**3GPP TSG-RAN4 Meeting #109 *R4-2321012***

Chicago, US, Nov 13 – Nov 17, 2023

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  |  | **CR** | **3946** | **rev** | **1** | **Current version:** | **17.11.0** |  |
|  |
| *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:***  | [NR\_SmallData\_INACTIVE-Perf] Formal CR to Rel-17 TS 38.133 on SDT test cases |
|  |  |
| ***Source to WG:*** | MediaTek inc. |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_SmallData\_INACTIVE-Perf |  | ***Date:*** | 02 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-17 |
|  | *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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | This is the re-submitted formal CR for the endorsed CR R4-2317398 in R4#108b:RAN5 LS (R5-235340) asks RAN4 to re-define the TS 38.133 test cases A.6.2.1 and A.7.2.1.1 for SDT by splitting the test into 2 subtests. |
|  |  |
| ***Summary of change:*** | The test is divided into two subtests, Sub-test#1 and Sub-test#2. The second subtest is only tested when the first one is passed. * In Sub-test#1, the original time points are reused with removing T5 and W1 from T4
* In Sub-test#2, the time points are repeated from Sub-test#1 with removing time point TH
* The power levels are updated accordingly for both subtests
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|  |  |
| ***Consequences if not approved:*** | RAN5 will not be able to test R17 SDT requirements. |
|  |  |
| ***Clauses affected:*** | A.6.2.1 and A.7.2.1.1 |
|  |  |
|  | **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:*** | R4-2321012 |

**----------------------START OF CHANGE 1----------------------------**

### A.6.2.1 Configured Grant based Small Data Transmissions (CG-SDT)

#### A.6.2.1.1 Test purpose and Environment

The purpose of this test is to partly verify that the UE properly perform TA validation for CG-SDT transmission in clause 5.5.3. 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 repectively. Sub-test#2 consists of two successive time periods, with time duration of T5 and T6 respectively. There is one cell, which is the active NR cell in FR1. Figure A.6.2.1.1-1 shows the variation of the RSRP over the duration of Sub-test#1, and Figure A.6.2.1.1-2 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.

After time point TG, RRC status is changed from RRC INACTIVE to RRC CONNECTED.

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 5.5.3. W3 is 860ms.



Figure A.6.2.1.1-1: RSRP variation model for CG-SDT Sub-test#1



Figure A.6.2.1.1-2: RSRP variation model for CG-SDT Sub-test#2

#### A.6.2.1.2 Test Parameters

There is one cells in the test, the FR1 PCell. The test parameters for the PCell are given in Table A.6.2.1.2-1, Table A.6.2.1.2-2, and Table A.6.2.1.2-3.

Table A.6.2.1.2-1: NR configuration for FR1 SSB

|  |  |
| --- | --- |
| Config | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 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.6.2.1.2-2 : General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| TDD Configuration |  | 1 | N/A |  |
|  |  | 2 | TDDConf.1.1 |  |
|  |  | 3 | TDDConf.2.1 |  |
| BWchannel | MHz | 1,2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| PDSCH Reference measurement channel |  | 1 | SR.1.1 FDD |  |
|  |  | 2 | SR.1.1 TDD |  |
|  |  | 3 | SR.2.1 TDD |  |
| RMSI CORESET Reference Channel |  | 1 | CR.1.1 FDD |  |
|  |  | 2 | CR.1.1 TDD |  |
|  |  | 3 | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel |  | 1 | CCR.1.1 FDD |  |
|  |  | 2 | CCR.1.1 TDD |  |
|  |  | 3 | CCR.2.1 TDD |  |
| SSB configuration |  | 1,2,3 | SSB.1 FR1 |  |
| OCNG Patterns |  | 1,2,3 | OP.1 |  |
| Initial BWP Configuration |  | 1,2,3 | DLBWP.0.1ULBWP.0.1 |  |
| Dedicated BWP configuration |  | 1,2,3 | DLBWP.1.1ULBWP.1.1 |  |
| SMTC configuration |  | 1,2,3 | SMTC.1 |  |
| DRX configuration |  | 1,2,3 | DRX.7 |  |
| T1 | s | 1,2,3 | 0.4 |  |
| T2 | s | 1,2,3 | 1.28 |  |
| T3 | s | 1,2,3 | 2.72 |  |
| T4 | s | 1,2,3 | 1.5 |  |
| T5 | s | 1,2,3 | 1.68 |  |
| T6 | s | 1,2,3 | 4.22 |  |
| cg-SDT-RSRP-ChangeThreshold | dB | 1,2,3 | 14 |  |
| cg-SDT-RSRP-ThresholdSSB | dBm | 1,2,3 | – 110dB |  |
| cg-SDT-TimeAlignmentTime |  | 1,2,3 | infinity |  |
| CG-SDT resource period | ms |  | 320 | configuredGrantConfig Peridocity at 38.331Config 1,2 : sym320x14, config 3 : sym640x14 |
| Propagation condition |  | 1,2,3 | AWGN |  |

Table A.6.2.1.2-3: SSB specific test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 |
|  |  |  | T1 | T2 | T3 | T4 | T5 | T6 |
|  | 1,2,3 | dBm/15kHz | -100 |
|  | 1,2 | dBm/SSB SCS | -100 |
| 3 | dBm/SSB SCS | -97 |
|  | 1,2,3 | dB | 0 | 8 | 0 | 18 | 18 | 0 |
| SS RSRP | 1,2,3 | dBm/SSB SCS | -100 | -92 | -100 | -82 | -82 | -100 |
| Io  | 1,2 | dBm/9.36MHz | -69.04 | [-63.41] | -69.04 | [-53.98] | [-53.98] | [-69.04] |
| 3 | dBm/38.16MHz | [-62.93] | [-57.31] | [-62.93] | [-47.88] | [-47.88] | [-62.93] |
|  | 1,2,3 | dB | 0 | 8 | 0 | [18] | [18] | [0] |

#### A.6.2.1.3 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%.

**----------------------END OF CHANGES 1----------------------------**

**----------------------START OF CHANGE 2----------------------------**

### A.7.2.1 Small Data Transmission

#### A.7.2.1.1 TA validation for CG-SDT in FR2

##### A.7.2.1.1.1 Test Purpose and Environment

The purpose of this test is to partly verify that the UE properly perform TA validation for CG-SDT transmission in clause 5.5.3. 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 repectively. Sub-test#2 consists of two successive time periods, with time duration of T5 and T6 repectively. There is one cell, which is the active NR cell in FR2. Figure A.7.2.1.1.1-1 shows the variation of the RSRP over the duration of Sub-test#1, and Figure A.7.2.1.1.1-2 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.

After time point TG, RRC status is changed from RRC INACTIVE to RRC CONNECTED.

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 480ms and W2 equals to 480ms based on requirements in clause 5.5.3. W3 is 1060ms.

Supported test configurations are shown in table A.7.2.1.1.1-1. The test parameters are given in Tables A.7.2.1.1.1-2 and A.7.2.1.1.1-3.

Table A.7.2.1.1.1-1: Supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

Table A.7.2.1.1.1-2: General test parameters for TA validation for CG-SDT in FR2

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
|  |  | Test 1 |
| Active PCell |  | Cell 1 |
| RF Channel Number |  | 1 |
| Duplex mode | Config 1 |  | TDD |
| BWchannel | Config 1 | MHz | 100: NRB,c = 66 |
| DL initial BWP configuration | Config 1 |  | DLBWP.0.1 |
| UL initial BWP configuration | Config 1 |  | ULBWP.0.1 |
| TDD Configuration | Config 1 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 DD |
| SSB Configuration | Config 1 |  | SSB.1 FR2 |
| SMTC Configuration | Config 1 |  | SMTC.X |
| PDSCH/PDCCH subcarrier spacing | Config 1 |  | 120 kHz |
| PRACH Configuration  | Config 1 |  | Table A.3.8.3.4 |
| OCNG parameters |  | OP.5 |
| CP length  |  | Normal |
| Correlation Matrix and Antenna Configuration |  | 2x2 Low |
| DRX | s | 0.64 |
| cg-SDT-RSRP-ThresholdSSB | dBm | -110 |
| cg-SDT-RSRP-ChangeThreshold | dB | 8 |
| cg-SDT-TimeAlignmentTime |  | infinity |
| CG-SDT resource period | ms | 320 |
| T1 | s | 0.8 |
| T2 | s | 0.96 |
| T3 | s | 3.04 |
| T4 | s | 1.54 |
| T5 | s | 1.76 |
| T6 | s | 4.58 |

Table A.7.2.1.1.1-3: Cell specific test parameters TA validation for CG-SDT in FR2

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
|  | T1 | T2 | T3 | T4 | T5 | T6 |
| AoA setup |  | Setup 1 defined in A.3.15 |
| Assumption for UE beams Note 4 |  | Rough |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | dB | 0 |
| EPRE ratio of PBCH to PBCH DMRS | dB |
| EPRE ratio of PSS to SSS | dB |
| EPRE ratio of PDSCH DMRS to SSS  | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | dB |
| EPRE ratio of OCNG DMRS to SSS | dB |
| EPRE ratio of OCNG to OCNG DMRS | dB |
|  | Config 1 | dBm/15kHz | -100 |
|  | Config 1 | dBm/SCS | -100 |
|  | Config 1 | dB | 0 | 13 | 0 | 24.5 | 24.5 | 0 |
|  | Config 1 | dB | 0 | 13 | 0 | 24.5 | 24.5 | 0 |
| SS-RSRP | Config 1 | dBm/SCS | -100 | -87 | -100 | -75.5 | -75.5 | -100 |
| Io | Config 1 | dBm/95.04 MHz | -68 | -57.8 | -68 | -46.50 | -46.50 | -68 |
| Propagation condition |  | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 4: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. |



Figure A.7.2.1.1.1-1: RSRP variation for TA validation for CG-SDT Sub-test#1



Figure A.7.2.1.1.1-2: RSRP variation for TA validation for CG-SDT Sub-test#2

##### A.7.2.1.1.2 Test Requirements

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

During Sub-test#1, UE shall transmit UL data with CG-SDT within 1060ms after time point TF.

During Sub-test#2, after passing Sub-test#1, UE shall not transmit UL data with CG-SDT.

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

**----------------------END OF CHANGES 2----------------------------**