**3GPP TSG-RAN WG1 Meeting #106-eR1-21xxxxx**

**e-Meeting, August 16th – 27th, 2021**

**Title: [Draft] LS on the TA validation and mapping details for CG-SDT**

**Response to:**

**Release:** Rel-17

**Work Item:** NR\_SmallData\_INACTIVE-Core

**Source:** ZTE [RAN1]

**To:** RAN2

**Contact Person:**

#### Name: Li Tian

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**Attachments:** None

**1. Overall Description:**

**TA validation**

RAN1 has further discussed the remaining issues on the SSB subset determination for RSRP based TA validation but still companies cannot reach consensus to select one from the following options. RAN1 kindly asks if the down-selection can be done in RAN2.

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| The SSB subset for RSRP based TA validation is determined as* Option 1: Within a set of SSBs configured per CG configuration
* Option 2: Within a set of SSBs configured for all CG configurations
* Option 3: Within a set of all SSBs actually transmitted as indicated in SIB1
* Option ~~4~~: Highest N SSBs of all SSBs actually transmitted as indicated in SIB1
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**SSB to PUSCH mapping for CG-SDT**

RAN1 has further discussed SSB to PUSCH mapping details for CG-SDT, and the following agreements have been achieved. RAN1 will continue working on the remaining details (FFS part).

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| Mapping ratio and association period* Each N of consecutive SSB indexes associated to one CG configuration are mapped to valid CG PUSCH resources
	+ first, in increasing order of DMRS resource indexes, where a DMRS resource index $DMRS\_{id}$ is determined first in an ascending order of a DMRS port index and second in an ascending order of a DMRS sequence index
	+ second, in increasing order of CG period indexes in the association period
* The mapping ratio N is explicitly signalled and the association period is implicitly derived
	+ FFS candidate value set of mapping ratio, and whether it is configured per CG configuration or per cell
	+ The SSB to CG PUSCH association period is the duration of multiple of CG periods depending the smallest time duration in the set determined by the CG period such that all SSBs associated with the CG configuration are mapped at least once to CG PUSCH resources.
	+ An association pattern period includes one or more association periods and is determined so that a pattern between CG PUSCH occasions and SS/PBCH block indexes associated with the CG configuration repeats at most every 640 msec.
* Note: The mapping ordering and steps may be revisited if multiple CG PUSCH occasions in one CG period is supported

Multiple DMRS per CG configuration* Support multiple DMRS resources per CG configuration when single layer PUSCH transmission is assumed, and each DMRS resource could be mapped to the same or different SSB(s)
	+ FFS if multi-layer PUSCH transmission is supported for CG-SDT
	+ FFS any limitation on the DMRS configuration if multiple CG PUSCH occasions per CG period is supported

Repetitions* Repetition K>1 is supported at least when a consistent number of valid repetitions across different CG periods can be guaranteed for each associated SSB.
	+ The repetitions within one CG period are considered as a bundle of transmission occasions that are mapped to the same SSB(s)
	+ FFS details if Rel-16 CG Type 1 repetition mechanism cannot work for CG-SDT in Rel-17.
* FFS if repetition can be supported or not when the number of valid repetitions across different CG periods for each associated SSB is not consistent.

Validation of PUSCH occasion* The following PUSCH occasion validation rule is applied for CG-SDT
	+ for unpaired spectrum and for SS/PBCH blocks with indexes provided by *ssb-PositionsInBurst* in *SIB1* or by *ServingCellConfigCommon*
		- if a UE is provided *tdd-UL-DL-ConfigurationCommon*, the valid PO is the PO in UL part in a slot, or at least *Ngap* symbols after the end of the DL part in a slot or after the end of the SSB in a slot
		- if a UE is not provided *tdd-UL-DL-ConfigurationCommon*, the valid PO does not precede a SS/PBCH block in the PUSCH slot, starts at least $N\_{gap}$ symbols after a last SS/PBCH block symbol
		- $N\_{gap}$ is provided in Table 8.1-2 in TS 38.213
	+ FFS if any validation rule following the CG-PUSCH in RRC connected state is applicable, and whether and how to handle the overlapping between CG-PUSCH occasions for CG-SDT and any valid PRACH occasion or MsgA PUSCH occasion.
* FFS the rule for paired spectrum, and whether or not to consider the impact for UEs operates in Type-A HD-FDD and CG-SDT if supported
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**2. Actions:**

**To RAN2:**

**ACTION:** RAN1 respectfully asks RAN2 to take the above information into account and select one option for the SSB subset determination for RSRP based TA validation.

**4. Date of Next TSG-RAN WG1 Meetings:**

TSG-RAN WG1 Meeting #106b-e 11th Oct – 19th Oct 2021 e-meeting

TSG-RAN WG1 Meeting #107-e 11th Nov – 19th Nov 2021 e-meeting