**3GPP TSG-RAN WG1 Meeting #112bis-eR1-23XXXXX**

E-meeting, April 17th – 26th, 2023

**Agenda item: 7.2**

**Source: Moderator (Nokia)**

**Title: Moderator summary #X of [112bis-e-R17-URLLC-01] Rel-17 URLLC & IIoT maintenance (HARQ-ACK)**

**Document for: Discussion and Decision**

# Introduction

As per chairman’s guidance, the email discussion is planned according to the following schedule:

[112bis-e-R17-URLLC-01] Email discussion on Rel-17 URLLC & IIoT maintenance (HARQ-ACK) by April 21 – Klaus (Nokia)

**The following TDocs have been allocated to this email thread by Mr. Chairman:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **TDoc** **Number** | **Tdoc title** | **company** | **Specs & clause** | **Moderator comments:** |
| [**R1-2302395**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112b-e/Docs/R1-2302395.zip) | Correction on URLLC/IIoT functionalities of DCI formats 1\_1 and 1\_2 | Nokia, Nokia Shanghai Bell | 38.212, clauses 7.3.1, 7.3.1.2.2 & 7.3.1.2.3 | Issue #1 |
| [**R1-2302655**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112b-e/Docs/R1-2302655.zip) | Correction on the applicable subcarrier spacings of Type-3 HARQ-ACK codebook | CATT | 38.213, clause 9.1.4 | Issue #2 |
| [**R1-2302656**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112b-e/Docs/R1-2302656.zip) | Clarification of configurations of serving cells and HARQ processes for enhanced Type-3 HARQ-ACK codebook | CATT | 38.213, clause 9.1.4 | Issue #3 |
| [**R1-2303567**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112b-e/Docs/R1-2303567.zip) | Clarification on CBG based Type 3 HARQ-ACK codebook including HARQ-ACK processes with different max number of CBGs | Qualcomm Incorporated | 38.213, clause 9.1.4 | Issue #4(no draft CR available) |
| [**R1-2303852**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112b-e/Docs/R1-2303852.zip) | Correction on adding PUCCH-sSCell for the BWP operation | Huawei, HiSilicon | 38.213, clause 12 | Issue #5 |

**Overall, suggested handling by moderator:**

* **Let’s have a relatively quick round 0 of discussions, with the aim to identify:**
	+ **Is this to be discussed / handled during RAN1#112bis-e?**
	+ **And if so, could this be referred to the editor CR or do we need a separate CR?**
	+ **Deadline of the round 0 as given by Mr. Chairman:**
		- ***Companies are recommended to provide their initial views by 11:59pm (UTC) on Day1 of RAN1#112bis-e***
* As in Athens in Feb/March, for issues where an approved CR is seen as needed, the moderator is planning to combine some issues in a single/joint CR (to keep the number of CRs low and reduce the needed handling for moderator, delegates and Mr. Chairman/Secretary)
	+ I will provide the CRs after the first round in the respective drafts folder.

# Issue#1: Missing functionalities in DCI format description (38.212)

* 1. Background & companies’ inputs

Nokia/NSB in [**R1-2302395**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112b-e/Docs/R1-2302395.zip) based on the following reasoning:

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| --- | --- |
| ***Reason for change:*** | Rel-17 URLLC introduced Type 3 HARQ-ACK codebook triggering for DCI format 1\_2 and HARQ-ACK codebook re-transmission for DCI formats 1\_1 and 1\_2 which are currently not captured in DCI format overview Table 7.3.1-1 and in the description of the functionalities of DCI format 1\_1 in 7.3.1.2.2 and DCI format 1\_2 in 7.3.1.2.3  |
|  |  |
| ***Summary of change:*** | * Capture the support for Type-3 HARQ-ACK codebook triggering for DCI format 1\_2 and HARQ-ACK re-transmission triggerin for DCI formats 1\_1 and 1\_2 in the DCI format overview table Table 7.3.1-1
* Capture the support for Type-3 HARQ-ACK codebook triggering and HARQ-ACK re-transmission triggerin for DCI formats 1\_1 in 7.3.1.2.2
* Capture the support for Type-3 HARQ-ACK codebook triggering and HARQ-ACK re-transmission triggerin for DCI formats 1\_2 in 7.3.1.2.3
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|  |  |
| ***Consequences if not approved:*** | Incomplete list of DCI functionalities for DCI formats 1\_1 and 1\_2 in clauses 7.3.1, 7.3.1.2.2 and 7.3.1.2.3 |

provided the following draft CR to 38.212, Sec. 7.3.1, 7.3.1.2.2 and 7.3.1.2.3

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| < Unchanged parts are omitted >7.3.1 DCI formatsThe DCI formats defined in table 7.3.1-1 are supported.**Table 7.3.1-1: DCI formats**

|  |  |
| --- | --- |
| **DCI format** | **Usage** |
| 0\_0 | Scheduling of PUSCH in one cell |
| 0\_1 | Scheduling of one or multiple PUSCH in one cell, or indicating downlink feedback information for configured grant PUSCH (CG-DFI) |
| 0\_2 | Scheduling of PUSCH in one cell |
| 1\_0 | Scheduling of PDSCH in one cell |
| 1\_1 | Scheduling of one or multiple PDSCH in one cell, and/or triggering one shot HARQ-ACK codebook feedback, or triggering HARQ-ACK codebook retransmission |
| 1\_2 | Scheduling of PDSCH in one cell, and/or triggering one shot HARQ-ACK codebook feedback, or triggering HARQ-ACK codebook retransmission |
| 2\_0 | Notifying a group of UEs of the slot format, available RB sets, COT duration and search space set group switching |
| 2\_1 | Notifying a group of UEs of the PRB(s) and OFDM symbol(s) where UE may assume no transmission is intended for the UE |
| 2\_2 | Transmission of TPC commands for PUCCH and PUSCH |
| 2\_3 | Transmission of a group of TPC commands for SRS transmissions by one or more UEs |
| 2\_4 | Notifying a group of UEs of the PRB(s) and OFDM symbol(s) where UE cancels the corresponding UL transmission from the UE |
| 2\_5 | Notifying the availability of soft resources as defined in Clause 9.3.1 of [10, TS 38.473] |
| 2\_6 | Notifying the power saving information outside DRX Active Time for one or more UEs |
| 2\_7 | Notifying paging early indication and TRS availability indication for one or more UEs. |
| 3\_0 | Scheduling of NR sidelink in one cell |
| 3\_1 | Scheduling of LTE sidelink in one cell |
| 4\_0 | Schedulng of PDSCH with CRC scrambled by MCCH-RNTI/G-RNTI for broadcast |
| 4\_1 | Schedulng of PDSCH with CRC scrambled by G-RNTI/G-CS-RNTI for multicast |
| 4\_2 | Schedulng of PDSCH with CRC scrambled by G-RNTI/G-CS-RNTI for multicast |

< Unchanged parts are omitted >7.3.1.2.2 Format 1\_1DCI format 1\_1 is used for the scheduling of one or multiple PDSCH in one cell, and/or triggering one shot HARQ-ACK codebook feedback, or triggering HARQ-ACK codebook retransmission. < Unchanged parts are omitted >7.3.1.2.3 Format 1\_2DCI format 1\_2 is used for the scheduling of PDSCH in one cell, and/or triggering one shot HARQ-ACK codebook feedback, or triggering HARQ-ACK codebook retransmission. < Unchanged parts are omitted > |

* 1. Initial moderator assessment & suggested handling

**The issues seem to be valid and should be discussed.**

**This is maybe an editorial issue that could be referred to the 38.212 editor CR.**

* 1. Issue to be handled during RAN1#112bis-e?

**Question: Do you support discussing the Issue (overall) during RAN1#112bis-e?**

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| --- | --- |
| Yes - support:  | QC,New H3C, ZTE Huawei/HiSi, LG, vivo, Nokia/NSB, Ericsson, Intel, CATT, OPPO |
| No - not support:  | [Samsung] |

**Question: If to be handled during RAN1#112bis-e, do you think this could be referred to the editor CR or is a separate CR needed?**

|  |  |
| --- | --- |
| Refer to Editor CR  | QC,New H3C, ZTE Huawei/HiSi, LG, [Samsung], Ericsson, Intel, CATT, OPPO |
| Separate CR |  |

**Comments on the moderator comments / suggested handling or any other comments on the draft CR:**

|  |  |
| --- | --- |
| *Company* | *Comments*  |
| Samsung | It is not an essential correction and the functionality of the DCI formats is captured by the description of the fields and their use in 38.213 and 38.214. There is no ambiguity.If an update is to be made, it would be simpler and cleaner to remove the current text at the beginning of 7.3.1.2.2/7.3.1.2.3 for DCI format 1\_1/1\_2 instead of also possibly adding/updating in next releases. |
| CATT | Following the text proposal, DCI format 1\_1 for indicating SCell dormancy without scheduling a PDSCH reception and DCI format 1\_1/1\_2 for indicating a TCI state update without scheduling PDSCH reception should also be included. |
|  |  |
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* 1. Round 1

Based on the initial round feedback, companies seem to feel that Issue #1 needs to be (a) addressed and (b) should be handled in the 38.212 editor CR. CATT brought up a good point, that some other functionalities of DCI 0\_1/0\_2 are currently not captured (TCI state update without PDSCH, SCell dormancy indication without scheduling PDSCH).

So maybe the best here is that we refer this to the editor CR, and the 38.212 editor will think / decide what / if she and how she wants to treat this issue (if including all functionalities – or remove the additional functionalities expect scheduling PDSCH)

Therefore, the following proposal is made here:

**Proposal 1\_v1: The changes identified by Nokia/NSB in** [**R1-2302395**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112b-e/Docs/R1-2302395.zip) **are referred the 38.212 Rel-17 editor CR.**

* **Note: The functionalities of DCI format 1\_1 indicating SCell dormancy without scheduling a PDSCH reception and DCI format 1\_1/1\_2 indicating a TCI state update without scheduling PDSCH reception are currently not captured either.**
* **Up to editor on how to address the situation of increasing functionalities of especially DCI formats scheduling PDSCH/PUSCH in 38.212**

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| Support | Vivo New H3C, DOCOMO, Intel, ZTE, CATT |
| Object | Samsung |

Comments:

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| --- | --- |
| *Company* | *Comments*  |
| Samsung | We still think the cleanest way is to remove the current text at the beginning of the clauses describing the DCI formats – basically for the reasons we and CATT mentioned before, and as the functionality of DCIs may further evolve, and as there is no information offered by those statements that is not also captured elsewhere. Table 7.3.1-1 can also be removed for the same reasons – it is redundant. Otherwise, it seems that the issue will be revisited again, at least to address the “Note” above. Instead of agreeing to go the proposed route now, things can wait to first have the complete picture of what updates will be required.   |
| Moderator |  @Samsung: I got some sympathy with the position here. My intention was also not to say – that all of it needs to be captured, but maybe we could stick to the bare functionality of the DCI formats (which was the case in Rel-15, started there from NR-U to add stuff). But leave this to the editor.  |
| Samsung2 | In such case, it would make sense to refer everything to the editor instead of making piece-wise agreements for CRs. What is the point to agree to the CR in x2395 and refer other stuff to the editor, instead of directly referring everything to the editor?Again, it is not an essential correction and there is no problem in the specifications if no change is made. If it was a simple one, that may be OK, but this will keep accumulating for no actual reason. It is better to keep things simple especially since there is no actual problem. |
| Huawei (38.212 editor) | Thank you very much for all the good discussions here! Please find my thinking below:1. The original intention of Table 7.3.1-1 is to give a whole picture of the usage for different DCI formats, then people can quickly figure out the corresponding DCI format based on what they are looking for. From this perspective, I think this table is useful.
2. However, with the enhancements developed in later releases, it is true that the potential usages of a DCI format cannot be determined only by 38.212, other specs like 38.213 and/or 38.214 are involved also. For some of the usages, e.g. TCI state update without scheduling PDSCH reception, the determination of the usage is even fully defined in other spec like 38.214. For this kind of usage, it is not appropriate to capture in Table 7.3.1-1 in 38.212, because usually the spec needs to be self-contained, otherwise it will be confusing for people. Due to these reasons, it is true that Table 7.3.1-1 cannot achieve its original goal perfectly, since it is not able to capture all usages for a DCI format there. However, at least for the basic usage and the usage(s) with key defintions in TS 38.212, the table is still helpful. So I prefer not to delete the table.
3. In the future, my thinking is not to add the usage(s) with the determination mainly defined in other specs, i.e. only add the basic usage or the one with determination mainly defined in 38.212.
4. Follow the thinking given in the above third point, I would recommend not to capture the text proposal given in [**R1-2302395**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112b-e/Docs/R1-2302395.zip), and also SCell dormancy without scheduling a PDSCH reception and DCI format 1\_1/1\_2 indicating a TCI state update without scheduling PDSCH reception. I do appreciate all the effort from Klaus for the TP.
5. For “, and/or triggering one shot HARQ-ACK codebook feedback” which is already captured in the current spec, I would recommend to leave it as it is since it is already there. However, if people really want to delete it, we can do the change in the aligment CR also.

Any other suggestions/views are appreciate! Thanks again for all your effort here! |
|  |  |

# Issue#2: Type 3 HARQ-ACK CB – applicable SCS (clause 9.1.4 of 38.213)

* 1. Companies’ inputs

CATT in [**R1-2302655**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112b-e/Docs/R1-2302655.zip) provided a draft CR to 38.213 based on the following reasoning:

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| --- | --- |
| ***Reason for change:*** | In Rel-16, Type-3 HARQ-ACK codebook was introduced for NR-U, which was supported in FR1 only. Accordingly, only subcarrier spacings of 15, 30 and 60kHz ($μ=0,1,2$) are considered for processing time of Type-3 HARQ-ACK codebook.However, Type-3 HARQ-ACK codebook is supported for HARQ-ACK retransmission in Rel-17, which should be supported in FR1, FR2-1 and FR2-2. Hence, $μ=3,5,6$ should also be considered for processing time of Type-3 HARQ-ACK codebook. |
|  |  |
| ***Summary of change:*** | Remove the limitation that only $μ=0,1,2$ is considered for processing time of Type-3 HARQ-ACK codebook. |
|  |  |
| ***Consequences if not approved:*** | There is no processing time defined for Type-3 HARQ-ACK codebook in FR2-1 and FR2-2. |

provided the following draft CR to clause 9.1.4 of 38.213:

|  |
| --- |
| 9.1.4 Type-3 HARQ-ACK codebook determination **<Unchanged parts are omitted>**If - a UE detects a DCI format that includes a One-shot HARQ-ACK request field with value 1, and- the CRC of the DCI is scrambled by a C-RNTI or an MCS-C-RNTI, and- *resourceAllocation* = *resourceAllocationType0* and all bits of the frequency domain resource assignment field in the DCI format are equal to 0, or- *resourceAllocation* = *resourceAllocationType1* and all bits of the frequency domain resource assignment field in the DCI format are equal to 1, or- *resourceAllocation = dynamicSwitch* and all bits of the frequency domain resource assignment field in the DCI format are equal to 0 or 1the DCI format provides a request for a Type-3 HARQ-ACK codebook report and does not schedule a PDSCH reception. If the UE is provided *pdsch-HARQ-ACK-EnhType3ToAddModList* and the DCI format includes an enhanced Type 3 codebook indicator field that provides a value for *pdsch-HARQ-ACK-EnhType3Index*, the UE determines a number of indicated serving cells $N\_{cells}^{DL,ind}$ and a number of indicated HARQ processes $N\_{HARQ,c}^{DL,ind}$ for each indicated serving cell $c$ from the entry in *pdsch-HARQ-ACK-EnhType3ToAddModList* corresponding to the *pdsch-HARQ-ACK-EnhType3Index* value. If the DCI format does not include the enhanced Type 3 codebook indicator field, the *pdsch-HARQ-ACK-EnhType3Index* value is provided by the value of the MCS field for transport block 1 in the DCI format 1\_1 or the MCS field in the DCI format 1\_2. The UE is expected to provide HARQ-ACK information in response to the request for the Type-3 HARQ-ACK codebook after $N$ symbols from the last symbol of a PDCCH providing the DCI format, where the value of $N$ ~~for~~ $μ=0,1,2$ is provided in clause 10.2 by replacing "SPS PDSCH release" with "DCI format". If a UE multiplexes HARQ-ACK information in a PUSCH transmission, the UE generates the HARQ-ACK codebook as described in this clause except that *harq-ACK-SpatialBundlingPUCCH* is replaced by *harq-ACK-SpatialBundlingPUSCH*.< Unchanged parts are omitted > |

* 1. Initial moderator assessment & suggested handling

**The issues seem to be valid and should be discussed.**

**A CR seems to be needed, but could be at least combined in a single CR with other aspects of Type 3 HARQ-ACK CB (e.g. of Issue #3, #4) or even in a single 38.213 CR combining all of the 38.213 Issues (Issues #2 to #5).**

* 1. Issue to be handled during RAN1#112bis-e?

**Question: Do you support discussing the Issue (overall) during RAN1#112bis-e?**

|  |  |
| --- | --- |
| Yes - support:  | QC,New H3C, ZTE, vivo, Nokia/NSB, Ericsson, Intel, CATT |
| No - not support:  | Huawei/HiSi, Samsung, OPPO |

**Question: If to be handled during RAN1#112bis-e, do you think this could be referred to the editor CR or is a separate CR needed?**

|  |  |
| --- | --- |
| Refer to Editor CR  | Ericsson |
| Separate CR | QC,New H3C, ZTE, vivo, Nokia/NSB, CATT |

**Comments on the moderator comments / suggested handling or any other comments on the draft CR:**

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| --- | --- |
| *Company* | *Comments*  |
| Huawei/HiSi | “However, Type-3 HARQ-ACK codebook is supported for HARQ-ACK retransmission in Rel-17, which should be supported in FR1, FR2-1 and FR2-2.” – in R17 URLLC, we have no specific enhancements on FR2, so in our understanding, R17 URLLC is the enhancements on FR1. As there is no agreement on expanding the value of $N$ , an agreement is needed before discussing the CR. |
| Nokia/NSB | Agree with HW that there is on agreement on it (and actually maybe would have been better fitted to the >52.6GHz discussions – as the baseline Type 3 HARQ-ACK codebook is not really a R17 URLLC feature). I guess we could have a combination here – have an agreement to support this case and also have the CR approved. But this would require making an agreement on >52.6GHz operation in the Rel-17 URLLC maintenance...  |
| Samsung | Agree with Huawei. It is clearly neither an essential correction nor the type of agreement that should be made for a new feature (which does not exist in corresponding UE features for FR2-2) deep into maintenance.  |
| Ericsosn | In Rel-16, the corresponding feature (FG10-16) was agreed to not to be limited to unlicensed. For corresponding RRC parameters in 38.331 (see e.g. ***pdsch-HARQ-ACK-OneShotFeedback )* there is no mention of SCS.**This means that this CB should be treated similary to other CBs, like Type.1 and Type.2.The CATT CR identifies **the misalignment between spec (38.331 and 38.213) for Rel-17** because of introduction of new SCS in general for Rel-17. We don’t think that a new agreement is needed. If one takes this approach, for every feature, we have to do this tedious exercise, and it is not a proper approach. |
| Intel | R17 URLLC was not limited to FR1, thus the issue seems valid. |
| CATT | We found the following discussion in R1-2002922.

|  |  |
| --- | --- |
| FL summary | Here is the summary of companies’ views on 120 kHz:- keep 120 kHz: Nokia, Qualcomm, Ericsson, OPPO- remove 120 kHz: Lenovo, Sharp, vivoI am not sure if Intel and LG agreed with keeping or removing 120 kHz, but in any cases there is no consensus on how to proceed with 120 kHz. Considering that applicability of type-3 HARQ-ACK codebook is not yet agreed for licensed bands, I propose to proceed with the TP without 120 kHz and discuss later whether to introduce 120 kHz after the relevant decision in the NR-U UE FG discussion.@ Ericsson: it is fine to discuss a simpler TP. We can focus on agreeing to the principle in this phase. Please refer to the conclusion part for the updated proposal. |

In RAN1#103, it was agreed that type-3 HARQ-ACK codebook (FG10-16) is applicable to licensed bands as well.Agreements:* The FG10-15/16 are also applicable to licensed bands
* The FG10-20a is also applicable to licensed bands
* Note: this agreement should not cause any specification impact

The intention of the Note, to our understanding, is not to preclude FR2.Based on the inputs so far, it seems that companies have different views on whether (enhanced)Type-3 HARQ-ACK codebook is applicable to FR2 and discussion and conclusion are needed. |
| OPPO | We share the same view as HW and Samsung. There is no agreement supporting the CR. |
| CATT |  [112bis-e-R17-FR2\_2-03] Email discussion on Rel-17 FR2\_2 maintenance (HARQ scheduling) by April 20 – Seonwook (LGE)One of the issues discussed for FR2-2 in the above email thread is:Issue#3: 32-HPN support for e-type3 HARQ-ACK codebookBased on the feedback so far, companies agree with the proposal and no one is questioning whether (e)Type-3 HARQ-ACK codebook is supported or not. So it is common understanding that (e)Type-3 HARQ-ACK codebook is supported for FR2-2 and no agreement is needed. |

* 1. Round 1

Based on the initial round feedback, companies seem to feel that this should be discussed, but as Huawei pointed out, there is no agreement to support the Type 3 HARQ-ACK codebook also for FR2. Clearly, this would be an extension of the URLLC operation (and actually, would have to be better covered in the >52GHz maintenance).

CATT noted, that initially in Rel-16 the Type 3 HARQ-ACK CB was intended as an NR-U enhancement and later on, was said to be applicable also for licensed band operation as part of the feature discussions – therefore the 120kHz excluded initially.

One point of course also being here, if we make this change here now, a UE indicating the Type 3 HARQ-ACK codebook would also need to support it for the larger SCS (than what it currently would not support). So if an additional UE capability for this feature would be required, then this seems to go a bit beyond normal maintenance here. Therefore, I see two possibilities here on how to tackle this in this meeting – we either do support this (without any new UE capability) – or we drop the issue (by not agreeing any changes).

**Proposal 2:** **We support higher SCS also for the (Enh) Type 3 HARQ-ACK codebook in Rel-17 by agreeing:**

* + **Proposed Agreement:** The Type 3 and Enhanced Type 3 HARQ-ACK codebook feedback in Rel-17 is supported for all subcarrier spacings (including also 120, 480~~240~~ and 960 kHz).
		- A UE indicating the support for Type 3 / Enhanced Type 3 HARQ-ACK triggering, also supports the triggering for 120, ~~240~~480 and 960kHz SCS (i.e. no separate UE capability signalling)
	+ **Adopt the TP (CR changes) proposed by CATT as laid out above in CR to 38.213 (to be combined wth Issue #3 and Issue #4 / if agreed)**

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| Support | Vivo, DOCOMO, Intel, QC, CATT |
| Object – do not support larger SCS | [Samsung – requesting conclusion on the last comment inline] [Huawei/HiSi] |

Comments:

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| --- | --- |
| *Company* | *Comments*  |
| vivo | 240KHz should be changed to 480KHz.  |
| Moderator | Thanks – should be 480kHz – changed.  |
| New H3C | For this proposal, it is better to wait for discussion result in [112bis-e-R17-FR2\_2-03] as FL mentioned and then decide on whether this proposal is needed or not. |
| Moderator | @New H3C: which specific discussions in FR2\_2-03 do you refer to? The discussions there seem to be focusing only on the number of HPN processes* I guess if they discuss on Issue #3 to allow Type 3 CB with up to 32 HPN processes, then they would equally need the support for >60kHz SCS to operate the CB for FR2\_2 in the first place
* So isn’t it maybe the other way around (unfortunate, that this issue was not allocated to FR2\_2) – we would first need to enable this for FR2\_2 (by supporting the SCS, which we are discussing here) and FR2\_2-03 would need to wait for us, as if the SCS is not supported in the first place, then no need to discuss if 32 HPNs are to be supported!?
 |
| Samsung | Although we do not agree with the argument “it is common understanding and no agreement is needed” (e.g. for NTN, when discussed, support for Type-3 was not agreed), or that the proposed CR represents an essential correction, or that there is no concern on the UE capability to support FR2-2 (e.g. the maximum number of HARQ processes is double the one in FR1/FR2-1 and that can lead to problems), we do not object if this is otherwise agreeable by all.However, one thing to be further clarified if we go that route and include the Rel-17 Type-3 codebook is which of the maximum of 32 HARQ processes for FR2-2 are addressed by the 16-bit RRC parameter *perHARQ* (which can be argued as being an indication that RAN1 did not agree to support the Rel-17 Type-3 for FR2-2) – e.g. the first 16 only? It would be good to have that understanding first and probably some corresponding text included in the CR or an LS to RAN2 to increase *perHARQ* to 32 bits. |
| Apple | CATT and other proponent companies, could you identify the relevant UE capabilities for eType 3 codebook? We would like to see how the extension to FR2 and FR2-2 would impact the UE feature reporting. |
| CATT | @Apple, it was agreed in RAN1#103, that type-3 HARQ-ACK codebook (FG10-16) is applicable to licensed bands as well.Agreements:* The FG10-15/16 are also applicable to licensed bands
* The FG10-20a is also applicable to licensed bands
* Note: this agreement should not cause any specification impact

The corresponding capability in TS38.306 is as follows.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***oneShotHARQ-feedback-r16***Indicates whether the UE supports one shot HARQ ACK feedback comprised of the following functional components:- Support feedback of type 3 HARQ-ACK codebook, triggered by a DCI 1\_1 scheduling a PDSCH;- Support feedback of type 3 HARQ-ACK codebook, triggered by a DCI 1\_1 without scheduling a PDSCH using a reserved FDRA value.This capability is also applicable to a frequency band that does not require shared spectrum access. | Band | No | N/A | N/A |

For eType3 HARQ-ACK codebook, the UE capability in TS38.306 is as follows.

| ***enhancedType3-HARQ-CodebookFeedback-r17***Indicates whether the UE supports enhanced type 3 HARQ-ACK codebook feedback based on triggering information in DCI 1\_1 and DCI 1\_2 (for a UE supporting DCI format 1\_2 as indicated in *dci-Format1-2And0-2-r16*) and also supports transmission of enhanced type 3 HARQ-ACK codebook using the first or second PUCCH configuration based on PHY priority indication in the triggering DCI (for a UE supporting two HARQ-ACK codebooks / PUCCH config as indicated in twoHARQ-ACK-Codebook-type1-r16). The capability signalling comprises the following parameters:- *enhancedType3-HARQ-Codebooks-r17* indicates the maximum number of supported enhanced type 3 HARQ-ACK codebooks;- *maxNumberPUCCH-Transmissions-r17* indicates the maximum number of actual PUCCH transmissions for type 3 or enhanced type 3 HARQ-ACK codebook feedback within a slot.UE only supports feedback of a dynamically selected enhanced type 3 HARQ-ACK codebook based on triggering information in DCI 1\_1 and DCI 1\_2 (for a UE supporting DCI format 1\_2 as indicated in *dci-Format1-2And0-2-r16*) if the UE supports more than one enhanced type 3 HARQ-ACK codebook to be configured (as indicated in *enhancedType3-HARQ-Codebooks-r17*). The UE indicates support of this capability shall also indicates support of *oneShotHARQ-feedback-r16*. | Band | No | N/A | N/A |
| --- | --- | --- | --- | --- |

 |
| Huawei/HiSi | It is weird that all the conclusions/agreements to support extending (e)Type 2 to FR2 are drawn at FR2-2, yet the CR is now being discussed at URLLC (as well as the LS mentioned by Samsung). We suggest moving the CR as well as the RAN2 LS to FR2-2, to avoid duplicated work over the topics. |

# Issue#3: Enhanced Type 3 CB: perHARQ & per CC subcodebook definition (9.1.4 in 38.213)

* 1. Companies’ inputs

CATT in [**R1-2302656**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112b-e/Docs/R1-2302656.zip) provided a draft CR to clause 9.2.5 of 38.213 based on the following reasoning:

|  |  |
| --- | --- |
| ***Reason for change:*** | For enhanced Type-3 HARQ-ACK codebook determination, it is not clear how serving cells and HARQ processes to be included in enhanced Type-3 HARQ-ACK codebook are configured.  |
|  |  |
| ***Summary of change:*** | 1. Clarify the mapping relationship between bitmap of *perCC* and corresponding serving cell index, and the mapping relationship between bitmap of *perHARQ* and corresponding serving cell index and HARQ process number;
2. Clarify the meaning of bit 0/1 indicated by *perCC* or *perHARQ*;
3. If the number of configured HARQ processes for PDSCH is smaller than 16 for a serving cell, clarify the mapping relationship between 16 bit for the serving cell provided by *perHARQ* and HARQ process numbers.
 |
|  |  |
| ***Consequences if not approved:*** | Unclear UE behavior for enhanced Type-3 HARQ-ACK codebook determination. |

... with the following draft CR to clause 9.1.4 of 38.213:

|  |
| --- |
|  9.1.4 Type-3 HARQ-ACK codebook determination If a UE is provided *pdsch-HARQ-ACK-OneShotFeedback*, the UE determines $\tilde{o}\_{0}^{ACK},\tilde{o}\_{1}^{ACK},…,\tilde{o}\_{O\_{ACK}-1}^{ACK}$ HARQ-ACK information bits, for a total number of $O\_{ACK}$ HARQ-ACK information bits, of a Type-3 HARQ-ACK codebook according to the following procedure. If the UE is provided *pdsch-HARQ-ACK-EnhType3ToAddModList* and a DCI format scheduling PDSCH reception and triggering the Type-3 HARQ-ACK codebook includes an enhanced Type 3 codebook indicator field that provides a value for *pdsch-HARQ-ACK-EnhType3Index*, the UE determines a size of a set of indicated serving cells $N\_{cells}^{DL,ind}$ and a size of a set of indicated ~~numbers of~~ HARQ processe numbers $N\_{HARQ,c}^{DL,ind}$ for each indicated serving cell and each indicated HARQ process number from the entry in *pdsch-HARQ-ACK-EnhType3ToAddModList* corresponding to the *pdsch-HARQ-ACK-EnhType3Index* value. Each bit from MSB to LSB provided by *perCC* corresponds to a serving cell in ascending order of serving cell index, where value ‘1’ or value ‘0’ indicate HARQ-ACK for the corresponding serving cell is included or not included in enhanced Type 3 HARQ-ACK codebook, respectively. Each 16-bit from MSB to LSB provided by *perHARQ* corresponds to a serving cell in ascending order of serving cell index, each bit within 16 bits corresponds to a HARQ process number on the serving cell in ascending order of HARQ process number, where value ‘1’ or value ‘0’ indicate HARQ-ACK for the corresponding HARQ process number on the corresponding serving cell is included or not included in enhanced Type 3 HARQ-ACK codebook, respectively. If the number of configured HARQ processes *N* for PDSCH for a serving cell is smaller than 16, the most significant *N* bits within the 16 bits are used to indicate whether HARQ-ACK for the HARQ process of the serving cell is included in enhanced Type 3 HARQ-ACK codebook. If the DCI format does not include the enhanced Type 3 codebook indicator field, the *pdsch-HARQ-ACK-EnhType3Index* value is zero.**<Unchanged parts are omitted>** |

* 1. Initial moderator assessment & suggested handling

**The provided draft CR would for sure clarify for me the intended configuration options per HARQ and per CC – so some discussion could be good to have here:**

* **On the 1. and 2. reason for change, the moderator agrees with the intention – that clarification here on the meaning of the bit could be useful**
* **In contrast, the moderator does not see a need for the 3rd clarification, as saying we ‘start from MSB to LSB’ should be clear enough to indicate which HARQ processes are up for activation. The pseudo-code is anyhow limited by the number of DL HARQ processes configured per DL serving cell, so this additional clarification seems to be clearly not needed here.**

**This is maybe an editorial issue that could be referred to the 38.213 editor CR (based on an agreed TP), or could be combined with other issues (such as Issue #2 & #4 – and potentially even Issue #5) in a single CR to 38.213.**

* 1. Issue to be handled during RAN1#112bis-e?

**Question: Do you support discussing the Issue (overall) during RAN1#112bis-e?**

|  |  |
| --- | --- |
| Yes - support:  | QC,New H3C, ZTE Huawei/HiSi, LG, vivo, Nokia/NSB, Samsung, Intel, CATT |
| No - not support:  | Ericsson |

**Question: If to be handled during RAN1#112bis-e, do you think this could be referred to the editor CR or is a separate CR needed?**

|  |  |
| --- | --- |
| Refer to Editor CR  | Samsung |
| Separate CR | QC,New H3C Huawei/HiSi, LG, vivo, Nokia/NSB, CATT |

**Comments on the moderator comments / suggested handling or any other comments on the draft CR (if all 3 reasons for change need to be addressed etc.):**

|  |  |
| --- | --- |
| *Company* | *Comments*  |
| LG | We are fine with the intention, and we also agree that FL’s comment on third point. In general, we think it would be better to include a description on how to interpret RRC parameters in the "field descriptions" section of 3GPP specification 38.331. |
| Nokia/NSB | Agree with the moderator, that the 3rd clarification seems to be not needed (but support the intention of 1. and 2.)  |
| Samsung | OK in principle with the CR but the text needs to be refined. Agree with the comments by the moderator. In our view, this is an alignment/clarification CR and does not correct a UE behavior/procedure – it is therefore a typical case for inclusion in Rel-17 alignment CR. |
| Ericsson | Regarding reason 1) If we follow the psedue code, it is clear how to loop on cells and HARq process configured per cell. We don’t see any ambiguity. Regarding reason 2) It is clear how to allocate 0 or 1 for the corresponding place holder in the CB, see e.g.:$\tilde{o}\_{j}^{ACK}$= HARQ-ACK information bit for TB $t$ for HARQ process index $h$ in the set of numbers of HARQ processes of serving cell $c$, if any; else, $\tilde{o}\_{j}^{ACK}=0$Regarding reason 3) It is not clear for us the ambiguity. Basically, based on the configuraitons, the size is clear. And how to find the corresponding value for each placeholder in CB is clear.Set $N\_{HARQ,c}^{DL}$ to the value of *nrofHARQ-ProcessesForPDSCH* for serving cell $c$, if provided; else, set $N\_{HARQ,c}^{DL}=8$ .Maybe, more explanation is needed to understand the short-coming of the current spec. |
| CATT | @Ericsson, for reason 1), it is to clarify the mapping relationship between RRC parametres (*perCC*/*perHARQ*) and the serving cell/HARQ process number, which is missing in current spec. For reason 2), the 0/1 is still for RRC configuration, not the HARQ-ACK generation.For reason 3), there are 16 bits for HARQ process configuration but the number of configured HARQ processes may be less than 16. The intention is to clarify how to interpret the 16-bit RRC configuration.In general, there seems to be misunderstanding on the intention of our CR. What we try to clarify is the interpretation of *perCC* and *perHARQ* in order to determine which CC/HARQ process should be included in the HARQ-ACK codebook. |

* 1. Round 1

Based on the initial round feedback, companies seem to feel some clarification seems to be useful – but 2 companies feel the last change /clarification may not be needed.

Based on this, the moderator suggesting the following TP here (only capturing first & second point by CATT):

**TP Issue#3** v01**:**

|  |
| --- |
| 9.1.4 Type-3 HARQ-ACK codebook determination If a UE is provided *pdsch-HARQ-ACK-OneShotFeedback*, the UE determines $\tilde{o}\_{0}^{ACK},\tilde{o}\_{1}^{ACK},…,\tilde{o}\_{O\_{ACK}-1}^{ACK}$ HARQ-ACK information bits, for a total number of $O\_{ACK}$ HARQ-ACK information bits, of a Type-3 HARQ-ACK codebook according to the following procedure. If the UE is provided *pdsch-HARQ-ACK-EnhType3ToAddModList* and a DCI format scheduling PDSCH reception and triggering the Type-3 HARQ-ACK codebook includes an enhanced Type 3 codebook indicator field that provides a value for *pdsch-HARQ-ACK-EnhType3Index*, the UE determines a size of a set of indicated serving cells $N\_{cells}^{DL,ind}$ and a size of a set of indicated ~~numbers of~~ HARQ process~~es~~ numbers $N\_{HARQ,c}^{DL,ind}$ for each indicated serving cell and each indicated HARQ process number from the entry in *pdsch-HARQ-ACK-EnhType3ToAddModList* corresponding to the *pdsch-HARQ-ACK-EnhType3Index* value. Each bit from MSB to LSB provided by *perCC* corresponds to a serving cell in ascending order of serving cell index, where value ‘1’ or value ‘0’ indicate HARQ-ACK for the corresponding serving cell is included or not included in ~~enhanced~~the Type 3 HARQ-ACK codebook, respectively. Each ~~16-~~bit string ~~from MSB to LSB~~ provided by *perHARQ* corresponds to a serving cell in ascending order of serving cell index, and each bit within ~~16 bits~~ a bit string corresponds to a HARQ process number on ~~the~~ a corresponding serving cell in ascending order of HARQ process number, where value ‘1’ or value ‘0’ indicate HARQ-ACK for the corresponding HARQ process number on the corresponding serving cell is included or not included in ~~enhanced~~the Type 3 HARQ-ACK codebook, respectively. If the DCI format does not include the enhanced Type 3 codebook indicator field, the *pdsch-HARQ-ACK-EnhType3Index* value is zero.**<Unchanged parts are omitted>** |

**Proposal 3.1: TP Issue#3** v01 **to be captured in a CR to 38.213 (to be combined wth Issue #2 and Issue #4 / if agreed).**

|  |  |
| --- | --- |
| Support | Vivo，New H3C, DOCOMO, Intel, QC, CATT Huawei/HiSi |
| Object – do not support larger SCS | ~~[Samsung – no objection on the core part, text amendement is requested]~~ |

Comments:

|  |  |
| --- | --- |
| *Company* | *Comments*  |
| Samsung | Suggest to remove the “enhanced” before the “Type-3 HARQ-ACK codebook” (there is no “enhanced” Type-3 CB defined in clause 9.1.4) and the ‘16’ (visible in 38.331, no need to capture the parameter size in 38.213) – i.e.Each bit from MSB to LSB provided by *perCC* corresponds to a serving cell in ascending order of serving cell index, where value ‘1’ or value ‘0’ indicate HARQ-ACK for the corresponding serving cell is included or not included in ~~enhanced~~the Type 3 HARQ-ACK codebook, respectively. Each ~~16-~~bit string ~~from MSB to LSB~~ provided by *perHARQ* corresponds to a serving cell in ascending order of serving cell index, and each bit within ~~16 bits~~ a bit string corresponds to a HARQ process number on ~~the~~ a corresponding serving cell in ascending order of HARQ process number, where value ‘1’ or value ‘0’ indicate HARQ-ACK for the corresponding HARQ process number on the corresponding serving cell is included or not included in ~~enhanced~~the Type 3 HARQ-ACK codebook, respectively. |
| Moderator | Many thanks to Samsung for the good suggestions – will adopt them. Also not referring to 16bit may help if FR2-2 is agreeing to support also 32... Related update in v01 |
| Apple | Okay for the clarification brought by CATT |
|  |  |
|  |  |

# Issue#4: Type 3 HARQ-ACK codebook: CBG handling for different number of CBGs per PHY priority (no draft CR provided, 38.314 clause 9.1.4)

* 1. Companies’ inputs

Qualcomm provided a discussion document in [**R1-2303567**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112b-e/Docs/R1-2303567.zip) (no draft CR provided):

|  |
| --- |
| ...Therefore, one issue could occur in the following scenario, as illustrated in **Fig 1**. * Type-3/eType-3 codebook is configured to report CBG-based HARQ-ACK (by RRC parameter pdsch-HARQ-ACK-OneShotFeedbackCBG-r16)
* Two HARQ processes (with different PHY priorities) are configured with different number of CBGs per TB (by RRC parameter pdsch-CodeBlockGroupTransmissionList-r16)
* Type-3/eType-3 codebook includes the two HARQ processes (with different PHY priorities)

The problem in this scenario is that, when UE generate the CBG based type-3 or eType-3 HARQ-ACK codebook, how many CBGs UE should report per TB?**Fig 1:** **CBG based Type 3/eType3 HARQ-ACK codebook including inter PHY priorities HARQ-ACK processes**A few solutions can be considered for this issue. * Option 1 (max of the two): Number of HARQ-Ack bits for each TB of a HARQ process for that CC in the type-3/eType-3 HARQ-ACK codebook consists of max{$N\_{HARQ-ACK,c,1}^{CBG/TB,max}$ , $N\_{HARQ-ACK,c,2}^{CBG/TB,max}$} bits. In this case, if actual number of CBGs for a given TB of a HARQ process in a CC is less than the number determined above, UE generates a NACK for each of the last remaining positions in the codebook.
* Option 2: The priority indicator field of the DCI that triggers type-3/eType 3 HARQ-ACK codebook determines the max number of CBGs and the number of HARQ-Ack bits for each TB of a HARQ process number for that CC. For example, in **Fig 1**, if the DCI trigger high priority type-3 codebook, max of 2 CBGs are assumed; otherwise, max of 8 CBGs are assumed.
	+ If a TB is scheduled originally with a larger number of CBGs than the max number of CBGs determined as above for type-3/eType-3 HARQ-ACK codebook, UE generates HARQ-ACK bit for a new CBG that consists of two or more original CBGs by the binary AND operation of the HARQ-ACK information bits corresponding the original CBGs.
* Option 3: if the max number of CBGs for the two priorities are different, or if only one is CBG based while the other is TB based, the UE is only expected to be configured with TB level A/N reporting for type-3/eType 3 codebook (does not expect to be configured with pdsch-HARQ-ACK-OneShotFeedbackCBG-r16)

Among the three options, option 1 is the simplest with some additional HARQ-ACK feedback overhead. Option 2 is more complicated because of the AND operation to merge HARQ-ACK feedback for multiple CBGs. Option 3 put restriction on gNB scheduling. We slightly prefer option 1 and propose resolve the issue with option 1. Proposal 1: When Type-3/eType-3 codebook is configured to report CBG-based HARQ-ACK which includes HARQ processes with two different max number of CBGs $N\_{HARQ-ACK,c,1}^{CBG/TB,max}$ and $N\_{HARQ-ACK,c,2}^{CBG/TB,max}$, max{$N\_{HARQ-ACK,c,1}^{CBG/TB,max}$ , $N\_{HARQ-ACK,c,2}^{CBG/TB,max}$} is assumed to generate the CBG based Type-3/eType-3 codebook.  |

* 1. Initial moderator assessment & suggested handling

**The issue is clearly valid and some solution /option would need to be chosen to clarify the Type 3 HARQ-ACK CB operation.**

**A possible change is clearly not just editorial (so a CR would be needed) but could be combined with at least with Issue #2 & #3 also on Type 3 CB (or even with Issue #5) in a single CR to 38.213.**

As the proponent of the change did not provide a potential draft CR, based on the understanding of the proponent’s intention, a draft CR may be looking as follows:

|  |
| --- |
| 9.1.4 Type-3 HARQ-ACK codebook determination **<Unchanged parts are omitted>**Set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the maximum number of HARQ-ACK information bits per TB for PDSCH receptions on serving cell $c$ as described in clause 9.1.1 if *maxCodeBlockGroupsPerTransportBlock* in *codeBlockGroupTransmission* or *pdsch-CodeBlockGroupTransmissionList* is provided for serving cell $c$ and *pdsch-HARQ-ACK-OneShotFeedbackCBG* or *pdsch-HARQ-ACK-EnhType3CBG* is provided; else, set $N\_{HARQ-ACK,c}^{CBG/TB,max}=0$**<Unchanged parts are omitted>** |

* 1. Issue to be handled during RAN1#112bis-e?

**Question: Do you support discussing the Issue (overall) during RAN1#112bis-e?**

|  |  |
| --- | --- |
| Yes - support:  | QC,New H3C, ZTE, Nokia/NSB, CATT |
| No - not support:  | Huawei/HiSi, Samsung, Ericsson, Intel |

**Question: If to be handled during RAN1#112bis-e, do you think this could be referred to the editor CR or is a separate CR needed?**

|  |  |
| --- | --- |
| Refer to Editor CR  |  |
| Separate CR | QC,New H3C, ZTE, LG, vivo, Nokia/NSB, CATT, OPPO |

**Comments on the moderator comments / suggested handling or any other comments on the draft TP / CR (by the moderator):**

|  |  |
| --- | --- |
| *Company* | *Comments*  |
| QC | We thank FL very much for providing the TP. Our intention was having a discussion with the group and identifying a solution first. Then we can provide the TP. Thanks FL taking the effort to provide the TP. But we think in the TP, it is still not clear that $N\_{HARQ-ACK,c}^{CBG/TB,max}$ is set to the max of maxCodeBlockGroupsPerTransportBlock for the two priorities. We suggest to go with the following TP, which is longer but clearer. Set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the number of HARQ-ACK information bits per TB for PDSCH receptions on serving cell $c$ as described in clause 9.1.1 if *maxCodeBlockGroupsPerTransportBlock* is provided for serving cell $c$ and *pdsch-HARQ-ACK-OneShotFeedbackCBG* or *pdsch-HARQ-ACK-EnhType3CBG* is provided; if pdsch-CodeBlockGroupTransmissionList is provided for serving cell c and pdsch-HARQ-ACK-OneShotFeedbackCBG or pdsch-HARQ-ACK-EnhType3CBG is provided, set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the maximum of the value of maxCodeBlockGroupsPerTransportBlock for the first priority and the value of maxCodeBlockGroupsPerTransportBlock for the second priority; else, set $N\_{HARQ-ACK,c}^{CBG/TB,max}=0$.  |
| Huawei/HiSi | We already have the agreement that UE is not supposed to be configured with different number of CBGs/NDIs.**RAN1#106bis-e****Agreement**For one enhanced Type 3 HARQ-ACK CB, the same CBG and NDI configuration applies to both PHY priorities following the RAN1#106-e agreement. |
| LG | We are fine to leave current specification as it is, if we already have common understanding on the previous agreement that Huawei/HiSi. |
| vivo | Based on Huawei/HiSi’s comments, need to check whether the agreement @106bis is captured in the specification or not. If not yet, it should be captured.  |
| Nokia/NSB | Thanks to HW for pointing this out. We can then check, if a different clarification would be needed in 38.213 to capture the earlier agreement instead having the max as proposed by QC.  |
| Samsung | Agree with Huawei. Even without the referenced agreement from RAN1#106bis-e, the issue is not an essential correction as it would be a gNB misconfiguration and something that the gNB can control. We do not think any specification change is needed. |
| Ericsson | We also agree with HW. Also, share the same view as vivo that if the agreement is not captured, we should capture it in the spec. |
| Intel | Given the agreement cited by Huawei/HiSi, it seems there is already a solution for this issue, but whether it is already present in specs or requires a CR needs to be checked. |
| QC2 | We have a different understanding wrt the agreement above cited by Huawei/HiSi. The agreement refers to “*pdsch-HARQ-ACK-EnhType3CBG*” and “*pdsch-HARQ-ACK-EnhType3NDI*”, as it was the context of the discussions in RAN1 #106-bis-e. This means that each of these configurations applies to the two priorities. Note that “*pdsch-HARQ-ACK-EnhType3CBG*” and “*pdsch-HARQ-ACK-EnhType3NDI*” cannot be configured per priority anway, but “*maxCodeBlockGroupsPerTransportBlock*” can be configured per priority.The agreement cannot be interpreted as referring to the two CBG sizes “*maxCodeBlockGroupsPerTransportBlock*” configured under “*pdsch-CodeBlockGroupTransmissionList*” because they are two separate configurations. Even if we want to interpret the two “*maxCodeBlockGroupsPerTransportBlock*” shall be the same, we need a new agreement such as “the max number of CBGs for the two priorities are the same when Type3 / enhanced Type 3 is configured”. **But then this would prohibit different CBG sizes for eMBB and URLLC for type 1 and type 2 CBs when type 3 CB is configured while not triggered, which sounds unreasonable restriction to us.** Also, we are not sure if “the issue is not an essential correction as it would be a gNB misconfiguration and something that the gNB can control” mentioned by Samsung is correct. This is not gNB misconfiguration. UE transmits HARQ-ACK for different priorities using regular Type1/Type2 CB with different parameters (e.g., eMBB and URLLC may require different CBG sizes since otherwise there was no need to introduce “*pdsch-CodeBlockGroupTransmissionList*” in Rel-16 to begin with). However, when Type3 / enahanced Type3 CB is triggered by the DCI, a same size should be assumed for the purpose of constructing Type3 CB, but the separate CBG sizes are still used when Type3 CB is not triggered. |
| OPPO | Agree with Huawei, and the agreement cited by HW should capture in the spec. |
| vivo2 | After further check, we agree with QC's interpretation that the agreement in RAN1#106bis-e cited by Huawei is only for pdsch-HARQ-ACK-EnhType3CBG-r17 and pdsch-HARQ-ACK-EnhType3NDI, where pdsch-HARQ-ACK-EnhType3CBG-r17 is only used to configure either TB-level or CBG-level HARQ-ACK feedback for both priorities. When CBG-level HARQ-ACK feedback is assumed, how many HARQ-ACK bits for a TB to be reported is determined based on maxCodeBlockGroupsPerTransportBlock or pdsch-CodeBlockGroupTransmissionList. When based on pdsch-CodeBlockGroupTransmissionList, the issue mentioned by QC is valid and we support to discuss it in this meeting. |

* 1. Round 1

Huawei identified, that in the initial round, that there is an agreement that the same CBG/NDI configuration is used for both PHY priorities.

|  |
| --- |
| **RAN1#106bis-e****Agreement**For one enhanced Type 3 HARQ-ACK CB, the same CBG and NDI configuration applies to both PHY priorities following the RAN1#106-e agreement. |

Qualcomm pointed out, that the agreement is to be understood in terms of “*pdsch-HARQ-ACK-EnhType3CBG*” and “*pdsch-HARQ-ACK-EnhType3NDI*” (i.e. if CBG is enabled with Type 3 HARQ-ACK codebook) and not in terms on the number CBGs given by *maxCodeBlockGroupsPerTransportBlock*. This seems rather logical as there is only a single EnhType3CBG/NDI configurable.

So the moderator sees basically 2 options here:

* Option 1: We clarify, that the UE does not expect different *maxCodeBlockGroupsPerTransportBlock* – but as QC pointed out, this would clearly be restrictive.
* Option 2: We allow the configuration of different *maxCodeBlockGroupsPerTransportBlock* (which at least had not been prevented by any decision) and apply the max{...} operation as suggested by QC

**Proposal 4.1: The following handling is to be applied during RAN1#112bis-e on Issue #4:**

* **Option 1**: **Adopt the following TP for a CR to 38.213 (to be combined with Issue #2 and Issue #3 / if agreed)**

|  |
| --- |
| 9.1.4 Type-3 HARQ-ACK codebook determination UE provided with *pdsch-HARQ-ACK-OneShotFeedback* does not expect to be provided with a different value of *maxCodeBlockGroupsPerTransportBlock* for different priority indexes in *pdsch-CodeBlockGroupTransmissionList*.If a UE is provided *pdsch-HARQ-ACK-OneShotFeedback*, the UE determines $\tilde{o}\_{0}^{ACK},\tilde{o}\_{1}^{ACK},…,\tilde{o}\_{O\_{ACK}-1}^{ACK}$ HARQ-ACK information bits, for a total number of $O\_{ACK}$ HARQ-ACK information bits, of a Type-3 HARQ-ACK codebook according to the following procedure. If the UE is provided *pdsch-HARQ-ACK-EnhType3ToAddModList* and a DCI format scheduling PDSCH reception and triggering the Type-3 HARQ-ACK codebook includes an enhanced Type 3 codebook indicator field that provides a value for *pdsch-HARQ-ACK-EnhType3Index*, the UE determines a size of a set of indicated serving cells $N\_{cells}^{DL,ind}$ and a size of a set of indicated HARQ processes $N\_{HARQ,c}^{DL,ind}$ for each indicated serving cell and each indicated HARQ process number from the entry in *pdsch-HARQ-ACK-EnhType3ToAddModList* corresponding to the *pdsch-HARQ-ACK-EnhType3Index* value. If the DCI format does not include the enhanced Type 3 codebook indicator field, the *pdsch-HARQ-ACK-EnhType3Index* value is zero.**<Unchanged parts are omitted>** |

* **Option 2 v2**: **Adopt the following TP for a CR to 38.213 (to be combined with Issue #2 and Issue #3 / if agreed)**

|  |
| --- |
| 9.1.4 Type-3 HARQ-ACK codebook determination **<Unchanged parts are omitted>**Set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the number of HARQ-ACK information bits per TB for PDSCH receptions on serving cell $c$ as described in clause 9.1.1 if *maxCodeBlockGroupsPerTransportBlock* is provided for serving cell $c$ and *pdsch-HARQ-ACK-OneShotFeedbackCBG* or *pdsch-HARQ-ACK-EnhType3CBG* is provided; set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the maximum of the value of *maxCodeBlockGroupsPerTransportBlock* for the smaller priority index and the value of *maxCodeBlockGroupsPerTransportBlock* for the larger priority index if *pdsch-CodeBlockGroupTransmissionList* is provided for serving cell c and *pdsch-HARQ-ACK-OneShotFeedbackCBG* or *pdsch-HARQ-ACK-EnhType3CBG* is provided; else, set $N\_{HARQ-ACK,c}^{CBG/TB,max}=0$**<Unchanged parts are omitted>** |

|  |  |
| --- | --- |
| Support Option 1 (at least in principle) | Huawei/HiSi |
| Object Option 1 |  |
| Support Option 2 (at least in principle) | Vivo, DOCOMO, Apple, QC, CATT |
| Object Option 2 | Samsung[Huawei/HiSi] |
| Other | [Samsung: No action needed] |

Comments:

|  |  |
| --- | --- |
| *Company* | *Comments*  |
| vivo | Option 2 is preferred since it is beneficial to have differentiated handling of URLLC and eMBB. |
| Moderator | After some further thinking on the text for Option 2 – not sure if it would be better to change the order in the added sentence to align with the order of the first sentence, i.e. Change:

|  |
| --- |
| Set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the number of HARQ-ACK information bits per TB for PDSCH receptions on serving cell $c$ as described in clause 9.1.1 if *maxCodeBlockGroupsPerTransportBlock* is provided for serving cell $c$ and *pdsch-HARQ-ACK-OneShotFeedbackCBG* or *pdsch-HARQ-ACK-EnhType3CBG* is provided; if *pdsch-CodeBlockGroupTransmissionList* is provided for serving cell c and *pdsch-HARQ-ACK-OneShotFeedbackCBG* or *pdsch-HARQ-ACK-EnhType3CBG* is provided, set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the maximum of the value of *maxCodeBlockGroupsPerTransportBlock* for the smaller priority index and the value of *maxCodeBlockGroupsPerTransportBlock* for the larger priority index; else, set $N\_{HARQ-ACK,c}^{CBG/TB,max}=0$ |

To:

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| Set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the number of HARQ-ACK information bits per TB for PDSCH receptions on serving cell $c$ as described in clause 9.1.1 if *maxCodeBlockGroupsPerTransportBlock* is provided for serving cell $c$ and *pdsch-HARQ-ACK-OneShotFeedbackCBG* or *pdsch-HARQ-ACK-EnhType3CBG* is provided; set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the maximum of the value of *maxCodeBlockGroupsPerTransportBlock* for the smaller priority index and the value of *maxCodeBlockGroupsPerTransportBlock* for the larger priority index, if *pdsch-CodeBlockGroupTransmissionList* is provided for serving cell c and *pdsch-HARQ-ACK-OneShotFeedbackCBG* or *pdsch-HARQ-ACK-EnhType3CBG* is provided; else, set $N\_{HARQ-ACK,c}^{CBG/TB,max}=0$ |

Maybe you could provide your views here as well – for the potential draft CR that I will provide after having some more clarify based on companies inputs.  |
| Apple | Support moderator’s latest version  |
| Samsung | It is not an essential correction and it is something that can be trivially handled by the network. We don’t even think that the text in option 1 is necessary – it only captures yet another NW misconfiguration that has no impact on what the UE will do (UE behavior remains undefined with or without the text of option 1 and there is no restriction on what the NW can configure – at some point, it would be good to stop with all those “UE does not expect …” statements that are meaningless and have no effect on either the UE or the gNB).  |
| Moderator | Apple would be fine with the changed order of the sentence – change in v01 (v025 of the document) as noted above, just changing the order of the two half sentences)i.e.

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| Set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the number of HARQ-ACK information bits per TB for PDSCH receptions on serving cell $c$ as described in clause 9.1.1 if *maxCodeBlockGroupsPerTransportBlock* is provided for serving cell $c$ and *pdsch-HARQ-ACK-OneShotFeedbackCBG* or *pdsch-HARQ-ACK-EnhType3CBG* is provided; if *pdsch-CodeBlockGroupTransmissionList* is provided for serving cell c and *pdsch-HARQ-ACK-OneShotFeedbackCBG* or *pdsch-HARQ-ACK-EnhType3CBG* is provided, set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the maximum of the value of *maxCodeBlockGroupsPerTransportBlock* for the smaller priority index and the value of *maxCodeBlockGroupsPerTransportBlock* for the larger priority index; else, set $N\_{HARQ-ACK,c}^{CBG/TB,max}=0$ |

Change to:

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| --- |
| Set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the number of HARQ-ACK information bits per TB for PDSCH receptions on serving cell $c$ as described in clause 9.1.1 if *maxCodeBlockGroupsPerTransportBlock* is provided for serving cell $c$ and *pdsch-HARQ-ACK-OneShotFeedbackCBG* or *pdsch-HARQ-ACK-EnhType3CBG* is provided; set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the maximum of the value of *maxCodeBlockGroupsPerTransportBlock* for the smaller priority index and the value of *maxCodeBlockGroupsPerTransportBlock* for the larger priority index, if *pdsch-CodeBlockGroupTransmissionList* is provided for serving cell c and *pdsch-HARQ-ACK-OneShotFeedbackCBG* or *pdsch-HARQ-ACK-EnhType3CBG* is provided; else, set $N\_{HARQ-ACK,c}^{CBG/TB,max}=0$ |

 |
| QC | Thanks FL update the TP for option 2, which indeed aligns with existing spec better. Regarding Samsung’s comment that gNB can handle it. I’d like to ask how is gNB going to handle it? The only way I can see so far is gNB taking option 1 by implementation. But option 1 would hurt the overall system of URLLC+eMBB co-existence. Following option 1, as long as type 3 CB is configured, even type 3 CB is not triggered, the same # CBGs has to be used for eMBB and URLLC, we don’t think this is a reasonable way for a gNB to run the network? Can Samsung please elaborate if there are other ways to handle this issue by gNB implementation? |
| Samsung2 | As commented, it is not an essential correction, nothing is problematic with the specs, and we are now way passed the point of fine-tuning optimizations for Rel-17. Yes, the same number of CBGs will need to be used for eMBB and URLLC. It may not be optimal but that is all - it should be clear that the proposed CR is an optimization for the case a UE has both eMBB and URLLC, and needs, and supports CBG-based retransmissions. What is the impact on system throughput if such UE is not even configured CBG-based retransmissions? Also, as far as we know, CBG-based HARQ-ACK is not even being deployed by networks.  |
| Huawei/HiSi | Out understanding to the 106b-e agreement is that both the CBG/TB configuration and the CBG size over priorities are aligned. When we trace back to the 106-e, there is FFS on separate configuration of CBG/NDI/HARQ ID for a eType 3 CB. In 106b-e, due to the intention of aligning the eType 3 CB size over HP and LP, it is decided to align the CB size in terms of HARQ ID, and CBG/NDI. That is why we had agreements later for the HARQ-ID part and CBG/NDI part. If now we are trying to revisit the agreement and support separate configuration of the CBG size, then do we also need to revisit the HARQ-ID number over priorities, since we can also make the same zero-padding method to align the payload?

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| 106-e**Agreement** Support PHY priority handling for a PUCCH carrying the Rel-17 enhanced Type 3 HARQ-ACK CB of smaller size. * The indicated PHY priority in the triggering DCI defines the PHY priority of the PUCCH carrying the Rel-17 enhanced Type 3 HARQ-ACK CB of smaller size.
* The A/N of HARQ processes is mapped to the Rel-17 enhanced Type 3 HARQ-ACK CB of smaller size irrespective of the PHY priority of the ‘A/N’ of the HARQ processes.

FFS: If the HARQ-ACK codebook size or structure is dependent on the PHY priority (e.g. separate configuration of CBG/NDI usage, separate configuration of HARQ IDs / CCs per priority, SPS HARQ-ACK process IDs of specific priority only for a SPS HARQ-ACK only codebook, …).**Agreement** For the PHY priority handling of the enhanced Type 3 CB(s) of smaller size, the enhanced Type 3 HARQ-ACK has the same structure, size and content (in terms of HARQ-IDs, CCs) irrespective of the PHY priority. |
| 106b-e**Agreement**For one enhanced Type 3 HARQ-ACK CB, the same CBG and NDI configuration applies to both PHY priorities following the RAN1#106-e agreement.  |

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# Issue#5: PUCCH-sSCell for the BWP operation (38.213, clause 12)

* 1. Companies’ inputs

Huawei proposed a draft CR in [**R1-2303852**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112b-e/Docs/R1-2303852.zip) based on the following reasons:

|  |  |
| --- | --- |
| ***Reason for change:*** | PUCCH configuration in pucch-sSCell is missing in the BWP operation clause. |
|  |  |
| ***Summary of change:*** | Add PUCCH-sSCell in the bandwidth part operation. |
|  |  |
| ***Consequences if not approved:*** | PUCCH configuration in pucch-sSCell is not supported in the BWP operation. |

.. with the draft CR reading as:

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| 12 Bandwidth part operation ========================= Unchanged parts =========================If a UE is provided *controlResourceSetZero* and *searchSpaceZero* in *PDCCH-ConfigSIB1* or *PDCCH-ConfigCommon*, the UE determines a CORESET for a search space set from *controlResourcesetZero* as described in clause 13 and for Tables 13-1 through 13-10, and determines corresponding PDCCH monitoring occasions as described in clause 13 and for Tables 13-11 through 13-15. If the active DL BWP is not the initial DL BWP, the UE determines PDCCH monitoring occasions for the search space set only if the CORESET bandwidth is within the active DL BWP and the active DL BWP has same SCS configuration and same cyclic prefix as the initial DL BWP.For each UL BWP in a set of UL BWPs of the PCell or of the PUCCH-SCell or of the PUCCH-sSCell, the UE is configured resource sets for PUCCH transmissions as described in clause 9.2.1.A UE receives PDCCH and PDSCH in a DL BWP according to a configured SCS and CP length for the DL BWP. A UE transmits PUCCH and PUSCH in an UL BWP according to a configured SCS and CP length for the UL BWP. ========================= Unchanged parts =========================  |

* 1. Initial moderator assessment & suggested handling

**The issue is clearly valid and should be handled.**

**This is maybe an editorial issue that could be referred to the 38.213 editor CR (based on an agreed TP), or could be combined with other issues in a single CR to 38.213 (Issue #2 to Issue #4).**

* 1. Issue to be handled during RAN1#112bis-e?

**Question: Do you support discussing the Issue (overall) during RAN1#112bis-e?**

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| --- | --- |
| Yes - support:  | QC,New H3C, ZTE Huawei/HiSi, LG, vivo, Nokia/NSB, Samsung, Ericsson, Intel, CATT, OPPO |
| No - not support:  |  |

**Question: If to be handled during RAN1#112bis-e, do you think this could be referred to the editor CR or is a separate CR needed?**

|  |  |
| --- | --- |
| Refer to Editor CR  | QC,New H3C, ZTE Huawei/HiSi, LG, vivo, Nokia/NSB, Samsung, Ericsson, Intel, CATT, OPPO |
| Separate CR |  |

**Comments on the moderator comments / suggested handling or any other comments on the draft CR:**

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| --- | --- |
| *Company* | *Comments*  |
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* 1. Round 1

Based on the initial round feedback, companies seem to feel that Issue #1 needs to be (a) addressed and (b) should be captured in the 38.213 editor CR.

Therefore, the following proposal is made here:

**Proposal 5: The changes identified by Huawei / HiSi in** [**R1-2303852**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112b-e/Docs/R1-2303852.zip) **are to be reflected in the 38.213 Rel-17 editor CR.**

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| --- | --- |
| Support | vivo, New H3C, DOCOMO, Intel, ZTE, Apple, CATT, Huawei/HiSi |
| Object |  |

Comments:

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| *Company* | *Comments*  |
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# Outcome

TBA