**3GPP TSG-RAN WG1 Meeting #106-eR1-210XXXX**

e-Meeting, August 16th – 27th, 2021

**Agenda item: 8.3**

**Source: Moderator (Nokia)**

**Title: [Post-106-e-Rel17-RRC-03] Enhanced IIoT and URLLC**

**Document for: Discussion and Decision**

# Introduction

As per chairman’s guidance, the email discussion

* [Post-106-e-Rel17-RRC-03] Enhanced IIoT and URLLC

is planned according to the following guidelines:

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| *As announced during RAN1#106-e, there will be a number of email threads on Rel-17 RRC parameters. For each Rel-17 work item, the work item rapporteur will kick off the email thread. The email discussions on RRC parameters will start from September 1 until September 10 (of course excluding the weekend). The purpose of these email discussions is to initiate our preparations to send the first LS to RAN2 on Rel-17 RRC parameters in October (e.g. tabulate agreed RRC parameters so far and identify ones that RAN1 should discuss whether or not to define).*  *Please note that RAN1 will NOT be making any decision with regards to the Rel-17 RRC parameters during the email discussions. Intention is to have the work item rapporteurs provide their initial assessment and collect company views if there are any. I am hoping that this discussion will help companies better prepare for RAN1#106bis-e. For each email thread, the rapporteur is to provide a tdoc collecting company views along with a draft list of RRC parameter at the end of the email discussion.* |

This document is there to support the RAN1 email discussion on the RRC parameter list for the Rel-17 URLLC/IIoT WI. Companies are encouraged to provide their comments on the latest version of the RRC parameter sheet in the respective AI specific drafts folder and the changes to the RRC parameter sheet will only be done by the AI moderator based on the received comments in each round or iteration of email discussions on this issue.

**This document is structured as follows:**

* Section 2 contains the email discussion for HARQ-ACK enhancements (AI 8.3.1.1)
* Section 3 contains the email discussion for CSI enhancements (AI 8.3.1.2)
* Section 4 contains the email discussion for NR-U enhancements (AI 8.3.2)
* Section 5 contains the email discussion for Intra-UE periodization enhancements (AI 8.3.3)
* Section 6 contains the email discussion for Other / Propagation delay compensation (AI 8.3.4)

# HARQ-ACK enhancements (AI 8.3.1.1)

* 1. Dropping of SPS HARQ-ACK feedback in TDD operation / SPS deferral

### 1st Round

The following need for RRC parameters has been identified by the moderator:

1. Enable the feature per SPS configuration
2. Configure the maximum deferral per SPS configuration

On these and in case of having missed some aspect, please comment below as well:

|  |  |
| --- | --- |
| *Company* | *Comments* |
| Samsung | We think that enabling/disabling the feature should be considered together with the maximum deferral per SPS configuration. That is, there is no need to make two separate RRC parameters. Just one RRC parameter is enough.   * Instead of {1..15}, {0..15} should be considered. Here, 0 means disable the feature. * Furthermore, there has been no explicit agreement to support new RRC parameter for enabling/disabling the feature   Moderator: Thanks for the feedback. I can remove the separate RRC parameter on enabling with an update.  Just to check: actually we would not need the value 0 either as if the parameter is not configured (as this would be an optional parameter anyhow), having the max. deferral value not configured could be understood as ‘not enabled’? |
| DOCOMO | Agree. |
| Intel | We prefer the approach with the parameters not configured = the feature is disabled. This is the most common throughout NR specs.  Regarding the maximum value 15, while we understand the rationale, probably a separate discussion and a formal agreement is needed for that. |
| vivo | We agree with Moderator and Intel that when the parameter is not configured, it means the feature is not enabled.  We are also fine with the value range. |
| Sony | We are fine whether to have a separate “Enable” parameter per SPS Config or lump it into max deferral. Also the “Enable the feature” should be per SPS Config (which was commented as per SPS Config in the spreadsheet but not in this document).  Moderator: sorry about not being that precise in this word document above, the important thing clearly seems the spreadsheet |
| ZTE | We are fine with separate “enable” parameter.  If parameters not configured = the feature is disabled, {1...15} is also fine, it seems no need to add {0}, as configuration absence means disable. |
| OPPO | We are fine to remove the separate RRC parameter on enabling.  With respect to maximum deferral, we’d like to clarify whether the value of maximum deferral can be less than the value of k1 configured for the SPS configuration,  If answer is no, we prefer to add restrictive sentence in description.  Moderator: First, the applicable k1 value for SPS is not configured but determined by the activation or do you refer to the configured k1 sets? Please note, that we discussed further restrictions already (e.g. if the k1+k1\_def needs to correspond to a value in the k1 set(s)) but there was no agreement on further restrictions). Clearly, having a smaller value of max (k1+k1\_def) configured than the k1 indicated in the activation DCI seems to be not really working. But we cannot really put this in RRC to my understanding, as the k1 value for the SPS configuration is not given by the RRC configuration but through activation. If a sentence would be needed here, this would need to be handled by the specifications (e.g. in 38.213), something like ‘the UE does not expect …” or similar.  [OPPO2] Thanks for FL’s clarification. Considering k1 value for SPS is indicated in activation DCI, we agree with FL’s suggestion, e.g. Add “UE does not expect…” in 38.213. |
| LG | We prefer the mechanism of no configuring parameter to disable the feature. Especially when only one parameter is required for the feature, this is more the consistent approach considering current specification.  Regarding maximum number, we think it is OK to leave for further discussion.  In our point of view, {1 … maxDeferral} is fine for now.  Moderator: maybe we could use the formulation by Ericsson below, i.e. FFS: 15 there. |
| Ericsson | * 1) We support the approach that not configuring *spsHARQdeferral-max* implies the feature is not enabled. The advantage of this approach to the other alternative is that without configuring this parameter, Rel-16 behaviour is applied. * 2) On the maximum range value, although “15” is fine with us, but we prefer to be consistent and leave that value as FFS when agreement is in place and update as following:   + {1…FFS:15} * 3) We suggest change the name such that it reflects HARQ-ACK , and not HARQ. To avoid long name, maybe we can skip “sps” since it is configured in SPS-Config.   + spsHARQdeferral-max ->HARQ-ACKdeferral-max   Moderator:  1. This seems to be majority view from companies above, will change 2. Fine to put FFS there, this should also address the comment from LG above 3. I will include the ‘ACK’ but leave the ‘sps’ there, as clearly the feature is for SPS HARQ-ACK only. In case RAN1 (or RAN2) would like to have it shorter, we could remove the ‘-max’ instead (as anyhow a single RRC parameter) of shorten the word deferral to ‘def’ or similar. But keeping the sps is maybe better. |
| Huawei/Hisi | We prefer that the feature should be disabled if the parameter is not configured.  Regarding the maximum deferral, more discussions may be needed for the specific value, so we share a similar view with LG that using maxDeferral (or ‘X’) would be better.  Moderator: maybe we could use the suggestion from Ericsson: FFS 15 |
| Moderator | Updates in v04 (in blue):   * having not configured the RRC parameter means it is not enabled (i.e. value range 1…FFS: 15) and change the description & comments accordingly * including the ‘ACK’ in the RRC parameter name |

* 1. PUCCH repetition enhancements

### 1st Round

1. The moderator could only identify the need for the RRC parameter of nrofSlots for PUCCH format0 (but there could be some overlap with defining this in Cov. Enh. WI).

2. For PUCCH format 2, this is already supported from signaling perspective through PUCCH format config, just the restriction to configure would need to be removed in Rel-17:

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3. The configuration for the dynamic PUCCH repetition indication could be re-used from Cov. Enh. WI. So no need for us to define the related RRC parameters.

On these and in case of having missed some aspect, please comment below as well.

Please provide your input to the table below:

|  |  |
| --- | --- |
| *Company* | *Comments* |
| Samsung | OK |
| DOCOMO | Agree. |
| Intel | We agree with Moderator’s explanation.  It is however questioned whether we need the parameter currently listed in Excel file ‘nrofSlotsFormat0’, since the same functionality would be achieved by removing the restriction, if we understand the intention correctly.  Moderator: Please note, that for Format 0 there is no ‘PUCCH-format config’ (see the first copied RRC part, only available for PUCCH formats 1, 2, 3 and 4), therefore there is no way with the current RCC signaling framework to indicate the repetition number. |
| vivo | We agree with Moderator’s views. |
| Sony | Agree. |
| ZTE | Agree |
| OPPO | Agree |
| LG | Agree |
| Ericsson | We understand enabling repetition for PF2 can be done as Moderator suggested and the same approach can not be applied for PF0. However, instead of introducing a new RRC parameter for PF0, and setting it equal to ‘nrofSlots’, can’t we promote ‘nrofSlots’ one level us as shown below?  Otherwise, it seems that operation using only PF0 with repetition would be dependent on configuration of any other PUCCH formats.  nrofSlots ENUMERATED {n2,n4,n8} OPTIONAL, -- Need S  PUCCH-FormatConfig ::= SEQUENCE {  interslotFrequencyHopping ENUMERATED {enabled} OPTIONAL, -- Need R  additionalDMRS ENUMERATED {true} OPTIONAL, -- Need R  maxCodeRate PUCCH-MaxCodeRate OPTIONAL, -- Need R  ~~nrofSlots ENUMERATED {n2,n4,n8} OPTIONAL, -- Need S~~  pi2BPSK ENUMERATED {enabled} OPTIONAL, -- Need R  simultaneousHARQ-ACK-CSI ENUMERATED {true} OPTIONAL -- Need R  }  Moderator: Thanks for the suggestion. Please note we cannot remove any RRC parameters (from the existing ASN.1 code) as the Rel-15/16 operation would still need to be maintained based on the Rel-15/16 signaling. Moreover, this would mean that the same repetition factor would need to be applied for all PUCCH formats, whereas in Rel-15/16 one can configure the value per PUCCH format.  The suggested signal is independent of the configuration of other PUCCH formats. The structure is exactly the same (this is part of PUCCH config IE) but just calling this *nrofSlotsFormat0* only applicable to Format 0 instead of nrofSlots as proposed above  So this would we looking like:  nrofSlotsFormat0 ENUMERATED {n2,n4,n8} OPTIONAL, -- Need S  PUCCH-FormatConfig ::= SEQUENCE {  interslotFrequencyHopping ENUMERATED {enabled} OPTIONAL, -- Need R  additionalDMRS ENUMERATED {true} OPTIONAL, -- Need R  maxCodeRate PUCCH-MaxCodeRate OPTIONAL, -- Need R  nrofSlots ENUMERATED {n2,n4,n8} OPTIONAL, -- Need S  pi2BPSK ENUMERATED {enabled} OPTIONAL, -- Need R  simultaneousHARQ-ACK-CSI ENUMERATED {true} OPTIONAL -- Need R  }  But please also check the Huawei proposal below, with could be a good alternative as well |
| Huawei/Hisi | Agree in principle. An alternative is to add ‘format 0’ under PUCCH-Config, and remove the restriction for ‘nrofSlots’ to be applicable to F0/1/2/3/4, while other parameters in ‘PUCCH-FormatConfig’ such as ‘interslotFrequencyHopping’, ‘pi2BPSK’, ‘simultaneousHARQ-ACK-CSI’, and ‘maxCodeRate’ should not be applicable for format 0).  PUCCH-Config ::= SEQUENCE {  resourceSetToAddModList SEQUENCE (SIZE (1..maxNrofPUCCH-ResourceSets)) OF PUCCH-ResourceSet OPTIONAL, -- Need N  resourceSetToReleaseList SEQUENCE (SIZE (1..maxNrofPUCCH-ResourceSets)) OF PUCCH-ResourceSetId OPTIONAL, -- Need N  resourceToAddModList SEQUENCE (SIZE (1..maxNrofPUCCH-Resources)) OF PUCCH-Resource OPTIONAL, -- Need N  resourceToReleaseList SEQUENCE (SIZE (1..maxNrofPUCCH-Resources)) OF PUCCH-ResourceId OPTIONAL, -- Need N  **format0 SetupRelease { PUCCH-FormatConfig } OPTIONAL, -- Need M**  format1 SetupRelease { PUCCH-FormatConfig } OPTIONAL, -- Need M  format2 SetupRelease { PUCCH-FormatConfig } OPTIONAL, -- Need M  format3 SetupRelease { PUCCH-FormatConfig } OPTIONAL, -- Need M  format4 SetupRelease { PUCCH-FormatConfig } OPTIONAL, -- Need M  Moderator: That would clearly be another option. Let’s check other companies views on that one. |
| Moderator | No changes to v04.  Please check the proposal from HW/HiSi above, if just simply making the whole PUCCH-Format Config simply also for PUCCH format 0 there. Clearly this would have less RAN1 specs impact here (as we then have the same RRC parameter applicable to all PUCCH formats).  And provide your related input. |

* 1. Type-1 HARQ-ACK Codebook enhancements

### 1st Round

The moderator did not find any needed RRC parameter for this feature, as the current RRC signaling supports this already.

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| --- |
| HARQ-ACK-CodebookList-r16 ::= SEQUENCE (SIZE (1..2)) OF ENUMERATED {semiStatic, dynamic} |

We just need to remove the Rel-16 restriction to now allow the configuration of sub-slot based PUCCH config and Type 1 CB.

Please provide your input to the table below:

|  |  |
| --- | --- |
| *Company* | *Comments* |
| Samsung | Agree |
| DOCOMO | Agree |
| Intel | Agree |
| vivo | Agree. |
| Sony | Agree |
| ZTE | Agree |
| OPPO | Agree |
| LG | Agree |
| Ericsson | Agree |
| Huawei/Hisi | Agree |

* 1. Retransmissions of dropped HARQ-ACK

### Rel-16 Type-3 CB enhancements (DCI 1\_2 / PHY prioritization)

#### 1st Round

We agreed the PHY priority handling and the support for DCI format 1\_2 for the Rel-16 Type 3 CB.

The moderator identified the following needs:

1. Clearly we need an RRC parameter for the DCI 1\_2 operation
2. But it seems none for the PHY prioritization, as this is already supported by the signaling framework (just need to remove the restriction of not being able to configure PHY prioritization and Rel-16 Type 3 CB at the same time).

Please provide your input to the table below:

|  |  |
| --- | --- |
| *Company* | *Comments* |
| Samsung | OK. We understand that “RRC parameter for the DCI 1\_2 operation” means the configuration for the presence of the priority indicator.  Moderator: I guess for DCI 1\_2, should be the presence of the ‘Type 3 triggering’!? |
| DOCOMO | We agree that no additional RRC parameter is needed to support PHY priority indication for DCI 1\_1 and 1\_2.  However, regarding “just need to remove the restriction of not being able to configure PHY prioritization and Rel-16 Type 3 CB at the same time”, we don’t think such restriction exists in current specification.  Moderator: Not fully sure, but clearly if there is no restriction currently then nothing would need to be removed. |
| Intel | Agree |
| vivo | We agree with moderator that the RRC parameter for triggering the Rel-16 Type 3 codebook by DCI format 1\_2 is needed. In addition to that, we wondered whether additional RRC parameters such as “pdsch-HARQ-ACK-OneShotFeedbackCBGDCI-1-2” and “pdsch-HARQ-ACK-OneShotFeedbackNDIDCI-1-2” are needed or those parameters for DCI format 1\_2 reuse the ones configured for DCI format 1\_1?  Moderator comment: Good comment & question. It was moderator’s implicit assumption as we don’t even distinguish between different priorities (where the payload size would have made a different), that we would not change the Type 3 CB structure for DCI format 1\_2 either. Please note, that the CBG and NDI does not have an impact on the DCI size, so the motivation for having this is slightly limited (different to having things separately configurable for DCI format 1\_2 to be able to configure the size of the DCI separately).  Or does vivo think that this would have an impact on the DCI size? If so, we could continue discussing here.  [vivo2] thanks a lot moderator’s replies. We do not think CBG and NDI setting have impacts on the size of DCI format 1\_2. While going through 331, there are some separate configurations for DCI format 1\_2 and DCI format 1\_1 that do not have impacts on the DCI size, e.g., mcs-Table, mcs-TableDCI-1-2, vrb-ToPRB-Interleaver, vrb-ToPRB-InterleaverDCI-1-2. If they are not separately configured for DCI format 1\_2, then we may need to clarify the assumption/default configuration of CBG/NDI for DCI format 1\_2. For example, the CBG/NDI re-use the same configurations as for DCI format 1\_1 or we consider that CBG/NDI is not used for Rel-16 Type 3 codebook triggered by DCI format 1\_2.  Moderator: Good points. Can we leave this for now, and if vivo is interested to have separate configuration to bring this as input to the Oct. meeting? I guess the default assumption would be if not agreed otherwise, the CB would have the same structure (as baseline, i.e. no changes to the CB). |
| Sony | Agree |
| ZTE | Agree |
| OPPO | Agree with DOCOMO.  In addition, Due to PHY prioritization is introduced, the collision handling between Type3 HARQ-ACK CB and other HARQ-ACK CB, i.e. Type1 or Type2 HARQ-ACK CB may be changed. To be specific, in R16, Type3 HARQ-ACK CB is always higher priority than other HARQ-ACK CBs, as described in TS38.213.  “If a UE detects a DCI format that includes a One-shot HARQ-ACK request field with value 1, the UE determines a PUCCH or a PUSCH to multiplex a Type-3 HARQ-ACK codebook for transmission in a slot as described in Clauses 9.2.3 and 9.2.5. The UE multiplexes only the Type-3 HARQ-ACK codebook in the PUCCH or the PUSCH for transmission in the slot.”  However, in R17, if Type3 HARQ-ACK CB is indicated as low priority, the existing collision handling seems not reasonable. At least, we need further discussion on collision handling. So we suggest to add RRC parameter related with PHY priority, e.g. *PriorityforType3* and highlighted by yellow.  Moderator:  First, the sentence above from the specifications describes the case that only a single HARQ-ACK codebook can be constructed per PUCCH slot (i.e. a single PHY priority, PHY priority and Type 3 CB cannot be configured for a UE in Rel-16). If having the ability and being configured with two PUCCH configs (i.e. UE can create more than one HARQ-ACK codebook for a slot), one can be of Type 3 and the other can be of any other type. So clearly some minor specs change will be needed there to clarify that the clause from above is to apply per priority. But then, wouldn’t the normal PHY prioritization procedure from 38.213 apply then there? Let’s not forget, this is under gNB control to indicate LP or HP in the Type 3 triggering DCI – so gNB should be aware of what is triggered and in the end, which of the HARQ CBs is to be dropped due to the Rel-16 PHY prioritization? If you think some further clarifications are needed, please bring some related input to the next RAN1 meeting. Without any additional agreements, the PHY prioritization procedure of Sec. 9 of 38.213 would automatically apply.  [OPPO2] Thanks for FL’s discussion and suggestion. We agree that normal PHY prioritization procedure from 38.213 should be applied for Type 3 CB in R17, which is also our intention. Due to configurations and procedures are independent for Type3 CB and PHY prioritization currently, so small specification change is needed to clarify that the clause from above is to apply per priority. We’d like to input next RAN1 meeting.  In addition, there is no explicit restriction on Type3 CB and PHY priority configuration in current TS38.331 and TS38.213, in other words, Type 3 CB and PHY priority can be configured simultaneously. so, the clause from above also covers the scenario that Type 3 CB and PHY priority can be configured simultaneously, in which Type 3 CB is always highest priority. If we misunderstand spec, please feel free to let me know.  If our common understanding is that Type3 CB and PHY priority configuration cannot be configured simultaneously in R16, we’d like to clarify this issue in R16 maintenance in future meeting. (According to chairman’s guidance, R16 maintenance will not be discussed in next RAN1 meeting, we have to clarify it in later meeting).  Second on the need for RRC parameter – bit unclear why this is needed? If the UE is configured with both in Rel-17, this means that the PHY priority handling for Type 3 CB is to be applied. So there is no need for any additional RRC parameter there (as the combination of PHY priority & Type 3 CB not supported earlier – there can be no miss-understanding).  [OPPO2] Our intention is that normal PHY prioritization procedure from 38.213 should be applied for Type 3 CB. If our intention can be expressed in any spec, e.g. TS 38.213. No RRC parameter is fine for us, especially when it is clear that Type3 CB and PHY priority cannot be configured simultaneously in R16. |
| LG | Agree with FL |
| Ericsson | * We understand that we need corresponding RRC parameters related to Type-3 CB triggering by DCI format 1\_2, mirroring the ones for DCI format 1\_1, to maintain similar functionalities, e.g.,   pdsch-HARQ-ACK-OneShotFeedback-r16 ENUMERATED {true} OPTIONAL, -- Need R  But we think row 12 is covered by row 25 and hence, row 12 is not needed and should be removed.   * + We wonder whether it is correct in the excel sheet, line 12, that RAN2 parent IE is *pdsch-config*. For Type-3 CB triggering by DCI format 1\_1, it is in *PhysicalCellGroupConfig.*   Moderator: First, we agreed to have RRC signalling specifically for this feature:  **Agreement**  Support Rel-16 Type 3 HARQ-ACK CB triggering using DCI format 1\_2 in Rel-17 for a UE supporting DCI format 1\_2.   * The support is subject to a Rel-17 UE capability and a UE supporting this capability can be configured with DCI format 1\_2 triggering of the Rel-16 Type 3 HARQ-ACK CB.   In principle this could be clearly done, but when thinking that this is a ‘1bit’ RRC parameter, it maybe cleaner (from RRC and especially specifications perspective, especially looking at 38.212 DCI field definition and 38.213) to have independent RRC parameters. I will leave this for now and let’s see further comments by companies. |
| Huawei/Hisi | Agree with the moderator in principle. For the redundant R-16 Type 3 enabling and R17 enhType-3 enabling, we think more discussions are needed to decide whether both RRC parameters need to be configured. E.g., if two separate DCI signalings are to be introduced to separately trigger R16 Type-3 CB (as full set) and R17 enhType-3 CB (as a subset), there is a need for separate RRC parameters; otherwise only R17 enhType-3 is enough. |

### Enhanced Type-3 CB of ‘smaller size’

#### 1st Round

There are still some pending decisions, but the intention here is to discuss also potential RRC parameters already (as per Mr. Chairman’s guidance).

The moderator identified at least the following needed parameters:

1. List of enhanced Type-3 HARQ-ACK codebooks of smaller size
2. For each enhanced Type 3 HARQ-ACK codebook of smaller size
   1. Enhanced Type 3 HARQ-ACK codebook set / structure (two options for configuration agreed, per CC – or per HARQ process & CC)
   2. CBG configuration for the enh. Type 3 HARQ-ACK CB
   3. NDI configuration for the enh. Type 3 HARQ-ACK CB
3. Enabling of DCI format 1\_2 operation for enh. Type 3 HARQ-ACK codebook.

On these, and in case you think there is something missing, please provide your input to the table below:

|  |  |
| --- | --- |
| *Company* | *Comments* |
| Samsung | CBG and NDI should be removed for now – can discuss in RAN1#106b-e whether to support when targeting a codebook with small size. Also, DCI 1\_2 does not support CBGs while the need/motivation for NDI may not exist in URLLC.  Moderator: Please see the RAN1 chair comments and note that we do not agree any of these RRC parameters (there is no real endorsement) but just the starting point for discussions (with endorsement) during RAN1#106-e. The point was also to identify RRC parameters maybe still needed, and this is such case. We could keep them there and mark them in yellow (if Samsung prefers). |
| DOCOMO | Share similar view as Samsung that we haven’t discussed CBG and/or NDI for enhanced type 3 HARQ-ACK CB so far. Better to remove “pdsch-HARQ-ACK-enhType3NDI” and “pdsch-HARQ-ACK-enhType3CBG”.  Moderator: see my reply to Samsung |
| Intel | It seems we may need another pdsch-HARQ-ACK-enhType3DCI-1-1 but for DCI format 1\_1. Is current assumption that 1\_1 is automatically enabled with the whole list, while 1\_2 is enabled with the subset of CBs ?  Moderator: The moderator assumption was that for DCI format 1\_1 this is then automatically enabled (following the logic of R16 Type 3 CB, where format 1\_1 is automatically the triggering DCI). Moderator assumption therefore was, that *pdsch-HARQ-ACK-enhType3ToAddModList*, *pdsch-HARQ-ACK-enhType3ToReleaseList* and *pdsch-HARQ-ACK-enhType3* would be the parameters automatically applicable to DCI format 1\_1 (so what you mean there would be those 3 parameters, why not adding DCI format 1\_1 there yet is that also in Rel-16 we don’t have this addition there).  Now to DCI format 1\_2, currently there is only the ‘enable’ parameter. We may need to discuss, if there is a separate configurability of the ‘number of sets / list’ there, but it is the moderator’s understanding that this may be dependent on the way the indication is carried (where RAN1 does not have any decision yet). In case the number of subset’s that can be dynamically indicated is not increasing the DCI size (as proposed by some companies), then there would be at least no need for separate lists. In case the number of dynamically indicated subsets does have an effect on the DCI size, then some further RRC parameters would be needed (e.g. for DCI format 1\_2 using a subset of the list configured, or only the first in the list can be triggered).  But the moderator’s assumption at least here was, that we could not configure different enh. Type 3 CBs for 1\_2 compared to 1\_1 (but only 1\_2 may not provide the full flexibility in the dynamic indication as discussed above). |
| vivo | In excel sheet row 25, we wondered whether the Parent IE for pdsch-HARQ-ACK-enhType3DCI-1-2 should be the pdsch-config, similar as pdsch-HARQ-ACK-OneShotFeedbackDCI-1-2 shown in row 12.  Moderator: Good point – should be consistent there (my mistake). But please also see my reply to Intel on the number of dynamically indiated enh. Type 3 CBs with DCI format 1\_2. Will be updated, change in green.  On Intel’s question, our understanding is same as Intel’s assumption that when the whole list is configured, DCI format 1\_1 is automatically enabled, similar as Rel-16 features/configurations indicated by compact DCI format.  Moderator: see reply to Intel above |
| Sony | Actually per CC and per HARQ/CC can be the same parameter. Or rather HARQ/CC would have cover per CC configuration since the network can configure “ALL” HARQ Process IDs for a particular CC.  Moderator comment: Fully agree here. When start drafting the RRC parameter list I was actually thinking that if having only the ‘per HARQ/CC’ would be sufficient and would simplify the RRC parameter list as well as the implementation in the specs. But moderator followed just the RAN1 agreements here.  Maybe we could discuss if we should not remove the ‘Alt. 1 per CC’ as this can be also indicated with the ‘per HARQ/CC’ signalling framework. |
| ZTE | We support the explanation on DCI format 1\_1 from moderator. i.e., that pds*ch-HARQ-ACK-enhType3ToAddModList*, *pdsch-HARQ-ACK-enhType3ToReleaseList* and *pdsch-HARQ-ACK-enhType3* would be the parameters automatically applicable to DCI format 1\_1.  A question to be clarified on the “**whole list**” in comments from Intel and vivo, this term means the list in Excel row 17/18, or the traditional whole 16 HARQ process?  Moderator: Better for Intel to clarify. But in the reply to Intel the moderators assumption had been that the ‘whole list’ would be the lists in row 17/18. |
| OPPO | Considering related bitfield sizes in DCI format 1\_2 and DCI format 1\_1 are usually separate, usually it requires further study on whether RRC parameters related with enhanced Type3 HARQ-ACK CB for DCI format 1\_2 is separate from that of DCI format 1\_1 too. So we need further agreements on RRC parameters related with enhanced Type3 HARQ-ACK CB for DCI format 1\_2.  Moderator: See my reply to Intel above on DCI format 1\_2. This is only the initial list and may be dependent on further discussions on the DCI signalling as well. |
| LG | We understand and prefer that the configuration is based on DCI format 1\_1, and DCI format 1\_2 only borrow parameters for DCI format 1\_1. But it is discussable that two separated parameter is necessary for legacy type-3 and enh. Type-3 of DCI format 1\_2. We think *pdsch-HARQ-ACK-OneShotFeedbackDCI-1-2* and *pdsch-HARQ-ACK-enhType3DCI-1-2* could be unified as single parameter.  For parameter for CBG and NDI, we are fine with current version as starting point but it should be discussed whether to support those indication and how to support those indication for each type-3 codebook in the list.  Moderator: In principle this could be clearly done, but when thinking that this is a ‘1bit’ RRC parameter, it maybe cleaner (from RRC and especially specifications perspective, especially looking at 38.212 DCI field definition and 38.213) to have independent RRC parameters. I will leave this for now and let’s see further comments by companies. |
| Ericsson | * In our understanding, the support for enhanced Type-3 codebook should be the same regardless of whether it is triggered by DCI format 1\_1 or 1\_2. Then, we have an agreement stating that for DCI format 1\_2, the triggering support is independently (from triggering using DCI format 1\_1) RRC configured to the UE (row 25). * We agree with LG that *pdsch-HARQ-ACK-OneShotFeedbackDCI-1-2* and *pdsch-HARQ-ACK-enhType3DCI-1-2* could be unified as single parameter (prefer the former, please see below). * Using both “enhType3” and “OneShot” is confusing. In Rel-16, 331 uses OneShot, but 213 uses Type 3. Also, the corresponding feature in 306 is oneShotHARQ-feedback. We can do the same here. (Not sure if we need to call it “enhanced” since it Rel-17). Therefore, we suggest to change Sub-feature group name and RRC parameter, respectively to:   + Enhanced OneShotFeedback   + pdsch-HARQ-ACK-OneShotFeedback-r17 * With respect to CBG and NDI, we do understand Moderator’s intention for allocating a place holder marked yellow to identify the remaining issues in RRC parameters. However, we think it would be better if the RRC parameter list is based on agreements and FFS that are reflected in agreements. Therefore, we suggest removing corresponding rows and update the list when the corresponding agreements are made.   Moderator:   * On the single versus separate RRC parameters for DCI format 1\_2 for R16 and R17 Type 3 CB, let’s hear some more companies views. As comment above also to LG (& Ericsson in the previous sub-section) this could be done, but maybe cleaner to have separate RRC parameters (as we have two separate agreements to have RRC parameters also agreed in RAN1#106-e) * On the naming, we could definitely call the feature ‘Enhanced One-Shot Feedback’ but would then also need to use this for the Rel-16. Please also note, that the feature names does not appear anywhere in the specifications and looking at the Rel-16, we have not even been consistent there as in RRC & 38.212, we call this one-shot feedback but then in 38.213 we call it ‘Type 3 CB’, but it is in the end is a dynamic triggering of a Type 3 CB transmission. So maybe we could in Rel-17 try to be more consistent here from the beginning and use the same wording throughout the specifications.  On the RRC parameter, we can use the ‘OneShotFeedback’ naming, but at least I would suggest to include the ‘Enh’ there as well (i.e. pdsch-HARQ-ACK-EnhOneShotFeedback), as just the -r17 suffix may mean an enhancement of the Rel-16 type (such as the DCI format 1\_2 triggering discussed above) and then it is not clear if we would agree later on enhancements in R18 (which we do now in R17 for R16 Type 3 CB) to which one this refers to.  Ericsson in their reply above on the sps deferral seems to be worried about the length of the RRC parameter names. Having ‘*EnhOneShotFeedback*’ instead of ‘*enhType3*’ adds here some 10 letters (… and will still have the additions of ToAddModList / CBG / NDI/ DCI-1-2 on top). This had been the reason to try to chose a shorter ‘main RRC parameter name’ here. I can definitely make the change, but before making it here, please also consider the RRC parameter length there. Moreover, as discussed in the last bullet, it would maybe be good in Rel-17 with the new ‘enhanced’ feature to try to be slightly more consistent using consistent wording / naming throughout the specifications (.. one not use Type 3 in some place and ‘one shot triggering’ in other places). As Ericsson comment in the next section, the wording of one short refers to getting all the HARQ information in a single ‘shot’. This is actually not trued with the enh. Type 3 CB anymore, as only a subset is to be reported. We can change the naming of the main RRC parameter for the enh. Type CB at any time, but before changing it – please consider your own worries about RRC parameter lengths. * With respect to NDI and CBG, please note the chairman’s guidance of also trying to identify potentially needed RRC parameters. We can keep in the end the whole row in yellow. As mentioned earlier, we don’t even agree here to this list (not going to RAN2 yet) but trying to have an as good as possible collection of RRC parameters based on the available agreements and some identified ones we may still need agreements on.  Having those in yellow will make it easier for companies in their input to RAN1#106bis- to have related proposals in their TDocs |
| Huawei/Hisi | Agree that DCI 1\_1 and DCI 1\_2 may share the same enhanced Type 3 CB set for simplified RRC configuration.  Agree with Samsung and DOCOMO that CBG/NDI may not be needed. We may keep them marked yellow and further discuss in the future meetings.  For Alt.1 per CC based, we have a same feeling that it can be totally achieved by Alt.2 per CC/per HARQ. May consider to remove Alt.1 in future discussions. |
| Moderator | No changes currently on this part.  Companies are encouraged to check and comment below on:   * If we should have separate RRC parameter to enable the DCI 1\_2 triggering for Rel-16 Type 3 CB and Rel-17 Enh. Type 3 CB (as in the current sheet) or having a single RRC parameter applicable to both (see the discussions with Ericsson & LG above) * If we should change the ‘feature name’ from *Rel-17 Enhanced Type 3 HARQ-ACK CB of smaller size* to ‘*Enhanced OneShotFeedback*’- see the discussions with Ericsson above and the related consistency throughout the specs at least for the Rel-17 feature. * the discussions with Ericsson above if we should RRC parameter names changed from *pdsch-HARQ-ACK-enhType3* to *pdsch-HARQ-ACK-EnhOneShotFeedback*. *Moderator clearly could be fine, but at the same time the RRC parameter length with all the suffixes will become very long* (having 10 additional letters) and the related consistency throughout the specs ‘Type 3’ in some places and ‘one-shot triggering’ in others. |

### One-shot triggering (by a DL assignment) of HARQ-ACK re-transmission on a PUCCH resource

#### 1st Round

There are still some pending decisions, but the intention here is to discuss also potential RRC parameters already (as per Mr. Chairman’s guidance).

The moderator identified at least the following needed parameters:

1. Enabling of the new ‘one-shot triggering’
2. Enabling of DCI format 1\_2 triggering
3. Configure the ‘offset’ for the dynamic indication of the PUCCH occasions / CB to be re-transmitted

On these, and in case you think there is something missing, please provide your input to the table below:

|  |  |
| --- | --- |
| *Company* | *Comments* |
| Samsung | It is not clear why RRC configuration for the “offset” of the PUCCH occasion is needed – may be discussed in RAN1#106b-e.  Moderator: same comment as above, it was also about identifying potentially needed RRC parameters. Will mark in yellow in an update (but not to remove..) |
| DOCOMO | We agree with the 1st and 2nd point for enabling. Regarding the third point, it’s better to be discussed after we have agreements on mechanisms to indicate the retransmitted HARQ-ACK CB.  Moderator: Same comment as to Samsung |
| Intel | Agree |
| vivo | We agree with moderator’s explanation. |
| Sony | Agree.  Do we need separate “1-shot” field for e-Type 3 and 1-shot ReTx. Can a single 1-shot indicator be used to trigger both.  Moderator: This could be still discussed in RAN1, but e.g. in Rel-16 for enh. Type 2 CB and Type 3 CB also there separate fields had been used (for simplicity). But as we don’t know yet the details of the DCI signaling for e-Type 3 and 1-shot ReTX, bit hard to say for now.  But based on the moderator’s understanding, this should not really have an effect on the RRC parameters (but more on the DCI field definition in 38.212 and the HARQ procedures in 38.213 Sec. 9.X) |
| ZTE | Agree. For Sony’s question, my primitive thought is e-Type 3 or 1-shot ReTx is enabled by gNB, and only one of alternatives can be enabled. It seems a single indicator can be used to trigger either of them. But I am open to either single indicator or two separate indicators to trigger because the detail of DCI structure is not determined. Anyway, it will not affect RRC parameters. |
| OPPO | Agree |
| LG | We slightly prefer to rename the first parameter to pdsch-HARQ-ACK-retxDCI-1-1, unless DCI format 1-0 supports one-shot triggering.  For the offset, it can be discussed whether to make the range of indication configurable. We prefer to remove the parameter for now.  Moderator: Please note, that also for the enh. Type 2 CB and the Rel-16 Type 3 CB triggering we do no have the name in the RRC parameter, even though triggering for DCI format 1\_0 is not supported either.  On the offset, the RRC parameter is in yellow already (will be yellow the whole row in the final version). So not agreed but to be considered (based on RAN1 chair guidance). |
| Ericsson | * Suggest to use “Triggering HARQ-ACKretx” for sub-feature group name:   + Not to confuse with OneShotHARQ-ACKFeedback (see comments in previous section).   + Although agreements use the term one-shot triggering, it is not in fact “one-shot” as in Rel-16 where the whole repost was triggered to be sent in one-shot. Here, only one HARQ-ACK codebook correspond to a PCCH is triggered to be “retransmitted”. * We prefer to change “pdsh-HARQ-ACK-retx”-> “HARQ-ACK-retx”. The reason is that the all the HARQ-ACK in the codebook are not necessarily correspond to a PDSCH. * Row 30: We don’t think new agreement is needed. The current agreement does not favor one DCI format over the other. Hence, it is applicable to both. If that is not the case, it would be reflected on agreement. * Row 31: We have same view as other companies, and although we understand moderator’s intention, for consistency as explained previously, we suggest to remove row 31.   Moderator:   * Change of feature name seems OK – just remove the ‘oneshot’ – i.e. using ‘Triggering HARQ-ACK re-transmission on a PUCCH resource’, changed in vo4 * Change of RRC parameter name to remove ‘pdsch-‘, it is true that no all HARQ is corresponding to PDSCH, but isn’t this the same or all the other RRC parameters (except Type 3 CB) that we are having? (i.e. Type 1 / Type 2 / enh. Type 2 CB – pdsch to HaRQ offset i.e. k1 is also appliable for other HARQ, although no PDSCH there for SPS release). So keeping the start of the RRC parameter names for the different operation seems preferable (for consistent naming there). * Row 30: I do understand and would be fine to remove the yellow marking, but companies seem to have in mind that what is not agreed yet to mark in yellow. Maybe we could have a simple agreement in Oct. meeting to have this clarified (and we can then remove the yellow marking). * Row 31: Similarly here, there is no agreement yet if the range is configurable or not. Prefer to keep this there (in yellow) as commented earlier in other parts and to other companies already, based on RAN1 chair guidance we should also identify potential RRC parameters still needed. In full yellow (the whole row) for now, can be changed or removed later on still (if seen that no parameter will be needed, this is also depending on the definition of how to indicate the PUCCH slot of the HARQ codebook to be re-tx) |
| Huawei/Hisi | Agree. |
| Moderator | Change in v04: only the feature group naming (remove the word ‘oneshot’ based on the comments by Ericsson. |

* 1. PUCCH carrier switching

### 1st Round

There are still some pending decisions, but the intention here is to discuss also potential RRC parameters already (as per Mr. Chairman’s guidance).

The moderator identified at least the following needed parameters **common to semi-static and dynamic indication of PUCCH carrier switching**:

1. Configuration of list of candidate cells (used by both, semi-static & dynamic switching)
2. RRC parameter(s) for independent TPC for the PUCCH cells for DCI format 2\_2

The moderator identified at least the following needed parameters **for PUCCH carrier switching based on dynamic indication**:

1. Enable the feature of PUCCH carrier switching based on dynamic indication
2. Enable the PUCCH carrier switching based on dynamic indication using DCI format 1\_2 (in case we decide to have a dedicated DCI field for the carrier indication).

The moderator identified at least the following needed parameters **for semi-static PUCCH carrier switching**:

1. Pattern periodicity (in case we agree to support this)
2. Pattern definition (using list of candidate carriers)

On these, and in case you think there is something missing, please provide your input to the table below:

|  |  |
| --- | --- |
| *Company* | *Comments* |
| Samsung | For “parameters **common to semi-static and dynamic indication”**   1. There is no need to have a list of candidate carriers – one SCell/SUL is enough. Support of PUCCH carrier switching is also conditioned on minimum spec impact.   Moderator: In the comments of that row, it is already captured that there may not be a need for list if having X=1.  For “parameters **for PUCCH carrier switching based on dynamic indication”**   1. OK - it is however unclear why DCI 1\_2 is explicitly mentioned but DCI 1\_1 is not.   Moderator: Moderator assumption is, that at least DCI format 1\_1 will support the dynamic indication (no need to separately configure). But for DCI format 1\_2, in the spirit of DCI format 1\_2 being independently configurable, enables to configure it separately for DCI format 1\_2.  For “parameters **for semi-static PUCCH carrier switching”**   1. Having RRC configuration for the pattern periodicity needs justification – there is no apparent need or benefit. Support of PUCCH carrier switching is also conditioned on minimum spec impact.   Moderator: Marked now in yellow. As for other RRC parameters not based on agreements, the intention is also to identify the related possibly needed RRC parameters based on Mr. chairman’s guidance.   1. The pattern definition is needed but there is no need to have a list of candidate carriers – one SCell/SUL is enough.   Moderator: The value of X is there still in red (cannot use yellow marking within a table field). If only one cell is supported (X=1), then this becomes effectively a bitmap anyhow. |
| DOCOMO | 1. parameters **common to semi-static and dynamic indication of PUCCH carrier switching**:  [Comment] One clarification question: Is the intention that “the index x” indicated by DCI or pucchCellPattern is commonly applied to both lists, and the PUCCH cell/carrier is determined by combination of the two lists with the index, is it correct understanding? Maybe single parameter “pucch-SCell-And-Carrier-List” is enough? For example, we can configured the list as “cell#1, cell#2, cell#3-UL, cell#3-SUL”.  Moderator: A single parameter may not be sufficient, as for the last two cases we need a cellID for cell’3 and UL & DL separately??  For the example above, based on the current list the gNB would configure:  pucch-SCellList = {cellID#1, cellID#2, cellID#3, cellID#3)  pucch-CarrierList={‘UL’,’UL’,’UL’,’SUL)  .. so there is a limit overall on the number of PUCCH carriers / cells given by X. But for each PUCCH carrier we would need to indicate the cell ID plus the corresponding information on if this is a normal UL or SUL carrier.  2. parameters **for PUCCH carrier switching based on dynamic indication**:  [Comment] Agree.  3. parameters **for semi-static PUCCH carrier switching**:  [Comment] Agree. |
| Intel | Agree as an initial list |
| vivo | We share the view as Samsung that dynamic switching between two CCs including PCell is sufficient for Rel-17 for minimum spec efforts. So, there is no need to have a list of candidate carriers. We are OK to keep it for now given moderator’s explanation. |
| ZTE | The number of candidate CCs is still pending to be discussed. We can keep the parameter (list of candidate carriers) here to be determined later. |
| LG | We are fine with the most of parameters. For RRC structure of patterns, We would like to suggest to have list of {slot length, cell index} for carrier switching pattern. In practical, consecutive slots may have same target cell index and adding slot length could be more scalable signaling design.  Moderator: Just to check - would this save any RRC overhead (as the maximum length would still be given by maxnrofSlots) – and then we could have two RRC parameters for each of the entries (where the second one ‘slot length’ would need to be again up to a very large integer number? |
| Ericsson | We appreciate moderator’s effort for laying out the open issues with respect to RRC. But, similarly to previous comments, we think the better approach is to remove the rows without agreements or FFs reflected in agreements.   * On particular, there has been contentious discussions on related to row 36. From our point of view, row 36 should be removed for now. The list can be updated later if needed. * Unfortunately, rows 37, 38, 45 should be removed too. If these three row are to be kept (being less controversial than row 36), we ask to remove “or carriers” or add FFS:or carriers. * On row 42, similar comment as previous section, we don’t think new agreement is needed. The current agreement does not favor one DCI format over the other. Hence, it is applicable to both. If that is not the case, it would be reflected on agreement.   Moderator:   * Row 36, 37, 38: As mentioned earlier, parts in yellow are not agreed and are there to identify potentially needed RRC parameters based on RAN1 chair guidance and this also helps companies to address in their input to Oct. meeting. * To address the ‘carrier issue’ in 37, 38, 45 I will add the FFS there. * Row 42, should be still in yellow – as the same should be equally applicable to the same places everywhere (.. some companies feel, not agreed yet – so in yellow). We just make a quick agreement in Oct. meeting (and then the yellow can be removed). |
| Huawei/Hisi | We are fine with the parameters, and we can keep the yellow marked parts there for further discussions on details. Note this data sheet is a draft instead of the final version for 331, and can reflect the key topics and possible way forwards that we have discussed during the previous meetings. We disagree to remove the yellow marked parts, otherwise the whole PUCCH carrier switching related parameters including Row 35 need to be removed since the notation issue is still under discussion. |
| Moderator | Updates in v04 (in blue) : only adding ‘FFS’ to still open or controversial points including number of cells X, ‘or carrier’ / ‘or PUCCH carrier’ to address some of the comments of not having an agreement and to make this therefore more clear. |

# CSI enhancements (AI 8.3.1.2)

VOID

1. NR-U Enhancements (AI 8.3.2)

VOID

1. Intra-UE multiplexing & priorization enh. (AI 8.3.3)

VOID

1. Propagation delay compensation (AI 8.3.4)

VOID