**3GPP TSG-RAN WG4 Meeting #104-e R4-2215211**

**E-Meeting, 15 Aug. – 26 Aug., 2022**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.133** | **CR** | **7180** | **rev** |  | **Current version:** | **17.6.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | R4-22xxxxx Big CR for 36.133 maintenance (Rel-17) | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | MCC, Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI 14, NR\_newRAT-Core, NR\_unlic-Core, NR\_redcap-Perf, NB\_IOTenh4\_LTE\_eMTC6-Perf | | | | |  | ***Date:*** | | | 2022-08-30 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***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:*** | | Big CR to merge the multiple endorsed draft CRs in RAN4#104-e. List of draft CRs merged are   * R4- 2211604 CR: Corrections on LTE V2X Synchronization Reference Selection/Reselection Tests   + The syncOffsetIndicators of SyncRef UE 1 and SyncRef UE 2 are different and therefore they can’t be the interference of each other as they are not overlapping in time domain. Without interference, Es/Noc and Es/Iot are the same. * R4-2212924 Correction to NR SCell interruption requirements 36.133\_r17   + During last 2 RAN4 meetings, interruption length for SSB-less SCell and SCell without SMTC configuration were discussed. For a SCell which actually transmits SSB but has no SMTC configuration, it’s agreed that the SMTC duration for this SCell shall be assumed as [X] ms, where X is TBD.   During discussion we received comments that X may be less than 5ms. The main reason is that for a SCell transmitting SSB, its SSB time domain pattern can be explicitly obtained from ssb-PositionsInBurst. Then the length of assumed SMTC duration can be reduced.  We suggest x = number of consecutive subframes which contains all SSBs indicated by ssb-PositionsInBurst.   * R4-2211840 Draft CR on inter-RAT NR-U RSSI and CO measurement without MG in TS36.133 R16   + In EN-DC mode, if LTE PCell configures UE to perform inter-RAT RSSI/CO measurement, and RSSI measurement bandwidth is fully within the active DL BWP of UE’s NR serving CC, UE can perform inter-RAT NR RSSI/CO measurements without measurement gaps. However, this inter-RAT NR RSSI/CO measurement without MG is missing in current RRM spec TS36.133. * R4-2214711 DraftCR on test cases for HD-FDD intra-frequency neighbour cell measurement of NB-IoT R17   + The test cases for intra-frequency neighbour cell measurement shall be defined * R4-2214712 DraftCR on test cases for TDD intra-frequency neighbour cell measurement of NB-IoT R17   + The test cases for intra-frequency neighbour cell measurement shall be defined. * R4-2214713 DraftCR on test cases for HD-FDD inter-frequency neighbour cell measurement of NB-IoT R17   + The test cases for inter-frequency neighbour cell measurement shall be defined. * R4-2214714 DraftCR on test cases for TDD inter-frequency neighbour cell measurement of NB-IoT R17   + The test cases for inter-frequency neighbour cell measurement shall be defined. * R4-2214925 Draft CR on test for RRC connection release with redirection to NR redcap   + Test cases need to be defined to verify the requirements of RRC connection release with redirection from E-UTRA to NR redcap. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The summary of change in each endorsed draft CRs are copied below.   * R4- 2211604 CR: Corrections on LTE V2X Synchronization Reference Selection/Reselection Tests   In T3, for SyncRef UE 1:  Es/Iot = Es/Noc = 0dB  and for SyncRef UE 2:  Es/Iot = Es/Noc = 3dB   * R4-2212924 Correction to NR SCell interruption requirements 36.133\_r15   + Interruption requirements for SCell addition/ activation are updated * R4-2211840 Draft CR on inter-RAT NR-U RSSI and CO measurement without MG in TS36.133 R17   + Add inter-RAT NR RSSI/CO measurement without MG for the case when RSSI measurement bandwidth is fully within the active DL BWP of UE’s NR serving CC. The intra-frequency NR RSSI/CO measurement requirement from TS38.133 section 9.2A.7.1/2 can be reused. * R4-2214711 DraftCR on test cases for HD-FDD intra-frequency neighbour cell measurement of NB-IoT R17   + Add the test cases for intra-frequency neighbour cell measurement. * R4-2214712 DraftCR on test cases for TDD intra-frequency neighbour cell measurement of NB-IoT R17   + Add the test cases for intra-frequency neighbour cell measurement. * R4-2214713 DraftCR on test cases for HD-FDD inter-frequency neighbour cell measurement of NB-IoT R17   + Add the test cases for inter-frequency neighbour cell measurement. * R4-2214714 DraftCR on test cases for TDD inter-frequency neighbour cell measurement of NB-IoT R17   + Add the test cases for inter-frequency neighbour cell measurement. * R4-2214925 Draft CR on test for RRC connection release with redirection to NR redcap   According to the work split, TC11 is provided to verify test cases for RRC connection release with redirection to NR for 1 Rx and 2 Rx Redcap UEs in TS 36.133.   |  |  |  |  | | --- | --- | --- | --- | | **Section** | **Type of test case** | **Volunteering company** | **Phase** | | A.6.3 | A.6.3.x1 RRC connection release with redirection to NR Redcap | OPPO | 1 | | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | * R4- 2211604 CR: Corrections on LTE V2X Synchronization Reference Selection/Reselection Tests   + Es/Iot specified in the test configuration is incorrect. * R4-2212924 Correction to NR SCell interruption requirements 36.133\_r17   + Requirements are not clear * R4-2211840 Draft CR on inter-RAT NR-U RSSI and CO measurement without MG in TS36.133 R17   + The inter-RAT NR RSSI/CO measurement without MG is missing in current RRM spec TS36.133. * R4-2214711 DraftCR on test cases for HD-FDD intra-frequency neighbour cell measurement of NB-IoT R17   + The requirements can not be verified * R4-2214712 DraftCR on test cases for TDD intra-frequency neighbour cell measurement of NB-IoT R17   + The requirements can not be verified * R4-2214713 DraftCR on test cases for HD-FDD inter-frequency neighbour cell measurement of NB-IoT R17   + The requirements can not be verified * R4-2214714 DraftCR on test cases for TDD inter-frequency neighbour cell measurement of NB-IoT R17   + The requirements can not be verified * R4-2214925 Draft CR on test for RRC connection release with redirection to NR redcap   + The requirements of RRC connection release with redirection from E-UTRA to NR redcap cannot be verified. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | * R4- 2211604 CR: Corrections on LTE V2X Synchronization Reference Selection/Reselection Tests   + A.12.3 * R4-2212924 Correction to NR SCell interruption requirements 36.133\_r17   + 7.32.2.4, 7.32.2.5, 7.36.2.3, 7.36.2.4 * R4-2211840 Draft CR on inter-RAT NR-U RSSI and CO measurement without MG in TS36.133 R17   + 8.17.4A.1.4; 8.17.4A.1.5 * R4-2214711 DraftCR on test cases for HD-FDD intra-frequency neighbour cell measurement of NB-IoT R17   + A.8.1.x1, A.8.1.x2 and A.8.1.x3 * R4-2214712 DraftCR on test cases for TDD intra-frequency neighbour cell measurement of NB-IoT R17   + A.8.1.x1, A.8.1.x2 and A.8.1.x3 * R4-2214713 DraftCR on test cases for HD-FDD inter-frequency neighbour cell measurement of NB-IoT R17   + A.8.1.x1, A.8.1.x2 and A.8.1.x3 * R4-2214714 DraftCR on test cases for TDD inter-frequency neighbour cell measurement of NB-IoT R17   + A.8.1.x1, A.8.1.x2 and A.8.1.x3 * R4-2214925 Draft CR on test for RRC connection release with redirection to NR redcap   + A.6.3.x1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 36.521-1 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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<Start of Change 1>

## A.12.3 V2X Synchronization Reference Selection/Reselection Tests

### A.12.3.1 V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority

#### A.12.3.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to SyncRef UE selection / reselection defined in clause 13.4, when GNSS is configured as the highest priority. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.12.3.1.1-1and A.12.3.1.1-2 below. There are no GNSS signals in this test. There are one active cell (PCell) and two active SyncRef UEs (SyncRef UE 1 and SyncRef UE 2) in this test. The test system shall emulate SyncRef UE 1 and SyncRef UE 2 to transmit SLSS and MIB-SL every SLSS period.

The test system can verify the selection / reselection of SyncRef UE by monitoring the SLSS ID used by the V2X UE for its SLSS+MIB-SL transmissions. When the V2X UE is not synchronized to any SyncRef UE, then the V2X UE shall use the SLSS ID pre-configured in the V2X UE. 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 5.10.7.3 of TS 36.331.

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 PCell 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.12.3.1.1-1: Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial condition | Active synchronization source |  | Cell 1 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 30 and in-coverage set as TRUE in MIB-SL. |
| T2 end condition | Active synchronization source |  | Sync Ref UE 1 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 168 and in-coverage set as FALSE in MIB-SL. |
| Final condition | Active synchronization source |  | Sync Ref UE 2 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 0 and in-coverage set as FALSE in MIB-SL. |
| Active SyncRef UEs | |  | SyncRef UE 1  SyncRef UE 2 | Transmitting SLSS+MIB-SL on RF channel number 1 (TDD carrier in Band 47) |
| Active cell | |  | Cell 1 | E-UTRA FDD Cell 1 on RF channel number 2 |
| Timing offset between SyncRef UE 1 and SyncRef UE 2 | | μs | 3 | Synchronous |
| Frequency offset of SyncRef UE 1 | | ppm | 0 |  |
| Frequency offset of SyncRef UE 2 | | ppm | 0 |  |
| V2X sidelink Communication configuration | |  | As specified in Table A.3.24.2-2  (Configuration #2) | IE values unless specified otherwise in this test. |
| typeTxSync | |  | *gnss* |  |
| slssid | |  | *30* |  |
| syncTxThreshIC | |  | +infinity |  |
| T1 | | s | 24 |  |
| T2 | | s | 16 |  |
| T3 | | s | 3.2 |  |

Table A.12.3.1.1-2: 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 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| E-UTRA RF Channel Number |  | 1 | | | | | |
| BWchannel Note 4 | MHz | 5 or 10 | | | | | |
| V2X Sidelink Communication resource pool configuration |  | As specified in Table A.3.24.2-1  (Configuration #1) | | | As specified in Table A.3.24.2-2  (Configuration #2) | | |
| networkControlledSyncTx |  | N/A | | | ON | | |
| syncTxThreshOoC | dBm/15 kHz | +infinity | | | N/A | | |
| slssid |  | 0 | | | 0 | | |
| inCoverage (in MIB-SL) |  | FALSE | | | TRUE | | |
| syncOffsetIndicator |  | syncOffsetIndicator2 | | | syncOffsetIndicator1 | | |
| Note1 | dBm/15 kHz | -95 | | | | | |
|  | dB | -infinity | 0 | 0 | -infinity | -infinity | 3 |
|  | dB | -infinity | 0 | 0 | -infinity | -infinity | 3 |
| S-RSRP Note2, Note 3 | dBm/15 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: S-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SSSS Es/Iot is set the same as PSSS/PSBCH Es/Iot. | | | | | | | |

Table A.12.3.1.1-3: Cell Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | | |
| T1 | T2 | T3 |
| E-UTRA RF Channel Number |  | 2 | | |
| BWchannel | MHz | 10 | | |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.3.1.2.1 |  | R.6 FDD | | |
| OCNG Patterns defined in A.3.2.1.2 |  | OP.2 FDD | | |
| PBCH\_RA | dB | 0 | | |
| PBCH\_RB |
| PSS\_RA |
| SSS\_RA |
| PCFICH\_RB |
| PHICH\_RA |
| PHICH\_RB |
| PDCCH\_RA |
| PDCCH\_RB |
| PDSCH\_RA |
| PDSCH\_RB |
| OCNG\_RANote 1 |
| OCNG\_RBNote 1 |
| Note2 | dBm/15 kHz | -95 | | |
|  | dB | 4.5 | 4.5 | 4.5 |
| RSRP Note3 | dBm/15 kHz | -90.5 | -90.5 | -90.5 |
| SCH\_RP Note 3 | dBm/15 kHz | -90.5 | -90.5 | -90.5 |
| Propagation Condition |  | AWGN | | |
| Note 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

#### A.12.3.1.2 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 SLSS transmissions timing and SLSS ID to follow SyncRef UE 1 as the synchronization source. For the test configuration, the SLSS ID will be changed to 168 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T2.

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

SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + SLSS period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 13.4)

- Tevaluate,SLSS = 0.64 (as specified in sub-clause 13.3.1.3)

- SLSS period = 160ms

This gives a total of 8.8seconds.

2) During T3, SyncRef UE reselection delay is defined as the time from the beginning of T3 to the time UE changes its synchronization source from SyncRef UE 1 to SyncRef UE 2, and changes its SLSS transmissions timing and SLSS ID to follow SyncRef UE 2 as the synchronization source. For the test configuration, the SLSS ID will still be 0 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T3.

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

SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + SLSS period

Where

- Tdetect,SyncRef UE = 1.6sec (as specified in sub-clause 13.4)

- Tevaluate,SLSS = 0.64 (as specified in sub-clause 13.3.1.3)

- SLSS period = 160ms

This gives a total of 2.4seconds.

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

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

### A.12.3.2 V2X Synchronization Reference Selection/Reselection Tests for eNB configured as the highest priority

#### A.12.3.2.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to SyncRef UE selection / reselection defined in clause 13.4, when eNB is configured as the highest priority. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.12.3.2.1-1and A.12.3.2.1-2 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.6.1. 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 SLSS and MIB-SL every SLSS period.

The test system can verify the selection / reselection of SyncRef UE by monitoring the SLSS ID used by the V2X UE for its SLSS+MIB-SL transmissions. When the V2X UE is not synchronized to any SyncRef UE, then the V2X UE shall use the SLSS ID pre-configured in the V2X UE. 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 5.10.7.3 of TS 36.331.

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.12.3.2.1-1: Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for eNB configured as the highest priority

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial condition | Active synchronization source |  | GNSS | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 0 and in-coverage set as TRUE in MIB-SL. |
| T2 end condition | Active synchronization source |  | Sync Ref UE 1 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 168+59 and in-coverage set as FALSE in MIB-SL. |
| Final condition | Active synchronization source |  | Sync Ref UE 2 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 30 and in-coverage set as FALSE in MIB-SL. |
| Active cell | |  | None |  |
| Active SyncRef UEs | |  | SyncRef UE 1  SyncRef UE 2 | Transmitting SLSS+MIB-SL on RF channel number 1 |
| Timing offset between SyncRef UE 1 and SyncRef UE 2 | | ms | 3 | Asynchronous |
| Frequency offset of SyncRef UE 1 | | ppm | 0 |  |
| Frequency offset of SyncRef UE 2 | | ppm | 5 |  |
| V2X sidelink Communication preconfiguration | |  | As specified in Table A.3.24.2-1  (Configuration #1) | IE values unless specified otherwise in this test. |
| syncPriority | |  | *enb* |  |
| syncTxThreshOoC | |  | 11 (+infinity) |  |
| T1 | | s | 24 |  |
| T2 | | s | 16 |  |
| T3 | | s | 16 |  |

Table A.12.3.2.1-2: SyncRef UE Specific Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for eNB configured as the highest priority

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | SyncRef UE 1 | | | SyncRef UE 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| E-UTRA RF Channel Number |  | 1 | | | | | |
| BWchannel | MHz | 5 or 10 | | | | | |
| V2X Sidelink Communication resource pool configuration |  | As specified in Table A.3.24.2-1  (Configuration #1) | | | As specified in Table A.3.24.2-2  (Configuration #2) | | |
| networkControlledSyncTx |  | N/A | | | ON | | |
| syncTxThreshOoC | dBm/15 kHz | +infinity | | | N/A | | |
| slssid |  | 59 | | | 30 | | |
| inCoverage (in MIB-SL) |  | FALSE | | | TRUE | | |
| syncOffsetIndicator |  | syncOffsetIndicator2 | | | syncOffsetIndicator1 | | |
| Note1 | dBm/15 kHz | -95 | | | | | |
|  | dB | -infinity | 0 | 0 | -infinity | -infinity | 3 |
|  | dB | -infinity | 0 | 0 | -infinity | -infinity | 3 |
| S-RSRP Note2, Note 3 | dBm/15 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: S-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SSSS Es/Iot is set the same as PSSS/PSBCH Es/Iot. | | | | | | | |

#### A.12.3.1.2 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 SLSS transmissions timing and SLSS ID to follow SyncRef UE 1 as the synchronization source. For the test configuration, the SLSS ID will be changed to 168+59 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T2.

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

SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + SLSS period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 11.4)

- Tevaluate,SLSS = 0.64 (as specified in sub-clause 13.3.1.3)

- SLSS period = 160ms

This gives a total of 8.8 seconds.

2) During T3, SyncRef UE reselection delay is defined as the time from the beginning of T3 to the time UE changes its synchronization source from SyncRef UE 1 to SyncRef UE 2, and changes its SLSS transmissions timing and SLSS ID to follow SyncRef UE 2 as the synchronization source. For the test configuration, the SLSS ID will be changed o 30 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T3.

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

SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + SLSS period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 11.4)

- Tevaluate,SLSS = 0.64 (as specified in sub-clause 13.3.1.3)

- SLSS period = 160ms

This gives a total of 8.8 seconds.

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

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

<End of Change 1>

<Start of Change 2>

#### 7.32.2.4 Interruptions at SCell addition/release

When one SCell belonging to MCG is added or released:

- the requirements in clause 7.8.2.7 shall apply.

When one NR SCell belonging to SCG is added or released:

- an interruption on PCell or activated SCell in MCG shall not exceed X1 subframes for synchronous intraband EN-DC, X1+1 subframes for asynchronous intraband EN-DC, 1 subframe for synchronous interband EN-DC or 2 subframes for asynchronous interband EN-DC. For SCell addition X1 is equal to the duration of the SMTC of the SCell being added + 1 ms. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being added, the SSB transmission periodicity is assumed to be 5ms and TSMTC duration for the SCell being added is x ms, where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being added. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being added, TSMTC duration for the SCell being added is 0ms.

- The interruption is based on assumption that the cell specific reference signals from both cells are available in the same slot. For SCell release X1 is equal to 1ms.

#### 7.32.2.5 Interruptions at SCell activation/deactivation

When one SCell belonging to MCG is activated or deactivated:

- the requirements in clause 7.8.2.8 shall apply.

When one NR SCell belonging to SCG is activated or deactivated

- an interruption on PCell or activated SCell in MCG shall not exceed X1 subframes for synchronous intraband EN-DC, X1+1 subframes for asynchronous intraband EN-DC, 1 subframe for synchronous interband EN-DC or 2 subframes for asynchronous interband EN-DC. For SCell activation X1 is equal to the duration of the SMTC of the SCell being activated + 1 ms. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and TSMTC duration for the SCell being activated is x ms, where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being activated. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being activated, TSMTC duration for the SCell being activated is 0ms.

- The interruption is based on assumption that the cell specific reference signals from both cells are available in the same slot. For SCell deactivation X1 is equal to 1ms.

When multiple NR SCells in SCG is activated or deactivated by a single MAC CE

- an interruption on PCell or activated SCell in MCG shall not exceed X1 subframes if the PCell or activated SCell is in the same band as any of the NR SCell being activated with synchronous EN-DC, X1+1 subframes if the PCell or activated SCell is in the same band as any of the NR SCell being activated with asynchronous EN-DC, 1 subframe if the PCell or activated SCell is not the same band as any of the NR SCell being activated with synchronous EN-DC, or 2 subframes if the PCell or activated SCell is not the same band as any of the NR SCell being activated with asynchronous EN-DC. For SCell activation X1 is equal to the longest duration of the SMTC of the NR SCells being activated in the same band as the interrupted cell + 1 ms. The interruption is based on assumption that the cell specific reference signals from both cells are available in the same slot. For SCell deactivation X1 is equal to 1ms.

<End of Change 2>

<Start of Change 3>

#### 7.36.2.3 Interruptions at SCell addition/release

When one SCell belonging to SCG is added or released:

- the requirements in clause 7.8.2.7 shall apply.

When one NR SCell belonging to MCG is added or released:

- an interruption on PSCell or activated SCell in SCG shall not exceed X1 subframes for synchronous intraband NE-DC, X1+1 subframes for asynchronous intraband NE-DC, 1 subframe for synchronous interband NE-DC or 2 subframes for asynchronous interband NE-DC. For SCell addition X1 is equal to the duration of the SMTC of the SCell being added + 1 ms. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being added, the SSB transmission periodicity is assumed to be 5ms and TSMTC duration for the SCell being added is x ms, where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being added. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being added, TSMTC duration for the SCell being added is 0ms.

- The interruption is based on assumption that the cell specific reference signals from both cells are available in the same slot. For SCell release X1 is equal to 1 ms.

#### 7.36.2.4 Interruptions at SCell activation/deactivation

When one SCell belonging to SCG is activated or deactivated:

- the requirements in clause 7.8.2.8 shall apply.

When one NR SCell belonging to MCG is activated or deactivated

- an interruption on PSCell or activated SCell in SCG shall not exceed X1 subframes for synchronous intraband NE-DC, X1+1 subframes for asynchronous intraband NE-DC, 1 subframe for synchronous interband NE-DC or 2 subframes for asynchronous interband NE-DC. For SCell activation X1 is equal to the duration of the SMTC of the NR SCell being activated + 1 ms. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and TSMTC duration for the SCell being activated is x ms, where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being activated. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being activated, TSMTC duration for the SCell being activated is 0ms.

- The interruption is based on assumption that the cell specific reference signals from both cells are available in the same slot. For SCell deactivation X1 is equal to 1 ms.

When multiple NR SCells in MCG is activated or deactivated by a single MAC CE

- an interruption on PSCell or activated SCell in SCG shall not exceed X1 subframes if the PSSCell or activated SCell is in the same band as any of the NR SCell being activated with synchronous NE-DC, X1+1 subframes if the PSCell or activated SCell is in the same band as any of the NR SCell being activated with asynchronous NE-DC, 1 subframe if the PSCell or activated SCell is not the same band as any of the NR SCell being activated with synchronous NE-DC, or 2 subframes if the PSCell or activated SCell is not the same band as any of the NR SCell being activated with asynchronous NE-DC. For SCell activation X1 is equal to the longest duration of the SMTC of the NR SCells being activated in the same band as the interrupted cell + 1 ms. The interruption is based on assumption that the cell specific reference signals from both cells are available in the same slot. For SCell deactivation X1 is equal to 1ms.

<End of Change 3>

<Start of Change 4>

8.17.4A.1.4 NR inter-RAT RSSI measurements

The UE physical layer shall be capable of performing the RSSI measurements, defined in TS 38.215 [58], on one or more inter-RAT carriers operating with CCA, TS 37.213 [57], if the carrier(s) are indicated by higher layers [38], and reporting the RSSI measurements to higher layers. The UE physical layer shall provide to higher layers a single RSSI sample for each OFDM symbol within each configured RSSI measurement duration [38] occurring with a configured RSSI measurement timing configuration periodicity, *rmtc-Periodicity,* according to [38].

**Table 8.17.4A.1.4-1: Measurement period for inter-RAT RSSI measurements with gaps**

|  |  |
| --- | --- |
| **Condition NOTE1,2,3,4** | **T RSSI\_measurement\_period\_NR\_cca** |
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x CSSFNR,EN-DC) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x CSSFNR,EN-DC) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [50]. | |

If the UE requires measurement gaps to perform inter-RAT measurements, a single measurement gap pattern is used for all concurrent inter-frequency and inter-RAT measurements, including inter-RAT RSSI measurements. The RSSI measurement duration and the measurement gap should be aligned, and the following additional condition should be fulfilled:

- Entire RSSI measurement duration should be contained in the measurement gap.

When the inter-RAT RSSI measurement object configured by E-UTRA PCell is on an NR serving frequency carrier and RSSI measurement bandwidth is fully within the active DL BWP of the UE, then the NR intra-frequency RSSI measurements requirements without measurement gap defined in clause 9.2A.7.1 of TS 38.133 [50] shall apply.

The RSSI measurement performed and reported according to this section shall meet the RSSI measurement accuracy requirement in Section TBD.

8.17.4A.1.5 NR inter-RAT channel occupancy measurements

The UE shall be capable of estimating the channel occupancy on one or more carrier frequencies indicated by higher layers [2], based on RSSI samples provided by the physical layer.

**8.17.4A.1.5-1: Measurement period for inter-RAT Channel Occupancy measurements with gaps**

|  |  |
| --- | --- |
| **Condition NOTE1,2,3,4** | **T CO\_measurement\_period\_NR\_cca** |
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x CSSFNR,EN-DC) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x CSSFNR,EN-DC) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [50]. | |

If the UE requires measurement gaps to perform inter-RAT measurements, a single measurement gap pattern is used for all concurrent inter-frequency and inter-RAT measurements, including inter-RAT channel occupancy measurements. The RSSI measurement duration used for channel occupancy measurement and the measurement gap should be aligned, and the following additional condition should be fulfilled:

- Entire RSSI measurement duration should be contained in the measurement gap.

When the inter-RAT channel occupancy measurement object configured by E-UTRA PCell is on an NR serving frequency carrier and RSSI measurement bandwidth is fully within the active DL BWP of the UE, then the NR intra-frequency channel occupancy measurements requirements without measurement gap defined in clause 9.2A.7.2 of TS 38.133 [50] shall apply.

The channel occupancy measurement performed and reported according to this section shall meet the channel occupancy measurement accuracy requirements in Section TBD of TS 38.133 [50].

<End of Change 4>

<Start of Change 5>

### A.8.1.x1 HD-FDD Intra-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

#### A.8.1.x1.1 Test Purpose and Environment

The purpose is to verify that the NB-IoT intra-frequency neighbour cell measurement requirement in clause 8.14.6.3 is met, and UE is only required to be tested in one operation mode out of SA, in-band, guard-band.

The test parameters are given in table A.8.1.x1.1-1 and table A.8.1.x1.1-2 below. nCell1 and nCell2 are NB-IoT cells with different physical cell ID on the same frequency carrier. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.

Table A.8.1.x1.1-1: General test parameters for HD-FDD Intra-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | In-band |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | eCell1, eCell2, nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| E-UTRA RF Channel Number | |  | 1 | One carrier frequency is used for eCell1 and eCell2. |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| NPDCCH repetition level | |  | 8 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311-v13xy | | ms | 15000 | RRC re-establishment timer |
| DRX | |  | OFF |  |
| T1 | | ms | 5000 |  |
| T2 | | ms | 900 |  |
| T3 | | ms | 3100 |  |
| T4 | | ms | 500 |  |
| T5 | | ms | 8520 |  |
| s-MeasureIntra | | dBm | -95 |  |
| s-MeasureDeltaP | | dB | 6 |  |
| t-MeasureDeltaP | | s | 60 |  |

Table A.8.1.x1.1-2: General test parameters for HD-FDD Intra-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | nCell 2 | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | kHz | 200 | | | | | 200 | | | | |
| PRB location within eCell | - | eCell1 BWchannel 5MHz: 17  eCell1 BWchannel 10MHz: 30 | | | | | eCell1 BWchannel 5MHz: 17  eCell1 BWchannel 10MHz: 30 | | | | |
| NPDSCH parameters |  | eCell1 BWchannel 5MHz: R.16 HD-FDD  eCell1 BWchannel 10MHz: R.14 HD-FDD | | | | | eCell1 BWchannel 5MHz: R.16 HD-FDD  eCell1 BWchannel 10MHz: R.14 HD-FDD | | | | |
| NPDCCH parameters |  | eCell1 BWchannel 5MHz: R.38 HD-FDD  eCell1 BWchannel 10MHz: R.26 HD-FDD | | | | | eCell1 BWchannel 5MHz: R.38 HD-FDD  eCell1 BWchannel 10MHz: R.26 HD-FDD | | | | |
| NPBCH\_RA | dB | 0 | | | | | 0 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | Specified in Table A.8.1.x1.1-3 | | | | | | | | | |
|  | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| Note2 | dB | 9 | -3 | -8.5 | -Infinity | -Infinity | -Infinity | -Infinity | 2.2 | 4 | 4 |
| NRSRP Note2 | dBm/15 kHz | -89 | -101 | -101 | -Infinity | -Infinity | -Infinity | -Infinity | -94 | -94 | -94 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to nCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table A.8.1.x1.1-3: eCell 1 and eCell2 specific test parameters for HD-FDD Intra-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | | | | eCell 2 | | | | |
|  |  | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | MHz | 5 or 10 | | | | | 5 or 10 | | | | |
| NOCNG Patterns |  | BWchannel 5MHz: NOP.4 FDD  BWchannel 10MHz: NOP.1 FDD | | | | | BWchannel 5MHz: NOP.4 FDD  BWchannel 10MHz: NOP.1 FDD | | | | |
| PBCH\_RA | | dB | 0 | | | | | 0 | | | | |
| PBCH\_RB | | dB |
| PSS\_RA | | dB |
| SSS\_RA | | dB |
| PDCCH\_RA | | dB |
| PDCCH\_RB | | dB |
| PCFICH\_RB | | dB |
| OCNG\_RANote 1 | | dB |
| OCNG\_RBNote 1 | | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Note2 | dBm/15 kHz | -98 | | | | | -98 | | | | |
|  | dBm | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to eCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: OCNG shall be used such that the eCell 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 .  Note 3: Es/Iot and RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

#### A.8.1.x1.2 Test Requirements

UE shall trigger RLF during T4 and complete neighbour cell measurement before end of T4. UE shall start to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2 before the end of T5 to fulfil the RRC re-establishment delay to a known NB-IoT FDD intra frequency cell.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 0 ms

- TSI\_NB-IoT = 8320 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT FDD cell.

- TPRACH\_NB-IoT = 80 ms; it is the additional delay caused by the random access procedure.

<End of Change 5>

<Starr of Change 6>

### A.8.1.x2 HD-FDD Intra-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

#### A.8.1.x2.1 Test Purpose and Environment

The purpose is to verify that the NB-IoT intra-frequency neighbour cell measurement requirement in clause 8.14.6.3 is met, and UE is only required to be tested in one operation mode out of SA, in-band, guard-band.

The test parameters are given in table A.8.1.x2.1-1 and table A.8.1.x2.1-2 below. nCell1 and nCell2 are NB-IoT cells with different physical cell ID on the same frequency carrier. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.

Table A.8.1.x2.1-1: General test parameters for HD-FDD Intra-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | guard-band |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| NPDCCH repetition level | |  | 8 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311-v13xy | | ms | 15000 | RRC re-establishment timer |
| DRX | |  | OFF |  |
| T1 | | ms | 5000 |  |
| T2 | | ms | 900 |  |
| T3 | | ms | 3100 |  |
| T4 | | ms | 500 |  |
| T5 | | ms | 8520 |  |
| s-MeasureIntra | | dBm | -95 |  |
| s-MeasureDeltaP | | dB | 6 |  |
| t-MeasureDeltaP | | s | 60 |  |

Table A.8.1.x2.1-2: General test parameters for HD-FDD Intra-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | nCell 2 | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | kHz | 200 | | | | | 200 | | | | |
| PRB location within eCell | - | eCell1 BWchannel 5MHz: 17  eCell1 BWchannel 10MHz: 30 | | | | | eCell1 BWchannel 5MHz: 17  eCell1 BWchannel 10MHz: 30 | | | | |
| NPDSCH parameters |  | eCell1 BWchannel 5MHz: R.32 HD-FDD  eCell1 BWchannel 10MHz: R.22 HD-FDD | | | | | eCell1 BWchannel 5MHz: R.32 HD-FDD  eCell1 BWchannel 10MHz: R.22 HD-FDD | | | | |
| NPDCCH parameters |  | eCell1 BWchannel 5MHz: R.42 HD-FDD  eCell1 BWchannel 10MHz: R.34 HD-FDD | | | | | eCell1 BWchannel 5MHz: R.42 HD-FDD  eCell1 BWchannel 10MHz: R.34 HD-FDD | | | | |
| NPBCH\_RA | dB | 0 | | | | | 0 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | Specified in Table A.8.1.x2.1-3 | | | | | | | | | |
|  | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| Note2 | dB | 9 | -3 | -8.5 | -Infinity | -Infinity | -Infinity | -Infinity | 2.2 | 4 | 4 |
| NRSRP Note2 | dBm/15 kHz | -89 | -101 | -101 | -Infinity | -Infinity | -Infinity | -Infinity | -94 | -94 | -94 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to nCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table A.8.1.x2.1-3: eCell 1 and eCell2 specific test parameters for HD-FDD Intra-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | | | | eCell 2 | | | | |
|  |  | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | MHz | 5 or 10 | | | | | 5 or 10 | | | | |
| NOCNG Patterns |  | BWchannel 5MHz: NOP.5 FDD  BWchannel 10MHz: NOP.2 FDD | | | | | BWchannel 5MHz: NOP.5 FDD  BWchannel 10MHz: NOP.2 FDD | | | | |
| PBCH\_RA | dB | 0 | | | | | 0 | | | | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PCFICH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Note2 | dBm/15 kHz | -98 | | | | | -98 | | | | |
|  | dBm | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to eCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: OCNG shall be used such that the eCell 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 .  Note 3: Es/Iot and RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

#### A.8.1.x2.2 Test Requirements

UE shall trigger RLF during T4 and complete neighbour cell measurement before end of T4. UE shall start to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2 before the end of T5 to fulfil the RRC re-establishment delay to a known NB-IoT FDD intra frequency cell.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 0 ms

- TSI\_NB-IoT = 8320 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT FDD cell.

- TPRACH\_NB-IoT = 80 ms; it is the additional delay caused by the random access procedure.

<End of Change 6>

<Start of Change 7>

### A.8.1.x3 HD-FDD Intra-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

#### A.8.1.x3.1 Test Purpose and Environment

The purpose is to verify that the NB-IoT intra-frequency neighbour cell measurement requirement in clause 8.14.6.3 is met, and UE is only required to be tested in one operation mode out of SA, in-band, guard-band.

The test parameters are given in table A.8.1.x3.1-1 and table A.8.1.x3.1-2 below. nCell1 and nCell2 are NB-IoT cells with different physical cell ID on the same frequency carrier. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.

Table A.8.1.x3.1-1: General test parameters for HD-FDD Intra-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | standalone |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| NPDCCH repetition level | |  | 8 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311-v13xy | | ms | 15000 | RRC re-establishment timer |
| DRX | |  | OFF |  |
| T1 | | ms | 5000 |  |
| T2 | | ms | 900 |  |
| T3 | | ms | 3100 |  |
| T4 | | ms | 500 |  |
| T5 | | ms | 8520 |  |
| s-MeasureIntra | | dBm | -95 |  |
| s-MeasureDeltaP | | dB | 6 |  |
| t-MeasureDeltaP | | s | 60 |  |

Table A.8.1.x3.1-2: General test parameters for HD-FDD Intra-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | nCell 2 | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | kHz | 200 | | | | | 200 | | | | |
| NPDSCH parameters |  | R.18 HD-FDD | | | | | R.18 HD-FDD | | | | |
| NPDCCH parameters |  | R.30 HD-FDD | | | | | R.30 HD-FDD | | | | |
| NOCNG Patterns |  | NOP.3 FDD | | | | | NOP.3 FDD | | | | |
| NPBCH\_RA | dB | 0 | | | | | 0 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | -98 | | | | | | | | | |
|  | dB | 9 | -3 | -8.5 | -Infinity | -Infinity | -Infinity | -Infinity | 2.2 | 4 | 4 |
| Note2 | dB | 9 | -3 | -8.5 | -Infinity | -Infinity | -Infinity | -Infinity | 2.2 | 4 | 4 |
| NRSRP Note2 | dBm/15 kHz | -89 | -101 | -101 | -Infinity | -Infinity | -Infinity | -Infinity | -94 | -94 | -94 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to nCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

#### A.8.1.x3.2 Test Requirements

UE shall trigger RLF during T4 and complete neighbour cell measurement before end of T4. UE shall start to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2 before the end of T5 to fulfil the RRC re-establishment delay to a known NB-IoT FDD intra frequency cell.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 0 ms

- TSI\_NB-IoT = 8320 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT FDD cell.

- TPRACH\_NB-IoT = 80 ms; it is the additional delay caused by the random access procedure.

<End of Change 7>

<Start of Change 8>

### A.8.1.x4 TDD Intra-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

#### A.8.1.x4.1 Test Purpose and Environment

The purpose is to verify that the NB-IoT intra-frequency neighbour cell measurement requirement in clause 8.14.6.3 is met, and UE is only required to be tested in one operation mode out of SA, in-band, guard-band.

The test parameters are given in table A.8.1.x4.1-1 and table A.8.1.x4.1-2 below. nCell1 and nCell2 are NB-IoT cells with different physical cell ID on the same frequency carrier. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.

Table A.8.1.x4.1-1: General test parameters for TDD Intra-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | In-band |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | eCell1, eCell2, nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| E-UTRA RF Channel Number | |  | 1 | One carrier frequency is used for eCell1 and eCell2. |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| NPDCCH repetition level | |  | 8 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311-v13xy | | ms | 15000 | RRC re-establishment timer |
| DRX | |  | OFF |  |
| T1 | | ms | 5 |  |
| T2 | | ms | 900 |  |
| T3 | | ms | 3100 |  |
| T4 | | ms | 500 |  |
| T5 | | ms | 8520 |  |
| s-MeasureIntra | | dBm | -95 |  |
| s-MeasureDeltaP | | dB | 6 |  |
| t-MeasureDeltaP | | s | 60 |  |

Table A.8.1.x4.1-2: General test parameters for TDD Intra-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | nCell 2 | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | kHz | 200 | | | | | 200 | | | | |
| PRB location within eCell | - | eCell1 BWchannel 10MHz: 30 | | | | | e  eCell1 BWchannel 10MHz: 30 | | | | |
| NPDSCH parameters |  | eCell1 BWchannel 10MHz: R.14 TDD | | | | | eCell1 BWchannel 10MHz: R.14 TDD | | | | |
| NPDCCH parameters |  | eCell1 BWchannel 10MHz: R.26 TDD | | | | | eCell1 BWchannel 10MHz: R.26 TDD | | | | |
| NPBCH\_RA | dB | 0 | | | | | 0 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | Specified in Table A.8.1.x1.1-3 | | | | | | | | | |
|  | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| Note2 | dB | 9 | -3 | -8.5 | -Infinity | -Infinity | -Infinity | -Infinity | 2.2 | 4 | 4 |
| NRSRP Note2 | dBm/15 kHz | -89 | -101 | -101 | -Infinity | -Infinity | -Infinity | -Infinity | -94 | -94 | -94 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to nCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table A.8.1.x4.1-3: eCell 1 and eCell2 specific test parameters for TDD Intra-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | | | | eCell 2 | | | | |
|  |  | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | MHz | 10 | | | | | 10 | | | | |
| NOCNG Patterns |  | BWchannel 10MHz: NOP.1 TDD | | | | | BWchannel 10MHz: NOP.1 TDD | | | | |
| PBCH\_RA | | dB | 0 | | | | | 0 | | | | |
| PBCH\_RB | | dB |
| PSS\_RA | | dB |
| SSS\_RA | | dB |
| PDCCH\_RA | | dB |
| PDCCH\_RB | | dB |
| PCFICH\_RB | | dB |
| OCNG\_RANote 1 | | dB |
| OCNG\_RBNote 1 | | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Note2 | dBm/15 kHz | -98 | | | | | -98 | | | | |
|  | dBm | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to eCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: OCNG shall be used such that the eCell 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 .  Note 3: Es/Iot and RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

#### A.8.1.x4.2 Test Requirements

UE shall trigger RLF during T4 and complete neighbour cell measurement before end of T4. UE shall start to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2 before the end of T5 to fulfil the RRC re-establishment delay to a known NB-IoT TDD intra frequency cell.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 0 ms

- TSI\_NB-IoT = 8320 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT TDD cell.

- TPRACH\_NB-IoT = 80 ms; it is the additional delay caused by the random access procedure.

<End of Change 8>

<Start of Change 9>

### A.8.1.x5 TDD Intra-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

#### A.8.1.x5.1 Test Purpose and Environment

The purpose is to verify that the NB-IoT intra-frequency neighbour cell measurement requirement in clause 8.14.6.3 is met, and UE is only required to be tested in one operation mode out of SA, in-band, guard-band.

The test parameters are given in table A.8.1.x5.1-1 and table A.8.1.x5.1-2 below. nCell1 and nCell2 are NB-IoT cells with different physical cell ID on the same frequency carrier. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.

Table A.8.1.x5.1-1: General test parameters for TDD Intra-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | guard-band |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| NPDCCH repetition level | |  | 8 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311-v13xy | | ms | 15000 | RRC re-establishment timer |
| DRX | |  | OFF |  |
| T1 | | ms | 5 |  |
| T2 | | ms | 900 |  |
| T3 | | ms | 3100 |  |
| T4 | | ms | 500 |  |
| T5 | | ms | 8520 |  |
| s-MeasureIntra | | dBm | -95 |  |
| s-MeasureDeltaP | | dB | 6 |  |
| t-MeasureDeltaP | | s | 60 |  |

Table A.8.1.x5.1-2: General test parameters for TDD Intra-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | nCell 2 | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | kHz | 200 | | | | | 200 | | | | |
| PRB location within eCell | - | eCell1 BWchannel 10MHz: 30 | | | | | eCell1 BWchannel 10MHz: 30 | | | | |
| NPDSCH parameters |  | eCell1 BWchannel 10MHz: R.22 TDD | | | | | eCell1 BWchannel 10MHz: R.22 TDD | | | | |
| NPDCCH parameters |  | eCell1 BWchannel 10MHz: R.34 TDD | | | | | eCell1 BWchannel 10MHz: R.34 TDD | | | | |
| NPBCH\_RA | dB | 0 | | | | | 0 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | Specified in Table A.8.1.x2.1-3 | | | | | | | | | |
|  | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| Note2 | dB | 9 | -3 | -8.5 | -Infinity | -Infinity | -Infinity | -Infinity | 2.2 | 4 | 4 |
| NRSRP Note2 | dBm/15 kHz | -89 | -101 | -101 | -Infinity | -Infinity | -Infinity | -Infinity | -94 | -94 | -94 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to nCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table A.8.1.x5.1-3: eCell 1 and eCell2 specific test parameters for TDD Intra-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | | | | eCell 2 | | | | |
|  |  | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | MHz | 10 | | | | | 10 | | | | |
| NOCNG Patterns |  | BWchannel 10MHz: NOP.2 TDD | | | | | BWchannel 10MHz: NOP.2 TDD | | | | |
| PBCH\_RA | dB | 0 | | | | | 0 | | | | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PCFICH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Note2 | dBm/15 kHz | -98 | | | | | -98 | | | | |
|  | dBm | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to eCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: OCNG shall be used such that the eCell 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 .  Note 3: Es/Iot and RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

#### A.8.1.x5.2 Test Requirements

UE shall trigger RLF during T4 and complete neighbour cell measurement before end of T4. UE shall start to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2 before the end of T5 to fulfil the RRC re-establishment delay to a known NB-IoT TDD intra frequency cell.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 0 ms

- TSI\_NB-IoT = 8320 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT TDD cell.

- TPRACH\_NB-IoT = 80 ms; it is the additional delay caused by the random access procedure.

<End of Change 9>

<Start of Change 10>

### A.8.1.x6 TDD Intra-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

#### A.8.1.x6.1 Test Purpose and Environment

The purpose is to verify that the NB-IoT intra-frequency neighbour cell measurement requirement in clause 8.14.6.3 is met, and UE is only required to be tested in one operation mode out of SA, in-band, guard-band.

The test parameters are given in table A.8.1.x6.1-1 and table A.8.1.x6.1-2 below. nCell1 and nCell2 are NB-IoT cells with different physical cell ID on the same frequency carrier. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.

Table A.8.1.x6.1-1: General test parameters for TDD Intra-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | standalone |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| NPDCCH repetition level | |  | 8 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311-v13xy | | ms | 15000 | RRC re-establishment timer |
| DRX | |  | OFF |  |
| T1 | | ms | 5 |  |
| T2 | | ms | 900 |  |
| T3 | | ms | 3100 |  |
| T4 | | ms | 500 |  |
| T5 | | ms | 8520 |  |
| s-MeasureIntra | | dBm | -95 |  |
| s-MeasureDeltaP | | dB | 6 |  |
| t-MeasureDeltaP | | s | 60 |  |

Table A.8.1.x6.1-2: General test parameters for TDD Intra-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | nCell 2 | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | kHz | 200 | | | | | 200 | | | | |
| NPDSCH parameters |  | R.18 TDD | | | | | R.18 TDD | | | | |
| NPDCCH parameters |  | R.30 TDD | | | | | R.30 TDD | | | | |
| NOCNG Patterns |  | NOP.3 TDD | | | | | NOP.3 TDD | | | | |
| NPBCH\_RA | dB | 0 | | | | | 0 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | -98 | | | | | | | | | |
|  | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| Note2 | dB | 9 | -3 | -8.5 | -Infinity | -Infinity | -Infinity | -Infinity | 2.2 | 4 | 4 |
| NRSRP Note2 | dBm/15 kHz | -89 | -101 | -101 | -Infinity | -Infinity | -Infinity | -Infinity | -94 | -94 | -94 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to nCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

#### A.8.1.x6.2 Test Requirements

UE shall trigger RLF during T4 and complete neighbour cell measurement before end of T4. UE shall start to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2 before the end of T5 to fulfil the RRC re-establishment delay to a known NB-IoT TDD intra frequency cell.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 0 ms

- TSI\_NB-IoT = 8320 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT TDD cell.

- TPRACH\_NB-IoT = 80 ms; it is the additional delay caused by the random access procedure.

<End of Change 10>

<Start of Change 11>

### A.8.1.x7 HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

#### A.8.1.x7.1 Test Purpose and Environment

The purpose is to verify that the NB-IoT inter-frequency neighbour cell measurement requirement in clause 8.14.6.4 is met, and UE is only required to be tested in one operation mode out of SA, in-band, guard-band.

The test parameters are given in table A.8.1.x7.1-1 and table A.8.1.x7.1-2 below. nCell1 and nCell2 are NB-IoT cells with different physical cell ID on different frequency carriers where nCell1 is in anchor carrier. The UE shall be indicated with the carrier frequency of nCell 2 which is the anchor carrier to ensure that the UE has the context of the carrier frequency of nCell 2. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.

Table A.8.1.x7.1-1: General test parameters for HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | In-band |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | eCell1, eCell2, nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| E-UTRA RF Channel Number | |  | 1 | One carrier frequency is used for eCell1 and eCell2. |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| NPDCCH repetition level | |  | 8 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311-v13xy | | ms | 15000 | RRC re-establishment timer |
| DRX | |  | 256 | See Table A.8.1.x1.1-4 |
| T1 | | ms | 5 |  |
| T2 | | ms | 1300 |  |
| T3 | | ms | 8500 |  |
| T4 | | ms | 5200 |  |
| T5 | | ms | 8520 |  |
| s-MeasureInter | | dBm | -95 |  |
| s-MeasureDeltaP | | dB | 6 |  |
| t-MeasureDeltaP | | s | 60 |  |

Table A.8.1.x7.1-2: General test parameters for HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | nCell 2 | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | kHz | 200 | | | | | 200 | | | | |
| PRB location within eCell | - | eCell1 BWchannel 5MHz: 17  eCell1 BWchannel 10MHz: 30 | | | | | eCell1 BWchannel 5MHz: 17  eCell1 BWchannel 10MHz: 30 | | | | |
| NPDSCH parameters |  | eCell1 BWchannel 5MHz: R.16 HD-FDD  eCell1 BWchannel 10MHz: R.14 HD-FDD | | | | | eCell1 BWchannel 5MHz: R.16 HD-FDD  eCell1 BWchannel 10MHz: R.14 HD-FDD | | | | |
| NPDCCH parameters |  | eCell1 BWchannel 5MHz: R.38 HD-FDD  eCell1 BWchannel 10MHz: R.26 HD-FDD | | | | | eCell1 BWchannel 5MHz: R.38 HD-FDD  eCell1 BWchannel 10MHz: R.26 HD-FDD | | | | |
| NPBCH\_RA | dB | 0 | | | | | 0 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | Specified in Table A.8.1.x1.1-3 | | | | | | | | | |
|  | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| Note2 | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| NRSRP Note2 | dBm/15 kHz | -89 | -101 | -101 | -Infinity | -Infinity | -Infinity | -Infinity | -94 | -94 | -94 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to nCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table A.8.1.x7.1-3: eCell 1 and eCell2 specific test parameters for HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | | | | eCell 2 | | | | |
|  |  | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | MHz | 5 or 10 | | | | | 5 or 10 | | | | |
| NOCNG Patterns |  | BWchannel 5MHz: NOP.4 FDD  BWchannel 10MHz: NOP.1 FDD | | | | | BWchannel 5MHz: NOP.4 FDD  BWchannel 10MHz: NOP.1 FDD | | | | |
| PBCH\_RA | | dB | 0 | | | | | 0 | | | | |
| PBCH\_RB | | dB |
| PSS\_RA | | dB |
| SSS\_RA | | dB |
| PDCCH\_RA | | dB |
| PDCCH\_RB | | dB |
| PCFICH\_RB | | dB |
| OCNG\_RANote 1 | | dB |
| OCNG\_RBNote 1 | | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Note2 | dBm/15 kHz | -98 | | | | | -98 | | | | |
|  | dBm | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to eCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: OCNG shall be used such that the eCell 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 .  Note 3: Es/Iot and RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table 8.1.x7.1-4: DRX-Configuration for HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| onDurationTimer | pp1 | As specified in clause 6.7.3 in TS 36.331 |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| drx-StartOffset | 0 |

#### A.8.1.x7.2 Test Requirements

UE shall trigger RLF during T4 and complete neighbour cell measurement before end of T4. UE shall start to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2 before the end of T5 to fulfil the RRC re-establishment delay to a known NB-IoT FDD inter frequency cell.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 0 ms

- TSI\_NB-IoT = 8320 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT FDD cell.

- TPRACH\_NB-IoT = 80 ms; it is the additional delay caused by the random access procedure.

<End of Change 11>

<Start of Change 12>

### A.8.1.x8 HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

#### A.8.1.x8.1 Test Purpose and Environment

The purpose is to verify that the NB-IoT inter-frequency neighbour cell measurement requirement in clause 8.14.6.4 is met, and UE is only required to be tested in one operation mode out of SA, in-band, guard-band.

The test parameters are given in table A.8.1.x8.1-1 and table A.8.1.x8.1-2 below. nCell1 and nCell2 are NB-IoT cells with different physical cell ID on different frequency carriers where nCell1 is in anchor carrier. The UE shall be indicated with the carrier frequency of nCell 2 which is the anchor carrier to ensure that the UE has the context of the carrier frequency of nCell 2. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.

Table A.8.1.x8.1-1: General test parameters for HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | guard-band |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| NPDCCH repetition level | |  | 8 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311-v13xy | | ms | 15000 | RRC re-establishment timer |
| DRX | |  | 256 | See Table A.8.1.x1.1-4 |
| T1 | | ms | 5 |  |
| T2 | | ms | 1300 |  |
| T3 | | ms | 8500 |  |
| T4 | | ms | 5200 |  |
| T5 | | ms | 8520 |  |
| s-MeasureInter | | dBm | -95 |  |
| s-MeasureDeltaP | | dB | 6 |  |
| t-MeasureDeltaP | | s | 60 |  |

Table A.8.1.x8.1-2: General test parameters for HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | nCell 2 | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | kHz | 200 | | | | | 200 | | | | |
| PRB location within eCell | - | eCell1 BWchannel 5MHz: 17  eCell1 BWchannel 10MHz: 30 | | | | | eCell1 BWchannel 5MHz: 17  eCell1 BWchannel 10MHz: 30 | | | | |
| NPDSCH parameters |  | eCell1 BWchannel 5MHz: R.32 HD-FDD  eCell1 BWchannel 10MHz: R.22 HD-FDD | | | | | eCell1 BWchannel 5MHz: R.32 HD-FDD  eCell1 BWchannel 10MHz: R.22 HD-FDD | | | | |
| NPDCCH parameters |  | eCell1 BWchannel 5MHz: R.42 HD-FDD  eCell1 BWchannel 10MHz: R.34 HD-FDD | | | | | eCell1 BWchannel 5MHz: R.42 HD-FDD  eCell1 BWchannel 10MHz: R.34 HD-FDD | | | | |
| NPBCH\_RA | dB | 0 | | | | | 0 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | Specified in Table A.8.1.x2.1-3 | | | | | | | | | |
|  | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| Note2 | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| NRSRP Note2 | dBm/15 kHz | -89 | -101 | -101 | -Infinity | -Infinity | -Infinity | -Infinity | -94 | -94 | -94 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to nCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table A.8.1.x8.1-3: eCell 1 and eCell2 specific test parameters for HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | | | | eCell 2 | | | | |
|  |  | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | MHz | 5 or 10 | | | | | 5 or 10 | | | | |
| NOCNG Patterns |  | BWchannel 5MHz: NOP.5 FDD  BWchannel 10MHz: NOP.2 FDD | | | | | BWchannel 5MHz: NOP.5 FDD  BWchannel 10MHz: NOP.2 FDD | | | | |
| PBCH\_RA | dB | 0 | | | | | 0 | | | | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PCFICH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Note2 | dBm/15 kHz | -98 | | | | | -98 | | | | |
|  | dBm | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to eCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: OCNG shall be used such that the eCell 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 .  Note 3: Es/Iot and RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table 8.1.x8.1-4: DRX-Configuration for HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in Guard-Band mode under normal coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| onDurationTimer | pp1 | As specified in clause 6.7.3 in TS 36.331 |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| drx-StartOffset | 0 |

#### A.8.1.x8.2 Test Requirements

UE shall trigger RLF during T4 and complete neighbour cell measurement before end of T4. UE shall start to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2 before the end of T5 to fulfil the RRC re-establishment delay to a known NB-IoT FDD inter frequency cell.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 0 ms

- TSI\_NB-IoT = 8320 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT FDD cell.

- TPRACH\_NB-IoT = 80 ms; it is the additional delay caused by the random access procedure.

<End of Change 12>

<Start of Change 13>

### A.8.1.x10 HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

#### A.8.1.x10.1 Test Purpose and Environment

The purpose is to verify that the NB-IoT inter-frequency neighbour cell measurement requirement in clause 8.14.6.4 is met, and UE is only required to be tested in one operation mode out of SA, in-band, guard-band.

The test parameters are given in table A.8.1.x10.1-1 and table A.8.1.x10.1-2 below. nCell1 and nCell2 are NB-IoT cells with different physical cell ID on different frequency carrier where nCell1 is in anchor carrier. The UE shall be indicated with the carrier frequency of nCell 2 which is the anchor carrier to ensure that the UE has the context of the carrier frequency of nCell 2. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.

Table A.8.1.x10.1-1: General test parameters for HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | standalone |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| NPDCCH repetition level | |  | 8 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311-v13xy | | ms | 15000 | RRC re-establishment timer |
| DRX | |  | 256 | See Table A.8.1.x1.1-4 |
| T1 | | ms | 5 |  |
| T2 | | ms | 1300 |  |
| T3 | | ms | 8500 |  |
| T4 | | ms | 5200 |  |
| T5 | | ms | 8520 |  |
| s-MeasureInter | | dBm | -95 |  |
| s-MeasureDeltaP | | dB | 6 |  |
| t-MeasureDeltaP | | s | 60 |  |

Table A.8.1.x10.1-2: General test parameters for HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | nCell 2 | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | kHz | 200 | | | | | 200 | | | | |
| NPDSCH parameters |  | R.18 HD-FDD | | | | | R.18 HD-FDD | | | | |
| NPDCCH parameters |  | R.30 HD-FDD | | | | | R.30 HD-FDD | | | | |
| NOCNG Patterns |  | NOP.3 FDD | | | | | NOP.3 FDD | | | | |
| NPBCH\_RA | dB | 0 | | | | | 0 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | -98 | | | | | | | | | |
|  | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| Note2 | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| NRSRP Note2 | dBm/15 kHz | -89 | -101 | -101 | -Infinity | -Infinity | -Infinity | -Infinity | -94 | -94 | -94 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to nCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table 8.1.x10.1-4: DRX-Configuration for HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| onDurationTimer | pp1 | As specified in clause 6.7.3 in TS 36.331 |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| drx-StartOffset | 0 |

#### A.8.1.x10.2 Test Requirements

UE shall trigger RLF during T4 and complete neighbour cell measurement before end of T4. UE shall start to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2 before the end of T5 to fulfil the RRC re-establishment delay to a known NB-IoT FDD inter frequency cell.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 0 ms

- TSI\_NB-IoT = 8320 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT FDD cell.

- TPRACH\_NB-IoT = 80 ms; it is the additional delay caused by the random access procedure.

<End of Change 13>

<Start of Change 14>

### A.8.1.x11 TDD Inter-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

#### A.8.1.x11.1 Test Purpose and Environment

The purpose is to verify that the NB-IoT inter-frequency neighbour cell measurement requirement in clause 8.14.6. 4 is met, and UE is only required to be tested in one operation mode out of SA, in-band, guard-band.

The test parameters are given in table A.8.1.x11.1-1 and table A.8.1.x11.1-2 below. nCell1 and nCell2 are NB-IoT cells with different physical cell ID on different frequency carriers where nCell1 is in anchor carrier. The UE shall be indicated with the carrier frequency of nCell 2 which is the anchor carrier to ensure that the UE has the context of the carrier frequency of nCell 2. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.

Table A.8.1.x11.1-1: General test parameters for TDD Inter-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | In-band |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | eCell1, eCell2, nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| E-UTRA RF Channel Number | |  | 1 | One carrier frequency is used for eCell1 and eCell2. |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| NPDCCH repetition level | |  | 8 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311-v13xy | | ms | 15000 | RRC re-establishment timer |
| DRX | |  | 256 | See Table A.8.1.x1.1-4 |
| T1 | | ms | 5 |  |
| T2 | | ms | 1300 |  |
| T3 | | ms | 8500 |  |
| T4 | | ms | 5200 |  |
| T5 | | ms | 8520 |  |
| s-MeasureInter | | dBm | -95 |  |
| s-MeasureDeltaP | | dB | 6 |  |
| t-MeasureDeltaP | | s | 60 |  |

Table A.8.1.x11.1-2: General test parameters for TDD Inter-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | nCell 2 | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | kHz | 200 | | | | | 200 | | | | |
| PRB location within eCell | - | eCell1 BWchannel 10MHz: 30 | | | | | eCell1 BWchannel 10MHz: 30 | | | | |
| NPDSCH parameters |  | eCell1 BWchannel 10MHz: R.14 TDD | | | | | eCell1 BWchannel 10MHz: R.14 TDD | | | | |
| NPDCCH parameters |  | eCell1 BWchannel 10MHz: R.26 TDD | | | | | eCell1 BWchannel 10MHz: R.26 TDD | | | | |
| NPBCH\_RA | dB | 0 | | | | | 0 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | Specified in Table A.8.1.x1.1-3 | | | | | | | | | |
|  | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| Note2 | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| NRSRP Note2 | dBm/15 kHz | -89 | -101 | -101 | -Infinity | -Infinity | -Infinity | -Infinity | -94 | -94 | -94 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to nCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table A.8.1.x11.1-3: eCell 1 and eCell2 specific test parameters for TDD Inter-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | | | | eCell 2 | | | | |
|  |  | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | MHz | 10 | | | | | 10 | | | | |
| NOCNG Patterns |  | BWchannel 10MHz: NOP.1 TDD | | | | | BWchannel 10MHz: NOP.1 TDD | | | | |
| PBCH\_RA | | dB | 0 | | | | | 0 | | | | |
| PBCH\_RB | | dB |
| PSS\_RA | | dB |
| SSS\_RA | | dB |
| PDCCH\_RA | | dB |
| PDCCH\_RB | | dB |
| PCFICH\_RB | | dB |
| OCNG\_RANote 1 | | dB |
| OCNG\_RBNote 1 | | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Note2 | dBm/15 kHz | -98 | | | | | -98 | | | | |
|  | dBm | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to eCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: OCNG shall be used such that the eCell 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 .  Note 3: Es/Iot and RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table 8.1.x11.1-4: DRX-Configuration for TDD Inter-frequency neighbour cell measurement for UE category NB1 in In-Band mode under normal coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| onDurationTimer | pp1 | As specified in clause 6.7.3 in TS 36.331 |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| drx-StartOffset | 0 |

#### A.8.1.x11.2 Test Requirements

UE shall trigger RLF during T4 and complete neighbour cell measurement before end of T4. UE shall start to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2 before the end of T5 to fulfil the RRC re-establishment delay to a known NB-IoT TDD inter frequency cell.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 0 ms

- TSI\_NB-IoT = 8320 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT TDD cell.

- TPRACH\_NB-IoT = 80 ms; it is the additional delay caused by the random access procedure.

<End of Change 14>

<Start of Change 15>

### A.8.1.x12 TDD Inter-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

#### A.8.1.x12.1 Test Purpose and Environment

The purpose is to verify that the NB-IoT inter-frequency neighbour cell measurement requirement in clause 8.14.6. 4 is met, and UE is only required to be tested in one operation mode out of SA, in-band, guard-band.

The test parameters are given in table A.8.1.x12.1-1 and table A.8.1.x12.1-2 below. nCell1 and nCell2 are NB-IoT cells with different physical cell ID on different frequency carriers where nCell1 is in anchor carrier. The UE shall be indicated with the carrier frequency of nCell 2 which is the anchor carrier to ensure that the UE has the context of the carrier frequency of nCell 2. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.

Table A.8.1.x12.1-1: General test parameters for TDD Inter-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | guard-band |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| NPDCCH repetition level | |  | 8 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311-v13xy | | ms | 15000 | RRC re-establishment timer |
| DRX | |  | 256 | See Table A.8.1.x1.1-4 |
| T1 | | ms | 5 |  |
| T2 | | ms | 1300 |  |
| T3 | | ms | 8500 |  |
| T4 | | ms | 5200 |  |
| T5 | | ms | 8520 |  |
| s-MeasureInter | | dBm | -95 |  |
| s-MeasureDeltaP | | dB | 6 |  |
| t-MeasureDeltaP | | s | 60 |  |

Table A.8.1.x12.1-2: General test parameters for TDD Inter-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | nCell 2 | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | kHz | 200 | | | | | 200 | | | | |
| PRB location within eCell | - | eCell1 BWchannel 10MHz: 30 | | | | | eCell1 BWchannel 10MHz: 30 | | | | |
| NPDSCH parameters |  | eCell1 BWchannel 10MHz: R.22 TDD | | | | | eCell1 BWchannel 10MHz: R.22 TDD | | | | |
| NPDCCH parameters |  | eCell1 BWchannel 10MHz: R.34 TDD | | | | | eCell1 BWchannel 10MHz: R.34 TDD | | | | |
| NPBCH\_RA | dB | 0 | | | | | 0 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | Specified in Table A.8.1.x2.1-3 | | | | | | | | | |
|  | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| Note2 | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| NRSRP Note2 | dBm/15 kHz | -89 | -101 | -101 | -Infinity | -Infinity | -Infinity | -Infinity | -94 | -94 | -94 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to nCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table A.8.1.x12.1-3: eCell 1 and eCell2 specific test parameters for TDD Inter-frequency neighbour cell measurement for UE category NB1 in guard-band mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | | | | eCell 2 | | | | |
|  |  | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | MHz | 10 | | | | | 10 | | | | |
| NOCNG Patterns |  | BWchannel 10MHz: NOP.2 TDD | | | | | BWchannel 10MHz: NOP.2 TDD | | | | |
| PBCH\_RA | dB | 0 | | | | | 0 | | | | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PCFICH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Note2 | dBm/15 kHz | -98 | | | | | -98 | | | | |
|  | dBm | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to eCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: OCNG shall be used such that the eCell 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 .  Note 3: Es/Iot and RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table 8.1.x12.1-4: DRX-Configuration for HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in Guard-Band mode under normal coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| onDurationTimer | pp1 | As specified in clause 6.7.3 in TS 36.331 |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| drx-StartOffset | 0 |

#### A.8.1.x12.2 Test Requirements

UE shall trigger RLF during T4 and complete neighbour cell measurement before end of T4. UE shall start to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2 before the end of T5 to fulfil the RRC re-establishment delay to a known NB-IoT TDD inter frequency cell.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 0 ms

- TSI\_NB-IoT = 8320 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT TDD cell.

- TPRACH\_NB-IoT = 80 ms; it is the additional delay caused by the random access procedure.

<End of Change 15>

<Start of Change 16>

### A.8.1.x13 TDD Inter-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

#### A.8.1.x13.1 Test Purpose and Environment

The purpose is to verify that the NB-IoT inter-frequency neighbour cell measurement requirement in clause 8.14.6. 4 is met, and UE is only required to be tested in one operation mode out of SA, in-band, guard-band.

The test parameters are given in table A.8.1.x13.1-1 and table A.8.1.x13.1-2 below. nCell1 and nCell2 are NB-IoT cells with different physical cell ID on different frequency carrier where nCell1 is in anchor carrier. The UE shall be indicated with the carrier frequency of nCell 2 which is the anchor carrier to ensure that the UE has the context of the carrier frequency of nCell 2. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.

Table A.8.1.x13.1-1: General test parameters for TDD Inter-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IOT operational mode | |  | standalone |  |
| Initial condition | Active cell |  | nCell1 |  |
| Neighbour cells |  | nCell2 |  |
| Final condition | Active cell |  | nCell2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| NPRACH Configuration | |  | NPRACH.R-1 | Refer to A.3.18 |
| NPDCCH repetition level | |  | 8 | NPDCCH Rmax |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311-v13xy | | ms | 15000 | RRC re-establishment timer |
| DRX | |  | 256 | See Table A.8.1.x1.1-4 |
| T1 | | ms | 5 |  |
| T2 | | ms | 1300 |  |
| T3 | | ms | 8500 |  |
| T4 | | ms | 5200 |  |
| T5 | | ms | 8520 |  |
| s-MeasureInter | | dBm | -95 |  |
| s-MeasureDeltaP | | dB | 6 |  |
| t-MeasureDeltaP | | s | 60 |  |

Table A.8.1.x13.1-2: General test parameters for TDD Inter-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | nCell 2 | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| BWchannel | kHz | 200 | | | | | 200 | | | | |
| NPDSCH parameters |  | R.18 TDD | | | | | R.18 TDD | | | | |
| NPDCCH parameters |  | R.30 TDD | | | | | R.30 TDD | | | | |
| NOCNG Patterns |  | NOP.3 TDD | | | | | NOP.3 TDD | | | | |
| NPBCH\_RA | dB | 0 | | | | | 0 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | -98 | | | | | | | | | |
|  | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| Note2 | dB | 9 | -3 | -3 | -Infinity | -Infinity | -Infinity | -Infinity | 4 | 4 | 4 |
| NRSRP Note2 | dBm/15 kHz | -89 | -101 | -101 | -Infinity | -Infinity | -Infinity | -Infinity | -94 | -94 | -94 |
| Propagation Condition |  | AWGN | | | | | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | | 1x1 | | | | |
| Timing offset to nCell 1 | ms | - | | | | | 3 | | | | |
| Note 1: NOCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Es/Iot and NRSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | |

Table 8.1.x13.1-4: DRX-Configuration for HD-FDD Inter-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| onDurationTimer | pp1 | As specified in clause 6.7.3 in TS 36.331 |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| drx-StartOffset | 0 |

#### A.8.1.x13.2 Test Requirements

UE shall trigger RLF during T4 and complete neighbour cell measurement before end of T4. UE shall start to send NPRACH preambles to cell 2 for sending the *RRCConnectionReestablishmentRequest* message to cell 2 before the end of T5 to fulfil the RRC re-establishment delay to a known NB-IoT TDD inter frequency cell.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Tre-establish\_delay= TUL\_grant + TUE-re-establish\_delay\_NB-IoT.

Where:

- TUL\_grant = It is the time required to acquire and process uplink grant from the target cell. The NPRACH reception at the system simulator is used as a trigger for the completion of the test; hence TUL\_grant is not used.

- TUE-re-establish\_delay\_NB-IoT = 100 ms + NNB-Iot-freq\*Tsearch\_NB-IoT + TSI\_NB-IoT + TPRACH\_NB-IoT

- NNB-Iot-freq = 1

- Tsearch\_NB-IoT = 0 ms

- TSI\_NB-IoT = 8320 ms; it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target NB-IoT TDD cell.

- TPRACH\_NB-IoT = 80 ms; it is the additional delay caused by the random access procedure.

<End of Change 16>

<Start of Change 17>

##### A.6.3.x1 Redirection from E-UTRA to NR FR1 for redcap UE

A.6.3.x1.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from E-UTRA to NR requirements specified in clause 6.3.2.4.

A.6.3.x1.2 Test Parameters

Supported test configurations are shown in table A.6.3.x1.2-1. The time delay is tested by using the parameters in table A.6.3.X1.2-2, and A.6.3.X1.2-3.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

Table A.6.3.X1.2-1: Redirection from E-UTRAN to NR test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE TDD |
| 5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 6 | NR 30kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.6.3.X1.2-2: General test parameters for Redirection from E-UTRAN to NR test case

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 | E-UTRAN cell |
|  | Neighbouring cell |  | Cell 2 | NR cell |
| Final condition | Active cell |  | Cell 2 |  |
| 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 | 2.3 |  |

Table A.6.3.X1.2-3: Cell specific test parameters for Redirection from E-UTRAN to NR test case (cell 1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Configuration | Cell 1 | |
|  |  |  | T1 | T2 |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode |  | 1, 2, 3 | FDD | |
|  |  | 4, 5, 6 | TDD | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | |
| PRACH ConfigurationNote2 |  | 1, 2, 3 | 4 | |
|  | 4, 5, 6 | 53 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | |
|  | 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | |
|  | 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | |
| OCNG PatternsNote3 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | |
|  | 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH\_RB |  |  |  | |
| PSS\_RA |  |  |  | |
| SSS\_RA |  |  |  | |
| PCFICH\_RB |  |  |  | |
| PHICH\_RA |  |  |  | |
| PHICH\_RB |  |  |  | |
| PDCCH\_RA |  |  |  | |
| PDCCH\_RB |  |  |  | |
| PDSCH\_RA |  |  |  | |
| PDSCH\_RB |  |  |  | |
| OCNG\_RANote4 |  |  |  | |
| OCNG\_RBNote4 |  |  |  | |
| NocNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 4 |
| Ês/IotNote6 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 4 |
| RSRPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -94 |
| SCH\_RPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -94 |
| IoNote6 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -70.22 | -64.76 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].  Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 5: 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 Noc to be fulfilled.  Note 6: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | |

Table A.6.3.X1.2-4: Cell specific test parameters for Redirection from E-UTRAN to NR test case (cell 2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 2 | | |
|  | | |  | T1 | | T2 |
| RF Channel Number | | |  | 1 | | |
| Duplex mode | | Config 1,4 |  | FDD | | |
|  | | Config 2,3,5,6 |  | TDD | | |
| SSB Configuration | | Config 1,2,4,5 |  | SSB.1 FR1 | | |
| Config 3,6 |  | SSB.1 RedCap FR1 | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | |
|  | | Config 2,5 |  | TDDConf.1.1 | | |
|  | | Config 3,6 |  | TDDConf.2.1 | | |
| BWchannel | | Config 1,4 | MHz | 10: NRB,c = 52 | | |
|  | | Config 2,5 |  | 10: NRB,c = 52 | | |
|  | | Config 3,6 |  | 20: NRB,c = 51 | | |
| BWP BW | | Config 1,4 | MHz | 10: NRB,c = 52 | | |
|  | | Config 2,5 |  | 10: NRB,c = 52 | | |
|  | | Config 3,6 |  | 20: NRB,c = 51 | | |
| DRx Cycle | | | ms | Not Applicable | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | | |
|  | | Config 2,5 |  | SR.1.1 TDD | | |
|  | | Config 3,6 |  | SR2.1 TDD | | |
| CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | | |
|  | | Config 2,5 |  | CR.1.1 TDD | | |
|  | | Config 3,6 |  | CR2.1 TDD | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | |
| SMTC configuration | | Config 1,2,4,5 |  | SMTC.1 RedCap FR1 | | |
|  | | Config 3,6 |  | SMTC.1 RedCap FR1 | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | | |
|  | | Config 3,6 |  | 30 kHz | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | | |
|  | | Config 3,6 |  | 30 kHz | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | |
| 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 | | |
| 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 | -98 | | |
| Note2 | Config 1,2,4,5 | | dBm/SCS | -98 | | |
|  | Config 3,6 | |  | -95 | | |
|  | | | dB | 4 | 4 | |
|  | | | dB | 4 | 4 | |
| IoNote3 | Config 1,2,4,5 | | dBm/  9.36MHz | -64.59 | -64.59 | |
|  | Config 3,6 | | dBm/  38.16MHz | -58.49 | -58.49 | |
| 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. | | | | | | |

A.6.3.x1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

Tconnection\_release\_redirect\_NR = TRRC\_procedure\_delay + Tidentify-NR + TSI-NR + TRACH,

where:

TRRC\_procedure\_delay = 110 ms in the test.

Tidentify-NR = 680 ms regardless RedCap UE is capable of 2 Rx or only supports 1 Rx antenna.

TSI-NR = 1280 ms, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target NR cell.

TRACH = 170 ms in the test.

This gives a total of 2240 ms.

<End of Change 17>