3GPP TSG-RAN WG4 Meeting # 104-e R4-2213952

Electronic Meeting, Aug. 15 – Aug. 26, 2022

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **-** | **rev** | **1** | **Current version:** | **17.6.0** |  |
|  | | | | | | | | |
| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | TC for EN-DC to EN-DC Handover with PSCell using CCA with known target PSCell | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_RRM\_enh2- Perf | | | | |  | ***Date:*** | | | 2022-08-26 |
|  |  | | | |  | |  | | |  |
| ***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:*** | | TC for HO with PSCell when PSCell is in CCA shall be introdcued to test the core requirements of the feature. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduce the test case for Handover with PSCell when PSCell is in CCA from EN-DC to EN-DC with known target PSCell. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The test case for HO with PSCell will be missing | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.10.1.x1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | R4-2213952 | | | | | | | | |

### <Start of Change 1>

#### 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 1>