**3GPP TSG-RAN4 Meeting #97-e *R4-2017075***

**Electronic Meeting, 2nd Nov 2020 – 13th Nov 2020**

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

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|  | | | | | | | | | | |
| ***Title:*** | Draft CR on test cases for UE specific DRX cycles for Rel-16 NB-IoT | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NB\_IOTenh3-Perf | | | | |  | ***Date:*** | | | 2020-11-11 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The test cases for UE specifc DRX cycle length is missing. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add the test cases for UE specific DRX cycles length. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The requirement is not completed. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.4.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 36.521-3 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

### <Start of Change 1>

### A.4.2.x1 HD – FDD Intra frequency case for UE Category NB1 In-Band mode in normal coverage with UE specific DRX

#### A.4.2.x1.1 Test Purpose and Environment

This test is to verify the requirement for the HD-FDD intra frequency cell reselection requirements for Cat-NB1 UE specified in clause 4.6.2.2.

The test scenario comprises of 1 E-UTRA carrier with two ecells of different cell ID and one NB-IoT carrier with 2 ncells of different physical cell ID, as given in tables A.4.2.x1.1-1, A.4.2.x1.1-2 and A.4.2.x1.1-3. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Only nCell1 is already identified by the UE prior to the start of the test, i.e. nCell 2 is not identified. nCell 1 and nCell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing nCell 2. In Test 1, UE supports the UE specific DRX cycle of 0.32 s and the UE shall be configured with DRX cycle of 0.32 s prior to the start of the test. In Test 2, UE supports the UE specific DRX cycle of 0.64 s and the UE shall be configured with DRX cycle of 0.64 s prior to the start of the test.

Table A.4.2.x1.1-1: General test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | Comment |
| Test 1 | Test 2 |
| NB-IOT operational mode | |  | In-band | |  |
| Initial condition | Active cell |  | nCell1 | |  |
| Neighbour cells |  | eCell1, eCell2, nCell2 | |  |
| T2 end condition | Active cell |  | nCell2 | |  |
| Neighbour cells |  | eCell1, eCell2, nCell1 | |  |
| Final condition | Visited cell |  | nCell1 | |  |
| 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 |
| DRX cycle length | | s | 0.32 | 0.64 | The value shall be used for all cells in the test. |
| T1 | | s | >7 | | During T1, nCell2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that nCell2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 35 | | T2 is defined so that cell re-selection time is taken into account. Once the UE has reselected to nCell2 (within T2) T3 starts |
| T3 | | s | 14 | | T3 is defined so that cell re-selection time is taken into account. |

Table A.4.2.x1.1-2: nCell 1, nCell 2 specific test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | nCell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| BWchannel | kHz | 180 | | | 180 | | |
| PRB location within eCell | **-** | eCell 1 BWchannel 5MHz: 17  eCell 1 BWchannel 10MHz: 30 | | | eCell 2 BWchannel 5MHz: 17  eCell 2 BWchannel 10MHz: 30 | | |
| NPBCH\_RA | dB | -3 | | | -3 | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | NRSRP | | | NRSRP | | |
|  | dBm/15 kHz | Specified in Table A.4.2.x1.1-3 | | | | | |
|  | dB | 17 | 13 | 17 | -infinity | 17 | 13 |
| Note2 | dB | 17 | -4.09 | 3.79 | -infinity | 3.79 | -4.09 |
| NRSRP Note2 | dBm/15 kHz | -81 | -85 | -81 | -infinity | -81 | -85 |
| Treselection | s | 0 | 0 | 0 | 0 | 0 | 0 |
| Propagation Condition |  | AWGN | | | AWGN | | |
| Antenna Configuration |  | 2x1 | | | 2x1 | | |
| 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.4.2.x1.1-3: eCell 1 and eCell2 specific test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | | eCell 2 | | |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| BWchannel | MHz | 5 or 10 | | | 5 or 10 | | |
| NOCNG Pattern defined in clause D.3 | **-** | BWchannel 5MHz: NOP.4 FDD  BWchannel 10MHz: NOP.1 FDD | | | BWchannel 5MHz: NOP.4 FDD  BWchannel 10MHz: NOP.1 FDD | | |
| PBCH\_RA | | dB | -3 | | | -3 | | |
| PBCH\_RB | | dB |
| PSS\_RA | | dB |
| SSS\_RA | | dB |
| PDCCH\_RA | | dB |
| PDCCH\_RB | | dB |
| PDSCH\_RA | | dB |
| PDSCH\_RB | | dB |
| OCNG\_RANote 1 | | dB |
| OCNG\_RBNote 1 | | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Note2 | dBm/15 kHz | -98 | | | -98 | | |
| Note2 | dBm | 3 | 3 | 3 | 3 | 3 | 3 |
| Treselection | s | 0 | 0 | 0 | 0 | 0 | 0 |
| Propagation Condition |  | AWGN | | | AWGN | | |
| Antenna Configuration |  | 2x1 | | | 2x1 | | |
| Timing offset to eCell 1 | ms | - | | | 3 | | |
| Note 1: OCNG shall be used such that the Cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: 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 . | | | | | | | |

#### A.4.2.x1.2 Test Requirements

In each test, the cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on nCell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 2.

The cell re-selection delay to a newly detectable cell shall be less than 34.32 s in test 1 and test 2.

In each test, the cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on nCell 1, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 1.

The cell re-selection delay to an already detected cell shall be less than 13.44 s in test 1 and test 2.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Tdetect,NB\_Intra\_NC + TSI, and to an already detected cell can be expressed as: Tevaluate, NB\_intra\_NC + TSI,

Where:

Tdetect,NB\_Intra\_NC See Table 4.6.2.2-1 in clause 4.6.2.2

Tevaluate, NB\_intra\_NC See Table 4.6.2.2-1 in clause 4.6.2.2

TSI Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 8.32 s is assumed in this test case.

This gives a total of 34.32 s, allow 35 s for the cell re-selection delay to a newly detectable cell and 13.44 s, allow 14s for the cell re-selection delay to an already detected cell in the test case.

### A.4.2.x2 HD – FDD Intra frequency case for UE Category NB1 In-Band mode in enhanced coverage with UE specific DRX

#### A.4.2.x2.1 Test Purpose and Environment

This test is to verify the requirement for the HD-FDD intra frequency cell reselection requirements for Cat-NB1 UE specified in clause 4.6.2.4.

The test scenario comprises of 1 E-UTRA carrier and a total of 4 cells as given in tables A.4.2.x2.1-1, A.4.2.x2.1-2 and A.4.2.x2.1-3. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Only nCell1 is already identified by the UE prior to the start of the test, i.e. nCell 2 is not identified. nCell 1 and nCell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing nCell 2. In Test 1, UE supports the UE specific DRX cycle of 0.32 s and the UE shall be configured with DRX cycle of 0.32 s prior to the start of the test. In Test 2, UE supports the UE specific DRX cycle of 0.64 s and the UE shall be configured with DRX cycle of 0.64 s prior to the start of the test.

Table A.4.2.x2.1-1: General test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in enhanced coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | Comment |
| Test 1 | Test 2 |
| NB-IOT operational mode | |  | In-band | |  |
| Initial condition | Active cell |  | nCell1 | |  |
| Neighbour cells |  | eCell1, eCell2, nCell2 | |  |
| T2 end condition | Active cell |  | nCell2 | |  |
| Neighbour cells |  | eCell1, eCell2, nCell1 | |  |
| Final condition | Visited cell |  | nCell1 | |  |
| 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 |
| DRX cycle length | | s | 0.32 | 0.64 | The value shall be used for all cells in the test. |
| T1 | | s | >7 | | During T1, nCell2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that nCell2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 35 | 38 | T2 is defined so that cell re-selection time is taken into account. Once the UE has reselected to nCell2 (within T2) T3 starts |
| T3 | | s | 19 | | T3 is defined so that cell re-selection time is taken into account. |

Table A.4.2.x2.1-2: nCell 1, nCell 2 specific test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in enhanced coverage

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | nCell 1 | | | nCell 2 | | |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| BWchannel | kHz | 180 | | | 180 | | |
| PRB location within eCell | **-** | eCell 1 BWchannel 5MHz: 17  eCell 1 BWchannel 10MHz: 30 | | | eCell 2 BWchannel 5MHz: 17  eCell 2 BWchannel 10MHz: 30 | | |
| NPBCH\_RA | dB | -3 | | | -3 | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -156 | -156 | -156 | -156 | -156 | -156 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | NRSRP | | | NRSRP | | |
|  | dBm/15 kHz | Specified in Table A.4.2.x2.1-3 | | | | | |
|  | dB | -9 | -9 | -0.7 | -infinity | -0.7 | -9 |
| Note2 | dB | -9 | -11.67 | -1.21 | -infinity | -1.21 | -11.67 |
| NRSRP Note2 | dBm/15 kHz | -107 | -107 | -98.7 | -infinity | -98.7 | -107 |
| Treselection | s | 0 | 0 | 0 | 0 | 0 | 0 |
| Propagation Condition |  | AWGN | | | AWGN | | |
| Antenna Configuration |  | 2x1 | | | 2x1 | | |
| 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.4.2.x2.1-3: eCell 1 and eCell2 specific test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in enhanced coverage

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | | eCell 2 | | |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| BWchannel | MHz | 5 or 10 | | | 5 or 10 | | |
| NOCNG Pattern | **-** | BWchannel 5MHz: NOP.4 FDD  BWchannel 10MHz: NOP.1 FDD | | | BWchannel 5MHz: NOP.4 FDD  BWchannel 10MHz: NOP.1 FDD | | |
| PBCH\_RA | | dB | -3 | | | -3 | | |
| PBCH\_RB | | dB |
| PSS\_RA | | dB |
| SSS\_RA | | dB |
| PDCCH\_RA | | dB |
| PDCCH\_RB | | dB |
| PDSCH\_RA | | dB |
| PDSCH\_RB | | dB |
| OCNG\_RANote 1 | | dB |
| OCNG\_RBNote 1 | | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Note2 | dBm/15 kHz | -98 | | | -98 | | |
| Note2 | dBm | 3 | 3 | 3 | 3 | 3 | 3 |
| Treselection | s | 0 | 0 | 0 | 0 | 0 | 0 |
| Propagation Condition |  | AWGN | | | AWGN | | |
| Antenna Configuration |  | 2x1 | | | 2x1 | | |
| Timing offset to eCell 1 | ms | - | | | 3 | | |
| Note 1: OCNG shall be used such that the Cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: 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 . | | | | | | | |

#### A.4.2.x2.2 Test Requirements

In each test, the cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on nCell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 2.

The cell re-selection delay to a newly detectable cell shall be less than 34.32 s in test 1.

The cell re-selection delay to a newly detectable cell shall be less than 37.32 s in test 2.

In each test, the cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on nCell 1, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 1.

The cell re-selection delay to an already detected cell shall be less than 18.56 s in test 1 and test 2.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Tdetect,NB\_Intra\_EC + TSI, and to an already detected cell can be expressed as: Tevaluate, NB\_intra\_EC + TSI,

Where:

Tdetect,NB\_Intra\_EC See Table 4.6.2.4-1 in clause 4.6.2.4

Tevaluate, NB\_intra\_EC See Table 4.6.2.4-1 in clause 4.6.2.4

TSI Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 8.32s is assumed in this test case.

This gives a total of 34.32 s in test 1 and 37.32 s in test 2, allow 35 s and 38 s for the cell re-selection delay to a newly detectable cell in each test respectively and 18.56 s, allow 19 s for the cell re-selection delay to an already detected cell in the test case.

### A.4.2.x3 HD – FDD Inter frequency case for UE Category NB1 In-Band mode in enhanced coverage with UE specific DRX

#### A.4.2.x3.1 Test Purpose and Environment

This test is to verify the requirement for the HD-FDD inter frequency cell reselection requirements for Cat-NB1 UE specified in clause 4.6.2.6.

The test scenario comprises of 1 E-UTRA carrier and a total of 3 cells as given in tables A.4.2.x3.1-1, A.4.2.x3.1-2 and A.4.2.x3.1-3. The test consists of four successive time periods, with time duration of T0, T1, T2 and T3 respectively. Only nCell1 is already identified by the UE prior to the start of the test, i.e. nCell 2 is not identified. nCell 1 and nCell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing nCell 2. In Test 1, UE supports the UE specific DRX cycle of 0.32 s and the UE shall be configured with DRX cycle of 0.32 s prior to the start of the test. In Test 2, UE supports the UE specific DRX cycle of 0.64 s and the UE shall be configured with DRX cycle of 0.64 s prior to the start of the test.

Table A.4.2.x3.1-1: General test parameters for HD-FDD inter frequency cell reselection test case for Cat-NB1 UE in enhanced coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | Comment |
| Test 1 | Test 2 |
| NB-IOT operational mode | |  | In-band | |  |
| Initial condition | Active cell |  | nCell1 | |  |
| Neighbour cells |  | eCell1, nCell2 | |  |
| T2 end condition | Active cell |  | nCell2 | |  |
| Neighbour cells |  | eCell1, nCell1 | |  |
| Final condition | Visited cell |  | nCell1 | |  |
| E-UTRA RF Channel Number | |  | 1 | | One carrier frequency is used for eCell. |
| Access Barring Information | | - | Not Sent | | No additional delays in random access procedure. |
| PRACH Configuration | |  | 1 | | Refer to A.3.16 |
| DRX cycle length | | s | 0.32 | 0.64 | The value shall be used for all cells in the test. |
| T0 | | s | 5 | | During T0, UE decodes SIB3-NB and SIB5-NB to acquire the inter-frequency carrier information. |
| T1 | | s | >7 | | During T1, nCell2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that nCell2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 35 | 38 | T2 is defined so that cell re-selection time is taken into account. |
| T3 | | s | 19 | | T3 is defined so that cell re-selection time is taken into account. |

Table A.4.2.x3.1-2: nCell 1, nCell 2 specific test parameters for HD-FDD inter frequency cell reselection test case for Cat-NB1 UE in enhanced coverage

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | nCell 1 | | | | nCell 2 | | | |
|  |  | T0 | T1 | T2 | T3 | T0 | T1 | T2 | T3 |
| BWchannel | kHz | 180 | | | | 180 | | | |
| PRB location within eCell | **-** | eCell 1 BWchannel 5MHz: 17  eCell 1 BWchannel 10MHz: 30 | | | | eCell 1 BWchannel 5MHz: 22  eCell 1 BWchannel 10MHz: 35 | | | |
| NPBCH\_RA | dB | -3 | | | | -3 | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | | | | -140 | | | |
| Pcompensation | dB | 0 | | | | 0 | | | |
| Qhysts | dB | 0 | | | | 0 | | | |
| Qoffsets, n | dB | 0 | | | | 0 | | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | NRSRP | | | | NRSRP | | | |
|  | dBm/15 kHz | Specified in Table A.4.2.x3.1-3 | | | | | | | |
|  | dB | 10 | -12 | -12 | -2.7 | -infinity | -infinity | -2.7 | -12 |
| Note2 | dB | 10 | -12 | -12 | -2.7 | -infinity | -infinity | -2.7 | -12 |
| NRSRP Note2 | dBm/15 kHz | -88 | -110 | -110 | -100.7 | -infinity | -infinity | -100.7 | -110 |
| Treselection | s | 0 | | | | 0 | | | |
| Propagation Condition |  | AWGN | | | | AWGN | | | |
| Antenna Configuration |  | 2x1 | | | | 2x1 | | | |
| Timing offset to nCell 1 | ms | 0 | | | | | | | |
| 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.4.2.x3.1-3: eCell 1 specific test parameters for HD-FDD inter frequency cell reselection test case for Cat-NB1 UE in enhanced coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | eCell 1 | | | |
|  |  | T0 | T1 | T2 | T3 |
| BWchannel | MHz | 5 or 10 | | | |
| OCNG Pattern | **-** | BWchannel 5MHz: NOP.4 FDD  BWchannel 10MHz: NOP.1 FDD | | | |
| PBCH\_RA | dB | -3 | | | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | | | |
| Pcompensation | dB | 0 | | | |
| Qhysts | dB | 0 | | | |
| Qoffsets, n | dB | 0 | | | |
|  | dBm/15 kHz | -98 | | | |
|  | dB | 3 | 3 | 3 | 3 |
| Treselection | s | 0 | | | |
| Propagation Condition |  | AWGN | | | |
| Antenna Configuration |  | 2x1 | | | |
| 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 . | | | | | |

#### A.4.2.x3.2 Test Requirements

In each test, the cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on nCell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 2.

The cell re-selection delay to a newly detectable cell shall be less than 34.32 s in test 1.

The cell re-selection delay to a newly detectable cell shall be less than 37.32 s in test 2.

In each test, the cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on nCell 1, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 1.

The cell re-selection delay to an already detected cell shall be less than 18.56 s in test 1 and test 2.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Tdetect,NB\_Inter\_EC + TSI, and to an already detected cell can be expressed as: Tevaluate, NB\_Inter\_EC + TSI,

Where:

Tdetect,NB\_Inter\_EC See Table 4.6.2.6-1 in clause 4.6.2.6

Tevaluate, NB\_Inter\_EC See Table 4.6.2.6-1 in clause 4.6.2.6

TSI Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 8.32 s is assumed in this test case.

This gives a total of 34.32 s in test 1 and 37.32 in test 2, allow 35 s and 38 s for the cell re-selection delay to a newly detectable cell in each test respectively and 18.56 s, allow 19 s for the cell re-selection delay to an already detected cell in the test case.

### A.4.2.x4 E-UTRAN TDD - TDD Intra frequency case for UE Category NB1 In-Band mode in normal coverage with UE specific DRX

#### A.4.2.x4.1 Test Purpose and Environment

This test is to verify the requirement for the TDD intra frequency cell reselection requirements for Cat-NB1 UE specified in clause 4.6.2.2.

The test scenario comprises of 1 E-UTRA carrier with two ecells of different cell ID and one NB-IoT carrier with 2 ncells of different physical cell ID, as given in tables A.4.2.x4.1-1, A.4.2.x4.1-2 and A.4.2.x4.1-3. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Only nCell1 is already identified by the UE prior to the start of the test, i.e. nCell 2 is not identified. nCell 1 and nCell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing nCell 2. In Test 1, UE supports the UE specific DRX cycle of 0.32 s and the UE shall be configured with DRX cycle of 0.32 s prior to the start of the test. In Test 2, UE supports the UE specific DRX cycle of 0.64 s and the UE shall be configured with DRX cycle of 0.64 s prior to the start of the test.

Table A.4.2.x4.1-1: General test parameters for TDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | Comment |
| Test 1 | Test 2 |
| NB-IOT operational mode | |  | In-band | |  |
| Initial condition | Active cell |  | nCell1 | |  |
| Neighbour cells |  | eCell1, eCell2, nCell2 | |  |
| T2 end condition | Active cell |  | nCell2 | |  |
| Neighbour cells |  | eCell1, eCell2, nCell1 | |  |
| Final condition | Visited cell |  | nCell1 | |  |
| 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. |
| Special subframe configuration | |  | 6 | | As specified in table 4.2-1 in TS 36.211 [16] |
| Uplink-downlink configuration | |  | 1 | | As specified in table 4.2-2 in TS 36.211 [16] |
| NPRACH Configuration | |  | NPRACH.R-2 | | As specified in A.3.18 |
| DRX cycle length | | s | 0.32 | 0.64 | The value shall be used for all cells in the test. |
| T1 | | s | >7 | | During T1, nCell2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that nCell2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 35 | | T2 is defined so that cell re-selection time is taken into account. Once the UE has reselected to nCell2 (within T2) T3 starts |
| T3 | | s | 14 | | T3 is defined so that cell re-selection time is taken into account. |

Table A.4.2.x4.1-2: nCell 1, nCell 2 specific test parameters for TDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | nCell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| BWchannel | kHz | 180 | | | 180 | | |
| PRB location within eCell | **-** | eCell 1 BWchannel 10MHz: 30 | | | eCell 2 BWchannel 10MHz: 30 | | |
| NPBCH\_RA | dB | -3 | | | -3 | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | NRSRP | | | NRSRP | | |
|  | dBm/15 kHz | Specified in Table A.4.2.x4.1-3 | | | | | |
|  | dB | 17 | 13 | 17 | -infinity | 17 | 13 |
| Note2 | dB | 17 | -4.09 | 3.79 | -infinity | 3.79 | -4.09 |
| NRSRP Note2 | dBm/15 kHz | -81 | -85 | -81 | -infinity | -81 | -85 |
| Treselection | s | 0 | 0 | 0 | 0 | 0 | 0 |
| Propagation Condition |  | AWGN | | | AWGN | | |
| Antenna Configuration |  | 2x1 | | | 2x1 | | |
| Timing offset to nCell 1 | μs | - | | | 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.4.2.x4.1-3: eCell 1 and eCell2 specific test parameters for TDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | | eCell 2 | | |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| BWchannel | MHz | 10 | | | 10 | | |
| NOCNG Pattern defined in clause D.3 | **-** | BWchannel 10MHz: NOP.1 TDD | | | BWchannel 10MHz: NOP.1 TDD | | |
| PBCH\_RA | | dB | -3 | | | -3 | | |
| PBCH\_RB | | dB |
| PSS\_RA | | dB |
| SSS\_RA | | dB |
| PDCCH\_RA | | dB |
| PDCCH\_RB | | dB |
| PDSCH\_RA | | dB |
| PDSCH\_RB | | dB |
| OCNG\_RANote 1 | | dB |
| OCNG\_RBNote 1 | | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Note2 | dBm/15 kHz | -98 | | | -98 | | |
| Note2 | dBm | 3 | 3 | 3 | 3 | 3 | 3 |
| Treselection | s | 0 | 0 | 0 | 0 | 0 | 0 |
| Propagation Condition |  | AWGN | | | AWGN | | |
| Antenna Configuration |  | 2x1 | | | 2x1 | | |
| Timing offset to eCell 1 | μs | - | | | 3 | | |
| Note 1: OCNG shall be used such that the Cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: 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 . | | | | | | | |

#### A.4.2.x4.2 Test Requirements

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on nCell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 2.

The cell re-selection delay to a newly detectable cell shall be less than 34.32 s in test 1 and test 2.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on nCell 1, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 1.

The cell re-selection delay to an already detected cell shall be less than 13.44 s in test 1 and test 2.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Tdetect,NB\_Intra\_NC + TSI, and to an already detected cell can be expressed as: Tevaluate, NB\_intra\_NC + TSI,

Where:

Tdetect,NB\_Intra\_NC See Table 4.6.2.2-1 in clause 4.6.2.2

Tevaluate, NB\_intra\_NC See Table 4.6.2.2-1 in clause 4.6.2.2

TSI Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 8.32 s is assumed in this test case.

This gives a total of 34.32 s, allow 35 s for the cell re-selection delay to a newly detectable cell and 13.44 s, allow 14 s for the cell re-selection delay to an already detected cell in the test case.

### A.4.2.x5 E-UTRAN TDD – TDD Intra frequency case for UE Category NB1 In-Band mode in enhanced coverage with UE specific DRX

#### A.4.2.x5.1 Test Purpose and Environment

This test is to verify the requirement for the TDD intra frequency cell reselection requirements for Cat-NB1 UE specified in clause 4.6.2.4.

The test scenario comprises of 1 E-UTRA carrier and a total of 4 cells as given in tables A.4.2.x5.1-1, A.4.2.x5.1-2 and A.4.2.x5.1-3. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Only nCell1 is already identified by the UE prior to the start of the test, i.e. nCell 2 is not identified. nCell 1 and nCell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing nCell 2. In Test 1, UE supports the UE specific DRX cycle of 0.32 s and the UE shall be configured with DRX cycle of 0.32 s prior to the start of the test. In Test 2, UE supports the UE specific DRX cycle of 0.64 s and the UE shall be configured with DRX cycle of 0.64 s prior to the start of the test.

Table A.4.2.x5.1-1: General test parameters for TDD intra frequency cell reselection test case for Cat-NB1 UE in enhanced coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | Comment |
| Test 1 | Test 2 |
| NB-IOT operational mode | |  | In-band | |  |
| Initial condition | Active cell |  | nCell1 | |  |
| Neighbour cells |  | eCell1, eCell2, nCell2 | |  |
| T2 end condition | Active cell |  | nCell2 | |  |
| Neighbour cells |  | eCell1, eCell2, nCell1 | |  |
| Final condition | Visited cell |  | nCell1 | |  |
| 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. |
| Special subframe configuration | |  | 6 | | As specified in table 4.2-1 in TS 36.211 [16] |
| Uplink-downlink configuration | |  | 1 | | As specified in table 4.2-2 in TS 36.211 [16] |
| NPRACH Configuration | |  | NPRACH.R-2 | | Refer to A.3.18 |
| DRX cycle length | | s | 0.32 | 0.64 | The value shall be used for all cells in the test. |
| T1 | | s | >7 | | During T1, nCell2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that nCell2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 35 | 38 | T2 is defined so that cell re-selection time is taken into account. Once the UE has reselected to nCell2 (within T2) T3 starts |
| T3 | | s | 19 | | T3 is defined so that cell re-selection time is taken into account. |

Table A.4.2.x5.1-2: nCell 1, nCell 2 specific test parameters for TDD intra frequency cell reselection test case for Cat-NB1 UE in enhanced coverage

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | nCell 2 | | |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| BWchannel | kHz | 180 | | | 180 | | |
| PRB location within eCell | **-** | eCell 1 BWchannel 10MHz: 30 | | | eCell 2 BWchannel 10MHz: 30 | | |
| NPBCH\_RA | dB | -3 | | | -3 | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -156 | -156 | -156 | -156 | -156 | -156 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | NRSRP | | | NRSRP | | |
|  | dBm/15 kHz | Specified in Table A.4.2.x5.1-3 | | | | | |
|  | dB | -9 | -9 | -0.7 | -infinity | -0.7 | -9 |
| Note2 | dB | -9 | -11.67 | -1.21 | -infinity | -1.21 | -11.67 |
| NRSRP Note2 | dBm/15 kHz | -107 | -107 | -98.7 | -infinity | -98.7 | -107 |
| Treselection | s | 0 | 0 | 0 | 0 | 0 | 0 |
| Propagation Condition |  | AWGN | | | AWGN | | |
| Antenna Configuration |  | 2x1 | | | 2x1 | | |
| 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.4.2.x5.1-3: eCell 1 and eCell2 specific test parameters for TDD intra frequency cell reselection test case for Cat-NB1 UE in enhanced coverage

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | | eCell 2 | | |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| BWchannel | MHz | 10 | | | 10 | | |
| NOCNG Pattern | **-** | BWchannel 10MHz: NOP.1 TDD | | | BWchannel 10MHz: NOP.1 TDD | | |
| PBCH\_RA | | dB | -3 | | | -3 | | |
| PBCH\_RB | | dB |
| PSS\_RA | | dB |
| SSS\_RA | | dB |
| PDCCH\_RA | | dB |
| PDCCH\_RB | | dB |
| PDSCH\_RA | | dB |
| PDSCH\_RB | | dB |
| OCNG\_RANote 1 | | dB |
| OCNG\_RBNote 1 | | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Note2 | dBm/15 kHz | -98 | | | -98 | | |
| Note2 | dBm | 3 | 3 | 3 | 3 | 3 | 3 |
| Treselection | s | 0 | 0 | 0 | 0 | 0 | 0 |
| Propagation Condition |  | AWGN | | | AWGN | | |
| Antenna Configuration |  | 2x1 | | | 2x1 | | |
| Timing offset to eCell 1 | ms | - | | | 3 | | |
| Note 1: OCNG shall be used such that the Cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: 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 . | | | | | | | |

#### A.4.2.x5.2 Test Requirements

In each test, the cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on nCell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 2.

The cell re-selection delay to a newly detectable cell shall be less than 34.32 s in test 1.

The cell re-selection delay to a newly detectable cell shall be less than 37.32 s in test 2.

In each test, the cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on nCell 1, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 1.

The cell re-selection delay to an already detected cell shall be less than 21.12 s.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Tdetect,NB\_Intra\_EC + TSI, and to an already detected cell can be expressed as: Tevaluate, NB\_intra\_EC + TSI,

Where:

Tdetect,NB\_Intra\_EC See Table 4.6.2.4-1 in clause 4.6.2.4

Tevaluate, NB\_intra\_EC See Table 4.6.2.4-1 in clause 4.6.2.4

TSI Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 8.32s is assumed in this test case.

This gives a total of 34.32 s in test 1 and 37.32 s in test 2, allow 35 s and 38 s for the cell re-selection delay to a newly detectable cell in each test respectively and 18.56 s, allow 19 s for the cell re-selection delay to an already detected cell in the test case.

### A.4.2.x6 E-UTRAN TDD – TDD Inter frequency case for UE Category NB1 In-Band mode in enhanced coverage with UE specific DRX

#### A.4.2.x6.1 Test Purpose and Environment

This test is to verify the requirement for the TDD inter frequency cell reselection requirements for Cat-NB1 UE specified in clause 4.6.2.6.

The test scenario comprises of 1 E-UTRA carrier and a total of 3 cells as given in tables A.4.2.x6.1-1, A.4.2.x6.1-2 and A.4.2.x6.1-3. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Only nCell1 is already identified by the UE prior to the start of the test, i.e. nCell 2 is not identified. nCell 1 and nCell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing nCell 2. In Test 1, UE supports the UE specific DRX cycle of 0.32 s and the UE shall be configured with DRX cycle of 0.32 s prior to the start of the test. In Test 2, UE supports the UE specific DRX cycle of 0.64 s and the UE shall be configured with DRX cycle of 0.64 s prior to the start of the test.

Table A.4.2.x6.1-1: General test parameters for TDD inter frequency cell reselection test case for Cat-NB1 UE in enhanced coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | Comment |
| Test 1 | Test 2 |
| NB-IOT operational mode | |  | In-band | |  |
| Initial condition | Active cell |  | nCell1 | |  |
| Neighbour cells |  | eCell1, nCell2 | |  |
| T2 end condition | Active cell |  | nCell2 | |  |
| Neighbour cells |  | eCell1, nCell1 | |  |
| Final condition | Visited cell |  | nCell1 | |  |
| E-UTRA RF Channel Number | |  | 1 | | One carrier frequency is used for eCell. |
| Access Barring Information | | - | Not Sent | | No additional delays in random access procedure. |
| Special subframe configuration | |  | 6 | | As specified in table 4.2-1 in TS 36.211 [16] |
| Uplink-downlink configuration | |  | 1 | | As specified in table 4.2-2 in TS 36.211 [16] |
| NPRACH Configuration | |  | NPRACH.R-2 | | Refer to A.3.18 |
| DRX cycle length | | s | 0.32 | 0.64 | The value shall be used for all cells in the test. |
| T1 | | s | >7 | | During T1, nCell2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that nCell2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 35 | 38 | T2 is defined so that cell re-selection time is taken into account. |
| T3 | | s | 19 | | T3 is defined so that cell re-selection time is taken into account. |

Table A.4.2.x6.1-2: nCell 1, nCell 2 specific test parameters for TDD inter frequency cell reselection test case for Cat-NB1 UE in enhanced coverage

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | nCell 2 | | |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| BWchannel | kHz | 180 | | | 180 | | |
| PRB location within eCell | **-** | eCell 1 BWchannel 10MHz: 30 | | | eCell 1 BWchannel 10MHz: 35 | | |
| NPBCH\_RA | dB | -3 | | | -3 | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | | | -140 | | |
| Pcompensation | dB | 0 | | | 0 | | |
| Qhysts | dB | 0 | | | 0 | | |
| Qoffsets, n | dB | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | NRSRP | | | NRSRP | | |
|  | dBm/15 kHz | Specified in Table A.4.2.x6.1-3 | | | | | |
|  | dB | -12 | -12 | -2.7 | -infinity | -2.7 | -12 |
| Note2 | dB | -12 | -12 | -2.7 | -infinity | -2.7 | -12 |
| NRSRP Note2 | dBm/15 kHz | -110 | -110 | -100.7 | -infinity | -100.7 | -110 |
| Treselection | s | 0 | | | 0 | | |
| Propagation Condition |  | AWGN | | | AWGN | | |
| Antenna Configuration |  | 2x1 | | | 2x1 | | |
| Timing offset to nCell 1 | ms | 0 | | | | | |
| 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.4.2.x6.1-3: eCell 1 specific test parameters for TDD inter frequency cell reselection test case for Cat-NB1 UE in enhanced coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | |
|  |  | T1 | T2 | T3 |
| BWchannel | MHz | 10 | | |
| OCNG Pattern | **-** | BWchannel 10MHz: NOP.1 TDD | | |
| PBCH\_RA | dB | -3 | | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | | |
| Pcompensation | dB | 0 | | |
| Qhysts | dB | 0 | | |
| Qoffsets, n | dB | 0 | | |
|  | dBm/15 kHz | -98 | | |
|  | dB | 3 | 3 | 3 |
| Treselection | s | 0 | | |
| Propagation Condition |  | AWGN | | |
| Antenna Configuration |  | 2x1 | | |
| 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 . | | | | |

#### A.4.2.x6.2 Test Requirements

In each test, the cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on nCell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 2.

The cell re-selection delay to a newly detectable cell shall be less than 34.32 s in test 1.

The cell re-selection delay to a newly detectable cell shall be less than 37.32 s in test 2.

In each test, the cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on nCell 1, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 1.

The cell re-selection delay to an already detected cell shall be less than 18.56 s in test 1 and test 2.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Tdetect,NB\_Inter\_EC + TSI, and to an already detected cell can be expressed as: Tevaluate, NB\_Inter\_EC + TSI,

Where:

Tdetect,NB\_Inter\_EC See Table 4.6.2.6-1 in clause 4.6.2.6

Tevaluate, NB\_Inter\_EC See Table 4.6.2.6-1 in clause 4.6.2.6

TSI Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 8.32 s is assumed in this test case.

This gives a total of 34.32 s in test 1 and 37.32 s in test 2, allow 35 s and 38 s for the cell re-selection delay to a newly detectable cell in each test respectively and 18.56 s, allow 19 s for the cell re-selection delay to an already detected cell in the test case.

### A.4.2.x7 HD – FDD Intra frequency case for UE Category NB1 In-Band mode in normal coverage with serving cell RRM measurement relaxation with UE specific DRX

#### A.4.2.x7.1 Test Purpose and Environment

This test is to verify the requirement for the HD-FDD intra frequency cell reselection requirements for Cat-NB1 UE specified in clause 4.6.2.1A when UE is configured to monitor WUS according to Table A.4.2.x7.1-1 and under the serving cell RRM measurement relaxation according to the subclause 4.6.2.1A and under the intra-frequency neighbor cell measurement relaxation according to the subclause 4.6.2.2.

The test scenario comprises of 1 E-UTRA carrier with two eCells of different cell ID and one NB-IoT carrier with 2 nCells of different physical cell ID, as given in tables A.4.2.x7.1-1, A.4.2.x7.1-2 and A.4.2.x7.1-3. The test consists of two successive time periods, with time duration of T1 and T2, respectively. Only nCell1 is already identified by the UE prior to the start of the test, i.e. nCell 2 is not identified. nCell 1 and nCell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing nCell 2. In Test 1, UE supports the UE specific DRX cycle of 0.32 s and the UE shall be configured with DRX cycle of 0.32 s prior to the start of the test. In Test 2, UE supports the UE specific DRX cycle of 0.64 s and the UE shall be configured with DRX cycle of 0.64 s prior to the start of the test.

Table A.4.2.x7.1-1: General test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | Comment |
| Test 1 | Test 2 |
| NB-IOT operational mode | |  | In-band | |  |
| Initial condition | Active cell |  | nCell1 | |  |
| Neighbour cells |  | eCell1, eCell2, nCell2 | |  |
| T2 end condition | Active cell |  | nCell2 | |  |
| Neighbour cells |  | eCell1, eCell2, nCell1 | |  |
| Final condition | Visited cell |  | nCell1 | |  |
| 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 |
| SSearchDeltaP | | dB | 6 | | Threshold for relaxed monitoring criterion as specified in 5.2.4.12.1 in [1] |
| Rmax | |  | 128 | |  |
| maxDurationFactor | |  | one4th | | WUS config. Wmax = 32 (=1/4\*Rmax) |
| numPOs | |  | n1 | | WUS config. Single PO mapped to each WUS occasion |
| timeOffsetDRX | |  | ms40 | | WUS config. Gap between the end of WUS duration to the associated PO |
| numDRX-CycleRelaxed | |  | 4 | | Serving cell RRM measurement is relaxed by |
| DRX cycle length | | s | 0.32 | 0.64 | The value shall be used for all cells in the test. |
| T1 | | s | >30 | | During T1, nCell2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that nCell2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 37 | 40 | T2 is defined so that cell re-selection time is taken into account. |

Table A.4.2.x7.1-2: nCell 1, nCell 2 specific test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | nCell 2 | |
| T1 | T2 | T1 | T2 |
| BWchannel | kHz | 180 | | 180 | |
| PRB location within eCell | **-** | eCell 1 BWchannel 5MHz: 18  eCell 1 BWchannel 10MHz: 30 | | eCell 2 BWchannel 5MHz: 18  eCell 2 BWchannel 10MHz: 30 | |
| NPBCH\_RA | dB | -3 | | -3 | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote 1 | dB |
| NOCNG\_RBNote 1 | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | NRSRP | | NRSRP | |
|  | dBm/15 kHz | Specified in Table A.4.2.18.1-3 | | | |
|  | dB | 17 | 7 | -infinity | 11 |
| Note2 | dB | 17 | -4.33 | -infinity | 3.21 |
| NRSRP Note2 | dBm/15 kHz | -81 | -91 | -infinity | -87 |
| Treselection | s | 0 | 0 | 0 | 0 |
| Propagation Condition |  | AWGN | | AWGN | |
| Antenna Configuration |  | 2x1 | | 2x1 | |
| 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.4.2.x7.1-3: eCell 1 and eCell2 specific test parameters for HD-FDD intra frequency cell reselection test case for Cat-NB1 UE in normal coverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | eCell 1 | | eCell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| BWchannel | MHz | 5 or 10 | | 5 or 10 | |
| NOCNG Pattern defined in clause D.3 | **-** | BWchannel 5MHz: NOP.4 FDD  BWchannel 10MHz: NOP.1 FDD | | BWchannel 5MHz: NOP.4 FDD  BWchannel 10MHz: NOP.1 FDD | |
| PBCH\_RA | | dB | -3 | | -3 | |
| PBCH\_RB | | dB |
| PSS\_RA | | dB |
| SSS\_RA | | dB |
| PDCCH\_RA | | dB |
| PDCCH\_RB | | dB |
| PDSCH\_RA | | dB |
| PDSCH\_RB | | dB |
| OCNG\_RANote 1 | | dB |
| OCNG\_RBNote 1 | | dB |
| Qrxlevmin | dBm | -140 | -140 | -140 | -140 |
| Pcompensation | dB | 0 | 0 | 0 | 0 |
| Qhysts | dB | 0 | 0 | 0 | 0 |
| Qoffsets, n | dB | 0 | 0 | 0 | 0 |
| Note2 | dBm/15 kHz | -98 | | -98 | |
| Note2 | dBm | 3 | 3 | 3 | 3 |
| Treselection | s | 0 | 0 | 0 | 0 |
| Propagation Condition |  | AWGN | | AWGN | |
| Antenna Configuration |  | 2x1 | | 2x1 | |
| Timing offset to eCell 1 | ms | - | | 3 | |
| Note 1: OCNG shall be used such that the Cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: 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 . | | | | | |

#### A.4.2.x7.2 Test Requirements

Before the beginning of T2, UE is under relaxed monitoring where the serving cell measurement is performed every 1.28 s in test 1 and 2.56 s in test 2 and the infra-frequency measurement for the neighbor cells is relaxed according to subclause 5.2.4.12.0 in TS 36.304 [1].

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on nCell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 2.

The cell re-selection delay to a newly detectable cell shall be less than 36.88 s in test 1.

The cell re-selection delay to a newly detectable cell shall be less than 39.44 s in test 2.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on nCell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on nCell 2.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Tevaluate, serv\_NB-NC + Tdetect,NB\_Intra\_NB-IoT-NC + TSI.

Where:

Tdetect,NB\_Intra\_NC See Table 4.6.2.2-1 in clause 4.6.2.2, based on the configured DRX cycle

Tevaluate, serv\_NB-NC See Table 4.6.2.2-1 in clause 4.6.2.2, based on the effective DRX cycle after relaxation; 2.56 s is assumed in test 1 and 5.12 s is assumed in test 2.

TSI Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 8.32 s is assumed in this test case.

This gives a total of 36.88 s in test 1 and 39.44 s in test 2, allow 37 s and 40 s for the cell re-selection delay to a newly detectable cell in each test respectively.

### <End of Change 1>