on asynchronous DAPS handover R16   * 5.7   R4-2210968 CR on beam level EMR requirements 36133 R16   * 4.9.2.4   R4-2210089 (mirror R17)Corrections on LTE V2X Resource Selection Test   * A.12.6.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 36.521-3 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

<Unchanged Text Skipped>

3.5 Additional notation

3.5.1 Groups of bands

The intention with the band grouping below is to increase the readability of the specification.

**Table 3.5.1-1: E-UTRA band groups**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Group** | **E-UTRA FDD** | | **E-UTRA TDD** | | **E-UTRA Frame Structure 3** | |
| **Band group notation** | **Operating bands** | **Band group notation** | **Operating bands** | **Band group notation** | **Operating bands** |
| A | FDD\_A | 1, 4, 6, 10, 11, 18, 19, 21, 23, 24, 32 Note 2, 67Note 2, 69Note 2, 70Note 7, 75 Note 2, 76 Note 2 | TDD\_A | 33, 34, 35, 36, 37, 38, 39, 40, 45, 50, 51, 53 | FS3\_A | - |
| B | FDD\_B1 | 65, 66 Note 5 | TDD\_B | - | FS3\_B | - |
| FDD\_B2 | 74Note 8 |
| C | FDD\_C | 9, 30 | TDD\_C | 42, 43, 48, 52 | FS3\_C | - |
| D | FDD\_D | 28, 68 | TDD\_D | - | FS3\_D | - |
| E | FDD\_E | 2, 5, 7, 27 | TDD\_E | 41, 44 | FS3\_E | - |
| F | FDD\_F | 26 Note 3 | TDD\_F | - | FS3\_F | - |
| G | FDD\_G | 3, 8, 12, 13, 14, 17, 20, 22, 29 Note 2, 71, 85 | TDD\_G | 47 Note4 | FS3\_G | 46 Note 2, 49 Note 2 |
| H | FDD\_H | 25 | TDD\_H | - | FS3\_H | - |
| I | FDD\_I | - | TDD\_I | - | FS3\_I | - |
| J | FDD\_J | - | TDD\_J | - | FS3\_J | - |
| K | FDD\_K | - | TDD\_K | - | FS3\_K | - |
| L | FDD\_L | - | TDD\_L | - | FS3\_L | - |
| M | FDD\_M | - | TDD\_M | - | FS3\_M | - |
| N | FDD\_N | 31, 72, 73, 87, 88 | TDD\_N | - | FS3\_N | - |
| NOTE 1: The bands within the same group have the same Io conditions in a corresponding requirement in this specification.  NOTE 2: This band is used only for E-UTRA carrier aggregation with other E-UTRA bands.  NOTE 3: The minimum Io condition for Band 26 is reduced by 0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.  NOTE 4: This band is used only for V2V operation.  NOTE 5: The range 2180-2200 MHz of the DL operating band 66 is restricted to E-UTRA operation when carrier aggregation is configured.  NOTE 6: Void  NOTE 7: The range 2010-2020 MHz of the DL operating band is restricted to E-UTRA operation when carrier aggregation is configured and TX-RX separation is 300 MHz The range 2005-2020 MHz of the DL operating band is restricted to E-UTRA operation when carrier aggregation is configured and TX-RX separation is 295 MHz  NOTE 8: The minimum Io condition for Band 74 is reduced by 0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 1475.9-1510.9 MHz. | | | | | | |

Table 3.5.1-2: Band groups for NB-IoT

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Group | E-UTRA/NR FDD | | E-UTRA/NR TDD | |
| Band group notation | Operating bands | Band group notation | Operating bands |
| A | NFDD\_A | - | NTDD\_A | - |
| B | NFDD\_B | - | NTDD\_B | - |
| C | NFDD\_C | - | NTDD\_C | - |
| D | NFDD\_D | - | NTDD\_D | - |
| E | NFDD\_E | - | NTDD\_E | - |
| F | NFDD\_F | - | NTDD\_F | - |
| G | NFDD\_G | 1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 14, 17, 18, 19, 20, 21, 24, 25, 26, 28, 31, 65, 66, 70, 71, 72, 73, 74, 85, 87, 88, 103, n1, n2, n3, n5, n7, n8, n12, n14, n18, n20, n25, n28, n65, n66, n70, n71, n74 | NTDD\_G | 41, 42, 43, n41, n90 |
| H | NFDD\_H | - | NTDD\_H | - |
| I | NFDD\_I | - | NTDD\_I | - |
| J | NFDD\_J | - | NTDD\_J | - |
| K | NFDD\_K | - | NTDD\_K | - |
| L | NFDD\_L | - | NTDD\_L | - |
| M | NFDD\_M | - | NTDD\_M | - |
| N | NFDD\_N | - | NTDD\_N | - |

<Unchanged Text Skipped>

9.1.22.1 Intra-frequency Absolute NRSRP Accuracy for UE Category NB1

The requirements for absolute accuracy of NRSRP in this clause apply to a cell on the same frequency as that of the serving cell for UE Category NB1 for stand-alone, guard-band and in-band deployments. For a UE capable of NSSS-based RRM measurement, provided that *nsss-NumOccDiffPrecoders* value *n1* has been indicated by higher layers, the accuracy requirement as specified in Table. 9.1.22.1-2 shall apply. Otherwise, the accuracy requirement as specified in Table 9.1.22.1-1 shall apply.

The accuracy requirements in Table 9.1.22.1-1 and Table 9.1.22.1-2 are valid under the following conditions:

Narrowband reference signals are transmitted either from one or two ports.

Conditions defined in Clause 7.3 of TS 36.101 [5] for reference sensitivity are fulfilled.

NRSRP|dBm according to Annex B.3.25 for a corresponding Band

At least 1 DL subframe per radio frame of measured cell is available at the UE for NRSRP measurement assuming measured cell is identified cell.

**Table 9.1.22.1-1: NRSRP Intra frequency absolute accuracy for UE Category NB1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | |
| **Normal condition** | **Extreme condition** | **Ês/Iot** | **Io Note 1 range** | | | |
| **E-UTRA/NR operating band groups Note 2** | **Minimum Io** | | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm/15kHz** | **dBm/BWChannel** | **dBm/BWChannel** |
| ±6 | ±9 | ≥-6 dB | NFDD\_G, NTDD\_G | -122.9 | N/A | -70 |
| ±8 | ±11 | ≥-6 dB | NFDD\_G, NTDD\_G | N/A | -70 | -50 |
| ±10.3 | ±13.3 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | - 122.9 | N/A | -70 |
| ±12.3 | ±15.3 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | | | | |

**Table 9.1.22.1-2: NRSRP Intra frequency absolute accuracy for UE Category NB1 under NSSS-based measurement**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | |
| **Normal condition** | **Extreme condition** | **Ês/Iot** | **Io Note 1 range** | | | |
| **E-UTRA/NR operating band groups Note 2** | **Minimum Io** | | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm/15kHz** | **dBm/BWChannel** | **dBm/BWChannel** |
| ±4 | ±7 | ≥-6 dB | NFDD\_G, NTDD\_G | -122.9 | N/A | -70 |
| ±6 | ±9 | ≥-6 dB | NFDD\_G, NTDD\_G | N/A | -70 | -50 |
| ±6 | ±9 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | -122.9 | N/A | -70 |
| ±8 | ±11 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | | | | |

9.1.22.2 Void

9.1.22.3 Intra-frequency Absolute NRSRQ Accuracy for UE Category NB1

The requirements for absolute accuracy of NRSRQ in this clause apply to a cell on the same frequency as that of the serving cell for NB-IoT UE for stand-alone, guard-band and in-band deployments. For a UE capable of NSSS-based RRM measurement, provided that *nsss-NumOccDiffPrecoders* value *n1* has been indicated by higher layers, the accuracy requirement as specified in Table. 9.1.22.3-2 shall apply. Otherwise, the accuracy requirement as specified in Table 9.1.22.3-1 shall apply.

The accuracy requirements in Table 9.1.22.3-1 and Table 9.1.22.3-2 are valid under the following conditions:

Narrowband reference signals are transmitted either from one or two antenna ports.

Conditions defined in Clause 7.3 of TS 36.101 [5] for reference sensitivity are fulfilled.

NRSRP|dBm according to Annex B.3.25 for a corresponding Band

At least 1 DL subframe per radio frame of measured cell is available at the UE for NRSRQ measurement assuming measured cell is identified cell.

**Table 9.1.22.3-1: NRSRQ Intra frequency absolute accuracy for UE Category NB1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | |
| **Normal condition** | **Extreme condition** | **Ês/Iot** | **Io Note 1 range** | | |
| **E-UTRA/NR operating band groups Note 3** | **Minimum Io** | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm/15kHz** | **dBm/BWChannel** |
| ±5.2 | ±8.2 | ≥-3 dB | NFDD\_G, NTDD\_G | -122.9 | -50 |
| ±7.2 | ±10.2 | ≥-6 dB | Note 2 | Note 2 | Note 2 |
| ±9.5 | ±12.5 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | -122.9 | -50 |
| ±11.5 | ±14.5 | -15≤Ês/Iot≤--6 dB | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | | | |

**Table 9.1.22.3-2: NRSRQ Intra frequency absolute accuracy for UE Category NB1 under NSSS-based measurement**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | |
| **Normal condition** | **Extreme condition** | **Ês/Iot** | **Io Note 1 range** | | | |
| **E-UTRA/NR operating band groups Note 2** | **Minimum Io** | | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm/15kHz** | **dBm/BWChannel** | **dBm/BWChannel** |
| ±3.2 | ±6.2 | ≥-6 dB | NFDD\_G, NTDD\_G | -122.9 | N/A | -70 |
| ±5.2 | ±8.2 | ≥-6 dB | NFDD\_G, NTDD\_G | N/A | -70 | -50 |
| ±5.2 | ±8.2 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | -122.9 | N/A | -70 |
| ±7.2 | ±10.2 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | | | | |

9.1.22.4 Void

9.1.22.5 Inter-frequency Absolute NRSRP Accuracy for UE Category NB1

The requirements for absolute accuracy of NRSRP in this clause apply to a cell that has different carrier frequency from the serving cell. For a UE capable of NSSS-based RRM measurement, provided that *nsss-NumOccDiffPrecoders* value *n1* has been indicated by higher layers, the accuracy requirement as specified in Table. 9.1.22.5-2 shall apply. Otherwise, the accuracy requirement as specified in Table 9.1.22.5-1 shall apply.

The accuracy requirements in Table 9.1.22.5-1 and Table 9.1.22.5-2 are valid under the following conditions:

Narrowband reference signals are transmitted either from one or two antenna ports.

Conditions defined in Clause 7.3 of TS 36.101 [5] for reference sensitivity are fulfilled.

NRSRP|dBm according to Annex B.3.26 for a corresponding Band

At least 1 DL subframe per radio frame of measured cell is available at the UE for NRSRP measurement assuming measured cell is identified cell.

**Table 9.1.22.5-1: NRSRP Inter frequency absolute accuracy for UE Category NB1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | |
| **Normal condition** | **Extreme condition** | **Ês/Iot** | **Io Note 1 range** | | | |
| **E-UTRA/NR operating band groups Note 2** | **Minimum Io** | | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm/15kHz** | **dBm/BWChannel** | **dBm/BWChannel** |
| ±6 | ±9 | ≥-6 dB | NFDD\_G, NTDD\_G | -122.9 | N/A | -70 |
| ±8 | ±11 | ≥-6 dB | NFDD\_G, NTDD\_G | N/A | -70 | -50 |
| ±10.3 | ±13.3 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | -122.9 | N/A | -70 |
| ±12.3 | ±15.3 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | | | | |

**Table 9.1.22.5-2: NRSRP Inter frequency absolute accuracy for UE Category NB1 under NSSS-based measurement**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | |
| **Normal condition** | **Extreme condition** | **Ês/Iot** | **Io Note 1 range** | | | |
| **E-UTRA/NR operating band groups Note 2** | **Minimum Io** | | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm/15kHz** | **dBm/BWChannel** | **dBm/BWChannel** |
| ±4 | ±7 | ≥-6 dB | NFDD\_G, NTDD\_G | -122.9 | N/A | -70 |
| ±6 | ±9 | ≥-6 dB | NFDD\_G, NTDD\_G | N/A | -70 | -50 |
| ±6 | ±9 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | -122.9 | N/A | -70 |
| ±8 | ±11 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | | | | |

9.1.22.6 Void

9.1.22.7 Inter-frequency Absolute NRSRQ Accuracy for UE Category NB1

The requirements for absolute accuracy of NRSRQ in this clause apply to a cell that has different carrier frequency from the serving cell. For a UE capable of NSSS-based RRM measurement, provided that *nsss-NumOccDiffPrecoders* value *n1* has been indicated by higher layers, the accuracy requirement as specified in Table. 9.1.22.7-2 shall apply. Otherwise, the accuracy requirement as specified in Table 9.1.22.7-1 shall apply.

The accuracy requirements in Table 9.1.22.7-1 and Table 9.1.22.7-2 are valid under the following conditions:

Narrowband reference signals are transmitted either from one or two antenna ports.

Conditions defined in Clause 7.3 of TS 36.101 [5] for reference sensitivity are fulfilled.

NRSRP|dBm according to Annex B.3.26 for a corresponding Band

At least 1 DL subframe per radio frame of measured cell is available at the UE for NRSRQ measurement assuming measured cell is identified cell.

**Table 9.1.22.7-1: NRSRQ Inter frequency absolute accuracy for UE Category NB1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | |
| **Normal condition** | **Extreme condition** | **Ês/Iot** | **Io Note 1 range** | | |
| **E-UTRA/NR operating band groups Note 3** | **Minimum Io** | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm/15kHz** | **dBm/BWChannel** |
| ±5.2 | ±8.2 | ≥-3 dB | NFDD\_G, NTDD\_G | -122.9 | -50 |
| ±7.2 | ±10.2 | ≥-6 dB | Note 2 | Note 2 | Note 2 |
| ±9.5 | ±12.5 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | -122.9 | -50 |
| ±11.5 | ±14.5 | -15≤Ês/Iot≤--6 dB | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  NOTE 3: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | | | |

**Table 9.1.22.7-2: NRSRQ Inter frequency absolute accuracy for UE Category NB1 under NSSS-based measurement**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | |
| **Normal condition** | **Extreme condition** | **Ês/Iot** | **Io Note 1 range** | | | |
| **E-UTRA/NR operating band groups Note 2** | **Minimum Io** | | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm/15kHz** | **dBm/BWChannel** | **dBm/BWChannel** |
| ±3.2 | ±6.2 | ≥-6 dB | NFDD\_G, NTDD\_G | -122.9 | N/A | -70 |
| ±5.2 | ±8.2] | ≥-6 dB | NFDD\_G, NTDD\_G | N/A | -70 | -50 |
| ±5.2 | ±8.2 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | -122.9 | N/A | -70 |
| ±7.2 | ±10.2 | -15≤Ês/Iot≤--6 dB | NFDD\_G, NTDD\_G | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  NOTE 2: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | | | | |

<Unchanged Text Skipped>

9.1.22.10 Intra-Frequency RSTD Accuracy Requirement for NB1 for normal coverage

The accuracy requirements in Table 9.1.22.10-1 are valid under the following conditions:

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

NPRP 1,2|dBm according to Annex B.3.29 for a corresponding Band

There are no measurement gaps overlapping with the NPRS subframes of the measured serving cell.

The parameter expectedRSTDUncertainty signalled over LPP by E-SMLC as defined in TS 36.355 [24] is less than 5 µs.

UE is configured via LPP with nprsInfo-Type2as specified in TS 36.355 [24] for any cell whose NPRS RE overlaps with the NPRS RE of any other cell in the OTDOA assistance data on the same frequency.

**Table 9.1.22.10-1: Intra RSTD measurement accuracy for normal coverage**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **NPRS Ês/Iot** | **UE NPRS measurement**  **bandwidth on the reference cell and the measured neighbour cell *i* Note 3** | **Minimum number of available measurement subframes among the reference cell and the measured neighbour cell *i*, *NNPRS\_total* Note 6** | **Io Note 7 range** | | |
| **E-UTRA/NR operating band groups Note 7** | **Minimum Io Note 1** | **Maximum Io** |
| **Ts Note 2** | **dB** | **RB** |  |  | **dBm/15kHz** | **dBm/BWChannel** |
| ±20 | (NPRS Ês/Iot)ref ≥-6dB  and  (NPRS Ês/Iot)*i* ≥-13dB | 1 | 320 | NFDD\_G, NTDD\_G | -118 | -70 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: Ts is the basic timing unit defined in TS 36.211 [16].  NOTE 3: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 4: The Io is defined in NPRS positioning subframes. The same Io range applies to NPRS and non-NPRS symbols. Io levels are different in NPRS and non-NPRS symbols within the same subframe.  NOTE 5: E-UTRA/NR operating band groups are as defined in Section 3.5.  NOTE 6: *NNPRS\_total* can be in one or more NPRS positioning occasions. | | | | | | |

9.1.22.11 Inter-Frequency RSTD Accuracy Requirement for NB1 for normal coverage

The accuracy requirements in Table 9.1.22.11-1 are valid under the following conditions:

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

NPRP 1,2|dBm according to Annex B.3.29 for a corresponding Band

There are no measurement gaps overlapping with the NPRS subframes of the measured serving cell.

The parameter expectedRSTDUncertainty signalled over LPP by E-SMLC as defined in TS 36.355 [24] is less than 5 µs.

UE is configured via LPP with nprsInfo-Type2as specified in TS 36.355 [24] for any cell whose NPRS RE overlaps with the NPRS RE of any other cell in the OTDOA assistance data on the same frequency.

**Table 9.1.22.11-1: Inter RSTD measurement accuracy for normal coverage**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **NPRS Ês/Iot** | **UE NPRS measurement**  **bandwidth on the reference cell and the measured neighbour cell *i* Note 3** | **Minimum number of available measurement subframes among the reference cell and the measured neighbour cell *i*, *NNPRS\_total* Note 6** | **Io Note 7 range** | | |
| **E-UTRA/NR operating band groups Note 7** | **Minimum Io Note 1** | **Maximum Io** |
| **Ts Note 2** | **dB** | **RB** |  |  | **dBm/15kHz** | **dBm/BWChannel** |
| ±28 | (NPRS Ês/Iot)ref ≥-6dB  and  (NPRS Ês/Iot)*i* ≥-13dB | 1 | 320 | NFDD\_G, NTDD\_G | -118 | -70 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: Ts is the basic timing unit defined in TS 36.211 [16].  NOTE 3: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 4: The Io is defined in NPRS positioning subframes. The same Io range applies to NPRS and non-NPRS symbols. Io levels are different in NPRS and non-NPRS symbols within the same subframe.  NOTE 5: E-UTRA/NR operating band groups are as defined in Section 3.5.  NOTE 6: *NNPRS\_total* can be in one or more NPRS positioning occasions. | | | | | | |

9.1.22.12 Intra-Frequency RSTD Accuracy Requirement for NB1 for enhanced coverage

The accuracy requirements in Table 9.1.22.12-1 are valid under the following conditions:

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

NPRP 1,2|dBm according to Annex B.3.29 for a corresponding Band

There are no measurement gaps overlapping with the NPRS subframes of the measured serving cell.

The parameter expectedRSTDUncertainty signalled over LPP by E-SMLC as defined in TS 36.355 [24] is less than 5 µs.

UE is configured via LPP with nprsInfo-Type2as specified in TS 36.355 [24] for any cell whose NPRS RE overlaps with the NPRS RE of any other cell in the OTDOA assistance data on the same frequency.

**Table 9.1.22.12-1: RSTD measurement accuracy for enhanced coverage**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **NPRS Ês/Iot** | **UE NPRS measurement**  **bandwidth on the reference cell and the measured neighbour cell *i* Note 3** | **Minimum number of available measurement subframes among the reference cell and the measured neighbour cell *i* , *NNPRS\_total* Note 6** | **Io Note 7 range** | | |
| **E-UTRA/NR operating band groups Note 7** | **Minimum Io Note 1** | **Maximum Io** |
| **Ts Note 2** | **dB** | **RB** |  |  | **dBm/15kHz** | **dBm/BWChannel** |
| ±32 | (NPRS Ês/Iot)ref ≥-15dB  and  (NPRS Ês/Iot)*i* ≥-15dB | 1 | 320 | NFDD\_G, NTDD\_G | -118 | -70 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: Ts is the basic timing unit defined in TS 36.211 [16].  NOTE 3: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 4: The Io is defined in NPRS positioning subframes. The same Io range applies to NPRS and non-NPRS symbols. Io levels are different in NPRS and non-NPRS symbols within the same subframe.  NOTE 5: E-UTRA/NR operating band groups are as defined in Section 3.5.  NOTE 6: *NNPRS\_total* can be in one or more NPRS positioning occasions. | | | | | | |

9.1.22.13 Inter-Frequency RSTD Accuracy Requirement for NB1 for enhanced coverage

The accuracy requirements in Table 9.1.22.13-1 are valid under the following conditions:

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

NPRP 1,2|dBm according to Annex B.3.29 for a corresponding Band

There are no measurement gaps overlapping with the NPRS subframes of the measured serving cell.

The parameter expectedRSTDUncertainty signalled over LPP by E-SMLC as defined in TS 36.355 [24] is less than 5 µs.

UE is configured via LPP with nprsInfo-Type2as specified in TS 36.355 [24] for any cell whose NPRS RE overlaps with the NPRS RE of any other cell in the OTDOA assistance data on the same frequency.

**Table 9.1.22.13-1: RSTD measurement accuracy for enhanced coverage**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **NPRS Ês/Iot** | **UE NPRS measurement**  **bandwidth on the reference cell and the measured neighbour cell *i* Note 3** | **Minimum number of available measurement subframes among the reference cell and the measured neighbour cell *i* , *NNPRS\_total* Note 6** | **Io Note 7 range** | | |
| **E-UTRA/NR operating band groups Note 7** | **Minimum Io Note 1** | **Maximum Io** |
| **Ts Note 2** | **dB** | **RB** |  |  | **dBm/15kHz** | **dBm/BWChannel** |
| ±40 | (NPRS Ês/Iot)ref ≥-15dB  and  (NPRS Ês/Iot)*i* ≥-15dB | 1 | 320 | NFDD\_G, NTDD\_G | -118 | -70 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: Ts is the basic timing unit defined in TS 36.211 [16].  NOTE 3: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 4: The Io is defined in NPRS positioning subframes. The same Io range applies to NPRS and non-NPRS symbols. Io levels are different in NPRS and non-NPRS symbols within the same subframe.  NOTE 5: E-UTRA/NR operating band groups are as defined in Section 3.5.  NOTE 6: *NNPRS\_total* can be in one or more NPRS positioning occasions. | | | | | | |

<Unchanged Text Skipped>

9.1.22.16 Downlink Channel Quality Measurement Accuracy for UE Category NB1

The requirements for accuracy of downlink channel quality reporting in this clause apply to the serving cell on the anchor carrier and non-anchor carrier for UE Category NB1.

The accuracy requirements in Table 9.1.22.16-1 are valid under the following conditions:

- Cell specific reference signals are transmitted either from one or two ports.

- Conditions defined in TS 36.101 [5] Clause 7.3 for reference sensitivity are fulfilled.

- NRSRP|dBm according to Annex B.3.25 for a corresponding Band.

**Table 9.1.22.16-1: Downlink channel quality reporting accuracy for UE Category NB1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **NPDCCH Repetition** | **Pm-Dsg (%)** | **Conditions** | | | | |
| **Ês/Iot** | **Io NOTE 1 range** | | | |
| **E-UTRA/NR operating band groups NOTE 2** | **Minimum Io** | | **Maximum Io** |
|  | **dB** |  | **dBm/15kHz** | **dBm/BWChannel** | **dBm/BWChannel** |
| R NOTE 1 | ≤1 | ≥ -6 dB | NFDD\_G | -122.9 | N/A | -70 |
| R/4 NOTE 1 | >1 | ≥ -6 dB | NFDD\_G | -122.9 | N/A | -70 |
| R NOTE 1 | ≤1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_G | - 122.9 | N/A | -70 |
| R/8 NOTE 1 | >1 | -15 ≤ Ês/Iot ≤ -6 dB | NFDD\_G | - 122.9 | N/A | -70 |
| NOTE 1: R is the reported NPDCCH repetition level that UE has reported in CQI-NPDCCH-NB or CQI-NPDCCH-Short-NB.  NOTE 2: Io is assumed to have constant EPRE across the bandwidth.  NOTE 3: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | | | | |

<Unchanged Text Skipped>

B.1.4 Conditions for measurements of intra-frequency NB-IoT cells for cell re-selection for UE Category NB1

This clause defines the NB-IoT intra-frequency NRSRP, NRSRP Ês/Iot, NSCH\_RP and NSCH Ês/Iot applicable for a corresponding operating band. The UE category NB1 applicability of the conditions in Appendix B.1.4 is defined in Section 3.6.

The conditions for measurements of intra-frequency NB-IoT cells in normal coverage for cell re-selection are defined in Table B.1.4-1 and B.1.4-3.

The conditions for measurements of intra-frequency NB-IoT cells in enhanced coverage for cell re-selection are defined in Table B.1.4-2 and B.1.4-4.

**Table B.1.4-1: NB-IoT intra-frequency measurements for HD-FDD in normal coverage**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum NRSRP** | **Minimum NSCH\_RP** | **NRS Ês/Iot** | **NSCH Ês/Iot** |
| **dBm/15kHz** | **dBm/15kHz** | **dB** | **dB** |
| **Conditions** | NFDD\_G | -129 | -129 | ≥ -6 | ≥ -6 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | | | |

**Table B.1.4-2: NB-IoT intra-frequency measurements for HD-FDD in enhanced coverage**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum NRSRP** | **Minimum NSCH\_RP** | **NRS Ês/Iot** | **NSCH Ês/Iot** |
| **dBm/15kHz** | **dBm/15kHz** | **dB** | **dB** |
| **Conditions** | NFDD\_G | -138 | -138 | ≥ -15 | ≥ -15 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | | | |

**Table B.1.4-3: NB-IoT intra-frequency measurements for TDD in normal coverage**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum NRSRP** | **Minimum NSCH\_RP** | **NRS Ês/Iot** | **NSCH Ês/Iot** |
| **dBm/15kHz** | **dBm/15kHz** | **dB** | **dB** |
| **Conditions** | NTDD\_G | -129 | -129 | ≥ -6 | ≥ -6 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | | | |

**Table B.1.4-4: NB-IoT intra-frequency measurements for TDD in enhanced coverage**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum NRSRP** | **Minimum NSCH\_RP** | **NRS Ês/Iot** | **NSCH Ês/Iot** |
| **dBm/15kHz** | **dBm/15kHz** | **dB** | **dB** |
| **Conditions** | NTDD\_G | -138 | -138 | ≥ -15 | ≥ -15 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | | | |

<Unchanged Text Skipped>

B.2.15 Conditions for NB-IoT intra-frequency measurements by UE Category NB1

This clause defines the NB-IoT intra-frequency NSCH\_RP and NSCH Ês/Iot applicable for a corresponding operating band. The UE category NB1 applicability of the conditions in Appendix B.2.15 is defined in Section 3.6.

The conditions for intra-frequency measurements in normal coverage are defined in Table B.2.15-1 and B.2.15-3.

The conditions for intra-frequency measurements in denhanced coverage are defined in Table B.2.15-2 and B.2.15-4.

**Table B.2.15-1: NB-IoT intra-frequency measurements for HD-FDD in normal coverrage**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum NSCH\_RP** | **NSCH Ês/Iot** |
|  | **dBm/15kHz** | **dB** |
| **Conditions** | NFDD\_G | -129 | ≥ -6 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | |

**Table B.2.15-2: NB-IoT intra-frequency measurements for HD-FDD in enhanced coverrage**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum NSCH\_RP** | **SCH Ês/Iot** |
|  | **dBm/15kHz** | **dB** |
| **Conditions** | NFDD\_G | -138 | ≥ -15 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | |

**Table B.2.15-3: NB-IoT intra-frequency measurements for TDD in normal coverrage**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum NSCH\_RP** | **NSCH Ês/Iot** |
|  | **dBm/15kHz** | **dB** |
| **Conditions** | NTDD\_G | -129 | ≥ -6 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | |

**Table B.2.15-4: NB-IoT intra-frequency measurements for TDD in enhanced coverrage**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum NSCH\_RP** | **SCH Ês/Iot** |
|  | **dBm/15kHz** | **dB** |
| **Conditions** | NTDD\_G | -138 | ≥ -15 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5. | | | |

B.2.16 Conditions for NB-IoT intra-frequency RSTD measurements by UE Category NB1

This clause defines the NB-IoT intra-frequency PRP1,2 applicable for a corresponding operating band. The UE category NB1 applicability of the conditions in Appendix B.2.16 is defined in Section 3.1.

The conditions for intra-frequency RSTD measurements in normal coverage are defined in Table B.2.16-1 and B.2.16-3.

The conditions for intra-frequency RSTD measurements in enhanced coverage are defined in Table B.2.16-2 and B.2.16-4.

**Table B.2.16-1: NB-IoT intra-frequency RSTD measurements for HD-FDD in normal coverrage**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum PRP1,2 Note 1** |
|  | **dBm/15kHz** |
| **Conditions** | NFDD\_G | -129 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5 | | |

**Table B.2.16-2: NB-IoT intra-frequency RSTD measurements for HD-FDD in enhanced coverrage**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum PRP1,2 Note 1** |
|  | **dBm/15kHz** |
| **Conditions** | NFDD\_G | -135 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5 | | |

**Table B.2.16-3: NB-IoT intra-frequency RSTD measurements for TDD in normal coverrage**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum PRP1,2 Note 1** |
|  | **dBm/15kHz** |
| **Conditions** | NTDD\_G | -129 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5 | | |

**Table B.2.16-4: NB-IoT intra-frequency RSTD measurements for TDD in enhanced coverrage**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum PRP1,2 Note 1** |
|  | **dBm/15kHz** |
| **Conditions** | NTDD\_G | -135 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5 | | |

B.2.17 Conditions for NB-IoT inter-frequency RSTD measurements by UE Category NB1

This clause defines the NB-IoT inter-frequency PRP1,2 applicable for a corresponding operating band. The UE category NB1 applicability of the conditions in Appendix B.2.17 is defined in Section 3.1.

The conditions for intra-frequency RSTD measurements in normal coverage are defined in Table B.2.17-1 and B.2.17-3.

The conditions for intra-frequency RSTD measurements in enhanced coverage are defined in Table B.2.17-2 and B.2.17-4.

**Table B.2.17-1: NB-IoT inter-frequency RSTD measurements for HD-FDD in normal coverrage**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum PRP1,2 Note 1** |
|  | **dBm/15kHz** |
| **Conditions** | NFDD\_G | -129 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5 | | |

**Table B.2.17-2: NB-IoT inter-frequency RSTD measurements for HD-FDD in enhanced coverrage**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum PRP1,2 Note 1** |
|  | **dBm/15kHz** |
| **Conditions** | NFDD\_G | -135 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5 | | |

**Table B.2.17-3: NB-IoT inter-frequency RSTD measurements for TDD in normal coverrage**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum PRP1,2 Note 1** |
|  | **dBm/15kHz** |
| **Conditions** | NTDD\_G | -129 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5 | | |

**Table B.2.17-4: NB-IoT inter-frequency RSTD measurements for TDD in enhanced coverrage**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum PRP1,2 Note 1** |
|  | **dBm/15kHz** |
| **Conditions** | NTDD\_G | -135 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5 | | |

<Unchanged Text Skipped>

B.3.25 Conditions for NB-IoT intra-frequency Absolute NRSRP and NRSRQ Accuracy Requirements for UE Category NB1

This clause defines the NB-IoT intra-frequency NRSRP applicable for a corresponding operating band. The UE category NB1 applicability of the conditions in Appendix B.3.25 is defined in Section 3.6.

The conditions for intra-frequency absolute NRSRP and NRSRQ accuracy requirements are defined in Table B.3.25-1.

**Table B.3.25-1: NB-IoT intra-frequency absolute NRSRP and NRSRQ Accuracy Requirements**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **E-UTRA/NR operating band groups Note 1** | **Minimum NRSRP** |
| **dBm/15kHz** |
| **Conditions** | NFDD\_G, NTDD\_G | -139.8 |
| NOTE 1: E-UTRA/NR operating band groups are as defined in Section 3.5. | | |

<Unchanged Text Skipped>

## 5.7 E-UTRAN DAPS Handover

### 5.7.1 Introduction

The purpose of DAPS handover is to change the PCell to another cell.

A DAPS handover is synchronous if it meets the conditions in Table 5.7.1-1, otherwise it is asynchronous.

Table 5.7.1-1: Synchronous conditions for DAPS handover

|  |  |  |
| --- | --- | --- |
| Type of handover | Maximum receive timing difference between source and target cells (µs) for sync DAPS handover | Maximum transmit timing difference between source and target cells (µs) for sync DAPS handover |
| Intra-frequencyNote 1,2,3 | 6µs | 8.21 µs |
| Intra-band inter-frequency Note 1,2,3 | 6µs | 8.21 µs |
| Inter-band inter-frequency | 33 µs | 35.21 µs |
| Note 1: For synchronous DAPS handover, if the receive time difference exceeds the cyclic prefix length, demodulation performance degradation is expected for the first symbol of the slot. For asynchronous DAPS handover, if the receive time difference exceeds the cyclic prefix length, interruptions may occur depending on UE implementation. The duration and frequency of occurrence of such interruptions is not specified.  Note 2: For DAPS handover on a TDD band, after starting RACH procedure, a UE is not required to transmit in the uplink to any of source and target cells earlier than 20usafter the end of the last received downlink symbol from any of source and target cells in the same TDD band.  Note 3: For DAPS handover on a TDD band, after starting RACH procedure, a UE is not required to receive in the downlink from any of source and target cells earlier than 20us after the end of the last transmitted uplink symbol to any of source and target cells in the same TDD band. | | |

### 5.7.2 Requirements

#### 5.7.2.1 E-UTRAN FDD – FDD

The requirements in this clause are applicable to both intra-frequency and inter-frequency DAPS handovers.

##### 5.7.2.1.1 DAPS Handover delay

Procedure delays for the procedure that can command a DAPS handover are specified in TS 36.331 [2]. DAPS delay is comprised of Dhandover1 and Dhandover2.

When the UE receives an RRC message implying handover, the UE shall be ready to start the transmission of the new uplink PRACH channel within Dhandover1 seconds from the end of the last TTI containing the RRC command when UE is configured with dual active protocol stack handover.

Dhandover1 = TRRC\_procedure+ Tsearch + TIU + 20 ms

Where

TRRC\_procedure is the maximum RRC procedure delay to be defined in clause 11.2 in TS 36.331 [2].

Tsearch is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then Tsearch = 0 ms. If the target cell is unknown and signal quality is sufficient for successful cell detection on the first attempt, then Tsearch = 80 ms. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

TIU is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. TIU can be up to 30 ms.

NOTE: The actual value of TIU shall depend upon the PRACH configuration used in the target cell.

A cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in Clause 8.1.2.2.1 (FDD) and Clause 8.1.2.2.2 (TDD) for intra-frequency handover and Clause 8.1.2.3.1 (FDD) and Clause 8.1.2.3.2 (TDD) for inter-frequency handover.

After successful RACH procedure of the target cell, when the UE receives an RRC message implying source cell release command, the UE shall accomplish the release actions specified in TS 36.331 [2] within Dhandover2.

Dhandover2 = TRRC\_procedure+ Tinterrupt2

Where:

TRRC\_procedure is the maximum RRC procedure delay to be defined in clause 11.2 in TS 36.331 [2].

Tinterrupt2 is defined in clause 5.7.2.1.2.

##### 5.7.2.1.2 Interruption time

During Dhandover1 the UE is allowed an interruption of up to Tinterrupt1 on source cell:

- Tinterrupt1 is 1 ms for synchronous intra-frequency DAPS handover and 2ms for asynchronous intra-frequency DAPS handover, when the bandwidth of target cell is no larger than the bandwidth of source cell,

- Tinterrupt1 is 2ms for synchronous intra-frequency DAPS handover and 3ms for asynchronous intra-frequency DAPS handover, when the bandwidth of target cell is larger than the bandwidth of source cell,

- Tinterrupt1 is 5 ms for synchronous intra-band inter-frequency DAPS handover and 6 ms for asynchronous intra-band inter-frequency DAPS handover

- Tinterrupt1 is 1 ms for synchronous inter-band inter-frequency DAPS handover and 2 ms for asynchronous inter-band inter-frequency DAPS handover.

During Dhandover2 the UE is allowed an interruption of up to Tinterrupt2 on target cell:

- Tinterrupt2 is 2 ms for synchronous intra-frequency DAPS handover and 3 ms for asynchronous intra-frequency DAPS handover, when the bandwidth of target cell is smaller than the bandwidth of source cell.

- Tinterrupt2 is 1 ms for synchronous intra-frequency DAPS handover and 2 ms for asynchronous intra-frequency DAPS handover, when the bandwidth of target cell is not smaller than the bandwidth of source cell

- Tinterrupt2 is 5 ms for synchronous intra-band inter-frequency DAPS handover and 6 ms for asynchronous intra-band inter-frequency DAPS handover.

- Tinterrupt2 is 1 ms for synchronous inter-band inter-frequency DAPS handover and 2ms for asynchronous inter-band inter-frequency DAPS handover.

#### 5.7.2.2 E-UTRAN FDD – TDD

The requirements in this clause are applicable to DAPS handover from FDD to TDD. The requirements in this clause shall apply to UE supporting FDD and TDD.

The requirements in clause 5.7.2.1 apply for this section.

#### 5.7.2.3 E-UTRAN TDD – FDD

The requirements in this clause are applicable to DAPS handover from TDD to FDD. The requirements in this clause shall apply to UE supporting FDD and TDD.

The requirements in clause 5.7.2.1 apply for this section.

#### 5.7.2.4 E-UTRAN TDD – TDD

The requirements in this clause are applicable to DAPS handover from TDD to TDD. The requirements in this clause shall apply to UE supporting TDD.

The requirements in clause 5.7.2.1 apply for this section.

<Unchanged Text Skipped>

4.9.2.4 Measurements of inter-RAT NR DC candidate cells

While T331 is running, the UE shall perform measurement on the configured NR inter-RAT carriers for idle mode measurement reporting.

In addition to the requirements defined in section 4.2.2.9 and 4.2.2.9a, a UE which supports *nr-IdleInactiveMeasFR1-r16 or nr-IdleInactiveMeasFR2-r16* shall be able to support idle mode DC measurements of.

- at least 8 inter-RAT NR carriers which are also configured for inter-RAT mobility measurements, and

- at least 2 inter-RAT NR carrier which are not configured for inter-RAT mobility measurements.

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least 8 inter-RAT NR carriers for idle mode DC measurements comprising of carriers configured for inter-RAT mobility measurements and carriers not configured for inter-RAT mobility measurements.

For idle mode DC measurements on NR inter-RAT carriers, if Srxlev ≤ SnonIntraSearchP and Squal ≤ SnonIntraSearchQ, the NR inter-RAT measurement requirements defined in clause 4.2.2.5.6 shall apply, where UE shall search for and measure inter-RAT layers configured for idle mode DC measurements in preparation for possible reporting.If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, the UE shall search for NR inter-RAT layers configured for idle mode DC measurements at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2, where UE shall search for and measure NR inter-RAT layers configured for idle mode DC measurements in preparation for possible reporting.

For UE supporting *nr-IdleInactiveBeamMeasFR1-r16* and/or *nr-IdleInactiveBeamMeasFR2-r16*, if the UE is configured with *beamMeasConfigIdle-r16* on one or more carriers for idle mode DC measurement, the UE, on each carrier, shall be able to

- detect a newly detectable inter-RAT NR cell and perform RSRP/RSRQ measurement in preparation for reporting, and

- detect and acquire the SSB index for a newly detectable inter-RAT NR cell if *beamMeasConfigIdle-r16* is configured on this carrier and perform RSRP/RSRQ measurement in preparation for reporting

within the requirements defined in clause 4.2.2.5.6 plus k\*TSSB\_index,NR, where k is the number of carriers configured for idle mode DC measurement with *beamMeasConfigIdle-r16*, and TSSB\_index,NR is the additional time period used to acquire the index of the SSB being measured as defined in Table 4.9.2.4-1.

**Table 4.9.2.4-1: TSSB\_index,NR**

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **Scaling Factor (N1)** | | **TSSB\_index,NR [s] (number of DRX cycles)** |
| **FR1** | **FR2Note1** |
| 0.32 | 1 | 8 | N2 x 1.28 x 1.5 x N1  (N2 x 4 x 1.5 x N1) |
| 0.64 | 5 | N2 x 1.28 x N1  (N2 x 2 x N1) |
| 1.28 | 4 | N2 x 1.28 x N1  (N2 x 1 x N1) |
| 2.56 | 3 | N2 x 2.56 x N1  (N2 x 1 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: N2 = 3 if the NR inter-RAT carrier for idle mode DC measurement reporting is in FR1, and N2= 5 if the NR inter-RAT carrier for idle mode DC measurement reporting is in FR2. | | | |

For UE supporting *nr-IdleInactiveBeamMeasFR1-r16* and/or *nr-IdleInactiveBeamMeasFR2-r16*, if the UE is configured with *beamMeasConfigIdle-r16* for idle mode DC measurement, the UE shall be capable of performing SS-RSRP, SS-RSRQ for at least

- 7 SSBs with different SSB index and/or PCI on an NR inter- RAT layer in FR1,

- 10 SSBs with different SSB index and/or PCI on an NR inter- RAT layer in FR2.

In the absence or expiration of T331, it is up to UE implementation to perform the idle mode DC measurement.

The UE shall be capable of performing SS-RSRP and SS-RSRQ measurements of the carriers for idle mode DC measurements, and the UE physical layer shall be capable of reporting SS-RSRP and SS-RSRQ measurements of the carriers for idle mode DC measurements to higher layers, with measurement accuracy as specified in sub-clauses [TBD] and [TBD], respectively. The UE shall be able to report idle mode DC measurements when idle mode DC measurement reporting is requested by the network.

<Unchanged Text Skipped>

### A.12.6.1 V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements

#### A.12.6.1.1 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 4 defined in clause 13.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.12.6.1.1-1and A.12.6.1.1-2 below. There are 20 active V2X sidelink UEs in this test. Both the UE under test and active V2X sidelink UEs select GNSS as synchronization reference source. The test system can emulate and send the GNSS signal to the test UE and active V2X sidelink UEs. The test parameters for GNSS signals are defined in B.6.1. The test system shall emulate the active V2X sidelink UEs to transmit PSCCH/PSSCH every 20ms. 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 36.321, 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 measured PSSCH-RSRP is above the measurement threshold, and the resource occupied by the active V2X sidelink UEs is expected to be excluded in the resource selection procedure. During T2, the signal from Test Equipement are configured such that the measured PSSCH-RSRP is below the measurement threshold, and the resource occupied by the active V2X sidelink UEs is expected to included in the resource selection procedure.

Table A.12.6.1.1-1: Test Parameters for V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| E-UTRA RF Channel Number | |  | 1 | TDD carrier in Band 47 |
| Channel Bandwidth (BWchannel) | | MHz | 10 |  |
| V2X sidelink communication pre-configuration | |  | As specified in Table A.3.24.2-1  (Configuration #1) | IE values unless specified otherwise in this test. |
| sl-Subframe-r14 included in SL-PreconfigV2X-TxPoolList | |  | 11111111111111111111 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 36.213 [23]) |
| numSubchannel-r14 included in SL-PreconfigV2X-TxPoolList | |  | 5 | Indicates the number of sub-channels for TX resource pool |
| minSubChannel-NumberPSSCH-r14 included in v2x-ResourceSelectionConfig-r14 | |  | 1 | Indicates the minimum number of sub-channels which may be used for transmissions on PSSCH |
| maxSubchannel-NumberPSSCH-r14 included in v2x-ResourceSelectionConfig-r14 | |  | 1 | Indicates the maximum number of sub-channels which may be used for transmissions on PSSCH |
| Number of Active Sidelink UEs | |  | 20 | Active Sidelink UE i = 0, .., 19 |
| *SL-ThresPSSCH-RSRP* | |  | 12 | Corresponding -106 dBm as defined in Section 6.3.8 in TS36.331 |
| Active Sidelink UEs | V2X sidelink Communication preconfiguration |  | As specified in Table A.3.24.2-1  (Configuration #1) | IE values unless specified otherwise in this test. |
| sl-Subframe-r14 included in SL-PreconfigV2X-TxPoolList |  | 10000000000000000000 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 36.213 [23]) |
| numSubchannel-r14 included in SL-PreconfigV2X-TxPoolList |  | 1 | Indicates the number of sub-channels for TX resource pool |
| startRB-Subchannel-r14 included in SL-PreconfigV2X-TxPoolList |  | 5 | Indicates the lowest RB index of the subchannel with the lowest index. |
| startRB-PSCCH-Pool-r14 included in SL-PreconfigV2X-TxPoolList |  | 5 | Indicates the lowest RB index of the PSCCH pool. |
| sl-OffsetIndicator-r14 |  | i mod 20 | For Active Sidelink UE i, where i = 0, .., 19 |
| Timing offset among Active Sidelink UEs | | μs | ≤3 | Synchronous |

Table A.12.6.1.1-2: 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, .., 19) | |
| T1 | T2 |
| E-UTRA RF Channel Number | - | 1 | |
| BWchannel Note 4 | MHz | 10 | |
| PSCCH RMC (defined in A.3.24.3) | - | CC.1A HD | |
| PSSCH RMC (defined in A.3.24.3) | - | CD.1B HD | |
| OCNG pattern defined in A.3.2.4 | - | VOP.1 HD | |
| Note1 | dBm/15 kHz | -103 | -113 |
| PSCCH | dB | 5 | |
| PSSCH | dB | 2 | |
| PSCCH  Note2 | dB | 5 | |
| PSSCH  Note2 | dB | 2 | |
| S-RSRP Note 2 | dB | -101 | -111 |
| S-RSSI1 Note 2 Note3 | dBm/0.9 MHz | -80.15 | -90.15 |
| S-RSSI2 Note 2 Note4 | dBm/0.9 MHz | -80.15 | -90.15 |
| S-RSSI3 Note 2 Note5 | dBm/0.9 MHz | -65.18 | -75.18 |
| Antenna Configuration | - | 1x2 | |
| Propagation Condition | - | AWGN | |
| Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: Es/Iot, S-RSRP and S-RSSI levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: S-RSSI1 is the S-RSSI level measured on subchannel #1.  Note 4: S-RSSI2 is the S-RSSI level measured on subchannel #3.  Note 5: S-RSSI3 is the S-RSSI level measured on subchannel #0/2/4. | | | |

#### A.12.6.1.2 Test Requirements

The test time T1 and T2 should be long enough. The rate of PSSCH transmissions on the resources on subchannel #1 or #3 shall be less than 10% during T1. The rate of PSSCH transmissions on the resources on subchannel #1 or #3 shall be more than 90% during T2.

<Unchanged Text Skipped>