**3GPP TSG- Meeting # *R4-2409160***

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| *CR-Form-v12.3* | | | | | | | | |
| **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:*** | for RedCap | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *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:*** | | SDT power levels and SDT change threshold were not correctly configured for RedCap tests. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | SDT power levels and TC parameters are changed according to the discussion in R4-2409134. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Incorrect test cases can lead to unpredictable UE behaviour in conformance tests. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.16.2.1.1, A.16.2.1.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

## <Start of Change #1>

### A.16.2.1 Configured Grant based Small Data Transmissions (CG-SDT) for RedCap

#### A.16.2.1.1 NR UE CG-SDT Test in FR1 for 1Rx RedCap UE

##### A.16.2.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE properly perform TA validation for CG-SDT transmission in clause 5.2B.2.1. The test includes two sub-tests, Sub-test#1 for testing valid TA where UE can initiate CG-SDT transmission, and Sub-test#2 for testing invalid TA where UE does not initiate CG-SDT transmission. Subtest#2 is only tested if Sub-test#1 is passed. For each sub-test, UE is configured with CG-SDT configurations when entering RRC Inactive state. Sub-test#1 consists of four successive time periods, with time duration of T1, T2, T3 and T4 respectively. There is one cell, which is the active NR cell in FR1. Figure A.16.2.1.1.1-1 shows the variation of the RSRP over the duration of Sub-test#1 and Figure A.16.2.1.1.1-2 shows the variation of the RSRP over the duration of Sub-test#2.

In Sub-test#1:

Prior to the time point TA, the UE shall be fully synchronized to PCell (Cell 1), be registered to the cell and have entered RRC connected mode.

Before starting the test at time point TA, test equipment configures RSRP to P0.

At time point TB, RSRP is changed from P0 to P1.

At time point TC, which is W1 after time point TB, UE expect to receive RRC release with CG-SDT configuration and RRC status is changed to INACTIVE status.

At time point TD, RSRP is changed from P1 to P0.

At time point TE, RSRP is changed from P0 to P2. TE must be W2 before TF.

Test equipment triggers UL data arrival at UE lower layer at time point TF. After time point TF, test equipment observes whether UE transmits with CG-SDT no later than TG which is W3 after TF.

At time point TH, which is 100ms after TG, UE expect to receive a RRC release with CG-SDT configurations.

At time point TI, RSRP is changed from P2 to P3, where TI is TH+W1.

Test equipment triggers UL data arrival at UE lower layer at time point TJ. TJ is 3360ms after TI.

In Sub-test#2:

Prior to the time point TA, the UE shall pass Sub-test#1 and have entered RRC connected mode. Otherwise, Sub-test#2 shall not be executed.

From time point TA to time point TD, RSRP is set to P2.

At time point TC, which is W1 after time point TB, UE expect to receive RRC release with CG SDT configuration and RRC status is changed to INACTIVE status.

At time point TD, RSRP is changed from P2 to P0.

Test equipment triggers UL data arrival at UE lower layer at time point TF. TF is 3360ms after TD. After time point TF, test equipment observes whether UE transmits with CG-SDT no later than TG which is W3 after TF.

W1 equals to 640ms and W2 equals to 640ms based on requirements in clause 5.2B.2.1. W3 is 860ms.

A diagram of a process

Description automatically generated

Figure A.16.2.1.1.1-1: RSRP variation model for CG-SDT Sub-test#1

A diagram of a diagram

Description automatically generated

Figure A.16.2.1.1.1-2: RSRP variation model for CG-SDT Sub-test#2

##### A.16.2.1.1.2 Test Parameters

Supported test configurations are shown in Table A.16.2.1.1.2-1. The test parameters for the PCell are given in Table A.16.2.1.1.2-2 and Table A.16.2.1.1.2-3.

Table A.16.2.1.1.2-1: NR configuration for FR1 SSB

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz |
| 4 | NR HD-FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.16.2.1.1.2-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Duplex mode | Config 1 |  | FDD |  |
| Config 2, 3 |  | TDD |  |
| Config 4 |  | HD-FDD |  |
| TDD Configuration | Config 1 |  | N/A |  |
| Config 2 |  | TDDConf.1.1 |  |
| Config 3 |  | TDDConf.2.1 |  |
| Config 4 |  | N/A |  |
| BWchannel | Config 1, 2, 4 | MHz | 10: NRB,c = 52 |  |
| Config 3 |  | 20: NRB,c = 51 |  |
| PDSCH Reference measurement channel | Config 1, 4 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |  |
| Config 3 |  | SR.2.1 TDD |  |
| RMSI CORESET Reference Channel | Config 1, 4 |  | CR.1.1 FDD |  |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | Config 1, 4 |  | CCR.1.3 FDD |  |
| Config 2 |  | CCR.1.3 TDD |  |
| Config 3 |  | CCR.2.2 TDD |  |
| SSB configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2, 4 |  | SSB.1 FR1 |  |
| Config 3 |  | SSB. 1 RedCap FR1 |  |
| OCNG Patterns |  |  | OP.1 |  |
| Initial BWP Configuration | Config 1, 2, 3, 4 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Dedicated BWP configuration | Config 1, 2, 3, 4 |  | DLBWP.1.1  ULBWP.1.1 |  |
| SMTC configuration | Config 1, 2, 4 |  | SMTC.1 |  |
| Config 3 |  | SMTC.1 |  |
| DRX configuration | Config 1, 2, 3, 4 |  | DRX.7 |  |
| T\_delay\_modeB | Config 1, 2, 3, 4 | s | [4] |  |
| T1 | Config 1, 2, 3, 4 | s | 0.4 |  |
| T2 | Config 1, 2, 3, 4 | s | 1.28 | 2 x W1 |
| T3 | Config 1, 2, 3, 4 | s | 2.72 | T\_timer\_modeB - W1 -W2 |
| T4 | Config 1, 2, 3, 4 | s | [1.5] | W2+W3 |
| T5 | Config 1, 2, 3, 4 | s | [1.68] | T1+T2 |
| T6 | Config 1, 2, 3, 4 | s | [4.22] | T3+W2+W3 |
| cg-SDT-RSRP-ChangeThreshold | Config 1, 2, 3, 4 | dB | 8 |  |
| cg-SDT-RSRP-ThresholdSSB | Config 1, 2, 3, 4 | dBm | – 110 |  |
| cg-SDT-TimeAlignmentTime | Config 1, 2, 3, 4 |  | Infinity |  |
| CG-SDT resource period | Config 1, 2, 3, 4 | ms | 320ms |  |
| 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 DMRS |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS |  |  |  |  |
| Propagation condition | Config 1, 2, 3, 4 |  | AWGN |  |

Table A.16.2.1.1.2-3: SSB specific test parameters

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | | | | |
|  |  |  | T1 | T2 | T3 | T4 | T5 | T6 |
| Note1 | 1, 2, 3, 4 | dBm/15kHz | -100 | | | | | |
| Note1 | 1, 2, 4 | dBm/SSB SCS | -100 | | | | | |
| 3 | dBm/SSB SCS | -97 | | | | | |
|  | 1, 2, 3, 4 | dB | 0 | 12 | 0 | 14 | 14 | 0 |
| SS RSRP Note2 | 1, 2, 4 | dBm/SSB SCS | -100 | -88 | -100 | -86 | -86 | -100 |
| 3 | dBm/SSB SCS | -97 | -85 | -97 | -83 | -83 | -97 |
| Io Note2 | 1, 2, 4 | dBm/ 9.36 MHz | -69.04 | -59.78 | -69.04 | -57.88 | -57.88 | -69.04 |
| 3 | dBm/ 18.36 MHz | -66.11 | -56.86 | -66.11 | -54.95 | -54.95 | -66.11 |
|  | 1, 2, 3, 4 | dB | 0 | 12 | 0 | 14 | 14 | 0 |
| 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: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

##### A.16.2.1.1.3 Test requirements

The UE behaviour in each test during time durations shall be as follows:

During Sub-test#1, UE shall transmit PUSCH at CG-SDT resource within 860ms after time point TF.

During Sub-test#2, after passing Sub-test#1, UE shall not transmit PUSCH at CG-SDT resources after TF until the end of the test at time point TG.

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

#### A.16.2.1.2 NR UE CG-SDT Test in FR1 for 2Rx RedCap UE

##### A.16.2.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE properly perform TA validation for CG-SDT transmission in clause 5.2B.2.1. The test includes two sub-tests, Sub-test#1 for testing valid TA where UE can initiat CG-SDT transmission, and Sub-test#2 for testing invalid TA where UE does not initiate CG-SDT transmission. Subtest#2 is only tested if Sub-test#1 is passed. For each sub-test, UE is configured with CG-SDT configurations when entering RRC Inactive state. Sub-test#1 consists of four successive time periods, with time duration of T1, T2, T3 and T4 respectively. There is one cell, which is the active NR cell in FR1. Figure A.16.2.1.2.1-1 shows the variation of the RSRP over the duration of Sub-test#1 and Figure A.16.2.1.2.1-2 shows the variation of the RSRP over the duration of Sub-test#2.

In Sub-test#1:

Prior to the time point TA, the UE shall be fully synchronized to PCell (Cell 1), be registered to the cell and have entered RRC connected mode.

Before starting the test at time point TA, test equipment configures RSRP to P0.

At time point TB, RSRP is changed from P0 to P1.

At time point TC which is W1 after time point TB, UE expect to receive RRC release with CG-SDT configuration and RRC status is changed to INACTIVE status.

At time point TD, RSRP is changed from P1 to P0.

At time point TE, RSRP is changed from P0 to P2. TE must be W2 before TF.

Test equipment triggers UL data arrival at UE lower layer at time point TF. After time point TF, test equipment observes whether UE transmits with CG-SDT no later than TG which is W3 after TF.

At time point TH which is 100ms after TG, UE expect to receive a RRC release with CG-SDT configurations.

At time point TI, RSRP is changed from P2 to P0, where TI is TH+W1.

Test equipment triggers UL data arrival at UE lower layer at time point TJ. TJ is 3360ms after TI.

In Sub-test#2:

Prior to the time point TA, the UE shall pass Sub-test#1 and have entered RRC connected mode. Otherwise, Sub-test#2 shall not be executed.

From time point TA to time point TD, RSRP is set to P2.

At time point TC, which is W1 after time point TB, UE expect to receive RRC release with CG SDT configuration and RRC status is changed to INACTIVE status.

At time point TD, RSRP is changed from P2 to P0.

Test equipment triggers UL data arrival at UE lower layer at time point TF. TF is 3360ms after TD. After time point TF, test equipment observes whether UE transmits with CG-SDT no later than TG which is W3 after TF.

W1 equals to 640ms and W2 equals to 640ms based on requirements in clause 5.2B.2.1. W3 is 860ms.

A diagram of a process

Description automatically generated

Figure A.16.2.1.2.1-1: RSRP variation model for CG-SDT Sub-test#1

A diagram of a diagram

Description automatically generated

Figure A.16.2.1.2.1-2: RSRP variation model for CG-SDT Sub-test#2

##### A.16.2.1.2.2 Test Parameters

Supported test configurations are shown in Table A.16.2.1.2.2-1. The test parameters for the PCell are given in Table A.16.2.1.2.2-2 and Table A.16.2.1.2.2-3.

Table A.16.2.1.2.2-1: NR configuration for FR1 SSB

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz |
| 4 | NR HD-FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.16.2.1.2.2-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Duplex mode | Config 1 |  | FDD |  |
| Config 2, 3 |  | TDD |  |
| Config 4 |  | HD-FDD |  |
| TDD Configuration | Config 1 |  | N/A |  |
| Config 2 |  | TDDConf.1.1 |  |
| Config 3 |  | TDDConf.2.1 |  |
| Config 4 |  | N/A |  |
| BWchannel | Config 1, 2, 4 | MHz | 10: NRB,c = 52 |  |
| Config 3 |  | 20: NRB,c = 51 |  |
| PDSCH Reference measurement channel | Config 1, 4 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |  |
| Config 3 |  | SR.2.1 TDD |  |
| RMSI CORESET Reference Channel | Config 1, 4 |  | CR.1.1 FDD |  |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | Config 1, 4 |  | CCR.1.3 FDD |  |
| Config 2 |  | CCR.1.3 TDD |  |
| Config 3 |  | CCR.2.2 TDD |  |
| SSB configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2, 4 |  | SSB.1 FR1 |  |
| Config 3 |  | SSB. 1 RedCap FR1 |  |
| OCNG Patterns |  |  | OP.1 |  |
| Initial BWP Configuration | Config 1, 2, 3, 4 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Dedicated BWP configuration | Config 1, 2, 3, 4 |  | DLBWP.1.1  ULBWP.1.1 |  |
| SMTC configuration | Config 1, 2, 4 |  | SMTC.1 |  |
| Config 3 |  | SMTC.1 |  |
| DRX configuration | Config 1, 2, 3, 4 |  | DRX.7 |  |
| T\_delay\_modeB | Config 1, 2, 3, 4 | s | 4 |  |
| T1 | Config 1, 2, 3, 4 | s | 0.4 |  |
| T2 | Config 1, 2, 3, 4 | s | 1.28 | 2 x W1 |
| T3 | Config 1, 2, 3, 4 | s | 2.72 | T\_timer\_modeB - W1 -W2 |
| T4 | Config 1, 2, 3, 4 | s | [1.5] | W2+W3 |
| T5 | Config 1, 2, 3, 4 | s | [1.68] | T1+T2 |
| T6 | Config 1, 2, 3, 4 | s | [4.22] | T3+W2+W3 |
| cg-SDT-RSRP-ChangeThreshold | Config 1, 2, 3, 4 | dB | 8 |  |
| cg-SDT-RSRP-ThresholdSSB | Config 1, 2, 3, 4 | dBm | – 110 |  |
| cg-SDT-TimeAlignmentTime |  |  | Infinity |  |
| CG-SDT resource period |  | ms | 320ms |  |
| 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 DMRS |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS |  |  |  |  |
| Propagation condition | Config 1, 2, 3, 4 |  | AWGN |  |

Table A.16.2.1.2.2-3: SSB specific test parameters

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | | | | |
|  |  |  | T1 | T2 | T3 | T4 | T5 | T6 |
| Note1 | 1, 2, 3, 4 | dBm/15kHz | -100 | | | | | |
| Note1 | 1, 2, 4 | dBm/SSB SCS | -100 | | | | | |
| 3 | dBm/SSB SCS | -97 | | | | | |
|  | 1, 2, 3, 4 | dB | 0 | 12 | 0 | 14 | 14 | 0 |
| SS RSRP Note2 | 1, 2, 4 | dBm/SSB SCS | -100 | -88 | -100 | -86 | -86 | -100 |
| 3 | dBm/SSB SCS | -97 | -85 | -97 | -83 | -83 | -97 |
| Io Note2 | 1, 2, 4 | dBm/ 9.36 MHz | -69.04 | -59.78 | -69.04 | -57.88 | -57.88 | -69.04 |
| 3 | dBm/ 18.36 MHz | -66.11 | -56.86 | -66.11 | -54.95 | -54.95 | -66.11 |
|  | 1, 2, 3, 4 | dB | 0 | 12 | 0 | 14 | 14 | 0 |
| 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: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

##### A.16.2.1.2.3 Test requirements

The UE behaviour in each test during time durations shall be as follows:

During Sub-test#1, UE shall transmit PUSCH at CG-SDT resource within 860ms after time point TF.

During Sub-test#2, after passing Sub-test#1, UE shall not transmit PUSCH at CG-SDT resources after TF until the end of the test at time point TG.

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

## <End of Change #1>