**3GPP TSG-RAN WG4 Meeting # 98-bis-e R4-2105718**

**Electronic Meeting, Apr. 12-20, 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **CR** | **Draft** | **rev** |  | **Current version:** | **16.7.0** |  |
|  |
| *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:***  | Draft CR of test cases for HO delay and interruption for NR-U |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_unlic-Perf |  | ***Date:*** | 2021-03-01 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***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 canbe 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:*** | The Draft CR is based on the endorsed CR R4-2103532. The new changes are using “additional changes for RAN4#98-bis-e”* Some configurations shall be added or updated according to the new configurations introduced for NR-U.
* Exceeding Lmax shall be avoided.
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|  |  |
| ***Summary of change:*** | * Add and update some configurations according to the agreements in RAN4#98e meeting.
* Add a note that the test shall not be considered in statistics when exceeding Lmax.
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| ***Consequences if not approved:*** | The test cases are incomplete. |
|  |  |
| ***Clauses affected:*** | A.11.2.1 |
|  |  |
|  | **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:*** |  |

### <Start of Change 1>

### A.11.2.1 Handover

#### A.11.2.1.1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; known target cell

##### A.11.2.1.1.1 Test Purpose and Environment

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

##### A.11.2.1.1.2 Test Parameters

Supported test configurations are shown in table A.11.2.1.1.2-1. Both handover delay and interruption length are tested by using the parameters in table A.11.2.1.1.2-2, and A.11.2.1.1.2-3.

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 may not have any timing information of cell 2.

NR shall send a RRC message implying handover to cell 2. The RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. T3 is defined as the end of the last TTI containing the RRC message implying handover.

Table A.11.2.1.1.2-1: Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex modeTarget cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Table A.11.2.1.1.2-2: General test parameters Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 | On the carrier under CCA |
|  | 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 |  |
| 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 |
| T1 | s | 5 |  |
| T2 | s | ≤ 5 |  |
| T3 | s | ≥ Tinterrupt | Tinterrupt is defined in clause 6.1B.1.2 |

Table A.11.2.1.1.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | Cell 2 |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number |  | 1 | 1 |
| CCA model |  | TBD | TBD |
| PCCA\_DL |  | [TBD] | [TBD] |
| PCCA\_UL |  | [TBD] | [TBD] |
| TDD configuration | Config 1 |  | TDDConf.1.1 CCA |
| BWchannel | Config 1 |  | 40: NRB,c = 106 |
| BWP BW | Config 1 |  | 40: NRB,c = 106 |
| DRX Cycle | ms | Not Applicable |
| PDSCH Reference | Config 1 |  | SR.1.1 CCA |
| CORESET Reference Channel | Config 1 |  | CR.1.1 CCA |
| TRS configuration | Config 1 |  | TRS.1.1 TDD |
| OCNG Patterns |  | OP.1 |
| SMTC Configuration |  | SMTC.1 |
| DBT window configuration | Config 1 |  | DBT.1 |
| SSB configuration | Config 1 |  | SSB.1 CCA |
| ssb-PositionQCL | Config 1 |  | [1] |
| PDSCH/PDCCH subcarrier spacing | Config 1 | kHz | 30 kHz |
| PUCCH/PUSCH subcarrier spacing | Config 1 | kHz | 30 kHz |
| PRACH configuration  |  | FR1 PRACH configuration 1 |
| 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 | 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 | dBm/SCS | -87 | -87 | -87 | -Infinity | -84 | -84 |
| IoNote3 | Config 1 | 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. |

##### A.11.2.1.1.3 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:

Tinterrupt = Tsearch + TIU + Tprocessing + T∆ + Tmargin

Tsearch = 0.

Tprocessing = 20 ms.

Tmargin = 2 ms.

T∆ = (1+ L2) \*20 ms.

TIU = (1+ L3)\*10 + 10 ms

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

#### A.11.2.1.2 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell

##### A.11.2.1.2.1 Test Purpose and Environment

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

##### A.11.2.1.2.2 Test Parameters

Supported test configurations are shown in table A.11.2.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.11.2.1.2.2-2, and A.11.2.1.2.2-3.

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.11.2.1.2.2-1: Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex modeTarget cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Table A.11.2.1.2.2-2: General test parameters Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 | On the carrier under CCA |
|  | 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. |
| Time offset between cells |  | 3 μs | Synchronous cells |
| T1 | s | 5 |  |
| T2 | s | ≥ Tinterrupt | Tinterrupt is defined in clause 6.1B.1.2 |

Table A.11.2.1.2.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | Cell 2 |
|  |  | T1 | T2 | T1 | T2 |
| NR RF Channel Number |  | 1 | 1 |
| CCA model |  | TBD | TBD |
| PCCA\_DL |  | [1] | [0.75] |
| PCCA\_UL |  | [1] | [1] |
| TDD configuration | Config 1 |  | TDDConf.1.1 CCA |
| BWchannel | Config 1 |  | 40: NRB,c = 106 |
| BWP BW | Config 1 |  | 40: NRB,c = 106 |
| DRX Cycle | ms | Not Applicable |
| PDSCH Reference | Config 1 |  | SR.1.1 CCA |
| CORESET Reference Channel | Config 1 |  | CR.1.1 CCA |
| TRS configuration | Config 1 |  | TRS.1.2 TDD |
| OCNG Patterns |  | OP.1 |
| SMTC Configuration |  | SMTC.1 |
| DBT window configuration | Config 1 |  | DBT.1 |
| SSB configuration | Config 1 |  | SSB.1 CCA |
| ssb-PositionQCL | Config 1 |  | [1] |
| PDSCH/PDCCH subcarrier spacing | Config 1 | kHz | 30 kHz |
| PUCCH/PUSCH subcarrier spacing | Config 1 | kHz | 30 kHz |
| PRACH configuration  |  | FR1 PRACH configuration 1 |
| 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 | dBm/SCS | -95 |
|  | dB | 8 | -0.64 | -Infinity | -0.64 |
|  | dB | 8 | 8 | -Infinity | 8 |
| SSB\_RP | Config 1 | dBm/SCS | -87 | -87 | -Infinity | -87 |
| IoNote3 | Config 1 | dBm/38.16MHz | -55.31 | -52.60 | -55.31 | -52.60 |
| 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.11.2.1.2.3 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:

Tinterrupt = Tsearch + TIU + Tprocessing + T∆ + Tmargin

Tsearch = (1+L1)\* 20 ms.

Tprocessing = 20 ms.

Tmargin = 2 ms.

T∆ = (1+ L2) \*20 ms.

TIU = (1+ L3)\*10 + 10 ms

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 intra-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. A test will not be considered in the statistics when T304 times expires considering the time extensions cause by L1´,L2 , L3.

#### A.11.2.1.3 Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell

##### A.11.2.1.3.1 Test Purpose and Environment

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

##### A.11.2.1.3.2 Test Parameters

Supported test configurations are shown in table A.11.2.1.3.2-1. Both handover delay and interruption length are tested by using the parameters in table A.11.2.1.3.2-2, and A.11.2.1.3.2-3.

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.11.2.1.3.2-1: Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex modeTarget cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Table A.11.2.1.3.2-2: General test parameters Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 | On the carrier under CCA |
|  | 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.11.2.1.3.2-3: Cell specific test parameters for NR FR1-FR1 Inter frequency handover test case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | Cell 2 |
|  |  | T1 | T2 | T1 | T2 |
| NR RF Channel Number |  | 1 | 2 |
| CCA model |  | TBD | TBD |
| PCCA\_DL |  | [1] | [0.75] |
| PCCA\_UL |  | [1] | [1] |
| TDD configuration | Config 1 |  | TDDConf.1.1 CCA |
| BWchannel | Config 1 |  | 40: NRB,c = 106 |
| BWP BW | Config 1 |  | 40: NRB,c = 106 |
| DRX Cycle | ms | Not Applicable |
| PDSCH Reference | Config 1 |  | SR.1.1 CCA |
| CORESET Reference Channel | Config 1 |  | CR1.1 CCA |
| TRS configuration | Config 1 |  | TRS.1.2 TDD |
| OCNG Patterns |  | OP.1 |
| SMTC Configuration |  | SMTC.1 |
| DBT window configuration | Config 1 |  | DBT.1 |
| SSB configuration | Config 1 |  | SSB.1 CCA |
| ssb-PositionQCL | Config 1 |  | [1] |
| PDSCH/PDCCH subcarrier spacing | Config 1 | kHz | 30 kHz |
| PUCCH/PUSCH subcarrier spacing | Config 1 | kHz | 30 kHz |
| PRACH configuration  |  | FR1 PRACH configuration 1 |
| 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 | dBm/SCS | -95 |
|  | dB | 4 | 4 | -Infinity | 5 |
|  | dB | 4 | 4 | -Infinity | 5 |
| SSB\_RP | Config 1 | dBm/SCS | -91 | -91 | -Infinity | -90 |
| IoNote3 | Config 1 | 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.11.2.1.3.3 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:

Tinterrupt = Tsearch + TIU + Tprocessing + T∆ + Tmargin

Tsearch = (3+L1’)\* 20 ms.

Tprocessing = 20 ms.

Tmargin = 2 ms.

T∆ = (1+ L2) \*20 ms.

TIU = (1+ L3)\*10 + 10 ms

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. A test will not be considered in the statistics when T304 times expires considering the time extensions cause by L1´,L2 , L3.

### <End of Change 1>