**3GPP TSG-RAN WG4 Meeting # 109 R4-2321472**

**Chicago, US, November 13 – 17, 2023**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.133** | **CR** | 7264 | **rev** | **1** | **Current version:** | **18.3.1** |  |
|  | | | | | | | | |
| *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:*** | CR on test for Random access, timing and signalling characteristics for LTE NB-IoT/eMTC over NTN | | | | | | | | | |
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| ***Source to WG:*** | MediaTek inc. | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | LTE\_NBIOT\_eMTC\_NTN\_req-Perf | | | | |  | ***Date:*** | | | 2023-11-13 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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:*** | | * Typo correction on serving satellite configuration * Missing clarification on timing pre-compensation in A.13.3.2.3 * Brackets remain * \_RA and \_RB values for 1Tx cells should be 0dB, comparing -3dB for 2Tx cells, to have consistent power level, as discussed in R4-1700489 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * A.13.3.2, A.13.4, A.14.4.2: Typo correction on serving satellite configuration * A.13.3.2.3: align clarification on timing pre-compensation in with A.13.3.2.1/2 * A.13.4.1.3: remove [] for npusch-TxDuration * A.13.4.1, A.13.4.3: \_RA and \_RB values for 1Tx cells should be 0dB | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Unclear test case | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.13.3.2, A.13.4, A.14.4.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 36.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

### <Start of change>

### A.13.3.2 Random Access for Satellite Access

This clause provides the list of Random Access test cases for category NB1 UEs when connecting to a NTN cell using satellite access. The list of supported test configurations is provided in Table A.13.3.2-1.

Table A.13.3.2-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

#### A.13.3.2.1 Contention Based Random Access Test for UE category NB1 UEs in Satellite Access - Standalone mode in normal coverage

##### A.13.3.2.1.1 Test Purpose and Environment

The purpose of this test is to verify whether the behavior of the random access procedure of a category NB1 UE in Normal Coverage is according to the requirements when connected to a NTN NB-IoT cell, whether the NPRACH power settings and timing are within specified limits, and whether the UE determines properly the enhanced coverage level based on the NRSRP measurement and the configured criterion in NRSRP-ThresholdsPrach [2]. This test will verify the requirements in Clause 6.6A.2, Clause 6.6A.3 and Clause 7.20A.2 in an AWGN model.

For this test a single NB-IoT cell is used. The test parameters are given in tables A.13.3.2.1.1-1, A.13.3.2.1.1-2 and A.13.3.2.1.1-3. The UE shall perform timing pre-compensation before the initial NPRACH transmission using AT command-based test approach.

Table A.13.3.2.1.1-1: nCell specific test parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Normal Coverage

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comments** |
| NB-IOT operational mode |  | Standalone |  |
| BWchannel | kHz | 200 |  |
| NPDSCH parameters Note 2 |  | R.18 HD-FDD | As defined in A.3.1.5.3 |
| NPDCCH parameters Note 2 |  | R.30 HD-FDD | As defined in A.3.1.6.3 |
| NPBCH\_RA | dB | 0 |  |
| NPBCH\_RB | dB | 0 |  |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RA Note 1 | dB |
| NOCNG\_RB Note 1 | dB |
| DRX |  | OFF |  |
|  | dBm/15 kHz | -98 |  |
|  | dB | 3 |  |
| Note 3 | dB | 3 |  |
| NRSRP Note 3 | dBm/15 kHz | -95 |  |
| Io Note 3 | dBm/180 KHz | -82.45 |  |
| Propagation Condition | - | AWGN |  |
| Antenna Configuration |  | 1x1 |  |
| Note 1: NOCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: The NPDSCH and NPDCCH reference measurement channels are used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: Es/Iot, NRSRP and Io level has been derived from other parameters for information purpose. They are not settable parameters themselves. | | | |

Table A.13.3.2.1.1-2: NTN specific test parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Normal Coverage

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Comment** |
| Configuration 1 | SSC.1 | GSO Test Configuration |
| Configuration 2 | SSC.2 | NGSO Test Configuration |

Table A.13.3.2.1.1-3: NPRACH-Configuration parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Normal Coverage

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Field** | **Value** | | | | **Comment** | |
| **Parameters not per NPRACH resource** | | | | | | |
| RSRP-ThresholdsNPRACH-InfoList | {40, 55} | | | | Corresponding to {-116, -101} dBm as defined in Section 9.1.22.9 | |
| nprach-CP-Length | us66dot7 | | | |  | |
| nrs-Power | -5 dBm/15 kHz | | | | As defined in clause 6.7.3 in TS 36.331. | |
| Backoff Parameter Index | 1 | | | | As defined in table 7.2-2 in TS 36.321 | |
| Configured UE transmitted power () | 23 dBm for power class 3,  20 dBm for power class 5 | | | | As defined in clause 6.2B.4 in TS 36.102 | |
| powerRampingStep | dB2 | | | |  | |
| preambleInitialReceivedTargetPower | dBm-112 | | | |  | |
| preambleTransMax-CE | n6 | | | |  | |
| **Parameters per NPRACH Resource** | | | | | | |
| ***NPRACH Resource*** | ***Level 0*** | ***Level 1*** | ***Level 2*** |  | |
| nprach-Periodicity | ms40 | ms240 | ms1280 |  | |
| nprach-StartTime | ms8 | ms64 | ms512 |  | |
| nprach-SubcarrierOffset | n0 | n0 | n0 |  | |
| nprach-NumSubcarriers | n12 | n12 | n12 |  | |
| nprach-SubcarrierMSG3-RangeStart | zero | zero | zero |  | |
| maxNumPreambleAttemptCE | n3 | n6 | n10 |  | |
| numRepetitionsPerPreambleAttempt | n2 | n8 | n64 |  | |
| npdcch-NumRepetitions-RA | r4 | r16 | r128 |  | |
| npdcch-StartSF-CSS-RA | v1dot5 | v1dot5 | v1dot5 |  | |
| npdcch-Offset-RA | zero | zero | Zero |  | |
| nprach-NumCBRA-StartSubcarriers | n8 | n8 | n8 |  | |
| ra-ResponseWindowSize (per NPRACH Resource) | pp2 | pp2 | pp2 |  | |
| mac-ContentionResolutionTimer (per NPRACH Resource) | pp8 | pp8 | pp8 |  | |
| Note 1: See Clause 6.7.3 in TS 36.331 for further information on the parameters in this table. | | | | | | |

##### A.13.3.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

A.13.3.2.1.2.1 Random Access Response Reception

To test the UE behavior specified in Subclause 6.6A.2, the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preamble transmission attempts (the preamble may be transmitted multiple times in each attempt) have been received by the System Simulator. In response to the first 2 preamble transmission attempts, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.6A.2. The power of the first preamble shall be -25 dBm with an accuracy specified in clause 6.3B.4 of TS 36.102 [60]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3B.4 of TS 36.102 [60].

The transmit timing of all NPRACH transmissions shall be within the accuracy specified in Subclause 7.20A.2.

A.13.3.2.1.2.2 No Random Access Response Reception

To test the UE behavior specified in subclause 6.6A.2.2, the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preamble transmission attempts have been received by the System Simulator. The System Simulator shall *not* respond to the first 2 preamble transmission attempts.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window. The RA response window shall be started at the point in time indicated by clause 5.1.4 in TS 36.321[17].

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.6A.2. The power of the first preamble shall be [-25] dBm with an accuracy specified in clause 6.3B.4 of TS 36.102 [60].The relative power applied to additional preambles shall have an accuracy specified in clause 6.3B.4 of TS 36.102 [60].

The transmit timing of all NPRACH transmissions shall be within the accuracy specified in Subclause 7.20A.2.

A.13.3.2.1.2.3 Receiving a NACK on msg3

To test the UE behavior specified in subclause 6.6A.2.3, the System Simulator shall NACK *all* UE msg3 following a successful Random Access Response.

The UE shall re-transmit the msg3 upon the reception of a NACK on msg3 until the maximum number of re-transmissions defined by *maxNumPreambleAttemptCE* in the table A.13.3.2.1.1-3 is reached.

A.13.3.2.1.2.4 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.6A.2.4, the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

A.13.3.2.1.2.5 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.6A.2.4, the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

The UE shall send ACK if the Contention Resolution is successful.

A.13.3.2.1.2.6 Contention Resolution Timer expiry

To test the UE behavior specified in Subclause 6.6A.2.5, the System Simulator shall *not* send a response to a msg3.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

A.13.3.2.1.2.7 NPRACH Resource Selection

The UE shall select NPRACH resources and transmits or re- transmits NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 0. The rate of correct coverage enhancement level selection during repeated tests shall be at least 90%.

Note: Correct coverage enhancement level selection is a prerequisite for testing the other NPRACH requirements.

#### A.13.3.2.2 Contention Based Random Access Test for UE category NB1 UEs in Satellite Access - Standalone mode in Enhanced Coverage

##### A.13.3.2.2.1 Test Purpose and Environment

The purpose of this test is to verify whether the behavior of the random access procedure of a category NB1 UE in Enhanced Coverage is according to the requirements when connected to a NTN NB-IoT cell, whether the NPRACH power settings and timing are within specified limits, and whether the UE determines properly the enhanced coverage level based on the NRSRP measurement and the configured criterion in NRSRP-ThresholdsPrach [2]. This test will verify the requirements in Clause 6.6A.2, Clause 6.6A.3 and Clause 7.20A.2 in an AWGN model.

For this test a single NB-IoT cell is used. The test parameters are given in tables A.13.3.2.1.1-1, A.13.3.2.1.1-2 and A.13.3.2.1.1-3. The UE shall perform timing pre-compensation before the initial NPRACH transmission using AT command-based test approach.

Table A.13.3.2.2.1-1: nCell specific test parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Enhanced Coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comments** | |
| NB-IOT operational mode |  | Standalone |  | |
| BWchannel | kHz | 200 |  | |
| NPDSCH parameters Note 2 |  | R.18 HD-FDD | As defined in A.3.1.5.3 | |
| NPDCCH parameters Note 2 |  | R.30 HD-FDD | As defined in A.3.1.6.3 | |
| NPBCH\_RA | dB | 0 |  | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RA Note 1 | dB |
| NOCNG\_RB Note 1 | dB |
| DRX |  | OFF |  | |
|  | dBm/15 kHz | -98 |  | |
|  | dB | -12.5 |  | |
| Note 3 | dB | -12.5 |  | |
| NRSRP Note 3 | dBm/15 kHz | -110.5 |  | |
| Io Note 3 | dBm/180KHz | -86.97 |  | |
| Propagation Condition | - | AWGN |  | |
| Antenna Configuration |  | 1x1 |  | |
| Note 1: NOCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: The NPDSCH and NPDCCH reference measurement channels are used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: Es/Iot, NRSRP and Io level has been derived from other parameters for information purpose. They are not settable parameters themselves. | | | |

Table A.13.3.2.2.1-2: NTN specific test parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Enhanced Coverage

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Comment** |
| Configuration 1 | SSC.1 | GSO Test Configuration |
| Configuration 2 | SSC.2 | NGSO Test Configuration |

Table A.13.3.2.2.1-4: NPRACH-Configuration parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Enhanced Coverage

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Field** | **Value** | | | | **Comment** | |
| **Parameters not per NPRACH resource** | | | | | | |
| RSRP-ThresholdsNPRACH-InfoList | {35, 56} | | | | Corresponding to {-121, -100} dBm as defined in Section 9.1.22.9 | |
| nprach-CP-Length | us266dot7 | | | |  | |
| nrs-Power | -5 dBm/15 kHz | | | | As defined in clause 6.7.3 in TS 36.331. | |
| Backoff Parameter Index | 1 | | | | As defined in table 7.2-2 in TS 36.321 | |
| Configured UE transmitted power () | 23 dBm for power class 3,  20 dBm for power class 5 | | | | As defined in clause 6.2B.4 in TS 36.102 | |
| powerRampingStep | dB2 | | | |  | |
| preambleInitialReceivedTargetPower | dBm-120 | | | |  | |
| preambleTransMax-CE | n6 | | | |  | |
| **Parameters per NPRACH Resource** | | | | | | |
| ***NPRACH Resource*** | ***Level 0*** | ***Level 1*** | ***Level 2*** |  | |
| nprach-Periodicity | ms40 | ms240 | ms1280 |  | |
| nprach-StartTime | ms8 | ms64 | ms512 |  | |
| nprach-SubcarrierOffset | n0 | n0 | n0 |  | |
| nprach-NumSubcarriers | n12 | n12 | n12 |  | |
| nprach-SubcarrierMSG3-RangeStart | zero | zero | zero |  | |
| maxNumPreambleAttemptCE | n3 | n6 | n10 |  | |
| numRepetitionsPerPreambleAttempt | n2 | n8 | n64 |  | |
| npdcch-NumRepetitions-RA | r4 | r16 | r128 |  | |
| npdcch-StartSF-CSS-RA | v1dot5 | v1dot5 | v1dot5 |  | |
| npdcch-Offset-RA | zero | zero | Zero |  | |
| nprach-NumCBRA-StartSubcarriers | n8 | n8 | n8 |  | |
| ra-ResponseWindowSize (per NPRACH Resource) | pp2 | pp2 | pp2 |  | |
| mac-ContentionResolutionTimer (per NPRACH Resource) | pp8 | pp8 | pp8 |  | |
| Note 1: See Clause 6.7.3 in TS 36.331 for further information on the parameters in this table. | | | | | | |

##### A.13.3.2.2.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

A.13.3.2.2.2.1 Random Access Response Reception

To test the UE behavior specified in Subclause 6.6A.2, the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preamble transmission attempts (the preamble may be transmitted multiple times in each attempt) have been received by the System Simulator. In response to the first 4 preamble transmission attempts, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.6A.2. The power of the first preamble shall be 23 dBm for power class 3, 20 dBm for power class 5 with an accuracy specified in clause 6.3B.4 of TS 36.102 [60].

The transmit timing of all NPRACH transmissions shall be within the accuracy specified in Subclause 7.20A.2.

A.13.3.2.2.2.2 No Random Access Response Reception

To test the UE behavior specified in subclause 6.6A.2.2, the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preamble transmission attempts have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preamble transmission attempts.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window. The RA response window shall be started at the point in time indicated by clause 5.1.4 in TS 36.321[17].

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2A.2. The power of the first preamble shall be 23 dBm for power class 3, 20 dBm for power class 5 with an accuracy specified in clause 6.3B.4 of TS 36.102 [60].

The transmit timing of all NPRACH transmissions shall be within the accuracy specified in Subclause 7.20A.2.

A.13.3.2.2.2.3 Receiving a NACK on msg3

To test the UE behavior specified in subclause 6.6A.2.3, the System Simulator shall NACK *all* UE msg3 following a successful Random Access Response.

The UE shall re-transmit the msg3 upon the reception of a NACK on msg3 until the maximum number of re-transmissions defined by *maxNumPreambleAttemptCE* in the table A.13.3.2.2.1-4 is reached.

A.13.3.2.2.2.4 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.6A.2.4, the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

A.13.3.2.2.2.5 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.6A.2.4, the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

The UE shall send ACK if the Contention Resolution is successful.

A.13.3.2.2.2.6 Contention Resolution Timer expiry

To test the UE behavior specified in Subclause 6.6A.2.5, the System Simulator shall *not* send a response to a msg3.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

A.13.3.2.2.2.7 NPRACH Resource Selection

The UE shall select NPRACH resources and transmits or re- transmits NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 1. The rate of correct coverage enhancement level selection during repeated tests shall be at least 90%.

Note: Correct coverage enhancement level Sselection requirement is a prerequisite already assumed for testing the other NPRACH requirements.

#### A.13.3.2.3 Contention Based Random Access on Non-anchor Carrier Test for UE category NB1 UEs Standalone mode in Enhanced Coverage

##### A.13.3.2.3.1 Test Purpose and Environment

The purpose of this test is to verify whether the behavior of the random access procedure of a category NB1 UE in Enhanced Coverage is according to the requirements, whether the NPRACH power settings and timing are within specified limits, and whether the UE determines properly the enhanced coverage level based on the NRSRP measurement and the configured criterion in NRSRP-ThresholdsPrach [2]. This test will verify the requirements in Clause 6.6A.2, Clause 6.6A.3 and Clause 7.20A2 in an AWGN model.

For this test a single NB-IoT cell is used. The test parameters are given in tables A.13.3.2.3.1-1, A.13.3.2.3.1-2 and A.13.3.2.3.1-3.

Table A.13.3.2.3.1-1: nCell specific test parameters for HD-FDD contention based random access on non-achor carrier test for UE category NB1 Standalone mode in Enhanced Coverage

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comments** |
| NB-IOT operational mode |  | Standalone |  |
| BWchannel | kHz | 200 |  |
| NPDSCH parameters Note 2 |  | R.18 HD-FDD | As defined in A.3.1.5.3 |
| NPDCCH parameters Note 2 |  | R.30 HD-FDD | As defined in A.3.1.6.3 |
| NPBCH\_RA | dB | 0 |  |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RA Note 1 | dB |
| NOCNG\_RB Note 1 | dB |
| DRX |  | OFF |  |
|  | dBm/15 kHz | -98 |  |
|  | dB | -12.5 |  |
| Note 3 | dB | -12.5 |  |
| NRSRP Note 3 | dBm/15 kHz | -110.5 |  |
| Io Note 3 | dBm/180 KHz | -86.97 |  |
| Propagation Condition | - | AWGN |  |
| Antenna Configuration |  | 1x1 |  |
| Note 1: NOCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: The NPDSCH and NPDCCH reference measurement channels are used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: Es/Iot, NRSRP and Io level has been derived from other parameters for information purpose. They are not settable parameters themselves. | | | |

Table A.13.3.2.1.3-2: NTN specific test parameters for HD-FDD contention based random access test for UE category NB1 Standalone mode in Normal Coverage

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Comment** |
| Configuration 1 | SSC.1 | GSO Test Configuration |
| Configuration 2 | SSC.2 | NGSO Test Configuration |

Table A.13.3.2.3.1-3: NPRACH-Configuration parameters for HD-FDD contention based random access on non-anchor carrier test for UE category NB1 Standalone mode in Enhanced Coverage

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Field** | **Value** | | | | **Comment** | |
| **Parameters not per NPRACH resource** | | | | | | |
| RSRP-ThresholdsNPRACH-InfoList | {35, 56} | | | | Corresponding to {-121, -100} dBm as defined in Section 9.1.22.9 | |
| nprach-CP-Length | us266dot7 | | | |  | |
| nrs-Power | -5 dBm/15 kHz | | | | As defined in clause 6.7.3 in TS 36.331. | |
| Backoff Parameter Index | 1 | | | | As defined in table 7.2-2 in TS 36.321 | |
| Configured UE transmitted power () | 23 dBm for power class 3,  20 dBm for power class 5 | | | | As defined in clause 6.2B.4 in TS 36.102 | |
| powerRampingStep | dB2 | | | |  | |
| preambleInitialReceivedTargetPower | dBm-120 | | | |  | |
| preambleTransMax-CE | n6 | | | |  | |
| **Parameters per NPRACH Resource** | | | | | | |
| ***NPRACH Resource*** | ***Level 0*** | ***Level 1*** | ***Level 2*** |  | |
| nprach-ProbabilityAnchor | zero | zero | zero |  | |
| nprach-NumCBRA-StartSubcarriers | n8 | n8 | n8 |  | |
| nprach-Periodicity | ms40 | ms240 | ms1280 |  | |
| nprach-StartTime | ms8 | ms64 | ms512 |  | |
| nprach-SubcarrierOffset | n0 | n0 | n0 |  | |
| nprach-NumSubcarriers | n12 | n12 | n12 |  | |
| nprach-SubcarrierMSG3-RangeStart | zero | zero | zero |  | |
| maxNumPreambleAttemptCE | n3 | n6 | n10 |  | |
| numRepetitionsPerPreambleAttempt | n2 | n8 | n64 |  | |
| npdcch-NumRepetitions-RA | r4 | r16 | r128 |  | |
| npdcch-StartSF-CSS-RA | v1dot5 | v1dot5 | v1dot5 |  | |
| npdcch-Offset-RA | zero | zero | Zero |  | |
| ra-ResponseWindowSize (per NPRACH Resource) | pp2 | pp2 | pp2 |  | |
| mac-ContentionResolutionTimer (per NPRACH Resource) | pp8 | pp8 | pp8 |  | |
| Note 1: See Clause 6.7.3 in TS 36.331 for further information on the parameters in this table. | | | | | |

##### A.13.3.2.3.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

A.13.3.2.3.2.1 Random Access Response Reception

To test the UE behavior specified in Subclause 6.6A.2, the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preamble transmission attempts (the preamble may be transmitted multiple times in each attempt) have been received by the System Simulator. In response to the first 4 preamble transmission attempts, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.6A.2. The power of the first preamble shall be 23 dBm for power class 3, 20 dBm for power class 5 with an accuracy specified in clause 6.3B.4 of TS 36.102 [60].

The transmit timing of all NPRACH transmissions shall be within the accuracy specified in Subclause 7.20A2.

A.13.3.2.3.2.2 No Random Access Response Reception

To test the UE behavior specified in subclause 6.6A.2.2, the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preamble transmission attempts have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preamble transmission attempts.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window. The RA response window shall be started at the point in time indicated by clause 5.1.4 in TS 36.321[17].

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.6A.2. The power of the first preamble shall be 23 dBm for power class 3, 20 dBm for power class 5 with an accuracy specified in clause 6.3B.4 of TS 36.102 [60].

The transmit timing of all NPRACH transmissions shall be within the accuracy specified in Subclause 7.20A2.

A.13.3.2.3.2.3 Receiving a NACK on msg3

To test the UE behavior specified in subclause 6.6A.2.3, the System Simulator shall NACK *all* UE msg3 following a successful Random Access Response.

The UE shall re-transmit the msg3 upon the reception of a NACK on msg3 until the maximum number of re-transmissions defined by *maxNumPreambleAttemptCE* in the table A.13.3.2.3.1-3 is reached.

A.13.3.2.3.2.4 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.6A.2.4, the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

A.13.3.2.3.2.5 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.6A.2.4, the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

The UE shall send ACK if the Contention Resolution is successful.

A.13.3.2.3.2.6 Contention Resolution Timer expiry

To test the UE behavior specified in Subclause 6.6A.2.5, the System Simulator shall *not* send a response to a msg3.

The UE shall re-select a preamble and transmit with the calculated NPRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

A.13.3.2.3.2.7 NPRACH Resource Selection

The UE shall select NPRACH resources in non-anchor carrier and transmits or re- transmits NPRACH preambles using the NPRACH resources and NPRACH configuration corresponding to the coverage enhancement level 1. The rate of correct coverage enhancement level selection during repeated tests shall be at least 90%.

Note: Correct coverage enhancement level selection is a prerequisite for testing the other NPRACH requirements.

## A.13.4 Timing and signalling characteristics for satellite access

### A.13.4.1 UE transmit timing for satellite access

#### A.13.4.1.1 E-UTRAN HD-FDD – UE Transmit Timing Accuracy Tests for Category NB1 UE Standalone mode under normal coverage for Satellite Access

##### A.13.4.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the Category NB1 UE under normal coverage is capable of following the frame timing change of the connected eNodeB and that the UE initial transmits timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.20A.

For this test a single NB-IoT cell is used. Test parameters are given in Table A.13.4.1.1.1-1, Table A.13.4.1.1.1-2 and A.13.4.1.1.1-3. The transmit timing is verified by the UE transmitting NPUSCH.

Table A.13.4.1.1.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Table A.13.4.1.1.1-2: General Test Parameters for UE Transmit Timing Accuracy Tests for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under normal coverage for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| **Test 1** |
| NB-IoT Operation mode | |  | Standalone |
| DRX | |  | OFF |
| Satellite information | Config 1 |  | SSC.1 |
| Config 2 |  | SSC.2 |
| NPRACH configuration | |  | NPRACH.R-1  As specified in A.3.18 |
| NPDCCH repetition level | |  | 1 |
| npdcch-StartSF-USS Note 1 | |  | v8 |
| npdcch-NumRepetitions-r13 Note 1 | |  | r1 |
| NPUSCH repetition level | |  | 1 |
| Note 1: For further information see clause 6.7.3.2 in TS 36.331 [2]. | | | |

Table A.13.4.1.1.1-3: nCell specific Test Parameters for UE Transmit Timing Accuracy Tests for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under normal coverage for Satellite Access

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| **Test 1** |
| RF Channel Number |  | 1 |
| BWchannel | kHz | 200 |
| NPDSCH parameter |  | R.18 HD-FDD |
| NPDCCH parameter |  | R.30 HD-FDD |
| NOCNG Patterns |  | NOP.3 FDD |
| NPBCH\_RA | dB | 0 |
| NPBCH\_RB |
| NPSS\_RA |
| NSSS\_RA |
| NPDCCH\_RA |
| NPDCCH\_RB |
| NPDSCH\_RA |
| NPDSCH\_RB |
| NOCNG\_RA Note1 |
| NOCNG\_RB Note1 |
|  | dBm/15 kHz | -88 |
|  | dB | 4 |
|  | dB | 4 |
| Antenna Configuration |  | 1x1 |
| Propagation condition | - | AWGN |
| Note 1 NOCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

##### A.13.4.1.1.2 Test Requirements

For parameters specified in Tables A.13.4.1.1.1-1, A.13.4.1.1.1-2 and A.13.4.1.1.1-3. the initial transmit timing accuracy, the maximum amount of timing change in one adjustment, the minimum and the maximum adjustment rate shall be within the limits defined in clause 7.20A.2.

The following sequence of events shall be used to verify that the requirements are met.

The test sequence shall be carried out in RRC\_CONNECTED:

a) After a connection is set up with the cell, the test system sends NPDCCH including uplink grant for NPUSCH transmission and the test system shall measure the UE transmit timing offset (n×Ts) and verify that it is within Te (n×Ts ≤ ×TS ± 97×TS + Tmargin) with respect to the first detected path (in time) of the corresponding downlink frame of NB-IoT cell 1.

*Editor’s notes: FFS on Tmargin*

b) Using the value of n measured in a), the test system adjusts the downlink transmit timing for the cell:

- if n < 0, by +(144 – |n|)×TS compared to that in (a).

- if n ≥ 0, by -(144 – |n|)×TS compared to that in (a).

The timing adjustment is performed monotonically in multiple steps of |∆T| ≤ 9×TS per 256 ms (∆T is to be defined in the test procedure) until the above required total timing change is achieved, during which no grant is transmitted for the UE.

c) Immediately after (b), the test system sends NPDCCH including uplink grant for NPUSCH transmission and immediately after receiving NPUSCH the test system repeatedly sends NPDCCH including uplink grant for NPUSCH transmission until the UE transmit timing offset is within ×TS ± 97×TS + Tmargin with respect to the first detected path (in time) of the corresponding downlink frame of cell 1. The test system shall verify that the difference in timing between the first NPUSCH transmission in step c) and the NPUSCH transmission in step a) shall be not greater than the maximum amount of the magnitude of the timing change in one adjustment requirement in clause 7.20.2. Using the first NPUSCH transmission in step c) and subsequent NPUSCH transmissions. The test system shall verify that the adjustment step size and the adjustment rate shall be according to the requirements in clause 7.20A.2 until the UE transmit timing offset is within ×TS ± 97×TS + Tmargin with respect to the first detected path (in time) of the corresponding downlink frame of cell 1.

d) The test system the test system sends NPDCCH including uplink grant for NPUSCH transmission and shall verify that the UE transmit timing offset stays within ×TS ± 97×TS + Tmargin with respect to the first detected path (in time) of the corresponding downlink frame of NB-IoT cell 1.

#### A.13.4.1.2 E-UTRAN HD-FDD – UE Transmit Timing Accuracy Tests for Category NB1 UE Standalone mode under enhanced coverage for Satellite Access

##### A.13.4.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the Category NB1 UE under enhanced coverage is capable of following the frame timing change of the connected eNode B, that the UE initial transmit timing accuracy is within the specified limits and that the UE shall not adjust the uplink transmission timing autonomously during an ongoing repetition period other than at initial transmission. This test will verify the requirements in clause 7.20A.

For this test a single NB-IoT cell is used. Test parameters are given in Table A.13.4.1.2.1-1 and Table A.13.4.1.2.1-2, Table A.13.4.1.2.1-3 and Table A.13.4.1.2.1-4. The transmit timing is verified by the UE transmitting NPUSCH.

Table A.13.4.1.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Table A.13.4.1.2.1-2: General Test Parameters for UE Transmit Timing Accuracy Tests for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under enhanced coverage for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | |
| **Test 1** | **Test 2** |
| NB-IoT Operation mode | |  | Standalone | Standalone |
| Satellite information | Config 1 |  | SSC.1 | SSC.1 |
| Config 2 |  | SSC.2 | SSC.2 |
| DRX | |  | OFF | ON |
| NPRACH configuration | |  | NPRACH.R-1  As specified in A.3.18 | |
| NPDCCH repetition level | |  | 32 | 32 |
| npdcch-StartSF-USS Note 2 | |  | v2 | v2 |
| npdcch-NumRepetitions-r13 Note 2 | |  | r32 | r32 |
| NPUSCH resource units | |  | 1 | 1 |
| NPUSCH repetition level | |  | 128 | 128 |
| NPUSCH subcarrier spacing | | kHz | 15 | 15 |
| NPUSCH number of subcarriers | |  | 1 | 1 |
| NPUSCH modulation | |  |  /4QPSK |  /4QPSK |
| NPUSCH Transport block size | | Bits | 40 | 40 |
| Note 1: DRX related parameters are defined in Table A.13.4.1.2.1-4.  Note 2: For further information see clause 6.7.3.2 in TS 36.331 [2]. | | | | |

Table A.13.4.1.2.1-3: nCell specific Test Parameters for UE Transmit Timing Accuracy Tests for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under enhanced coverage for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | |
| **Test 1** | **Test 2** |
| RF Channel Number |  | 1 | 1 |
| BWchannel | kHz | 200 | 200 |
| NPDSCH parameter |  | R.18 HD-FDD | R.18 HD-FDD |
| NPDCCH parameter |  | R.30 HD-FDD | R.30 HD-FDD |
| NOCNG Patterns |  | NOP.3 FDD | NOP.3 FDD |
| NPBCH\_RA | dB | 0 | 0 |
| NPBCH\_RB |
| NPSS\_RA |
| NSSS\_RA |
| NPDCCH\_RA |
| NPDCCH\_RB |
| NPDSCH\_RA |
| NPDSCH\_RB |
| NOCNG\_RA Note1 |
| NOCNG\_RB Note1 |
|  | dBm/15 kHz | -88 | -88 |
|  | dB | -11 | -11 |
|  | dB | -11 | -11 |
| Antenna Configuration |  | 1x1 | 1x1 |
| Propagation condition | - | AWGN | AWGN |
| Note 1 NOCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.13.4.1.2.1-4: drx-Configuration to be used in UE Transmit Timing Accuracy Test 2 for E-UTRAN HD-FDD Category NB1 UE Standalone mode under enhanced coverage for Satellite Access

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| **Test 2** |
| onDurationTimer | pp1 |  |
| drx-InactivityTimer | pp0 |  |
| drx-RetransmissionTimer | pp0 |  |
| longDRX-CycleStartOffset | sf2048 |  |
| shortDRX | disable |  |
| Note 1: For further information see clause 6.7.3 in TS 36.331 [2]. | | |

##### A.13.4.1.2.2 Test Requirements

For parameters specified in Tables A.13.4.1.2.1-1, Tables A.13.4.1.2.1-2, Tables A.13.4.1.2.1-3 and Tables A.13.4.1.2.1-4, the initial transmit timing accuracy shall be within the limits defined in clause 7.20A.2 and the UE shall not adjust the uplink transmission timing autonomously during an ongoing repetition period other than at initial transmission.

The following sequence of events shall be used to verify that the requirements are met.

The test sequence shall be carried out in RRC\_CONNECTED for both non-DRX (for Test1) and DRX with a cycle length of 2048 ms (Tests 2):

a) After a connection is set up with the cell, the test system sends NPDCCH including uplink grant for NPUSCH transmission and the test system shall measure the UE transmit timing offset (n×Ts) and verify that it is within Te (n×Ts ≤×TS ± 97×TS + Tmargin) with respect to the first detected path (in time) of the corresponding downlink frame of NB-IoT cell 1.

*Editor’s notes: FFS on Tmargin*

b) The test system sends NPDCCH including uplink grant for NPUSCH transmission. After 16ms from the initial NPUSCH transmission, the test system adjusts the downlink transmit timing for the cell, using the value of n measured in a),

- if n < 0, by +(144 – |n|)×TS compared to that in (a).

- if n ≥ 0, by -(144 – |n|)×TS compared to that in (a).

The timing adjustment is performed monotonically in multiple steps of |∆T| ≤ 9×TS per 256 ms (∆T is to be defined in the test procedure) until the above required total timing change is achieved, during which no grant is transmitted for the UE.

c) For test 2, the test system sends NPDCCH including uplink grant for NPUSCH transmission and shall verify that the UE transmit timing offset stays within (×TS ± 97×TS + Tmargin with respect to the first detected path (in time) of the corresponding downlink frame of NB-IoT cell 1. The UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

#### A.13.4.1.3 E-UTRAN HD-FDD – UE Transmit Timing Accuracy Tests for Category NB1 UE Standalone mode under enhanced coverage with segment transmission in NGSO for Satellite Access

##### A.13.4.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the Category NB1 UE, which is not supporting the capability of *ntn-SegmentedPrecompensationGaps-r17,* under enhanced coverage is capable of following the frame timing change of the connected eNode B, that the UE initial transmit timing accuracy is within the specified limits and that the UE shall not adjust the uplink transmission timing autonomously during an ongoing repetition period other than at initial transmission or at the start of a transmission segment boundary. This test will verify the requirements in clause 7.20A.

For this test a single NB-IoT cell is used. Test parameters are given in Table A.13.4.1.3.1-1 and Table A.13.4.1.3.1-2. The transmit timing is verified by the UE transmitting NPUSCH.

Table A.13.4.1.3.1-1: General Test Parameters for UE Transmit Timing Accuracy Tests for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under enhanced coverage for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Commnet** |
| **Test 1** |  |
| NB-IoT Operation mode |  | Standalone |  |
| Satellite information |  | SSC.2 | For NGSO |
| DRX |  | OFF |  |
| NPRACH configuration |  | NPRACH.R-1  As specified in A.3.18 |  |
| NPDCCH repetition level |  | 32 |  |
| npdcch-StartSF-USS Note 2 |  | v2 |  |
| npdcch-NumRepetitions-r13 Note 2 |  | r32 |  |
| NPUSCH resource units |  | 1 |  |
| NPUSCH repetition level |  | 128 |  |
| NPUSCH subcarrier spacing | kHz | 15 |  |
| NPUSCH number of subcarriers |  | 1 |  |
| NPUSCH modulation |  |  /4QPSK |  |
| NPUSCH Transport block size | Bits | 40 |  |
| npusch-TxDuration | ms | 64 |  |
| Note 1: void  Note 2: For further information see clause 6.7.3.2 in TS 36.331 [2]. | | | |

Table A.13.4.1.3.1-2: nCell specific Test Parameters for UE Transmit Timing Accuracy Tests for E-UTRAN HD-FDD Category NB1 UE in Standalone mode under enhanced coverage for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Commnet** |
| **Test 1** |  |
| RF Channel Number |  | 1 |  |
| BWchannel | kHz | 200 |  |
| NPDSCH parameter |  | R.18 HD-FDD |  |
| NPDCCH parameter |  | R.30 HD-FDD |  |
| NOCNG Patterns |  | NOP.3 FDD |  |
| NPBCH\_RA | dB | 0 |  |
| NPBCH\_RB |
| NPSS\_RA |
| NSSS\_RA |
| NPDCCH\_RA |
| NPDCCH\_RB |
| NPDSCH\_RA |
| NPDSCH\_RB |
| NOCNG\_RA Note1 |
| NOCNG\_RB Note1 |
|  | dBm/15 kHz | -88 |  |
|  | dB | -11 |  |
|  | dB | -11 |  |
| Antenna Configuration |  | 1x1 |  |
| Propagation condition | - | AWGN |  |
| Note 1 NOCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

##### A.13.4.1.3.2 Test Requirements

For parameters specified in Tables A.13.4.1.3.1-1, and Tables A.13.4.1.3.1-2, the initial transmit timing accuracy shall be within the limits defined in clause 7.20A.2 and the UE shall not adjust the uplink transmission timing autonomously during an ongoing repetition period other than at initial transmission or at the start of a transmission segment boundary.

The following sequence of events shall be used to verify that the requirements are met.

The test sequence shall be carried out in RRC\_CONNECTED for both non-DRX (for Test1):

a) After a connection is set up with the cell, the test system sends NPDCCH including uplink grant for NPUSCH transmission and the test system shall measure the UE transmit timing offset (n×Ts) of the first transmission in each segment and verify that it is within Te (n×Ts ≤(×TS ± 97×TS + Tmargin) with respect to the first detected path (in time) of the corresponding downlink frame of NB-IoT cell 1.

*Editor’s notes: FFS on Tmargin*

b) The test system sends NPDCCH including uplink grant for NPUSCH transmission. After 16ms from the initial NPUSCH transmission, the test system adjusts the downlink transmit timing for the cell, using the value of n measured in a),

- if n < 0, by +(144 – |n|)×TS compared to that in (a).

- if n ≥ 0, by -(144 – |n|)×TS compared to that in (a).

The timing adjustment is performed monotonically in multiple steps of |∆T| ≤ 9×TS per 256 ms (∆T is to be defined in the test procedure) until the above required total timing change is achieved, during which no grant is transmitted for the UE.

### A.13.4.2 UE timing advance for satellite access

#### A.13.4.2.1 HD-FDD UE Timing Advance Adjustment Accuracy Test for UE Category NB1 in Standalone Mode under Normal Coverage for Satellite Access

##### A.13.4.2.1.1 Test Purpose and Environment

The purpose of the test is to verify E-UTRAN Timing Advance adjustment accuracy requirements for UE category NB1 in normal coverage, defined in clause 7.22A.2.2, in an AWGN model.

The test parameters are given in tables A.13.4.2.1.1-1 A.13.4.2.1.1-2 and A.13.4.2.1.1-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and the UE is scheduled in every uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.5 in TS 36.321. The Timing Advance Command value shall be set to 31, which according to Clause 16.1.2 in TS 36.213 results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.13.4.2.1.1-3. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the NPUSCH sent from the UE.

As specified in Clause 7.22A.2.1, the UE adjusts its uplink timing at sub-frame *n*+12 for a timing advance command received in sub-frame *n*, where sub-frame *n* refers to the last subframe in the repetition period in which the MAC control element containing timing advance command was received. In addition, the UE shall not apply a TA command during an uplink repetition period. The timing advance adjustment accuracy is verified via the uplink transmission of NPUSCH carrying ACK/NACK response to the NPDSCH carrying TA command. *k0* in ACK/NACK resource filed in DCI is set as 13.

The UE Time Alignment Timer, described in Clause 5.2 in TS 36.321, shall be configured so that it does not expire in the duration of the test.

Table A.13.4.2.1.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Table A.13.4.2.1.1-2: General Test Parameters for E-UTRAN Timing Advance Accuracy Test for UE Category NB1 in Standalone Mode under Normal Coverage for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| CP Length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 |  |
| Config 2 |  | SSC.2 |  |
| Timing Advance Command (*TA*) value during T1 | |  | 31 | *NTA* = 0 for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 | |  | 39 | *NTA* = 128 |
| Number of repetitons | NPDCCH |  | 128 |  |
| NPDSCH |  | 128 |  |
| NPUSCH |  | 32 |  |
| DRX | |  | OFF |  |
| T1 | | s | 5 |  |
| T2 | | s | 5 |  |

**Table A.13.4.2.1.1-3: Cell specific Test Parameters for E-UTRAN Timing Advance Accuracy Test for UE Category NB1 in Standalone Mode under Normal Coverage for Satellite Access**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | |
| **T1** | **T2** |
| E-UTRA RF Channel Number |  | 1 | |
| BWchannel | KHz | 200 | |
| NPDSCH parameters:  DL Reference Measurement Channel defined in A.3.1.5.3 |  | R.18 HD-FDD | |
| NPDCCH parameters:  DL Reference Measurement Channel defined in A.3.1.6.3 |  | R.30 HD-FDD | |
| NOCNG Patterns defined in A.3.2.3.3 |  | NOP.3 FDD | |
| NPBCH\_RA | dB | 0 | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote1 | dB |
| NOCNG\_RBNote1 | dB |
| Timing Advance Command (*TA*) |  | 31 | 39 |
|  | dB | -12 | |
|  | dBm/15 KHz | -88 | |
|  | dB | -12 | |
| IoNote2 | dBm/ 180 KHz | -76.9 | |
| Antenna Configuration |  | 1x1 | |
| Propagation Condition |  | AWGN | |
| 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: Io level has been derived from other parameters for information purpose. It is not a settable parameter. | | | |

##### A.13.4.2.1.2 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at subframe *n*+12, where subframe *n* is the last subframe in the repetition period of NPDSCH in which the timing advance command is received by the UE.

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.22A.2.2.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

#### A.13.4.2.2 HD-FDD UE Timing Advance Adjustment Accuracy Test for UE Category NB1 in Standalone Mode under Enhance Coverage for Satellite Access

##### A.13.4.2.2.1 Test Purpose and Environment

The purpose of the test is to verify E-UTRAN Timing Advance adjustment accuracy requirements for UE category NB1 in enhanced coverage, defined in clause 7.22A.2.2, in an AWGN model.

The test parameters are given in tables A.13.4.2.2.1-1, A.13.4.2.2.1-2and A.13.4.2.2.1-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and the UE is scheduled in every uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.5 in TS 36.321. The Timing Advance Command value shall be set to 31, which according to Clause 16.1.2 in TS 36.213 results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.13.4.2.2.1-3. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the NPUSCH sent from the UE.

As specified in Clause 7.22A.2.1, the UE adjusts its uplink timing at sub-frame *n*+12 for a timing advance command received in sub-frame *n*, where sub-frame *n* refers to the last subframe in the repetition period in which the MAC control element containing timing advance command was received. In addition, the UE shall not apply a TA command during an uplink repetition period. The timing advance adjustment accuracy is verified via the uplink transmission of NPUSCH carrying ACK/NACK response to the NPDSCH carrying TA command. *k0* in ACK/NACK resource filed in DCI is set as 13.

The UE Time Alignment Timer, described in Clause 5.2 in TS 36.321, shall be configured so that it does not expire in the duration of the test.

Table A.13.4.2.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Table A.13.4.2.2.1-2: General Test Parameters for E-UTRAN Timing Advance Accuracy Test for UE Category NB1 in Standalone Mode under Enhanced Coverage for Satellite Access

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| CP Length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 |  |
| Config 2 |  | SSC.2 |  |
| Timing Advance Command (*TA*) value during T1 | |  | 31 | *NTA* = 0 for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 | |  | 39 | *NTA* = 128 |
| Number of repetitons | NPDCCH |  | 128 |  |
| NPDSCH |  | 128 |  |
| NPUSCH |  | 32 |  |
| DRX | |  | OFF |  |
| T1 | | s | 5 |  |
| T2 | | s | 5 |  |

Table A.13.4.2.2.1-3: Cell specific Test Parameters for E-UTRAN Timing Advance Accuracy Test for UE Category NB1 in Standalone Mode under Enhanced Coverage for Satellite Access

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | |
| **T1** | **T2** |
| E-UTRA RF Channel Number |  | 1 | |
| BWchannel | KHz | 200 | |
| NPDSCH parameters:  DL Reference Measurement Channel defined in A.3.1.5.3 |  | R.18 HD-FDD | |
| NPDCCH parameters:  DL Reference Measurement Channel defined in A.3.1.6.3 |  | R.30 HD-FDD | |
| NOCNG Patterns defined in A.3.2.3.3 |  | NOP.3 FDD | |
| NPBCH\_RA | dB | 0 | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| NOCNG\_RANote1 | dB |
| NOCNG\_RBNote1 | dB |
| Timing Advance Command (*TA*) |  | 31 | 39 |
|  | dB | -12 | |
|  | dBm/15 KHz | -88 | |
|  | dB | -12 | |
| IoNote2 | dBm/ 180 KHz | -76.9 | |
| Antenna Configuration |  | 1x1 | |
| Propagation Condition |  | AWGN | |
| 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: Io level has been derived from other parameters for information purpose. It is not a settable parameter. | | | |

##### A.13.4.2.2.2 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at subframe *n*+12, where subframe *n* is the last subframe in the repetition period of NPDSCH in which the timing advance command is received by the UE.

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.22A.2.2.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

A.13.4.3 Radio Link Monitoring for satellite access

A.13.4.3.1 HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 Standalone mode in normal coverage

A.13.4.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the HD-FDD category NB1 UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell. This test will partly verify the NB-IoT HD-FDD radio link monitoring requirements in clause 7.23A.

The test parameters are given in Tables A.13.4.3.1.1-1, A.13.4.3.1.1-2, A.13.4.3.1.1-3, A.13.4.3.1.1-4 and A.13.4.3.1.1-5. nCell 1 is the active NB-IoT SAN PCell in the test. The test consists of four successive time periods with time duration of T1, T2, T3 and T4 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.13.4.3.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync state with the following testing procedure:

- Prior to the start of the time duration T1, the UE shall be fully synchronized to nCell1

- Starting at point A, the SNR is decreased in small steps from SNR1 to SNR2 within dT

- At the start of the time duration T2, the UE is provided with a UL grant with NPDCCH

Note: The UE is expected to decode the NPDCCH and complete the UL transmission during T2 according to the UL grant. The UE shall not be provisioned with any more UL grants until the start of time period T4.

- Starting at point B, the SNR is decreased in small steps from SNR2 to SNR3 within dT

- During T3, the SNR is kept as SNR3

Note: The UE is expected to detect OOS and declare RLF during T3.

- Starting at point C, the SNR is increased in small steps from SNR3 to SNR1 with dT

- At the start of the time period T4, the UE will be provided with another UL grant with NPDCCH

Note: The UE is not expected to decode the UL grant and conduct any UL transmission during T4, since the UE is expected to declare RLF during T3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode the NPDCCH and complete the UL transmission when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

During the test, the test system shall emulate and send the GNSS signal to the test UE by AT command. The UE shall be provided with the valid information about the SAN serving cells before the test.

**Table A.13.4.3.1.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

**Table A.13.4.3.1.1-2: General test parameters for HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 Standalone mode in normal coverage**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Deployment Mode | |  | Standalone |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| NPDCCH transmission parameters Rmax | |  | 8 | Other NPDCCH parameters are defined in “ out-of-sync” column in Table 7.23A.2-1 |
| DRX cycle | | ms | 256 | See Table A.13.4.3.1.1-4 |
| Layer 3 filtering Note 2,3 | |  | Enabled | Counters:  N310 = 1  N311 = 1 |
| T310 timer Note 2,3 | | ms | 0 | T310 is disabled |
| T311 timer Note 2,3 | | ms | 1000 | T311 is enabled |
| T1 | | s | 5.12 |  |
| dT | | S | 0.8 |  |
| T2 | | s | 10.24 |  |
| dT | | S | 0.7 |  |
| T3 | | s | 5.12 |  |
| dT | | S | 1.4 |  |
| T4 | | s | 5.12 |  |
| Note 1: NPDCCH corresponding to the out of sync transmission parameters need not be included in the Reference Measurement Channel.  Note 2: N310, N311, T310 and T311 are defined in TS 36.331.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | |

**Table A.13.4.3.1.1-3: nCell specific test parameters for HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 Standalone mode in normal coverage**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** | **dT** | **T4** |
| BWchannel | kHz | 200 | | | | | | |
| OCNG Pattern as defined in A.3.2.3.3 Note 1 |  | NOP.3 FDD | | | | | | |
| NPDCCH parameters as defined in A.3.1.6.3 |  | R.30 HD-FDD | | | | | | |
| NPBCH\_RA | dB | 0 | | | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | -98 | | | | | | |
| SNR Note 4, 5 | dB | -3.1 | Note 6 | -9.1 | Note 7 | -14.1 | Note 8 | -3.1 |
| Propagation condition |  | AWGN | | | | | | |
| Antenna Configuration |  | 1x1 | | | | | | |
| 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. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Void  Note 3: Void  Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 5: The SNRs in time periods T1, T2, T3 and T4 are denoted as SNR1, SNR2, SNR3 and SNR1 respectively in figure A.13.4.3.1.1-1.  Note 6: The Test system shall reduce its transmit power in steps of ((SNR2-SNR1) / (10\*dT)) dB every 100ms until SNR2 is achieved at the end of dT.  Note 7: The Test system shall reduce its transmit power in steps of ((SNR3-SNR2) / (10\*dT)) dB every 100ms until SNR3 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of ((SNR1-SNR3) / (10\*dT)) dB every 100ms until SNR1 is achieved at the end of dT. | | | | | | | | |

**Table A.13.4.3.1.1-4: DRX-Configuration for HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 Standalone mode in 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 |

**Table A.13.4.3.1.1-5: *TimeAlignmentTimer* -Configuration for NB-IoT HD-FDD out-of-sync testing for UE category NB1 Standalone mode in normal coverage**

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 |

****

**Figure A.13.4.3.1.1-1: SNR variation for out-of-sync testing in DRX for NB-IoT HD-FDD out-of-sync testing for UE category NB1 Standalone mode in normal coverage**

A.13.4.3.1.2 Test Requirements

The UE behaviors in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T2 according to the received UL grant;

- The UE shall not conduct any NPUSCH transmission during T4

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90%.

A.13.4.3.2 HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 Standalone mode in enhanced coverage

A.13.4.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the HD-FDD category NB1 UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell. This test will partly verify the NB-IoT HD-FDD radio link monitoring requirements in clause 7.23A.

The test parameters are given in Tables A.13.4.3.2.1-1, A.13.4.3.2.1-2, A.13.4.3.2.1-3, A.13.4.3.2.1-4 and A.13.4.3.2.1-5. nCell 1 is the active NB-IoT SAN PCell in the test. The test consists of four successive time periods with time duration of T1, T2, T3 and T4 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.13.4.3.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync state with the following testing procedure:

- Prior to the start of the time duration T1, the UE shall be fully synchronized to nCell1

- Starting at point A, the SNR is decreased in small steps from SNR1 to SNR2 within dT

- At the start of the time duration T2, the UE is provided with a UL grant with NPDCCH

Note: The UE is expected to decode the NPDCCH and complete the UL transmission during T2 according to the UL grant. The UE shall not be provisioned with any more UL grants until the start of time period T4.

- Starting at point B, the SNR is decreased in small steps from SNR2 to SNR3 within dT

- During T3, the SNR is kept as SNR3

Note: The UE is expected to detect OOS and declare RLF during T3.

- Starting at point C, the SNR is increased in small steps from SNR3 to SNR1 with dT

- At the start of the time period T4, the UE will be provided with another UL grant with NPDCCH

Note: The UE is not expected to decode the UL grant and conduct any UL transmission during T4, since the UE is expected to declare RLF during T3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode the NPDCCH and complete the UL transmission when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

During the test, the test system shall emulate and send the GNSS signal to the test UE by AT command. The UE shall be provided with the valid information about the SAN serving cells before the test.

**Table A.13.4.3.2.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

**Table A.13.4.3.2.1-2: General test parameters for HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 Standalone mode in enhanced coverage**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| Deployment Mode | |  | Standalone |  |
| NPDCCH transmission parameters Rmax | |  | 16 | Other NPDCCH parameters are defined in “ out-of-sync” column in Table 7.23A.2-1 |
| DRX cycle | | ms | 256 | See Table A.13.4.3.2.1-4 |
| Layer 3 filtering Note 2,3 | |  | Enabled | Counters:  N310 = 1  N311 = 1 |
| T310 timer Note 2,3 | | ms | 0 | T310 is disabled |
| T311 timer Note 2,3 | | ms | 1000 | T311 is enabled |
| T1 | | s | 5.12 |  |
| dT | | s | 0.7 |  |
| T2 | | s | 10.24 |  |
| dT | | s | 0.8 |  |
| T3 | | s | 5.12 |  |
| dT | | s | 1.4 |  |
| T4 | | s | 5.12 |  |
| Note 1: NPDCCH corresponding to the out of sync transmission parameters need not be included in the Reference Measurement Channel.  Note 2: N310, N311, T310 and T311 are defined in TS 36.331.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | |

**Table A.13.4.3.2.1-3: nCell specific test parameters for HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 Standalone mode in enhanced coverage**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** | **dT** | **T4** |
| BWchannel | kHz | 200 | | | | | | |
| OCNG Pattern as defined in A.3.2.3.3 Note 1 |  | NOP.3 FDD | | | | | | |
| NPDCCH parameters as defined in A.3.1.6.3 |  | R.30 HD-FDD | | | | | | |
| NPBCH\_RA | dB | 0 | | | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | -98 | | | | | | |
| SNR Note 4, 5 | dB | -6.3 | Note 6 | -11.4 | Note 7 | -17.4 | Note 8 | -6.3 |
| Propagation condition |  | AWGN | | | | | | |
| Antenna Configuration |  | 1x1 | | | | | | |
| 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. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Void  Note 3: Void  Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 5: The SNRs in time periods T1, T2, T3 and T4 are denoted as SNR1, SNR2, SNR3 and SNR1 respectively in figure A.13.4.3.2.1-1.  Note 6: The Test system shall reduce its transmit power in steps of ((SNR2-SNR1) / (10\*dT)) dB every 100ms until SNR2 is achieved at the end of dT.  Note 7: The Test system shall reduce its transmit power in steps of ((SNR3-SNR2) / (10\*dT)) dB every 100ms until SNR3 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of ((SNR1-SNR3) / (10\*dT)) dB every 100ms until SNR1 is achieved at the end of dT. | | | | | | | | |

**Table A.13.4.3.2.1-4: DRX-Configuration for HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 Standalone mode in enhanced 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 |

**Table A.13.4.3.2.1-5: *TimeAlignmentTimer* -Configuration for HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 Standalone mode in enhanced coverage**

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 |

****

**Figure A.13.4.3.2.1-1: SNR variation for HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 Standalone mode in enhanced coverage**

A.13.4.3.2.2 Test Requirements

The UE behaviors in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T2 according to the received UL grant;

- The UE shall not conduct any NPUSCH transmission during T4.

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90%.

A.13.4.3.3 HD-FDD Radio Link Monitoring Test for In-sync with DRX for UE Category NB1 Standalone mode in Enhanced Coverage

A.13.4.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the HD-FDD category NB1 UE configured in enhanced coverage properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell when DRX is used. This test will partly verify the HD-FDD radio link monitoring requirements in clause 7.23A.

The test parameters are given in Tables A.13.4.3.3.1-1, A.13.4.3.3.1-2, A.13.4.3.3.1-3, A.13.4.3.3.1-4 and A.13.4.3.3.1-5. nCell 1 is the active cell in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.13.4.3.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.

Prior to the start of the time duration T1, the UE shall be fully be synchronized to nCell 1. The UE is scheduled in designated uplink subframes to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync and in sync requirements can be measured. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode NPDCCH and to send NPUSCH during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The test setup in each test during time durations T1, T2 and T3 shall be as follows:

- During the period from time point A to time point B, the SNR is decreasing linearly from SNR1 to SNR2.

- During the period from time point C to time point D, the SNR is increasing linearly from SNR2 to SNR1.

- During the period T3, the test system shall send the UE a grant to transmit in uplink. UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. During the period from time point A to time point D, the UE shall not be provisioned with any UL grant.

- Thereafter UE switches back to downlink.

In each run of the test, the test equipment selects NPDCCH repetition level, and sends the RRC configuration to the UE. NPDCCH repetition level is determined by RRC parameter *npdcch-NumRepetitions* [3]. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

During the test, the test system shall emulate and send the GNSS signal to the test UE by AT command. The UE shall be provided with the valid information about the SAN serving cells before the test.

**Table A.13.4.3.3.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

**Table A.13.4.3.3.1-2: General test parameters for HD-FDD in-sync test with DRX for UE category NB1 Standalone mode in enhanced coverage**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| In sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212[21] |
| Number of OFDM symbols for legacy control channels |  | 3 | In sync threshold Qin\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 4 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to NRS EPRE |  | 0 |
| Out of sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [21] |
| Number of OFDM symbols for legacy control channels |  | 3 | Out of sync threshold Qout\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 16 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to RS EPRE | dB | 0 |
| DRX cycle | | ms | 256 | See Table A.13.4.3.3.1-4 |
| Layer 3 filtering | |  | Enabled | Counters:  N310 = 1; N311 = 1 |
| T310 timer | | ms | 4000 | T310 is enabled |
| T311 timer | | ms | 1000 | T311 is enabled |
| T1 | | s | 4 |  |
| dT | | s | 1.4 |  |
| T2 | | s | 2.12 |  |
| dT | | s | 1.4 |  |
| T3 | | s | 4 |  |
| Note 1: NPDCCH corresponding to the in-sync and out of sync transmission parameters need not be included in the Reference Measurement Channel. | | | | |

**Table A.13.4.3.3.1-3: nCell 1 specific test parameters for HD-FDD in-sync radio link monitoring test with DRX for UE category NB1 Standalone mode in enhanced coverage**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** |
| BWchannel | kHz | 200 | | | | |
| OCNG Pattern as defined in A.3.2.3.3 Note 1 |  | NOP.3 FDD | | | | |
| NPDCCH parameters defined in A.3.1.6.3 |  | R.30 HD-FDD | | | | |
| Ratio of NPDSCH to NRS EPRE | dB | 0 | | | | |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPBCH\_RA | dB |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NOCNG\_RANote1 | dB |
| NOCNG\_RBNote1 | dB |
|  | dBm/15 kHz | -98 | | | | |
| SNR Note 5, Note 6 | dB | -6.3 | Note 7 | -17.4 | Note 8 | -6.3 |
| Propagation condition |  | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | |
| Note 1: OCNG shall be used such that the resources in ncell1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CQI reporting are assigned to the UE prior to the start of time period T1.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 4: The signal contains NPDCCH for UEs other than the device under test as part of OCNG.  Note 5: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 6: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2, and SNR1 respectively in figure A.13.4.3.3.1-1.  Note 7: The Test system shall reduce its transmit power in steps of (((SNR2-SNR1) / (10\*dT)) dB every 100ms till SNR2 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of (((SNR1-SNR2) / (10\*dT)) dB every 100ms till SNR1 is achieved at the end of dT. | | | | | | |

**Table A.13.4.3.3.1-4: DRX-Configuration for E-UTRAN HD-FDD in-sync tests with DRX for UE category NB1 Standalone mode in enhanced 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 |

**Table A.13.4.3.3.1-5: *TimeAlignmentTimer* -Configuration for E-UTRAN HD-FDD in-sync tests with DRX for UE category NB1 Standalone mode in enhanced coverage**

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 |

****

**Figure A.13.4.3.3.1-1: SNR variation for in-sync testing with DRX**

A.13.4.3.3.2 Test Requirements

The UE behaviour in each test shall be as follows:

During the period T3, the UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. This is considered a correct event.

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

A.13.4.3.4 HD-FDD Radio Link Monitoring Test for In-sync with DRX for UE Category NB1 Standalone mode in Normal Coverage

A.13.4.3.4.1 Test Purpose and Environment

The purpose of this test is to verify that the HD-FDD category NB1 UE configured in normal coverage properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell when DRX is used. This test will partly verify the HD-FDD radio link monitoring requirements in clause 7.23A.

The test parameters are given in Tables A.13.4.3.4.1-1, A.13.4.3.4.1-2, A.13.4.3.4.1-3, A.13.4.3.4.1-4 and A.13.4.3.4.1-5. nCell 1 is the active cell in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.13.4.3.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.

Prior to the start of the time duration T1, the UE shall be fully be synchronized to nCell 1. The UE is scheduled in designated uplink subframes to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync and in sync requirements can be measured. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode NPDCCH and to send NPUSCH during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The test setup in each test during time durations T1, T2 and T3 are as follows:

- During the period from time point A to time point B, the SNR is decreasing linearly from SNR1 to SNR2.

- During the period from time point C to time point D, the SNR is increasing linearly from SNR2 to SNR1.

- During the period T3, the test system shall send the UE a grant to transmit in uplink. UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. During the period from time point A to time point D, the UE shall not be provisioned with any UL grant.

- Thereafter UE switches back to downlink.

In each run of the test, the test equipment selects NPDCCH repetition level, and sends the RRC configuration to the UE. NPDCCH repetition level is determined by RRC parameter *npdcch-NumRepetitions* [2]. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

During the test, the test system shall emulate and send the GNSS signal to the test UE by AT command. The UE shall be provided with the valid information about the SAN serving cells before the test.

**Table A.13.4.3.4.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

**Table A.13.4.3.4.1-2: General test parameters for HD-FDD in-sync test with DRX for UE category NB1 Standalone mode in normal coverage**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| In sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [21] |
| Number of OFDM symbols for legacy control channels |  | 3 | In sync threshold Qin\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 2 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to NRS EPRE |  | 0 |
| Out of sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212[21] |
| Number of OFDM symbols for legacy control channels |  | 3 | Out of sync threshold Qout\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 8 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to RS EPRE | dB | 0 |
| DRX cycle | | ms | 256 | See Table A.13.4.3.4.1-4 |
| Layer 3 filtering | |  | Enabled | Counters:  N310 = 1; N311 = 1 |
| T310 timer | | ms | 4000 | T310 is enabled |
| T311 timer | | ms | 1000 | T311 is enabled |
| T1 | | s | 4 |  |
| dT | | s | 1.4 |  |
| T2 | | s | 2.12 |  |
| dT | | s | 1.4 |  |
| T3 | | s | 4 |  |
| Note 1: NPDCCH corresponding to the in-sync and out of sync transmission parameters need not be included in the Reference Measurement Channel. | | | | |

**Table A.13.4.3.4.1-3: nCell 1 specific test parameters for HD-FDD in-sync radio link monitoring test with DRX for UE category NB1 Standalone mode in normal coverage**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** |
| BWchannel | kHz | 200 | | | | |
| OCNG Pattern as defined in A.3.2.3.3 Note 1 |  | NOP.3 FDD | | | | |
| NPDCCH parameters defined in A.3.1.6.3 |  | R.30 HD-FDD | | | | |
| Ratio of NPDSCH to NRS EPRE | dB | 0 | | | | |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPBCH\_RA | dB |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NOCNG\_RANote1 | dB |
| NOCNG\_RBNote1 | dB |
|  | dBm/15 kHz | -98 | | | | |
| SNR Note 5, Note 6 | dB | -3.1 | Note 7 | -14.1 | Note 8 | -3.1 |
| Propagation condition |  | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | |
| Note 1: OCNG shall be used such that the resources in ncell1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CQI reporting are assigned to the UE prior to the start of time period T1.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 4: The signal contains NPDCCH for UEs other than the device under test as part of OCNG.  Note 5: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 6: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2, and SNR1 respectively in figure A.13.4.3.4.1-1.  Note 7: The Test system shall reduce its transmit power in steps of (((SNR2-SNR1) / (10\*dT)) dB every 100ms till SNR2 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of (((SNR1-SNR2) / (10\*dT)) dB every 100ms till SNR1 is achieved at the end of dT. | | | | | | |

**Table A.13.4.3.4.1-4: DRX-Configuration for E-UTRAN HD-FDD in-sync tests with DRX for UE category NB1 Standalone mode in 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 |

**Table A.13.4.3.4.1-5: *TimeAlignmentTimer* -Configuration for E-UTRAN HD-FDD in-sync tests with DRX for UE category NB1 Standalone mode in normal coverage**

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 |

****

**Figure A.13.4.3.4.1-1: SNR variation for in-sync testing with DRX**

A.13.4.3.4.2 Test Requirements

The UE behaviour in each test shall be as follows:

During the period T3, the UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. This is considered a correct event.

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

A.13.4.3.5 HD-FDD Radio Link Monitoring Test for In-sync without DRX for UE Category NB1 Standalone mode in Normal Coverage

A.13.4.3.5.1 Test Purpose and Environment

The purpose of this test is to verify that the HD-FDD category NB1 UE configured in normal coverage properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell ~~when DRX is used~~. This test will partly verify the HD-FDD radio link monitoring requirements in clause 7.23A.

The test parameters are given in Tables A.13.4.3.5.1-1, A.13.4.3.5.1-2, A.13.4.3.5.1-3, and A.13.4.3.5.1-4. nCell 1 is the active cell in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.13.4.3.5.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.

Prior to the start of the time duration T1, the UE shall be fully be synchronized to nCell 1. The UE is scheduled in designated uplink subframes to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync and in sync requirements can be measured. In the test, DRX configuration is disabled. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The test setup in each test during time durations T1, T2, dT and T3 shall be as follows:

- During the period from time point A to time point B, the SNR is decreasing linearly from SNR1 to SNR2.

- During the period from time point C to time point D, the SNR is increasing linearly from SNR2 to SNR1.

- During the period T3, the test system shall send the UE a grant to transmit in uplink. UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. During the period from time point A to time point D, the UE shall not be provisioned with any UL grant.

- Thereafter UE switches back to downlink.

In each run of the test, the test equipment selects NPDCCH repetition level, and sends the RRC configuration to the UE. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

During the test, the test system shall emulate and send the GNSS signal to the test UE by AT command. The UE shall be provided with the valid information about the SAN serving cells before the test.

**Table A.13.4.3.5.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

**Table A.13.4.3.5.1-2: General test parameters for HD-FDD in-sync test without DRX for UE category NB1 Standalone mode in normal coverage**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| In sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [21] |
| Number of OFDM symbols for legacy control channels |  | 3 | In sync threshold Qin\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 2 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to NRS EPRE |  | 0 |
| Out of sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212[21] |
| Number of OFDM symbols for legacy control channels |  | 3 | Out of sync threshold Qout\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 8 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to RS EPRE | dB | 0 |
| Layer 3 filtering | |  | Enabled | Counters:  N310 = 1; N311 = 1 |
| T310 timer | | ms | 4000 | T310 is enabled |
| T311 timer | | ms | 1000 | T311 is enabled |
| T1 | | s | 4 |  |
| dT | | s | 1.4 |  |
| T2 | | s | 2.12 |  |
| dT | | s | 1.4 |  |
| T3 | | s | 4 |  |
| Note 1: NPDCCH corresponding to the in-sync and out of sync transmission parameters need not be included in the Reference Measurement Channel. | | | | |

**Table A.13.4.3.5.1-3: nCell 1 specific test parameters for HD-FDD in-sync radio link monitoring test without DRX for UE category NB1 Standalone mode in normal coverage**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** |
| BWchannel | kHz | 200 | | | | |
| OCNG Pattern as defined in A.3.2.3.3 Note 1 |  | NOP.3 FDD | | | | |
| NPDCCH parameters defined in A.3.1.6.3 |  | R.30 HD-FDD | | | | |
| NPDSCH\_RA | dB | 0 | | | | |
| NPDSCH\_RB | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPBCH\_RA | dB |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
|  | dBm/15 kHz | -98 | | | | |
| SNR Note 5, Note 6 | dB | -3.1 | Note 7 | -14.1 | Note 8 | -3.1 |
| Propagation condition |  | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | |
| Note 1: OCNG shall be used such that the resources in ncell1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CQI reporting are assigned to the UE prior to the start of time period T1.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 4: The signal contains NPDCCH for UEs other than the device under test as part of OCNG.  Note 5: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 6: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2, and SNR1 respectively in figure A.13.4.3.5.1-1.  Note 7: The Test system shall reduce its transmit power in steps of (((SNR2-SNR1) / (10\*dT)) dB every 100ms till SNR2 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of (((SNR1-SNR2) / (10\*dT)) dB every 100ms till SNR1 is achieved at the end of dT. | | | | | | |

**Table A.13.4.3.5.1-4: *TimeAlignmentTimer* -Configuration for E-UTRAN HD-FDD in-sync tests without DRX for UE category NB1 Standalone mode in normal coverage**

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 |

****

**Figure A.13.4.3.5.1-1: SNR variation for in-sync testing without DRX**

A.13.4.3.5.2 Test Requirements

The UE behavior in each test shall be as follows:

During the period T3, the UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. This is considered a correct event.

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

A.13.4.3.6 HD-FDD Radio Link Monitoring Test for In-sync without DRX for UE Category NB1 Standalone mode in Enhanced Coverage

A.13.4.3.6.1 Test Purpose and Environment

The purpose of this test is to verify that the HD-FDD category NB1 UE configured in enhanced coverage properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell ~~when DRX is used~~. This test will partly verify the HD-FDD radio link monitoring requirements in clause 7.23A.

The test parameters are given in Tables A.13.4.3.6.1-1, A.13.4.3.6.1-2, A.13.4.3.6.1-3, and A.13.4.3.6.1-4. nCell 1 is the active cell in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.13.4.3.6.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.

Prior to the start of the time duration T1, the UE shall be fully be synchronized to nCell 1. The UE is scheduled in designated uplink subframes to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync and in sync requirements can be measured. In the test, DRX configuration is disabled. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The test setup in each test during time durations T1, T2, dT and T3 shall be as follows:

- During the period from time point A to time point B, the SNR is decreasing linearly from SNR1 to SNR2.

- During the period from time point C to time point D, the SNR is increasing linearly from SNR2 to SNR1.

- During the period T3, the test system shall send the UE a grant to transmit in uplink. UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. During the period from time point A to time point D, the UE shall not be provisioned with any UL grant.

- Thereafter UE switches back to downlink.

In each run of the test, the test equipment selects NPDCCH repetition level, and sends the RRC configuration to the UE. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

During the test, the test system shall emulate and send the GNSS signal to the test UE by AT command. The UE shall be provided with the valid information about the SAN serving cells before the test.

**Table A.13.4.3.6.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

**Table A.13.4.3.6.1-2: General test parameters for HD-FDD in-sync test without DRX for UE category NB1 Standalone mode in enhanced coverage**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| In sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212[21] |
| Number of OFDM symbols for legacy control channels |  | 3 | In sync threshold Qin\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 4 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to NRS EPRE |  | 0 |
| Out of sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212[21] |
| Number of OFDM symbols for legacy control channels |  | 3 | Out of sync threshold Qout\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23A.2 and Table 7.23A.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 16 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to RS EPRE | dB | 0 |
| Layer 3 filtering | |  | Enabled | Counters:  N310 = 1; N311 = 1 |
| T310 timer | | ms | 4000 | T310 is enabled |
| T311 timer | | ms | 1000 | T311 is enabled |
| T1 | | s | 4 |  |
| dT | | s | 1.4 |  |
| T2 | | s | 2.12 |  |
| dT | | s | 1.4 |  |
| T3 | | s | 4 |  |
| Note 1: NPDCCH corresponding to the in-sync and out of sync transmission parameters need not be included in the Reference Measurement Channel. | | | | |

**Table A.13.4.3.6.1-3: nCell 1 specific test parameters for HD-FDD in-sync radio link monitoring test without DRX for UE category NB1 Standalone mode in enhanced coverage**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** |
| BWchannel | kHz | 200 | | | | |
| OCNG Pattern as defined in A.3.2.3.3 Note 1 |  | NOP.3 FDD | | | | |
| NPDCCH parameters defined in A.3.1.6.3 |  | R.30 HD-FDD | | | | |
| NPDSCH\_RA | dB | 0 | | | | |
| NPDSCH\_RB | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPBCH\_RA | dB |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
|  | dBm/15 kHz | -98 | | | | |
| SNR Note 5, Note 6 | dB | -6.3 | Note 7 | -17.4 | Note 8 | -6.3 |
| Propagation condition |  | AWGN | | | | |
| Antenna Configuration |  | 1x1 | | | | |
| Note 1: OCNG shall be used such that the resources in ncell1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CQI reporting are assigned to the UE prior to the start of time period T1.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 4: The signal contains NPDCCH for UEs other than the device under test as part of OCNG.  Note 5: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 6: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2, and SNR1 respectively in figure A.13.4.3.6.1-1.  Note 7: The Test system shall reduce its transmit power in steps of (((SNR2-SNR1) / (10\*dT)) dB every 100ms till SNR2 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of (((SNR1-SNR2) / (10\*dT)) dB every 100ms till SNR1 is achieved at the end of dT. | | | | | | |

**Table A.13.4.3.6.1-4: *TimeAlignmentTimer* -Configuration for E-UTRAN HD-FDD in-sync tests without DRX for UE category NB1 Standalone mode in enhanced coverage**

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 |

****

**Figure A.13.4.3.6.1-1: SNR variation for in-sync testing without DRX**

A.13.4.3.6.2 Test Requirements

The UE behavior in each test shall be as follows:

During the period T3, the UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. This is considered a correct event.

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

A.13.4.3.7 HD-FDD Radio Link Monitoring Test for Out-of-sync without DRX for UE Category NB1 Standalone mode in Normal Coverage

A.13.4.3.7.1 Test Purpose and Environment

The purpose of this test is to verify that the HD-FDD category NB1 UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell. This test will partly verify the NB-IoT HD-FDD radio link monitoring requirements in clause 7.23A.

The test parameters are given in Tables A.13.4.3.7.1-1, Tables A.13.4.3.7.1-2 and A.13.4.3.7.1-3. nCell1 is the active NB-IoT SAN PCell in the test. The test consists of four successive time periods with time duration of T1, T2, T3 and T4 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.13.4.3.7.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync state with the following testing procedure:

- Prior to the start of the time duration T1, the UE shall be fully synchronized to nCell1

- Starting at point A, the SNR is decreased in small steps from SNR1 to SNR2 within dT

- At the start of the time duration T2, the UE is provided with a UL grant with NPDCCH

Note: The UE is expected to decode the NPDCCH and complete the UL transmission during T2 according to the UL grant. The UE shall not be provisioned with any more UL grants until the start of time period T4.

- Starting at point B, the SNR is decreased in small steps from SNR2 to SNR3 within dT

- During T3, the SNR is kept as SNR3

Note: The UE is expected to detect OOS and declare RLF during T3.

- Starting at point C, the SNR is increased in small steps from SNR3 to SNR1 with dT

- At the start of the time period T4, the UE will be provided with another UL grant with NPDCCH

Note: The UE is not expected to decode the UL grant and conduct any UL transmission during T4, since the UE is expected to declare RLF during T3.

During the test, the test system shall emulate and send the GNSS signal to the test UE by AT command. The UE shall be provided with the valid information about the SAN serving cells before the test.

**Table A.13.4.3.7.1-1: Supported test configurations**

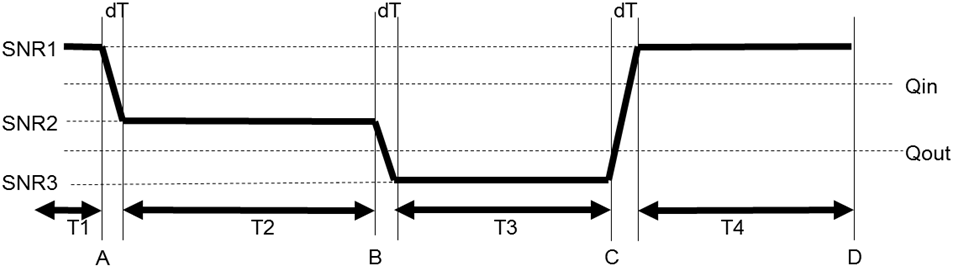
|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

**Table A.13.4.3.7.1-2: General test parameters for HD-FDD Radio Link Monitoring Test for out-of-sync tests without DRX for UE Category NB1 Standalone mode in normal coverage**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| NPDCCH repetition level Rmax | |  | 8 | Other NPDCCH parameters are defined in “ out-of-sync” column in Table 7.23A.2-1 |
| DRX | |  | OFF |  |
| Layer 3 filtering Note 2,3 | |  | Enabled | Counters:  N310 = 1  N311 = 1 |
| T310 timer Note 2,3 | | ms | 0 | T310 is disabled |
| T311 timer Note 2,3 | | ms | 3000 | T311 is enabled |
| T1 | | s | 2 |  |
| dT | | s | 0.8 |  |
| T2 | | s | 0.4 |  |
| dT | | s | 0.7 |  |
| T3 | | s | 0.5 |  |
| dT | | s | 1.4 |  |
| T4 | | s | 0.4 |  |
| Note 1: NPDCCH corresponding to the out of sync transmission parameters need not be included in the Reference Measurement Channel.  Note 2: N310, N311, T310 and T311 are defined in TS 36.331.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | |

**Table A.13.4.3.7.1-3: nCell1 specific test parameters for HD-FDD Radio Link Monitoring Test for out-of-sync without DRX for UE Category NB1 Standalone mode in normal coverage**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** | **dT** | **T4** |
| NB-IoT Channel Bandwidth (BWchannel) | kHz | 200 | | | | | | |
| OCNG Pattern as defined in A.3.2.3.3 Note 1 |  | NOP.3 FDD | | | | | | |
| NPDCCH parameters as defined in A.3.1.6.3 |  | R.30 HD-FDD | | | | | | |
| NPBCH\_RA | dB | 0 | | | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RA Note 1 | dB |
| OCNG\_RB Note 1 | dB |
|  | dBm/15 KHz | -98 | | | | | | |
| SNR Note 4,5 | - | -3.1 | Note 6 | -9.1 | Note 7 | -14.1 | Note 6 | -3.1 |
| Propagation Condition | - | AWGN | | | | | | |
| Antenna Configuration | - | 1x1 | | | | | | |
| 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. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Void  Note 3: Void  Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 5: The SNRs in time periods T1, T2, T3 and T4 are denoted as SNR1, SNR2, SNR3 and SNR1 respectively in figure A.13.4.3.7.1-1.  Note 6: The Test system shall reduce its transmit power in steps of ((SNR2-SNR1) / (10\*dT)) dB every 100ms until SNR2 is achieved at the end of dT.  Note 7: The Test system shall reduce its transmit power in steps of ((SNR3-SNR2) / (10\*dT)) dB every 100ms until SNR3 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of ((SNR1-SNR3) / (10\*dT)) dB every 100ms until SNR1 is achieved at the end of dT. | | | | | | | | |

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**Figure A.13.4.3.7.1-1: SNR variation for out-of-sync testing**

A.13.4.3.7.2 Test Requirements

The UE behaviors in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T2 according to the received UL grant;

- The UE shall not conduct any NPUSCH transmission during T4

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90%.

A.13.4.3.8 HD-FDD Radio Link Monitoring Test for Out-of-sync without DRX for UE Category NB1 Standalone mode in Enhanced Coverage

A.13.4.3.8.1 Test Purpose and Environment

The purpose of this test is to verify that the HD-FDD category NB1 UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the NB-IoT SAN PCell. This test will partly verify the NB-IoT HD-FDD radio link monitoring requirements in clause 7.23A.

The test parameters are given in Tables A.13.4.3.8.1-1, A.13.4.3.8.1-2 and A.13.4.3.8.1-3 below. nCell1 is the active NB-IoT SAN PCell, in the test. The test consists of four successive time periods with time duration of T1, T2, T3 and T4 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.13.4.3.8.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync state with the following testing procedure.

- Before the start of the time duration T1, the UE shall be fully synchronized to nCell1

- Starting at point A, the SNR is decreased in small steps from SNR1 to SNR2 with duration dT

- At the start of the time duration T2, the UE is provided with a UL grant with NPDCCH.

Note: The UE is expected to decode NPDCCH and complete the UL transmission during T2 according to the UL grant. The UE shall not be provisioned with any more UL grants until the start of time period T4.

- Starting at point B, the SNR is decreased in small steps from SNR2 to SNR3 with duration dT

- During T3, the SNR is kept at SNR3.

Note: The UE is expected to detect OOS and declare RLF during T3.

- Starting at point C, the SNR is increased in small steps from SNR3 to SNR1 with duration dT

- At the start of the time period T4, the UE will be provided with another UL grant with NPDCCH

Note: The UE is not expected to decode the UL grant and conduct the UL transmission during T4 since the UE is expected to declare RLF during T3.

During the test, the test system shall emulate and send the GNSS signal to the test UE by AT command. The UE shall be provided with the valid information about the SAN serving cells before the test.

**Table A.13.4.3.8.1-1: Supported test configurations**

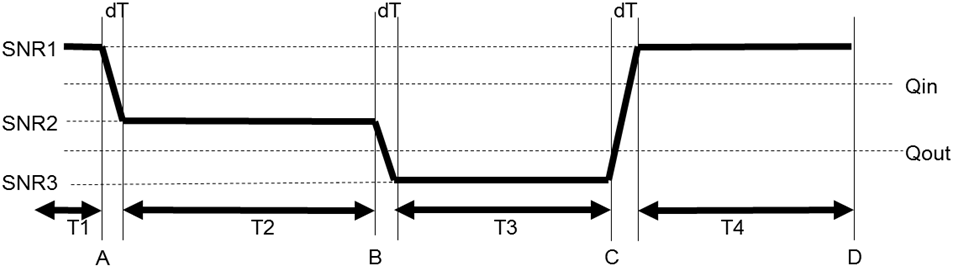
|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

**Table A.13.4.3.8.1-2: General test parameters for HD-FDD Radio Link Monitoring Test for out-of-sync tests without DRX for UE Category NB1 Standalone mode in enhanced coverage**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NB-IoT operational mode | |  | Standalone |  |
| Active cell | |  | nCell 1 |  |
| CP length | |  | Normal |  |
| Satellite information | Config 1 |  | SSC.1 | GSO |
| Config 2 |  | SSC.2 | NGSO |
| NB-IoT RF Channel Number | |  | 1 | One NB-IoT carrier frequency |
| NPDCCH repetition level Rmax | |  | 16 | Other NPDCCH parameters are defined in “ out-of-sync” column in Table 7.23A.2-1 |
| DRX | |  | OFF |  |
| Layer 3 filtering Note 2 | |  | Enabled | Counters:  N310 = 1  N311 = 1 |
| T310 timer Note 2 | | ms | 0 | T310 is disabled |
| T311 timer Note 2 | | ms | 3000 | T311 is enabled |
| T1 | | s | 2 |  |
| dT | | s | 0.7 |  |
| T2 | | s | 0.4 |  |
| dT | | s | 0.8 |  |
| T3 | | s | 0.5 |  |
| dT | | s | 1.4 |  |
| T4 | | s | 0.4 |  |
| Note 1: NPDCCH corresponding to the out of sync transmission parameters need not be included in the Reference Measurement Channel.  Note 2: N310, N311, T310 and T311 are defined in TS 36.331.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | |

**Table A.13.4.3.8.1-3: nCell1 specific test parameters for HD-FDD Radio Link Monitoring Test for out-of-sync without DRX for UE Category NB1 Standalone mode in enhanced coverage**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **nCell 1** | | | | | | |
| **T1** | **dT** | **T2** | **dT** | **T3** | **dT** | **T4** |
| BWchannel | kHz | 200 | | | | | | |
| OCNG Pattern as defined in A.3.2.3.3 Note 1 |  | NOP.3 FDD | | | | | | |
| NPDCCH parameters as defined in A.3.1.6.3 |  | R.30 HD-FDD | | | | | | |
| NPBCH\_RA | dB | 0 | | | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RA Note 1 | dB |
| OCNG\_RB Note 1 | dB |
|  | dBm/15 KHz | -98 | | | | | | |
| SNR Note 4,5 | - | -6.3 | Note 6 | -11.4 | Note 7 | -17.4 | Note 8 | -6.3 |
| Propagation Condition | - | AWGN | | | | | | |
| Antenna Configuration | - | 1x1 | | | | | | |
| 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. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Void  Note 3: Void  Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 5: The SNR in time periods T1, T2, T3 and T4 is denoted as SNR1, SNR2, SNR3 and SNR1 respectively in figure A.13.4.3.8.1-1.  Note 6: The Test system shall reduce its transmit power in steps of ((SNR2-SNR1) / (10\*dT)) dB every 100ms until SNR2 is achieved at the end of dT.  Note 7: The Test system shall reduce its transmit power in steps of ((SNR3-SNR2) / (10\*dT)) dB every 100ms until SNR3 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of ((SNR1-SNR3) / (10\*dT)) dB every 100ms until SNR1 is achieved at the end of dT. | | | | | | | | |

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**Figure A.13.4.3.8.1-1: SNR variation for out-of-sync testing**

A.13.4.3.8.2 Test Requirements

The UE behaviors in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T2 according to the received UL grant;

- The UE shall not conduct any NPUSCH transmission during T4

A correct event is defined as UE behave correctly in all above steps. The correct events observed during repeated tests shall be at least 90%.

In the following section, any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

### <Next change>

### A.14.4.2 UE timing advance for satellite access

This clause provides the UE timing advance test cases for Cat-M1 UEs using satellite access, the supported test configurations are provided in Table A.14.4.2-1.

Table A.14.4.2-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, HD-FDD duplex mode |
| 2 | NGSO, HD-FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

#### A.14.4.2.1 E-UTRAN FDD Timing Advance Adjustment Accuracy Test for Cat-M1 UE in CEModeA

##### A.14.4.2.1.1 Test Purpose and Environment

The purpose of the test is to verify E-UTRAN FDD Timing Advance adjustment accuracy requirements for Cat-M1 UE configured with CEModeA, defined in clause 7.28A.2.2, in an AWGN model.

The test parameters are given in tables A.14.4.2.1.1-1, A.14.4.2.1.1-2, and A.14.4.2.1.1-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.14.4.2.1.1-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

The UE shall be provided with the valid information about the Satellite Access Node serving cell before and during the test via SI messages configured as provided in Table A.14.4.2.1.1-4. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.5 in TS 36.321. The Timing Advance Command value shall be set to 31, which according to Clause 4.2.3 in TS 36.213 results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established. The reference timing advance used by the UE is equal to: .

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.14.4.2.1.1-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in Clause 7.28A.2.1, the UE adjusts its uplink timing at sub-frame *n*+6+Koffset for a timing advance command received in sub-frame n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

The UE Time Alignment Timer, described in Clause 5.2 in TS 36.321, shall be configured so that it does not expire in the duration of the test.

Table A.14.4.2.1.1-1: General Test Parameters for E-UTRAN FDD Timing Advance Accuracy Test for Cat-M1 UE in CEModeA

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| PDSCH parameters:  DL Reference Measurement Channel |  | [R.20 FDD] | As specified in clause A.3.1.4.1 |
| MPDCCH parameters:  DL Reference Measurement Channel |  | [R.16 FDD] | As specified in clause A.3.1.3.1 |
| Timing Advance Command (*TA*) value during T1 |  | 31 | *NTA* = 0 for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 |  | 39 | *NTA* = 128 |
| DRX |  | OFF |  |
| T1 | s | 5 |  |
| T2 | s | 5 |  |

Table A.14.4.2.1.1-2: Cell specific Test Parameters for E-UTRAN FDD UE Timing Advance Accuracy Test for Cat-M1 UE in CEModeA

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | |
| **T1** | **T2** |
| E-UTRA RF Channel Number |  | 1 | |
| BWchannel | MHz | 1.4 | |
| PDSCH parameters:  DL Reference Measurement Channel |  | [R.20 FDD] | |
| MPDCCH parameters:  DL Reference Measurement Channel |  | [R.16 FDD] | |
| OCNG Patterns defined in A.3.2.1.21 |  | OP.21 FDD | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| MPDCCH\_RA | dB |
| MPDCCH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
| Timing Advance Command (*TA*) |  | 31 | 39 |
|  | dB | 3 | |
|  | dBm/15 KHz | -98 | |
|  | dB | 3 | |
| IoNote2 | dBm/9 MHz | -65.5 | |
| Propagation Condition |  | AWGN | |
| Antenna configuration |  | 1x1 | |
| Note 1: OCNG shall be used such that cells is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Io level has been derived from other parameters for information purpose. It is not a settable parameter. | | | |

Table A.14.4.2.1.1-3: Sounding Reference Symbol Configuration for E-UTRAN FDD UE Transmit Timing Accuracy Test for Cat-M1 UE in CEModeA

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| srsBandwidthConfiguration | Bw5 |  |
| srsSubframeConfiguration | sc3 | Once every 5 subframes |
| ackNackSrsSimultaneousTransmission | FALSE |  |
| srsMaxUpPTS | N/A | Not applicable for E-UTRAN FDD |
| srsBandwidth | 0 | No hopping |
| srsHoppingBandwidth | hbw0 |
| frequencyDomainPosition | 0 |  |
| Duration | TRUE | Indefinite duration |
| Srs-ConfigurationIndex | 17 | SRS periodicity of 20. |
| transmissionComb | 0 |  |
| cyclicShift | cs0 | No cyclic shift |
| SRS-AntennaPort | an1 | Number of antenna ports used for SRS transmission |
| Note 1: For further information see clause 6.3.2 in TS 36.331. | | |

Table A.14.4.2.1.1-4: NTN specific test for E-UTRAN FDD UE Transmit Timing Accuracy Test for Cat-M1 UE in CEModeA

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Comment** |
| Configuration 1 | SSC.1 | GSO Test Configuration |
| Configuration 2 | SSC.2 | NGSO Test Configuration |

##### A.14.4.2.1.2 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. 6 + Koffset sub frames after the reception of the timing advance command. The applied timing advance shall be additional to any variation on the timing advance components caused by the satellite ephemeris and common delay information.

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.28A.2.2.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

#### A.14.4.2.2 E-UTRAN HD-FDD UE Timing Advance Adjustment Accuracy Test for Cat-M1 UE in CEModeA

##### A.14.4.2.2.1 Test Purpose and Environment

The purpose of the test is to verify E-UTRAN HD-FDD Timing Advance adjustment accuracy requirements for Cat-M1 UE configured with CEModeA, defined in clause 7.28A.2.2, in an AWGN model.

The test parameters are given in tables A.14.4.2.2.1-1, A.14.4.2.2.1-2, and A.14.4.2.2.1-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.14.4.2.2.1-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

The UE shall be provided with the valid information about the Satellite Access Node serving cell before and during the test via SI messages configured as provided in Table A.14.4.2.2.1-4. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.5 in TS 36.321. The Timing Advance Command value shall be set to 31, which according to Clause 4.2.3 in TS 36.213 results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established. The reference timing advance used by the UE is equal to: .

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.14.4.2.2.1-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in Clause 7.28A.2.1, the UE adjusts its uplink timing at sub-frame *n*+6+Koffset for a timing advance command received in sub-frame n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

The UE Time Alignment Timer, described in Clause 5.2 in TS 36.321, shall be configured so that it does not expire in the duration of the test.

Table A.14.4.2.2.1-1: General Test Parameters for E-UTRAN HD-FDD Timing Advance Accuracy Test for Cat-M1 UE in CEModeA

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| PDSCH parameters:  DL Reference Measurement Channel |  | [R.10 HD-FDD] | As specified in clause A.3.1.4.2 |
| MPDCCH parameters:  DL Reference Measurement Channel |  | [R.6 HD-FDD] | As specified in clause A.3.1.3.2 |
| Timing Advance Command (*TA*) value during T1 |  | 31 | *NTA* = 0 for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 |  | 39 | *NTA* = 128 |
| DRX |  | OFF |  |
| T1 | s | 5 |  |
| T2 | s | 5 |  |

Table A.14.4.2.2.1-2: Cell specific Test Parameters for E-UTRAN HD-FDD Timing Advance Accuracy Test for Cat-M1 UE in CEModeA

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | |
| **T1** | **T2** |
| E-UTRA RF Channel Number |  | 1 | |
| BWchannel | MHz | 1.4 | |
| PDSCH parameters:  DL Reference Measurement Channel |  | [R.10 HD-FDD] | |
| MPDCCH parameters:  DL Reference Measurement Channel |  | [R.6 HD-FDD] | |
| OCNG Patterns defined in A.3.2.1.21 |  | OP.21 FDD | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| MPDCCH\_RA | dB |
| MPDCCH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
| Timing Advance Command (*TA*) |  | 31 | 39 |
|  | dB | 3 | |
|  | dBm/15 KHz | -98 | |
|  | dB | 3 | |
| IoNote2 | dBm/9 MHz | -65.5 | |
| Propagation Condition |  | AWGN | |
| Antenna configuration |  | 1x1 | |
| 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: Io level has been derived from other parameters for information purpose. It is not a settable parameter. | | | |

Table A.14.4.2.2.1-3: Sounding Reference Symbol Configuration for E-UTRAN HD-FDD Transmit Timing Accuracy Test for Cat-M1 UE in CEModeA

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| srsBandwidthConfiguration | Bw5 |  |
| srsSubframeConfiguration | sc3 | Once every 5 subframes |
| ackNackSrsSimultaneousTransmission | FALSE |  |
| srsMaxUpPTS | N/A |  |
| srsBandwidth | 0 | No hopping |
| srsHoppingBandwidth | hbw0 |
| frequencyDomainPosition | 0 |  |
| Duration | TRUE | Indefinite duration |
| Srs-ConfigurationIndex | 17 | SRS periodicity of 20. |
| transmissionComb | 0 |  |
| cyclicShift | cs0 | No cyclic shift |
| SRS-AntennaPort | an1 | Number of antenna ports used for SRS transmission |
| Note 1: For further information see clause 6.3.2 in TS 36.331. | | |

Table A.14.4.2.2.1-4: NTN specific test parameters for E-UTRAN HD-FDD Transmit Timing Accuracy Test for Cat-M1 UE in CEModeA

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Comment** |
| Configuration 1 | SSC.1 | GSO Test Configuration |
| Configuration 2 | SSC.2 | NGSO Test Configuration |

##### A.14.4.2.2.2 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. 6+ Koffset sub frames after the reception of the timing advance command.

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.28A.2.2. The applied timing advance shall be additional to any variation on the timing advance components caused by the satellite ephemeris and common delay information.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

#### A.14.4.2.3 E-UTRAN FDD UE Timing Advance Adjustment Accuracy Test in CEModeB

##### A.14.4.2.3.1 Test Purpose and Environment

The purpose of the test is to verify E-UTRAN FDD Timing Advance adjustment accuracy requirements for Cat-M1 UE configured with CEModeB, defined in clause 7.28A.2.2, in an AWGN model.

The test parameters are given in tables A.14.4.2.3.1-1and A.14.4.2.3.1-2. The test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and PUSCH are sent from the UE and received by the test equipment. By measuring the reception of the PUSCH, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

The UE shall be provided with the valid information about the Satellite Access Node serving cell before and during the test via SI messages configured as provided in Table A.14.4.2.3.1-3. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.5 in TS 36.321. The Timing Advance Command value shall be set to 31, which according to Clause 4.2.3 in TS 36.213 results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established. The reference timing advance used by the UE is equal to: .

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.14.4.2.3.1-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using PUSCH sent from the UE.

As specified in Clause 7.28A.2.1, the UE adjusts its uplink timing at sub-frame *n*+6+Koffset for a timing advance command received in sub-frame n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via PUSCH sent from the UE.

The UE Time Alignment Timer, described in Clause 5.2 in TS 36.321, shall be configured so that it does not expire in the duration of the test.

Table A.14.4.2.3.1-1: General Test Parameters for E-UTRAN FDD UE Timing Advance Adjustment Accuracy Test in CEModeB

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| Timing Advance Command (*TA*) value during T1 |  | 31 | *NTA* = 0 for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 |  | 39 | *NTA* = 128 |
| DRX |  | OFF |  |
| T1 | s | 5 |  |
| T2 | s | 5 |  |
| Number of repetitions of MPDCCH |  | 128 |  |
| Number of repetitions of PUSCH |  | 32 |  |

Table A.14.4.2.3.1-2: Cell specific Test Parameters for E-UTRAN FDD UE Timing Advance Adjustment Accuracy Test in CEModeB

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | |
| **T1** | **T2** |
| E-UTRA RF Channel Number |  | 1 | |
| BWchannel | MHz | 1.4 | |
| PDSCH Reference Measurement Channel in clause A.3.1.4.4 |  | [R.22 FDD] | |
| MPDCCH Reference Measurement Channel in clause A.3.1.3.4 |  | [R.18 FDD] | |
| OCNG Patterns defined in A.3.2.1.21 |  | OP.21 FDD | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| MPDCCH\_RA | dB |
| MPDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
| Timing Advance Command (*TA*) |  | 31 | 39 |
|  | dBm/15 KHz | -98 | |
|  | dB | -12 | |
| Note2 | dB | -12 | |
| RSRP Note2 | dBm/15 KHz | -110 | |
| Io Note2 | dBm/9 MHz | -69.95 | |
| Propagation Condition |  | AWGN | |
| Antenna Configuration |  | 1x1 | |
| Note 1: OCNG shall be used such that cells is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: , RSRP, Io level has been derived from other parameters for information purpose. It is not a settable parameter. | | | |

Table A.14.4.2.3.1-3: NTN specific test for E-UTRAN FDD UE Timing Advance Adjustment Accuracy Test in CEModeB

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Comment** |
| Configuration 1 | SSC.1 | GSO Test Configuration |
| Configuration 2 | SSC.2 | NGSO Test Configuration |

##### A.14.4.2.3.2 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. 6 subframes after the reception of the timing advance command.

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.28A.2.2. The applied timing advance shall be additional to any variation on the timing advance components caused by the satellite ephemeris and common delay information.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

When a repetition period is configured on the uplink, the UE shall not adjust the uplink transmission timing autonomously during an ongoing repetition segment period for which R>1. The repetition segment period is given by the higher layer parameter Tx-Duration as specified in TS 36.331.

#### A.14.4.2.4 E-UTRAN HD-FDD UE Timing Advance Adjustment Accuracy Test in CEModeB

##### A.14.4.2.4.1 Test Purpose and Environment

The purpose of the test is to verify E-UTRAN HD-FDD Timing Advance adjustment accuracy requirements for Cat-M1 UE configured with CEModeB, defined in clause 7.28A.2.2, in an AWGN model.

The test parameters are given in tables A.14.4.2.4.1-1and A.14.4.2.4.1-2. The test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and PUSCH are sent from the UE and received by the test equipment. By measuring the reception of the PUSCH, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

The UE shall be provided with the valid information about the Satellite Access Node serving cell before and during the test via SI messages configured as provided in Table A.14.4.2.4.1-3. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.5 in TS 36.321. The Timing Advance Command value shall be set to 31, which according to Clause 4.2.3 in TS 36.213 results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established. The reference timing advance used by the UE is equal to: .

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.14.4.2.4.1-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using PUSCH sent from the UE.

As specified in Clause 7.28A.2.1, the UE adjusts its uplink timing at sub-frame *n*+6+Koffset for a timing advance command received in sub-frame n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via PUSCH sent from the UE.

The UE Time Alignment Timer, described in Clause 5.2 in TS 36.321, shall be configured so that it does not expire in the duration of the test.

Table A.14.4.2.4.1-1: General Test Parameters for E-UTRAN HD-FDD UE Timing Advance Adjustment Accuracy Test in CEModeB

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| Timing Advance Command (*TA*) value during T1 |  | 31 | *NTA* = 0 for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 |  | 39 | *NTA* = 128 |
| DRX |  | OFF |  |
| T1 | s | 5 |  |
| T2 | s | 5 |  |
| Number of repetitions of MPDCCH |  | 128 |  |
| Number of repetitions of PUSCH |  | 32 |  |

Table A.14.4.2.4.1-2: Cell specific Test Parameters for E-UTRAN HD-FDD UE Timing Advance Adjustment Accuracy Test in CEModeB

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | |
| **T1** | **T2** |
| E-UTRA RF Channel Number |  | 1 | |
| BWchannel | MHz | 1.4 | |
| PDSCH Reference Measurement Channel in clause A.3.1.4.5 |  | [R.12 HD-FDD] | |
| MPDCCH Reference Measurement Channel in clause A.3.1.3.5 |  | [R.8 HD-FDD] | |
| OCNG Patterns defined in A.3.2.1.21 |  | OP.21 FDD | |
| PBCH\_RA | dB | 0 | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote1 | dB |
| OCNG\_RBNote1 | dB |
| Timing Advance Command (*TA*) |  | 31 | 39 |
|  | dBm/15 KHz | -98 | |
|  | dB | -12 | |
| Note2 | dB | -12 | |
| RSRP Note2 | dBm/15 KHz | -110 | |
| IoNote2 | dBm/9 MHz | -69.95 | |
| Propagation Condition |  | AWGN | |
| Antenna Configuration |  | 1x1 | |
| 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: , RSRP, Io level has been derived from other parameters for information purpose. It is not a settable parameter. | | | |

Table A.14.4.2.3.3-3: NTN specific test for E-UTRAN FDD UE Timing Advance Adjustment Accuracy Test in CEModeB

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Comment** |
| Configuration 1 | SSC.1 | GSO Test Configuration |
| Configuration 2 | SSC.2 | NGSO Test Configuration |

##### A.14.4.2.4.2 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. 6 + Koffset sub frames after the reception of the timing advance command.

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.28A.2.2. The applied timing advance shall be additional to any variation on the timing advance components caused by the satellite ephemeris and common delay information.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

When a repetition period is configured on the uplink, the UE shall not adjust the uplink transmission timing autonomously during an ongoing repetition segment period for which R>1. The repetition segment period is given by the higher layer parameter Tx-Duration as specified in TS 36.331.

### <End of change>