**SSB3GPP TSG-RAN WG4 Meeting #98bis-e *R4-2105717***

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

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

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|  | | | | | | | | | | |
| ***Title:*** | Introduction of NR-U handover tests | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_Unlic-Perf | | | | |  | ***Date:*** | | | 2021-04-12 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | RRM test cases for verifying NR-U handover requirements for following cases are missing: between NR and NR-U, from NR-U to E-UTRAN | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Change #1: Inter-frequency from FR1 to FR1 carrier under CCA; unknown target cell  Change #2: SA NR FR1 carrier under CCA - E-UTRAN handover with known target cell  Change #3: SA NR FR1 carrier under CCA - E-UTRAN handover with unknown target cell  *New changes compared to the original one are shown in yellow.*  *Changes which will be made during the meeting depending on the progress in test configuration are marked in cyan.*  *The numbering is also changed and will need to be aligned with R4-2105716.* | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Core handover requirements are not tested for handvoers between NR and NR-U, from NR-U to E-UTRAN. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | New clauses introduced: A.11.2.1.4, A.11.2.1.5, and A.11.2.1.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

Change 1

#### A.11.2.1.4 Inter-frequency handover from FR1 to FR1 carrier under CCA; unknown target cell

##### A.11.2.1.4.1 Test Purpose and Environment

This test is to verify the requirement for inter frequency handover requirements from FR1 to FR1 carrier under CCA specified in clause 6.1B.1.2.

##### A.11.2.1.4.2 Test Parameters

Supported test configurations are shown in table A.11.2.1.4.2-1. Both handover delay and interruption length are tested by using the parameters in table A.11.2.1.4.2-2, and A.11.2.1.4.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 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.11.2.1.4.2-1: Inter-frequency handover from FR1 to FR1 carrier under CCA test configurations

|  |  |  |
| --- | --- | --- |
| Configuration | Description of a cell with CCA | Description of a cell without CCA |
| 1 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Table A.11.2.1.4.2-2: General test parameters Inter-frequency handover from FR1 to FR1 carrier under CCA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 | On the carrier under CCA |
| Final condition | Active cell |  | Cell 2 | On the carrier under CCA |
| DL CCA model | |  | As specified in clause A.3.20.2.1 |  |
| UL CCA model | |  | As specified in clause A.3.20.2.2 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| T1 | | s | 5 |  |
| T2 | | s | ≤ Tinterrupt | Tinterrupt is defined in clause 6.1B.1.2 |

Table A.11.2.1.4.2-3: Cell specific test parameters for NR FR1-FR1 Inter frequency handover test case

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Configuration | Cell 1 | | Cell 2 | |
|  | |  |  | T1 | T2 | T1 | T2 |
| NR RF Channel Number | |  | 1, 2, 3 | 1 | | 2 | |
| CCA model | |  | 1, 2, 3 | N/A | | TBD | |
| TDD configuration | |  | 1 | N/A | | TDDConf.1.1.CCA | |
|  | 2 | TDDConf.1.1 | | TDDConf.1.1.CCA | |
|  | 3 | TDDConf.1.2 | | TDDConf.1.1.CCA | |
| BWchannel | |  | 1 | 10: NRB,c = 52 | | 40: NRB,c = 106 | |
|  | 2 | 10: NRB,c = 52 | | 40: NRB,c = 106 | |
|  | 3 | 40: NRB,c = 106 | | 40: NRB,c = 106 | |
| BWP BW | |  | 1 | 10: NRB,c = 52 | | 40: NRB,c = 106 | |
|  | 2 | 10: NRB,c = 52 | | 40: NRB,c = 106 | |
|  | 3 | 40: NRB,c = 106 | | 40: NRB,c = 106 | |
| DRX Cycle | | ms |  | Not Applicable | | | |
| PDSCH Reference | |  | 1 | SR.1.1 FDD | | SR.1.1 CCA | |
|  | 2 | SR.1.1 TDD | | SR.1.1 CCA | |
|  | 3 | SR.2.1 TDD | | SR.1.1 CCA | |
| CORESET Reference Channel | |  | 1 | CR.1.1 FDD | | Table TBD | |
|  | 2 | CR.1.1 TDD | | Table TBD | |
|  | 3 | CR.2.1 TDD | | Table TBD | |
| TRS configuration | |  | 1 | TRS.1.1 FDD | | TRS.1.2 TDD | |
|  | 2 | TRS.1.1 TDD | | TRS.1.2 TDD | |
|  | 3 | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | |  | 1, 2, 3 | OP.1 | | | |
| SMTC Configuration | |  | 1, 2, 3 | SMTC.1 | | | |
| DBT window configuration | |  | 1, 2, 3 | N/A | | As defined in A.3.21.1 | |
| SSB configuration | |  | 1, 2 | SSB.1 FR1 | | SSB.1 CCA for semi-static channel;  SSB.2 CCA for dynamic channel; | |
|  | 3 | SSB.2 FR1 | | SSB.1 CCA for semi-static channel;  SSB.2 CCA for dynamic channel; | |
| ssb-PositionQCL | |  |  | N/A | | [1] | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 1 | 15 kHz | | 30 kHz | |
| 2 | 15 kHz | | 30 kHz | |
| 3 | 30 kHz | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 1 | 15 kHz | | 30 kHz | |
| 2 | 15 kHz | | 30 kHz | |
| 3 | 30 kHz | | 30 kHz | |
| PRACH configuration | |  |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP |  | 1, 2, 3 | DLBWP.0.1 | | | |
|  | Dedicated DL BWP |  | 1, 2, 3 | DLBWP.1.1 | | | |
|  | Initial UL BWP |  | 1, 2, 3 | ULBWP.0.1 | | | |
|  | Dedicated UL BWP |  | 1, 2, 3 | 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 | dBm/SCS | 1, 2 | -98 | | | |
|  | 3 | -95 | | | |
|  | | dB |  | 4 | 4 | -Infinity | 5 |
|  | | dB |  | 4 | 4 | -Infinity | 5 |
| SSB\_RP | Config 1 | dBm/SCS | 1, 2 | -94 | -94 | -Infinity | -93 |
|  | 3 | -91 | -91 | -Infinity | -90 |
| IoNote3 | Config 1 | dBm/  9.36MHz | 1, 2 | -64.59 | -64.59 | -70.05 | -63.85 |
|  | dBm/  38.16MHz | 3 | -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. | | | | | | | |

##### A.11.2.1.4.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than Tinterrupt from the beginning of time period T3, where Tinterrupt ­is defined in clause 6.1B.1.2

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 = 10 ms and is specified in clause 12 in TS 38.331 [2], L1’is the number of SMTC occasions not available at the UE during the inter-frequency detection period, L2 is the number of SMTC occasions not available at the UE during the time tracking period, 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. 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,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].

Change 2

#### A.11.2.1.5 SA NR FR1 carrier under CCA - E-UTRAN handover with known target cell

##### A.11.2.1.5.1 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 when operating in standalone (SA) operation with PCell in FR1 carrier under CCA. This test shall verify the NR to E-UTRAN handover requirements as specified in clause 6.1.2.1.

The test comprises of one NR carrier under CCA and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of three successive time periods, 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. Starting T2, Cell 2 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.

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.

Supported test configurations are shown in table A.11.2.1.5-1. General test parameters are provided in Table A.11.2.1.5-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.11.2.1.5-3 and A.11.2.1.5-4 respectively.

Table A.11.2.1.5-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests

|  |  |  |
| --- | --- | --- |
| Configuration | Description of a cell with CCA | Description of a cell without CCA |
| 1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 2 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Table A.11.2.1.5-2: General test parameters for SA inter-RAT E-UTRAN handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR RF Channel Number | |  | 1 | 1 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 on a carrier under CCA |
|  | Neighbouring cell |  | Cell 2 | E-UTRAN cell |
| Final condition | Active cell |  | Cell 2 |  |
| DL CCA model | |  | As specified in clause A.3.20.2.1 |  |
| UL CCA model | |  | As specified in clause A.3.20.2.2 |  |
| NR measurement quantity | |  | SS-RSRP |  |
| E-UTRAN measurement quantity | |  | RSRP |  |
| b2-Threshold1 | | dBm | As specified in Table A.11.2.1.5-3 | 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 |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | |  | 0 | As specified in Table 9.1.2-1 started before T2 starts |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |

Table A.11.2.1.5-3: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Configuration | Cell 1 | | |
|  | |  |  | T1 | T2 | T3 |
| RF channel number | |  | 1, 2 | 1 | | |
| TDD Configuration | |  | 1, 2 | TDDConf.1.1.CCA | | |
| BWchannel | |  | 1, 2 | 40: NRB,c = 106 (TDD) | | |
| PDSCH reference measurement channel | |  | 1, 2 | SR.1.1 CCA | | |
| CORESET reference channel | |  | 1, 2 | TBD | | |
| TRS configuration | |  | 1, 2 | TRS.1.2 TDD | | |
| 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 | | |
| DBT window configuration | |  | 1, 2 | As defined in A.3.21.1 | | |
| SSB configuration | |  | 1, 2 | SSB.1 CCA for semi-static channel;  SSB.2 CCA for dynamic channel; | | |
| b2-Threshold1 | | dBm | 1, 2 | -93 | | |
| 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 | -97 | -101 | -97 |
| Ês/Noc | | dB | 1, 2 | 12 | 0 | -4 |
| Ês/IotNote3 | | dB | 1, 2 | 12 | 0 | -4 |
| SS-RSRPNote3 | | dBm/SCS | 1, 2 | -85 | -101 | -101 |
| IoNote3 | | dBm/38.16 MHz | 1, 2 | -53.68 | -66.9448 | -64.49 |
| 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.11.2.1.5-4: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Configuration | Cell 2 | | |
|  |  |  | T1 | T2 | T3 |
| RF channel number |  | 1, 2 | 2 | | |
| Duplex mode |  | 1 | FDD | | |
| 2 | TDD | | |
| TDD special subframe configurationNote1 |  | 2 | 6 | | |
| TDD uplink-downlink configurationNote1 |  | 2 | 1 | | |
| BWchannel | MHz | 1, 2 | 10 MHz: NRB,c = 50 | | |
| PRACH ConfigurationNote2 |  | 1 | 4 | | |
|  |  | 2 | 53 | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1 | 10 MHz: R.3 FDD | | |
|  |  | 2 | 10 MHz: R.0 TDD | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1 | 10 MHz: R.6 FDD | | |
|  |  | 2 | 10 MHz: R.6 TDD | | |
| OCNG PatternsNote3 |  | 1 | 10 MHz: OP.10 FDD | | |
|  |  | 2 | 10 MHz: OP.1 TDD | | |
| 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]. | | | | | |

##### A.11.2.1.5.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 85 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 = 50 ms and is specified in clause 6.1.2.1.

Tinterrupt = 35 ms in the test; Tinterrupt is defined in clause 6.1.2.1.

This gives a total of 85 ms.

Change 3

#### A.11.2.1.6 SA NR FR1 carrier under CCA - E-UTRAN handover with unknown target cell

##### A.11.2.1.6.1 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 when operating in standalone (SA) operation with PCell in FR1 carrier under CCA. This test shall verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in clause 6.1.2.1.

The test comprises of one NR carrier under CCA and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN 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. Starting T2, Cell 2 becomes detectable. No Gap pattern shall be configured.

A RRC message implying handover 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 is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.11.2.1.6-1. General test parameters are provided in Table A.11.2.1.6-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.11.2.1.6-3 and A.11.2.1.6-4 respectively.

Table A.11.2.1.6-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests

|  |  |  |
| --- | --- | --- |
| Configuration | Description of a cell with CCA | Description of a cell without CCA |
| 1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 2 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Table A.11.2.1.6-2: General test parameters for SA inter-RAT E-UTRAN handover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR RF Channel Number | |  | 1 | 1 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 on a carrier under CCA |
| Neighbouring cell |  | Cell 2 | E-UTRAN cell |
| Final condition | Active cell |  | Cell 2 |  |
| DL CCA model | |  | As specified in clause A.3.20.2.1 |  |
| UL CCA model | |  | As specified in clause A.3.20.2.2 |  |
| NR measurement quantity | |  | SS-RSRP |  |
| DRX | |  | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | |  | 3 ms | Asynchronous cells |
| T1 | | s | ≤5 |  |
| T2 | | s | 1 |  |

Table A.11.2.1.6-3: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Configuration** | **Cell 1** | |
| **T1** | **T2** |
| RF channel number | |  | 1, 2 | 1 | |
| TDD Configuration | |  | 1, 2 | TDDConf.1.1.CCA | |
| BWchannel | | MHz | 1, 2 | 40: NRB,c = 106 (TDD) | |
| PDSCH reference measurement channel | |  | 1, 2 | SR.1.1 CCA | |
| CORESET reference channel | |  | 1, 2 | TBD | |
| TRS configuration | |  | 1, 2 | TRS.1.2 TDD | |
| 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 | |
| DBT window configuration | |  | 1, 2 | As defined in A.3.21.1 | |
| SSB configuration | |  | 1, 2 | SSB.1 CCA for semi-static channel;  SSB.2 CCA for dynamic channel; | |
| 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 | -98 | |
| *Noc*Note2 | | dBm/SCS | 1, 2 | -95 | |
| Ês/Noc | | dB | 1, 2 | 0 | 0 |
| Ês/IotNote3 | | dB | 1, 2 | 0 | 0 |
| SS-RSRPNote3 | | dBm/SCS | 1, 2 | -95 | -95 |
| IoNote3 | | dBm/38.16 MHz | 1, 2 | -60.94 | -60.94 |
| 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.11.2.1.6-4: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Configuration | Cell 2 | |
| T1 | T2 |
| RF channel number |  | 1, 2 | 2 | |
| Duplex mode |  | 1 | FDD | |
| 2 | TDD | |
| TDD special subframe configurationNote1 |  | 2 | 6 | |
| TDD uplink-downlink configurationNote1 |  | 2 | 1 | |
| BWchannel | MHz | 1, 2 | 10 MHz: NRB,c = 50 | |
| PRACH ConfigurationNote2 |  | 1 | 4 | |
| 2 | 53 | |
| PDSCH parameters:  DL Reference Measurement ChannelNote3 |  | 1 | 10 MHz: R.3 FDD | |
| 2 | 10 MHz: R.0 TDD | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote3 |  | 1 | 10 MHz: R.6 FDD | |
| 2 | 10 MHz: R.6 TDD | |
| OCNG PatternsNote3 |  | 1 | 10 MHz: OP.10 FDD | |
| 2 | 10 MHz: OP.1 TDD | |
| 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 | 7 |
| Ês/IotNote6 | dB | 1, 2 | -Infinity | 7 |
| RSRPNote6 | dBm/15kHz | 1, 2 | -Infinity | -91 |
| SCH\_RPNote6 | dBm/15kHz | 1, 2 | -Infinity | -91 |
| IoNote6 | dBm/9MHz | 1, 2 | -70.22 | -62.43 |
| 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]. | | | | |

##### A.11.2.1.6.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 165 ms from the beginning of time period T2.

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 = 50 ms and is specified in clause 6.1.2.1.

Tinterrupt = 115 ms in the test; Tinterrupt is defined in clause 6.1.2.1.

This gives a total of 165 ms.