**3GPP TSG-RAN WG4 Meeting #112 R4-2411567**

**Maastricht, Netherland, Aug 19-23, 2024**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** |  | **rev** | - | **Current version:** |  |  |
|  | | | | | | | | |
| *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:*** | Correction CR on NES based CHO HO delay TCs | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell, Intel | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | Netw\_Energy\_NR-Perf | | | | |  | ***Date:*** | | | 2024-8-21 |
|  |  | | | |  | |  | | |  |
| ***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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 1. In A.6.3.3.7, there is duplicated texts. 2. In A.7.3.3.4, the DCI 2-9 should come after NES based conditiona is fulfilled. The timing for sending DCI2-9 is not correct. 3. In A.7.3.3.4, Table numbers are corrected. TBD for T2 is corrected. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Some correction. 2. Changing the time when DCI2-9 is indicated. 3. Table numbers are corrected. TBD for T2 is corrected and dditorial changes. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The NES-based conditional handover TCs are not correct. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.6.3.3.7, A. 7.3.3.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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.6.3.3.7 NES-based Inter-frequency conditional handover from FR1 to FR1

##### A.6.3.3.7.1 Test Purpose and Environment

This test is to verify the requirement for the NES-based NR FR1-NR FR1 inter frequency conditional handover requirements specified in clause 6.1.4.2.

##### A.6.3.3.7.2 Test Parameters

Supported test configurations are shown in table A.6.3.3.7.2-1. Both conditional handover delay and interruption length are tested by using the parameters in table A.6.3.3.7.2-2 and A.6.3.3.7.2-3.

The test scenario comprises of two carriers and one cell on each carrier. Gap pattern ID gp0 is 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. NR shall configure a condition implying handover to cell 2 during T1, at a time earlier than TRRC before the beginning of T2. At the start of T2, cell 2 becomes detectable and meets the NES-based handover condition. In this test, UE is not indicated to report SSB based RRM measurement result with the associated SSB index for carrier of cell 2, and DCI 2-9 command of ‘1’ value for indicating NES-specific CHO execution condition is transmitted to UE at 950ms from the start of T2, i.e., UE receives DCI 2-9 command later than the time at the end of TEvent\_DU + Tidentify\_inter\_without\_index.

Table A.6.3.3.7.2-1: NES-based inter-frequency conditional handover from FR1 to FR1 test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: 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.6.3.3.7.2-2: General test parameters for NES-based inter-frequency conditional handover from FR1 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset in handover condition without nesEvent-r18 | | dB | 6 |  |
| A3-Offset in handover condition with nesEvent-r18 = true | | 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. |
| T1 | | s | 5 |  |
| T2 | | s | ≤2 |  |

Table A.6.3.3.7.2-3: Cell specific test parameters for NES-based NR FR1-FR1 inter frequency conditional handover test case

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | Cell 2 | |
|  | | |  | 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 | | | |
| Gap pattern ID | | |  | gp0 | | | |
| 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 | | |  | OCNG pattern 1 | | | |
| SMTC Configuration | | |  | SMTC pattern 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.6.3.3.7.3 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 2 less than Tmeasure + Tinterrupt + TCHO\_execution =950 +62 +10=1022 ms from the start of T2 and the interruption during T2 shall not exceeed Tinterrupt=Tprocessing + TIU + T∆ + Tmargin =40+20+2 = 62ms excluding any transmissions which do not occur due to measurement gaps.

<End of Change 1>

<Start of Change 2>

#### A.7.3.3.4 NES triggering inter-frequency conditional handover from FR2 to FR1

##### A.7.3.3.4.1 Test Purpose and Environment

This test is to verify the requirement for the NES triggering NR FR2-NR FR1 inter frequency conditional handover requirements specified in clause 6.1.4.3.

##### A.7.3.3.4.2 Test Parameters

Supported test configurations are shown in table A.7.3.3.4.2-1. Both conditional handover delay and interruption length are tested by using the parameters in table A.7.3.3.4.2-2, A.7.3.3.4.2-3 and A.7.3.3.4.2-4.

The test scenario comprises of two carriers and one cell on each carrier. Measurement gap is 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. NR shall configure a NES based CHO condition implying handover to cell 2 during T1, at a time earlier than TRRC before the beginning of T2. At the start of T2, cell 2 becomes detectable and meets the NES-based handover condition. In this test, UE is not indicated to report SSB based RRM measurement result with the associated SSB index for carrier of cell 2, and DCI 2-9 command of ‘1’ value for indicating NES-specific CHO execution condition is transmitted to UE at 950ms from the start of T2, i.e. UE is expected to decode the DCI command 2-9 later than the time when the NES condition is considered met.

*Editors’ note: Due to the FR1 + FR2 testability issues as in Rel-18, the applicability of the requirements in this test case is FFS.*

Table A.7.3.3.4.2-1: Inter-frequency conditional handover from FR2 to FR1 test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |

Table A.7.3.3.4.2-2: General test parameters Inter-frequency conditional handover from FR2 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A3-Offset in condition | | 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 |
| T1 | | s | 5 |  |
| T2 | | s | 3 |  |

Table A.7.3.3.4.2-3: Cell specific test parameters for NR FR2-FR1 Inter frequency conditional handover test case

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | | | Cell 2 | |
|  | |  | T1 | T2 | | T1 | T2 |
| NR RF Channel Number | |  | 1 | | | 2 | |
| AoA setup | |  | Setup 1 as defined in A.3.15 | | NA | | |
| Assumption for UE beamsNote 6 | |  | Rough | | NA | | |
| Duplex mode | |  | TDD | | FDD | | |
| TDD configuration | |  | TDDConf.3.1 | | NA | | |
| BWchannel | | MHz | 100: NRB,c = 66 | |  | | |
| BWP BW | | MHz | 100: NRB,c = 66 | |  | | |
| DRx Cycle | | ms | Not Configured | | Not Configured | | |
| Gap pattern ID | |  | gp0 | | NA | | |
| PDSCH Reference measurement channel | |  | SR3.1 TDD | | SR.1.1 FDD | | |
| CORESET Reference Channel | |  | CR3.1 TDD | | CR.1.1 FDD | | |
| OCNG Patterns | |  | OCNG pattern 1 | | OCNG pattern 1 | | |
| SMTC Configuration | |  | SMTC pattern 1 | | SMTC pattern 1 | | |
| SSB Configuration | |  | SSB.1 FR2 | | SSB.1 FR1 | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | 15 kHz | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | 15 kHz | | |
| PRACH configuration | |  | FR2 PRACH configuration 1 | | FR1 PRACH configuration 1 | | |
| TRS configuration | |  | TRS.2.1 TDD | | NA | | |
| TCI configuration | |  | CSI-RS.Config.0 | | NA | | |
| BWP configuraiton | Initial DL BWP |  | DLBWP.0.1 | | DLBWP.0.1 | | |
|  | Dedicated DL BWP |  | DLBWP.1.1 | | DLBWP.1.1 | | |
|  | Initial UL BWP |  | ULBWP.0.1 | | ULBWP.0.1 | | |
|  | Dedicated UL BWP |  | ULBWP.1.1 | | 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) | |  |  | | |  | |
| Propagation condition | | - | AWGN | | N/A  Link only, see clause A.3.7A | | |
| 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.7.3.3.4.2-4: OTA related test parameters for NR FR2-FR1 Inter frequency conditional handover test case

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | | | | Cell 2 | | | |
| T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 |
| Angle of arrival configuration | |  | According to clause A.3.15.1 | | | | N/A | | | |
| Assumption for UE beams Note 7 | |  | Rough | | | | N/A | | | |
| Note 1 | Config 1,2,3 | dBm/15kHz | -104.7 | | | | Link only, see clause A.3.7A | | | |
| Note 1 | Config 1,2,3 | dBm/SCS | -95.7 | | | |
|  | Config 1,2,3 | dB | 7 | | | |
|  | Config 1,2,3 | dB | 7 | | | |
| SSB\_RPNote 2, Note 4 | Config 1,2,3 | dBm/SCS | -88.7 | | | |
| IoNote 2, Note 4 | Config 1,2,3 | dBm/95.04 MHz | -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: Void  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Void  Note 7: Information about types of UE beam is given in B.2.1.3 and does not imit UE implementation or test system implementation. | | | | | | | | | | |

##### A.7.3.3.4.3 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 2 less than Tmeasure + Tinterrupt + TCHO\_execution = 1022ms from the start of T2 and the interruption during T2 shall not exceeed Tinterrupt=Tprocessing + TIU + T∆ + Tmargin = 62 ms excluding any transmissions which do not occur due to measurement gaps.

<End of Change 2>