**3GPP TSG-RAN WG4 Meeting # 105 R4-22XXXXX**

**Toulouse, France, November 14th – November 18th , 2022**

**Agenda item:** 6.8.3

**Source:** Moderator (MediaTek)

**Title:** Topic summary for [105][213] NR\_SmallData\_INACTIVE

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this summary (e.g. list of treated agenda items).*

*List of candidate target of discussions for this topic.*

* 1st round: Consensus on the time points and power setting for the RRM test cases
* 2nd round: Update the CRs on test cases

# Topic #1: Title

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2218538**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_105/Docs/R4-2218538.zip) | Qualcomm Incorporated | draftCR Cat-F: Update detail timeline description for FR1 CG-SDT test case. |
| [**R4-2218539**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_105/Docs/R4-2218539.zip) | Qualcomm Incorporated | Proposal: General parameter designs• Start RSRP level is -100dBm. Lowest SNR is 0dB.• DRX cycle 640ms is configured during RRC Inactive states.• SMTC periodicity =20ms, TAT infinity • 8dB Cg-SDT threshold is configured based on -91.65dBm reference RSRP.• CG-SDT periodicity = 640msModerator: parameters’ value can be discussed directly in the draftCR after concluding the time points Proposal: During T\_delaymodeB, there can be multiple CG-SDT occasions and UE will skip the occasions. Proposal: timeline description• After 640ms (T1) from the first power changes from -100 to -91.65dbm, UE receive RRC release message with CG-SDT configuration at time point A.• After 640ms (T2) from time point A, RSRP is dropped to -100 from -91.65 dBm at time point B.• After 1.28s (T3) from time point B, RSRP is changed to -86.75 from -100 dBm.• (Invisible parameter) after 2.6s from time pointA, UL data is triggered• After 1.28s (T4) from time point C, PUSCH is transmitted at time point D.o (note : Second measurement window can start as far as 1.28second from CG-SDT occasion. Thus, RSRP change starts 1.28second prior to CG-SDT occasion)• After 0.3s (T5) from time point D (or 3.5s from time pointA), UE receive RRC release message with suspend config to indicate the first CG-SDT session is closed. RSRP is changed to -81.65 from -86.75 dBm. • (Invisible parameter) after 0.1s from RRC release message, UL data is triggered• No PUSCH transmission after time point E.Moderator: parameters’ value can be discussed directly in the draftCR after concluding the time points  |
| [**R4-2219441**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_105/Docs/R4-2219441.zip) | ZTE Corporation | Proposal 1: From the expiry of the timer T\_delay+modeB, we can derive TF. Further more, this issue would not have any impact on the spec.Proposal 2: Time point TF’ is necessary so as to verify the RSRP2 measurement validation.Proposal 3: Regarding to how to derive TG, it should not exceed TF+W2+640ms, which is aligned with our agreements in core part.Proposal 4: Regarding to how to derive TG, it should not exceed TF+W2+640ms, which is aligned with our agreements in core part.Proposal 5: With respect to the time relation between RRC release with CG configuration and T\_delay\_modeB timer staring, we believe as long as RRC release with CG configuration is not later than T\_delay\_modeB timer staring is enough. For simplicity, they can share a same time point.Proposal 6: Regarding to the time point of SDT data distribution by TE, it should be not later than the RRC\_release command. For simplicity, RRC release with CG configuration, T\_delay\_modeB timer starting, and the SDT data distribution can share a same time point.Proposal 7: About the 2nd UL data generation, there are two options as follows. However no matter which one, not any impact to the subsequent steps.Option 1: Waiting for LS reply from RAN5, if the answer is positive, it is not necessary for 2nd UL data generation. TE can send two or multiple CG-SDT packets during the 1st UL data generation in the 1st sub step.Option 2: Waiting for LS reply from RAN5, if the answer is negative, make use of the retransmission of the 1st CG-SDT.Proposal 8: From the perspective of test itself, not need CG-SDT re-configuration; Otherwise, so as to comply with the RRC assumption of RRC\_INACTIVE, a suspend configuration should be along with the RRC release, i.e. a CG-SDT configuration can be indicated along with the RRC release.Proposal 9: A basic assumption can be: If the test is under AWGN, then RSRP1 measurement in 2nd sub step can be ignored; otherwise, it can not be ignored.Proposal 10: Within the already approved big CR, AWGN is assumed as the propagation condition. So it is preferred that the RSRP1 measurement in 2nd sub step can be ignored.Proposal 11: if RSRP1 measurement can not be ignored, then the RSRP1 measurement validation should also be verified similar as that in 1st sub step, i.e. TE should set transmission power as P3’ at the start and end of RSRP1 measurement window.Proposal 12: Regarding to how to derived TK, it should not exceed TJ+W2+640ms.Proposal 13: So for both RSRP1 and RSRP2 measurement, the test validity are needed.Proposal 14: So as to verify the RSRP1/RSRP2 measurement validation, the restriction between TE transmit power of  , ,[], can be identified.Proposal 15: Based on the agreements achieved in core part, not need to consider test case for UL Transmit timing verification for CG-SDT in INACTIVE. |
| [**R4-2219546**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_105/Docs/R4-2219546.zip) | Huawei, HiSilicon | Proposal 1a: TF is derived as TF’ – W2, where TF’ = TC + T\_delay\_modeB is the time of data arrival for the first UL data.Proposal 1b: TJ is derived as TJ’ – W2, where TJ’ = FFS (pending on RAN5 reply) is the time of data arrival for the second UL data.Proposal 2: TG should be within TF’ + 640ms + Z and TK should be within TJ’ + 640ms + Z, where Z is the margin for UE internal processing and measurement. Proposal 3: Adopt the following restrictions between power levels.* P0 = P2 = P5 (denoted as Plow)
* P1 = P3 (denoted as Phigh)
* P4 is in between P3 and P5 (denoted as Pmiddle)
* Phigh – Plow is ≥ RSRP change threshold plus margin (for measurement inaccuracy)
* Pmiddle is the middle point of Phigh and Plow

Proposal 4: Adopt Figure 1 for the SDT RRM test design.Proposal 5: UE is supposed to update RSRP1 after receiving the second RRCRelease.Proposal 6: If RAN5 concludes that triggering second UL data is not feasible or requires too much efforts, RAN4 to split the two sub-tests into two separate test cases.Proposal 7: The second RRCRelease is sent to UE during the DL subsequent transmission after the first CG-SDT transmission.**Figure 1: timeline and power setup for SDT RRM tests** |
| [**R4-2219547**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_105/Docs/R4-2219547.zip) | Huawei, HiSilicon | draftCR Cat-F: Add detailed setup for SDT RRM test in FR2. |
| [**R4-2219738**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_105/Docs/R4-2219738.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: Only configure 1 ConfiguredGrantConfig at a time not to potentially conflict with UE capabilities.Proposal 2: Use the timeDomainOffset of individual ConfiguredGrantConfig’s to allow multiple test iterations of CG-SDT while in test mode, one ConfiguredGrantConfig at a time.Proposal 3: Configure CG-SDT occasion with ConfiguredGrantConfig’s where the PUSCH for each fits the data of the test mode command.Moderator: moderator believes Proposal 2 and 3 are belong to RAN5 discussion.Proposal 4: Testing TA validation must include both testing RSRP measurements are performed within the specified time windows of TS 38.133 and that the value comparison of RSRP measurements for TA validation is valid.Proposal 5: Testing of TA validation for CG-SDT transmission in RRC\_INACTIVE state with RA\_SDT not configured should only cover the following two cases:Proposal 6: Define CG-SDT test cases which test the validity of both RSRP1 and RSRP2 measurements by checking whether the measurements are taken outside (both before and after) the correct measurement window or not.Proposal 7: For testing the validity of RSRP1 and RSRP2 propose to define the following different power levels Pout1,Pin1,Pout2,Pout3,Pin2, which are explained below.Proposal 8: Define TA validation test cases such that if the UE measures RSRP outside the measurement window, the tests will fail.Proposal 9: Define test case where the test procedure is configured with the appropriate values of the power levels Pout1, Pin1,Pout2,Pout3, and Pin2.If the UE measures RSRP1/RSRP2 or both in the incorrect measurement window, it is possible to identify that window by appropriately setting the values of Pout1,Pin1,Pout2,Pout3, and Pin2. This testing feature can help in debugging.Proposal 10: Considering valid TA (Condition A), design the test such that each test run will have multiple iterations, and the parameters in each iteration are set so that  Pout1- Pin1 or  Pout2- Pin1 or  Pout3- Pin1 > cg-SDT-ChangeThreshold (only one out of the above three conditions is met).Proposal 11: Considering valid TA (Condition A), if the UE’s both RSRP1 and RSRP2 measurements are taken outside the correct windows as specified in TS 38.133, the values of Pout1, Pout2, Pout3 must be selected for testing Condition A such thata.  Pout3- Pout2> cg-SDT-ChangeThresholdb.  Pout3- Pout1> cg-SDT-ChangeThresholdProposal 12: As the UE in RRC\_INACTIVE state measures RSRP once in every DRX cycle, the time-lengths of the Pout1, Pout2, Pout3 windows can be defined as follows:$T\_{out1} \geq 1280 ms$**,** $T\_{out2} \geq 2⋅T\_{DRX}$**, and** $T\_{out3} \geq 2⋅T\_{DRX}$where, $T\_{out1}$, $T\_{out2}$ and $T\_{out3}$ are the time-lengths of $P\_{out1}, P\_{out2}, and P\_{out3}$ windows, respectively.Moderator: moderator believes Proposal 10, 11, 12 can be discussed directly in the draftCRs.Proposal 13: Each test case should have multiple iterations with parameter variation and at least vary Pin1, Pin2, Pout1, Pout2, Pout3, SDT-ChangeThreshold and T\_delay\_modeB/CG-SDT resource time.Proposal 14: Define test cases for verification of UL Transmit timing in RRC inactive for SDT operation. |
| [**R4-2219918**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_105/Docs/R4-2219918.zip) | MediaTek inc. | Proposal 1: Since TE does not know the exact time of UE actions (e.g., when UE measures RSRPs), the test can depend on the RSRP change criteria condition to guarantee the success and failure of CG-SDT transmission in sub-tets#1 and sub-test#2, respectively.Proposal 2: Time points (without considering the validity of the RSRPs):* + TA - start of the test and start of RSRP1 window W1,
		- TE set power to P0 to verify success TA validation
	+ TC - RRC release message with CG-SDT configuration, UE goes to RRC inactive
		- TC = TA + W1/2
	+ TD - end of RSRP1 measurement window
		- TD = TC + W1/2
	+ TF - start of RSRP2 window
		- TF = TC + T\_delay\_modeB + Z ms, Z is margin for processing and measurement.
	+ TG - CG-SDT occasion
		- TG should not exceed TF+W2+640ms
	+ TH - RRC release message without CG-SDT configuration
		- TE set power to P1 to verify fail TA validation (P1> P0+ RSRP\_threshold)
	+ TJ - start of RSRP2 window limit
		- TJ = TH + [X], where X will depend on the reply LS from RAN5 on how to trigger the second SDT session.
	+ TK - CG-SDT occasion
		- TK should not exceed TJ+W2+640ms

Proposal 3: Align RAN4 understanding with RAN2 on the following: RRC release message is sent at the end of SDT session, regardless of whether another SDT session is followed.Proposal 4: For the sake of reducing test duration, it is proposed that CG-SDT configuration should not be included in the second RRC release message since UE can reuse CG-SDT configuration received from the first RRC release message, and RSRP1 measurement can be skipped in the second sub-test.Proposal 5: If the validity of RSRP measurements for CG-SDT to be tested, then testing the validity of one of them (e.g., RSRP1) should be sufficient. |

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

*In the last meeting, RAN4 agreed on the time points for the test cases as captured below. This agreement can be used as baseline for further discussion in the following sub-topics.*

|  |
| --- |
| * Agree on the following time points defined for the tests:
* **Time points**
	+ TA - start of test, TE set power to [P0]
	+ TB - start of RSRP1 window **set power to [P1]**
		- A different power after TB, so as to verify if old measurement was used for TA validation in the first CG-SDT transmission; and TB>=serving cell measurement period+TA
	+ TC - RRC release message with CG-SDT configuration, UE goes to RRC innactive
	+ TD - end of RSRP1 measurement window, **TE set power to [P2]**

(Note: P2 is to verify measurement window, TD = TC + min(640ms, M1\*TDRX) for FR1, TC + max(480ms, 8\*SMTC periodicity) for FR2)* + TF - start of RSRP2 window, **TE set power to [P3]**
		- (Note : TF = TC + T\_delay\_modeB + Z ms, Z is margin for processing and measurement, TF>=serving cell measurement period+TD)
		- Assumption is that T\_delay\_modeB starts at TC, this can be further revisited
		- Further discussion on determination of TF
			* Inferred from the actual CG-SDT transmission
			* Inferred from UL data arrival or expiry of the timer T\_delay\_modeB
		- A different power after TF, such that TA validation passes for RSRP1 measured between TB and TD, and RSRP2 measured between TF and TG
	+ TG - CG-SDT occasion
		- FFS whether TG should not exceed TF+W2+640ms
	+ TH - RRC release
		- FFS if power needs to be set before or after TH for RSRP1 measurement window

(Note: P2 is to verify fail TA validation)* + TH’ - end of RSRP1 measurement window, **TE set power to [P4]**
	+ TJ - start of RSRP2 window limit, **TE set power to [P5]; TJ >=serving cell measurement period+TH’**
		- A different power is needed after TJ, such that TA validation does not pass for RSRP1 measured between TH-RSRP1 window and TH’, and RSRP2 measured between TJ and TK
		- Further discussion on determination of TJ
			* Inferred from the actual CG-SDT transmission
			* Inferred from UL data arrival or expiry of the timer T\_delay\_modeB or UL data periodicity
	+ TK - CG-SDT occasion
		- FFS how to determine TK when UE is not expected to transmit CG-SDT
		- FFS whether TK should not exceed TJ+W2+640ms
* FFS the following consideration and FFS whether it may further impact on the time points definition
	+ second RRCRelease
		- CG-SDT configuration should be contained
			* If CG-SDT configuration is contained, it means the second RSRP1 measurement should be included in the test
			* If CG-SDT configuration is not included and the old CG-SDT configuration is not released, it means the second RSRP1 measurement should be skipped in the test.
		- A new RSRP1 measurement is needed for the second sub-testcase
	+ second UL data trigger
	+ Whether or not to test the validity of RSRP2
* FFS: the details or restrictions on the duration between time points, power level settings and thresholds, relationship to measurement windows (e.g., start of measurement windows), and test steps based on these time points
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### Sub-topic 1-1: Time points

*Sub-topic description: discuss the time points of the test cases using the previous agreement (above) as a baseline.*

*Open issues and candidate options before f2f meeting:*

**Issue 1-1-1: On time point TC:**

* Proposals
	+ Option 1: For simplicity, RRC release with CG configuration, T\_delay\_modeB timer starting, and the SDT data distribution can share a same time point. (ZTE)
	+ Option2: others
* Recommended WF
	+ TBA

**Issue 1-1-2: On time point TF:**

* Proposals
	+ Option 1: TF= TF’ – W2, where TF’ = TC + T\_delay\_modeB is the time of data arrival for the first UL data. (HW)
	+ Option 2: TF can be derived from T\_delay\_modeB (ZTE)
	+ Option 3: TF starts at most 2\*W2 before CG-SDT transmission at TG. (QC)
* Recommended WF
	+ TBA

**Issue 1-1-3: New time point TF’**

* Proposals
	+ Option 1: TF’ = TC + T\_delay\_modeB (HW)
	+ Option 2: Time point TF’ is necessary so as to verify the RSRP2 measurement validation (ZTE)
* Recommended WF
	+ TBA

**Issue 1-1-4: On time point TG:**

* Proposals
	+ Option 1: TG should be within TF’ + 640ms + Z, where Z is the margin for UE internal processing and measurement. (HW)
	+ Option2: TG should not exceed TF+W2+640ms, which is aligned with our agreements in core part. (ZTE)
* Recommended WF
	+ TBA

**Issue 1-1-5: On time point TJ:**

* Proposals
	+ Option 1: TJ = TJ’ – W2, where TJ’ = FFS (pending on RAN5 reply) is the time of data arrival for the second UL data. (HW)
	+ Option 2: TJ is at most 2\*W2 before 2nd CG-SDT occasion at TK. (QC)
* Recommended WF
	+ TBA

**Issue 1-1-6: On time point TK:**

* Proposals
	+ Option 1: TK should be within TJ’ + 640ms + Z, where Z is the margin for UE internal processing and measurement. (HW)
	+ Option2: TK should not exceed TJ+W2+640ms. (ZTE)
	+ Option3: TK is based on CG-SDT periodicity and offset from TH
* Recommended WF
	+ TBA

**Issue 1-1-7: Do you agree to the following: during T\_delaymodeB, there can be multiple CG-SDT occasions and UE will skip the occasions?**

* Proposals
	+ Option 1: Yes (QC)
	+ Option 2: No
* Recommended WF
	+ TBA

**Issue 1-1-8: On the 2nd UL data generation**

* Proposals
	+ Option 1: Waiting for LS reply from RAN5, if the answer is positive, it is not necessary for 2nd UL data generation. TE can send two or multiple CG-SDT packets during the 1st UL data generation in the 1st sub step. (ZTE)
	+ Option 2: Waiting for LS reply from RAN5, if the answer is negative, make use of the retransmission of the 1st CG-SDT. (ZTE)
	+ Option 3: If RAN5 concludes that triggering second UL data is not feasible or requires too much efforts, RAN4 to split the two sub-tests into two separate test cases. (HW)
* Recommended WF
	+ TBA

**Issue 1-1-9: Whether CG-SDT configuration should be contained in the second RRC release?**

* Proposals
	+ Option 1: Yes (HW)
		- A new RSRP1 measurement is needed for the second sub-testcase
	+ Option 2: No (ZTE, MTK, Nokia, QC)
		- If CG-SDT configuration is not included and the old CG-SDT configuration is not released, it means the second RSRP1 measurement should be skipped in the test.
* Recommended WF
	+ TBA

**Issue 1-1-10: Whether to test the validity of RSRP2?**

* Proposals
	+ Option 1: Yes (ZTE, Nokia)
	+ Option 2: No (MTK)
* Recommended WF
	+ TBA

**Issue 1-1-11: whether to test the validity of RSRP1 if RSRP1 measurement can not be ignored in the second sub-test?**

* Proposals
	+ Option 1: Yes (ZTE)
	+ Option 2: No
* Recommended WF
	+ Wait to conclude the issue regarding whether RSRP1 of the second sub-test can be skipped or not in Issue 1-1-9.

**Issue 1-1-12: The second RRC\_Release should be triggered by:**

* Proposals:
	+ Option 1: subsequent DL transmission from TE to UE (HW)
	+ Option 2: align RAN4 understanding with RAN2 on the following: RRC release message is sent at the end of SDT session, regardless of whether another SDT session is followed. (MTK, QC)
		- Option 2a : Second RRC release at the end of SDT session can be preconfigured based on certain time period from the first RRC release with CG-SDT configuration (e.g, X sec from first RRC release)
	+ Option 3: others, please elaborate
* Recommended WF
	+ TBA

**Issue 1-1-13: Testing of TA validation for CG-SDT transmission in RRC\_INACTIVE state with RA\_SDT not configured should only cover the following two cases:**

* Proposals:
	+ Option 1: (Nokia)
		- Case I: Valid TA resulting in CG-SDT transmission.
		- Case II: Invalid TA resulting in non-SDT transmission.
	+ Option 3: others, please elaborate
* Recommended WF
	+ TBA

### Sub-topic 1-2: Power levels

*Sub-topic description: discuss the power settings for the time pints of the test cases.*

*Open issues and candidate options before f2f meeting:*

**Issue 1-2-1: Discuss the power levels of the test cases based on the following options with their corresponding figures**

* Proposals
	+ Option 1: three power levels, where: (HW)
		- P0 = P2 = P5 (denoted as Plow)
		- P1 = P3 (denoted as Phigh)
		- P4 is in between P3 and P5 (denoted as Pmiddle)
		- Phigh – Plow is ≥ RSRP change threshold plus margin (for measurement inaccuracy)
		- Pmiddle is the middle point of Phigh and Plow



* + Option 2: four power levels (QC)



* + Option 3: five power levels, where: (Nokia)
		- $P\_{in1}$: It is the transmit power at the test equipment inside the RSRP1 measurement window
		- $P\_{in2}$: It is the transmit power at the test equipment while the UE is in RRC inactive mode inside the RSRP2 measurement window
		- $P\_{out1}$: It is the transmit power at the test equipment prior to the RSRP1 measurement window
		- $P\_{out2}$: It is the transmit power at the test equipment after the RSRP1 measurement window
		- $P\_{out3}$: It is the transmitted power at the test equipment while the UE is in RRC inactive mode prior to the RSRP2 measurement window



* + Option 4: same as Option 3 but with [$P\_{out2}$] in bracket.
* Recommended WF
	+ TBA

**Issue 1-2-2: Do you agree on each test case should have multiple iterations with parameter variation and at least vary Pin1, Pin2, Pout1, Pout2, Pout3, SDT-ChangeThreshold and T\_delay\_modeB/CG-SDT resource time?**

Proposals

* + Option 1: Yes (Nokia)
	+ Option 2: No
* Recommended WF
	+ TBA

**Issue 1-2-3 Define TA validation test cases such that if the UE measures RSRP outside the measurement window, the tests will fail.**

Proposals

* + Option 1: Yes (Nokia)
	+ Option 2: No
* Recommended WF
	+ TBA

### Sub-topic 1-3: CG-SDT configuration

*Sub-topic description: discuss the time points of the test cases using the previous agreement (above) as a baseline.*

*Open issues and candidate options before f2f meeting:*

**Issue 1-3-1: CG-SDT configuration:**

* Proposals:
	+ Proposal 1: Only configure 1 ConfiguredGrantConfig at a time not to potentially conflict with UE capabilities.
	+ Proposal 2: Use the timeDomainOffset of individual ConfiguredGrantConfig’s to allow multiple test iterations of CG-SDT while in test mode, one ConfiguredGrantConfig at a time.
	+ Proposal 3: Configure CG-SDT occasion with ConfiguredGrantConfig’s where the PUSCH for each fits the data of the test mode command.
* Recommended WF
	+ TBA

### Sub-topic 1-4 Time requirements

*Sub-topic description: discuss the verification of time requirements of the test cases.*

*Open issues and candidate options before f2f meeting:*

**Issue 1-4-3: Do you agree to define test cases for verification of UL Transmit timing in RRC inactive for SDT operation?**

* Proposals
	+ Option 1: Yes (Nokia)
	+ Option 2: No (ZTE)
* Recommended WF
	+ TBA