**3GPP TSG-RAN4 Meeting #111 *R4-2410413***

**Fukuoka, Japan, May 20 - 24, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **Draft** | **rev** | **1** | **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:*** | Draft CR on TC for NTN-NTN time-based trigger CHO enhancements for NR NTN | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | LG Electronics | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_NTN\_enh-Perf | | | | |  | ***Date:*** | | | 2024-05-10 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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:*** | | Introduction of test case for NTN-NTN time-based trigger CHO enhancements was agreed in the last meeting . | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Test cases for NTN-NTN time-based trigger CHO enhancements have been added. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | NR NTN performance requirements are not completed. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | New clause: A.14.2.1.x, A.14.2.1.y | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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.14.2.1.x Intra-frequency SAN time-based conditional Handover without L3 measurement criteria from FR1 to FR1

##### A.14.2.1.x.1 Test Purpose and Environment

This test is to verify the requirement for intra-frequency SAN time-based conditional handover without L3 measurement criteria from FR1 to FR1 specified in clause 6.1C.2.3.

##### A.14.2.1.x.2 Test Parameters

The test scenario comprises of 1 NR FDD carrier and 2 cells as given in table A.14.2.1.x.2-1, and A.14.2.1.x.2-2. Both handover delay and interruption length are tested.

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 may not have any timing information of cell 2. During T1, the UE is configured to measure intra-frequency neighbour cell. The RRC message implying time-based handover to cell 2 with Event CondEvent T1 shall be sent to UE, at a time earlier than TRRC (10ms) before the beginning of T2.

Starting T2, cell 2 becomes detectable and time condition event t1-Threshold-r17 is fulfilled.

Table A.14.2.1.x.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |

Table A.14.2.1.x.2-2: General test parameters for Intra-frequency SAN time-based conditional handover without L3 measurement criteria from FR1 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| RF Channel Number | |  | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 | FDD duplex mode cell |
|  | Neighbouring cell |  | Cell 2 | FDD duplex mode cell |
| Final condition | Active cell |  | Cell 2 |  |
| Satellite configuration | Config 1 |  | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) | |  | [(0, 0, 0)] | Set by AT command |
| t1-Threshold-r17.condEventT1-r17 | | s | T2 | Entering condition |
| duration-r17.condEventT1-r17 | | slot | 1000 | Give 1s search duration |
| 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 | ≤ 2 |  |

Table A.14.2.1.x.2-3: Cell specific test parameters for Intra-frequency SAN time-based conditional handover without L3 measurement criteria from FR1 to FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1 |  | 1 | | 1 | |
| BWchannel | |  | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| BWP BW | |  | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| TACommon | | Config 1 | s | 0 | | 0 | |
| TACommonDrift | |  | s | 0 | | 0 | |
| TACommonDriftVariation | |  | s | 0 | | 0 | |
| Koffset | | Config 1 | ms | [4] | | [4] | |
| Kmac | | Config 1 | ms | 0 | | 0 | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD | | | |
| CORESET Reference Channel | |  | CR.1.1 FDD | | | |
| TRS configuration | |  | TRS.1.1 FDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| SMTC Configuration | |  | SMTC.1 | | | |
| SSB Configuration | |  | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1 |  | 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 | | Config 1 | 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 | | Config 1 | dBm/ 15kHz | -98 | | | |
| Note2 | | dBm/ SCS | -98 | | | |
|  | | dB | 8 | -3.3 | -Infinity | 2.36 |
|  | | dB | 8 | 8 | -Infinity | 11 |
| SSB\_RP | | dBm/ SCS | -90 | -90 | -Infinity | -87 |
| IoNote3 | | dBm/ 9.36MHz | -61.41 | -57.06 | -61.41 | -57.06 |
| 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. | | | | | | | |

##### A.14.2.1.x.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 92 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 is defined in clause 6.1C.2.3, can be expressed as:

DCHO = TRRC + TEvent\_DU + Tinterrupt + TCHO\_execution

where:

RRC procedure delay TRRC = 10 ms and is specified in clause 12 in TS 38.331 [2].

TEvent\_DU = start of T2

Tinterrupt = 82ms; TCHO\_execution = 10ms.

This gives a total of 92 ms.

#### A.14.2.1.y Inter-frequency SAN time-based conditional Handover without L3 measurement criteria from FR1 to FR1

##### A.14.2.1.y.1 Test Purpose and Environment

This test is to verify the requirement for inter -frequency SAN time-based conditional handover without L3 measurement criteria from FR1 to FR1 specified in clause 6.1C.2.

##### A.14.2.1.y.2 Test Parameters

The test scenario comprises of 2 NR FDD carrier and one cell on each carrier as given in table A.14.2.1.y.2-1, and A.14.2.1.y.2-2. Both handover delay and interruption length are tested.

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 may not have any timing information of cell 2. During T1, the UE is configured to measure inter-frequency neighbour cell and Gap pattern ID gp0. The RRC message implying time-based handover to cell 2 with Event CondEvent T1 shall be sent to UE, at a time earlier than TRRC (10ms) before the beginning of T2.

Starting T2, cell 2 becomes detectable and time condition event t1-Threshold-r17 is fulfilled.

Table A.14.2.1.y.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |

Table A.14.2.1.y.2-2: General test parameters for Inter-frequency SAN time-based conditional handover from FR1 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| RF Channel Number | |  | 1, 2 | Two NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 | FDD duplex mode cell |
|  | Neighbouring cell |  | Cell 2 | FDD duplex mode cell |
| Final condition | Active cell |  | Cell 2 |  |
| Satellite configuration | Config 1 |  | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) | |  | [(0, 0, 0)] | Set by AT command |
| t1-Threshold-r17.condEventT1-r17 | | s | T2 | Entering condition |
| duration-r17.condEventT1-r17 | | slot | 1000 | Give 1s search duration |
| 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 | ≤ 2 |  |

Table A.14.2.1.y.2-3: Cell specific test parameters for Inter-frequency SAN time-based conditional handover from FR1 to FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1 |  | 1 | | 2 | |
| BWchannel | | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| BWP BW | | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| TACommon | | Config 1 | s | 0 | | 0 | |
| TACommonDrift | | s | 0 | | 0 | |
| TACommonDriftVariation | | s | 0 | | 0 | |
| Koffset | | Config 1 | ms | [4] | | [4] | |
| Kmac | | Config 1 | ms | 0 | | 0 | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD | | | |
| CORESET Reference Channel | |  | CR.1.1 FDD | | | |
| TRS configuration | |  | TRS.1.1 FDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| SMTC Configuration | |  | SMTC.1 | | | |
| SSB Configuration | |  | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1 |  | 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 | | Config 1 | 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 | | Config 1 | dBm/ 15kHz | -98 | | | |
| Note2 | | dBm/ SCS | -98 | | | |
|  | | dB | 4 | 4 | -Infinity | 9 |
|  | | dB | 4 | 4 | -Infinity | 9 |
| SSB\_RP | | dBm/ SCS | -94 | -94 | -Infinity | -89 |
| IoNote3 | | dBm/ 9.36MHz | -64.59 | -64.59 | -70.05 | -60.53 |
| 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. | | | | | | | |

##### A.14.2.1.y.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 132 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 is defined in clause 6.1C.2.3, can be expressed as:

DCHO = TRRC + TEvent\_DU + Tinterrupt + TCHO\_execution

where:

RRC procedure delay TRRC = 10 ms and is specified in clause 12 in TS 38.331 [2].

TEvent\_DU = start of T2

Tinterrupt = 122ms; TCHO\_execution = 10ms.

This gives a total of 132 ms.

-------------- End of Change <1> --------------