3GPP TSG-RAN WG1 Meeting #115 Draft R1-2312280

Chicago, USA, 13th – 17th November 2023

**Agenda Item: 8.4.1**

**Title: FL summary #1 on Rel-18 RedCap UE complexity reduction**

**Source: Moderator (Ericsson)**

**Document for: Discussion, Decision**

# Introduction

This feature lead (FL) summary (FLS) concerns the Rel-18 work item (WI) on enhanced support of reduced capability (RedCap) NR devices [1, 2]. The final FLS from the previous RAN1 meeting can be found in [3]. The RAN1 agreement summary from the previous RAN1 meeting is available in [4].

This document summarizes contributions [5] – [29] submitted to agenda item 9.4.1 and the following email discussion:

|  |
| --- |
| [115-R18-RedCap] Email discussion on eRedCap – Johan (Ericsson)* To be used for sharing updates on online/offline schedule, details on what is to be discussed in online/offline sessions, Tdoc number of the moderator summary for online session, etc.
 |

Issues in this document are tagged and color coded with High Priority, Medium Priority, and Low Priority, and the issues that are in the focus of the initial discussion round are furthermore tagged FL1.

Follow the naming convention in this example:

* *eRedCapFLS1-v000.docx*
* *eRedCapFLS1-v001-CompanyA.docx*
* *eRedCapFLS1-v002-CompanyA-CompanyB.docx*
* *eRedCapFLS1-v003-CompanyB-CompanyC.docx*

If needed, you may “lock” a discussion document for 30 minutes by creating a checkout file, as in this example:

* Assume CompanyC wants to update *eRedCapFLS1-v002-CompanyA-CompanyB.docx*.
* CompanyC uploads an empty file named *eRedCapFLS1-v003-CompanyB-CompanyC.checkout.*
* CompanyC checks that no one else has created a checkout file simultaneously, and if there is a collision, CompanyC tries to coordinate with the company who made the other checkout (see, e.g., contact list below).
* CompanyC then has 30 minutes to upload *eRedCapFLS1-v003-CompanyB-CompanyC.docx.*
* If no update is uploaded in 30 minutes, other companies can ignore the checkout file.
* Note that the file timestamps on the server are in UTC time.

In file names, please use the hyphen character (not the underline character) and include ‘v’ in front of the version number, as in the examples above and in line with the general recommendation (see slide 11 in [R1-2310782](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_115/Docs/R1-2310782.zip)), otherwise the sorting of the files will be messed up (which can only be fixed by the RAN1 secretary).

To avoid excessive email load on the RAN1 email reflector, please note that there is NO need to send an info email to the reflector just to inform that you have uploaded a new version of this document. Companies are invited to enter the contact info in the table below.

**FL1 Question 0-1a: Please consider entering contact info below for the points of contact for this email discussion.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Point(s) of contact** | **Email address(es)** |
| vivo | Lihui Wang | wanglihui@vivo.com |
| Nordic | Karol Schober | karol.schober@nordicsemi.no |
| CMCC | Jiazhen Zhang | zhangjiazhen@chinamobile.com |
| Sharp | Xiaojun Ma | xiaojun.ma@cn.sharp-world.com |
| ZTE, Sanechips | Youjun Hu | hu.youjun1@zte.com.cn |
| Spreadtrum | Sicong Zhao | Sicong.zhao@unisoc.com |

# 1 Early indication

RAN1#113 made the following agreements regarding the early indication via Msg1/MsgA PRACH [4]:

|  |
| --- |
| Agreement:* A network-configurable additional separate early indication in Msg1 for Rel-18 eRedCap UEs is supported.
	+ When Msg1 indication for Rel-18 eRedCap UEs is configured, it is used by Rel-18 eRedCap UEs (with or without UE BB bandwidth reduction).
* When Msg1 indication for Rel-18 eRedCap UEs is not configured while Msg1 indication for Rel-17 RedCap UEs is configured, Rel-18 eRedCap UEs shall share the PRACH that is configured for Rel-17 RedCap UEs.
	+ Note: Rel-18 eRedCap UEs will be differentiated from Rel-17 RedCap UEs based on Msg3 of Rel-18 eRedCap UEs.
* Additional early indication in MsgA PRACH is not supported.
 |

The following contribution discusses early indication via Msg1/MsgA PRACH:

|  |  |  |  |
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| [11] | [R1-2311262](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311262.zip)(section 2.1) | Further consideration on specification for Rel-18 RedCap | OPPO |

Contribution [11] notes that it is unclear from the RAN1#113 agreement that a Rel-18 eRedCap UE should use Rel-17 RedCap MsgA PRACH resources if configured.

**FL1 High Priority Proposal 1-1a: When MsgA PRACH early indication for Rel-17 RedCap UEs is configured, Rel-18 eRedCap UEs shall share the MsgA PRACH that is configured for Rel-17 RedCap UEs.**

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| **Company** | **Y/N** | **Comments** |
| vivo | Y | Since it was agreed that additional early indication in MsgA PRACH is not supported, it is better for R18 eRedCap share Rel-17 MsgA PRACH rather than sharing non-RedCap UE’s MsgA PRACH. |
| Nordic | Y |  |
| CMCC | Y |  |
| Sharp | Y |  |
| ZTE, Sanechips | Y |  |
| Spreadtrum | Y |  |

# 2 Random access timeline relaxation

RAN#114bis made the following agreements regarding the random access timeline relaxation [3, 4]:

|  |
| --- |
| Agreement:* The following does not apply to FG 48-2 UEs for CFRA:
	+ RAR PDSCH timeline relaxation

Agreement:For which (if any) of the following 2-step RACH cases, continue to discuss if there is a need to update the specifications to reflect the RAN1 agreement that RAR PDSCH timeline relaxation does not apply to FG 48-2 UEs for CFRA:* Case 2a: Between reception of fallbackRAR and transmission of Msg3
* Case 2b: Between reception of successRAR and transmission of corresponding HARQ-ACK
* Case 2c: Between reception of MsgB PDSCH scheduled by MSGB-RNTI in which UE does not correctly receive the transport block in the corresponding PDSCH within the window and transmission of only PRACH according to Type-1 random access procedure or to transmit both PRACH and PUSCH according to Type-2 random access procedure.
* Case 2d: Between reception of MsgB PDSCH scheduled by MSGB-RNTI with RAPID which is not associated with the corresponding PRACH transmission from the UE and transmission of only PRACH according to Type-1 random access procedure or to transmit both PRACH and PUSCH according to Type-2 random access procedure.
 |

The relevant specification text in 38.213 clause 17.1A [36] is inserted below (with some parts highlighted), where the first paragraph corresponds to Case 2a, the middle paragraph to Case 2c/2d, and the last paragraph to Case 2b.

|  |
| --- |
| When - a UE receives a PDSCH scheduled by a DCI format with CRC scrambled by a RA-RNTI or a MsgB-RNTI over a number of PRBs that is larger than 25 PRBs for 15 kHz SCS or larger than 12 PRBs for 30 kHz SCS, and - the PDSCH includes a RAR message with an RAR UL grant scheduling a Msg3 PUSCH transmission from the UE, as described in Clauses 8.2 and 8.2A the UE transmits the Msg3 PUSCH if a time between the last symbol of a PDSCH reception conveying the RAR message and the first symbol of the Msg3 PUSCH transmission is not smaller than $N\_{T,1}+N\_{T,2}+1.5$ msec for 15 kHz SCS or $N\_{T,1}+N\_{T,2}+1.0$ msec for 30 kHz SCS where $N\_{T,1}$ and $N\_{T,2}$ are defined in clause 8.3; otherwise, the UE behaviour is based on UE implementation.When - a UE receives a PDSCH scheduled by a DCI format with CRC scrambled by a RA-RNTI or a MsgB-RNTI over a number of PRBs that is larger than 25 PRBs for 15 kHz SCS or larger than 12 PRBs for 30 kHz SCS, and - the UE does not correctly receive the transport block provided by the PDSCH, or if the higher layers at the UE do not identify a RAPID associated with a corresponding PRACH transmission from the UEif requested by higher layers, the UE shall be ready to transmit a PRACH no later than $N\_{T,1}+1.75$ msec for 15 kHz SCS, or no later than $N\_{T,1}+1.25$ msec for 30 kHz SCS, after the last symbol of the PDSCH reception, or after the last symbol of the window as described in Clauses 8.2 and 8.2A.When - a UE receives a PDSCH scheduled by a DCI format with CRC scrambled by MsgB-RNTI over a number of PRBs that is larger than 25 PRBs for 15 kHz SCS or larger than 12 PRBs for 30 kHz SCS, and - the PDSCH includes a RAR message that is for successRAR for the UE as described in Clause 8.2A the UE transmits a PUCCH with HARQ-ACK information if a time between the last symbol of the PDSCH reception conveying the RAR message and the first symbol of the PUCCH transmission is not smaller than $N\_{T,1}+1.5$ msec for 15 kHz SCS or $N\_{T,1}+1.0$ msec for 30 kHz SCS; otherwise, the UE behaviour is based on UE implementation. |

The following contributions discuss random access timeline relaxation:

|  |  |  |  |
| --- | --- | --- | --- |
| [7] | [R1-2310992](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2310992.zip)(TP 3) | Discussion on further UE complexity reduction | ZTE, Sanechips |
| [8] | [R1-2311000](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311000.zip)(section 2.1) | Maintenance on UE complexity reduction for eRedCap | Panasonic |
| [9] | [R1-2311101](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311101.zip)(section 2) | Remaining issues on further UE complexity reduction | Vivo |
| [11] | [R1-2311262](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311262.zip)(section 2.2) | Further consideration on specification for Rel-18 RedCap | OPPO |
| [12] | [R1-2311346](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311346.zip)(section 3) | Remaining issues of Rel-18 RedCap | CATT |
| [13] | [R1-2311406](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311406.zip)(section 2.1) | Discussion on further complexity reduction for eRedCap UEs | Xiaomi |
| [14] | [R1-2311486](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311486.zip)(section 2.4) | Maintenance on further complexity reduction for eRedCap | CMCC |
| [16] | [R1-2311545](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311545.zip) | Remaining issues on UE complexity reduction for eRedCap UEs | China Telecom |
| [17] | [R1-2311626](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311626.zip)(section 2.2) | Maintenance on further UE complexity reduction for eRedCap | NTT DOCOMO, INC. |
| [18] | [R1-2311688](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311688.zip)(section 2.1) | Further RedCap UE complexity reduction | Apple |
| [19] | [R1-2311746](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311746.zip)(proposal 1) | Discussion on UE complexity reduction | DENSO CORPORATION |
| [21] | [R1-2311786](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311786.zip)(issue 1/2) | Remaining Issues for eRedCap | Nokia, Nokia Shanghai Bell |
| [24] | [R1-2311894](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311894.zip)(issue 1) | Remaining issues of further UE complexity reduction for eRedCap | LG Electronics |
| [25] | [R1-2311978](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311978.zip) | Maintenance on eRedCap UE complexity reduction | MediaTek Inc. |
| [26] | [R1-2312040](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312040.zip)(section 2.1) | UE complexity reduction for eRedCap | Qualcomm Incorporated |
| [27] | [R1-2312126](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312126.zip)(section 2.1) | On maintenance of further complexity reduction of NR UE | Nordic Semiconductor ASA |
| [29] | [R1-2312204](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312204.zip)(section 2.1) | Maintenance issues for UE Redcap | Sony |

Several contributions express that one or more of the cases may not valid or already covered by current specification:

* For Case 2a, several contributions [9, 13, 17, 19, 21, 24, 25] claim that it is not valid in 2-step CFRA.
* For Case 2b, some contributions [12, 17, 24, 25] express that the current specification already allows PUCCH to be transmitted without timeline relaxation thanks to the formulation “otherwise, the UE behaviour is based on UE implementation”, which does not preclude earlier PUCCH transmission.
* For Case 2c/2d, some contributions [17, 21, 24, 25] express that the current specification already allows PRACH to be transmitted without timeline relaxation thanks to the formulation “the UE shall be ready to transmit a PRACH no later than”, which does not preclude earlier PRACH transmission.

As a result, there are different views regarding the need for specification changes:

* Some contributions [16, 18, 29] propose to confirm that the random access timeline relaxation does not apply for Cases 2a/2b/2c/2d for CFRA for an FG 48-2 UE.
* Several contributions [7, 11, 13, 14, 19, 21, 26] express that a spec update is needed for one or more valid cases, and contributions [7, 11, 14, 26] provide corresponding TPs for 38.213.
* Several contributions [8, 9, 24, 25, 27] express that no spec update is needed for any of the cases.
* Some contributions [12, 17] express that either the spec should be updated for the valid cases, or it should be clarified that according to the current spec, an FG 48-2 UE does not apply relaxed timeline for 2-step CFRA.

Companies are invited to reply to the following question:

**FL1 High Priority Question 2-1a: Companies are invited to indicate a preference between these options.**

* **Option 1: Make a RAN1 conclusion that the current specification reflects the RAN1 agreement that RAR PDSCH timeline relaxation does not apply to FG 48-2 UEs for CFRA.**
* **Option 2: Update the RAN1 specification to reflect the RAN1 agreement that RAR PDSCH timeline relaxation does not apply to FG 48-2 UEs for CFRA.**
* **Option 3: Other way forward (please elaborate in the comment field).**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option** | **Comments** |
| vivo | Opt.1 | For case 2a, Msg.3 does not exist for 2-step CFRA.For case 2b, it does not exist for 2-step CFRA. Because the successRAR is used for contention resolution for contention based 2-step RACH. * In TS 38.321 spec, the successRAR is to response for the MsgA PUSCH which includes the CCCH, and CCCH is used for CBRA for Idle/inactive UEs, not for CFRA for connected UEs. In addition, in TS38.321 Figure 6.2.3a-2, successRAR includes the UE Contention Resolution Identity which is used for CBRA, not CFRA.

For case 2c and 2d, the spec says ”the UE shall be ready to transmit a PRACH no later than...”, it does not restrict the UE to transmit PRACH in earlier timing.  |
| Nordic  | Option1 |  |
| CMCC | Option2 | For case 2a, when fallback to 4-step CFRA, Msg.3 does not exist.For case 2b, successRAR does not exist for 2-step CFRA. For case 2c and 2d, UE retransmits PRACH depends on its capability, the spec should restrict RAR timeline relaxation is only for FG48-1 UE, and FG48-2 UE in idle mode. |
| Sharp | Option1 |  |
| ZTE, Sanechips | Opt3 | For the paragraph with “the UE shall be ready to transmit a PRACH no later than” , we do not have strong view to change, because it does not restrict the UE to transmit PRACH earlier. However, for the paragraph with “otherwise, the UE behaviour is based on UE implementation”, it is better to have some change, because, if the timeline for on PUCCH is earlier, up to UE implementation means the UE may not send PUCCH even the UE can handle it. Additionally, if there is no change, it actually reverts the agreement. |
| Spreadtrum | Option 1 |  |

# 3 Msg4 PDSCH bandwidth

RAN1#112bis-e sent the following LS to RAN2 in [30]:

|  |  |
| --- | --- |
| 1 Overall descriptionRAN1 discussed Msg4 PDSCH transmission to Rel-18 eRedCap UEs and made the following agreement:

|  |
| --- |
| AgreementConfirm the following working assumption by assuming that Msg3 indication is availableWorking Assumption* For UE BB complexity reduction, a UE is able to receive a Msg4 PDSCH resource allocation spanning a bandwidth of more than ~5 MHz per slot.
	+ The UE is not required to process a Msg4 PDSCH with a larger number of PRBs than 25 PRBs for 15 kHz SCS and 12 PRBs for 30 kHz SCS.
 |

RAN1 would like to inform RAN2 about the following case, to consider, if needed, the UE behavior in the RAN2 specifications, and ask RAN2 for feedback if any:* For UE BB complexity reduction, the case when the UE detects a DCI scheduling a Msg4 PDSCH transmission with a larger bandwidth than it can receive or process

The case was also discussed in RAN1 in Question 2.7-2b of summary [R1-2303936](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_112b-e/Docs/R1-2303936.zip).2 Actions**To RAN2:****ACTION:** RAN1 respectfully requests RAN2 to take the above into account in their future work and to provide feedback to RAN1 if any. |

RAN1#114bis received the following LS reply from RAN2 in [31]:

|  |
| --- |
| **1. Overall Description:**RAN2 would like to thank RAN1 on the LS on Msg4 PDSCH transmission to Rel-18 eRedCap UEs. RAN2 had some discussion on the issue mentioned in the LS, and achieved the following agreement:* **An eRedCap UE considers the contention resolution not successful and stop the *ra-ContentionResolutionTimer*, when the UE detects a PDCCH transmission addressed to its TEMPORARY\_C-RNTI with a DCI that schedules a Msg4 PDSCH transmission with a larger bandwidth than it can receive or process, i.e. option 1 is adopted.**

**2. Actions:****To RAN WG1:**RAN2 kindly request RAN1 to take the above information into account, and provide feedback, if any. |

RAN1#114bis discussed the RAN2 reply and considered the following proposal without reaching a conclusion [3].

|  |
| --- |
| **RAN1#114bis High Priority Proposal 2.3-1c:*** Conclusion: It is up to UE implementation about how the physical layer notifies higher layers when it detects a DCI that schedules a Msg4 PDSCH transmission with a larger bandwidth than the UE can receive or process.
 |

The following contributions discuss Msg4 PDSCH bandwidth:

|  |  |  |  |
| --- | --- | --- | --- |
| [5] | [R1-2310820](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2310820.zip)(section 2.1) | Maintenance of R18 RedCap | FUTUREWEI |
| [9] | [R1-2311101](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311101.zip)(section 4) | Remaining issues on further UE complexity reduction | Vivo |
| [15] | [R1-2311541](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311541.zip) | Maintenance on Rel-18 RedCap UE | NEC |
| [17] | [R1-2311626](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311626.zip)(proposal 2/3) | Maintenance on further UE complexity reduction for eRedCap | NTT DOCOMO, INC. |
| [19] | [R1-2311746](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311746.zip)(proposal 2) | Discussion on UE complexity reduction | DENSO CORPORATION |

The above contributions express the following views on Msg4 PDSCH bandwidth:

* Contribution [5] expresses that Msg4 PDSCH bandwidth restriction should be applied to FG 48-2 UE in RRC\_IDLE and RRC\_INACTIVE.
* Contribution [9] proposes to apply Msg4 PDSCH bandwidth restriction to FG 48-2 UE in RRC\_INACTIVE.
* Contribution [15] proposes that the Msg4 PDSCH bandwidth restriction only applies in RRC\_IDLE or CBRA.
* Contribution [17] expresses that it would be unnecessary for an FG 48-2 UE to stop the contention resolution timer when it encounters a Msg4 PDSCH larger than 25/12 PRBs for 15/30 kHz SCS.
* Contribution [19] proposes to discuss the potential physical layer notification to higher layers when the RAN2 specifications are more complete.

Companies are invited to comment on the question below.

**FL1 Medium Priority Question 3-1a: To avoid that the contention resolution timer is stopped unnecessarily if/when gNB happens to schedule a Msg4 PDSCH wider than 25/12 PRBs for 15/30 kHz SCS (e.g., to non-eRedCap UEs), would it be acceptable to agree the following TP for 38.213 clause 17.1A?**

|  |
| --- |
| A UE not supporting FG 48-2 is not required to process a PDSCH reception that is scheduled by a DCI format with CRC scrambled by a TC-RNTI over a number of PRBs that is larger than 25 PRBs for 15 kHz SCS, or larger than 12 PRBs for 30 kHz SCS, in a slot. |
| **Company** | **Y/N** | **Comments** |
| vivo | N | Same procedure applies to FG48-1 and 48-2 RedCap UEs during the initial access. |
| Nordic | No | do not support change.  |
| Sharp | N | For CBRA, the same procedure should be applied for FG48-1 and FG48-2 Ues. For CFRA, there are no msg4 PDSCH scheduled by TC-RNTI. |
| ZTE, Sanechips | N |  |
| Spreadtrum | N |  |

# 4 MBS PDSCH bandwidth

RAN1#114 and RAN#114bis made the following agreements on broadcast/multicast MBS PDSCH bandwidth [3, 4]:

|  |
| --- |
| Agreement:* For UE BB bandwidth reduction, the number of PRBs scheduled in DCI can be larger than 25 PRBs for 15 kHz SCS and 12 PRBs for 30 kHz SCS for:
	+ Broadcast MBS PDSCH without any PDSCH in next slot
	+ Broadcast MBS PDSCH without MBS PDSCH repetition

Agreement:* For a UE with BB bandwidth reduction, for multicast MBS specified in Rel-17, the number of PRBs scheduled in DCI is not larger than 25/15 PRBs for 15/30 kHz SCS (irrespective of whether HARQ feedback is enabled or disabled).
 |

The following contributions discuss broadcast/multicast MBS PDSCH bandwidth:

|  |  |  |  |
| --- | --- | --- | --- |
| [5] | [R1-2310820](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2310820.zip)(section 2.2) | Maintenance of R18 RedCap | FUTUREWEI |
| [6] | [R1-2310857](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2310857.zip)(section 2.2.1) | Maintenance on Rel-18 RedCap | Huawei, HiSilicon |
| [12] | [R1-2311346](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311346.zip)(section 2.2) | Remaining issues of Rel-18 RedCap | CATT |
| [13] | [R1-2311406](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311406.zip)(section 2.2) | Discussion on further complexity reduction for eRedCap UEs | Xiaomi |
| [14] | [R1-2311486](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311486.zip)(section 2.1) | Maintenance on further complexity reduction for eRedCap | CMCC |
| [17] | [R1-2311626](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311626.zip)(section 2.3) | Maintenance on further UE complexity reduction for eRedCap | NTT DOCOMO, INC. |
| [20] | [R1-2311749](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311749.zip)(issue 1) | Remaining issues on UE complexity reduction | Sharp |
| [26] | [R1-2312040](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312040.zip)(section 3.1) | UE complexity reduction for eRedCap | Qualcomm Incorporated |

The contributions express the following views regarding broadcast MBS:

* For broadcast MBS with other PDSCH in next slot or with MBS PDSCH repetition, contribution [7] proposes that it should be supported when the number of PRBs is not larger than 25/12 PRBs for 15/30 kHz, while contributions [13, 14] propose that it can be up to UE implementation whether larger number of PRBs is also supported.
* The Rel-18 broadcast MBS feature for RedCap-specific CFR is brought up in contribution [17] which proposes that it should be supported with other PDSCH in next slot or with MBS PDSCH repetition even when the number of PRBs is larger than 25/12 PRBs for 15/30 kHz SCS.
* Contribution [20] proposes that the UE should be able to receive MCCH PDSCH with larger number of PRBs than 25/12 PRBs for 15/30 kHz SCS when another PDSCH is scheduled in the same slot.
* Contribution [20] proposes that the same broadcast MBS procedure should be used for UEs with and without UE BB bandwidth reduction.
* Contribution [6] provides a TP for 38.213 clause 17.1A to rewrite the broadcast MBS paragraph to refer to slots {*n*-1, *n*} instead of slots {*n*, *n*+1}.

The contributions express the following views regarding multicast MBS:

* The Rel-18 multicast MBS feature for inactive state is brought up in contributions [5, 26] which propose that it should support the same number of PRBs as broadcast MBS (without any PDSCH in next slot, and without MBS PDSCH repetition), whereas contribution [12] instead proposes that it supports the same number of PRBs as Rel-17 multicast MBS for connected state.

Companies are invited to comment on the questions below.

**FL1 High Priority Question 4-1a: Please indicate your preference among the following options:**

* **Option 1: For UE BB bandwidth reduction, the number of PRBs scheduled in DCI is not larger than 25/12 PRBs for 15/30 kHz SCS for (Rel-17) broadcast MBS PDSCH with any PDSCH in next slot or MBS PDSCH repetition.**
* **Option 2: For UE BB bandwidth reduction, the number of PRBs scheduled in DCI can be larger than 25/12 PRBs for 15/30 kHz SCS for (Rel-17) broadcast MBS PDSCH with any PDSCH in next slot or MBS PDSCH repetition.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option** | **Comments** |
| vivo | Option 2, but | Current spec reads like the option 2: “A UE that has not indicated FG 48-2 is not required to process a PDSCH reception in slot $n$ that is scheduled by a DCI format with CRC scrambled by a G-RNTI for broadcast over a number of PRBs that is larger than 25 PRBs for 15 kHz SCS, or larger than 12 PRBs for 30 kHz SCS, when the PDSCH reception is with repetitions or when the UE receives another PDSCH in slot $n+1$.”But it seems not clear how to understand the UE behavior. Does above text mean the UE is not required to process a broadcast MBS PDSCH in slot n, but the UE should prioritize the broadcast MBS PDSCH repetition in slot n+1, over the repetition in slot n, if the broadcast MBS PDSCH is with repetition, and the UE should prioritize another PDSCH in slot n+1? Or the UE behavior is up to implementation for such case? |
| Nordic  | Option 1 | i.e. current agreement  |
| CMCC | Option2 | Current spec aligns with option 2. Supporting broadcast larger than 5MHz can avoid impose restriction on broadcast for legacy UEs. Considering capability of FG48-1 UE, it can process broadcast in one slot or one repetition. |
| Sharp | Option2 | “Can be larger than 25/12 PRBs” and “UE does not require to…” are not contradict.  |
| ZTE, Sanechips | Option 2 | Actually, if gNB side restrict the broadcast PDSCH for eRedCap UE within 5MHz, it is unfair to the Rel-17 RedCap UE. Therefore, it is not Okay to restrict the broadcast bandwidth.For the UE behavior, the UE should prioritize another PDSCH in slot n+1 if any. For the MBS PDSCH in slot n, it can be dropped or something else, which is up to UE implementation. |
| Spreadtrum |  | For option 1, we understand that the 48-1 UE can handle this case. Do we need to reflect this case in the spec?For option 2, actually, we don’t think the current spec is align with option 2, option 2 didn’t say anything about UE behavior for dropping. Option 2 may require a higher UE capability, i.e., to process MBS in slot n, even when the PDSCH reception is with repetitions or when the UE receives another PDSCH in slot $n+1$. Then, we are negative for option 2.* If option 2 includes UE behavior for dropping, then we may need to make it more clear before we agree it, for example:
	+ Reuse the current spec, i.e., “the UE is not required to process a PDSCH reception in slot $n$ that is scheduled …”. If it is, option 2 is already included in the current spec...
	+ Up to UE implementation.
 |
|  |  |  |

**FL1 Medium Priority Question 4-2a: Please indicate your preference among the following options:**

* **Option 1: For UE BB bandwidth reduction, the number of PRBs scheduled in DCI is not larger than 25/12 PRBs for 15/30 kHz SCS for Rel-18 multicast MBS feature for inactive state.**
* **Option 2: For UE BB bandwidth reduction, the number of PRBs scheduled in DCI can be larger than 25/12 PRBs for 15/30 kHz SCS for Rel-18 multicast MBS feature for inactive state.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option** | **Comments** |
| Nordic  |  | This R18 feature combination is of lower priority, we should first resolve R17MBS with R18eRedCap. |
| CMCC | Option1 | Considering multicast UE in inactive mode and in connected mode may be in one group, the same bandwidth restriction is preferred. |
| ZTE, Sanechips |  | Agree with Nordic, there are many Rel-18 features also, and this MBS issue could be deprioritized, or other R18 features also should be treated. |
| Spreadtrum |  | Agree with Nordic, this R18 feature combination is of lower priority, we should focus on R17 MBS.For R17 MBS, we understand that all the cases we discussed for R18 eRedCap is that the total span of R17 MSB CFR and RedCap BWP is no larger than 20MHz. This means for the case that the total span of MSB CFR and RedCap BWP is larger than 20MHz (as shown in the following figure), R18 eRedCap does not need to handle. In order to avoid ambiguous, we suggest RAN1 to conclude the following:* R18 eRedCap does not need to handle the case that the total span of R17 MSB CFR and RedCap BWP is larger than 20MHz.
 |

**FL1 Medium Priority Question 4-3a: Please indicate which (if any) of the following proposals you think should be prioritized in this meeting (and please elaborate in the comment field):**

* **Proposal 1: The Rel-18 broadcast MBS feature for RedCap-specific CFR is brought up in contribution [17] which proposes that it should be supported with other PDSCH in next slot or with MBS PDSCH repetition even when the number of PRBs is larger than 25/12 PRBs for 15/30 kHz SCS.**
* **Proposal 2: Contribution [20] proposes that the UE should be able to receive MCCH PDSCH with larger number of PRBs than 25/12 PRBs for 15/30 kHz SCS when another PDSCH is scheduled in the same slot.**
* **Proposal 3: Contribution [20] proposes that the same broadcast MBS procedure should be used for UEs with and without UE BB bandwidth reduction.**
* **Proposal 4: Contribution [6] provides a TP for 38.213 clause 17.1A to rewrite the broadcast MBS paragraph to refer to slots {*n*-1, *n*} instead of slots {*n*, *n*+1}.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Proposal(s)** | **Comments** |
|  Nordic  | None |  |
| CMCC |  | Proposal 4 can be further discussed. |
| Sharp | At least 2 | In 38.331, UE is requred to process the MCCH immediately if the DCI indicated a MCCH change notification. For this case, the UE should receive MCCH PDSCH with higher priority even if another PDSCH is scheduled in next slot. |
| ZTE, Sanechips |  | For P1, we did not see the spec change. If there is no spec change, we do not think it is critical in this maintenance stage.For P2, there is no need to make such differentiation between MCCH and MTCH PDSCH. If the UE can process, then it will process the MCCH and does not impact the next slot processing. If the UE can not process MCCH within slot n, the slot n+1 PDSCH still should be prioritized.For P3, we are open to discuss the procedure if the peak data rate is larger than 10Mbps for UE with 48-2. but whether it should be the same procedure for the UE with 48-1 and 48-2, we donot think it is critical.For P4, it has been discussed in last meeting and there is no consensus. Moreover, with such change, the unicast PDSCH in slot n may be dropped, which is not aligned with the agreement. Therefore, there is no need to discuss P4. |
|  |  |  |

# 5 Simultaneous reception of MBS and other PDSCH

RAN#114bis made the following agreements regarding simultaneous reception of MBS and other PDSCH [3, 4]:

|  |
| --- |
| Agreement:* An eRedCap UE with bandwidth reduction, depending on indicated UE capability, the UE can decode a PDSCH for MBS broadcast and a PDSCH for unicast with the two PDSCH partially or fully overlapping in time in non-overlapping PRBs, if the total number of PRBs does not exceed the maximum number of PRBs that the UE can receive or process per slot.

Agreement:* An eRedCap UE with bandwidth reduction, depending on indicated UE capability, the UE can decode a PDSCH for MBS multicast and a PDSCH for unicast with the two PDSCH partially or fully overlapping in time in non-overlapping PRBs, if the total number of PRBs does not exceed the maximum number of PRBs that the UE can receive or process per slot.

Agreement:* Continue to discuss whether and how to update the specification regarding the following aspect:
	+ simultaneous MBS broadcast/multicast and unicast when the total number of PRBs exceeds the maximum number of PRBs that the UE can receive or process per slot (if this is a valid case)
 |

The following contributions discuss simultaneous reception of MBS and other PDSCH:

|  |  |  |  |
| --- | --- | --- | --- |
| [5] | [R1-2310820](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2310820.zip)(section 2.2) | Maintenance of R18 RedCap | FUTUREWEI |
| [6] | [R1-2310857](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2310857.zip)(section 2.1) | Maintenance on Rel-18 RedCap | Huawei, HiSilicon |
| [7] | [R1-2310992](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2310992.zip)(proposal 1) | Discussion on further UE complexity reduction | ZTE, Sanechips |
| [8] | [R1-2311000](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311000.zip)(section 2.2) | Maintenance on UE complexity reduction for eRedCap | Panasonic |
| [9] | [R1-2311101](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311101.zip)(section 3) | Remaining issues on further UE complexity reduction | Vivo |
| [10] | [R1-2311169](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311169.zip)(section 2.2) | Remaining issues on enhanced support of RedCap devices | Spreadtrum Communications |
| [11] | [R1-2311262](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311262.zip)(section 2.3) | Further consideration on specification for Rel-18 RedCap | OPPO |
| [12] | [R1-2311346](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311346.zip)(section 2.3) | Remaining issues of Rel-18 RedCap | CATT |
| [14] | [R1-2311486](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311486.zip)(section 2.2) | Maintenance on further complexity reduction for eRedCap | CMCC |
| [17] | [R1-2311626](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311626.zip)(section 2.3) | Maintenance on further UE complexity reduction for eRedCap | NTT DOCOMO, INC. |
| [18] | [R1-2311688](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311688.zip)(section 2.2) | Further RedCap UE complexity reduction | Apple |
| [19] | [R1-2311746](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311746.zip)(proposal 3) | Discussion on UE complexity reduction | DENSO CORPORATION |
| [20] | [R1-2311749](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311749.zip)(issue 2) | Remaining issues on UE complexity reduction | Sharp |
| [21] | [R1-2311786](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311786.zip)(issue 3) | Remaining Issues for eRedCap | Nokia, Nokia Shanghai Bell |
| [24] | [R1-2311894](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311894.zip)(issue 3) | Remaining issues of further UE complexity reduction for eRedCap | LG Electronics |
| [26] | [R1-2312040](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312040.zip)(section 4) | UE complexity reduction for eRedCap | Qualcomm Incorporated |
| [27] | [R1-2312126](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312126.zip)(section 2.3.1) | On maintenance of further complexity reduction of NR UE | Nordic Semiconductor ASA |
| [28] | [R1-2312167](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312167.zip)(section 3) | Maintenance issues for Rel-18 eRedCap | Ericsson |
| [29] | [R1-2312204](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312204.zip)(section 2.2) | Maintenance issues for UE Redcap | Sony |

The contributions express the following views regarding simultaneous reception of MBS and other PDSCH:

* Contributions [5, 7, 9, 11, 12, 17, 18, 19, 27] propose to only support simultaneous MBS broadcast/multicast and unicast when the total number of PRBs does not exceed the maximum number of PRBs that the UE can receive or process per slot (and possibly leave the behavior unspecified when the number of PRBs is larger).
* Contributions [6, 8, 21, 24, 28, 29] propose for simultaneous MBS broadcast/multicast and unicast that when the total number of PRBs exceeds the maximum number of PRBs that the UE can receive or process per slot, the UE is not required to decode both PDSCHs. Furthermore, contributions [8, 21, 24, 28, 29] propose to prioritize the unicast over the broadcast/multicast MBS.
* Contributions [14, 20] propose to support simultaneous MBS broadcast and unicast with a larger number of PRBs, but not simultaneous MBS multicast and unicast with a larger number of PRBs.
* Contributions [10, 26] propose to use UE capabilities to indicate whether the UE supports simultaneous MBS multicast and unicast with a smaller or a larger number of PRBs than the UE can receive or process per slot. Furthermore, contribution [26] proposes additional UE capabilities related to MIMO and 256QAM.

Companies are invited to comment on the questions below.

**FL1 High Priority Question 5-1a: Please indicate your preferences among the following options:**

* **Option 1: For UE BB bandwidth reduction, simultaneous MBS broadcast/multicast and unicast when the total number of PRBs exceeds the maximum number of PRBs that the UE can receive or process per slot is not a valid case.**
* **Option 2: For UE BB bandwidth reduction, simultaneous MBS broadcast/multicast and unicast when the total number of PRBs exceeds the maximum number of PRBs that the UE can receive or process per slot is a valid case, and the UE prioritizes unicast over MBS broadcast/multicast.**
* **Option 3: Other option (please elaborate in the comment field).**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Preferred option for broadcast** | **Preferred option for multicast** | **Comments** |
| vivo | Option 1, but open for Option 2 | Option 1 | Option 1 is our preference for both broadcast and multicast. But we can be open to support option 2 for broadcast if companies think option 1 for broadcast MBS is too restrictive. Because for multicast, the UE will always receive each multicast PDSCH. While for broadcast MBS, the UE only receives it when the UE wants to receive. |
| Nordic  | Option 1 | Option 1 |  |
| CMCC | Option3 | Option1 | Since broadcast has no processing timeline requirement and no HARQ feedback, UE can buffer broadcast and process it later, thus simultaneous reception of broadcast and unicast can depend on UE capability.In MBS topic, FDMed DG multicast and DG unicast is allowed. If bandwidth of FDMed DG multicast and DG unicast is larger than maximum number of PRBs and multicast has HARQ feedback, decoding unicast firstly may impact HARQ of multicast. One solution is option1, and gNB avoids scheduling unicast to be FDMed with DG multicast if total PRB is larger than maximum number of PRBs. In this way, when R18 RedCap UEs and legacy UEs are in the same multicast group, the scheduling of multicast of legacy UEs will not be impacted. |
| Sharp | Option3 | Option1 | For the cases simultaneous MBS broadcast and unicast reception, it can be up to UE to select one of PDSCH to decode. For example, UE can decode the MBS broadcast to get better MBS experience and trans a NACK for the discarded unicast PDSCH, or UE can decode the unicast PDSCH with higher priority and skip the MBS broadcast which may be not so critical. |
| ZTE, Sanechips | Option2 | Option2 | We do not think UE can process the PRBs number larger than 5MHz without relaxation. Therefore, option2 is a baseline solution. If companies has strong preference on option1, we are OK to consider it as an optional capability. |
| Spreadtrum | Option 1 | Option 1 |  |

# 6 Simultaneous reception of SI and other PDSCH

RAN1#114 made the following agreements related to simultaneous reception of SI/RAR/MBS and other PDSCH [4]:

|  |
| --- |
| Agreement:* For handling of multiple reception in a slot during P-RNTI triggered SI acquisition when the total number of PRBs for the PDSCH scheduled with SI-RNTI and the PDSCH scheduled with C-RNTI, MCS-C-RNTI, or CS-RNTI scheduled in the slot is larger than the maximum number of PRBs that the UE can process per slot, the UE may skip decoding of the scheduled PDSCH with C-RNTI, MCS-C-RNTI, or CS-RNTI.

Agreement:* For UE BB bandwidth reduction, when PDSCH scheduled with RA-RNTI or MSGB-RNTI is greater than 25/12 PRBs with 15/30kHz SCS, support the following UE behavior:
	+ UE behavior 2: Relaxed random access processing timeline in connected mode:
		- The UE is not expected to decode a PDSCH scheduled with C-RNTI, MCS-C-RNTI, G-RNTI for multicast or broadcast, MCCH-RNTI, G-CS-RNTI or CS-RNTI in the same or next slot if another PDSCH in the same cell is scheduled with RA-RNTI or MSGB-RNTI.

Agreement:* For UE BB bandwidth reduction, the number of PRBs scheduled in DCI can be larger than 25 PRBs for 15 kHz SCS and 12 PRBs for 30 kHz SCS for:
	+ Broadcast MBS PDSCH without any PDSCH in next slot
	+ Broadcast MBS PDSCH without MBS PDSCH repetition
 |

The following contribution discusses the consistency between the agreements listed above.

|  |  |  |  |
| --- | --- | --- | --- |
| [28] | [R1-2312167](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312167.zip) | Maintenance issues for Rel-18 eRedCap | Ericsson |

Contribution [28] notes that the first agreement listed above (related to SI PDSCH reception) seems to be based on an assumption that the UE only needs a single slot to process a transmission wider than 25/12 PRBs for 15/30 kHz SCS, whereas the second agreement (related to RAR PDSCH reception) and the third agreement (related to MBS PDSCH reception) seem to be based on an assumption that the UE may need two slots to process a transmission.

**FL1 Medium Priority Question 6-1a: Is there a need to relax the agreed requirement on simultaneous reception of SI PDSCH and other PDSCH? If the answer is no, please elaborate in the comment on whether you think the requirement is consistent with the RAR/MBS PDSCH requirements.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Comments** |
| vivo | N? | Different from RAR, there is no subsequent transmission is requested for SI reception and broadcast MBS PDSCH reception. Comparing the SIB and broadcast MBS PDSCH reception, the TBS is usually smaller than broadcast MBS PDSCH, so additional slot may not be needed.  |
| Nordic | Y | we support relaxing the requirement, to have consistent processing with RAR and broadcast. But agree that TBS is much smaller for SI compared to unicast.  |
| ZTE, Sanechips | Y | We think it can be aligned with RAR processing and there is no harm to the UE. |
|  |  |  |

# 7 Default values of peak rate related UE capabilities

RAN1#114bis discussed a proposal to modify the default values of the peak rate related UE capability parameters for eRedCap UEs [3]. It was suggested to continue the discussion if needed when it is clear how RAN2 will capture the RAN1 agreements listed in the LS in [32] in their specifications. The running RAN2 CRs can be found in [33, 34].

|  |  |  |  |
| --- | --- | --- | --- |
| [32] | [R1-2308610](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_114/Docs/R1-2308610.zip) | LS on reduced peak data rate for Rel-18 eRedCap UEs | RAN1, Ericsson |
| [33] | [R2-2312189](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_124/Docs/R2-2312189.zip) | 38.306 CR draft (Rel-18, B) UE capabilities for Rel-18 eRedCap WI | Intel Corporation |
| [34] | [R2-2312190](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_124/Docs/R2-2312190.zip) | 38.331 CR draft (Rel-18, B) UE capabilities for Rel-18 eRedCap WI | Intel Corporation |
| [13] | [R1-2311406](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311406.zip)(section 2.3) | Discussion on further complexity reduction for eRedCap UEs | Xiaomi |

Contribution [13] expresses that the current default values of the peak rate related UE capability parameters are not suitable for eRedCap UEs and proposes to follow one of these directions:

* **Direction 1:** Specify that it is mandatory for Rel-18 eRedCap UEs to report UE capability related RRC parameters *scalingFactor*, *supportedModulationOrderDL* and *supportedModulationOrderUL* to the gNB.
* **Direction 2:** Introduce new default values for *scalingFactor*, *supportedModulationOrderDL* and *supportedModulationOrderUL*.

**FL1 High Priority Question 7-1a: Is there an issue with the current default values of the peak rate related UE capability parameters that needs to be addressed? Please elaborate in the comment field.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Comments** |
| vivo |  | If the NW knows the UE is Rel-18 eRedCap, then it seems clear that the peak data rate for Rel-18 eRedCap is around 10Mbps? |
| Nordic  | Y | Capability reporting overhead is unnecessary. But corresponding spec is RAN2. |
| CMCC |  | Similar view as vivo. |
| ZTE, Sanechips |  | We can come back to this issue, if RAN2 does not discuss this in this meeting. |
|  |  |  |

# 8 Clarification of “UE that [has not] indicated FG 48-2”

RAN1#114bis discussed and agreed to continue to discuss potential clarification of “A UE that has not indicated FG 48-2” and “A UE that indicated FG 48-2” in the following paragraphs in 38.213 clause 17.1A [3, 35, 36]:

|  |
| --- |
| A UE that has not indicated FG 48-2 does not expect to transmit a PUSCH over a bandwidth that is larger than 25 PRBs for 15 kHz SCS, or larger than 12 PRBs for 30 kHz SCS, per hop in a slot.A UE that has not indicated FG 48-2 does not expect to process a PDSCH reception that is scheduled by a DCI format with CRC scrambled by a C-RNTI, CS-RNTI, MCS-C-RNTI, G-RNTI for multicast, or G-CS-RNTI over a number of PRBs that is larger than 25 PRBs for 15 kHz SCS, or larger than 12 PRBs for 30 kHz SCS, in a slot.A UE that has not indicated FG 48-2 is not required to process a PDSCH reception in slot $n$ that is scheduled by a DCI format with CRC scrambled by a G-RNTI for broadcast or a MCCH-RNTI over a number of PRBs that is larger than 25 PRBs for 15 kHz SCS, or larger than 12 PRBs for 30 kHz SCS, when the PDSCH reception is with repetitions or when the UE receives another PDSCH in slot $n+1$.A UE is not required to process a PDSCH reception that is scheduled by a DCI format with CRC scrambled by a TC-RNTI over a number of PRBs that is larger than 25 PRBs for 15 kHz SCS, or larger than 12 PRBs for 30 kHz SCS, in a slot.A UE that indicated FG 48-2 does not expect to transmit a PUSCH over a bandwidth that is larger than 25 PRBs for 15 kHz SCS, or larger than 12 PRBs for 30 kHz SCS, per hop in a slot, where the PUSCH is scheduled by RAR UL grant or by a DCI scrambled by a TC-RNTI, or is configured for a Type-2 random access procedure. |

The potential clarification of “A UE that [has not] indicated FG 48-2” is discussed in the following contributions:

|  |  |  |  |
| --- | --- | --- | --- |
| [5] | [R1-2310820](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2310820.zip)(section 2.1) | Maintenance of R18 RedCap | FUTUREWEI |
| [6] | [R1-2310857](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2310857.zip)(section 2.2.2) | Maintenance on Rel-18 RedCap | Huawei, HiSilicon |
| [7] | [R1-2310992](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2310992.zip)(TP 2) | Discussion on further UE complexity reduction | ZTE, Sanechips |
| [8] | [R1-2311000](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311000.zip)(section 2.3) | Maintenance on UE complexity reduction for eRedCap | Panasonic |
| [9] | [R1-2311101](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311101.zip)(section 4) | Remaining issues on further UE complexity reduction | Vivo |
| [10] | [R1-2311169](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311169.zip)(section 2.1) | Remaining issues on enhanced support of RedCap devices | Spreadtrum Communications |
| [12] | [R1-2311346](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311346.zip)(section 4) | Remaining issues of Rel-18 RedCap | CATT |
| [13] | [R1-2311406](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311406.zip)(section 2.5) | Discussion on further complexity reduction for eRedCap UEs | Xiaomi |
| [14] | [R1-2311486](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311486.zip)(section 2.5) | Maintenance on further complexity reduction for eRedCap | CMCC |
| [15] | [R1-2311541](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311541.zip) | Maintenance on Rel-18 RedCap UE | NEC |
| [17] | [R1-2311626](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311626.zip)(section 2.1/2.2) | Maintenance on further UE complexity reduction for eRedCap | NTT DOCOMO, INC. |
| [20] | [R1-2311749](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311749.zip)(issue 3) | Remaining issues on UE complexity reduction | Sharp |
| [21] | [R1-2311786](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311786.zip)(issue 4) | Remaining Issues for eRedCap | Nokia, Nokia Shanghai Bell |
| [23] | [R1-2311848](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311848.zip) | Remaining issues on further UE complexity reduction for eRedCap | Samsung |
| [24] | [R1-2311894](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311894.zip)(issue 2) | Remaining issues of further UE complexity reduction for eRedCap | LG Electronics |
| [26] | [R1-2312040](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312040.zip)(section 2.2) | UE complexity reduction for eRedCap | Qualcomm Incorporated |
| [27] | [R1-2312126](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312126.zip)(section 2.2) | On maintenance of further complexity reduction of NR UE | Nordic Semiconductor ASA |
| [28] | [R1-2312167](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312167.zip)(section 4) | Maintenance issues for Rel-18 eRedCap | Ericsson |

The views expressed in the contributions are summarized below for each one of the affected paragraphs in 38.213 [36].

First, we have the first PUSCH paragraph:

|  |
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| A UE that has not indicated FG 48-2 does not expect to transmit a PUSCH over a bandwidth that is larger than 25 PRBs for 15 kHz SCS, or larger than 12 PRBs for 30 kHz SCS, per hop in a slot. |
| The contributions express the following views regarding the above paragraph:* **View 1:** Contributions [8, 9, 12, 17, 21, 27, 28] propose to replace the highlighted text with “A UE not supporting FG 48-2” to eliminate potential ambiguous interpretations.
* **View 2:** Contributions [10, 14] propose to clarify that the highlighted text refers to UEs with UE BB bandwidth reduction in all RRC states, and FG 48-2 UEs in RRC\_IDLE.
* **View 3:** Contribution [7] proposes to replace the highlighted text with “A UE not indicating FG 48-2” to make the text clearer.
* **View 4:** Contributions [13, 15, 20, 23, 24] express that there is no need for a clarification in this paragraph.

**FL1 Medium Priority Question 8-1a: Please indicate your preferred view(s) for the above 38.213 paragraph.** |
| **Company** | **Preferred view(s)** | **Comments** |
| vivo | View 1 | The wording of “has not indicated” and “indicated” is ambiguous on the timing and the valid period for the capability indication. For example, the indicated capability can be considered valid/effective as long as an eRedCap UE indicates once, even if the eRedCap is release to the idle mode or changed the cell/operators. The UE may consider it “has indicated”. |
| Nordic  | View 1 or View 4 |  |
| CMCC |  | Understand the worry about “has not indicated” and “indicated”. IF view 1 is chosen, another paragraph is needed to restrict PUSCH bandwidth for FG 48-2 UE in idle mode. Similarly, whole clause 17.1A needs to be checked to cover all previous agreements. |
| Sharp | View 4 | The change of “does not support” has also take ambiguity for gNB’s scheduler, we perfer to keep current wording. |
| ZTE, Sanechips | View 3, can live with View 1 | Current spec has similar wording using ‘indicate’. |
| Spreadtrum | View 2, can live with view 1 | If view 1 is adopted, then paragraph 5 needs to be updated, otherwise, the restriction for 48-2 UE for initial access is not clear (we need to keep the same initial access behavior between 48-1 and 48-1 UEs). |

Second, we have the unicast PDSCH paragraph:

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| A UE that has not indicated FG 48-2 does not expect to process a PDSCH reception that is scheduled by a DCI format with CRC scrambled by a C-RNTI, CS-RNTI, MCS-C-RNTI, G-RNTI for multicast, or G-CS-RNTI over a number of PRBs that is larger than 25 PRBs for 15 kHz SCS, or larger than 12 PRBs for 30 kHz SCS, in a slot. |
| The contributions express the following views regarding the above paragraph:* **View 1:** Contributions [8, 9, 12, 17, 21, 27, 28] propose to replace the highlighted text with “A UE not supporting FG 48-2” to eliminate potential ambiguous interpretations.
* **View 2:** Contributions [10, 14] propose to clarify that the highlighted text refers to UEs with UE BB bandwidth reduction in all RRC states, and FG 48-2 UEs in RRC\_IDLE.
* **View 3:** Contribution [5] proposes to replace the highlighted text with “A UE that has indicated FG 48-1” to make the text clearer.
* **View 4:** Contribution [7] proposes to replace the highlighted text with “A UE not indicating FG 48-2” to make the text clearer.
* **View 5:** Contributions [13, 15, 20, 23, 24] express that there is no need for a clarification in this paragraph.

**FL1 Medium Priority Question 8-2a: Please indicate your preferred view(s) for the above 38.213 paragraph.** |
| **Company** | **Preferred view(s)** | **Comments** |
| vivo | View 1 | Same comments for FL1 Medium Priority Question 8-1a. |
| Nordic  | View 1 or View 5 |  |
| CMCC |  | Same comments for FL1 Medium Priority Question 8-1a. |
| Sharp | View5 |  |
| ZTE, Sanechips | View 3, can live with View 1 |  |
| Spreadtrum | View 2, can live with view 1 |  |

Third, we have the broadcast PDSCH paragraph:

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| --- |
| A UE that has not indicated FG 48-2 is not required to process a PDSCH reception in slot $n$ that is scheduled by a DCI format with CRC scrambled by a G-RNTI for broadcast or a MCCH-RNTI over a number of PRBs that is larger than 25 PRBs for 15 kHz SCS, or larger than 12 PRBs for 30 kHz SCS, when the PDSCH reception is with repetitions or when the UE receives another PDSCH in slot $n+1$. |
| The contributions express the following views regarding the above paragraph:* **View 1:** Contributions [8, 9, 12, 13, 17, 21, 27, 28] propose to replace the highlighted text with “A UE not supporting FG 48-2” to eliminate potential ambiguous interpretations.
* **View 2:** Contributions [10, 14] propose to clarify that the highlighted text refers to UEs with UE BB bandwidth reduction in all RRC states, and FG 48-2 UEs in RRC\_IDLE.
* **View 3:** Contribution [7] proposes to replace the highlighted text with “A UE not indicating FG 48-2” to make the text clearer.
* **View 4:** Contributions [15, 20, 23, 24] express that there is no need for a clarification in this paragraph.

**FL1 Medium Priority Question 8-3a: Please indicate your preferred view(s) for the above 38.213 paragraph.** |
| **Company** | **Preferred view(s)** | **Comments** |
| vivo | View 1 | Same comments as before. |
| Nordic  | View 1 or View 4 |  |
| CMCC |  | Same comments for FL1 Medium Priority Question 8-1a. |
| Sharp | View 4 |  |
| ZTE, Sanechips | View 3, can live with View 1 |  |
| Spreadtrum | View 2, can live with view 1 |  |

Finally, skipping the Msg4 PDSCH paragraph (which is treated in Section 3), we get to the Msg3 PUSCH paragraph:

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| --- |
| A UE that indicated FG 48-2 does not expect to transmit a PUSCH over a bandwidth that is larger than 25 PRBs for 15 kHz SCS, or larger than 12 PRBs for 30 kHz SCS, per hop in a slot, where the PUSCH is scheduled by RAR UL grant or by a DCI scrambled by a TC-RNTI, or is configured for a Type-2 random access procedure. |
| The contributions express the following views regarding the above paragraph:* **View 1:** Contributions [6, 8, 9, 10, 12, 15, 23, 27, 28] propose to replace the highlighted text with “A UE” or “A UE supporting FG 48-2” to eliminate potential ambiguous interpretations.
* **View 2:** Contributions [17, 26] express that the Msg3 PUSCH bandwidth restriction is not necessary for FG 48-2 and that the paragraph should be removed.
* **View 3:** Contribution [7] proposes to replace the highlighted text with “A UE indicating FG 48-2” to make the text clearer.
* **View 4:** Contribution [17] argues that if the motivation for the restriction is that the UE capabilities are not known yet, then the Msg5 PUSCH bandwidth should be restricted in the same way as the Msg3 PUSCH bandwidth.
* **View 5:** Contribution [14] proposes to clarify that the highlighted text refers to FG 48-2 UEs in RRC\_INACTIVE and RRC\_CONNECTED.
* **View 6:** Contributions [13, 20, 21, 24] express that there is no need for a clarification in this paragraph.

**FL1 Medium Priority Question 8-4a: Please indicate your preferred view(s) for the above 38.213 paragraph.** |
| **Company** | **Preferred view(s)** | **Comments** |
| vivo | View 1 | For Msg.3 and configured Msg.A PUSCH, we prefer the same handling as following text for Msg.4 scheduled by a DCI format with TC-RNTI, which includes both FG48-1 and FG48-2 eRedCap. “A UE is not required to process a PDSCH reception that is scheduled by a DCI format with CRC scrambled by a TC-RNTI over a number of PRBs that is larger than 25 PRBs for 15 kHz SCS, or larger than 12 PRBs for 30 kHz SCS, in a slot.” |
| Nordic  | View 1 or View 6 |  |
| CMCC |  | PUSCH bandwidth restriction is different for FG 48-2 UE in idle mode and connected mode. In idle mode, PUSCH bandwidth<5MHz. In inactive and connected mode, PUSCH bandwidth can be larger than 5MHz for Type-2 random access for CFRA. |
| Sharp | View 6 | it is aligned with the conclusion of that FG48-1 and FG48-2 Ues have the same procedure in CFRA. |
| ZTE, Sanechips | View 3, can live with View 1 |  |
| Spreadtrum | View 1 |  |

# 9 Other aspects

The following contributions bring up some other aspects which are not covered in any other section in this FLS.

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| [22] | [R1-2311797](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311797.zip) | Remaining issues on UE complexity reduction | Transsion Holdings |
| [23] | [R1-2311848](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311848.zip) | Remaining issues on further UE complexity reduction for eRedCap | Samsung |
| [27] | [R1-2312126](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312126.zip)(section 3) | On maintenance of further complexity reduction of NR UE | Nordic Semiconductor ASA |

The above contributions have the following proposals:

* Contribution [22] proposes that the optional feature of DL 256QAM is not applicable to FG 48-2 UEs.
* Contribution [23] proposes that unicast FDRA indications and RBG sizes can be based on 5-MHz sub-bands.
* Contribution [27] proposes that HD-FDD UE is capable of processing one additional unicast DCI for PUSCH.

Companies were invited to comment on similar proposals also in the previous RAN1 meeting [3].

**FL1 Low Priority Question 9-1a: Is there a need to treat any of the proposals listed above in this meeting?**

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| **Company** | **Y/N** | **Comments** |
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# References

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| --- | --- | --- | --- |
| [1] | [RP-232671](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_101/Docs/RP-232671.zip) | Revised WID on Enhanced support of reduced capability NR devices | Ericsson |
| [2] | [R1-2300177](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112/Docs/R1-2300177.zip) | WI work plan for Rel-18 RedCap | Rapporteur (Ericsson) |
| [3] | [R1-2310568](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_114b/Docs/R1-2310568.zip) | FL summary #4 on Rel-18 RedCap UE complexity reduction | Moderator (Ericsson) |
| [4] | [R1-2310329](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_114b/Docs/R1-2310329.zip) | RAN1 agreements for Rel-18 NR RedCap | Rapporteur (Ericsson) |
| [5] | [R1-2310820](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2310820.zip) | Maintenance of R18 RedCap | FUTUREWEI |
| [6] | [R1-2310857](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2310857.zip) | Maintenance on Rel-18 RedCap | Huawei, HiSilicon |
| [7] | [R1-2310992](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2310992.zip) | Discussion on further UE complexity reduction | ZTE, Sanechips |
| [8] | [R1-2311000](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311000.zip) | Maintenance on UE complexity reduction for eRedCap | Panasonic |
| [9] | [R1-2311101](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311101.zip) | Remaining issues on further UE complexity reduction | Vivo |
| [10] | [R1-2311169](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311169.zip) | Remaining issues on enhanced support of RedCap devices | Spreadtrum Communications |
| [11] | [R1-2311262](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311262.zip) | Further consideration on specification for Rel-18 RedCap | OPPO |
| [12] | [R1-2311346](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311346.zip) | Remaining issues of Rel-18 RedCap | CATT |
| [13] | [R1-2311406](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311406.zip) | Discussion on further complexity reduction for eRedCap UEs | Xiaomi |
| [14] | [R1-2311486](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311486.zip) | Maintenance on further complexity reduction for eRedCap | CMCC |
| [15] | [R1-2311541](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311541.zip) | Maintenance on Rel-18 RedCap UE | NEC |
| [16] | [R1-2311545](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311545.zip) | Remaining issues on UE complexity reduction for eRedCap UEs | China Telecom |
| [17] | [R1-2311626](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311626.zip) | Maintenance on further UE complexity reduction for eRedCap | NTT DOCOMO, INC. |
| [18] | [R1-2311688](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311688.zip) | Further RedCap UE complexity reduction | Apple |
| [19] | [R1-2311746](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311746.zip) | Discussion on UE complexity reduction | DENSO CORPORATION |
| [20] | [R1-2311749](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311749.zip) | Remaining issues on UE complexity reduction | Sharp |
| [21] | [R1-2311786](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311786.zip) | Remaining Issues for eRedCap | Nokia, Nokia Shanghai Bell |
| [22] | [R1-2311797](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311797.zip) | Remaining issues on UE complexity reduction | Transsion Holdings |
| [23] | [R1-2311848](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311848.zip) | Remaining issues on further UE complexity reduction for eRedCap | Samsung |
| [24] | [R1-2311894](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311894.zip) | Remaining issues of further UE complexity reduction for eRedCap | LG Electronics |
| [25] | [R1-2311978](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2311978.zip) | Maintenance on eRedCap UE complexity reduction | MediaTek Inc. |
| [26] | [R1-2312040](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312040.zip) | UE complexity reduction for eRedCap | Qualcomm Incorporated |
| [27] | [R1-2312126](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312126.zip) | On maintenance of further complexity reduction of NR UE | Nordic Semiconductor ASA |
| [28] | [R1-2312167](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312167.zip) | Maintenance issues for Rel-18 eRedCap | Ericsson |
| [29] | [R1-2312204](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_115/Docs/R1-2312204.zip) | Maintenance issues for UE Redcap | Sony |
| [30] | [R1-2304262](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_112b-e/Docs/R1-2304262.zip) | LS on Msg4 PDSCH transmission to Rel-18 eRedCap UEs | RAN1, Ericsson |
| [31] | [R1-2308830](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_114b/Docs/R1-2308830.zip) | Reply LS to RAN1 on Msg4 PDSCH transmission to Rel-18 eRedCap UEs | RAN2, Vivo |
| [32] | [R1-2308610](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_114/Docs/R1-2308610.zip) | LS on reduced peak data rate for Rel-18 eRedCap UEs | RAN1, Ericsson |
| [33] | [R2-2312189](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_124/Docs/R2-2312189.zip) | 38.306 CR draft (Rel-18, B) UE capabilities for Rel-18 eRedCap WI | Intel Corporation |
| [34] | [R2-2312190](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_124/Docs/R2-2312190.zip) | 38.331 CR draft (Rel-18, B) UE capabilities for Rel-18 eRedCap WI | Intel Corporation |
| [35] | [TS 38.213 V18.0.0](https://www.3gpp.org/ftp/Specs/archive/38_series/38.213/38213-i00.zip) | NR; Physical layer procedures for control (Release 18) | 3GPP |
| [36] | [R1-2310738](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_114b/Docs/R1-2310738.zip) | 38.213 CR draft (Rel-18, F) Maintenance of support for enhanced reduced capability NR devices | Samsung |
| [37] | [TS 38.214 V18.0.0](https://www.3gpp.org/ftp/Specs/archive/38_series/38.214/38214-i00.zip) | NR; Physical layer procedures for data (Release 18) | 3GPP |
| [38] | [R1-2310767](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_114b/Docs/R1-2310767.zip) | 38.214 CR draft (Rel-18, F) Correction of enhanced reduced capability NR devices | Nokia |