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

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

**Agenda Item: 7.2.1**

**Source: Moderator (ZTE)**

**Title: FL summary on the maintenance of 2-step RACH**

**Document for: Discussion**

# Introduction

This document contains the feature lead summary of issues related to maintenance of the Rel-16 2-step RACH WI.

The issues mentioned in the submitted TDocs are collected and summarized in Section 2, and the feature lead recommendation for the first round email discussion can be found in Section 3.

# Maintenance issues

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| --- | --- | --- | --- |
| # | Issue | Description | Related TDoc # |
| 1 | Alignment on RRC parameters | Align the RRC parameter names with 38.331 in RAN1 specs | R1-2005664  R1-2006284  R1-2006407  Proposal 5 in R1-2006609 |
| 2 | Modulation order of MsgB PDSCH | The UE is not expected to decode a PDSCH scheduled with msgB-RNTI and *Qm* > 2 | R1-2005605 |
| 3 | Subset RO sharing | Adding the condition “within an SSB-RO mapping cycle” according to the agreement | Proposal 1 in R1-2006091 |
| 4 | PUSCH occasion across slot boundary | POs derived for one slot could be across the slot boundary and/or extend to the next slot. | Proposal 2 in R1-2006091 |
| 5 | Gap between MsgA PRACH and PUSCH | Clarify that MsgA PUSCH is not transmitted if the gap between PRACH and PUSCH is not satisfied | Proposal 1 in R1-2006609 |
| 6 | Resource determination for CFRA | Capture MsgA PUSCH resource determination for CFRA in 38.213 | Proposal 2 in R1-2006609 |
| 7 | TDRA for MsgA PUSCH | 7.1 Editorial issues related to the time domain resource allocation of MsgA PUSCH | Proposal 4 in R1-2006407 and Proposal 3 in R1-2006609 |
| 7.2 Capture the default TDRA table 6.1.2.1.1-3 for extended CP in 38.213 | Proposal 3 in R1-2006609 |
| 8 | Resource overhead of MsgA PUSCH | Align the resource overhead determination with Msg3 for MsgA PUSCH in 38.214 | Proposal 4 in R1-2006609 |
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# Summary and recommendation

The budget for email discussion of 2-step RACH in this meeting is only 1. Please indicate your views on the priority of the listed issues into the following table by Wednesday 8/12.

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| Company | Priority | | | | | | | | |
| Issue#1 | Issue#2 | Issue#3 | Issue#4 | Issue#5 | Issue#6 | Issue#7.1 | Issue#7.2 | Issue#8 |
| ZTE | High | Medium | Medium | Low | Low | Medium | High | Medium | High |
| Ericsson | High | Medium | High | Low | Low | Medium | High | High | High |
| Samsung | High | Medium | High | Medium | Low | Medium | High | Medium | High |
| CATT | High | Medium | Medium | Low | Low | Low | High | Medium | High |
| Intel | High | Medium | High | Low | Low | Medium | High | Medium | High |
| vivo | High | Medium | Medium | Low | Low | Low | High | Medium | High |
| Huawei | High | Medium | High | Low | Low | Low | High | Medium | Medium |
| Qualcomm | High | Medium | High | Low | Medium | Medium | High | Medium | High |
| Spreadtrum | High | Medium | High | Low | Low | Medium | High | Medium | High |
| Apple | High | Medium | High | Low | Low | Low | High | Medium | High |
| LG Electronics | High | Medium | Medium | Low | Low | Low | High | Medium | High |
| DOCOMO | High | Medium | High | Low | Low | Medium | High | Medium | High |

Email thread #1:

To be updated based on companies’ feedback…

Any comments?

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| --- | --- |
| Company | Comment |
| ZTE | For issue#4, we think PO should not across the slot boundary.  For issue#5, it has been discussed in the last meeting, but no conclusion was achieved. |
| Ericsson | Since there’re not that may controversial issues this time, we assume all the issues listed will be in the scope for discussion and the priority just means how much effort needed to conclude the discussions. Based on this understanding we provide our views as below.  Low:  Issue #4, issue #5 may need more discussions in this meeting to at least get some conclusions in the coming 2 weeks.  Note that issue #5 that we proposed in last meeting was not discussed due to NR-U was still discussing whether same gap requirement used in licensed band should be applied to NR-U as well. And now NR-U has agreed to apply the N gap requirement between preamble and PUSCH for both licensed and unlicensed operation, which is why we proposed to discuss this in this meeting.  Medium (some effort but easy to conclude):  Issue #2 was discussed in email earlier when editor tried to capture 2-step RACH in a first version, it looks companies had concerns on this at that time. We’re fine to discuss more on this now although we’re a bit preferring to align MsgB with Msg2 on this as ZTE proposed.  Issue 6, in our view, it is necessary to capture CFRA resource determination in RAN1 spec. as well. Although I remember in last meeting, we agreed that no RAN1 changes for CFRA, we also said some clarification TPs might be needed in 38.213 among the options to be down-selected by RAN2. We would like to see other companies views on this on whether and how to capture this.  High (little effort needed):  For all other issues, we think it is obvious that they need to be addressed with related TPs in some way, but maybe some polishing is needed on the original proposed TPs which we can discuss in the coming meetings, e.g. the TPs related to restricted set configuration may need to be merged among companies.  Issue 7.1 and 7.2 can be merged since the other default table for extended CP was just missed by editors in the beginning, as there’s no intention to support only normal CP for 2-step RACH in RAN1.  Issue 3 is also just to capture the agreement we made, which was missed by editor. |
| Samsung | For issue #1, #3, #7.1, they are more like alignment TP, just need to correctly reflect the agreement RAN1/RAN2 made.  For issue #2, no strong view, maybe ok with it;  For issue#4, we think it’s beneficial to allow PO to extend to next slot, maybe not to across boundary (e.g., partially extend to next slot) which might be complicated; it will be good to utilize the UL resource, which is important in TDD system.  For issue#5, it has been discussed in the last meeting, but we think the understanding is that the gNB shall handle and avoid this case.  For issue#6, #7.2, #8 can be further discussed. |
| CATT | Issue #1, #7.1 and #8 need be handled with high priority because the agreement of RAN1/RAN2 and latest RAN2 spec need be correctly & timely reflected in RAN1 spec.  Issue#2, #3 and#7.2 can also be discussed if necessary.  For issue#4, PO configuration on crossing the slot boundary shouldn’t be supported.  For issue#5, it has been discussed in the last meeting and N gap between MSGA RO and MSGA PO can be guaranteed by gNB configuration.  For issue#6, we have agreement on no RAN1 spec impact for CFRA. So this issue can be discussed with low priority. |
| Intel | We share similar views as other companies that Issue#1/#3/#7.1/#8 should be treated as higher priority as we already had clear agreements, or we need to update parameter names.  For issues with medium priority, we think it would be good to also discuss these issues in the meeting, assuming that we would not take much time on issues with higher priorities.  For issues with low priority, our understanding is that 1) issue#4 may not be needed and 2) issue#5 was discussed in the last meeting and it is up to gNB configuration. |
| vivo | From our understanding, the priority for discussion is depending on whether the issue is essential.  Based on this understanding, we think issues #1, #7.1 and #8 are of high priority.  Issue #3 can be discussed with medium priority for clarification.  Issues #2, #4, #5, #6, #7.2 are not essential at the CR stage.  For issue #2, since a MsgB PDSCH would include RRC message which may have larger payload than Msg2 PDSCH, it is not necessary to limit the modulation order for MsgB PDSCH as QPSK.  For issue #4, for a given PO, it is not allowed to cross slot boundary, which is similar to a normal PUSCH (except PUSCH repetition type B). For multiple POs within a slot, they are not allowed to span over multiple slots, which is similar to the PUSCH allocation within a slot for configured grant in shared spectrum.  For issue #5, similar view as ZTE. It was discussed in last meeting and there is no conclusion on it.  For issue #6, according to the previous agreement, RAN1 impact from introduction of CFRA is not expected. Based on current RAN2 spec, it is clear for the determination of MsgA PUSCH for CFRA 2-step RACH. |
| Huawei, HiSilicon | For issue #1, #3 and #7.1, they are just to capture the previous agreement, and should be discussed with high priority.  For issue #2, #7.2 and #8, they are more like to align some features of 2-step RACH to that of 4-step RACH. However, we don’t have corresponding agreements and most of them can be handled up to gNB configuration. We can discuss them with medium priority if we have time.  For issue #4, #5 and #6, they are adding new features that may need more justification on criticality at current stage. |
| Qualcomm | For Issue #4, we are not sure if there is a use case for “POs derived for one slot cross the slot boundary.” Actually, this should be avoided in PO configuration for NR Rel-16.  Issue #5 can be discussed at this meeting and it is not expected to be a controversial topic, considering the agreements made by NR-U.  Issues #1, #3 and #7 have higher priority for this meeting, and we expect companies can reach an agreement sooner than the rest of the issues in the list. |
| Spreadtrum | For Issue#4, agreements from RAN1#99 are as follows:  Agreements:   * It is up to gNB implementation to guarantee the PUSCH occasion including guard period does not span across the slot boundaries   For Issue#5, similar view as ZTE. It was discussed in last meeting and there is no conclusion on it.  We share similar views as other companies that Issue#1/#3/#7.1/#8 should be treated as higher priority. |
| Apple | Issue#4, the proposal is not aligned with previous meeting agreement.  Issue#6, according to WID, this CFRA should be pursued in RAN2 only. The RAN1 impacts should be as minor as possible.  Iusse#1, #3, #7.1 and #8 should have the high priority, and can be solved in this meeting. |
| LG Electronics | Issue#1, #7.1: TPs for editorial correction can be handled with high priority.  Issue#8: TP for alignment with other spec description are necessity to be discussed with high priority.  Issue#2, #3, #7.2: If there is not a significant problem, we may keep the current description. But, no strong view.  Issue#4: New feature for further enhancement is not necessity for discussion.  Issue#5: If this issue was discussed in previous meeting, it is not necessity to discuss again in RAN1#102-e meeting.  Issue#6: It is not necessity to have further discussion for CFRA 2-step RACH in RAN1. |
| DOCOMO | For issue#1, the correction should be needed with high priority. We think most of proposals, e.g., just RRC parameter name alignment, seems minor editorial ones and can be directly reflected into CR even without discussion.  For issue#3, the current spec seems to lead some ambiguity, and needs to be corrected.  For issue#4 and #5, it is not essential and with low priority.  For issue#6, although RAN2 spec might cover CFRA behavior, we can discuss and check if there is the missing one.  For issue #7.1 and #8, it would be straightforward, and can be discussed based on the proposed TP.  For issue #2 and #7.2, it can be further discussed. |

# References

1. R1-2005329 Remaining issues on 2-step RACH vivo
2. R1-2005605 Text proposal on the modulation order of MsgB PDSCH ZTE, Sanechips
3. R1-2005664 Remaining issues on 2-step RACH for NR CATT
4. R1-2006091 Remaining issues for two step RACH for NR Samsung
5. R1-2006284 Remaining issues on channel structure for 2-step RACH Spreadtrum Communications
6. R1-2006407 Remaining issues for 2-step RACH Huawei, HiSilicon
7. R1-2006609 Maintenance of Two step RACH Ericsson
8. R1-2006692 Maintenance for Two-step RACH NTT DOCOMO, INC.

# Appendix

List of proposals in the submitted contributions.

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| TDoc | Proposals |
| R1-2005329, vivo | **Proposal 1:** **Keep current specification unchanged for the determination of scrambling for msgA PUSCH of both CBRA and CFRA 2-step RACH.**  **Proposal 2:** **Keep current specification unchanged for the determination of time domain resource allocation for msgA PUSCH of both CBRA and CFRA 2-step RACH.**  **Proposal 3:** **RAN1 make conclusion on *msgA-RSRP-ThresholdSSB* in *RACH-ConfigCommonTwoStepRA* is used for the selection of the SSB for 2-step RACH triggered by BFR.**   * + **No spec change is needed.** |
| R1-2005605,  ZTE | The following change to TS 38.214 is proposed  **----------------------------------------- Start of TP ------------------------------------------------**  5.1.3.1 Modulation order and target code rate determination  <---------------------------Other parts are omitted------------------------------->  The UE is not expected to decode a PDSCH scheduled with P-RNTI, RA-RNTI, msgB-RNTI, SI-RNTI and *Qm* > 2  <---------------------------Other parts are omitted------------------------------->  **---------------------------------------- End of TP ----------------------------------------------------** |
| R1-2005664, CATT | **Proposal 1: We suggest applying RRC parameter names for 2-step RACH in TS38.331 to section 8 in 38.213 in order to make RAN1 spec clearer and make parameter names consistent on 2 step RACH between RAN1 spec and RRC spec. Below TPs for TS 38.213 are adopted.**  --------------------------Start of TP 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-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*.  <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>  -----------------------End of TP for TS 38.213 --------------------------------------------- |
| R1-2006091, Samsung | ***Observation 1: whether the POs derived for one slot could be extended to the next slot is not clear;***  ***Observation 2: allowing the POs derived for one slot could be extended to the next slot can make efficient use of the UL resource and reduce the delay.***  ***Proposal 1: Adopt following TP in section 8.1 in TS38.213:***  ========== section 8.1 in TS38.213 unchanged part 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 a SSB-RO mapping cycle for a UE provided with a PRACH mask index by *msgA-ssb-sharedRO-MaskIndex* according to [11, TS 38.321].  ========== End ==========================  ***Proposal 2: the POs derived for one slot could be across the slot boundary and/or extend to the next slot.***  ***Proposal 3: adopt following TP in section 8.2 of TS38.213***  =========== section 8.2 in TS38.213 unchanged part omitted ===========  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*.  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*. The POs derived for one slot might be extended the next slot.  ============= End =========================== |
| R1-2006284, Spreadtrum | ***Proposal 1: To complete the restricted set application for 2-step RACH, adopt TP#1 in the Appendix.***  ***Proposal 2: Align RO related configuration parameters in TS38.213 with TS 38.331, adopt TP#2 in the Appendix.***  ***Proposal 3: To correct the new PRACH configuration index for 2-step RACH, adopt TP#1 in the Appendix.*** Text Proposal1 for TS38.211 --------------------------------- Start of Text Proposal ----------------------------------------  -------------------------------- Unchanged parts omitted --------------------------------------- 6.3.3.1 Sequence generation The set of random-access preambles  shall be generated according to    from which the frequency-domain representation shall be generated according to    where , , , or depending on the PRACH preamble format as given by Tables 6.3.3.1-1 and 6.3.3.1-2.  There are 64 preambles defined in each time-frequency PRACH occasion, enumerated in increasing order of first increasing cyclic shift  of a logical root sequence, and then in increasing order of the logical root sequence index, starting with the index obtained from the higher-layer parameter *prach-RootSequenceIndex* or *rootSequenceIndex-BFR* or by *msgA-PRACH-RootSequenceIndex-r16*if configured and a type-2 random-access procedure is initiated as described in clause 8.1 of [5, TS 38.213]. Additional preamble sequences, in case 64 preambles cannot be generated from a single root Zadoff-Chu sequence, are obtained from the root sequences with the consecutive logical indexes until all the 64 sequences are found. The logical root sequence order is cyclic; the logical index 0 is consecutive to . The sequence number  is obtained from the logical root sequence index according to Tables 6.3.3.1-3 to 6.3.3.1-4B.  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* for Type-1 random access procedure and the higher-layer parameter *msgA-RestrictedSetConfig* for Type-2 random access procedure determine the type of restricted sets (unrestricted, restricted type A, restricted type B), 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. 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  - for Tables 6.3.3.2-2 and 6.3.3.2-4 given by the higher-layer parameter *prach-ConfigurationIndex,* or by *msgA-PRACH-ConfigurationIndex-r16* if configured.------------------------------ Unchanged parts omitted --------------------------------------  ------------------------------End of Text Proposal ------------------------------------------ Text Proposal2 for TS38.213 --------------------------- Start of Text Proposal -------------------------------------------  --------------------------Unchanged parts omitted ----------------------------------------- 8.1 Random access preamble Physical random access procedure is triggered upon request of a PRACH transmission by higher layers or by a PDCCH order. A configuration by higher layers for a PRACH transmission includes the following:  - A configuration for PRACH transmission [4, TS 38.211].  - A preamble index, a preamble SCS, , a corresponding RA-RNTI, and a PRACH resource.  A PRACH is transmitted using the selected PRACH format with transmission power ,as described in Clause 7.4, on the indicated PRACH resource.  For 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 *ssb-perRACH-OccasionAndCB-PreamblesPerSSB*.  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-r16*. 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-r16* 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-r16* 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-r16*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 .  For Type-2 random access procedure with common configuration of PRACH occasions with 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 . 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.  ----------------------------- Unchanged parts omitted --------------------------------------  ----------------------------- End of Text Proposal ---------------------------------------- |
| R1-2006407, Huawei | Text proposal #1 for TS 38.211 Clause 5.3.2: ==================== Unchanged part omitted ====================  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 part omitted ==================== Text proposal #2 for TS 38.211 Clause 6.3.3.2: ==================== Unchanged part 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 part omitted ==================== Text proposal #3 for TS 38.211 Clause 6.3.3.1: ==================== Unchanged part 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 part omitted ==================== Text proposal #4 for TS 38.213 Clause 8.1A: ==================== Unchanged part 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 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 part omitted ================== |
| R1-2006609, Ericsson | [Proposal 1 If the MsgA resource the UE determines does not meet the gap requirement between MsgA preamble and PUSCH, the PUSCH is not transmitted, according to text proposal TP1.](#_Toc47771623)  --------------------------start of TP1 for 38.213 section 8.1A-------------------------------- 8.1A PUSCH for Type-2 random access procedure For a Type-2 random access procedure, a UE transmits a PUSCH, when applicable, after transmitting a PRACH. The UE encodes a transport block provided for the PUSCH transmission using redundancy version number 0. The PUSCH transmission is after the PRACH transmission by at least symbols where for or , for or , and is the SCS configuration for the active UL BWP.  A UE does not transmit a PUSCH in a PUSCH occasion if the PUSCH occasion associated with a DMRS resource is not mapped to a preamble of valid PRACH occasions or if the associated PRACH preamble is not transmitted as described in Clause 7.5 or Clause 11.1 or if the time gap between the PUSCH occasion and corresponding PRACH occasion is less than symbols. A UE can transmit a PRACH preamble in a valid PRACH occasion if the PRACH preamble is not mapped to a valid PUSCH occasion.  A mapping between one or multiple PRACH preambles and a PUSCH occasion associated with a DMRS resource is per PUSCH configuration.  🡨----------------------------unchanged text omitted---------------------------------🡪  -------------------------------end of TP1------------------------------------------  [Proposal 2 Capture the MsgA PUSCH resource determination in CFRA in 38.213, according to text proposal TP2.](#_Toc47771624)  ----------------------start of TP2 for 38.213 section 8.1A---------------------------------  🡨------------------------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-Configuration*.  For contention-based Type-2 random access procedure, ~~E~~each consecutive number of preamble indexes from valid PRACH occasions in a PRACH slot  - first, in increasing order of preamble indexes within a single PRACH occasion  - second, in increasing order of frequency resource indexes for frequency multiplexed PRACH occasions  - third, in increasing order of time resource indexes for time multiplexed PRACH occasions within a PRACH slot  are mapped to a valid PUSCH occasion and the associated DMRS resource  - first, in increasing order of frequency resource indexes for frequency multiplexed PUSCH occasions  - second, in increasing order of DMRS resource indexes within a PUSCH occasion, where a DMRS resource index is determined first in an ascending order of a DMRS port index and second in an ascending order of a DMRS sequence index [4, TS 38.211]  - third, in increasing order of time resource indexes for time multiplexed PUSCH occasions within a PUSCH slot  - fourth, in increasing order of indexes for PUSCH slots  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 *msgA-PUSCH-PreambleGroup*, 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-Configuration*.  For contention-free Type-2 random access procedure, UE determines the PUSCH occasion and the associated DMRS resource provided by dedicated higher layer parameter *msgA-PUSCH-resource-Index* [12, TS 38.331] if present, otherwise UE determines a PUSCH occasion with = 0, = 0, , a DMRS sequence provided by msgA-ScramblingID0 and a DMRS port 0 for MsgA PUSCH transmission.  🡨-------------------------unchanged text omitted------------------------------🡪  -------------------------------end of TP2---------------------------------------------------  [Proposal 3 Capture the default TDRA table 6.1.2.1.1-3 for extended CP for MsgA PUSCH and correct the typo according to text proposal TP3.](#_Toc47771625)  ------------------start of TP3 for 38.213 section 8.1A-----------------------------------  🡨-----------------------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  - first *maxNrofUL-Allocations* values from *PUSCH-TimeDomainResourceAllocationList*, if *PUSCH-TimeDomainResourceAllocationList* is provided in *PUSCH-ConfigCommon*  - entries from table 6.1.2.1.1-2 for normal CP or table 6.1.2.1.1-3 for extended CP in [6, TS 38.214] according to the higher layer parameter *cyclicPrefix*, 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.  🡨-------------------------unchanged text omitted--------------------------------🡪  -------------------------------------end of TP3-----------------------------------------  [Proposal 4 Align the resource overhead determination with Msg3 for MsgA PUSCH, according to text proposal TP4.](#_Toc47771626)  ------------------------start of TP4 for 38.214 section 6.1.4.2-------------------------------  🡨---------------------------unchanged text omitted-------------------------------🡪  The UE shall first determine the number of REs (*NRE*) within the slot:  - A UE first determines the number of REs allocated for PUSCH within a PRB  by  - , where is the number of subcarriers in the frequency domain in a physical resource block,  is the number of symbols *L* of the PUSCH allocation according to Clause 6.1.2.1 for scheduled PUSCH or Clause 6.1.2.3 for configured PUSCH,  is the number of REs for DM-RS per PRB in the allocated duration including the overhead of the DM-RS CDM groups without data, as described for PUSCH with a configured grant in Clause 6.1.2.3 or as indicated by DCI format 0\_1 or DCI format 0\_2 or as described for DCI format 0\_0 in Clause 6.2.2, and  is the overhead configured by higher layer parameter *xOverhead* in*PUSCH-ServingCellConfig*. If the  is not configured (a value from 6, 12, or 18), the  is assumed to be 0. For Msg3 or MsgA PUSCH transmission the  is always set to 0. In case of PUSCH repetition Type B,  is determined assuming a nominal repetition with the duration of *L* symbols without segmentation.  🡨-----------------------unchanged text omitted-----------------------------🡪  --------------------------------end of TP4-----------------------------------------------  [Proposal 5 *msgA-PreambleReceivedTargetPower*, if provided, should be used for the power control of MsgA PUSCH, according to text proposal TP5.](#_Toc47771627)  --------------------------start of TP5 for 38.213 section 7.1.1-----------------------------  🡨-------------------------unchanged text omitted-----------------------------🡪 7.1.1 UE behaviour If a UE transmits a PUSCH on active UL BWP  of carrier  of serving cell  using parameter set configuration with index  and PUSCH power control adjustment state with index , the UE determines the PUSCH transmission power  in PUSCH transmission occasion  as  [dBm]  where,  - is the UE configured maximum output power defined in [8-1, TS 38.101-1], [8-2, TS38.101-2] and [8-3, TS38.101-3] for carrier  of serving cell  in PUSCH transmission occasion .  -  is a parameter composed of the sum of a component  and a component  where .  - If a UE established dedicated RRC connection using a Type-1 random access procedure, as described in Clause 8, and is not provided *P0-PUSCH-AlphaSet* or for a PUSCH transmission scheduled by a RAR UL grant as described in Clause 8.3,  , , and ,  where is provided by *preambleReceivedTargetPower* [11, TS 38.321] and is provided by *msg3-DeltaPreamble*, or  dB if *msg3-DeltaPreamble* is not provided, for carrier  of serving cell  - 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----------------------------🡪  -------------------------------end of TP5------------------------------------------ |
| R1-2006692, Docomo | **Proposal 1: There is no need to add the parameter “msgA-RSRP-ThresholdSSB” to section 6 in TS 38.213.** |
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