**3GPP TSG-RAN WG1 Meeting #100bis R1-200xxxx**

**e-meeting, April 20th – 30th, 2020**

**Agenda Item: 7.2.1.2**

**Source: Moderator (ZTE)**

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

**Document for: Discussion**

# Introduction

This document contains the feature lead summary of issues related to maintenance of the procedures under 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.

# Remaining issues on the related procedure

## Potential issues to be handled

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| Issue # | Issue | Description | Related TDoc # |
| 1 | Align terminology and parameters between RAN1 and RAN2 specifications | 1.1 Update the RAN1 specifications to reflect the terminology used in 38.300.1.2 Update section 8.2A of 38.213 to RAN1 specifications to use MSGB-RNTI instead of RA-RNTI to ensure proper operation of the two-step RACH procedure.1.3 Align the parameter names of RAN1 such that they reflect the RAN2 parameter names. | R1-2001959 |
| 2 | TBS of PUSCH scheduled fallback RAR | TP for 38.214 based on to RAN2 agreement | R1-2002113 |
| 3 | Confirm working assumption | The preambles without associated PRUs can be used for msgA transmission (preamble only) for 2-step RACH | R1-2002260 |
| 4 | RO parameter | For reusing 4-step RACH parameters for 2-step RACH, if the 4-step RACH parameters are not configured on the UL BWP | R1-2002432 |
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FL comments:

The issue #1 can be handled as editorial issue, where

* + 1.1 has been proposed in the last meeting but seems no consensus has been reached.
	+ 1.2 has been reflected in the latest version of 38.213.
	+ 1.3 can be proposed to editors directly.

The issue #2 is agreed in RAN2, and the following note has been captured in 38.321 section 5.1.4a. Seem there is no need to duplicate this in 38.214.

*NOTE:      If within a 2-step RA type procedure, an uplink grant provided in the fallback RAR has a different size than the MSGA payload, the UE behavior is not defined.*

The issue #3 is not necessary, as the working assumption was autonomously agreed and the description has already been captured in the lasted spec.

The issue #4 has been discussed in RAN2 in Feb meeting, and we think it is better to continue the discussion under RRC agenda in RAN2 rather than in RAN1.

## Issues triggered by the LSs from RAN2

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| Issue # | Issue | Description | Related TDoc # |
| L1 | CSI-RS based CFRA | Based on the LS from RAN2 R1-2001236 | R1-2001976R1-2001648R1-2001711R1-2001767R1-2001984R1-2002370R1-2002527 R1-2001717R1-2002660 |
| L2 | Description and validation of SFN | Based on the LS from RAN2 R1-2001506 | R1-2001976R1-2001711R1-2001767R1-2001950R1-2002065R1-2002370 R1-2001641R1-2001718R1-2001946 |
| L3 | MsgB window | Based on the LS from RAN2 R1-2001511 | R1-2001766R1-2001976R1-2001525R1-2001711R1-2001950R1-2001984R1-2002065R1-2002113R1-2002260R1-2002370R1-2002527R1-2001640R1-2001716R1-2001947R1-2002103R1-2002309 R1-2002375R1-2002658 |
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# Summary and recommendation

It is supposed that the following three reply LSs and the corresponding TPs are to be handled in AI 5.

**L1. Support of CSI-RS based CFRA (R1-2001236)**

Reply LS needed, TP for 38.213

**L2. Capture the description of SFN validation (R1-2001506)**

Reply LS may or may not be needed, TP for 38.213

**L3. Start of MsgB window (R1-2001511)**

Reply LS needed, TP for 38.213

Apart from the three LSs, it seems that we do not need any other dedicated email discussion for this sub agenda item.

**The following editorial changes in Issue #1 and #2 can be directly proposed to the editors.**

1.3 Align the parameter names of RAN1 such that they reflect the RAN2 parameter names

2 TP for 38.214 section 6.1.4.2

Next, proceed with steps 2-4 as defined in Clause 5.1.3.2

- For a PUSCH scheduled by fallbackRAR UL grant, UE assumes the TB size determined by the UL grant in the fallback RAR shall be the same as the TB size used in the corresponding MsgA PUSCH transmission.

Any further comments?

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| Company | Comment |
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# References

1. R1-2001525 Corrections on procedure of 2-step RACH Huawei, HiSilicon
2. R1-2001648 Remaining issues on procedure for 2-step RACH vivo
3. R1-2001711 Remaining issues of the 2-step RACH procedures ZTE, Sanechips
4. R1-2001767 Remaining issues for procedure of 2-step RACH OPPO
5. R1-2001950 Remaining details of Procedure for 2-step RACH LG Electronics
6. R1-2001959 RAN1 terminology alignment for two-step RACH Nokia, Nokia Shanghai Bell
7. R1-2001984 Remaining details of procedure for 2-step RACH Intel Corporation
8. R1-2002065 Remaining issues on 2-step RACH procedure CATT
9. R1-2002113 Procedure for Two-step RACH Samsung
10. R1-2002260 Clarification on the starting point of MsgB window Spreadtrum Communications
11. R1-2002370 Procedure Related Corrections for 2-Step RACH Ericsson
12. R1-2002432 Maintenance for Procedure for Two-step RACH NTT DOCOMO, INC.
13. R1-2002527 Remaining issues on procedures for Two-Step RACH Qualcomm Incorporated
14. R1-2001506 LS on random access procedure in NR-U RAN2, InterDigital
15. R1-2001641 Discussion on random access procedure in NR-U vivo
16. R1-2001718 Discussion on the LS for the random access procedure in NR-U ZTE, Sanechips
17. R1-2001946 Draft Reply LS on random access procedure in NR-U LG Electronics
18. R1-2001511 LS to RAN1 on the starting point of MSGB window RAN2, ZTE
19. R1-2001640 Discussion on the starting point of MSGB window vivo
20. R1-2001716 [Draft] Reply LS on the starting point of MsgB window ZTE, Sanechips
21. R1-2001947 Draft Reply LS on the starting point of MSGB window LG Electronics
22. R1-2002103 Draft reply LS on the starting point of MSGB window Samsung
23. R1-2002309 Discussion on the starting point of MsgB window Apple
24. R1-2002375 [DRAFT] LS Response on the starting point of MSGB window Ericsson
25. R1-2002658 Draft LS reply to RAN2 on the starting point of MSGB window Huawei, HiSilicon
26. R1-2001717 [Draft] Reply LS on the support of 2-step CFRA ZTE, Sanechips
27. R1-2002660 Draft LS reply to RAN2 on support of 2-step CFRA Huawei, HiSilicon

# Appendix

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| TDoc | Issue # | Proposals |
| [1525, 2660]HW | L1, L3 | ***Proposal 1:*** *For msgA PRACH transmission without associating to valid POs, the msgB window can start one symbol after the last symbol of PRACH.* ***Proposal 2:*** *To correct the operations related to msgB window, adopt TP#1 in the Appendix.* |
| [1648, 1640, 1641]vivo | L1, L2,L3 | **Proposal 1: Support CSI-RS based contention free 2-step RACH.****Proposal 2: RAN1 adopts the following text proposal #1 for section 8.2A of TS 38.213:****Proposal 1: MsgB window starts at the first symbol of the earliest CORESET the UE is configured to receive PDCCH for MsgB, and at least one symbol after the last symbol of the PRACH occasion corresponding to the PRACH transmission in case of the PRACH transmission of MsgA without associated PUSCH occasion.****Proposal 1: Capture the validation of LSBs of SFN in DCI with RA-RNTI or MsgB-RNTI in response to a PRACH transmission in 38.213.**  |
| [1711]ZTE | L1,L2,L3 | According to the request from RAN2 and the common sense reached in last RAN1 meeting, a TP is proposed below.For the type-2 RACH procedure, the second paragraph in section 8.2 could be duplicated to the section 8.2A, and there is no other RAN1 impact.**Proposal 1: The MsgB window starts at the first symbol of the earliest CORESET the UE is configured to receive PDCCH for MsgB, and at least one symbol after the last symbol of MsgA preamble in case of preambles without associated PRUs.** |
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| [1766, 1767]OPPO | L1,L2,L3 | **Proposal 1: RAN1 support the PDCCH ordering in 2-step RACH and its QCL assumption for DMRS in addition to support basic 2-step RACH for CFRA with RACH associated to the CSI-RS and SSB.****Proposal 2: TS38.213 should capture that validation description for determining whether a downlink assignment is valid for successful RAR reception.*****Proposal 1: The msgB window starts at the first symbol of the earliest CORESET the UE is configured to receive PDCCH for Type1-PDCCH CSS set, as defined in Subclause 10.1, that is at least one symbol, after the last symbol of the preamble transmission when there is no PRU associated with the preamble.*** |
| [1950]LGE | L2, L3 | ***Proposal 1:*** For resolving SFN issue, select one solution among below three alternatives: * Alt.1: In DCI with CRC scrambled by msgB-RNTI, the indication bits ‘LSBs of SFN’ are interpreted to indicate msgB monitoring time duration with same msgB-RNTI within N\*10ms duration.
	+ msgB monitoring time duration started before 0\*N ~ 10\*N ms, where, N = $\sum\_{k=0}^{1}s^{(k)}$, and $s^{(k)}$ is the LSB of SFN
* Alt.2: For handover purpose to a target cell in asynchronous network, for msgB monitoring with msgB-RNTI, UE assumes that the length of the monitoring window is up to 10ms when UE is configured that the length of the monitoring window is over 10ms by *msgB-ResponseWindow*. Also, for msgB monitoring with C-RNTI, UE assumes the length of monitoring window configured by *msgB-ResponseWindow*. Send LS to RAN2 for confirming the RAN1 assumption.
* Alt.3: In the handover case in asynchronous network, UE shall complete the 2-step RACH based handover procedure within the handover interrupt time T2step\_RACH\_handover for 2-step RACH, which needs to be defined in TS38.133 and shall be smaller than or equal to Tinterrupt (=Tsearch + TIU + Tprocessing + T Δ+Tmargin ms) in Section 6.1.1.2 (NR FR1 – FR1 Handover) in TS38.133. Send LS to RAN4 for confirming the RAN1 assumption.

***Proposal 2:*** For msgA PRACH only case, select one alternative among below two alternatives as the starting of msgB window * Alt.1: If the PUSCH occasion associated with a DMRS resource is not mapped to a preamble of valid PRACH occasions, the window starts at the first symbol of the earliest CORESET the UE is configured to receive PDCCH for Type1-PDCCH CSS set, as defined in Clause 10.1, that is at least one symbol, after the last symbol of the PRACH occasion corresponding to the PRACH transmission.
* Alt.2: If the PUSCH occasion associated with a DMRS resource is not mapped to a preamble of valid PRACH occasions, the window starts at the first symbol of the earliest CORESET the UE is configured to receive PDCCH for Type1-PDCCH CSS set, as defined in Clause 10.1, that is at least one symbol, after the last symbol of any valid PUSCH occasion mapped to a preamble of the valid PRACH occasion for the preamble, where the symbol duration corresponds to the SCS for Type1-PDCCH CSS set.

***Proposal 3:*** * The description for msgB monitoring window start should be changed for taking ‘PUSCH dropping / PUSCH transmission case in NR-U’ into account.
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| [1959, 1976]Nokia | 1,L1,L2,L3 | **Proposal 1: Update the RAN1 specifications to reflect the terminology used in 38.300.****Proposal 2: Update section 8.2A of 38.213 to RAN1 specifications to use MSGB-RNTI instead of RA-RNTI to ensure proper operation of the two-step RACH procedure.****Proposal 3: Align the parameter names of RAN1 such that they reflect the RAN2 parameter names.****Proposal 1: Adopt the following text proposal to include support for CSI-RS based 2-step CFRA:****Proposal 3: Adopt the following text proposal in 38.213 to correct the starting point of MsgB window for cases where MsgA preamble is transmitted without MsgA PUSCH transmission.****Proposal 4: Adopt the following text proposals in 38.213 to capture the successRAR validation as requested by RAN2.** |
| [1984]Intel | L1,L3 | **Proposal 1*** *If the PRACH occasion is not mapped to a valid PUSCH occasion, when UE transmits only PRACH in a valid PRACH occasion, the MsgB window starts at the first symbol of the earliest CORESET the UE is configured to receive PDCCH for MsgB, and at least one symbol after the last symbol of MsgA PRACH occasion corresponding to the PRACH transmission, where the symbol duration corresponds to the SCS for Type1-PDCCH CSS set.*

**Proposal 2*** *Support CSI-RS for 2-step CFRA.*

**Proposal 3*** *Adopt the following text in 38.213 Subclause 8.2A.*
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| [2065]CATT | L2,L3 | **Proposal 1: Interpretation of 2 LSBs of SFN is captured in TS38.213 and TP in the Appendix for TS 38.213 is adopted.****Proposal 2: PBCH decoding of target cell during handover is left to RAN2 to discuss.****Proposal 3: If MSGA PRACH occasion is not mapped to a valid MSGA PUSCH occasion, the starting point for MSGB window starts at the first symbol of the earliest CORESET the UE is configured to receive PDCCH for MSGB and that is at least one symbol, after the last symbol of the MSGA PRACH occasion corresponding to the MSGA PRACH transmission.** |
| [2113]Samsung | 2,L3 | ***Proposal 1: for a transmission of both PRACH and the corresponding PUSCH, UE determines the msgB window starting position by using end of corresponding PUSCH as reference points;******Proposal 2: for a transmission of only PRACH with the corresponding PUSCH is not transmitted, UE determines the msgB window starting position by using end of corresponding PUSCH as reference points;******Proposal 3: for a transmission of only PRACH without a valid corresponding PUSCH, UE determines the msgB window starting position by using end of the PRACH as reference points.******Proposal 4: adopt following TP in section 8.2A in TS38.213:******Proposal 5: adopted following TP in section 6.1.4.2 in TS 38.214:***  |
| [2260]Spreadtrum | 3,L3 | ***Proposal1: Confirm the working assumption:**** ~~(Working Assumption)~~ The preambles without associated PRUs can be used for msgA transmission (preamble only) for 2-step RACH

***Proposal2: Modify the reference point to start the MsgB response window from “PUSCH occasion corresponding to the PUSCH transmission” to “MsgA transmission”.*** |
| [2370]Ericsson | L1,L2,L3 | 1. Inform RAN2 in the reply LS that there’s no issue to support CSI-RS resource for 2-step RA.
2. Add procedure text to 38.213 checking the SFN LSBs in DCI for MsgB against the SFN in which PRACH is transmitted and correct the description of SFN LSBs and reserved bits in 38.212 with respect to MsgB-RNTI and RA-RNTI, according to text proposals TP2 and TP3.
3. For a MsgA transmission with only preamble transmitted, the start of the MsgB window is at least 1 symbol after the last symbol of the PRACH occasion for the MsgA transmission, according to text proposals TP4.
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| [2432]DCM | 4 | **Proposal 1:*** **For reusing 4-step RACH parameters for 2-step RACH, if the 4-step RACH parameters are not configured on the UL BWP where 2-step RACH procedure is to be performed, the corresponding 4-step RACH parameters configured on the initial UL BWP are reused.**
* **Following text proposal is applied to section 8.1 in TS 38.213.**
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| [2527]QC | L1, L3 | ***Proposal 1: Correct Section 8.2A of TS 38.213 according to the text proposal TP1, to specify the starting point of msgB RAR window when UE has selected a valid PRACH occasion for msgA of a Type-2 random access procedure, but cannot find a valid PUSCH occasion to associate with the msgA PRACH occasion based on Section 8.1A of TS 38.213.******Proposal 2: NR Rel-16 does not support CSI-RS based two-step CFRA. SSB-based two-step CFRA can be supported as an optional UE feature in NR Rel-16 two-step RACH, if needed.******Proposal 3: Correct Section 8.2A of TS 38.213 according to the text proposal TP2, to capture the SSB-based QCL assumption for UE in monitoring msgB PDCCH for a Type-2 random access procedure.*** |
| [2309, 2310]Apple | L2, L3 | **Proposal: If the RO is not mapped to a valid PO, the starting point of MsgB window is after the last symbol of the PRACH occasion corresponding to the PRACH transmission.****Proposal 2: Capture the proposed TP in TS 38.213.** |