**3GPP TSG- RAN4 Meeting #** **111R4-2408591**

**Fukuoka City, Fukuoka, Japan, 20th – 24th May, 2024**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **-** | **rev** | **-** | **Current version:** | **18.5.0** |  |
|  | | | | | | | | |
| *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:*** | Update on test case for NR conditional handover including target MCG and target SCG from FR1-FR1 NR-DC to FR1-FR1 NR-DC | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_Mob\_enh2-Perf | | | | |  | ***Date:*** | | | 2024-4-26 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | On top of endorsed big CR [R4-2406514], some corrections are made on NR conditional handover including target MCG and target SCG from FR1-FR1 NR-DC to FR1-FR1 NR-DC. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | On top of endorsed big CR [R4-2406514], some corrections are made on NR conditional handover including target MCG and target SCG from FR1-FR1 NR-DC to FR1-FR1 NR-DC. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | A.6.3.3.x | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS38.533 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

<Start of Change 1>

#### A.6.3.3.x NR conditional handover including target MCG and target SCG from FR1-FR1 NR-DC to FR1-FR1 NR-DC

##### A.6.3.3.x.1 Test Purpose and Environment

The purpose of this test is to verify that UE can make correct NR-RC to NR-DC conditional handover including target MCG in FR1 and target SCG in FR1 as specified in clauses 6.1.6.1.

The supported test configurations are given in Table A.6.3.3.x.1-1. The test scenario comprises four NR cells, source PCell (Cell 1) and source PSCell (Cell 2), target PCell (Cell 3), and 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 FR1.

Test parameters are given in Tables A.6.3.3.x.1-2, A.6.3.3.x.1-3, A.6.3.3.x.1-4 and A.6.3.3.x.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. NR shall configure a condition implying handover to Cell 3 and Cell 4 during T1, at a time earlier than TRRC before the beginning of T2.

At the start of T2, Cell3 and Cell 4 become detectable. The condition for conditional PCell handover is met during T2.

Table A.6.3.3.x.1-1: Supported test configurations for NR conditional handover including target MCG and target SCG from FR1-FR1 NR-DC to FR1-FR1 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: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target PSCell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD 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: FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target PSCell: FR1 NR 15 kHz SSB SCS, 10 MHz 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: FR1 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target PSCell: FR1 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.6.3.3.x.1-2: General test parameters for PCell handover at conditional handover including target MCG and target SCG from FR1-FR1 NR-DC to FR1-FR1 NR-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 3 |  |
| Final condition | Active cell |  | Cell 3 |  |
| A3-Offset in handover condition | | dB | -4 |  |
| 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 | Cell 1 and Cell 3 are synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤2 |  |

Table A.6.3.3.x.1-3: Cell specific test parameters for PCell handover at conditional handover including target MCG and target SCG from FR1-FR1 NR-DC to FR1-FR1 NR-DC

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | Cell 3 | |
|  | | |  | T1 | T2 | T1 | T2 |
| 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 | | | |
| 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.6.3.3.x.1-4: General test parameters for PSCell change at conditional handover including target MCG and target SCG from FR1-FR1 NR-DC to FR1-FR1 NR-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 2 |  |
|  | Neighbouring cell |  | Cell 4 |  |
| Final condition | Active cell |  | Cell 4 |  |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Cell 2 and Cell 4 are synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤10 |  |

Table A.6.3.3.x.1-5: Cell specific test parameters for PSCell change at conditional handover including target MCG and target SCG from FR1-FR1 NR-DC to FR1-FR1 NR-DC

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 2 | | Cell 4 | |
|  | | |  | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | |  | 2 | | 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. | | | | | | | |

##### A.6.3.3.x.2 Test Requirements

TRRC + TEvent\_DU occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 3 less than Tmeasure + Tinterrupt + TCHO\_execution =920 +57 +10=987 ms from the start of T2, and the interruption during T2 shall not exceeed TIU + Tprocessing + T∆ + Tmargin=10+25+20+2=57ms.

The UE shall start to transmit the PRACH to Cell 4 less than Tmeasure + TCHO\_execution + Tprocessing + Tsearch\_PCell\_Conditional + Tsearch\_PSCell + T∆\_PSCell + TPSCell\_ DU + 2 ms =920+10+25+0+ (3\*20)+ 20+2=1037ms from the start of T2, excluding any transmissions which do not occur due to measurement gaps.

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

Note1: The PCell conditional handover delay can be expressed as specified in clause 6.1.6.1:

DCHOwithPSCell\_PCell = TRRC + TEvent\_DU + Tmeasure + Tinterrupt + TCHO\_execution

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH as specified in clause 6.1.6.1.1

Tinterrupt = TIU + Tprocessing + T∆ + Tmargin ms

The PSCell conditional handover delay can be expressed as specified in clause 6.1.6.1.2:

DCHOwithPSCell\_PSCell = TRRC + TEvent\_DU + Tmeasure + TCHO\_execution + Tprocessing + Tsearch\_PCell\_Conditional + Tsearch\_PSCell + T∆\_PSCell + TPSCell\_DU + 2 ms

<End of Change 1>