**3GPP TSG RAN WG1 Meeting #107-e R1-210xxxx**

**e-Meeting, November 11th-19th, 2021**

**Agenda Item: 8.13.2**

**Source: Moderator (Huawei)**

**Title: [Draft] Summary#1 of LS on triggering signaling of temporary RS**

**Document for: Discussion and Decision**

# Introduction

A LS to RAN2 was agreed as below,

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| Agreement* Provide the functionality to be fulfilled, as well as the status about the understanding on Alt 1 and Alt 2, which could be provided by examples (including respective possible RRC parameters, if agreed, required by Alt 1 and Alt 2) to facilitate RAN2’ understanding.
* Send LS to ask RAN2 to consider the following alternatives and finalize the MAC-CE or RRC signalling design, including parameters.
* RAN1 only needs to focus on RRC parameters examples, if needed.
* ~~List of RAN1 endorsed RRC parameters for this issue will not be sent to RAN2~~

Alt 1: Bitmap approach in MAC-CE * Every Z-bit block in the bitmap corresponds to a SCell, Z>=0
* A Z-bit block indicates the temporary RS [configuration index], and a value zero indicated by the bit block means no RS resource transmitted.
* The to-be-activated SCell is indicated via the C values in the legacy SCell activation/de-activation MAC CE or in the new MAC-CE

Alt 2: Reuse A-TRS triggering framework* A trigger state is indicated by the MAC-CE explicitly
* The association between a trigger state and temporary RS for one or multiple SCells is configured by RRC according Rel-16 A-TRS triggering framework
* FFS: The value zero of the MAC-CE indication means no temporary RS is triggered by the MAC-CE for all to-be-activated SCells
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A LS to RAN1 was agreed in RAN2 R2-2111413,

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| 1 Overall descriptionRAN2 discussed the TRS based SCell activation and mad the following agreements.**1: For TRS based SCell activation, RAN2 finalizes the MAC CE based SCell activation case first and come back on RRC case if time allows.****2: The TRS can be activated for fast SCell activation, only when all following conditions are met:****(a) The TRS for SCell activation is configured for this SCell;****(b) The SCell is activated from deactivated state by New SCell A/D MAC CE;****(c) The BWP indicated by firstActiveDownlinkBWP-Id is not dormant BWP;****FFS how we handle the case when some Scells use TRS and some don't****RAN2 will not specify UE behaviour for the case when new MAC CE is used but a)+c) are not fulfilled for the SCell that uses TRS****3: One new MAC CE for to trigger both SCell activation and corresponding temporary RS.****4: Define 2 eLCIDs for new MAC CEs with “one octet” SCell activation indication and with “four octet” SCell activation indication respectively.****Wait for RAN1 input on RRC parameters and capabilities**RAN2 also discussed the design of new MAC CE for TRS activation, including the alternative of using per-SCell TRS configuration index and the alternative of using per cell group TRS trigger state id and would like to ask RAN1 to provide feedbacks for the following questions to help RAN2 to progress further.For Alt1 (include per SCell TRS configuration index in MAC CE):**Q1: What is the maximum number of TRS configurations supported per SCell? Is there a difference for FR1 and for FR2?**For Alt2 (include per cell group TRS trigger state id in MAC CE)**Q2: What is the maximum number of TRS trigger states (where a "trigger state" indicates a set of TRS used for activation of a set of SCell(s)) supported per cell group? Is there a difference for FR1 and for FR2?**2 Actions**To RAN1:**1. RAN2 respectfully asks RAN1 to take into account the above RAN2 agreements, provide answers for the questions of Q1 and Q2.
2. RAN2 respectfully asks RAN1 to provide a list of RRC parameters.

**To RAN4:**RAN2 respectfully asks RAN4 to take into account the above RAN2 agreements in RAN4 work. |

# Discussions

## Draft Text for LS

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| **1. Overall Description:**Regarding the triggering signalling of temporary RS for SCell activation, RAN1 has reached the following agreements,

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| **Agreement**For efficient activation of SCells* Option 1a: MAC CE(s) contained in a single PDSCH to trigger both SCell activation and corresponding temporary RS(s)
	+ Details FFS including timeline design for receiving temporary RS

Note: Separate from the support of Option 1a, it is up to RAN4 whether or not to consider an activation time enhancement for Option 2 without requiring further RAN1 work* Option 2: A Rel-15/16 SCell activation MAC-CE to trigger SCell activation and a Rel-15/16 DCI to trigger corresponding Rel-15/16 A-TRS(s)

Send an LS to RAN4. The LS is endorsed in R1-2104110.Agreement To trigger temporary RS, * MAC-CE at least provides the following information:
	+ temporary RSs are to be triggered on X out of Y (Y≥X) to-be-activated SCells, respectively, while no temporary RS is to be triggered on the other to-be-activated SCells.
* The following information can be provided by RRC for temporary RS for each SCell
	+ The number of RS bursts and the gap length between the RS bursts (Opt 2.3.3)
	+ Triggering offset of temporary RS (Opt 2.3.4)
		- ~~Triggering offset can be provided, e.g., by reusing existing CSI-RS framework~~
	+ QCL information (Opt 2.3.5)
		- ~~Triggering QCL information can be provided, e.g., by reusing existing CSI-RS framework~~
	+ ~~A unique temporary RS configuration index~~
	+ FFS: the maximum number of temporary RS per cell/per UE

Note: Reusing A-TRS triggering framework is not precluded.* Information for 0, 1, or more temporary RS can be provided for each configured SCell

Agreement* Provide the functionality to be fulfilled, as well as the status about the understanding on Alt 1 and Alt 2, which could be provided by examples (including respective possible RRC parameters, if agreed, required by Alt 1 and Alt 2) to facilitate RAN2’ understanding.
* Send LS to ask RAN2 to consider the following alternatives and finalize the MAC-CE or RRC signalling design, including parameters.
* RAN1 only needs to focus on RRC parameters examples, if needed.
* ~~List of RAN1 endorsed RRC parameters for this issue will not be sent to RAN2~~

Alt 1: Bitmap approach in MAC-CE * Every Z-bit block in the bitmap corresponds to a SCell, Z>=0
* A Z-bit block indicates the temporary RS [configuration index], and a value zero indicated by the bit block means no RS resource transmitted.
* The to-be-activated SCell is indicated via the C values in the legacy SCell activation/de-activation MAC CE or in the new MAC-CE

Alt 2: Reuse A-TRS triggering framework* A trigger state is indicated by the MAC-CE explicitly
* The association between a trigger state and temporary RS for one or multiple SCells is configured by RRC according Rel-16 A-TRS triggering framework
* FFS: The value zero of the MAC-CE indication means no temporary RS is triggered by the MAC-CE for all to-be-activated SCells

AgreementThe detailed signaling structure of the triggering MAC-CE(s) including the down-selection between the following options is left to RAN2 to decide:* Opt. 1: One new MAC CE for both SCell activation triggering and corresponding temporary RS triggering
* Opt. 2: One R15/16 SCell activation MAC CE for SCell activation triggering and one new MAC CE (in the same PDSCH) for corresponding temporary RS triggering

AgreementIf two temporary RS bursts are configured, both bursts share the same antenna port index, OFDM symbol location and PRB location of CSI-RS resources in a slot or CSI-RS resources in two consecutive slots.**Agreement***The max number of NZP CSI-RS resource set configurations for temporary RS per serving cell is the same as current maxNrofNZP-CSI-RS-ResourceSetsPerConfig.***Agreement***For efficient SCell activation with assistance of temporary RS, a ~~SSB~~ P-TRS of the to-be-activated SCell is to be configured as a QCL source for the temporary RS in case of known SCell same as existing specification.** *Note: a SSB of the to-be-activated SCell is a QCL source for the P-TRS per existing specification*
* *Note: It is RAN1 understanding that Scell activation latency can be reduced compared to Rel-16 even when P-TRS is configured as QCL source for the temporary RS in case of known SCell*

***Agreement****For both Alt 1 and Alt 2 of temporary RS triggering,** *For Alt 1, the gap between temporary RS bursts is explicitly configured.*
* *A set of possible gap lengths from which the triggering MAC-CE can indicate one from RAN1 perspective. Up to RAN2 to decide details.*
* *For Alt 2, a gap length is configured by RRC for each temporary RS having two bursts. For different temporary RS, the value of the gap length can be different based on RRC configuration.*
* *the number of bursts is up to 2. It can be either explicitly configured, or implicitly indicated by the gap configuration ((Up to RAN2 to decide one)*

 ***Agreement****For Alt 2 of temporary RS triggering, to avoid potential impact on the existing CSI-AperiodicTriggerStateList, a separate trigger-state list is used.** *Note: it does not imply that Alt 2 has been selected by RAN2.*

 ***Agreement****For the RRC and MAC-CE designs of temporary RS triggering (both Alt1 and Alt2), from functionality perspective, the max number of to-be-activated SCells should be 15, irrespective of triggered number of temporary RS bursts per cell.*·        *Note: UE capability for the max number of to-be-activated SCells with 2-burst temporary RS is not precluded.* |

Both alternatives above, i.e. Alt 1 and Alt 2 are different in term of MAC-CE design and requires different RRC signalling. Because RAN1 has no consensus on which alternative can result in a better signaling design, RAN1 did not further select one from them and thus respectfully requests RAN2 to consider the two alternatives and finalize the design of MAC-CE and RRC signalling. RAN1 has no intention to support both alternatives.To facilitate the RAN2 discussion on RRC signalling required for either alternative, two example sets of RRC parameters are provided, respectively, as attachment. It is up to RAN2 to finalize the RRC signaling design. Regarding the questions in R2-2111413, RAN1 answers are provided by those two example sets of RRC parameters, i.e. row#2 ~ 4 of sheet Alt1 and row#2 ~ 3 in sheet Alt2.**2. Actions:****To:** RAN2**ACTION:** RAN1 respectfully requests RAN2 to consider the two alternatives above, i.e. Alt 1 and Alt 2, and finalize the design of MAC-CE and RRC signalling. |

Comments are welcome.

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| MTK | We are generally fine with the moderator proposed reply LS and RRC excel file (v010). For the reply of Q1 & Q2, we suggest to directly calculate out the number instead of instructing RAN2 to refer to the excel file only. This may assist RAN2 to avoid confusion when reading the excel file and also better align companies’ understanding in RAN1. For example:**Q1: For Alt1, what is the maximum number of TRS configurations supported per SCell? Is there a difference for FR1 and for FR2?****Ans**: RAN1 answer is provided by example set of RRC parameters row #2 ~ 4 of sheet Alt1, i.e., maximum number of TRS configurations supported per SCell is [*maxNrofCSI-ResourceConfigurations* = 112]. There is no difference for FR1 and FR2.**Q2: For Alt2, what is the maximum number of TRS trigger states (where a "trigger state" indicates a set of TRS used for activation of a set of SCell(s)) supported per cell group? Is there a difference for FR1 and for FR2?****Ans**: RAN1 answer is provided by example set of RRC parameters row #2 ~ 3 in sheet Alt2, i.e., maximum number of TRS trigger states supported per cell group is [15\**maxNrOfCSI-temporaryTriggers* = 15\*128 = 1920]. There is no difference for FR1 and FR2.MTK Note: The numbers in [ ] may not be correctly captured and need further check. |
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## Other Issues

Issues or comments that do not fit in any of the previous sections of this document can be provided in this section.

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# Conclusions

# References

1. R1-210xxxx xxxx, Huawei

# Appendix: