**3GPP TSG-RAN WG1 Meeting #102-e R1-200xxxx**

**e-Meeting, August 17th – 28th, 2020**

**Agenda Item: 7.2.1**

**Source: Moderator (ZTE)**

**Title: Email discussion #1 for 2-step RACH**

**Document for: Discussion**

# Introduction

This document is intended to address the following remaining issues by email discussion.

[102-e-NR-2step-RACH-01] Email discussion/approval of potential CR(s) addressing issues #1, #3, #7.1 as in the summary:

* Alignment on RRC parameters
* Capture the condition in the previous agreement for subset RO sharing
* Editorial issues related to the TDRA

By 8/21 – Li (ZTE)

# Alignment on RRC parameters (issue #1)

There are multiple contributions proposed to align the RRC parameter names for 2-step RACH between the RAN1 specs and RRC spec, including the changes on 38.211 (R1-2006284, R1-2006407 and R1-2006609), 38.213 (R1-2005664 and R1-2006284). The proposed TPs are merged into proposal 1 for 38.211 and proposal 2 for 38.213 as follows.

***Proposal 1:***

* Adopt the TP#1 in 38.211, to align the RRC parameters names with RRC specs.

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| **Reasons for change**  To align the RRC parameter names for 2-step RACH between the RAN1 specs and RRC spec  **Summary of changes**  Implement the above update  **Specs/Sections impacted**  TS 38.211, Section 5.3.2, 6.3.3.1, 6.3.3.2  -------------------------**Text proposal #1 starts for TS 38.211** ----------------------------  5.3.2 OFDM baseband signal generation for PRACH  The time-continuous signal  on antenna port for PRACH is defined by  where  and  -  is given by clause 6.3.3;  -  is the subcarrier spacing of the initial uplink bandwidth part during initial access. Otherwise,  is the subcarrier spacing of the active uplink bandwidth part;  - is the largest value among the subcarrier spacing configurations by the higher-layer parameter *scs-SpecificCarrierList*;  -  is the lowest numbered resource block of the initial uplink bandwidth part and is derived by the higher-layer parameter *initialUplinkBWP* during initial access. Otherwise,  is the lowest numbered resource block of the active uplink bandwidth part and is derived by the higher-layer parameter *BWP-Uplink*;  - is the frequency offset of the lowest PRACH transmission occasion in frequency domain with respect to physical resource block 0 of the active uplink bandwidth part. The quantity is given by the higher-layer parameter *msgA-RO-FrequencyStart-r16* if configured and a type-2 random-access procedure is initiated as described in clause 8.1 of [5, TS 38.213], otherwise by *msg1-FrequencyStart* as described in clause 8.1 of [5 TS 38.213];  <Unchanged Text Omitted> 6.3.3.1 Sequence generation <Unchanged Text Omitted>  The cyclic shift  is given by    where  is given by Tables 6.3.3.1-5 to 6.3.3.1-7, the higher-layer parameter *restrictedSetConfig* determines the type of restricted sets (unrestricted, restricted type A, restricted type B), or the higher-layer parameter *msgA-RestrictedSetConfig-r16*, if provided, determines the type of restricted sets (unrestricted, restricted type A, restricted type B) if a type-2 random access procedure is initiated as described in clause 8.1 of [TS 38.213], and Tables 6.3.3.1-1 and 6.3.3.1-2 indicate the type of restricted sets supported for the different preamble formats.  <Unchanged Text Omitted> 6.3.3.2 Mapping to physical resources The preamble sequence shall be mapped to physical resources according to    where  is an amplitude scaling factor in order to conform to the transmit power specified in [5, TS38.213], and  is the antenna port. Baseband signal generation shall be done according to clause 5.3 using the parameters in Table 6.3.3.1-1 or Table 6.3.3.1-2 with  given by Table 6.3.3.2-1.  Random access preambles can only be transmitted in the time resources obtained from Tables 6.3.3.2-2 to 6.3.3.2-4 and depends on FR1 or FR2 and the spectrum type as defined in [8, TS38.104]. The PRACH configuration index in Tables 6.3.3.2-2 to 6.3.3.2-4 is  - for Table 6.3.3.2-3 given by the higher-layer parameter *prach-ConfigurationIndex-v1610* if configured, otherwise by the higher-layer parameter *prach-ConfigurationIndex,* or by *msgA-PRACH-ConfigurationIndex-r16* if configured; and  <Unchanged Text Omitted>  Random access preambles can only be transmitted in the frequency resources given by either the higher-layer parameter *msg1-FrequencyStart* or *msgA-RO-FrequencyStart-r16* if configured as described in clause 8.1 of [5 TS 38.213]. The PRACH frequency resources , where equals the higher-layer parameter *msg1-FDM* or *msgA-RO-FDM* if configured, are numbered in increasing order within the initial uplink bandwidth part during initial access, starting from the lowest frequency. Otherwise, are numbered in increasing order within the active uplink bandwidth part, starting from the lowest frequency.  <Unchanged Text Omitted>  ------------------------- **Text proposal #1 ends for TS 38.211** ------------------------------- |

Any comments to Proposal 1?

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| Company | Comments |
| Nokia | We agree to the intention of the proposed changes. In our opinion, the TP in 6284 is simpler, and could be used as reference for updating. Suggestion for update: “the higher-layer parameter *restrictedSetConfig* for Type-1 random access procedure and the higher-layer parameter *msgA-RestrictedSetConfig*, if configured, for Type-2 random access procedure determine…”. In this way, the text becomes simpler and more compact. One thing to note is that when referencing higher layer parameters in RAN1 specifications, we should not have the release tag from the ASN.1 appended. That is, *msgA-RestrictedSetConfig-r16* should rather be *msgA-RestrictedSetConfig*. This comment applies to all changes in the TP. |
| Qualcomm | We agree with the intention of TP #1. In addition, we have the same concerns as Nokia regarding the inclusion of release number into new RRC parameters for msgA. |
| Ericsson | Agree that “it is possible that Type 2 random access also uses *restrictedSetConfig* if *msgA-RestrictedSetConfig* is not provided” should be captured as well. |
| CATT | In general, we are fine with TP#1, we have the same opinion with Nokia & QC on release tag. We should exclude release tag for RRC parameters related to MSGA. |
| Apple | The wording of TP#1 may need to update, the following TP can be considered.  “where  is given by Tables 6.3.3.1-5 to 6.3.3.1-7, the higher-layer parameter *msgA-RestrictedSetConfig-r16*, if provided, determines the type of restricted sets (unrestricted, restricted type A, restricted type B); otherwise, the higher-layer parameter *restrictedSetConfig* determines the type of restricted sets (unrestricted, restricted type A, restricted type B)”  In addition, we agree that release tag is not necessary to introduce in RAN1 spec. |

***Proposal 2:***

* Adopt the TP#2 in 38.213, to align the RRC parameters names with RRC specs.

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| **Reasons for change**  To align the RRC parameter names for 2-step RACH between the RAN1 specs and RRC spec  **Summary of changes**  Implement the above update  **Specs/Sections impacted**  TS 38.213, Section 7.1.1, 8.1  -------------------------**Text proposal #2 starts for TS 38.213** ------------------------------ 7.1.1 UE behavior <Unchanged Text Omitted>  - If a UE established dedicated RRC connection using a Type-2 random access procedure, as described in Clause 8, and is not provided *P0-PUSCH-AlphaSet*,or for a PUSCH transmission for Type-2 random access procedure as described in Clause 8.1A,  , , and ,  where is provided by *msgA-preambleReceivedTargetPower*, or by *preambleReceivedTargetPower* if *msgA-preambleReceivedTargetPoweris* not provided, and is provided by *msgADeltaPreamble*, or dB if *msgADeltaPreamble* is not provided, for carrier of serving cell  <Unchanged Text Omitted> 8.1 Random access preamble <Unchanged Text Omitted>  For Type-2 random access procedure with common configuration of PRACH occasions with Type-1 random access procedure, a UE is provided a number of SS/PBCH block indexes associated with one PRACH occasion by *ssb-perRACH-OccasionAndCB-PreamblesPerSSB* and a number of contention based preambles per SS/PBCH block index per valid PRACH occasion by  *msgA-CB-PreamblesPerSSB-PerSharedRO*. The PRACH transmission can be on a subset of PRACH occasions associated with a same SS/PBCH block index for a UE provided with a PRACH mask index by *msgA-SSB-SharedRO-MaskIndex* according to [11, TS 38.321].  For Type-2 random access procedure with separate configuration of PRACH occasions with Type-1 random access procedure, a UE is provided a number of SS/PBCH block indexes associated with one PRACH occasion and a number of contention based preambles per SS/PBCH block index per valid PRACH occasion by *msgA-SSB-PerRACH-OccasionAndCB-PreamblesPerSSB* when provided; otherwise, by *ssb-perRACH-OccasionAndCB-PreamblesPerSSB*.  For Type-1 random access procedure, or for Type-2 random access procedure with separate configuration of PRACH occasions from Type 1 random access procedure, if , one SS/PBCH block index is mapped to consecutive valid PRACH occasions and contention based preambles with consecutive indexes associated with the SS/PBCH block index per valid PRACH occasion start from preamble index 0. If , contention based preambles with consecutive indexes associated with SS/PBCH block index , , per valid PRACH occasion start from preamble index where is provided by *totalNumberOfRA-Preambles* for Type-1 random access procedure, or by *msgA-TotalNumberOfRA-Preambles* for Type-2 random access procedure with separate configuration of PRACH occasions from a Type 1 random access procedure, and is an integer multiple of .  <Unchanged Text Omitted>  A UE determines a first interlace or first RB for a first PUSCH occasion in an active UL BWP respectively from *interlaceIndexFirstPO-MsgA-PUSCH* or from *frequencyStartMsgA-PUSCH* that provides an offset, in number of RBs in the active UL BWP, from a first RB of the active UL BWP. A PUSCH occasion includes a number of interlaces or a number of RBs provided by *nrofInterlacesPerMsgA-PO* or by *nrofPRBs-perMsgA-PO*, respectively. Consecutive PUSCH occasions in the frequency domain of an UL BWP are separated by a number of RBs provided by *guardBandMsgA-PUSCH*. A number of PUSCH occasions in the frequency domain of an UL BWP is provided by  *nrofMsgA-PO-FDM*.  <Unchanged Text Omitted>  Consecutive PUSCH occasions within each slot are separated by *guardPeriodMsgA-PUSCH* symbols and have same duration. A number of time domain PUSCH occasions in each slot is provided by *nrofMsgA-PO-perSlot* and a number of consecutive slots that include PUSCH occasions is provided by *nrofSlotsMsgA-PUSCH*.  A UE is provided a DMRS configuration for a PUSCH transmission in a PUSCH occasion in an active UL BWP by *msgA-DMRS-Config*.  <Unchanged Text Omitted>  A PUSCH occasion for PUSCH transmission is defined by a frequency resource and a time resource, and is associated with a DMRS resource. The DMRS resources are provided by  *msgA-DMRS-Config*.  <Unchanged Text Omitted>  where , is a total number of valid PRACH occasions per association pattern period multiplied by the number of preambles per valid PRACH occasion provided by *rach-ConfigCommonTwoStepRA*, and is a total number of valid PUSCH occasions per PUSCH configuration per association pattern period multiplied by the number of DMRS resource indexes per valid PUSCH occasion provided by *msgA-DMRS-Config*.  <Unchanged Text Omitted>  ------------------------- **Text proposal #2 ends for TS 38.213** ------------------------------- |

Any comments to Proposal 2?

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| Company | Comments |
| Nokia | Agree with the TP#2. One editorial: It seems that “msgA-preambleReceivedTargetPoweris” from first part of the TP is missing a space. |
| Qualcomm | We agree with TP#2 to align the names of RRC parameters for 2-step RACH. On the other hand, we noticed that RAN1 specifications and RAN2/RRC specifications are using different terminologies for 2-step RACH (i.e. “Type-2 random access procedure” vs “2-step random access (RA) type procedure”). For the sake of consistency, it would be great to clarify (e.g. adding a note in RAN1 specifications) that these terminologies are used interchangeably in different specifications. |
| Ericsson | OK. |
| CATT | We are fine with proposed TP#2 with Nokia’s editorial change. |
| Apple | Agree with TP#2 |

# Capture the condition in the previous agreement for subset RO sharing (issue #3)

In R1-2006091, it was pointed out that one constraint is missing in the description of subset RO sharing in 38.213 according to our previous agreement

***Proposal 1:***

* Adopt the TP#3 in 38.213, to capture the missing condition in the description of subset RO sharing.

**Reasons for change**

To capture the missing condition in the description of subset RO sharing

**Summary of changes**

Implement the above update

**Specs/Sections impacted**

TS 38.213, Section 8.1

-------------------------**Text proposal #3 starts for TS 38.213** ----------------------------

8.1 Random access preamble

<Unchanged Text Omitted>

For Type-2 random access procedure with common configuration of PRACH occasions with Type-1 random access procedure, a UE is provided a number of SS/PBCH block indexes associated with one PRACH occasion by *ssb-perRACH-OccasionAndCB-PreamblesPerSSB* and a number of contention based preambles per SS/PBCH block index per valid PRACH occasion by *msgA-CB-PreamblesPerSSB*. The PRACH transmission can be on a subset of PRACH occasions associated with a same SS/PBCH block index within an SSB-RO mapping cycle for a UE provided with a PRACH mask index by *msgA-ssb-sharedRO-MaskIndex* according to [11, TS 38.321].

<Unchanged Text Omitted>

------------------------- **Text proposal #3 ends for TS 38.213** -------------------------------

Any comments to Proposal 3?

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| Company | Comments |
| Nokia | Agree with the TP#3 |
| Qualcomm | TP#3 looks good to us. The wording could be improved though for easier reading. |
| Ericsson | OK. |
| CATT | OK |
| Apple | Agree with the TP#3 |

# Editorial issues related to the TDRA (issue #7.1)

R1-2006407 (proposal 4) and R1-2006609 (proposal 3) pointed out the following editorial issue related to the TDRA for MsgA PUSCH.

***Proposal 4:***

* Adopt the TP#4 in 38.213, to correct the description of TDRA for MsgA PUSCH.

**Reasons for change**

To correct the description of TDRA for MsgA PUSCH

**Summary of changes**

Implement the above update

**Specs/Sections impacted**

TS 38.213, Section 8.1A

-------------------------**Text proposal #4 starts for TS 38.213** ----------------------------

8.1A PUSCH for Type-2 random access procedure

<Unchanged Text Omitted>

If a UE does not have dedicated RRC configuration, or has an initial UL BWP as an active UL BWP, or is not provided *startSymbolAndLengthMsgA-PO*, *msgA-PUSCH-timeDomainAllocation* provides a SLIV and a PUSCH mapping type for a PUSCH transmission by indicating

- one of the first *maxNrofUL-Allocations* values from *PUSCH-TimeDomainResourceAllocationList*, if *PUSCH-TimeDomainResourceAllocationList* is provided in *PUSCH-ConfigCommon*

- one of the entries from table 6.1.2.1.1-2 in [6, TS 38.214], if *PUSCH-TimeDomainResourceAllocationList* is not provided in *PUSCH-ConfigCommon*

else, the UE is provided with a SLIV by *startSymbolAndLengthMsgA-PO*, and a PUSCH mapping type by *mappingTypeMsgA-PUSCH* for a PUSCH transmission.

For mapping one or multiple preambles of a PRACH slot to a PUSCH occasion associated with a DMRS resource, a UE determines a first slot for a first PUSCH occasion in an active UL BWP from *msgA-PUSCH-TimeDomainOffset* that provides an offset, in number of slots in the active UL BWP, relative to the start of a PUSCH slot including the start of each PRACH slot. The UE does not expect to have a PRACH preamble transmission and a PUSCH transmission with a msgA in a PRACH slot or in a PUSCH slot, or to have overlapping msgA PUSCH occasions for a MsgA PUSCH configuration. The UE expects that a first PUSCH occasion in each slot has a same SLIV [6, TS 38.214] for a PUSCH transmission that is provided by *startSymbolAndLengthMsgA-PO* or by *msgA-PUSCH-timeDomainAllocation*.

<Unchanged Text Omitted>

------------------------- **Text proposal #4 ends for TS 38.213** -------------------------------

Any comments to Proposal 4?

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| Company | Comments |
| Nokia | We are not OK with this proposal. The specifications are not broken, and we do not see a need for introducing an optimization. Basically, this proposal will introduce a change of the baseline functionality by introducing a different mapping. |
| Qualcomm | We don’t think TP #4 is necessary. |
| Ericsson | OK. |
| CATT | We are fine with TP#4.  In RAN#99 meeting, we have below agreement  Agreements:   * For RRC\_CONNECTED UEs in non-initial UL BWP, PUSCH mapping type and SLIV of the first PUSCH occasion can be explicitly configured.   + Value ranges for *startSymbolAndLengthMsgAPO* is INTEGER (0,127);   + If *startSymbolAndLengthMsgAPO* is not configured, and if the TDRA list *PUSCH-TimeDomainResourceAllocationList* is provided in *PUSCH-ConfigCommon*, use *msgA-timeDomainAllocation* (INTEGER (1..~~16~~ *maxNrofUL-Allocations*))to indicate which values are used in the list   + otherwise, use the default table 6.1.2.1.1-2 in 38.214, *msgA-timeDomainAllocation* (INTEGER (1,16))indicates which values are used in the default table     - the parameter K2 in the default table is not used for msgA PUSCH * For RRC\_IDLE/INACTIVE state and RRC\_CONNECTED UEs in initial UL BWP,   + If the TDRA list *PUSCH-TimeDomainResourceAllocationList* is provided in *PUSCH-ConfigCommon*, use *msgA-timeDomainAllocation* (INTEGER (1.. ~~16~~ *maxNrofUL-Allocations*))to indicate which values are used in the list   + otherwise, use the default table 6.1.2.1.1-2 in 38.214, *msgA-timeDomainAllocation* indicates which values are used in the default table. |
| Apple | The TP#4 seems not really necessary. |

# Summary

The final proposals and the potential CRs are to be updated…