**3GPP TSG-RAN4 Meeting #104-e *R4-22xxxxx***

**Electronic Meeting, August 15-26, 2022**

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

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|  | | | | | | | | | | |
| ***Title:*** | Big CR for test cases of Rel-17 FeRRM – HO with PSCell (Rel-17) | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | MCC, vivo | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_RRM\_enh2-Perf | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Test cases for HO with PSCell of Rel-17 FeRRM were agreed to be introduced. The following draft CRs for test cases were endorsed during RAN4#104-e meeting.  R4-2211634 Test case of handover with PSCell from EN-DC to EN-DC with known target PSCell in FR1  R4-2214670 Draft CR on TC for HO with PSCell from NR-SA to EN-DC with parallel processing and known FR2 PSCell in TS38.133 R17  R4-2214677 draft CR on TC2 for HO with PSCell from NR SA to EN-DC with parallel processing  R4-2214683  R4-2214697 draft CR on test cases for Handover with PSCell from NE-DC to NE-DC with known target PSCell  R4-2214698 DraftCR for Correction on test cases for Handover with PSCell from NE-DC to NE-DC  R4-2214709 CR on TC for HO with PSCell from NR SA to EN-DC  R4-2214732 TC for EN-DC to EN-DC Handover with PSCell using CCA with known target PSCell  R4-2214733 TC for NR SA to EN-DC Handover with PSCell using CCA with known target PSCell  R4-2215108 draftCR for test case on HO with PSCell from EN-DC to EN-DC with target FR2 known PSCell | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | R4-2211634:  Introducing the test case for handover with PSCell from EN-DC to EN-DC with known target PSCell in FR1.  This CR is represented based on R4-2211006 with saveral editorial modification.  R4-2214670:  Introduce the TC for HO with PSCell from NR-SA to EN-DC with parallel processing and known FR2 PSCell.  R4-2214677:  Introduce the delay requirements for test case: Handover with PSCell from NR SA to EN-DC with parallel processing, when SMTC of target known PSCell in FR1 is NOT present in RRCConnectionReconfiguration  R4-2214683:  Add handover with PSCell from NR-DC to NR-DC with parallel processing test case.  R4-2214697:  Introduce intra-frequency handover with PSCell from FR1+LTE NE-DC to FR1+LTE with known target PCell and known target E-UTRA PSCell  R4-2214698:  Correct the expression for E-UTRAN PSCell change in the test case for HO with PSCell from FR1+LTE NE-DC to NE-DC with intra-F handover with unknown target cell. (based on R4-2211012)  R4-2214709:  Corret the configurations of Noc, Es/Iot, Es/Noc configurations for NR PSCell (Cell 3) to align with PSCell addition test cases (A.4.5.7).  Correct typos.  R4-2214732:  Introduce the test case for Handover with PSCell when PSCell is in CCA from EN-DC to EN-DC with known target PSCell.  R4-2214733:  Introduce the test case for Handover with PSCell when PSCell is in CCA from NR SA to EN-DC with known target PSCell.  R4-2215108:  Add test case on HO with PSCell from EN-DC to EN-DC with source FR1 PSCell to target FR2 known PSCell (TC10) | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.4.3.x1, A.4A.1.X1, A.4A.1.X2, A.5.3.x1, A.6.3.1.x1, A.6.3.1.x2, A.7.3.1.x2, A.7.3.1.x4, A.10.1.x1, A.11.2.1.xn | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**<Start of Change 1>**

#### A.4.3.x1 Handover with PSCell from EN-DC to EN-DC with known target PSCell in FR1

##### A.4.3.x1.1 Test Purpose and Environment

This test is to verify the requirement for E-UTRA intra frequency handover with NR FR1 PSCell change specified in clause 5.8 in E-UTRA RRM specification [15] for the case when the target PSCell is known by the UE. Supported test configurations are shown in table A.4.3.x1.1-1.

The general test parameters are given in Table A.4.3.x1.1-2. E-UTRA cells and NR cells specific test parameters are given in Table A.4.3.x1.1-3 and A.4.3.x1.1-4. In the test there are four cells: Cell1 and Cell2 are PCell and target PCell on E-UTRA carrier, Cell3 and Cell4 are PSCell and target PSCell on NR FR1 carrier. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. Before the test starts the UE is connected to Cell1 (E-UTRA PCell) and Cell3 (NR PSCell) with EN-DC mode. At the start of time duration T1, the UE has not any timing information of cell 2 and cell 4. During T1, the UE is configured in the measurement control information that event-triggered reporting with Event A3 for neighbour cells on E-UTRA carrier and NR carrier.

The Cell2 and Cell4 becomes known to the UE, and E-UTRA PCell (Cell1) shall send a RRC message implying handover with PSCell to cell 2 and cell4 during T2. The RRC message implying handover with PSCell shall be sent to the UE after the UE has reported Event A3 for SpCells.The start of T3 is defined as the end of the last TTI containing the RRC message implying handover with PSCell.

Table A.4.3.x1.1-1: Handover with PSCell from EN-DC to EN-DC test configurations in FR1

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, PSCell FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, PSCell TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, SCell FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, SCell TDD duplex mode |
| 6 | 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 | |

Table A.4.3.x1.1-2: General test parameters for Handover with PSCell from EN-DC to EN-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1, 2 | One is E-UTRA RF channel and one is NR RF channel |
| Initial conditions | Active PCell |  | Cell1 | On E-UTRA RF channel number 1. |
| E-UTRA Neighbouring cell |  | Cell2 | On E-UTRA RF channel number 1. |
| Active PSCell |  | Cell3 | On NR RF channel number 1. |
| NR Neighbouring cell |  | Cell4 | On NR RF channel number 1. |
| Final conditions | Active PCell |  | Cell2 |  |
| Active PSCell |  | Cell4 |  |
| CP length | |  | Normal | Applicable to Cell1, Cell2, Cell3 and Cell4. |
| A3-Offset | | dB | 0 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| DRX | |  | OFF | Continuous monitoring of primary cell |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between same RAT cells | | µs | 3 | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |

Table A.4.3.x1.1-3: E-UTRAN cell specific test parameters for Handover with PSCell from EN-DC to EN-DC

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell1 | | | Cell2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| Duplex mode |  | FDD or TDD | | | FDD or TDD | | |
| TDD special subframe configurationNote1 |  | 6 | | | 6 | | |
| TDD uplink-downlink configurationNote1 |  | 1 | | | 1 | | |
| BWchannel |  | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD  5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | | | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD  5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD  5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD  5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | |
| OCNG Patterns defined in A.3.2.1 (FDD) and in A.3.2.2(TDD) Note2 |  | 5 MHz: OP.20 FDD  10MHz: OP.1 FDD  20 MHz: OP.17 FDD  5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | | OP.18 FDD  OP.2 FDD  OP.14 FDD  OP.10 TDD  OP.2 TDD  OP.8 TDD | 5MHz: OP.18 FDD  10MHz: OP.2 FDD  20MHz: OP.14 FDD  5MHz: OP.10 TDD  10MHz: OP.2 TDD  20MHz: OP.8 TDD | | OP.20 FDD  OP.1 FDD  OP.17 FDD  OP.9 TDD  OP.1 TDD  OP.7 TDD |
| PRACH configuration |  | - | | | 4, As specified in table 5.7.1-2 in TS 36.211 | | |
| PBCH\_RA | dB | 0 | | | 0 | | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote3 | dB |
| OCNG\_RBNote3 | dB |
| NocNote4 | dBm/15 kHz | -98 | | | | | |
| Ês/Noc | dB | 8 | 8 | 8 | -infinite | 11 | 11 |
| Ês/Iot | dB | 8 | -3.3 | -3.3 | -infinite | 2.36 | 2.36 |
| RSRP Note5 | dBm/15 kHz | -90 | -90 | -90 | -infinite | -87 | -87 |
| SCH\_RP Note5 | dBm/15 kHz | -90 | -90 | -90 | -infinite | -87 | -87 |
| Io Note5 | dBm/Ch BW | -61.58+10∙ log(NRB,c /50) | -57.23+10∙log(NRB,c /50) | | -61.58+10∙ log(NRB,c /50) | -57.23+10∙log(NRB,c /50) | |
| Propagation Condition |  | AWGN | | | | | |
| Antenna Configuration |  | 1x2 | | | | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 5: Es/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

Table A.4.3.x1.1-4: NR cell specific test parameters for Handover with PSCell from EN-DC to EN-DC

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 3 | | | Cell 4 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | |  | 1 | | | 1 | | |
| Duplex mode | Config 1, 4 |  | FDD | | | | | |
| Config 2,3,5,6 | TDD | | | | | |
| TDD configuration | Config 1, 4 |  | Not Applicable | | | | | |
| Config 2, 5 | TDDConf.1.1 | | | | | |
| Config 3, 6 | TDDConf.2.1 | | | | | |
| BWchannel | Config 1,2,4,5 | MHz | 10: NRB,c = 52 | | | | | |
| Config 3,6 | 40: NRB,c = 106 | | | | | |
| BWP BW | Config 1,2,4,5 | MHz | 10: NRB,c = 52 | | | | | |
| Config 3,6 | 40: NRB,c = 106 | | | | | |
| DRx Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference  measurement channel | Config 1,4 |  | SR.1.1 FDD | | | | | |
| Config 2,5 | SR.1.1 TDD | | | | | |
| Config 3,6 | SR.2.1 TDD | | | | | |
| CORESET Reference Channel | Config 1,4 |  | CR.1.1 FDD | | | | | |
| Config 2,5 | CR.1.1 TDD | | | | | |
| Config 3,6 | CR.2.1 TDD | | | | | |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD | | | | | |
| Config 2,5 | TRS.1.1 TDD | | | | | |
| Config 3,6 | TRS.1.2 TDD | | | | | |
| OCNG Patterns | |  | OP.1 | | | | | |
| SMTC Configuration | |  | SMTC.1 | | | | | |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 | | | | | |
| Config 3,6 | SSB.2 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | | | | | |
| Config 3,6 | 30 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | | | | | |
| Config 3,6 | 30 kHz | | | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | | | |
| BWP configuration | Initial DL BWP |  | DLBWP.0.1 | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | dBm/15kHz | -98 | | | | | |
| Note2 | Config 1,2,4,5 | dBm/SCS | -98 | | | | | |
| Config 3,6 | -95 | | | | | |
|  | | dB | 8 | -3.3 | -3.3 | -Infinity | 2.36 | 2.36 |
|  | | dB | 8 | 8 | 8 | -Infinity | 11 | 11 |
| SSB\_RP | Config 1,2,4,5 | dBm/SCS | -90 | -90 | -90 | -Infinity | -87 | -87 |
| Config 3,6 | dBm/SCS | -87 | -87 | -87 | -Infinity | -84 | -84 |
| IoNote3 | Config 1,2,4,5 | dBm/ 9.36MHz | -61.41 | -57.06 | -57.06 | -61.41 | -57.06 | -57.06 |
| Config 3,6 | dBm/ 38.16MHz | -55.31 | -50.96 | -50.96 | -55.31 | -50.96 | -50.96 |
| Propagation condition | | - | AWGN | | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

##### A.4.3.x1.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 60 ms from the beginning of time period T3.

The UE shall transmit the PRACH preamble to Cell 4 less than 87 ms from the beginning of time period T3.

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

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

NOTE: The handover requirements for handover with PSCell for EN-DC is defined in clause 5.8 in [15] as:

DHOwithPSCel\_PSCell = TRRC\_delay + Tsearch + TIU + Tprocessing

Where:

TRRC\_delay = 20 ms for ‘RRC connection reconfiguration (NR SCG establishment/ /modification/release)’.

Tsearch = 0 ms for known cell.

TIU = 15 ms in the test configuration.

Tprocessing = 25ms for source Cell and target Cell are in the same FR.

This gives a total of 60ms for handover delay.

NOTE: The PSCell change delay for handover with PSCell for EN-DC is defined in clause 5.8 in [15] as:

DHOwithPSCel\_PSCell = TRRC\_delay + Tprocessing + Tsearch + T∆ + TPSCell\_ DU + TPCell\_DU + 2 ms

Where:

TRRC\_delay = 20 ms for ‘RRC connection reconfiguration (NR SCG establishment/ /modification/release)’.

Tprocessing = 25ms for source Cell and target Cell are in the same FR.

Tsearch = 0 ms for known cell.

T∆ = 20 ms for fine time tracking and acquiring full timing information of the target cell. 1 SMTC period.

TPSCell\_ DU = 20 ms based on PSCell addition test in TS38.133 A.4.5.7.

TPCell\_ DU = 0 ms, no clolliding with PCell RACH.

This gives a total of 87ms for handover delay.

**<End of Change 1>**

**<Start of Change 2>**

### A.4A.1.X1 Intra-frequency handover with E-UTRAN PSCell

#### A.4A.1.X1.1 Test purpose and environment

The purpose of this test is to verify that the intra-frequency handover with PSCell addition/change delay and interruption under NE-DC are within the requirements stated in clause 6.1.5.3 for the case when the PCell and PSCell are known by the UE.

Supported test configurations are shown in A.4A.1.X1.1-1. The test parameters for the E-UTRA cell are given in Table A.3.7.2.1-1.

The test parameters for NR cells are given in Tables A.4A.1.X1.1-2 and cell-specific parameters in A.4A.1.X1.1-3 below. The test consists of four time periods with duration of T1, T2, T3 and T4 respectively. There are two carriers each with two cells. Before the test starts the UE is connected to Cell 1 (NR PCell) on radio channel 1 (PCC) and Cell 2 (E-UTRAN PSCell) on radio channel 2. During T1 only Cell 1 and Cell 2 are known to the UE.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event A3 is configured for NR neighbour cell (Cell 3), and event-triggered reporting with Event A3 is configured for E-UTRAN neighbour cell (Cell4). The Cell3 and Cell4 become known to the UE during T2. Therefore, during T2 the UE shall report Event A3 for the PCC freqnecy layer and Event A3 for the PSCC frequency layer.

The test system shall send a RRC message to the UE implying handover with PSCell, with targe PCell as Cell 3 and target PSCell as Cell 4 at the end of T2 duration. The RRC message shall be sent after the measurement gaps are released by the test system. The point in time at which the RRC message implying handover with PSCell is received at the UE antenna connector defines the start of period T3 and T4.

Table A.4A.1.X1.1-1: Applicable E-UTRA and NR configurations for NE-DC Handover with PSCell test

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | 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 | |

Table A.4A.1.X1.1-2: General Test Parameters for Intra-frequency handover with PSCell

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1, 2 | Two radio channels are used for this test. One for NR cell and second for E-UTRAN Cell |
| Initial | Active PCell |  | Cell1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell2 | PSCell cell on RF channel number 2. |
| Neighbour PCell |  | Cell3 | Neighbor PCell on RF channel number 1. |
| Neighbour PSCell |  | Cell4 | Neighbor PSCell on RF channel number 2. |
| Final | Active PCell |  | Cell3 | PCell on RF channel number 1. |
| Condition | Active PSCell |  | Cell4 | PSCell on RF channel number 2. |
| A3 for PCC frequency layer | A3-Offset | dB | 0 |  |
| Hysteresis | dB | 0 | Hysteresis for evaluation of event A3. |
| Time To Trigger | s | 0 | Time to Trigger of event A3 |
| A3 for PSCC frequency layer | A3-Offset | dB | 0 | Hysteresis for evaluation of event A3. |
|  | Hysteresis | dB | 0 | Actual RSRP threshold for event A3. |
|  | Time to Trigger | S | 0 | Time to Trigger of event A3 |
| DRX | |  | OFF | Continuous monitoring of primary cell |
| Measurement gap pattern Id | |  | 0 | Gaps are configured before T2 and released before T3. |
| Cell-individual offset for cells on RF channel number 1 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| T1 | | s | 1 | During this time the PCell shall be known and cell2 shall be unknown. |
| T2 | | s | [TBD] | During this time the UE shall identify neighbour cell (cell3 and cell 4) and report event A3 in Cell 1 and Cell 2, and RRC message implying handover with PSCell at the end of this duration |
| T3 | | s | [TBD] | During this time the UE finishes PCell handover. |
| T4 | | s | [TBD] | During this time the UE finishes PSCell addition/change. |

Table A.4A.1.X1.1-3: NR Cell Specific Parameters for Intra-frequency handover with PSCell

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 1 | | | Cell 3 | | | |
|  |  |  | T1 | T2 | T3 | T1 | T2 | T3 | |
| NR RF Channel Number |  | 1,2,3,4,5,6 | 1 | | | | | | |
| E-UTRA RF Channel Number |  | 1,2,3,4,5,6 | 2 | | | | | | |
| TDD |  | 1,4 | Not Applicable | | | | | | |
| configuration |  | 2,5 | TDDConf.1.1 | | | | | | |
|  |  | 3,6 | TDDConf.2.1 | | | | | | |
| BWchannel | MHz | 1,4 | 10: NRB,c = 52 | | | | | | |
|  |  | 2,5 | 10: NRB,c = 52 | | | | | | |
|  |  | 3,6 | 40: NRB,c = 106 | | | | | | |
| Initial BWP Configuration |  | 1,2,3 | DLBWP.0.1  ULBWP.0.1 | | | | | | |
| Dedicated BWP Configuration |  | 1,2,3 | DLBWP.1.1  ULBWP.1.1 | | | | | | |
| PDSCH Reference |  | 1,4 | SR.1.1 FDD | | | | | | |
| measurement |  | 2,5 | SR.1.1 TDD | | | | | | |
| channel |  | 3,6 | SR.2.1 TDD | | | | | | |
| CORESET Reference |  | 1,4 | CR.1.1 FDD | | | | | | |
| Channel |  | 2,5 | CR.1.1 TDD | | | | | | |
|  |  | 3,6 | CR.2.1 TDD | | | | | | |
| OCNG Patterns |  | 1,2,3,4,5,6 | OP.1 | | | | | | |
| SSB configuration |  | 1,2,4,5 | SSB.1 FR1 | | | | | | |
|  |  | 3,6 | SSB.2 FR1 | | | | | | |
| SMTC configuration |  | 1,2,4,5 | SMTC.1 | | | | | | |
|  |  | 3,6 | SMTC.1 | | | | | | |
| TRS Configuration |  | 1,4 | TRS.1.1 FDD | | | | | | |
|  |  | 2,5 | TRS.1.1 TDD | | | | | | |
|  |  | 3,6 | TRS.1.2 TDD | | | | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2,4,5 | 15 kHz | | | | | |
| 3,6 | 30 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | kHz | 1,2,4,5 | 15 kHz | | | | | |
| 3,6 | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS |  |  |  | | | | | | |
| EPRE ratio of PBCH DMRS to SSS |  |  |  | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 1,2,3,4,5,6 | 0 | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  | | | | | | |
| EPRE ratio of PDSCH to PDSCH |  |  |  | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  | | | | | | |
| Note2 | dBm/15 kHz | 1,2,3,4,5,6 | -98 | | | | | | |
| Note2 | dBm/SCS | 1,2,4,5 | -98 | | | | | | |
|  |  | 3,6 | -95 | | | | | | |
|  |  | 1,2,3,4,5,6 | 8 | -3.3 | -3.3 | -Infinity | 2.36 | 2.36 | |
|  |  | 1,2,3,4,5,6 | 8 | 8 | 8 | -Infinity | 11 | 11 | |
| SS-RSRPNote3 | dBm/SCS | 1,2,4,5 | -90 | -90 | -90 | -Infinity | -87 | -87 | |
|  |  | 3,6 | -87 | -87 | -87 | -Infinity | -84 | -84 | |
| IoNote3 | dBm/9.36MHz | 1,2,4,5 | -61.41 | -57.06 | -57.06 | -61.41 | -57.06 | -57.06 | |
|  | dBm/38.1MHz | 3,6 | -55.31 | -50.96 | -50.96 | -55.31 | -50.96 | -50.96 | |
| Propagation condition |  | 1,2,3,4,5,6 | AWGN | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | | | |

Table A.4A.1.X1.1-4: E-UTRAN cell specific test parameters for Intra-frequency handover with PSCell

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 2 | | | Cell 4 | | |
| T1 | T2 | T4 | T1 | T2 | T4 |
| Duplex mode |  | FDD or TDD | | | | | |
| TDD special subframe configurationNote1 |  | 6 | | | | | |
| TDD uplink-downlink configurationNote1 |  | 1 | | | | | |
| BWchannel |  | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | | | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD  5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | | | | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD  5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | | | | |
| OCNG PatternsNote2 |  | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD  5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | | | | | |
| PBCH\_RA | dB |  | | | | | |
| PBCH\_RB | dB |  | | | | | |
| PSS\_RA | dB |  | | | | | |
| SSS\_RA | dB |  | | | | | |
| PCFICH\_RB | dB |  | | | | | |
| PHICH\_RA | dB |  | | | | | |
| PHICH\_RB | dB | 0 | | | | | |
| PDCCH\_RA | dB |  | | | | | |
| PDCCH\_RB | dB |  | | | | | |
| PDSCH\_RA | dB |  | | | | | |
| PDSCH\_RB | dB |  | | | | | |
| OCNG\_RANote3 | dB |  | | | | | |
| OCNG\_RBNote3 | dB |  | | | | | |
| NocNote4 | dBm/15 kHz | -104 | | | | | |
| Ês/Noc | dB | 14 | 14 | 14 | -Infinity | 17 | 17 |
| Ês/Iot | dB | 14 | 14 | 14 | -Infinity | 17 | 17 |
| RSRP Note5 | dBm/15 kHz | -90 | -90 | -90 | -Infinity | -87 | -87 |
| SCH\_RP Note5 | dBm/15 kHz | -90 | -90 | -90 | -Infinity | -87 | -87 |
| Io Note5 | dBm/Ch BW | -56.13+10log(NRB,c /50) | -56.13+10log(NRB,c /50) | -56.13+10log(NRB,c /50) | N/A | -59.13+10log(NRB,c /50) | -59.13+10log(NRB,c /50) |
| Propagation Condition |  | AWGN | | | | | |
| Antenna Configuration |  | 1x2 | | | | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 5: Es/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

#### A.4A.1.X1.2 Test Requirements

The UE shall transmit the PRACH to PCell at latest DHOwithPSCell\_PCellinto T3.

The UE shall transmit the PRACH to PSCell at latest DHOwithPSCell\_PSCell into T4.

The PCell handover delay, DHOwithPSCell\_PCell, is equals the applicable RRC procedure delay defined in clause 12 in TS 38.331 [2] plus the PCell interruption time (Tinterrupt) define in clause 6.1.5.3.2.

PSCell addition/change delay, DHOwithPSCell\_PSCell is defined in clause 6.1.5.3.3.

All the above test requirements shall be fulfilled in order for the observed handover with PSCell delay to be counted as correct. The rate of correct observed handover with PSCell delay during repeated tests shall be at least 90%.

**<End of Change 2>**

**<Start of Change 3>**

### A.4A.1.X2 Handover with PSCell from NE-DC to NE-DC with unknown target PSCell

#### A.4A.1.X2.1 Test Purpose and Environment

This test is to verify the requirement for the requirements of HO with PSCell requirements specified in clause 6.1.5.3. HO from NR FR1 to NR FR1 and E-UTRAN PSCell change are tested independently in the same test, with different end points.

#### A.4A.1.X2.2 Test Parameters

Supported test configurations are shown in table A.4A.1.X2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.4A.1.X2.2-2, and A.4A.1.X2.2-3.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, UE is connected to Cell 1 (NR PCell) and Cell 3 (LTE PSCell 1). The UE may not have any timing information of Cell 2 at the start of T1. Starting of T1, Cell 2 becomes detectable and known to UE for entire T1 duration.

Cell 4 is turned on at the end of T1. At the start of T2, UE do not have timing information of Cell 4 (LTE PSCell 2).

During T2, UE reports Event A3 to TE and TE shall send a RRC message implying handover from Cell 1 to Cell 2 and PSCell change from Cell 3 to Cell 4 in the same RRC message implying handover with PSCell change during T2.

Start of T3 is defined as the end of the last TTI containing the RRC message implying handover with PSCell change. UE shall complete PRACH transmission to PCell and PSCell by end of T3.

**Table A.4A.1.X2.2-1: NE-DC test configurations for NE-DC to NE-DC HO with PSCell**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | 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 | |

**Table A.4A.1.X2.2-2: General test parameters NE-DC to NE-DC HO with PSCell**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| RF Channel Number | |  | 1, 2, 3 | Three radio channels are used for this test. One for NR cell and second for E-UTRAN Cell |
| Initial conditions | Active cell |  | Cell 1 | PCell on RF channel number 1. |
|  | Active PSCell | Cell 3 | PSCell released on RF channel number 3. |
| Final  Condition | Active PCell |  | Cell2 | PCell on RF channel number 2. |
| Active PSCell | Cell4 | PSCell released on RF channel number 3. |
| A3-Offset | | dB | 0 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | S | 1 |  |

**Table A.4A.1.X2.2-3: Cell specific test parameters for NR for NE-DC to NE-DC HO with PSCell test**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Cell 1** | | | | | | **Cell 2** | | | | |
|  | | |  | **T1** | | **T2** | | **T3** | | **T1** | | **T2** | | **T3** |
| NR RF Channel Number | | |  | 1 | | | | | | 1 | | | | |
| Duplex mode | | Config 1 |  | FDD | | | | | | | | | | |
|  | | Config 2,3 |  | TDD | | | | | | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | | | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | | | | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | | | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | | | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | | | | | |
| PDSCH Reference | | Config 1 |  | SR.1.1 FDD | | | | | | | | | | |
| measurement channel | | Config 2 |  | SR.1.1 TDD | | | | | | | | | | |
|  | | Config 3 |  | SR2.1 TDD | | | | | | | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | | | | | | | |
|  | | Config 2 | CR.1.1 TDD | | | | | | | | | | |
|  | | Config 3 | CR2.1 TDD | | | | | | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | | | | | | | | |
|  | | Config 2 |  | TRS.1.1 TDD | | | | | | | | | | |
|  | | Config 3 |  | TRS.1.2 TDD | | | | | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | | | | | |
| SMTC Configuration | | |  | SMTC.1 | | | | | | | | | | |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 | | | | | | | | | | |
|  | | Config 3 |  | SSB.2 FR1 | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | | | | | |
|  | | Config 3 |  | 30 kHz | | | | | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | | | | | |
|  | | Config 3 |  | 30 kHz | | | | | | | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | | | | | | | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | | | | | | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | | | | | | | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | | | | | | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | | | | | | | | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | | | | | | | | |
|  | Config 3 | |  | -95 | | | | | | | | | | |
|  | | | dB | 8 | -3.3 | | -3.3 | | -Infinity | | 2.36 | | 2.36 | |
|  | | | dB | 8 | 8 | | 8 | | -Infinity | | 11 | | 11 | |
| SSB\_RP | Config 1,2 | | dBm/SCS | -90 | -90 | | -90 | | -Infinity | | -87 | | -87 | |
|  | Config 3 | | dBm/SCS | -87 | -87 | | -87 | | -Infinity | | -84 | | -84 | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -61.41 | -57.06 | | -57.06 | | -61.41 | | -57.06 | | -57.06 | |
|  | Config 3 | | dBm/  38.16MHz | -55.31 | -50.96 | | -50.96 | | -55.31 | | -50.96 | | -50.96 | |
| Propagation condition | | | - | AWGN | | | | | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | | | | | |

**Table A.4A.1.X2.2-4: E-UTRAN cell specific test parameters for EUTRA PSCell addition/change**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **E-UTRAN Cell 3** | | **E-UTRAN Cell 4** | |
| **T1** | **T2** | | **T3** |
| Duplex mode |  | FDD or TDD | | | |
| TDD special subframe configurationNote1 |  | 6 | | | |
| TDD uplink-downlink configurationNote1 |  | 1 | | | |
| BWchannel |  | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD  5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD  5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | | |
| OCNG PatternsNote2 |  | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD  5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | | | |
| PBCH\_RA | dB |  | | | |
| PBCH\_RB | dB |  | | | |
| PSS\_RA | dB |  | | | |
| SSS\_RA | dB |  | | | |
| PCFICH\_RB | dB |  | | | |
| PHICH\_RA | dB |  | | | |
| PHICH\_RB | dB | 0 | | | |
| PDCCH\_RA | dB |  | | | |
| PDCCH\_RB | dB |  | | | |
| PDSCH\_RA | dB |  | | | |
| PDSCH\_RB | dB |  | | | |
| OCNG\_RANote3 | dB |  | | | |
| OCNG\_RBNote3 | dB |  | | | |
| NocNote4 | dBm/15 kHz | N/A | -104 | | |
| Ês/Noc | dB | -infinite | 17 | | |
| Ês/Iot | dB | -infinite | 17 | | |
| RSRP Note5 | dBm/15 kHz | -infinite | -87 | | |
| SCH\_RP Note5 | dBm/15 kHz | -infinite | -87 | | |
| Io Note5 | dBm/Ch BW | N/A | -59.13+10log(NRB,c /50) | | |
| Propagation Condition |  | AWGN | | | |
| Antenna Configuration |  | 1x2 | | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 5: Es/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

#### A.4A.1.X2.3.1 Test Requirements for NR HO

The UE shall start to transmit the PRACH to Cell 2 less than 83 ms from the beginning of time period T3.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + Tinterrupt, where:

RRC procedure delay = 16 ms and is specified in clause 12 in TS 38.331 [2], RRC reconfiguration (LTE/NR SCG

establishment/ modification/ release).

Tinterrupt = 67 ms in the test. Tinterrupt is defined in clause 6.1.5.3.2.

This gives a total of 83 ms.

#### A.4A.1.X2.3.2 Test Requirements for LTE PSCell Change

The UE shall transmit the PRACH to PSCell at latest 131 msNote1 into T3.

There cannot be any interruptions on PCell during PSCell change.

All the above test requirements shall be fulfilled in order for the observed PSCell change delay to be counted as correct. The rate of correct observed PSCell change delay during repeated tests shall be at least 90%.

Note1: The PSCell change delay can be expressed as follows as specified in clause 6.1.5.3.3 of TS 38.133 is

DHOwithPSCel\_PSCell = Tconfig\_EUTRAN-PSCell + 5ms,

Tconfig\_EUTRAN-PSCell  =TRRC\_delay + Tactivation\_time + 50ms + TE-UTRAN-PSCell\_ DU,

Tactivation\_time is the PSCell activation delay. If the PSCell is known, then Tactivation\_time is 20ms. If the PSCell is unknown, then Tactivation\_time is 30ms provided the PSCell can be successfully detected on the first attempt.

TE-UTRAN-PSCell\_DU is the delay uncertainty in acquiring the first available PRACH occasion in the E-UTRAN PSCell. TE-UTRAN-PSCell\_DU is up to 30ms.

Where:

TRRC\_delay = 16ms

Tactivation\_time = 30ms

TE-UTRAN-PSCell\_DU = 30ms

**<End of Change 3>**

**<Start of Change 4>**

A.5.3.x1 Handover with PSCell with known FR2 target PSCell

A.5.3.x1.1 Test purpose and environment

The purpose of this test is to verify that the NR PSCell change delays in handover with PSCell from EN-DC to EN-DC are within the requirements stated in clause 5.8 of TS 36.133 [15] for the case when the source PSCell is in FR1 and the target PSCell in FR2 is known by the UE at the time of handover with PSCell.

Supported test configurations are shown in A.5.3.x1.1-1. The test parameters for the E-UTRA cells are given in Table A.3.7.2.2-1. The E-UTRA Cell 1 will handover to E-UTRA Cell 2 in this test case. The test parameters for NR cells are given in Tables A.5.3.x1.1-2, cell-specific parameters in A.5.3.x1.1-3 and OTA parameters in A.5.3.x1.1-4 below. The test consists of three successive time periods with duration of T1, T2 and T3. There are four carriers each with one cell. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on E-UTRA and Cell 4 (SCell) on NR. The UE is monitoring the PCell and PSCell.

The test system shall send a RRC message to the UE to handover with PSCell (target PCell Cell 2, target PSCell Cell 4). The RRC message (to handover with PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The RRC message to handover with PSCell shall be sent to the UE during period T1. The point in time at which the RRC message to handover with PSCell (Cell2, Cell 4) is received at the UE antenna connector defines the start of period T2.

The test system shall observe the periodic reporting of CSI for the target PSCell during T3. The point in time at which the UE has sent PRACH to the target PSCell (Cell 4) defines the start of period T3.

**Table A.5.3.x1.1-1: Supported test configurations for Handover with PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | Cell 1 LTE FDD,  Cell 2 LTE FDD,  Cell 3 NR FDD 15kHz SSB SCS, 10MHz bandwidth,  Cell 4 NR TDD 120kHz SSB SCS, 100MHz bandwidth |
| 2 | Cell 1 LTE FDD,  Cell 2 LTE FDD,  Cell 3 NR TDD 15kHz SSB SCS, 10MHz bandwidth,  Cell 4 NR TDD 120kHz SSB SCS, 100MHz bandwidth |
| 3 | Cell 1 LTE FDD,  Cell 2 LTE FDD,  Cell 3 NR TDD 30kHz SSB SCS, 40MHz bandwidth,  Cell 4 NR TDD 120kHz SSB SCS, 100MHz bandwidth |
| 4 | Cell 1 LTE TDD,  Cell 2 LTE TDD,  Cell 3 NR FDD 15kHz SSB SCS, 10MHz bandwidth,  Cell 4 NR TDD 120kHz SSB SCS, 100MHz bandwidth |
| 5 | Cell 1 LTE TDD,  Cell 2 LTE TDD,  Cell 3 NR TDD 15kHz SSB SCS, 10MHz bandwidth,  Cell 4 NR TDD 120kHz SSB SCS, 100MHz bandwidth |
| 6 | Cell 1 LTE TDD,  Cell 2 LTE TDD,  Cell 3 NR TDD 30kHz SSB SCS, 40MHz bandwidth,  Cell 4 NR TDD 120kHz SSB SCS, 100MHz bandwidth |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table A.5.3.x1.1-2: General Test Parameters for Handover with PSCell**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| RF Channel Number | |  | 1, 2,3,4 | Two E-UTRAN radio channel (1,2) and two NR radio channel (3,4) are used for this test |
| Initial  Condition | Active PCell |  | Cell 1 | PCell on E-UTRAN RF channel number 1.  As specified in clause A.3.7.2.1 |
| Neighbour Cell | Cell 2 | Neighbour cell on E-UTRAN RF channel number 2.  As specified in clause A.3.7.2.1 |
| Active PSCell | Cell 3 | PSCell on NR RF channel number 3. |
| Neighbour Cell | Cell 4 | Neighbour cell on NR RF channel number 4. |
| Final  Condition | Active PCell |  | Cell 2 |  |
| Neighbour Cell | Cell 1 |  |
| Active PSCell | Cell 4 |  |
| Neighbour Cell | Cell 3 |  |
| Access Barring Information | |  | Not Sent | No additional delays in random access procedure. |
| DRX | |  | OFF | Continuous monitoring of primary cell |
| PRACH configuration on Cell 4 | |  | FR2 configuration 2 | Captured in A.3.8.3.2 |
| Cell-individual offset for cells on E-UTRAN RF channel | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on NR RF channel | | dB | 0 | Individual offset for cells on second component carrier |
| T1 | | s | 1 | During this time the PCell and PSCell shall be known and SCells configured and detected. |
| T2 | | s | 0.5 | During this time the UE change the PSCell. |
| T3 | | s | 1 | During this time the UE sends CSI reports for PSCell. |

**Table A.5.3.x1.1-3: Cell specific test parameters for Handover with PSCell**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 3** | | | **Cell 4** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| SSB ARFCN | |  | Freq1 | | | Freq2 | | |
| Duplex mode | Config 1,4 |  | FDD | | | TDD | | |
| Config 2,3,5,6 | TDD | | | TDD | | |
| TDD configuration | Config 1,4 |  | Not Applicable | | | TDDConf.3.1 | | |
| Config 2,5 | TDDConf.1.1 | | |
| Config 3,6 | TDDConf.2.1 | | |
| BWchannel | Config 1,4 | MHz | 10: NRB,c = 52 | | | 100: NRB,c = 66 | | |
| Config 2,5 | 10: NRB,c = 52 | | |
| Config 3,6 | 40: NRB,c = 106 | | |
| Data RBs allocated | Config 1,4 |  | 52 | | | 66 | | |
| Config 2,5 | 52 | | |
| Config 3,6 | 106 | | |
| DL initial BWP configuration | Config 1~6 |  | DLBWP.0.1 | | | | | |
| DL dedicated BWP configuration | Config 1~6 |  | DLBWP.1.1 | | | | | |
| UL initial BWP configuration | Config 1~6 |  | ULBWP.0.1 | | | | | |
| UL dedicated BWP configuration | Config 1~6 |  | ULBWP.1.1 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD | | | SR.3.1 TDD | | |
| Config 2,5 | SR.1.1 TDD | | |
| Config 3,6 | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | Config 1,4 |  | CR.1.1 FDD | | | CR.3.1 TDD | | |
| Config 2,5 | CR.1.1 TDD | | |
| Config 3,6 | CR.2.1 TDD | | |
| RMC CORESET Reference Channel | Config 1,4 |  | CCR.1.1 FDD | | | CCR.3.1 TDD | | |
| Config 2,5 | CCR.1.1 TDD | | |
| Config 3,6 | CCR.2.1 TDD | | |
| OCNG Patterns | |  | OP.1 | | | | | |
| SMTC configuration | |  | SMTC.1 | | | | | |
| TCI state | |  | NA | | | TCI.State.0 | | |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD | | | TRS.2.1 TDD | | |
|  | Config 2,5 | TRS.1.1 TDD | | |
|  | Config 3,6 | TRS.1.2 TDD | | |
| SSB configuration | Config 1,2,4,5 |  | SSB.1 FR1 | | | SSB.1 FR2 | | |
|  | Config 3,6 | SSB.2 FR1 | | |
| CSI-RS configuration for CSI reporting | Config 1,4 |  | CSI-RS.1.1 FDD | | | CSI-RS.3.1 TDD | | |
| Config 2,5 | CSI-RS.1.1 TDD | | |
| Config 3,6 | CSI-RS.2.1 TDD | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15kHz | | | 120kHz | | |
| Config 3,6 | 30kHz | | |
| reportConfigType | Config 1~6 |  | N/A | | | Periodic | | |
| reportQuantity | Config 1~6 |  | N/A | | | cri-RI-PMI-CQI | | |
| CSI reporting periodicity | Config 1~6 | slot | N/A | | | 40 | | |
| CSI reporting offset | Config 1~6 | slot | N/A | | | 4 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Propagation condition | |  | NA  Link only, see clause A.3.7A | | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | | |

**Table A.5.3.x1.1-4: OTA related test parameters for Handover with PSCell**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 3** | | | **Cell 4** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| Angle of arrival configuration | |  | NA  Link only, see clause A.3.7A | | | Setup 1 according to clause A.3.15.1 | | |
| Assumption for UE beamsNote 5 | |  | Rough | | |
| Note1 | | dBm/15kHz | -104.7 | | |
| Note1 | Config 1,2,4,5 | dBm/SCS | -95.7 | | |
| Config 3,6 |
| SSB\_RPNote2 | Config 1,2,4,5 | dBm/SCS  Note3 | -88.7 | | |
| Config 3,6 |
|  | Config 1~12 | dB | 7 | | |
| Note2 | | dB | 7 | | |
| IoNote2 | Config 1~12 | dBm/ChBwNote3,Note4 | -58.92 | | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 4: ChBW is 94.04 MHz for Cell4, 9.36 MHz for Cell 3 in configurations 1,2,4,5,7,8,10,11, 38.1 MHz in configurations 3,6,9,12.  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | |

A.5.3.x1.2 Test Requirements

The UE shall transmit the PRACH to PSCell at latest 107 msNote1 into T2.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T3.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T3

All the above test requirements shall be fulfilled for the observed PSCell change delay to be counted as correct. The rate of correct observed PSCell change delay during repeated tests shall be at least 90%.

Note1: The PSCell change delay can be expressed as follows as specified in clause 5.8.1.2 of TS 36.133 [15]:

DHOwithPSCel\_PSCell = TRRC\_delay + Tprocessing + Tsearch + T∆ + TPSCell\_ DU + TPCell\_DU + 2 ms

Where:

TRRC\_delay = 20 ms

Tprocessing = 45 ms

Tsearch = 0 ms

T∆ = 20 ms

TPSCell\_ DU = 1\*10+10 = 20 ms

TPCell\_ DU = 0 ms

**<End of Change 4>**

**<Start of Change 5>**

A.6.3.1.x1 SA NR - E-UTRAN with NR PSCell addition in FR1

A.6.3.1.x1.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct inter-RAT E-UTRAN handover with PSCell addition when operating in standalone (SA) operation with PCell in FR1 where target PCell and target PSCell are unknown. This test shall verify the Handover with PSCell from NR SA to EN-DC requirements as specified in clause 6.1.5.1.

The test comprises of two NR carrier and one E-UTRA carrier. There are three cells and one cell on each carrier. Cell 1 is the NR PCell, Cell 2 is an inter-RAT E-UTRAN neighbour cell and Cell 3 is an NR neighbour cell. The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2 and Cell 3. Starting T2, Cell 2 and Cell 3 becomes detectable

A RRC message implying handover with PSCell shall be sent to the UE during period T1. The start of T2 is the instant when the last TTI containing the RRC message implying handover with PSCell is sent to the UE.Before T2, the UE does not have any information of Cell 3. The handover with PSCell message shall contain Cell 2 and Cell 3 as the target cells and the SMTC for Cell 3 is configured in *RRCConnectionReconfiguration.*

Supported test configurations are shown in table A.6.3.1.x1-1. General test parameters are provided in Table A.6.3.1.x1-2. Cell specific test parameters for Cell 1, Cell 2 and Cell 3 are provided in Tables A.6.3.1.x1-3, A.6.3.1.x1-4 and A.6.3.1.x1-5 respectively.

**Table A.6.3.1.x1-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table A.6.3.1.x1-2: General test parameters for Handover with PSCell from NR SA to EN-DC**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NR RF Channel Number | |  | 1, 2 | 2 NR carrier frequency is used in the test |
| LTE RF Channel Number | |  | 3 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell |  | Cell 1 | NR cell |
|  | Neighbouring cell |  | Cell 2, Cell3 | E-UTRAN cell and NR Cell |
| Final condition | Active cell |  | Cell 2 and Cell 3 |  |
| DRX | |  | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between Cell 1 and Cell 2 | |  | 3 ms | Asynchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |

**Table A.6.3.1.x1-3: Cell specific test parameters for Handover with PSCell from NR SA to EN-DC (Cell1)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Configuration** | **Cell 1** | |
|  | |  |  | **T1** | **T2** |
| RF channel number | |  | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | |  | 1, 4 | FDD | |
|  | |  | 2, 3, 5, 6 | TDD | |
| TDD Configuration | |  | 2, 5 | TDDConf.1.1 | |
|  | |  | 3, 6 | TDDConf.2.1 | |
| BWchannel | | MHz | 1, 4 | 10: NRB,c = 52 (FDD) | |
|  | |  | 2, 5 | 10: NRB,c = 52 (TDD) | |
|  | |  | 3, 6 | 40: NRB,c = 106 (TDD) | |
| PDSCH reference measurement channel | |  | 1, 4 | SR.1.1 FDD | |
|  | |  | 2, 5 | SR.1.1 TDD | |
|  | |  | 3, 6 | SR.2.1 TDD | |
| CORSET reference channel | |  | 1, 4 | CR.1.1 FDD | |
|  | |  | 2, 5 | CR.1.1 TDD | |
|  | |  | 3, 6 | CR.2.1 TDD | |
| TRS configuration | |  | 1, 4 | TRS.1.1 FDD | |
|  | |  | 2, 5 | TRS.1.1 TDD | |
|  | |  | 3, 6 | TRS.1.2 TDD | |
| OCNG patternNote1 | |  | 1, 2, 3, 4, 5, 6 | OP.1 | |
| BWP | Initial DL BWP |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | |
| SMTC configuration | |  | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | |  | 1, 2, 4, 5 | SSB.1 FR1 | |
|  | |  | 3, 6 | SSB.2 FR1 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH\_DMRS to SSS | |  |  |  | |
| EPRE ratio of PBCH to PBCH\_DMRS | |  |  |  | |
| EPRE ratio of PDCCH\_DMRS to SSS | |  |  |  | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |  |  |  | |
| EPRE ratio of PDSCH\_DMRS to SSS | |  |  |  | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |  |  |  | |
| EPRE ratio of OCNG DMRS to SSS | |  |  |  | |
| EPRE ratio of OCNG to OCNG DMRS | |  |  |  | |
| *Noc*Note2 | | dBm/15 KHz | 1, 2, 3, 4, 5, 6 | -100 | -100 |
| *Noc*Note2 | | dBm/SCS | 1, 2, 4, 5 | -100 | -100 |
|  | |  | 3, 6 | -97 | -97 |
| Ês/Noc | | dB | 1, 2, 3, 4, 5, 6 | 12 | -4 |
| Ês/IotNote3 | | dB | 1, 2, 3, 4, 5, 6 | 12 | -4 |
| SS-RSRPNote3 | | dBm/SCS | 1, 2, 4, 5 | -88 | -104 |
|  | |  | 3, 6 | -85 | -101 |
| IoNote3 | | dBm/9.36 MHz | 1, 2, 4, 5 | -59.78 | -70.59 |
|  | | dBm/38.16 MHz | 3, 6 | -53.68 | -64.49 |
| Propagation condition | |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for *Noc* to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

**Table A.6.3.1.x1-4: Cell specific test parameters for Handover with PSCell from NR SA to EN-DC (Cell 2)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Configuration** | **Cell 2** | |
|  |  |  | **T1** | **T2** |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 3 | |
| Duplex mode |  | 1, 2, 3 | FDD | |
| 4, 5, 6 | TDD | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | |
| PRACH ConfigurationNote2 |  | 1, 2, 3 | 4 | |
|  |  | 4, 5, 6 | 53 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | |
|  |  | 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | |
|  |  | 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | |
| OCNG PatternsNote3 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | |
|  |  | 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH\_RB |  |  |  | |
| PSS\_RA |  |  |  | |
| SSS\_RA |  |  |  | |
| PCFICH\_RB |  |  |  | |
| PHICH\_RA |  |  |  | |
| PHICH\_RB |  |  |  | |
| PDCCH\_RA |  |  |  | |
| PDCCH\_RB |  |  |  | |
| PDSCH\_RA |  |  |  | |
| PDSCH\_RB |  |  |  | |
| OCNG\_RANote4 |  |  |  | |
| OCNG\_RBNote4 |  |  |  | |
| NocNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 78 |
| Ês/IotNote6 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 78 |
| RSRPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -90 |
| SCH\_RPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -90 |
| IoNote6 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -67.21  +10log(NRB,c/100) | -58.57  +10log(NRB,c/100) |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix Note7 |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].  Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 6: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | |

**Table A.6.3.1.x1-5: Cell specific test parameters for Handover with PSCell from NR SA to EN-DC (Cell 3)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Configuration** | **Cell 3** | |
|  | |  |  | **T1** | **T2** |
| RF channel number | |  | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode | |  | 1, 4 | FDD | |
|  | |  | 2, 3, 5, 6 | TDD | |
| TDD Configuration | |  | 2, 5 | TDDConf.1.1 | |
|  | |  | 3, 6 | TDDConf.2.1 | |
| BWchannel | | MHz | 1, 4 | 10: NRB,c = 52 (FDD) | |
|  | |  | 2, 5 | 10: NRB,c = 52 (TDD) | |
|  | |  | 3, 6 | 40: NRB,c = 106 (TDD) | |
| PDSCH reference measurement channel | |  | 1, 4 | SR.1.1 FDD | |
|  | |  | 2, 5 | SR.1.1 TDD | |
|  | |  | 3, 6 | SR.2.1 TDD | |
| CORSET reference channel | |  | 1, 4 | CR.1.1 FDD | |
|  | |  | 2, 5 | CR.1.1 TDD | |
|  | |  | 3, 6 | CR.2.1 TDD | |
| TRS configuration | |  | 1, 4 | TRS.1.1 FDD | |
|  | |  | 2, 5 | TRS.1.1 TDD | |
|  | |  | 3, 6 | TRS.1.2 TDD | |
| PRACH configuration | |  | 1, 2, 3, 4, 5, 6 | FR1 PRACH configuration 1 | |
| OCNG patternNote1 | |  | 1, 2, 3, 4, 5, 6 | OP.1 | |
| BWP | Initial DL BWP |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | |
| SMTC configuration | |  | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | |  | 1, 2, 4, 5 | SSB.1 FR1 | |
|  | |  | 3, 6 | SSB.2 FR1 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH\_DMRS to SSS | |  |  |  | |
| EPRE ratio of PBCH to PBCH\_DMRS | |  |  |  | |
| EPRE ratio of PDCCH\_DMRS to SSS | |  |  |  | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |  |  |  | |
| EPRE ratio of PDSCH\_DMRS to SSS | |  |  |  | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |  |  |  | |
| EPRE ratio of OCNG DMRS to SSS | |  |  |  | |
| EPRE ratio of OCNG to OCNG DMRS | |  |  |  | |
| *Noc*Note2 | | dBm/15 KHz | 1, 2, 3, 4, 5, 6 | -100 | -85 |
| *Noc*Note2 | | dBm/SCS | 1, 2, 4, 5 | -100 | -85 |
|  | |  | 3, 6 | -100 | -82 |
| Ês/Noc | | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 0 |
| Ês/IotNote3 | | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 0 |
| SS-RSRPNote3 | | dBm/SCS | 1, 2, 4, 5 | -Infinity | -85 |
|  | 3, 6 | -Infinity | -82 |
| IoNote3 | | dBm/9.36 MHz | 1, 2, 4, 5 | -72.05 | -57 |
|  | | dBm/38.16 MHz | 3, 6 | -68.96 | -51 |
| Propagation condition | |  | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for *Noc* to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

A.6.3.1.x1.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 175 ms from the beginning of time period T2.

The UE shall start to transmit the PRACH to Cell 3 less than 270 ms from the beginning of time period T2.

NOTE: The handover delay can be expressed as: RRC procedure delay + Tinterrupt, where:

RRC procedure delay = 50 ms and is specified in clause 6.1.5.1.

Tinterrupt = 125 ms in the test; Tinterrupt is defined in clause 6.1.5.1.

The PSCell addition time can be expressed as: TRRC\_delay + Tprocessing + Tsearch\_HO + Tsearch\_PSCell + T∆ + TPSCell\_ DU + 2 ms which is defined in clause 6.1.5.1

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

**<End of Change 5>**

**<Start of Change 6>**

A.6.3.1.x2 SA NR - E-UTRAN handover with NR FR1 PScell addition

A.6.3.1.x2.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct SA inter-RAT handover from NR to E-UTRAN with FR1 PSCell addition when operating in standalone (SA) operation with PCell in FR1, for the case where the PSCell is known to the UE at the time of addition and SMTC of target known PSCell is not present in *RRCConnectionReconfiguration*. This test shall verify delay requirements of inter-RAT handover from NR to E-UTRAN and FR1 PSCell addition as specified in clause 6.1.5.

The test comprises of two NR cells and one E-UTRA cell. Cell 1 is the NR PCell, Cell 2 is an inter-RAT E-UTRAN neighbour cell and Cell 3 is the target NR PSCell, on radio channel 1 in FR1, radio channel 2 in E-UTRAN and radio channel 3 in FR1, respectively.

In this test, inter-RAT handover from NR to E-UTRAN and FR1 PSCell addition are performed in parallel processing. The test consists of successive time periods for inter-RAT handover and FR1 PSCell addition with time durations of T1, T2 and T3 respectively.

At the start of time duration T1, the UE does not have any timing information of Cell 2 and Cell 3, and the UE is only monitoring Cell 1. During T1, only Cell1 is known to the UE.

Before the start of T2, the test system shall send measurement control information including measurement gap configuration and event-triggered reporting configuration with event B2 for neighbour Cell 2 and event B1 for Cell 3. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 is configured before T2 begins.

Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report, and the Cell 3 (PSCell-to-be) on radio channel 3 becomes known to the UE at the time of addition. The RRC message implying handover with PSCell shall be sent to the UE during period T2 after the UE has reported Event B2 and Event B1. After receiving both Event B2 and Event B1the test system shall send a RRC message to the UE to release the measurement gaps.

The point in time at which the RRC message implying handover with PSCell is received at the UE antenna connector defines the start of period T3 and T3’. The handover with PSCell message shall contain Cell 2 as the target cell and Cell 3 as PSCell-to-be added.

During T3, the UE shall carry out random access (i.e., transmit the PRACH) towards the Cell 2. Reception by the test system of the PRACH preamble defines the end of T3.

During T3’, the UE shall carry out random access (i.e., transmit the PRACH) towards the Cell 3. Reception by the test system of the PRACH preamble defines the start of period T4’.

During T4’, the UE shall send periodic CSI reports in PSCell and the test system shall observe the periodic reporting of CSI for PSCell.

Supported test configurations are shown in table A.6.3.1.x2-1. General test parameters are provided in Table A.6.3.1.x2-2. Cell specific test parameters for NR Cell 1, E-UTRAN PCell Cell 2 and NR PScell Cell 3 are provided in Tables A.6.3.1.x2-3, A.6.3.1.x2-4 and A.6.3.1.x2-5 respectively.

**Table A.6.3.1.x2-1: Supported test configurations for SA inter-RAT E-UTRAN handover with FR1 PSCell addition tests**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD, LTE FDD |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD, LTE FDD |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD, LTE FDD |
| 4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD, LTE TDD |
| 5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD, LTE TDD |
| 6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table A.6.3.1.x2-2: General test parameters for SA inter-RAT E-UTRAN handover with FR1 PSCell addition**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** | **Comment** |
| NR RF Channel Number | | |  | 1, 3 | 2 NR carrier frequency is used in the test |
| LTE RF Channel Number | | |  | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | |  | Cell 1 | NR cell |
|  | Neighbouring cell | |  | Cell 2, 3 | E-UTRAN cell and NR cell in FR1 |
| Final condition | Active Pcell | |  | Cell 2 | E-UTRAN cell |
| Active PSCell | |  | Cell 3 | NR cell in FR1 |
| NR measurement quantity | | |  | SS-RSRP |  |
| E-UTRAN measurement quantity | | |  | RSRP |  |
| Event B1 | | Hysteresis | dB | 0 | Hysteresis for evaluation of event B1. |
| Threshold RSRP | dBm | -93 | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.1.11.1 into account plus margin. |
| Time to Trigger | S | 0 |  |
| Event B2 | | Threshold1 | dBm | As specified in Table A.6.3.1.4-3 | Absolute NR SS-RSRP threshold for event B2 |
| Threshold2EUTRAN | dBm | -98 | Absolute E-UTRAN RSRP threshold for event B2 |
| Hysteresis | dB | 0 |  |
| TimeToTrigger | s | 0 |  |
| Filter coefficient | | |  | 0 | L3 filtering is not used |
| DRX | | |  | OFF | Non-DRX test |
| Access Barring Information | | | - | Not sent | No additional delays in random access procedure |
| Time offset between cell 1 and cell 2 | | |  | 3 ms | Asynchronous cells |
| Measurement Gap pattern ID | | |  | 0 | As specified in Table 9.1.2-1 |
| T1 | | | s | 1 | During this time only Cell 1 is known to UE. |
| T2 | | | s | ≤5 | During this time the UE shall identify Cell 2 and report event B2, and identify Cell 3 and report event B1. |
| T3 | | | s | 1 | During this time the UE handovers to Cell 2. |
| T3’ | | | s | 0.5 | During this time the UE adds the PSCell (Cell 3). |
| T4’ | | | s | 0.5 | During this time the UE sends CSI reports for PSCell (Cell 3). |

**Table A.6.3.1.x2-3: Cell specific test parameters for SA inter-RAT E-UTRA handover with FR1 PSCell addition (NR Cell 1)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Configuration** | **Cell 1** | | |
|  | |  |  | **T1** | **T2** | **T3** |
| RF channel number | |  | 1, 2, 3, 4, 5, 6 | 1 | | |
| Duplex mode | |  | 1, 4 | FDD | | |
|  | |  | 2, 3, 5, 6 | TDD | | |
| TDD Configuration | |  | 2, 5 | TDDConf.1.1 | | |
|  | |  | 3, 6 | TDDConf.2.1 | | |
| BWchannel | | MHz | 1, 4 | 10: NRB,c = 52 (FDD) | | |
|  | |  | 2, 5 | 10: NRB,c = 52 (TDD) | | |
|  | |  | 3, 6 | 40: NRB,c = 106 (TDD) | | |
| PDSCH reference measurement channel | |  | 1, 4 | SR.1.1 FDD | | |
|  | |  | 2, 5 | SR.1.1 TDD | | |
|  | |  | 3, 6 | SR.2.1 TDD | | |
| CORSET reference channel | |  | 1, 4 | CR.1.1 FDD | | |
|  | |  | 2, 5 | CR.1.1 TDD | | |
|  | |  | 3, 6 | CR.2.1 TDD | | |
| TRS configuration | |  | 1, 4 | TRS.1.1 FDD | | |
|  | |  | 2, 5 | TRS.1.1 TDD | | |
|  | |  | 3, 6 | TRS.1.2 TDD | | |
| OCNG patternNote1 | |  | 1, 2, 3, 4, 5, 6 | OP.1 | | |
| BWP | Initial DL BWP |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | |
| SMTC configuration | |  | 1, 2, 3, 4, 5, 6 | SMTC.1 | | |
| SSB configuration | |  | 1, 2, 4, 5 | SSB.1 FR1 | | |
|  | |  | 3, 6 | SSB.2 FR1 | | |
| b2-Threshold1 | | dBm | 1, 2, 4, 5 | -96 | | |
|  | |  | 3, 6 | -93 | | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| EPRE ratio of PBCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PBCH to PBCH\_DMRS | |  |  |  | | |
| EPRE ratio of PDCCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |  |  |  | | |
| EPRE ratio of PDSCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |  |  |  | | |
| EPRE ratio of OCNG DMRS to SSS | |  |  |  | | |
| EPRE ratio of OCNG to OCNG DMRS | |  |  |  | | |
| *Noc*Note2 | | dBm/15 KHz | 1, 2, 3, 4, 5, 6 | -100 | -104 | -100 |
| *Noc*Note2 | | dBm/SCS | 1, 2, 4, 5 | -100 | -104 | -100 |
|  | |  | 3, 6 | -97 | -101 | -97 |
| Ês/Noc | | dB | 1, 2, 3, 4, 5, 6 | 12 | 0 | -4 |
| Ês/IotNote3 | | dB | 1, 2, 3, 4, 5, 6 | 12 | 0 | -4 |
| SS-RSRPNote3 | | dBm/SCS | 1, 2, 4, 5 | -88 | -104 | -104 |
|  | |  | 3, 6 | -85 | -101 | -101 |
| IoNote3 | | dBm/9.36 MHz | 1, 2, 4, 5 | -59.78 | -73.04 | -70.59 |
|  | | dBm/38.16 MHz | 3, 6 | -53.68 | -66.9448 | -64.49 |
| Propagation condition | |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix | |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for *Noc* to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

**Table A.6.3.1.x2-4: Cell specific test parameters for SA inter-RAT E-UTRA handover with FR1 PSCell addition (E-UTRA Cell 2)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Configuration** | **Cell 2** | | |
|  |  |  | **T1** | **T2** | **T3** |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 2 | | |
| Duplex mode |  | 1, 2, 3 | FDD | | |
| 4, 5, 6 | TDD | | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | |
| PRACH ConfigurationNote2 |  | 1, 2, 3 | 4 | | |
|  |  | 4, 5, 6 | 53 | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | | |
|  |  | 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | | |
|  |  | 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | |
| OCNG PatternsNote3 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | | |
|  |  | 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| PBCH\_RB |  |  |  | | |
| PSS\_RA |  |  |  | | |
| SSS\_RA |  |  |  | | |
| PCFICH\_RB |  |  |  | | |
| PHICH\_RA |  |  |  | | |
| PHICH\_RB |  |  |  | | |
| PDCCH\_RA |  |  |  | | |
| PDCCH\_RB |  |  |  | | |
| PDSCH\_RA |  |  |  | | |
| PDSCH\_RB |  |  |  | | |
| OCNG\_RANote4 |  |  |  | | |
| OCNG\_RBNote4 |  |  |  | | |
| NocNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 8 | 78 |
| Ês/IotNote6 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 78 | 78 |
| RSRPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -90 | -90 |
| SCH\_RPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -90 | -90 |
| IoNote6 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -67.21  +10log(NRB,c/100) | -58.57  +10log(NRB,c/100) | -58.57  +10log(NRB,c/100) |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix Note7 |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].  Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 6: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | | |

**Table A.6.3.1.x2-5: Cell specific test parameters for SA inter-RAT E-UTRA handover with FR1 PSCell addition (NR Cell 3)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Test | | | | |
|  |  |  | T1 | T2 | T3’ | T4’ | |
| E-UTRA RF Channel Number |  | 1,2,3,4,5,6 | 1 | | | | |
| NR RF Channel Number |  | 1,2,3,4,5,6 | 2 | | | | |
| TDD |  | 1,4 | Not Applicable | | | | |
| configuration |  | 2,5 | TDDConf.1.1 | | | | |
|  |  | 3,6 | TDDConf.2.1 | | | | |
| BWchannel | MHz | 1,4 | 10: NRB,c = 52 | | | | |
|  |  | 2,5 | 10: NRB,c = 52 | | | | |
|  |  | 3,6 | 40: NRB,c = 106 | | | | |
| Initial BWP Configuration |  | 1,2,3 | DLBWP.0.1  ULBWP.0.1 | | | | |
| Dedicated BWP Configuration |  | 1,2,3 | DLBWP.1.1  ULBWP.1.1 | | | | |
| PDSCH Reference |  | 1,4 | SR.1.1 FDD | | | | |
| measurement |  | 2,5 | SR.1.1 TDD | | | | |
| channel |  | 3,6 | SR.2.1 TDD | | | | |
| RMSI CORESET Reference |  | 1,4 | CR.1.1 FDD | | | | |
| Channel |  | 2,5 | CR.1.1 TDD | | | | |
|  |  | 3,6 | CR.2.1 TDD | | | | |
| Dedicated CORESET Reference |  | 1,4 | CCR.1.1 FDD | | | | |
| Channel |  | 2,5 | CCR.1.1 TDD | | | | |
|  |  | 3,6 | CCR.2.1 TDD | | | | |
| OCNG Patterns |  | 1,2,3,4,5,6 | OP.1 | | | | |
| SSB configuration |  | 1,2,4,5 | SSB.1 FR1 | | | | |
|  |  | 3,6 | SSB.2 FR1 | | | | |
| SMTC configuration |  | 1,2,4,5 | SMTC.1 | | | | |
|  |  | 3,6 | SMTC.1 | | | | |
| TRS Configuration |  | 1,4 | TRS.1.1 FDD | | | | |
|  |  | 2,5 | TRS.1.1 TDD | | | | |
|  |  | 3,6 | TRS.1.2 TDD | | | | |
| PRACH configuration on cell2 |  | FR1 PRACH configuration 1 | Captured in A.3.8.2.1 | | | |
| CSI-RS configuration for CSI reporting |  | 1,4 | CSI-RS.1.1 FDD | | | |
| 2,5 | CSI-RS.1.1 TDD | | | |
| 3,6 | CSI-RS.2.1 TDD | | | |
| reportConfigType |  | 1,2,3,4,5,6 | periodic | | | |
| reportQuantity |  | 1,2,3,4,5,6 | cri-RI-PMI-CQI | | | |
| CSI reporting periodicity | slot | 1,2,4,5 | 5 | | | |
| 3,6 | 10 | | | |
| CSI reporting offset | slot | 1,2,4,5 | 2 | | | |
| 3,6 | 4 | | | |
| EPRE ratio of PSS to SSS |  |  |  | | | |
| EPRE ratio of PBCH DMRS to SSS |  |  |  | | | |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  | | | |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 1,2,3,4,5,6 | 0 | | | |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  | | | |
| EPRE ratio of PDSCH to PDSCH |  |  |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  | | | |
| Note2 | dBm/15 kHz | 1,2,3,4,5,6 | N/A | -85 | | |
| Note2 | dBm/SCS | 1,2,4,5 | N/A | -85 | | |
|  |  | 3,6 | N/A | -82 | | |
|  |  | 1,2,3,4,5,6 | -infinity | 0 | | |
|  |  | 1,2,3,4,5,6 | -infinity | 0 | | |
| SS-RSRPNote3 | dBm/SCS | 1,2,4,5 | -infinity | -85 | | |
|  |  | 3,6 | -infinity | -82 | | |
| IoNote3 | dBm/9.36MHz | 1,2,4,5 | N/A | -57 | | |
|  | dBm/38.1MHz | 3,6 | N/A | -51 | | |
| Propagation condition |  | 1,2,3,4,5,6 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

A.6.3.1.x2.2 Test Requirements

In this test, the UE shall start to transmit the PRACH to E-UTRA Cell 2 less than 85 ms Note1 from the beginning of time period T3.

The UE shall transmit the PRACH to PSCell no later than 117 ms Note2 from the start of T3’. The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4’. The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4’.

The above test requirements shall be fulfilled in order of T1, T2, T3 for the observed inter-RAT handover delay from NR to E-UTRAN to be counted as correct, and in order of T1, T2, T3‘, T4‘ for the observed PSCell addition delay to be counted as correct.

The rate of correct handovers and correct PSCell addition delay during repeated tests shall be at least 90%.

NOTE1: The handover delay can be expressed as specified in clause 6.1.5.2:

DHOwithPSCell\_PCell = RRC procedure delay + Tinterrupt,

Where RRC procedure delay = 50 ms, Tinterrupt = Tsearch\_HO + TIU + Tprocessing is defined in clause 6.1.5.2.1, where

Tsearch = 0 ms

TIU = 10 ms,

Tprocessing = 25ms

Note2: The PSCell addition delay can be expressed as follows as specified in clause 6.1.5.2.2:

DHOwithPSCell\_PSCell = TRRC\_delay + Tprocessing + Tsearch\_HO + Tsearch\_PSCell + T∆ + TPSCell\_ DU + 2 ms

Where:

TRRC\_delay = 50 ms

Tprocessing = 25ms

Tsearch\_HO = 0

Tsearch\_PSCell = 0

T∆ = 20ms

TPSCell\_ DU = 1\*10+10 = 20ms

**<End of Change 6>**

**<Start of Change 7>**

#### A.7.3.1.x2 HO with PSCell from FR1 NR-SA to EN-DC with known E-UTRA PCell and known FR2 PSCell

##### A.7.3.1.x2.1 Test purpose and environment

The purpose of this test is to verify that the delay of HO with PSCell from FR1 NR-SA to EN-DC with known E-UTRA PCell and known FR2 PSCell are within the requirements stated in clause 6.1.5.2.2 of TS 36.133 [15] for the case when the E-UTRA PCell and FR2 PSCell are known by the UE at the time of handover with PSCell.

Supported test configurations are shown in A.7.3.1.x2.1-1. The test parameters for the E-UTRA cell are given in Table A.3.7.2.2-1. The E-UTRA cell once set up is not changed across time.

The test parameters for NR cell are given in Tables A.7.3.1.x2.1-2, cell-specific parameters in A.7.3.1.x2.1-3, A.7.3.1.x2.1-4, A.7.3.1.x2.1-5 and OTA parameters in A.7.3.1.x2.1-6 below. The test consists of three successive time periods with duration of T1, T2, and T3. There are three carriers each with one cell. Before the test starts the UE is connected to Cell 1 (source FR1 PCell) on radio channel 1 (FR1 PCC) and is aware of Cell 2 (target E-UTRA PCell) on radio channel 2 and Cell 3 (FR2 target PSCell) on radio channel 3. The UE is monitoring both cell 2 and cell 3 before receives a RRC message implying handover with PSCell. At the start of time duration T1, the UE does not have any timing information of Cell 2 and Cell 3. Starting T2, Cell 2 and Cell 3 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 is configured before T2 begins to enable inter-RAT frequency monitoring.

The test system shall send a RRC message to the UE to trigger HO (Cell 2) with PSCell (Cell 3) during period T2, after UE has reported Event B2. The point in time at which the RRC message implying HO (Cell 2) with PSCell (Cell 3) is received at the UE antenna connector defines the start of period T3. The test system shall observe the UE sends PRACH to the PSCell (Cell 3) during period T3.

Table A.7.3.1.x2.1-1: Supported test configurations for FR2 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | Source FR1 PCell: NR FDD, SSB SCS 15kHz, data SCS 15 kHz, 10 MHz bandwidth  Target PCell: LTE FDD,  Target PSCell: NR TDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |
| 2 | Source FR1 PCell: NR FDD, SSB SCS 15kHz, data SCS 15 kHz, 10 MHz bandwidth  Target PCell: LTE TDD,  Target PSCell: NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.7.3.1.x2.1-2: General Test Parameters for HO with PSCell

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1, 2, 3 | Three radio channels are used for this test. One for FR1 source PCell, second for E-UTRA target PCell and third for target NR PSCell |
| Initial | Active PCell |  | Cell1 | PCell on RF channel number 1. |
| Condition | Neighbour cell |  | Cell2, Cell3 | Neighbour cell on RF channel number 2 and 3. |
| Final  Condition | Active PCell |  | Cell2 | E-UTRA PCell on RF channel number 2. |
| Active PSCell |  | Cell3 | PSCell on RF channel number 3. |
| Neighbour Cell |  | Cell1 | RF channel number 1 |
| NR measurement quantity | |  | SS-RSRP |  |
| E-UTRAN measurement quantity | |  | RSRP |  |
| b2-Threshold1 | | dBm | As specified in Table A.6.3.1.4-3 | Absolute NR SS-RSRP threshold for event B2 |
| b2-Threshold2EUTRAN | | dBm | -98 | Absolute E-UTRAN RSRP threshold for event B2 |
| Hysteresis | | dB | 0 |  |
| TimeToTrigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| DRX | |  | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| PRACH configuration on cell3 | |  | FR2 configuration 2 | Captured in A.3.8.3.2 |
| Time offset between cell 1 and 2 | |  | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | |  | 0 | As specified in Table 9.1.2-1 started before T2 starts |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 3 | | dB | 0 | Individual offset for cells on carrier frequency of cell3. |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 | During this time the cell 2 and cell 3 shall be known. |
| T3 | | s | 1 | During this time the UE perform HO with PSCell addition. |

Table A.7.3.1.x2.1-3: Cell specific test parameters for Cell 1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Configuration | Cell 1 | | |
|  | |  |  | T1 | T2 | T3 |
| RF channel number | |  | 1, 2 | 1 | | |
| Duplex mode | |  | 1, 2 | FDD | | |
| BWchannel | | MHz | 1, 2 | 10: NRB,c = 52 (FDD) | | |
| PDSCH reference measurement channel | |  | 1, 2 | SR.1.1 FDD | | |
| CORSET reference channel | |  | 1, 2 | CR.1.1 FDD | | |
| TRS configuration | |  | 1, 2 | TRS.1.1 FDD | | |
| OCNG patternNote1 | |  | 1, 2 | OP.1 | | |
| BWP | Initial DL BWP |  | 1, 2 | DLBWP.0.1 | | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | |
| SMTC configuration | |  | 1, 2 | SMTC.1 | | |
| SSB configuration | |  | 1, 2 | SSB.1 FR1 | | |
| b2-Threshold1 | | dBm | 1, 2 | -96 | | |
| EPRE ratio of PSS to SSS | | dB | 1, 2 | 0 | | |
| EPRE ratio of PBCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PBCH to PBCH\_DMRS | |  |  |  | | |
| EPRE ratio of PDCCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |  |  |  | | |
| EPRE ratio of PDSCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |  |  |  | | |
| EPRE ratio of OCNG DMRS to SSS | |  |  |  | | |
| EPRE ratio of OCNG to OCNG DMRS | |  |  |  | | |
| *Noc*Note2 | | dBm/15 KHz | 1, 2 | -100 | -104 | -100 |
| *Noc*Note2 | | dBm/SCS | 1, 2 | -100 | -104 | -100 |
| Ês/Noc | | dB | 1, 2 | 12 | 0 | -4 |
| Ês/IotNote3 | | dB | 1, 2 | 12 | 0 | -4 |
| SS-RSRPNote3 | | dBm/SCS | 1, 2 | -88 | -104 | -104 |
| IoNote3 | | dBm/9.36 MHz | 1, 2 | -59.78 | -73.04 | -70.59 |
| Propagation condition | |  | 1, 2 | AWGN | | |
| Antenna Configuration and Correlation Matrix | |  | 1, 2 | 1x2 Low | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for *Noc* to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

Table A.7.3.1.x2.1-4: Cell specific test parameters for Cell 2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Configuration | Cell 2 | | |
|  |  |  | T1 | T2 | T3 |
| RF channel number |  | 1, 2 | 2 | | |
| Duplex mode |  | 1, 2 | FDD | | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | | |
| BWchannel | MHz | 1, 2 | 10 MHz: NRB,c = 50 | | |
| PRACH ConfigurationNote2 |  | 1, 2 | 4 | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2 | 10 MHz: R.3 FDD | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2 | 10 MHz: R.6 FDD | | |
| OCNG PatternsNote3 |  | 1, 2 | 10 MHz: OP.10 FDD | | |
| PBCH\_RA | dB | 1, 2 | 0 | | |
| PBCH\_RB |  |  |  | | |
| PSS\_RA |  |  |  | | |
| SSS\_RA |  |  |  | | |
| PCFICH\_RB |  |  |  | | |
| PHICH\_RA |  |  |  | | |
| PHICH\_RB |  |  |  | | |
| PDCCH\_RA |  |  |  | | |
| PDCCH\_RB |  |  |  | | |
| PDSCH\_RA |  |  |  | | |
| PDSCH\_RB |  |  |  | | |
| OCNG\_RANote4 |  |  |  | | |
| OCNG\_RBNote4 |  |  |  | | |
| NocNote5 | dBm/15kHz | 1, 2 | -98 | | |
| Ês/Noc | dB | 1, 2 | -Infinity | 8 | 78 |
| Ês/IotNote6 | dB | 1, 2 | -Infinity | 78 | 78 |
| RSRPNote6 | dBm/15kHz | 1, 2 | -Infinity | -90 | -90 |
| SCH\_RPNote6 | dBm/15kHz | 1, 2 | -Infinity | -90 | -90 |
| IoNote6 | dBm/9MHz | 1, 2 | -67.21  +10log(NRB,c/100) | -58.57  +10log(NRB,c/100) | -58.57  +10log(NRB,c/100) |
| Propagation Condition |  | 1, 2 | AWGN | | |
| Antenna Configuration and Correlation Matrix Note7 |  | 1, 2 | 1x2 Low | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].  Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 6: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | | |

Table A.7.3.1.x2.1-5: Cell specific test parameters for Cell 3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Test | | |
|  |  |  | T1 | T2 | T3 |
| E-UTRA Channel Number |  | 1,2 | 1 | | |
| NR Channel Number |  | 1,2 | 2 | | |
| Duplex Mode |  | 1,2 | TDD | | |
| TDD configuration |  | 1,2 | TDDConf.3.1 | | |
| BWchannel | MHz | 1,2 | 100: NRB,c = 66 | | |
| Data RBs allocated |  | 1,2 | 48 | | |
| Initial BWP Configuration |  | 1,2 | DLBWP.0.1  ULBWP.0.1 | | |
| Dedicated BWP Configuration |  | 1,2 | DLBWP.1.1  ULBWP.1.1 | | |
| TRS Configuration |  | 1,2 | TRS.2.1 TDD | | |
| PDSCH/PDCCH TCI state |  | 1,2 | TCI.State.2 | | |
| PDSCH Reference measurement channel |  | 1,2 | SR.3.3 TDD | | |
| RMSI CORESET Reference Channel |  | 1,2 | CR.3.2 TDD | | |
| Dedicated CORESET Reference Channel |  | 1,2 | CCR.3.7 TDD | | |
| OCNG Patterns |  | 1,2 | OP.3 | | |
| SSB configuration |  | 1,2 | SSB.2 FR2 | | |
| SMTC configuration |  | 1,2 | SMTC.2 | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 120 | | |
| TRS Configuration |  | 1,2 | TRS.2.1 TDD | | |
| CSI-RS configuration for CSI reporting |  | 1,2 | CSI-RS.3.1 TDD | | |
| reportConfigType |  | 1,2 | periodic | | |
| reportQuantity |  | 1,2 | cri-RI-PMI-CQI | | |
| CSI reporting periodicity | slot | 1,2 | 40 | | |
| CSI reporting offset | slot | 1,2 | 4 | | |
| EPRE ratio of PSS to SSS | dB | 1,2 | 0 | | |
| EPRE ratio of PBCH DMRS to SSS |  |  |  | | |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  | | |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  | | |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  | | |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  | | |
| EPRE ratio of PDSCH to PDSCH |  |  |  | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  | | |
| Propagation condition |  | 1,2 | AWGN | | |

Table A.7.3.1.x2.1-6: OTA related test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 3 | | |
| T1 | T2 | T3 |
| Angle of arrival configuration |  | Setup 2a according to clause A.3.15.2.1 | | |
| Assumption for UE beamsNote 6 |  | Rough | | |
| Ês Note2 | dBm/SCS | -Infinity | -81 | |
| SSB\_RPNote2, Note 4 | dBm/SCS | -Infinity | -81 | |
| BB Note 2, Note 7 | dB | -Infinity | 4.88 | |
| IoNote 2, Note 4 | dBm/95.04 MHz | N/A | -56.41 | |
| Note 1: Void  Note 2: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 7: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | |

##### A.7.3.1.x2.2 Test Requirements

The UE shall transmit the PRACH to PSCell at latest 137 msNote1 into T3.

The rate of correct observed PSCell addition delay in HO with PSCell during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 6.1.5.2:

DHOwithPSCell\_PSCell = TRRC\_delay + Tprocessing + Tsearch\_HO + Tsearch\_PSCell + T∆ + TPSCell\_ DU + 2 ms

Where:

TRRC\_delay = 50ms

Tprocessing = 45ms

Tsearch\_HO = 0 ms

Tsearch\_PSCell = 0 ms

T∆ = 20ms

TPSCell\_ DU = 1\*10+10 = 20 ms

**<End of Change 7>**

**<Start of Change 8>**

#### A.7.3.1.x4 NR PSCell change delay in HO with PSCell from NR-DC to NR-DC

##### A.7.3.1.x4.1 Test Purpose and Environment

The purpose of this test is to verify the PSCell change delay requirements in HO with PSCell from NR-DC to NR-DC defined in clauses 6.1.5.4.2. The requirements are applicable to NR FR1-FR1 inter-frequency PCell handover and NR FR2-FR2 intra-frequency PSCell change.

The supported test configurations are given in Table A.7.3.1.x4.1-1. The test scenario comprises four NR cells, source PCell(Cell 1) and source PSCell(Cell 2), target PCell(Cell 3), target PSCell(Cell 4).

Cell 1 and Cell 3 are on radio channel 1 in FR1.Cell 2 and Cell 4 are on radio channel 2 in FR2. Test parameters are given in Tables A.7.3.1.x4.1-2, A.7.3.1.x4.1-3, A.7.3.1.x4.1-4 and A.7.3.1.x4.1-5 below. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of T1, the UE shall be connected to Cell 1 on radio channel 1 and Cell 2 on radio channel 2. UE is not aware of Cell 3 and Cell 4. Starting T2, cell 3 and Cell 4 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

Table A.7.3.1.x4.1-1: Supported test configurations for HO with PSCell from NR-DC to NR-DC

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source PCell: FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target PCell: FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Source PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode  Target PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 2 | Source PCell: FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target PCell: FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Source PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode  Target PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 3 | Source PCell: FR1 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target PCell: FR1 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Source PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode  Target PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.7.3.1.x4.1-2: General test parameters for PCell FR1-FR1 Inter frequency handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 3 |  |
| Final condition | Active cell |  | Cell 3 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |

Table A.7.3.1.x4.1-3: Cell specific test parameters for PCell FR1-FR1 Inter frequency handover

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | | | Cell 3 | | |
|  | | |  | T1 | | T2 | | T1 | | T2 |
| NR RF Channel Number | | |  | 1 | | | | 2 | | |
| Duplex mode | | Config 1 |  | FDD | | | | | | |
|  | | Config 2,3 |  | TDD | | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | | | | |
|  | | Config 2 |  | TRS.1.1 TDD | | | | | | |
|  | | Config 3 |  | TRS.1.2 TDD | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | | | | |
|  | | Config 2 |  | SR.1.1 TDD | | | | | | |
|  | | Config 3 |  | SR2.1 TDD | | | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | | | |
|  | | Config 2 |  | CR.1.1 TDD | | | | | | |
|  | | Config 3 |  | CR2.1 TDD | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | |
| SMTC Configuration | | |  | SMTC.1 | | | | | | |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 | | | | | | |
|  | | Config 3 |  | SSB.2 FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
|  | | Config 3 |  | 30 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | | |
|  | | Config 3 |  | 30 kHz | | | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 | | | | | | |
| BWP | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | | | | | |
| Note2 | | | dBm/15kHz | -98 | | | -98 | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | -98 | | | |
|  | Config 3 | |  | -95 | | | -95 | | | |
|  | | | dB | 4 | 4 | | -Infinity | | 5 | |
|  | | | dB | 4 | 4 | | -Infinity | | 5 | |
| SSB\_RP | Config 1,2 | | dBm/SCS | -94 | -94 | | -Infinity | | -93 | |
|  | Config 3 | | dBm/SCS | -91 | -91 | | -Infinity | | -90 | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -64.59 | -64.59 | | -70.05 | | -63.85 | |
|  | Config 3 | | dBm/  38.16MHz | -58.49 | -58.49 | | -63.94 | | -57.75 | |
| Propagation condition | | | - | AWGN | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | |

Table A.7.3.1.x4.1-4: General test parameters Intra-frequency FR2-FR2 PSCell change

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 2 |  |
|  | Neighbouring cell |  | Cell 4 |  |
| Final condition | Active cell |  | Cell 4 |  |
| A4-Offset | | dBm | -120 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤10 |  |

Table A.7.3.1.x4.1-5: Cell specific test parameters for Intra-frequency FR2-FR2 PSCell change

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 2 | | | | Cell 4 | | |
|  | | |  | T1 | | T2 | | T1 | | T2 |
| Assumption for UE beamsNote 6 | | |  | Rough | | | | Rough | | |
| AoA setup | | |  | Setup 1 as defined in A.3.15 | | | | | | |
| NR RF Channel Number | | |  | **1** | | | | **1** | | |
| Duplex mode | | |  | TDD | | | | | | |
| TDD configuration | | |  | TDDConf.3.1 | | | | | | |
| BWchannel | | | MHz | 100: NRB,c = 66 | | | | | | |
| BWP BW | | | MHz | 100: NRB,c = 66 | | | | | | |
| Data RBs allocated | | |  | 66 | | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | | |  | SR3.1 TDD | | | | | | |
| RMSI CORESET Reference Channel | | |  | CR3.1 TDD | | | | | | |
| Control Channel RMC | | |  | CCR.3.1 TDD | | | | | | |
| OCNG Patterns | | |  | O P. 1 | | | | | | |
| SMTC Configuration | | |  | SMTC pattern 1 | | | | | | |
| SSB Configuration | | |  | SSB. 3 FR2 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 120 kHz | | | | | | |
| PRACH configuration | | |  | FR2 PRACH configuration 1 | | | | | | |
| TRS configuration | | |  | TRS.2.1 TDD | | | | | | |
| PDSCH/PDCCH TCI state | | |  | TCI.State.2 | | | | | | |
| BWP configuraiton | | Initial DL BWP |  | DLBWP.0.1 | | | | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | | | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | |  | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | |  | | | |
| Note2 | | | dBm/15kHz | -104.7 | | | | | | |
| Note2 |  | | dBm/SCS | -95.7 | | | | | | |
|  | | | dB | 6 | -1.8 | | -Infinity | | 0 | |
|  | | | dB | 6 | 6 | | -Infinity | | 7 | |
| IoNote3 |  | | dBm/  BW | -59.7 | -56.7 | | -59.7 | | -56.7 | |
| Propagation condition | | | - | AWGN | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | | | |

##### A.7.3.1.x4.2 Test Requirements

The UE shall start to transmit the PRACH to target PSCell (Cell 4) less than 83 ms from the beginning of time period T2.

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

**<End of Change 8>**

**<Start of Change 9>**

#### A.10.1.x1 Handover with PSCell from EN-DC to EN-DC with known target PSCell using CCA

##### A.10.1.x1.1 Test Purpose and Environment

This test is to verify the requirement for E-UTRA handover with NR PSCell change, where NR PSCell is on carrier with CCA. The requirements for EN-DC HO with PSCell change on CCA are specified in clause 5.9 in E-UTRA RRM specification [15] for the case when the target PSCell is on carrier with CCA. Supported test configurations are shown in table A.10.1.x1.1-1.

Table A.10.1.x1.1-1 gives general test configurations for Handover with PSCell from EN-DC to EN-DC, Table A.10.1.x1.1-2 provides general test parameters for Handover from E-UTRA to E-UTRA cell in EN-DC to EN-DC, Table A.10.1.x1.1-3 provides E-UTRAN cell specific test parameters for Handover with PSCell from EN-DC to EN-DC, Table A.10.1.x1.1-4 provides general test parameters for PSCell change from FR1 carrier under CCA to FR1 carrier under CCA, Table A.10.1.x1.1-5 provides cell specific test parameters for PSCell change from FR1 carrier under CCA to FR1 carrier under CCA.

In the test there are four cells: Cell1 and Cell2 are PCell and target PCell on E-UTRA carrier, Cell3 and Cell4 are PSCell and target PSCell on NR CCA carrier. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. Before the test starts the UE is connected to Cell1 (E-UTRA PCell) and Cell3 (NR PSCell) with EN-DC mode.

At the start of time duration T1, the UE do not have any information of cell 2 and cell 4. AT the end of T1, UE is configured with neighbour cell measurements on the Cell 3 and Cell 4 for Event A3 conditional measurement report.

During T2, UE acquires the timing information of Cell3 and Cell 4 and performs L3-RSRP measurements on the configured neighbour cells. UE sends measurement report to the Cell1 to indicate the event triggering condition A3 is satisfied for the configured for neighbour cells. By end of T2, E-UTRA PCell (Cell1) shall send a RRC message implying handover with PSCell change.

The start of T3 is defined as the end of the last TTI containing the RRC message implying handover with PSCell. UE shall complete PRACH transmission to PCell and PSCell by end of T3.

Table A.10.1.x1.1-1: General test configurations for Handover with PSCell from EN-DC to EN-DC with CCA on NR Cell

|  |  |
| --- | --- |
| 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 the UE capability | |

Table A.10.1.x1.1-2: General test parameters for Handover from E-UTRA to E-UTRA cell in EN-DC to EN-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1, 2 | One is E-UTRA RF channel and one is NR RF channel |
| Initial conditions | Active PCell |  | Cell1 | On E-UTRA RF channel number 1. |
| E-UTRA Neighbouring cell |  | Cell2 | On E-UTRA RF channel number 1. |
| Final conditions | Active PCell |  | Cell2 |  |
| CP length | |  | Normal | Applicable to Cell1, Cell2, Cell3 and Cell4. |
| A3-Offset | | dB | 0 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| DRX | |  | OFF | Continuous monitoring of primary cell |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between same RAT cells | | µs | 3 | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 | Tinterrupt is defined in clause 6.1B.1.2 |

Table A.10.1.x1.1-3: E-UTRAN cell specific test parameters for Handover with PSCell from EN-DC to EN-DC

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell1 | | | Cell2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| Duplex mode |  | FDD or TDD | | | FDD or TDD | | |
| TDD special subframe configurationNote1 |  | 6 | | | 6 | | |
| TDD uplink-downlink configurationNote1 |  | 1 | | | 1 | | |
| BWchannel |  | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD  5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | | | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD  5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD  5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD  5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | |
| OCNG Patterns defined in A.3.2.1 (FDD) and in A.3.2.2(TDD) Note2 |  | 5 MHz: OP.20 FDD  10MHz: OP.1 FDD  20 MHz: OP.17 FDD  5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | | OP.18 FDD  OP.2 FDD  OP.14 FDD  OP.10 TDD  OP.2 TDD  OP.8 TDD | 5MHz: OP.18 FDD  10MHz: OP.2 FDD  20MHz: OP.14 FDD  5MHz: OP.10 TDD  10MHz: OP.2 TDD  20MHz: OP.8 TDD | | OP.20 FDD  OP.1 FDD  OP.17 FDD  OP.9 TDD  OP.1 TDD  OP.7 TDD |
| PRACH configuration |  | - | | | 4, As specified in table 5.7.1-2 in TS 36.211 | | |
| PBCH\_RA | dB | 0 | | | 0 | | |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote3 | dB |
| OCNG\_RBNote3 | dB |
| NocNote4 | dBm/15 kHz | -98 | | | | | |
| Ês/Noc | dB | 8 | 8 | 8 | -infinite | 11 | 11 |
| Ês/Iot | dB | 8 | -3.3 | -3.3 | -infinite | 2.36 | 2.36 |
| RSRP Note5 | dBm/15 kHz | -90 | -90 | -90 | -infinite | -87 | -87 |
| SCH\_RP Note5 | dBm/15 kHz | -90 | -90 | -90 | -infinite | -87 | -87 |
| Io Note5 | dBm/Ch BW | -61.58 | -57.23+10log(NRB,c /50) | | N/A | -57.23+10log(NRB,c /50) | |
| Propagation Condition |  | AWGN | | | | | |
| Antenna Configuration |  | 1x2 | | | | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 5: Es/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

Table A.10.1.x1.1-4: General test parameters for PSCell change from FR1 carrier under CCA to FR1 carrier under CCA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 3 | On the carrier under CCA |
|  | Neighbouring cell |  | Cell 4 | On the carrier under CCA |
| Final condition | Active cell |  | Cell 4 | On the carrier under CCA |
| DL CCA model | Dynamic channel accessNote 1, 3 |  | As specified in clause A.3.20.2.1 |  |
| Semi-static channel access Note 2, 3 |
| UL CCA model | Dynamic channel access Note 1, 3 |  | As specified in clause A.3.20.2.2 |  |
| Semi-static channel access Note 2,3 |
| A3-Offset | | dB | 0 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T304 | | ms | 500 |  |
| LCCA\_DL | |  | 5 |  |
| WCCA\_DL | | ms | T304 |  |
| LCCA\_UL | |  | 5 |  |
| WCCA\_UL | | ms | T304 |  |
| T1 | | s | 5 |  |
| T2 | | s | ≤ 5 |  |
| T3 | | s | ≥ Tinterrupt | Tinterrupt is defined in clause 6.1B.1.2 |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.  NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.  NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | |

Table A.10.1.x1.1-5: Cell specific test parameters for PSCell change from FR1 carrier under CCA to FR1 carrier under CCA

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 3 | | | | | | Cell 4 | | | | |
|  | | |  | T1 | | T2 | | T3 | | T1 | | T2 | | T3 |
| NR RF Channel Number | | |  | 1 | | | | | | 1 | | | | |
| PCCA\_DL for dynamic channel access Note 4,6 | | | - | PCCA\_DL\_1=0.75  PCCA\_DL\_2=0.75 | | | | | | PCCA\_DL\_1=0.75  PCCA\_DL\_2=0.75 | | | | |
| PCCA\_DL for semi-static channel access Note 5,6 | | | - | PCCA\_DL=0.9375 | | | | | | PCCA\_DL=0.9375 | | | | |
| PCCA\_UL for dynamic channel access Note 4,6 | | | - | 0.75 | | | | | | 0.75 | | | | |
| PCCA\_UL for semi-static channel access Note 5,6 | | | - | 0.87 | | | | | | 0.87 | | | | |
| TDD configuration | | Config 1, 2 |  | TDDConf.1.1 CCA | | | | | | | | | | |
| BWchannel | | Config 1, 2 |  | 40: NRB,c = 106 | | | | | | | | | | |
| BWP BW | | Config 1, 2 |  | 40: NRB,c = 106 | | | | | | | | | | |
| DRX Cycle | | | ms | Not Applicable | | | | | | | | | | |
| PDSCH Reference | | Config 1, 2 |  | SR.1.1 CCA | | | | | | | | | | |
| CORESET Reference Channel | | Config 1, 2 |  | CR.1.1 CCA | | | | | | | | | | |
| Dedicated CORESET RMC configuration | | Config 1, 2 |  | CCR.1.1 CCA | | | | | | | | | | |
| TRS configuration | | Config 1, 2 |  | TRS.1.1 TDD | | | | | | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | | | | | | |
| SMTC Configuration | | |  | SMTC.1 | | | | | | | | | | |
| DBT window configuration | | Config 1, 2 |  | DBT.1 | | | | | | | | | | |
| SSB configuration for semi-static channel accessNote 4, 6 | | Config 1, 2 |  | SSB.1 CCA | | | | | | | | | | |
| SSB configuration for dynamic channel accessNote 5, 6 | | Config 1, 2 |  | SSB.2 CCA | | | | | | | | | | |
| ssb-PositionQCL | | Config 1, 2 |  | [1] | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | kHz | 30 kHz | | | | | | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1, 2 | kHz | 30 kHz | | | | | | | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 under CCA | | | | | | | | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | | | | | | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | | | | | | | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | | | | | | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | | | | | | | | | | |
| Note2 | Config 1, 2 | | dBm/SCS | -95 | | | | | | | | | | |
|  | | | dB | 8 | -3.3 | | -3.3 | | -Infinity | | 2.36 | | 2.36 | |
|  | | | dB | 8 | 8 | | 8 | | -Infinity | | 11 | | 11 | |
| SSB\_RP | Config 1, 2 | | dBm/SCS | -87 | -87 | | -87 | | -Infinity | | -84 | | -84 | |
| IoNote3 | Config 1, 2 | | dBm/  38.16MHz | -55.31 | -50.96 | | -50.96 | | -55.31 | | -50.96 | | -50.96 | |
| Propagation condition | | | - | AWGN | | | | | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  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 a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | | | | | | | | |

##### A.10.1.x1.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 60 ms from the beginning of time period T3.

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

NOTE: The handover requirements for handover with PSCell for EN-DC is defined in clause 5.9 in [15] as:

DHOwithPSCel\_PCell = TRRC\_delay + Tsearch + TIU + Tprocessing

Where:

TRRC\_delay = 20 ms for ‘RRC connection reconfiguration (NR SCG establishment/ /modification/release)’.

Tsearch = 0 ms for known cell.

TIU = 15 ms in the test configuration.

Tprocessing = 25ms for source Cell and target Cell are in the same FR.

This gives a total of 60ms for handover delay.

The UE shall transmit the PRACH preamble to Cell 4 less than DHOwithPSCell\_PSCell from the beginning of time period T3.

NOTE: The PSCell change delay for handover with PSCell for EN-DC is defined in clause 5.8 in [15] as:

DHOwithPSCell\_PSCell = TRRC\_delay + Tprocessing + Tsearch + T∆ + TIU\_PSCell + 2 ms

Where:

TRRC\_delay = 20 ms for ‘RRC connection reconfiguration (NR SCG establishment/ /modification/release)’.

Tprocessing = 25ms for source Cell and target Cell are in the same FR.

Tsearch = 0 ms for known cell.

T∆ = (1+ L2) \*20 ms.

TIU = (1+ L3) \*10 + 10 ms

L2 is the number of SMTC occasions not available at the UE during the time tracking period where L2 ≤ LCCA\_DL, and L3 is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure, where L3 ≤ LCCA\_UL. L3 = 0 for Type 2C UL channel access procedure as defined in TS 37.213 [33]. The interruption time considering the potential extensions caused by L1,L2, L3 and by the UL CCA failure detection/recovery mechanism is limited by the T304 timer. The UE behaviour at the T304 timer expiry is detailed in TS 38.331 [2].Test equipment should make sure that LCCA\_DL and LCCA\_UL are not exceeded during a test by monitoring the number of CCA failures and preventing additional CCA failures from happening after LCCA\_DL or LCCA\_UL is reached.

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

**<End of Change 9>**

**<Start of Change 10>**

A.11.2.1.xn Handover with PSCell from NR SA to EN-DC with known target PSCell using CCA

A.11.2.1.xn.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct SA inter-RAT handover from NR to E-UTRAN with FR1 PSCell addition when operating in standalone (SA) operation with PCell in FR1, for the case where the PSCell is known to the UE at the time of addition and SMTC of target known PSCell is not present in *RRCConnectionReconfiguration*. This test shall verify delay requirements of inter-RAT handover from NR to E-UTRAN and FR1 PSCell carrier with CCA addition as specified in clause 6.1.5.

The test comprises of two NR cells and one E-UTRA cell. Cell 1 is the NR PCell, Cell 2 is an inter-RAT E-UTRAN neighbour cell and Cell 3 is the target NR PSCell, which is on CCA, on radio channel 1 in FR1, radio channel 2 in E-UTRAN and radio channel 3 in FR1 with CCA, respectively.

In this test, inter-RAT handover from NR to E-UTRAN and FR1 PSCell addition are performed in parallel processing. The test consists of successive time periods for inter-RAT handover with time durations of T1, T2 and T3 respectively, and successive time periods for FR1 PSCell addition with time durations of T1’, T2’, T3’and T4’ respectively.

At the start of time duration T1, the UE does not have any timing information of Cell 2, and the UE is only monitoring Cell 1. During T1, only Cell1 is known to the UE.

Before the start of T2 or T2’, the test system shall send measurement control information including measurement gap configuration and event-triggered reporting configuration with event B2 for neighbour Cell 2 and event B1 for Cell 3. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 is configured before T2 or T2’ begins.

Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

During T3, the UE shall carry out random access (i.e., transmit the PRACH) towards the Cell 2. Reception by the test system of the PRACH preamble defines the end of T3.

Starting T2’, the Cell 3 (PSCell-to-be) on radio channel 3 becomes known to the UE at the time of addition. Therefore, during T2’ the UE shall report Event B1. After receiving the Event B1, the test system shall send a RRC message to the UE to release the measurement gaps. The test system shall send a RRC message to the UE to add PSCell (Cell 3) on radio channel 3. The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The RRC message to add PSCell shall be sent to the UE during period T2’, after the measurement gaps are released by the test system. The point in time at which the RRC message to add PSCell (Cell 3) is received at the UE antenna connector defines the start of period T3’.

During T3’, the UE shall carry out random access (i.e., transmit the PRACH) towards the Cell 3. Reception by the test system of the PRACH preamble defines the start of period T4’.

During T4’, the UE shall send periodic CSI reports in PSCell and the test system shall observe the periodic reporting of CSI for PSCell.

Supported test configurations are shown in table A.11.2.1.xn.1-1. General test parameters are provided in Table A.11.2.1.xn.1-2. Cell specific test parameters for NR Cell 1, E-UTRAN PCell Cell 2 are provided in Tables A.11.2.1.xn.1-3, A.11.2.1.xn.1-4 and A.11.2.1.xn-5 respectively. Table A.11.2.1.xn.1-5 provides General test parameters for NR FR1 PSCell carrier with CCA addition, and Table A.11.2.1.xn.1-6 provides Cell specific test parameters for PSCell addition of FR1 carrier under CCA.

**Table A.11.2.1.xn.1-1: Supported test configurations for SA inter-RAT E-UTRAN handover with FR1 PSCell addition tests**

|  |  |  |
| --- | --- | --- |
| Config | Description | |
|  | NR PCell and EUTRA PCell | NR PSCell on CCA |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD, LTE FDD, | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD, LTE FDD |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD, LTE FDD |
| 4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD, LTE TDD |
| 5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD, LTE TDD |
| 6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations depending on the UE capability | | |

**Table A.11.2.1.xn.1-2: General test parameters for SA inter-RAT E-UTRAN handover with FR1 PSCell addition**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** | **Comment** |
| NR RF Channel Number | | |  | 1, 3 | 2 NR carrier frequency is used in the test |
| LTE RF Channel Number | | |  | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | |  | Cell 1 | NR cell |
|  | Neighbouring cell | |  | Cell 2, 3 | E-UTRAN cell and NR cell in FR1 |
| Final condition | Active Pcell | |  | Cell 2 | E-UTRAN cell |
| Active PSCell | |  | Cell 3 | NR cell in FR1 |
| NR measurement quantity | | |  | SS-RSRP |  |
| E-UTRAN measurement quantity | | |  | RSRP |  |
| Event B1 | | Hysteresis | dB | 0 | Hysteresis for evaluation of event B1. |
| Threshold RSRP | dBm | -93 | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.1.11.1 into account plus margin. |
| Time to Trigger | S | 0 |  |
| Event B2 | | Threshold1 | dBm | As specified in Table A.6.3.1.4-3 | Absolute NR SS-RSRP threshold for event B2 |
| Threshold2EUTRAN | dBm | -98 | Absolute E-UTRAN RSRP threshold for event B2 |
| Hysteresis | dB | 0 |  |
| TimeToTrigger | s | 0 |  |
| Filter coefficient | | |  | 0 | L3 filtering is not used |
| DRX | | |  | OFF | Non-DRX test |
| Access Barring Information | | | - | Not sent | No additional delays in random access procedure |
| Time offset between cell 1 and cell 2 | | |  | 3 ms | Asynchronous cells |
| Measurement Gap pattern ID | | |  | 0 | As specified in Table 9.1.2-1 |
| T1/T1’ | | | s | 1 | During this time only Cell 1 is known to UE. |
| T2 | | | s | ≤5 | During this time the UE shall identify Cell 2 and report event B2. |
| T3 | | | s | 1 | During this time the UE handovers to Cell 2. |
| T2’ | | | s | ≤ 5 | During this time the UE shall identify Cell 3 and report event B1. |
| T3’ | | | s | ≥ Tinterrupt | During this time the UE adds the PSCell (Cell 3). |
| T4’ | | | s | ≤ 1 | During this time the UE sends CSI reports for PSCell (Cell 3). |

**Table A.11.2.1.xn.1-3: Cell specific test parameters for SA inter-RAT E-UTRA handover with FR1 PSCell addition (NR Cell 1)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Configuration** | **Cell 1** | | |
|  | |  |  | **T1** | **T2** | **T3** |
| RF channel number | |  | 1, 2, 3, 4, 5, 6 | 1 | | |
| Duplex mode | |  | 1, 4 | FDD | | |
|  | |  | 2, 3, 5, 6 | TDD | | |
| TDD Configuration | |  | 2, 5 | TDDConf.1.1 | | |
|  | |  | 3, 6 | TDDConf.2.1 | | |
| BWchannel | | MHz | 1, 4 | 10: NRB,c = 52 (FDD) | | |
|  | |  | 2, 5 | 10: NRB,c = 52 (TDD) | | |
|  | |  | 3, 6 | 40: NRB,c = 106 (TDD) | | |
| PDSCH reference measurement channel | |  | 1, 4 | SR.1.1 FDD | | |
|  | |  | 2, 5 | SR.1.1 TDD | | |
|  | |  | 3, 6 | SR.2.1 TDD | | |
| CORSET reference channel | |  | 1, 4 | CR.1.1 FDD | | |
|  | |  | 2, 5 | CR.1.1 TDD | | |
|  | |  | 3, 6 | CR.2.1 TDD | | |
| TRS configuration | |  | 1, 4 | TRS.1.1 FDD | | |
|  | |  | 2, 5 | TRS.1.1 TDD | | |
|  | |  | 3, 6 | TRS.1.2 TDD | | |
| OCNG patternNote1 | |  | 1, 2, 3, 4, 5, 6 | OP.1 | | |
| BWP | Initial DL BWP |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | |
| SMTC configuration | |  | 1, 2, 3, 4, 5, 6 | SMTC.1 | | |
| SSB configuration | |  | 1, 2, 4, 5 | SSB.1 FR1 | | |
|  | |  | 3, 6 | SSB.2 FR1 | | |
| b2-Threshold1 | | dBm | 1, 2, 4, 5 | -96 | | |
|  | |  | 3, 6 | -93 | | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| EPRE ratio of PBCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PBCH to PBCH\_DMRS | |  |  |  | | |
| EPRE ratio of PDCCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PDCCH to PDCCH\_DMRS | |  |  |  | | |
| EPRE ratio of PDSCH\_DMRS to SSS | |  |  |  | | |
| EPRE ratio of PDSCH to PDSCH\_DMRS | |  |  |  | | |
| EPRE ratio of OCNG DMRS to SSS | |  |  |  | | |
| EPRE ratio of OCNG to OCNG DMRS | |  |  |  | | |
| *Noc*Note2 | | dBm/15 KHz | 1, 2, 3, 4, 5, 6 | -100 | -104 | -100 |
| *Noc*Note2 | | dBm/SCS | 1, 2, 4, 5 | -100 | -104 | -100 |
|  | |  | 3, 6 | -97 | -101 | -97 |
| Ês/Noc | | dB | 1, 2, 3, 4, 5, 6 | 12 | 0 | -4 |
| Ês/IotNote3 | | dB | 1, 2, 3, 4, 5, 6 | 12 | 0 | -4 |
| SS-RSRPNote3 | | dBm/SCS | 1, 2, 4, 5 | -88 | -104 | -104 |
|  | |  | 3, 6 | -85 | -101 | -101 |
| IoNote3 | | dBm/9.36 MHz | 1, 2, 4, 5 | -59.78 | -73.04 | -70.59 |
|  | | dBm/38.16 MHz | 3, 6 | -53.68 | -66.9448 | -64.49 |
| Propagation condition | |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix | |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for *Noc* to be fulfilled.  Note 3: Ês/Iot, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

**Table A.11.2.1.xn.1-4: Cell specific test parameters for SA inter-RAT E-UTRA handover with FR1 PSCell addition (E-UTRA Cell 2)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Configuration** | **Cell 2** | | |
|  |  |  | **T1** | **T2** | **T3** |
| RF channel number |  | 1, 2, 3, 4, 5, 6 | 2 | | |
| Duplex mode |  | 1, 2, 3 | FDD | | |
| 4, 5, 6 | TDD | | |
| TDD special subframe configurationNote1 |  | 4, 5, 6 | 6 | | |
| TDD uplink-downlink configurationNote1 |  | 4, 5, 6 | 1 | | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | |
| PRACH ConfigurationNote2 |  | 1, 2, 3 | 4 | | |
|  |  | 4, 5, 6 | 53 | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD | | |
|  |  | 4, 5, 6 | 5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1, 2, 3 | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD | | |
|  |  | 4, 5, 6 | 5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | |
| OCNG PatternsNote3 |  | 1, 2, 3 | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD | | |
|  |  | 4, 5, 6 | 5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | | |
| PBCH\_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| PBCH\_RB |  |  |  | | |
| PSS\_RA |  |  |  | | |
| SSS\_RA |  |  |  | | |
| PCFICH\_RB |  |  |  | | |
| PHICH\_RA |  |  |  | | |
| PHICH\_RB |  |  |  | | |
| PDCCH\_RA |  |  |  | | |
| PDCCH\_RB |  |  |  | | |
| PDSCH\_RA |  |  |  | | |
| PDSCH\_RB |  |  |  | | |
| OCNG\_RANote4 |  |  |  | | |
| OCNG\_RBNote4 |  |  |  | | |
| NocNote5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | | |
| Ês/Noc | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 8 | 78 |
| Ês/IotNote6 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 78 | 78 |
| RSRPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -90 | -90 |
| SCH\_RPNote6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -90 | -90 |
| IoNote6 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -67.21  +10log(NRB,c/100) | -58.57  +10log(NRB,c/100) | -58.57  +10log(NRB,c/100) |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix Note7 |  | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].  Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 6: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25]. | | | | | |

Table A.11.2.1.xn.1-5: General test parameters for NR FR1 PSCell carrier with CCA addition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial condition | Neighbouring cell |  | Cell 3 | On the carrier under CCA |
| Final condition | Active cell |  | Cell 3 | On the carrier under CCA |
| DL CCA model | Dynamic channel accessNote 1, 3 |  | As specified in clause A.3.20.2.1 |  |
| Semi-static channel access Note 2, 3 |
| UL CCA model | Dynamic channel access Note 1, 3 |  | As specified in clause A.3.20.2.2 |  |
| Semi-static channel access Note 2,3 |
| A3-Offset | | dB | 0 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T304 | | ms | 500 |  |
| LCCA\_DL | |  | 5 |  |
| WCCA\_DL | | ms | T304 |  |
| LCCA\_UL | |  | 5 |  |
| WCCA\_UL | | ms | T304 |  |
| T1’ | | s | 5 |  |
| T2’ | | s | ≤ 5 |  |
| T3’ | | s | ≥ Tinterrupt | Tinterrupt is defined in clause 6.1B.1.2 |
| T4’ | | s | ≤ 1 |  |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.  NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.  NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | |

Table A.11.2.1.xn.1-6: Cell specific test parameters for PSCell addition of FR1 carrier under CCA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 3 | | | |
|  | | |  | T1’ | T2’ | T3’ | T4’ |
| NR RF Channel Number | | |  | 1 | | | |
| PCCA\_DL for dynamic channel access Note 4,6 | | | - | PCCA\_DL\_1=0.75  PCCA\_DL\_2=0.75 | | | |
| PCCA\_DL for semi-static channel access Note 5,6 | | | - | PCCA\_DL=0.9375 | | | |
| PCCA\_UL for dynamic channel access Note 4,6 | | | - | 0.75 | | | |
| PCCA\_UL for semi-static channel access Note 5,6 | | | - | 0.87 | | | |
| TDD configuration | | Config 1, 2, 3, 4, 5, 6 |  | TDDConf.1.1 CCA | | | |
| BWchannel | | Config 1, 2, 3, 4, 5, 6 |  | 40: NRB,c = 106 | | | |
| BWP BW | | Config 1, 2, 3, 4, 5, 6 |  | 40: NRB,c = 106 | | | |
| DRX Cycle | | | ms | Not Applicable | | | |
| PDSCH Reference | | Config 1, 2, 3, 4, 5, 6 |  | SR.1.1 CCA | | | |
| CORESET Reference Channel | | Config 1, 2, 3, 4, 5, 6 |  | CR.1.1 CCA | | | |
| Dedicated CORESET RMC configuration | | Config 1, 2, 3, 4, 5, 6 |  | CCR.1.1 CCA | | | |
| TRS configuration | | Config 1, 2, 3, 4, 5, 6 |  | TRS.1.1 TDD | | | |
| OCNG Patterns | | |  | OP.1 | | | |
| SMTC Configuration | | |  | SMTC.1 | | | |
| DBT window configuration | | Config 1, 2, 3, 4, 5, 6 |  | DBT.1 | | | |
| SSB configuration for semi-static channel accessNote 4, 6 | | Config 1, 2, 3, 4, 5, 6 |  | SSB.1 CCA | | | |
| SSB configuration for dynamic channel accessNote 5, 6 | | Config 1, 2, 3, 4, 5, 6 |  | SSB.2 CCA | | | |
| ssb-PositionQCL | | Config 1, 2, 3, 4, 5, 6 |  | 1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 3, 4, 5, 6 | kHz | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1, 2, 3, 4, 5, 6 | kHz | 30 kHz | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 1 under CCA | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | | | |
| Note2 | Config 1, 2, 3, 4, 5, 6 | | dBm/SCS | -95 | | | |
|  | | | dB | -∞ | 2.36 | 2.36 | 2.36 |
|  | | | dB | -∞ | 11 | 11 | 11 |
| SSB\_RP | Config 1, 2, 3, 4, 5, 6 | | dBm/SCS | -∞ | -84 | -84 | -84 |
| IoNote3 | Config 1, 2, 3, 4, 5, 6 | | dBm/  38.16MHz | -55.31 | -50.96 | -50.96 | -50.96 |
| Propagation condition | | | - | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  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 a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | |

A.11.2.1.xn.2 Test Requirements

In this test, the UE shall start to transmit the PRACH to E-UTRA Cell 2 less than 55 ms Note1 from the beginning of time period T3.

The above test requirements shall be fulfilled in order of T1, T2, T3 for the observed inter-RAT handover delay from NR to E-UTRAN to be counted as correct, and in order of T1, T2‘, T3‘, T4‘ for the observed PSCell addition delay to be counted as correct.

The rate of correct handovers and correct PSCell addition delay during repeated tests shall be at least 90%.

NOTE1: The handover delay can be expressed as specified in clause 6.1.5.2:

DHOwithPSCell\_PCell = RRC procedure delay + Tinterrupt,

Where RRC procedure delay = 50 ms, and

Tinterrupt = Tsearch\_HO + TIU + Tprocessing is defined in clause 6.1.5.2.1, where

Tsearch = 0 ms

TIU = 10 ms,

Tprocessing = 25ms

DHOwithPSCell\_PCell is equal to 85ms.

The UE shall transmit the PRACH to PSCell no later than DHOwithPSCell\_PSCell from the start of T3’. The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4’. The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4.

The PSCell addition delay can be expressed as follows as specified in clause 6.1.5.5.3:

DHOwithPSCell\_PSCell = TRRC\_delay + Tprocessing + Tsearch\_PCell + Tsearch\_PSCell + T∆ + TIU\_PSCell + 2 ms

Where:

TRRC\_delay = 20 ms

Tprocessing = 25ms

Tsearch\_PCell = 0

Tsearch\_PSCell = 0T∆ = (1+ L2) \*20 ms.

TIU\_PSCell = (1+ L3) \*10 + 10 ms

L2 is the number of SMTC occasions not available at the UE during the time tracking period where L2 ≤ LCCA\_DL, and L3 is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure, where L3 ≤ LCCA\_UL. L3 = 0 for Type 2C UL channel access procedure as defined in TS 37.213 [33]. The interruption time considering the potential extensions caused by L1,L2, L3 and by the UL CCA failure detection/recovery mechanism is limited by the T304 timer. The UE behaviour at the T304 timer expiry is detailed in TS 38.331 [2].Test equipment should make sure that LCCA\_DL and LCCA\_UL are not exceeded during a test by monitoring the number of CCA failures and preventing additional CCA failures from happening after LCCA\_DL or LCCA\_UL is reached.

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

**<End of Change 10>**