**3GPP TSG-RAN WG2 Meeting #118-e R2-2206665**

**Online, 09 – 20 May 2022**

**Agenda Item: 8.19.2**

**Source: ZTE Corporation**

**Title: [AT117-e][118][CovEnh] MAC CR (ZTE)**

**Document for: Discussion and decision**

# Introduction

This document summarizes the following offline discussion.

* [AT118-e][118][CovEnh] MAC CR (ZTE)

Scope: Update MAC CR considering the submitted contributions

Intended outcome: Agreeable MAC CR

Deadline (for companies' feedback): Thursday 2022-05-19 12:00 UTC

Deadline (for final CR in R2-2206412): Friday 2022-05-20 08:00 UTC

In this offline document, we discuss the following contributions:

38.321 CRs

[R2-2204739](file:///C:\Data\3GPP\Extracts\R2-2204739%20-%20Correction%20to%2038.321%20on%20redundancy%20version%20for%20Msg3%20repetition.doc) Correction to 38.321 on redundancy version for Msg3 repetition OPPO CR Rel-17 38.321 17.0.0 1227 - F NR\_cov\_enh-Core

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[R2-2205067](file:///C:\Data\3GPP\Extracts\R2-2205067%20Clarification%20on%20Msg3%20repetition%20RV%20determination%20to%20MAC%20spec.doc) Clarification on Msg3 repetition RV determination to MAC spec Huawei, HiSilicon CR Rel-17 38.321 17.0.0 1251 - F NR\_cov\_enh-Core

* Continue in offline 118

In addition, we will also discuss the potential MAC spec impact for supporting CE only BWP.

# Contact from companies

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| --- | --- |
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# Discussion

## Redundancy version for Msg3 repetition

In current MAC spec, the redundancy version (RV) is applied on the nth transmission occasion within a bundle of dynamic grant or configure grant. In R2-2204739[1] and R2-2205067[2], companies pointed out the redundancy version for Msg3 repetition is agreed, and it is specified in RAN1 spec as follows, So [1][2] propose to update the MAC CR to also capture this scenario.

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| ***from TS 38.214 clause 6.1.2.1***  For a PUSCH transmission scheduled by DCI format 0\_1, or 0\_2, or 0\_0 with CRC scrambled by TC-RNTI, the redundancy version to be applied on the *n*th transmission occasion of the TB, where n = 0, 1, …-1, is determined according to table 6.1.2.1-2.  For a PUSCH transmission of a PUSCH repetition Type A scheduled by RAR UL grant, the redundancy version to be applied on the *n*th transmission occasion of the TB, where n = 0, 1, …-1, is determined according to the first row of Table 6.1.2.1-2.  Table 6.1.2.1-2: Redundancy version for PUSCH transmission   |  |  |  |  |  | | --- | --- | --- | --- | --- | | *rvid* indicated by the DCI scheduling the PUSCH | *rvid* to be applied to *n*th transmission occasion (repetition Type A) or TB processing over multiple slots) or *n*th actual repetition (repetition Type B) | | | | | *((n-(n mod N))/N)* mod 4 = 0 | *((n-(n mod N))/N)* mod 4 = 0 | *((n-(n mod N))/N)* mod 4 = 0 | *((n-(n mod N))/N)* mod 4 = 0 | | 0 | 0 | 2 | 3 | 1 | | 2 | 2 | 3 | 1 | 0 | | 3 | 3 | 1 | 0 | 2 | | 1 | 1 | 0 | 2 | 3 | |

**Q1. Do company agree with the intention of CRs in [1][2]?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Samsung | Yes |  |
| Qualcomm | Yes |  |
| LGE | Yes |  |
| Nokia | Yes |  |
| OPPO | Yes |  |
| CATT | Yes |  |
| vivo | Yes |  |
| Ericsson | Yes |  |
| ZTE | Yes |  |

Summary:

All companies agree with the intention of CR in [1][2].

If answer “Yes” to Q1, regarding the MAC TP, the content of [1][2] are given as below:

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| *from R2-2204739[1]*  5.4.2.1 HARQ Entity  \*\*\*omit non-related part\*\*\*  For each transmission within a bundle of the dynamic grant or uplink grant received in a MAC RAR, the sequence of redundancy versions is determined according to clause 6.1.2.1 of TS 38.214 [7]. For each transmission within a bundle of the configured uplink grant, the sequence of redundancy versions is determined according to clause 6.1.2.3 of TS 38.214 [7].  *from R2-2205067[2]*  5.4.2.1 HARQ Entity  \*\*\*omit non-related part\*\*\*  For each transmission within a bundle of the dynamic grant, the sequence of redundancy versions is determined according to clause 6.1.2.1 of TS 38.214 [7]. For each transmission within a bundle of the configured uplink grant, the sequence of redundancy versions is determined according to clause 6.1.2.3 of TS 38.214 [7]. For each transmission within a bundle of the uplink grant received in a MAC RAR, the sequence of redundancy versions is determined according to clause 6.1.2.1 of TS 38.214 [7]. |

**Q2. Which TP do you prefer, [1] or [2]? (Please elaborate your comment if you prefer other wording)**

|  |  |  |
| --- | --- | --- |
| **Company** | **[1] or [2]** | **Comments** |
| Samsung | [2] |  |
| Qualcomm | [1] | We think two TPs are technically correct but the TP in [1] is simpler |
| LGE | [2] |  |
| Nokia | [2] | Better to refer to RAN1 specification. |
| Huawei, HiSilicon | [2] | We prefer not to touch the legacy text, so additive sentence for new case is better. |
| OPPO | [1] | Proponent |
| CATT | [1] | We slightly prefer the TP in [1] which seems simpler. |
| vivo | [1] | Option 1 is simpler and has not changed anything about the legacy part. |
| Ericsson | Preference for [1] | Not a strong view, but we are anyways referencing the same table and it doesn’t really change legacy text. |
| ZTE | [1] | The TP in [1] is simpler. |

**Summary:**

Regarding the MAC CR, 6 companies perfer the TP in [1] and 4 companies prefer the TP in [2].

Considering the changes are basically aligned, rapporteur suggests we adopt TP in [1]. Official proposal is not needed, Rapporteur will provide CR based on [1].

## CE only BWP

Based on RAN1 feedback, RAN2 confirms the feasibility of supporting CE only BWP in R17, regarding how to specify CE only BWP and corresponding UE behaviour, it is now discussed under offline-103, and the following 3 options are provided.

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| Option 1: If the BWP selected for the Random Access procedure is only configured with CE RACH resources, the UE shall assume Msg3 repetition is applicable for the current Random Access resources as in R2-2205841 and R2-2205068;  Option 2: If the BWP selected for the Random Access procedure is NOT configured with rsrp-ThresholdMsg3, the UE shall assume Msg3 repetition is applicable for the current Random Access resources as in R2-2205851;  Option 3: If the BWP selected for the Random Access procedure is only configured with CE RACH resources, the network shall set the value of rsrp-ThresholdMsg3 to infinity as commented online. |

Regarding above 3 options, Option 1 has MAC spec impact as pointed out in [3][4]. For Option 2, it also affect MAC spec, because the UE is not required to evaluate rsrpThresholdMsg3, but Option 3 has no MAC impact, because there is no special handling at UE side, just the rsrp-ThresholdMsg3 will be set to a very large value so the UE always meets the criterion.

However, besides offline-103, rapporteur noticed the similar issue is also discussed under offline-507 and offline-508 in RACH common session. So rapporteur suggests to wait for the progress in other offline discussion. No question on MAC TP regarding CE only BWP is provided in this version of document.

**Update on 2022-05-17 Monday Week2.**

After Week 2 Monday online discussion, the following is agreed in RACH partitioning session:

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| Agreement:  4. Adopt the text proposals for rsrp-ThresholdMsg3 in BWP-UplinkCommon above with the editorial correction “The field is mandatory if both set(s) of Random Access resources with MSG3 repetition indication and set(s) of Random Access resources without MSG3 repetition indication are configured in the BWP. It is absent otherwise”. |

The corresponding MAC CR will be discussed under offline-508, so we will not discuss the MAC change in this offline.

However, based on the comments from QC in section 3.3, rapporteur suggests to further discuss the proposal in R2-2206034[5].

In [5], for CE only BWP, whether to trigger Msg3 repetition is controlled by the network. The proponent of [5] thinks when the UE’s link quality is strong, the network should set repetition factor K=1 in RAR, otherwise, it will waste radio resource and UE power. Considering RAN1 agrees that candidate repetition factors (e.g. numberOfMsg3Repetitions) are configured by the network. So to ensure the network would not force UE to perform Msg3 repetition, they propose the below proposal.

**Proposal. Downselect the following two options:**

**Option 1. In a UL BWP with RACH resources only for Msg3 repetition, if repetition factor K=1 is not one of the candidate repetition factors, it is up to UE implementation whether to perform RACH in this UL BWP or in initial UL BWP (after BWP switch);**

**Option 2. Repetition factor K=1 is always configured for a UL BWP with RACH resources only for Msg3 repetition.**

Rapporteur understands the concern, however, Option 1 causes many MAC spec impact. For Option 2, even if the network includes repetition factor K=1 as one of candidate repetition factors, the network is able to always indicate K>1 in the RAR when the link quality is good. Considering CE only BWP is only applicable to dedicated BWP for RRC\_CONNECTED UEs, rapporteur thinks it can be up to the network to configure appropriate configuration to the UE, additional restriction may not be needed.

Companies are invited to show your views to above proposal. The proposal is split into two questions.

**Q3. For CE only BWP, do you agree that repetition factor K=1 should be configured as one of the candidate repetition factors (i.e. Option 2)?**

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| **Company** | **Yes or No?** | **Comments**  **(please elaborate if answers No)** |
| Qualcomm | Yes | We hope this proposal can be a good compromise between UE and network.  - From UE’s perspective, we want to avoid the case where UE has good link quality but is forced to perform Msg3 repetition (slow and wasteful).  - For network, always including repetition factor K=1 in a BWP with only CE helps cover all scenarios of link quality (isn’t it one of the reasons why RAN2 accepted the proposal?). And it is not too restrictive for network configuration, as there are still other candidate values that network may configure. |
| Samsung | No | Prefer to leave it to network configuration. |
| LGE | No | Of course, this can resolve the concern raised in this contribution. We think whether to configure repetition factor K=1 is up to network configuration. |
| OPPO | Yes | We share the sympathy of R2-2206034 |
| CATT | No | We understand the concern of power assumption. However, we think this can be resolved by network configuration and no need to introduce the additional limitation for network configuration. |
| vivo | No | We agree with the reasoning mentioned by the rapporteur. K=1 can be configured but is not always needed. |
| Ericsson | No | K=1 is up to network. We do not want any unnecessary BWP-switching. We do not see the need to address this problem. |
| ZTE | No | We prefer to leave it to network implementation, not to add additional restrictions. |
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**Summary:**

8 companies provide feedback, 2 companies think for CE only BWP, the network should configure repetition factor K=1 as one of candidate repetition factors, but 6 compaines disagree and prefer to leave it to network implementation.

Based on the majority, rapporteur suggests:

**Proposal 1 For CE only BWP, it is up to the network to configure the candidate repetition factors, it may or may not include repetition factor K=1.**

**Q4. If answers “No” to Q3, do you agree that it is up to UE implementation whether to perform RACH in this UL BWP or in initial UL BWP (after BWP switch) (i.e. Option 1)?**

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| **Company** | **Yes or No?** | **Comments**  **(please elaborate if answers No)** |
| Qualcomm | Yes | If companies support the intention of the proposals but do not prefer to mandate a particular value in network’s configuration, then we may opt for UE implementation. |
| Samsung | No | We prefer to keep legacy principle where UE does not switch to initial UL BWP if RACH occasions are configured in active UL BWP. |
| LGE | No | Keeping legacy principle for this issue should be fine.  In our understanding, even if the network dose not configure repetition factor K=1 on this BWP, the network would give the lowest configured repetition factor in RAR after receiving the preamble. After that successful RACH procedure, if needed, the network would reconfigure candidate repetition factors with K=1 on the BWP or switch the UE to a BWP having legacy RACH resource.  We think that this proposal is to avoid only a few repetition during only one RACH procedure because the next RACH procedure would be performed based on the reconfigured RACH configuration by the network, if reconfiguration is really needed to avoid UE power consumption. Thus, power saving for a few repetition during only one RACH procedure is a small optimization and no critical problems are identified although both option 1 and 2 above are not pursued. |
| OPPO | No | There is RACH configured in the CE only BWP, would like to stick to legacy behaviour, i.e., UE switches to initial BWP when there is no RACH resources configured in the active BWP. |
| CATT | No | If the UE is allowed to switch to initial UL BWP, this brings transmission interruption. And if the repetition number is not proper, the network can reconfigure the parameters. |
| vivo | No | We believe the NW can properly decide with K=1 should be configured. The legavy UE behaviour is sufficient. |
| Ericsson | No | No, we do not want unnecessary BWP switching and this “problem” can be solved through network implementation. We cannot agree for BWP-switching up to UE implementation. |
| ZTE | No | Same comments as above companies. |
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**Summary:**

8 companies provide feedback, 1 company thinks for CE only BWP, if repetition factor K=1 is not configured as one of candidate repetition factors, it is up to the UE to perform RACH in this UL BWP or in initial UL BWP (after BWP switch), but 7 compaines disagree and think BWP switched should not be triggered in this case.

Based on the majority, rapporteur suggests:

**Proposal 2 For CE only BWP, the UE cannot trigger BWP switch due to repetition factor K=1 is not configured as one of candidate repetition factors.**

## Other

Except redundancy version and CE-only BWP, any other changes to MAC spec?

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| **Company** | **Comments** |
| Qualcomm | R2-2206034  Proposal. Downselect the following two options:  Option 1. In a UL BWP with RACH resources only for Msg3 repetition, if repetition factor K=1 is not one of the candidate repetition factors, it is up to UE implementation whether to perform RACH in this UL BWP or in initial UL BWP (after BWP switch);  Option 2. Repetition factor K=1 is always configured for a UL BWP with RACH resources only for Msg3 repetition.  [Rapp-ZTE] Thanks for the comment, I have added Q3/Q4 in section 3.2. |
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# Conclusions

***Proposals for easy agreements:***

**Proposal 1 For CE only BWP, it is up to the network to configure the candidate repetition factors, it may or may not include repetition factor K=1.**

**Proposal 2 For CE only BWP, the UE cannot trigger BWP switch due to repetition factor K=1 is not configured as one of candidate repetition factors.**

# Reference

1. R2-2204739 Correction to 38.321 on redundancy version for Msg3 repetition OPPO CR Rel-17 38.321 17.0.0 1227 - F NR\_cov\_enh-Core
2. R2-2205067 Clarification on Msg3 repetition RV determination to MAC spec Huawei, HiSilicon CR Rel-17 38.321 17.0.0 1251 - F NR\_cov\_enh-Core
3. R2-2205841 CE RACH only BWP handling Nokia, Nokia Shanghai Bell CR Rel-17 38.321 17.0.0 1289 - F NR\_cov\_enh-Core
4. R2-2205068 Discussion on the leftover issues for CE-specific RACH Huawei, HiSilicon discussion Rel-17 NR\_cov\_enh-Core