**3GPP TSG-RAN4 Meeting # 98bis-e *R4-2105721***

**Electronic Meeting, 12th April 2021 - 20th April 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **draftCR** | **rev** | 1 | **Current version:** | **16.7.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Draft CR: Random access procedure test cases for NR-U | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson, Nokia, Nokia Shanghai Bell | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_unlic-Perf | | | | |  | ***Date:*** | | | 2021-04-20 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Test cases for random access procedure for NR-U are missing | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Define the random access procedure test cases for NR-U. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Cannot verify the random access procedure for NR-U. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.10.1.1.1 (new), A.11.2.2.2 (new) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS38.533 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Revised from R4-2106877, merge with R4-2106579. Change the spec structure. | | | | | | | | |

----------------------------------------------------- Beginning of Change ------------------------------------------------------------

#### A.10.1.1.1 Random Access

##### A.10.1.1.1.1 4-step RA type contention-based random access for NR PSCell with CCA

###### A.10.1.1.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2A.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7A.2.1 and Cell 2 configured as PSCell in FR1. Cell 1 is on a lisenced band and cell 2 is subjected to CCA. Supported test parameters are shown in Table A.10.1.1.1.1.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.10.1.1.1.1.1-2.

Table A.10.1.1.1.1.1-1: Supported test configurations for contention based random access test in FR1 for PSCell with CCA

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

Table A.10.1.1.1.1.1-2: General test parameters for contention based random access test in FR1 for PSCell with CCA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | | Unit | Test-1 | Comments |
| SSB Configuration | Note 5, 7 | | | Config 1,2 |  | SSB.1 CCA | As defined in A.3.10A |
|  | Note 6, 7 | | | Config 1,2 |  | SSB.2 CCA | As defined in A.3.10A |
| DBT Window Configuration | | | | Config 1,2 |  | [DBT.1] | As specifeind in A.3.21.1 |
| DL CCA model | | | | Config 1,2 |  | As specifed in A.3.20.2.1 |  |
| UL CCA model | | | | Config 1,2 |  | As specifed in A.3.20.2.2 |  |
| Duplex Mode for Cell 2 | | | | Config 1,2 |  | TDD |  |
| TDD Configuration | | | | Config 1,2 |  | TDDConf.1.1 CCA |  |
| OCNG Pattern Note 1 | | | | |  | OCNG pattern 1 | As defined in A.3.2.1. |
| PDSCH parameters Note 4 | | | | Config 1,2 |  | SR.1.1 CCA | As defined in A.3.1A.1. |
| NR RF Channel Number | | | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | | | dB |  |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | | | dB | 0 |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | | | dB |  |  |
| SSB with index 0 | |  | | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | |  | | Config 1,2 | dBm/15kHz | -101 |  |
|  | |  | | | dB | 3 |  |
|  | | SS-RSRP Note 3 | | | dBm/ SCS | -95 |  |
| SSB with index 1 | |  | | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | |  | | Config 1,2 | dBm/15kHz | -101 |  |
|  | |  | | | dB | -17 |  |
|  | | SS-RSRP Note 3 | | | dBm/ SCS | -115 |  |
| Io Note 2 | | | | Config 1,2 | dBm | -62.2/38.16MHz | For symbols without SSB index 1 |
| ss-PBCH-BlockPower | | | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [2]. |
| Configured UE transmitted power () | | | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| PRACH Configuration | | | | |  | FR1 PRACH configuration 1 | As defined in A.3.8.2. |
| DL CCA probability | | | Note 5, 7 | |  | TBD |  |
| PCCA\_DL | | | Note 6, 7 | |  | TBD |  |
| UL CCA probability | | | Note 5, 7 | |  | TBD |  |
| PCCA\_UL | | | Note 6, 7 | |  | TBD |  |
| 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. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: Void  Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  Note 7: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | |

###### A.10.1.1.1.1.2 Test Requirements

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

A.10.1.1.1.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2A.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*, if the UL CCA is successful.

The three requirements below are relevant for all cases of PRACH transmissions described within the whole clause A.10.1.1.1.1.2:

* The system simulator shall implement the UL CCA model of A.3.20.2 for the RACH occasions where PRACH transmissions are expected. The system simulator shall monitor the RACH occasions to detect if the UE is transmitting PRACH preambles. If a PRACH transmission is detected on a RACH occasion that is expected to have UL CCA failure, the test is considered as failed.
* In case of CCA DL failure, the test equipment should verify that the UE does not transmit PRACH for semi-static channel access mode; for dynamic channel access mode it is assumed that RACH occasions are always scheduled within a UE-initiated COT.
* In case of UL CCA failure, The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.10.1.1.1.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2A.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

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 if UL CCA is successful. The system simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 transmission is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH 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 Clause 6.2.2A.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.10.1.1.1.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2A.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.10.1.1.1.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2A.2.1.4, the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response if UL CCA is successful. The system simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

A.10.1.1.1.1.2.5 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2A.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

##### A.10.1.1.1.2 4-step RA type non-contention based random access for NR PSCell with CCA

###### A.10.1.1.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2A.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7A.2.1 and Cell 2 configured as PSCell in FR1. Cell 1 is on a lisenced band and cell 2 is subjected to CCA. Supported test parameters are shown in Table A.10.1.1.1.2.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.10.1.1.1.2.1-2 for SSB-based non-contention based random access test (Test 1).

Table A.10.1.1.1.2.1-1: Supported test configurations for non-contention based random access test in FR1 for PSCell with CCA

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

Table A.10.1.1.1.2.1-2: General test parameters for non-contention based random access test in FR1 for PSCell with CCA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | | Unit | Test-1 | Comments |
| SSB Configuration | Note 5, 7 | | | Config 1,2 |  | SSB.1 CCA | As defined in A.3.10A |
|  | Note 6, 7 | | | Config 1,2 |  | SSB.2 CCA | As defined in A.3.10A |
| DBT Window Configuration | | | | Config 1,2 |  | [DBT.1] | As specifeind in A.3.21.1 |
| DL CCA model | | | | Config 1,2 |  | As specifed in A.3.20.2.1 |  |
| UL CCA model | | | | Config 1,2 |  | As specifed in A.3.20.2.2 |  |
| Duplex Mode for Cell 2 | | | | Config 1,2 |  | TDD |  |
| TDD Configuration | | | | Config 1,2 |  | TDDConf.1.1 CCA |  |
| OCNG Pattern Note 1 | | | | |  | OCNG pattern 1 | As defined in A.3.2.1. |
| PDSCH parameters Note 4 | | | | Config 1,2 |  | SR.1.1 CCA | As defined in A.3.1A.1. |
| NR RF Channel Number | | | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | | | dB |  |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | | | dB | 0 |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | | | dB |  |  |
| SSB with index 0 | |  | | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | |  | | Config 1,2 | dBm/15kHz | -101 |  |
|  | |  | | | dB | 3 |  |
|  | | SS-RSRP Note 3 | | | dBm/ SCS | -95 |  |
| SSB with index 1 | |  | | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | |  | | Config 1,2 | dBm/15kHz | -101 |  |
|  | |  | | | dB | -17 |  |
|  | | SS-RSRP Note 3 | | | dBm/ SCS | -115 |  |
| Io Note 2 | | | | Config 1,2 | dBm | -62.2/38.16MHz | For symbols without SSB index 1 |
| ss-PBCH-BlockPower | | | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [2]. |
| Configured UE transmitted power () | | | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| PRACH Configuration | | | | |  | FR1 PRACH configuration 2 | As defined in A.3.8.2. |
|  | | | | |  |  |  |
|  | | | | |  |  |  |
| DL CCA probability | | | Note 5, 7 | |  | TBD |  |
| PCCA\_DL | | | Note 6, 7 | |  | TBD |  |
| UL CCA probability | | | Note 5, 7 | |  | TBD |  |
| PCCA\_UL | | | Note 6, 7 | |  | TBD |  |
| 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. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: Void  Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  Note 7: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | |

###### A.10.1.1.1.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

A.10.1.1.1.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2A.2.2.1 for SSB-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

The three requirements below are relevant for all cases of PRACH transmissions described within the whole clause A.10.1.1.1.2.2:

* The system simulator shall implement the UL CCA model of A.3.20.2 for the RACH occasions where PRACH transmissions are expected. The system simulator shall monitor the RACH occasions to detect if the UE is transmitting PRACH preambles. If a PRACH transmission is detected on a RACH occasion that is expected to have UL CCA failure, the test is considered as failed.
* In case of CCA DL failure, the test equipment should verify that the UE does not transmit PRACH for semi-static channel access mode; for dynamic channel access mode it is assumed that RACH occasions are always scheduled within a UE-initiated COT.
* In case of UL CCA failure, The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belong to the PRACH occassions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.10.1.1.1.2.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2A.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE may stop monitoring for Random Access Response(s) if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble if UL CCA is successful. The system simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed..

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power 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 Clause 6.2.2A.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.10.1.1.1.2.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2A.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.10.1.1.1.3 2-step RA type contention-based random access for NR PSCell with CCA

###### A.10.1.1.1.3.1 Test Purpose and Environment

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

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7A.2.1 and Cell 2 configured as PSCell in FR1. Cell 1 is on a lisenced band and cell 2 is subjected to CCA. Supported test parameters are shown in Table A.10.1.1.1.3.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.10.1.1.1.3.1-2.

Table A.10.1.1.1.3.1-1: Supported test configurations for 2-step RA type contention based random access test in FR1 for PSCell with CCA

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

Table A.10.1.1.1.3.1-2: General test parameters for 2-step RA type contention based random access test in FR1 for PSCell with CCA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | | Unit | Test-1 | Comments |
| SSB Configuration | Note 4, 6 | | | Config 1,2 |  | SSB.1 CCA | As defined in A.3.10A |
|  | Note 5, 6 | | | Config 1,2 |  | SSB.2 CCA | As defined in A.3.10A |
| DBT Window Configuration | | | | Config 1,2 |  | [DBT.1] | As specifeind in A.3.21.1 |
| DL CCA model | | | | Config 1,2 |  | As specifed in A.3.20.2.1 |  |
| UL CCA model | | | | Config 1,2 |  | As specifed in A.3.20.2.2 |  |
| Duplex Mode for Cell 2 | | | | Config 1,2 |  | TDD |  |
| TDD Configuration | | | | Config 3,4 |  | TDDConf.1.1 CCA |  |
| OCNG Pattern Note 1 | | | | |  | OCNG pattern 1 | As defined in A.3.2.1. |
| PDSCH parameters Note 3 ­ | | | | Config 1,2 |  | SR.1.1 CCA | As defined in A.3.1A.1. |
| NR RF Channel Number | | | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | | | dB |  |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | | | dB | 0 |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | | | dB |  |  |
| SSB with index 0 | |  | | | dB | 3 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
|  | |  | | Config 1,2 | dBm/15kHz | -101 |  |
|  | |  | | | dB | 3 |  |
|  | | SS-RSRP Note 2 | | | dBm/ SCS | -95 |  |
| SSB with index 1 | |  | | | dB | -17 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
|  | |  | | Config 1,2 | dBm/15kHz | -101 |  |
|  | |  | | | dB | -17 |  |
|  | | SS-RSRP Note 2 | | | dBm/ SCS | -115 |  |
| Io | | | | Config 1,2 | dBm | -62.2/38.16MHz | For symbols without SSB index 1 |
| ss-PBCH-BlockPower | | | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [2]. |
| Configured UE transmitted power () | | | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| MsgA Configuration | | | | |  | FR1 MsgA configuration 1 | As defined in A.3.20.2.1. |
| *msgA-RSRP-ThresholdSSB* | | | | | dBm | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| DL CCA probability | | | Note 4, 6 | |  | TBD |  |
| PCCA\_DL | | | Note 5, 6 | |  | TBD |  |
| UL CCA probability | | | Note 4, 6 | |  | TBD |  |
| PCCA\_UL | | | Note 5, 6 | |  | TBD |  |
| 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. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  Note 6: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | |

###### A.10.1.1.1.3.2 Test Requirements

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

A.10.1.1.1.3.2.1 MsgA Transmission

To test the UE behaviour specified in Clause 6.2.2A.3.1.1 the System Simulator shall receive the MsgA with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*, if the UL CCA is successful.

The three requirements below are relevant for all cases of MsgA transmissions described within the clause A.10.1.1.1.3.2:

* The system simulator shall implement the UL CCA model for the MsgA occasions (i.e. both MsgA PRACH and MsgA PUSCH occasions) where MsgA transmissions are expected. The system simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on MsgA occasions that are expected to have UL CCA failure, the test is considered as failed.
* In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode; for dynamic channel access mode it is assumed that MsgA occasions are always scheduled within a UE-initiated COT.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated PRACH transmission power in case of UL CCA failure. In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first MsgA preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

A.10.1.1.1.3.2.2 MsgB Reception

To test the UE behaviour specified in Clause 6.2.2A.3.1.2 the System Simulator shall transmit a MsgB with fallbackRAR containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE may stop monitoring for MsgB(s) and shall transmit the msg3 if the MsgB with a fallbackRAR contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble if UL CCA is successful. The system simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB’s contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble .

In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first MsgA preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

A.10.1.1.1.3.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2A.3.1.3 the System Simulator shall transmit a MsgB with fallbackRAR containing a successRAR message and a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first MsgA preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

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

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

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

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

Table A.10.1.1.1.4.1-1: Supported test configurations for non-contention based random access test for 2-step RA type in FR1 for PSCell with CCA

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

Table A.10.1.1.1.4.1-2: General test parameters for non-contention based random access test for 2-step RA type in FR1 for PSCell with CCA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | | Unit | Test-1 | Comments |
| SSB Configuration | Note 4, 6 | | | Config 1,2 |  | SSB.1 CCA | As defined in A.3.10A |
|  | Note 5, 6 | | | Config 1,2 |  | SSB.2 CCA | As defined in A.3.10A |
| DBT Window Configuration | | | | Config 1,2 |  | [DBT.1] | As specifeind in A.3.21.1 |
| DL CCA model | | | | Config 1,2 |  | As specifed in A.3.20.2.1 |  |
| UL CCA model | | | | Config 1,2 |  | As specifed in A.3.20.2.2 |  |
| Duplex Mode for Cell 2 | | | | Config 1,2 |  | TDD |  |
| TDD Configuration | | | | Config 1,2 |  | TDDConf.1.1 CCA |  |
| OCNG Pattern Note 1 | | | | |  | OCNG pattern 1 | As defined in A.3.2.1. |
| PDSCH parameters Note 3 | | | | Config 1,2 |  | SR.1.1 CCA | As defined in A.3.1A.1. |
| NR RF Channel Number | | | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | | | dB |  |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | | | dB | 0 |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | | | dB |  |  |
| SSB with index 0 | |  | | | dB | 3 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
|  | |  | | Config 1,2 | dBm/15kHz | -101 |  |
|  | |  | | | dB | 3 |  |
|  | | SS-RSRP | | | dBm/ SCS | -95 |  |
| SSB with index 1 | |  | | | dB | -17 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
|  | |  | | Config 1,2 | dBm/15kHz | -101 |  |
|  | |  | | | dB | -17 |  |
|  | | SS-RSRP | | | dBm/ SCS | -115 |  |
| Io Note 2 | | | | Config 1,2 | dBm | -62.2/38.16MHz | For symbols without SSB index 1 |
| ss-PBCH-BlockPower | | | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [2]. |
| Configured UE transmitted power (PCMAX,f,c) | | | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| MsgA Configuration | | | | |  | FR1 MsgA configuration 2 | As defined in A.3.20.2. |
| *msgA-RSRP-ThresholdSSB* | | | | | dBm | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
|  | | | | |  |  |  |
|  | | | | |  |  |  |
| DL CCA probability | | | Note 4, 6 | |  | TBD |  |
| PCCA\_DL | | | Note 5, 6 | |  | TBD |  |
| UL CCA probability | | | Note 4, 6 | |  | TBD |  |
| PCCA\_UL | | | Note 5, 6 | |  | TBD |  |
| 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. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  Note 6: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | |

###### A.10.1.1.1.4.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

A.10.1.1.1.4.2.1 MsgA Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2A.3.2.1 for MsgA transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the MsgA which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the MsgA on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured.

The three requirements below are relevant for all cases of MsgA transmissions described within the clause A.10.1.1.1.4.2:

* The system simulator shall implement the UL CCA model for the MsgA occasions (i.e. both MsgA PRACH and MsgA PUSCH occasions) where MsgA transmissions are expected. The system simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on MsgA occasions that are expected to have UL CCA failure, the test is considered as failed.
* In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode; for dynamic channel access mode it is assumed that MsgA occasions are always scheduled within a UE-initiated COT.
* The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated PRACH transmission power in case of UL CCA failure.

In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

A.10.1.1.1.4.2.2 MsgB Reception

To test the UE behavior specified in Clause 6.2.2A.3.2.2 the System Simulator shall transmit a MsgB containing a successRAR MAC subPDU corresponding to the transmitted Random Access Preamble after 5 MsgA transmissions have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE may stop monitoring for MsgB if the MsgB contains a successRAR MAC subPDU corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA transmission power if Random Access Responses Reception has not been considered as successful.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18] , where indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

A.10.1.1.1.4.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2A.3.2.3 the System Simulator shall transmit a MsgB corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA transmission power when the backoff time expires if no MsgB is received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA*.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

------------------------------------------------- Unchanged sections omitted --------------------------------------------------------

#### A.11.2.2.2 Random Access

##### A.11.2.2.2.1 4-step RA type contention-based random access for NR PCell with CCA

###### A.11.2.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2A.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1, which operates on a carrier frequency with CCA. Supported test parameters are shown in Table A.11.2.2.2.1.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.11.2.2.2.1.1-2.

Table A.11.2.2.2.1.1-1: Supported test configurations for contention based random access test for FR1 PCell with CCA

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

Table A.11.2.2.2.1.1-2: General test parameters for contention based random access test for FR1 PCell with CCA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | | Unit | Test-1 | Comments |
| SSB Configuration | Note 5 | | | Config 1 |  | SSB.3 CCA | As defined in A.3.10A |
|  | Note 6 | | | Config 1 |  | SSB.4 CCA | As defined in A.3.10A |
| DBT Window Configuration | | | | Config 1 |  | [DBT.1] | As specifeind in A.3.21.1 |
| DL CCA model | | | | Config 1 |  | As specifed in A.3.20.2.1 |  |
| UL CCA model | | | | Config 1 |  | As specifed in A.3.20.2.2 |  |
| Duplex Mode for Cell 2 | | | | Config 1 |  | TDD |  |
| TDD Configuration | | | | Config 1 |  | TDDConf.1.1 CCA |  |
| OCNG Pattern Note 1 | | | | |  | OCNG pattern 1 | As defined in A.3.2.1. |
| PDSCH parameters Note 4 | | | | Config 1 |  | SR.1.1 CCA | As defined in A.3.1A.1. |
| NR RF Channel Number | | | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | | | dB |  |  |
| SSB with index 0 | |  | | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | |  | | Config 1 | dBm/15kHz | -101 |  |
|  | |  | | | dB | 3 |  |
|  | | SS-RSRP Note 3 | | | dBm/ SCS | -95 |  |
| SSB with index 1 | |  | | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | |  | | Config 1 | dBm/15kHz | -101 |  |
|  | |  | | | dB | -17 |  |
|  | | SS-RSRP Note 3 | | | dBm/ SCS | -115 |  |
| Io Note 2 | | | | Config 1 | dBm | -62.2/38.16MHz | For symbols without SSB index 1 |
| ss-PBCH-BlockPower | | | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [2]. |
| Configured UE transmitted power (PCMAX,f,c) | | | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| PRACH Configuration | | | | |  | FR1 PRACH configuration 1 | As defined in A.3.8. |
| DL CCA probability | | | Note 5, 7 | |  | TBD |  |
| PCCA\_DL | | | Note 6, 7 | |  | TBD |  |
| UL CCA probability | | | Note 5, 7 | |  | TBD |  |
| PCCA\_UL | | | Note 6, 7 | |  | TBD |  |
| 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. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: Void  Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. | | | | | | | |

###### A.11.2.2.2.1.2 Test Requirements

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

A.11.2.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2A.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*, if the UL CCA is successful.

The three requirements below are relevant for all cases of PRACH transmissions described within the whole clause A.11.2.2.2.1.2:

* The system simulator shall implement the UL CCA model of A.3.20.2 for the RACH occasions where PRACH transmissions are expected. The system simulator shall monitor the RACH occasions to detect if the UE is transmitting PRACH preambles. If a PRACH transmission is detected on a RACH occasion that is expected to have UL CCA failure, the test is considered as failed.
* In case of CCA DL failure, the test equipment should verify that the UE does not transmit PRACH for semi-static channel access mode; for dynamic channel access mode it is assumed that RACH occasions are always scheduled within a UE-initiated COT.
* In case of UL CCA failure, The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.11.2.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2A.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

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 if UL CCA is successful. The system simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 transmission is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH 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 Clause 6.2.2A.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.11.2.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2A.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.11.2.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2A.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response if UL CCA is successful. The system simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

A.11.2.2.2.1.2.5 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2A.2.1.5 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 again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH 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.11.2.2.2.1.2.6 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2A.2.1.5 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.11.2.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2A.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

##### A.11.2.2.2.2 4-step RA type non-contention-based random access for NR PCell with CCA

###### A.11.2.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2A.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1, which operates on a carrier frequency with CCA. Supported test parameters are shown in Table A.11.2.2.2.2.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.11.2.2.2.2.1-2 for SSB-based non-contention based random access test (Test 1).

Table A.11.2.2.2.2.1-1: Supported test configurations for non-contention based random access test for FR1 PCell with CCA

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

**Table A.11.2.2.2.2.1-2: General test parameters for non-contention based random access test for FR1 PCell with CCA**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | | Unit | Test-1 | Comments |
| SSB Configuration | Note 5 | | | Config 1 |  | SSB.3 CCA | As defined in A.3.10A |
|  | Note 6 | | | Config 1 |  | SSB.4 CCA | As defined in A.3.10A |
| DBT Window Configuration | | | | Config 1 |  | [DBT.1] | As specifeind in A.3.21.1 |
| DL CCA model | | | | Config 1 |  | As specifed in A.3.20.2.1 |  |
| UL CCA model | | | | Config 1 |  | As specifed in A.3.20.2.2 |  |
| Duplex Mode for Cell 2 | | | | Config 1 |  | TDD |  |
| TDD Configuration | | | | Config 1 |  | TDDConf.1.1 CCA |  |
| OCNG Pattern Note 1 | | | | |  | OCNG pattern 1 | As defined in A.3.2.1. |
| PDSCH parameters Note 4 | | | | Config 1 |  | SR.1.1 CCA | As defined in A.3.1A.1. |
| NR RF Channel Number | | | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | | | dB |  |  |
| SSB with index 0 | |  | | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | |  | | Config 1 | dBm/15kHz | -101 |  |
|  | |  | | | dB | 3 |  |
|  | | SS-RSRP Note 3 | | | dBm/ SCS | -95 |  |
| SSB with index 1 | |  | | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | |  | | Config 1 | dBm/15kHz | -101 |  |
|  | |  | | | dB | -17 |  |
|  | | SS-RSRP Note 3 | | | dBm/ SCS | -115 |  |
| Io Note 2 | | | | Config 1 | dBm | -62.2/38.16MHz | For symbols without SSB index 1 |
| ss-PBCH-BlockPower | | | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [2]. |
| Configured UE transmitted power () | | | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| PRACH Configuration | | | | |  | FR1 PRACH configuration 2 | As defined in A.3.8.2. |
| DL CCA probability | | | Note 5, 7 | |  | TBD |  |
| PCCA\_DL | | | Note 6, 7 | |  | TBD |  |
| UL CCA probability | | | Note 5, 7 | |  | TBD |  |
| PCCA\_UL | | | Note 6, 7 | |  | TBD |  |
| 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. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: Void  Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. | | | | | | | |

###### A.11.2.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

A.11.2.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2A.2.2.1 for SSB-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

The three requirements below are relevant for all cases of PRACH transmissions described within the clause A.11.2.2.2.2.2:

* The system simulator shall implement the UL CCA model of A.3.20.2 for the RACH occasions where PRACH transmissions are expected. The system simulator shall monitor the RACH occasions to detect if the UE is transmitting PRACH preambles. If a PRACH transmission is detected on a RACH occasion that is expected to have UL CCA failure, the test is considered as failed.
* In case of CCA DL failure, the test equipment should verify that the UE does not transmit PRACH for semi-static channel access mode; for dynamic channel access mode it is assumed that RACH occasions are always scheduled within a UE-initiated COT.
* In case of UL CCA failure The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occassions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.11.2.2.2.2.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2A.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE may stop monitoring for Random Access Response(s) if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble if UL CCA is successful. The system simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power 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 Clause 6.2.2A.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.11.2.2.2.2.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2A.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

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

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

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

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

Table A.11.2.2.2.3.1-1: Supported test configurations for 2-step RA type contention based random access with successRAR test for FR1 PCell with CCA

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

Table A.11.2.2.2.3.1-2: General test parameters for 2-step RA type contention based random access with successRAR test for FR1 PCell with CCA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | | Unit | Test-1 | Comments |
| SSB Configuration | Note 4 | | | Config 1 |  | SSB.3 CCA | As defined in A.3.10A |
|  | Note 5 | | | Config 1 |  | SSB.4 CCA | As defined in A.3.10A |
| DBT Window Configuration | | | | Config 1 |  | [DBT.1] | As specifeind in A.3.21.1 |
| DL CCA model | | | | Config 1 |  | As specifed in A.3.20.2.1 |  |
| UL CCA model | | | | Config 1 |  | As specifed in A.3.20.2.2 |  |
| Duplex Mode for Cell 2 | | | | Config 1 |  | TDD |  |
| TDD Configuration | | | | Config 2 |  | TDDConf.1.1 CCA |  |
| OCNG Pattern Note 1 | | | | |  | OCNG pattern 1 | As defined in A.3.2.1. |
| PDSCH parameters Note 3 | | | | Config 1 |  | SR.1.1 CCA | As defined in A.3.1A.1. |
| NR RF Channel Number | | | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | | | dB |  |  |
| SSB with index 0 | |  | | | dB | 3 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
|  | |  | | Config 1 | dBm/15kHz | -101 |
|  | |  | | | dB | 3 |
|  | | SS-RSRP | | | dBm/ SCS | -95 |
| SSB with index 1 | |  | | | dB | -17 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
|  | |  | | Config 1 | dBm/15kHz | -101 |
|  | |  | | | dB | -17 |
|  | | SS-RSRP | | | dBm/ SCS | -115 |
| Io Note 2 | | | | Config 1 | dBm | -62.2/38.16MHz | For symbols without SSB index 1 |
| ss-PBCH-BlockPower | | | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [2]. |
| Configured UE transmitted power (PCMAX,f,c) | | | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| MsgA Configuration | | | | |  | FR1 MsgA configuration 1 | As defined in A.3.20.2.1. |
| *msgA-RSRP-ThresholdSSB* | | | | | dBm | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| DL CCA probability | | | Note 4, 6 | |  | TBD |  |
| PCCA\_DL | | | Note 5, 6 | |  | TBD |  |
| UL CCA probability | | | Note 4, 6 | |  | TBD |  |
| PCCA\_UL | | | Note 5, 6 | |  | TBD |  |
| 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. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. | | | | | | | |

###### A.11.2.2.2.3.2 Test Requirements

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

A.11.2.2.2.3.2.1 MsgA Transmission

To test the UE behavior specified in Clause 6.2.2A.3.1.1 the System Simulator shall receive the MsgA with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*, if the UL CCA is successful.

The three requirements below are relevant for all cases of MsgA transmissions described within the clause A.11.2.2.2.3.2:

* The system simulator shall implement the UL CCA model for the MsgA occasions (i.e. both MsgA PRACH and MsgA PUSCH occasions) where MsgA transmissions are expected. The system simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on MsgA occasions that are expected to have UL CCA failure, the test is considered as failed.
* In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode; for dynamic channel access mode it is assumed that MsgA occasions are always scheduled within a UE-initiated COT.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated PRACH transmission power in case of UL CCA failure.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first MsgA preamble transmission shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

A.11.2.2.2.3.2.2 MsgB Reception

To test the UE behavior specified in Clause 6.2.2A.3.1.2 the System Simulator shall transmit a MsgB containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE may stop monitoring for MsgB(s) and shall transmit an ACK if the MsgB with a successRAR contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble and if the Contention Resolution is successful and if UL CCA is successful. The system simulator shall monitor if the UE is transmitting ACK in the case of CCA UL failure. If ACK transmission is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE may stop monitoring for MsgB(s) and shall transmit the msg3 if the MsgB with a fallbackRAR contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble if UL CCA is successful. The system simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB(s) contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

A.11.2.2.2.3.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2A.3.1.3 the System Simulator shall transmit a MsgB containing a successRAR message and a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

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

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

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

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

Table A.11.2.2.2.4.1-1: Supported test configurations for non-contention based random access test for FR1 PCell with CCA

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

Table A.11.2.2.2.4.1-2: General test parameters for non-contention based random access test for FR1 PCell with CCA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | | Unit | Test-1 | Comments |
| SSB Configuration | Note 4 | | | Config 1 |  | SSB.3 CCA | As defined in A.3.10A |
|  | Note 5 | | | Config 1 |  | SSB.4 CCA | As defined in A.3.10A |
| DBT Window Configuration | | | | Config 1 |  | [DBT.1] | As specifeind in A.3.21.1 |
| DL CCA model | | | | Config 1 |  | As specifed in A.3.20.2.1 |  |
| UL CCA model | | | | Config 1 |  | As specifed in A.3.20.2.2 |  |
| Duplex Mode for Cell 1 | | | | Config 1 |  | TDD |  |
| TDD Configuration | | | | Config 1 |  | TDDConf.1.1 CCA |  |
| OCNG Pattern Note 1 | | | | |  | OCNG pattern 1 | As defined in A.3.2.1. |
| PDSCH parameters Note 4 | | | | Config 1 |  | SR.1.1 CCA | As defined in A.3.1A.1. |
| NR RF Channel Number | | | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | | | dB |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | | | dB |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | | | dB |  |  |
| msgA-*RSRP-ThresholdSSB* | | | | | dBm | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| SSB with index 0 | |  | | | dB | 3 | Power of SSB with index 0 is set to be above configured msgA-*RSRP-ThresholdSSB* |
|  | |  | | Config 1 | dBm/15kHz | -101 |
|  | |  | | | dB | 3 |
|  | | SS-RSRP Note 3 | | | dBm/ SCS | -95 |
| SSB with index 1 | |  | | | dB | -17 | Power of SSB with index 1 is set to be below configured msgA-*RSRP-ThresholdSSB* |
|  | |  | | Config 1 | dBm/15kHz | -101 |
|  | |  | | | dB | -17 |
|  | | SS-RSRP Note 3 | | | dBm/ SCS | -115 |
| Io Note 2 | | | | Config 1 | dBm | -62.2/38.16MHz | For symbols without SSB index 1 |
| ss-PBCH-BlockPower | | | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [2]. |
| Configured UE transmitted power () | | | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| MsgA Configuration | | | | |  | FR1 MsgA configuration 2 | As defined in A.3.20.2.2. |
| DL CCA probability | | | Note 4, 6 | |  | TBD |  |
| PCCA\_DL | | | Note 5, 6 | |  | TBD |  |
| UL CCA probability | | | Note 4, 6 | |  | TBD |  |
| PCCA\_UL | | | Note 5, 6 | |  | TBD |  |
| 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. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. | | | | | | | |

###### A.11.2.2.2.4.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

A.11.2.2.2.4.2.1 MsgA Transmission

To test the UE behavior specified in Clause 6.2.2A.3.2.1, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the MsgA with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0.

In addition, the System Simulator shall receive the MsgA PRACH on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured.

The three requirements below are relevant for all cases of MsgA transmissions described within the clause A.11.2.2.2.4.2:

* The system simulator shall implement the UL CCA model for the MsgA occasions (i.e. both MsgA PRACH and MsgA PUSCH occasions) where MsgA transmissions are expected. The system simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on MsgA occasions that are expected to have UL CCA failure, the test is considered as failed.
* In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode; for dynamic channel access mode it is assumed that MsgA occasions are always scheduled within a UE-initiated COT.
* The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated PRACH transmission power in case of UL CCA failure.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

A.11.2.2.2.4.2.2 MsgB Reception

To test the UE behavior specified in Clause 6.2.2A.3.2.2 the System Simulator shall transmit a MsgB containing a fallbackRAR containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE may stop monitoring for MsgB(s) and shall transmit the msg3 containing the payload of MsgA PUSCH if the MsgB with a fallbackRAR contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble if UL CCA is successful. The system simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed. The UE shall monitor contention resolution as described in clause 8.2A in TS 38.213 [3].

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB’s contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The system simulator shall implement the UL CCA model of A.3.20.2 for the MsgA occasions where MsgA transmissions are expected. The system simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on a MsgA occasion that is expected to have UL CCA failure, the test is considered as failed.

In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static configuration.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA transmission power in case UL CCA failure.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where indicates the MsgA PUSCH numerology. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA and msg3 transmissions shall be within the accuracy specified in Clause 7.1.2.

A.11.2.2.2.4.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2A.3.2.3 the System Simulator shall transmit a MsgB containing a successRAR message and a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

The system simulator shall implement the UL CCA model of A.3.20.2 for the MsgA occasions where MsgA transmissions are expected. The system simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on a MsgA occasion that is expected to have UL CCA failure, the test is considered as failed.

In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static configuration.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA transmission power in case UL CCA failure.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

------------------------------------------------------------- End of change ------------------------------------------------------------