3GPP TSG-RAN WG1 #122 R1-2506431

Bengaluru, India, 25th-29th August, 2025

**Agenda Item: 5**

**Source: MediaTek Inc.**

**Title:** **Moderator summary #2 on reply LS on CB-msg3-EDT on IoT-NTN uplink capacity and throughput enhancements**

**Document for: Discussion & Decision**

# 1. Introduction

In RAN#107, a revised WID on IoT NTN enhancements was endorsed for Release 19 with an objective on enhancements to reduce the necessary uplink and downlink signaling to complete an EDT transaction as shown below [1]. This feature is now referred to as CB-Msg3-EDT procedure (tentatively) in RAN2.

* *Study and specify, if beneficial the following* *enhancements to reduce the necessary uplink and downlink signaling to complete an EDT transaction [RAN2]:*
  + *Msg3 transmission without msg1/RAR*
  + Efficient delivery (reduced overhead) of msg4 / RRCEarlyDataComplete
  + Study and specify RRM requirement, if identified [RAN4]

RAN2#129bis sent an LS to RAN1#121 on L1 parameters for on CB-msg3-EDT [2],[3][4]. RAN2 has agreed to introduce the shared resource configuration in system information for CB-Msg3-EDT procedure. This configuration is used for the UE to transmit Msg3 on a PUSCH channel in a contention-based manner and to receive Msg4. RAN2 assumes that the configuration introduced for PUR could be reused as much as possible in the shared resource configuration for both eMTC and NB-IoT. RAN2 also assumes that the shared resource configuration is per CE level. Since the configuration is mainly L1 parameters, RAN2 kindly request RAN1 help to finalize the signaling design. RAN1#121 provided answers in reply LS

RAN2#130 sent a further LS to RAN1#121 on CB-msg3-EDT [5], [6]. RAN2#130 made agreements regarding HARQ feedback for MSG4 and ask RAN1

1. whether there is any concern from RAN1 on the agreements regarding HARQ feedback for MSG4
2. whether there is any concern from RAN1 and RAN4 on the agreements regarding TAC in MSG4

In addition, the Question 5 and Question 8 on L1 parameters for on CB-msg3-EDT in LS R1-2503613 (R2-2503175) have not been replied in the previous reply LS (R1-2504905).

RAN2 agreements in RAN2#129, RAN2#129bis, and RAN2#130 are copied in Appendix A.

This contribution summarizes companies views and proposed replies to RAN2#130 LS on CB-Msg3 EDT for questions Q1 and Q2 for eMTC NTN and NB-IoT NTN. Remaining issues for RAN2#129bis LS on CB-Msg3 EDT for questions Q1, Q3, Q5, and Q8 will also be discussed.

# [CLOSED] Question Q1 on HARQ feedback for MSG4

RAN2 ask question Q1 on HARQ feedback for MSG4

**Q1**: RAN2 ask RAN1 whether there is any concern from RAN1 on the agreements regarding HARQ feedback for MSG4

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| RAN2#130 Agreements regarding HARQ feedback for MSG4 (i.e., CB-msg3 response):   * The HARQ feedback resource information can be included in the CB-Msg4 together with contention resolution ID which identity the specific UE. RAN2 could revisit this proposal if RAN1 has some concern. * Whether to send the HARQ feedback for CB-Msg4 can be controlled by NW. UE does not send HARQ NACK. * For NB-IoT, the SubCarrierSpacing of the HARQ feedback for CB-Msg4 is same as the CB-Msg3. * Reuse the existing format of HARQ ACK allocation signalling in the DCI. There is 2-bit HARQ ACK resource for eMTC and 4-bit HARQ ACK resource for NB-IoT. Reuse the meaning of DCI field in R1 SPEC. * Introduce a new CB-Msg3 Response (CBR) MAC sub-header in CB-Msg4. It has 1bit E for sub-header/payload indication, 2 bits T for sub-header type, 1bit T2 for HARQ ACK resource present, 1 bit T3 for TAC present, 1 bit T4 for C-RNTI present and 2bit R for reservation |

## Companies contributions

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| Companies | Observation/Proposals |
| Huawei [9] | ***Proposed answer to Q1****: RAN1 has no concern on the RAN2 agreements regarding HARQ feedback for MSG4.* |
| Xiaomi [10] | ***Proposal 1****: Confirm RAN2 design regarding HARQ feedback for MSG4.*  ***Proposal 2:*** *For the determine of number of HARQ-ACK repetitions of CB-Msg4, consider one of the following two options:*   * *Reuse ack-NACK-NumRepetitions-Msg4 from NPUSCH-ConfigCommon-NB* * *Define a separate RRC parameter via SIB2-NB* |
| Samsung [11] | **Observation:** RAN1 does not require any potential RAN1 specification updates according to the above RAN2 agreements. |
| OPPO [12] | ***Proposal 1****: RAN1 has no concerns on the agreements regarding HARQ feedback for CB-Msg4 and the specification is updated correspondingly.* |
| Nokia [13] | ***Observation 1****: Providing the HARQ feedback resource information per UE in the CB-Msg4 is a valid approach.*  ***Proposal 1****: RAN1 has no concern on RAN2’s agreements related to HARQ feedback for CB-Msg4.*  ***Proposal 2****: Adopt the below TP for TS 36.212 to clarify the HARQ feedback resource information field is not present in DCI N1, when the DCI schedules CB-Msg4. (See Appendix C)* |
| Apple [14] | ***Observation 1****: For NB-IoT-based CB-Msg3-EDT, if HARQ feedback resource information is included in the CB-Msg4, then HARQ-ACK resource field in DCI format N1 is redundant, and additional RAN1 standard work is needed.*  ***Observation 2****: For eMTC-based CB-Msg3-EDT, if HARQ feedback resource information is included in the CB-Msg4, then HARQ-ACK resource offset field in DCI format 6-1A is redundant and additional RAN1 standard work is needed.* |
| CATT [18] | ***Proposal 1****: For the agreement on HARQ feedback resource information regarding CB-MSG4, from RAN1 perspective, there is no technical concern*. |
| Qualcomm [19] | ***Observation 1****: In eMTC, using 2 bits for Δ\_ARO in Msg4 leads to having only 4 HARQ-ACK resources across all UEs in the msg4 response. In NB-IoT, the total number of HARQ-ACK resources is 16.*  ***Proposal 1****: RAN1 recommends increasing the “HARQ ACK resource offset” in eMTC from 2 bits to 4 bits.*   * *This value may be further increased by RAN2 (also the field “HARQ ACK resource”) if RAN2 decides that having 16 HARQ-ACK resources are insufficient.* |
| Ericsson [20] | ***Observation 1****: Msg4 is delivered to the UE through transmitting (N)PDCCH and (N)PDSCH, the former one is used to schedule the latter one which carries Msg4.*  ***Observation 2****: In our understanding, the way of delivering Msg4 will re-use legacy procedures and therefore it will continue making use of both (N)PDCCH and (N)PDSCH. Thus, the DCI fields “HARQ-ACK resource” and “HARQ-ACK resource offset” can continue being indicated via DCI Format N1 (NB-IoT) and 6-1A (LTE-MTC) respectively.*  ***Proposal 1****: CB-Msg4 is delivered to the UE re-using legacy procedures (i.e., via (N)PDCCH and (N)PDSCH). Thus, the DCI fields “HARQ-ACK resource” and “HARQ-ACK resource offset” continue to be indicated via DCI Format N1 (NB-IoT) and 6-1A (LTE-MTC) respectively.*  ***Observation 3****: On the delivery of the “contention resolution ID,” no information has been provided around it, but most likely its length will make it difficult to deliver it via DCI. Thus, it is recommended that RAN2 delivers the “contention resolution ID” by a mean other than DCI.* |

For question Q1, 5 companies indicated no issue. 2 companies proposed CRs.

To the moderator understanding, RAN2 agreed a new CB-Msg3 Response (CBR) MAC sub-header in CB-Msg4 which allows indication of HARQ ACK resource information per UE for CB-Msg4. This makes the HARQ-ACK resource field in DCI format N1 redundant as observed by Apple and Nokia.

One company’s understanding is that the way of delivering Msg4 will re-use legacy procedures and therefore it will continue making use of both (N)PDCCH and (N)PDSCH. Thus, the DCI fields “HARQ-ACK resource” and “HARQ-ACK resource offset” can continue being indicated via DCI Format N1 (NB-IoT) and 6-1A (LTE-MTC) respectively.

One company discussed n TS 38.213 Clause 16.4.2. For the number of HARQ-ACK repetitions of CB-Msg4, we recommend reusing ack-NACK-NumRepetitions-Msg4 from NPUSCH- ConfigCommon-NB or defining an separate RRC parameter via SIB2-NB. It is proposed to consider one of the following two options to determine of number of HARQ-ACK repetitions of CB-Msg4:

* Reuse ack-NACK-NumRepetitions-Msg4 from NPUSCH-ConfigCommon-NB
* Define a separate RRC parameter via SIB2-NB

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| - *the value of is given by the higher layer parameter ack-NACK-NumRepetitions-Msg4 configured for the associated NPRACH resource for Msg4 NPDSCH transmission, and higher layer parameter ack-NACK-NumRepetitions otherwise* |

One company observed in eMTC, using 2 bits for Δ\_ARO in Msg4 leads to having only 4 HARQ-ACK resources across all UEs in the msg4 response. In NB-IoT, the total number of HARQ-ACK resources is 16.. It is proposed RAN1 recommends increasing the “HARQ ACK resource offset” in eMTC from 2 bits to 4 bits. This value may be further increased by RAN2 (also the field “HARQ ACK resource”) if RAN2 decides that having 16 HARQ-ACK resources are insufficient.

The draft CR proposed for TS 36.212 Clause 6.4.3.2 proposed by Nokia is a helpful clarification of the specifications. Likewise, Apple proposed draft reply LS is helpful “RAN1 reply: With RAN2 agreement that HARQ feedback resource information is included in the CB-Msg4, HARQ-ACK resource field in DCI format N1 is redundant for NB-IoT-based CB-Msg3-EDT; and HARQ-ACK resource offset field in DCI format 6-1A is redundant for eMTC-based CB-Msg3-EDT.”

The draft CR for **TS 36.213 Clause 10.1.2.1 FDD HARQ-ACK procedure for one configured serving cell** (for eMTC) and **TS 36.213 Clause 16.4.2 UE procedure for reporting ACK/NACK** (for NB-IoT) proposed by OPPO is also helpful.

## Proposed reply to Q1

***Initial Proposal 1****: RAN1 reply: With RAN2 agreement that HARQ feedback resource information is included in the CB-Msg4, HARQ-ACK resource field in DCI format N1 is redundant for NB-IoT-based CB-Msg3-EDT; and HARQ-ACK resource offset field in DCI format 6-1A is redundant for eMTC-based CB-Msg3-EDT.*

***Initial Proposal 2****: RAN1 can discuss whether to support Nokia R1-2505862 TP for TS 36.212 to clarify the HARQ feedback resource information field is not present in DCI N1, when the DCI schedules CB-Msg4 (see draft CR in Appendix B).*

***Initial Proposal 3****: RAN1 can discuss whether to support OPPO R1-2505716 TP for TS 36.213 to* **TS 36.213 Clause 10.1.2.1 FDD HARQ-ACK procedure for one configured serving cell** (for eMTC) and **TS 36.213 Clause 16.4.2 UE procedure for reporting ACK/NACK** (for NB-IoT) to add text “or in the CB-Msg4”*, when the DCI schedules CB-Msg4 (see draft CR in Appendix B).*

***Initial proposal 4****: For the determine of number of HARQ-ACK repetitions of CB-Msg4, consider one of the following two options:*

* *Reuse ack-NACK-NumRepetitions-Msg4 from NPUSCH-ConfigCommon-NB*
* *Define a separate RRC parameter via SIB2-NB*

Companies are encouraged to provides comments on RAN1 reply to Q1 below

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| Companies | Comments |
| LGE | It would be good to clarify why the HARQ feedback resource information should be included in CB-Msg4 redundantly.  Considering that RAN2 also considers skipping NACK transmission, we can reuse the existing HARQ feedback resource determination. To be specific, only UE with matched contention resolution ID will transmit ACK while other UEs would not transmit any HARQ feedback. In this case, there is no HARQ feedback collision.  I prefer to minimize the impact on the RAN1 specification. |
| Qualcomm | We are OK with clarifying in the RAN1 specs that the HARQ ACK resource in DCI is ignored.  About the reply to RAN2, as described in our paper R1-2506169, we think 2 bits are not enough for eMTC for HARQ-Ack resource information:  **Observation 1: In eMTC, using 2 bits for in Msg4 leads to having only 4 HARQ-ACK resources across all UEs in the msg4 response. In NB-IoT, the total number of HARQ-ACK resources is 16.**  **Proposal 1: RAN1 recommends increasing the “HARQ ACK resource offset” in eMTC from 2 bits to 4 bits.**   * **This value may be further increased by RAN2 (also the field “HARQ ACK resource”) if RAN2 decides that having 16 HARQ-ACK resources are insufficient.** |
| MODERATOR | Apology, Qualcomm TDoc was missed from moderator summary. It has been added and proposal 1 for reply to RAN2 is update as below.  ***Initial Proposed reply to Q1# 1****: RAN1 reply: With RAN2 agreement that HARQ feedback resource information is included in the CB-Msg4,*   * *HARQ-ACK resource field in DCI format N1 is redundant for NB-IoT-based CB-Msg3-EDT; and HARQ-ACK resource offset field in DCI format 6-1A is redundant for eMTC-based CB-Msg3-EDT.* * *RAN1 recommends increasing the “HARQ ACK resource offset” in eMTC from 2 bits to 4 bits. This value may be further increased by RAN2 (also the field “HARQ ACK resource”) if RAN2 decides that having 16 HARQ-ACK resources are insufficient.* |
| Nokia, NSB | Comment to LGE: the CB-Msg4 can address multiple UEs and therefore they need individually allocated HARQ feedback resource information. The legacy solution based on DCI can only provide the information for a single UE.  For updated Q1#`, wo do not support increase the “HARQ ACK resource offset” in eMTC from 2 bits to 4 bits, as it is not good for the size of the MAC PDU, because currently the 2 bits for HARQ + 6 bits for TAC fits one byte.  OK to proposals 1-3.  For proposal 4, we prefer to reuse the field from NPUSCH-ConfigCommon-NB |
| Vivo1 | Initial proposal 1: RAN2 agreed to reuse the 2-bit HARQ-ACK resource offset indicator in DCI as well as the way interpretating the DCI field, we understand that extending 2 bits to 4 bits may allow more UE to be multiplexed in a single RB, but this would revert RAN2 agreement. In addition, additional RAN1 spec change is also needed.  Initial proposal 2 and 3: proposal 2 seems to be conflicted with proposal1 and 3. Proposal 2 assumes the field is not present, while proposal 2 and 3 assume that the field is present but ignored.  Initial proposal 4: either way is fine for us |
| CATT | For Moderator reply, we don’t think we need to tell HARQ-ACK indication in DCI is redundant, because we can’t change the RAN2 agreement. Current DCI redundancy can be resolved by the RAN1.  For increasing the “HARQ ACK resource offset” in eMTC from 2 bits to 4 bits, it is up to RAN2 signalling design. For MAC layer, it will care about multi-users HARQ indication, not single user indication. We are not sure if increasing to 4 bits can help RAN2 design. |
| Huawei, HiSilicon | Initial Proposal 1: although we do not think it necessary to inform RAN2 about the RAN1 impact, we can live with the proposal if majority hope to send it. It would be better to clarify that there is no RAN2 impact.  Initial Proposal 2: Not support. The field is still there but is ignored. Otherwise, the DCI size will be changed.  Initial Proposal 3: It can be discussed later after RAN2 finalize whether 2 bit or 4 bit is used. considering there is view to increase the bits.  Initial proposal 4: we just need to let RAN2 know the field of ack-NACK-NumRepetitions-Msg4 is needed. whether it is in the original location or in SIB2 can be up to RAN2. |
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## OFFLINE proposal

***Initial Proposed reply to Q1# 1****: RAN1 reply: With RAN2 agreement that HARQ feedback resource information is included in the CB-Msg4,*

* *RAN1 sees no issue for RAN2*
* *HARQ-ACK resource field in DCI format N1 is not used for NB-IoT-based CB-Msg3-EDT; and HARQ-ACK resource offset field in DCI format 6-1A is redundant for eMTC-based CB-Msg3-EDT.*
* *RAN2 may consider increasing the “HARQ ACK resource offset” in eMTC from 2 bits to 4 bits if RAN2 intends to multiplex more than 4 users in the same response. This value may be further increased by RAN2 (also the field “HARQ ACK resource”) if RAN2 decides that having 16 HARQ-ACK resources are insufficient.*

***Initial Proposal 2****: RAN1 can discuss whether to support Nokia R1-2505862 TP for TS 36.212 to clarify the HARQ feedback resource information field is not present in DCI N1, when the DCI schedules CB-Msg4 (see draft CR in Appendix B).*

***Initial Proposal 3****: RAN1 can discuss whether to support OPPO R1-2505716 TP for TS 36.213 to* ***TS 36.213 Clause 10.1.2.1 FDD HARQ-ACK procedure for one configured serving cell*** *(for eMTC) and* ***TS 36.213 Clause 16.4.2 UE procedure for reporting ACK/NACK*** *(for NB-IoT) to add text “or in the CB-Msg4”, when the DCI schedules CB-Msg4 (see draft CR in Appendix B).*

***Initial proposal 4****: For the determine of number of HARQ-ACK repetitions of CB-Msg4, consider one of the following two options:*

* *Reuse ack-NACK-NumRepetitions-Msg4 from NPUSCH-ConfigCommon-NB*
* *Define a separate RRC parameter via SIB2-NB*

## Conclusion

**Agreement**

RAN1 reply to Q1#1:

* RAN1 sees no issue with the RAN2 agreement that HARQ feedback resource information is included in the CB-Msg4
* RAN1 also notes that using 2 bits for “HARQ ACK resource offset” in eMTC allows multiplexing only up to 4 users in the same response.

# [CLOSED] Question Q2 on TAC in MSG4

RAN2 ask question Q2 regarding TAC in MSG4

**Q2**: RAN2 ask RAN1 whether there is any concern from RAN1 and RAN4 on the agreements regarding TAC in MSG4

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| Agreements regarding TAC in MSG4 (i.e., CB-msg3 response):   * The TAC is optionally used in the CB-Msg3 response. * RAN2 assumes that NTA=0 for initial CB-msg3 transmission. * RAN2 assumes the length of the TAC field is 6 bits (we can revisit this if there is major R1 impact on TA calculation) |

## Companies contribution

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| Companies | Observation/Proposals |
| Huawei [9] | ***Proposed answer to Q1****: RAN1 has no concern on the RAN2 agreements regarding TAC in MSG4.* |
| Samsung [11] | **Observation:** RAN1 does not require any potential RAN1 specification updates according to the above RAN2 agreements. |
| OPPO [12] | ***Proposal 2****: RAN1 has no concerns on the agreements regarding the 6-bits length of the TAC field in CB-Msg4.* |
| Nokia [13] | ***Proposal 3****: RAN1 has no concern on RAN2’s agreements related to TAC in CB-Msg4.* |
| Apple [14] | ***Proposal 1****: For the second question, from RAN1 perspective, 6 bits TAC field in MSG4 is enough for NB-IoT and eMTC CE mode A.* |
| CATT [18] | ***Proposal 2****: For the agreement on TAC in CB-MSG4, from RAN1 perspective, there is no technical concern.* |
| Qualcomm [19] | ***Observation 2****: NTN networks may operate with an artificial delay in the uplink (at the ULSRP) to accommodate negative timing errors in (N)PRACH.*  ***Proposal 2****: RAN1 recommends configuring in system information the NTA for initial CB-msg3 transmission.* |
| Ericsson [20] | ***Observation 4 In our understanding, the RAN2 agreements regarding “TAC in Msg4” are in principle suitable assumptions for the CB-msg3-EDT feature.*** |

For question Q2, 7 companies indicated no issue.

One company observed NTN networks may operate with an artificial delay in the uplink (at the ULSRP) to accommodate negative timing errors in (N)PRACH. It is proposed RAN1 recommends configuring in system information the NTA for initial CB-msg3 transmission.

## Proposed reply to Q2

***Proposal 2****: RAN1 has no issue on TAC in MSG4 (i.e., CB-msg3 response)*

Companies are encouraged to provides comments on RAN1 reply to Q2 below

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| Companies | Comments |
| LGE | OK. Whether or not to have negative values would be up to RAN2 decision. |
| Qualcomm | In our contribution we presented the following observations and proposals:  **Observation 2: NTN networks may operate with an artificial delay in the uplink (at the ULSRP) to accommodate negative timing errors in (N)PRACH.**  We would propose to configure the value for CB-msg3 such that the timing offset between CB-msg3 and unicast (N)PUSCH is minimized.  **Proposal 2: RAN1 recommends configuring in system information the NTA for initial CB-msg3 transmission.** |
| ZTE | Fine with the proposal. |
| MODERATOR | Apology, Qualcomm TDoc was missed from moderator summary. It has been added and proposal 1 for reply to RAN2 is update as below.  **Initial proposed reply to Q2-#1 (no change)**: RAN1 has no issue on TAC in MSG4 (i.e., CB-msg3 response)  **Initial proposed reply to Q2#2 (new):** RAN1 recommends configuring in system information the NTA for initial CB-msg3 transmission. |
| Nokia, NSB | We support Initial proposed reply to Q2-#1 (no change): RAN1 has no issue on TAC in MSG4 (i.e., CB-msg3 response) |
| Vivo1 | Support Initial proposed reply to Q2-#1 |
| CATT | Support, now no issue. |
| Huawei, HiSilicon | support |
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## OFFLINE proposal

**Offline proposed reply to Q2-#1 (no change)**: RAN1 has no issue on TAC in MSG4 (i.e., CB-msg3 response)

**Offline proposed reply to Q2#2 (new):** RAN1 recommends configuring in system information the NTA for initial CB-msg3 transmission.

## Conclusion

**Agreement**

RAN1 reply to Q2:

* RAN1 has no issue on TAC in MSG4 (i.e., CB-msg3 response).

# 2. Remaining issues on RAN2#129bis LS on CB-Msg3 EDT

RAN2#130 sent a further LS to RAN1#121 on CB-msg3-EDT [5], [6] acknowledged the Question 5 and Question 8 on L1 parameters for on CB-msg3-EDT in LS R1-2503613 (R2-2503175) have not been replied in the previous reply LS (R1-2504905).

In addition, the Question 5 and Question 8 on L1 parameters for on CB-msg3-EDT in LS R1-2503613 (R2-2503175) have not been replied in the previous reply LS (R1-2504905). RAN1 has considered these two questions and made the following replies:

**Question 5**: For eMTC, RAN2 agrees to have PUCCH configuration for shared resource configuration and decides to reuse the parameters from PUR PUCCH configuration (in *IE PUR-PUCCH-Config-r16*, as below) as baseline. RAN2 would like to check with RAN1 on how to define the detailed PUCCH configuration.

**Reply to Q5:** From RAN1 perspective, *n1PUCCH-AN-r16* and *pucch-NumRepetitionCE-Format1-r16* can be reused as in *PUR-PUCCH-Config*. They are cell-specifically configured.

**Question 8**: For both eMTC and NB-IoT, any other L1 parameters are needed for CB-Msg3-EDT procedure in additional to previous discussion?

**Reply to Q8:** From RAN1 perspective, *ack-NACK-NumRepetitions-r16* can be supported for NB-IoT to configure number of repetitions for HARQ-ACK feedback corresponding to the NPDSCH carrying CB-msg4.

Contributing companies further discussed questions Q1, Q3, Q5, and Q8.

## 1. [CLOSED] Question Q1

RAN2 asked question Q1 for both eMTC and NB-IoT on power ramping should be supported for CB-msg3-EDT:

**Q1**: For both eMTC and NB-IoT, RAN2 assumes power ramping should be supported for CB-msg3-EDT. RAN2 would like to confirm with RAN1 on whether to have power ramping on this Msg3 (re-)transmission. If RAN1 confirms, please provide the control parameters for power ramping.

**RAN1#121 Reply to Q1**

* RAN1 has not evaluated the potential performance of power ramping for CB-msg3-EDT, and it is likely that there will not be sufficient time to evaluate this topic within the R19 timeframe
* For open loop power control the following UL power control parameters can be reused for CB-msg3-EDT
  + p0-UE-NPUSCH-r16 and alpha-r16 for NB-IoT NTN
  + p0-UE-PUSCH-r16 and alpha-r16 for eMTC NTN

### Companies contributions

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| Companies | Observation/Proposals |
| Nokia [13] | ***Proposal 5****: RAN1 to reply to RAN2 that power ramping between CB-Msg3 windows shall be supported.*  ***Proposal 6****: RAN1 to suggest to RAN2 that the same principle as for legacy Msg3 power ramping (j=2, use of powerRampingStep) should be followed to limit the specification impact on TS 36.213.* |

One company proposed RAN1 to reply to RAN2 that power ramping between CB-Msg3 windows shall be supported. The same principle as for legacy Msg3 power ramping (j=2, use of powerRampingStep) should be followed to limit the specification impact on TS 36.213.

***Moderator view***: *RAN1 already discussed power ramping for CB-msg3-EDT and replied to RAN2 in RAN1#121. Proponent of this issue will need to further discuss with other companies to get more support.*

### Proposed reply to Q1

***Proposed reply to Q1:*** *No further reply to Q1 from RAN1 following agreement on Q1 in RAN1#121*

Companies are encouraged to provides comments on RAN1 reply to Q1 below

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| Companies | Comments |
| LGE | OK |
| ZTE | OK |
| Nokia, NSB | Not OK. RAN2 has agreed the UE can attempt CB-Msg3 transmissions multiple times on the selected CE level, but also that the UE cannot switch to a different CE level. Without power ramping the UE will be stuck with no chance of improving the CB-Msg3 transmission success likelihood.  We think the RAN1 specification impact can be limited by reusing the power control principle for RAR grant of NPUSCH. |
| Vivo1 | Support  CB-msg3 provides a set of resources for access, which can reduce the probability of access failure. Thus, there is no need to consider power ramping. |
| CATT | OK |
| Huawei, HiSilicon | We already replied in last meeting. |
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## 2. [CLOSED] Question Q3

RAN2 asked question Q2 for eMTC on PUSCH configuration for shared resource configuration for CB-msg3-EDT

**Q3**: For eMTC, RAN2 agrees to have PUSCH configuration for shared resource configuration and decides to reuse the parameters from PUR PUSCH configuration (in IE PUR-PUSCH-Config-r16, as below) as baseline. RAN2 has some questions on some parameters:

* Whether pusch-CyclicShift-r16 and pusch-NB-MaxTBS-r16 are needed
* Whether prb-AllocationInfo should be defined as a “set” format with intention to provide a set of shared frequency-domain resources

Note that:

* CE mode B related parameters will not be included as RAN2 agreed to preclude CE mode B.
* The power related parameters (p0-UE-PUSCH-r16 and alpha-r16) should be updated based on the result of Q1.

RAN2 would like to check with RAN1 on how to define the detail PUSCH configuration.

PUR-PUSCH-Config-r16 ::= SEQUENCE {

pur-GrantInfo-r16 CHOICE {

ce-ModeA SEQUENCE {

numRUs-r16 BIT STRING (SIZE(2)),

prb-AllocationInfo-r16 BIT STRING (SIZE(10)),

mcs-r16 BIT STRING (SIZE(4)),

numRepetitions-r16 BIT STRING (SIZE(3))

},

~~ce-ModeB SEQUENCE {~~

~~subPRB-Allocation-r16 BOOLEAN,~~

~~numRUs-r16 BOOLEAN,~~

~~prb-AllocationInfo-r16 BIT STRING (SIZE(8)),~~

~~mcs-r16 BIT STRING (SIZE(4)),~~

~~numRepetitions-r16 BIT STRING (SIZE(3))~~

~~}~~

} OPTIONAL, -- Need ON

pur-PUSCH-FreqHopping-r16 BOOLEAN,

p0-UE-PUSCH-r16 INTEGER (-8..7),

alpha-r16 Alpha-r12,

pusch-CyclicShift-r16 ENUMERATED {n0, n6},

pusch-NB-MaxTBS-r16 BOOLEAN,

~~locationCE-ModeB-r16 INTEGER (0..5) OPTIONAL – Cond SubPRB~~

}

**Reply to Q3**

From RAN1 perspective:

* pusch-NB-MaxTBS-r16 and pusch-CyclicShift-r16 are not needed to be signaled.
* prb-AllocationInfo should be defined as a “set” format with intention to provide a set of shared frequency-domain esources
* pur-PUSCH-FreqHopping-r16 is not needed
* RAN1 wonders whether RAN2 intends to support multi-PRB allocation or sub-PRB allocation or both

### Companies contributions

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| --- | --- |
| Companies | Observation/Proposals |
| ZTE [16] | ***Proposal 1****: From RAN1’s perspective, the following aspects should be confirmed and feedback to RAN2.*  *Answer 3: From RAN1’s perspective:*  *The set of prb-AllocationInfo can be configured by a list, where each entry corresponds to a resource allocation configuration.* |

One company proposed the set of prb-AllocationInfo can be configured by a list, where each entry corresponds to a resource allocation configuration.

***Moderator view****: the company proposal is aligned with the RAN1#121 agreement. Further discussions and clarifications in RAN1 will be helpful.*

***Initial proposal for Q3****: For CB-Msg3 EDT for eMTC, the set of prb-AllocationInfo can be configured by a list, where each entry corresponds to a resource allocation configuration.*

Companies are encouraged to provides comments on initial proposal for Q3 below

|  |  |
| --- | --- |
| Companies | Comments |
| LGE | OK |
| ZTE | Support. Further clarification in RAN1 will be helpful for RAN2 signaling design. |
| Nokia, NSB | OK |
| CATT | OK |
| Huawei, HiSilicon | In last meeting, we already agreed it is a set according to RAN2 questions. No need to further reply. |
|  |  |

## 3. [ACTIVE] Question Q5

RAN2 asked question Q2 for eMTC on PUCCH configuration for shared resource configuration for CB-msg3-EDT

**Q5**: For eMTC, RAN2 agrees to have PUCCH configuration for shared resource configuration and decides to reuse the parameters from PUR PUCCH configuration (in IE PUR-PUCCH-Config-r16, as below) as baseline. RAN2 would like to check with RAN1 on how to define the detailed PUCCH configuration.

PUR-PUCCH-Config-r16 ::= SEQUENCE {

n1PUCCH-AN-r16 INTEGER (0..2047) OPTIONAL, -- Need ON

pucch-NumRepetitionCE-Format1-r16 ENUMERATED {n1, n2, n4, n8} OPTIONAL -- Need ON

}

### Companies contributions

|  |  |
| --- | --- |
| Companies | Observation/Proposals |
| Huawei [9] | ***Proposed answer to Q5****: n1PUCCH-AN and pucch-NumRepetitionCE-Format1 can be reused as in PUR-PUCCH-Config. They are cell-specifically configured.* |
| Nokia [13] | ***Proposal 4****: RAN1 to discuss the question 5 of LS R2-2503175 based on the RAN2 agreements defining HARQ feedback resource information is included in CB-msg4.* |
| ZTE [16] | ***Proposal 2****: From RAN1’s perspective, the following aspects should be confirmed and feedback to RAN2.*  *Answer 5: From RAN1’s perspective, n1PUCCH-AN and pucch-NumRepetitionCE-Format1 can be reused as in PUR-PUCCH-Config when configuring HARQ feedback resource for a specific UE in CB-Msg4.* |

One company proposed that from RAN1’s perspective, n1PUCCH-AN and pucch-NumRepetitionCE-Format1 can be reused as in PUR-PUCCH-Config when configuring HARQ feedback resource for a specific UE in CB-Msg4.

One company discussed RAN2 agreed in RAN2 #130 that there is a broadcast response to CB-msg3-EDT which includes HARQ feedback resource information. Hence, at least the pucch-NumRepetitionCE-Format1 can be reused from the PUR-PUCCH-Config. It is proposed RAN1 discuss the question 5 of LS R2-2503175 based on the RAN2 agreements defining HARQ feedback resource information is included in CB-msg4.

One company proposed n1PUCCH-AN and pucch-NumRepetitionCE-Format1 are cell-specifically configured.

One company proposed from RAN1’s perspective, n1PUCCH-AN and pucch-NumRepetitionCE-Format1 can be reused as in PUR-PUCCH-Config when configuring HARQ feedback resource for a specific UE in CB-Msg4

***Moderator view****: This proposal was discussed online in RAN1#121 without reply. It can be discussed in this meeting.*

### [ACTIVE] Proposed reply to Q5

***Initial proposal for Q5****: For CB-Msg3 EDT for eMTC, n1PUCCH-AN and pucch-NumRepetitionCE-Format1 can be reused as in PUR-PUCCH-Config*

* *Option 1: UE-specific when configuring HARQ feedback resource for a specific UE in CB-Msg4.*
* *Option 2: are cell-specific configured.*

Companies are encouraged to provides comments on initial proposal for Q5 below

|  |  |
| --- | --- |
| Companies | Comments |
| LGE | Option 2. CB-Msg3 EDT is for initial access. In this case, it is unclear how to support UE-specific configuration. |
| ZTE | RAN2 has agreed that the HARQ feedback resource information can be included in the CB-Msg4 together with contention resolution ID which identity the specific UE in the latest LS. Option 1 can be default if no concern. |
| Nokia, NSB | We prefer option 2. |
| Vivo1 | Our understanding is option2, as the configuration is for idle UEs. RAN2 agreed to support broadcast msg4, which includes responses for multiple identified UEs, and the HARQ-ACK resource information carried in msg4 can be used to determine the UE-specific HARQ-ACK resource for each identified UE. |
| CATT | Option 2 is preferred for initial access stage. |
| Huawei, HiSilicon | As other configuration for CB-msg3 in idle mode, it should be cell specific. Option 2 is preferred. |
|  |  |

## 4. [ACTIVE] Question Q8

RAN2 asked question Q8 for both eMTC and NB-IoT on PUR PDCCH configuration (in IE NPDCCH-ConfigDedicated-NB-r13) as baseline:

**Q8**: For both eMTC and NB-IoT, any other L1 parameters are needed for CB-Msg3-EDT procedure in additional to previous discussion?

In addition, RAN2 agrees that:

**Introduce a new RNTI (i.e. CB-RNTI)** **for CB-Msg4 monitoring and CB-Msg3 scrambling. We include this agreement in the LS to RAN1**

RAN2 would like to inform RAN1 on the new RNTI for CB-Msg4 monitoring and CB-Msg3 scrambling. RAN2 has not yet made agreements on how to determine the RNTI, but RAN2 assumes there may be some potential RAN1 specification impact on this.

### Companies contributions

|  |  |
| --- | --- |
| Companies | Observation/Proposals |
| Huawei [9] | ***Proposed answer to Q8****: From RAN1 perspective, ack-NACK-NumRepetitions-r16 can be supported to configure number of repetitions for HARQ-ACK feedback corresponding to the NPDSCH carrying CB-msg4..* |
| MediaTek [17] | ***Proposal 1****: RAN1 can discuss specification impact for CB-Msg4 monitoring and CB-Msg3 scrambling with a new CB-RNTI.*  ***Observation 1****: In legacy specifications, scrambling of NPUSCH Format 1 and NPUSCH Format 2 is initialised with* *the radio network temporary identifier nRNTI as specified in TS 36.211 Clause 10.1.3.1.*  ***Observation 2****: In legacy specifications, scrambling of NPDSCH is initialised with the radio network temporary identifier nRNTI as specified in TS 36.211 Clause 10.2.3.1.*  ***Observation 3****: The UE does may not know the radio network temporary identifier nRNTI since Msg1 and Msg2 are skipped in CB-Msg3 EDT.*  ***Proposal 2****: RAN1 confirms that the CB-RNTI is used to initialize the scrambling sequence for NPUSCH Format 1, NPUSCH Format 2, and NPDSCH instead of the temporary C-RNTI for CB-Msg3 EDT.* |

Two companies proposed ack-NACK-NumRepetitions-r16 for NB-IoT and eMTC is used for HARQ-ACK feedback of NPDSCH carrying CB-msg4. One company proposed this parameter is indicated on SIB2-NB for NB-IoT.

One company proposed RAN1 can discuss specification impact for CB-Msg4 monitoring and CB-Msg3 scrambling with a new CB-RNTI. In legacy specifications, scrambling of NPUSCH Format 1 and NPUSCH Format 2 is initialised with the radio network temporary identifier nRNTI as specified in TS 36.211 Clause 10.1.3.1. Further, crambling of NPDSCH is initialised with the radio network temporary identifier nRNTI as specified in TS 36.211 Clause 10.2.3.1. The UE does may not know the radio network temporary identifier nRNTI since Msg1 and Msg2 are skipped in CB-Msg3 EDT. NPDCCH with the CRC scrambled by the Temporary C-RNTI is used with DCI Format N1 on Type2-NPDCCH common search space for Msg4. It is proposed the CB-RNTI is used instead of the temporary C-RNTI for CB-Msg3 EDT.

MediaTek discussed RAN2 agreed HARQ process 0 is used to transmit all the CB-Msg3 replicas in the transmission window (RV0 is used to transmit the first repetition of each CB-Msg3 replica in the transmission window). This is simple way and will allow straightforward chase combining at the receiver in gNB.

It is proposed to confirm RAN2 agreement HARQ process 0 is used to transmit all the CB-Msg3 replicas in the transmission window (RV0 is used to transmit the first repetition of each CB-Msg3 replica in the transmission window.

*Moderator view: This proposal was discussed in RAN1#121 meeting. RAN1#121 had no additional L1 parameters that may need to be signaled, but did not provide a reply to RAN2 accordingly. It can be discussed in this meeting.*

### Proposed reply to Q8

***Proposal 1 for reply to Q8****: For CB-Msg3 EDT for eMTC and NB-IoT, ack-NACK-NumRepetitions-r16*

* *Can be supported to configure the number of repetitions for HARQ-ACK feedback of PDSCH corresponding to NPDSCH carrying CB-msg4*
* *indicated on SIB2 / SIB2-NB*

***Proposal 2 for reply to Q8****: CB-RNTI is used to initialize the scrambling sequence for NPUSCH Format 1, NPUSCH Format 2, and NPDSCH instead of the temporary C-RNTI for CB-Msg3 EDT*

***Proposal 3 for reply to Q8****: NPDCCH with the CRC scrambled by the CB-RNTI is used with DCI Format N1 on Type2-NPDCCH common search space for CB-Msg4*

***Proposal 4 for reply to Q8****: HARQ process 0 is used to transmit all the CB-Msg3 replicas in the transmission window (RV0 is used to transmit the first repetition of each CB-Msg3 replica in the transmission window*

Companies are encouraged to provides comments on initial proposal for Q8 below

|  |  |
| --- | --- |
| Companies | Comments |
| LGE | On Proposal 3, it is necessary to clarify whether or not to consider the coexistence between CB-Msg3 EDT and normal initial access procedure. If they can coexist, it would be necessary to have separate CSS. Otherwise, it will have the impact on the BD attempts. |
| Nokia, NSB | OK to the proposals. |
| Huawei, HiSilicon | The proposal 1 for Q8 looks same as proposal 4 in section for Q1.  The other proposals are not necessary as they are not asked by RAN2. |
|  |  |

# 3. First Online proposals

## 3.1 Proposed reply to Q1 on HARQ feedback for MSG4

***Proposed reply to Q1# 1****: RAN1 reply: With RAN2 agreement that HARQ feedback resource information is included in the CB-Msg4,*

* *RAN1 sees no issue for RAN2*
* *HARQ-ACK resource field in DCI format N1 is not used for NB-IoT-based CB-Msg3-EDT; and HARQ-ACK resource offset field in DCI format 6-1A is redundant for eMTC-based CB-Msg3-EDT.*
* *RAN2 may consider increasing the “HARQ ACK resource offset” in eMTC from 2 bits to 4 bits if RAN2 intends to multiplex more than 4 users in the same response. This value may be further increased by RAN2 (also the field “HARQ ACK resource”) if RAN2 decides that having 16 HARQ-ACK resources are insufficient.*

***Proposal 1-2****: Support Nokia R1-2505862 TP for TS 36.212 to clarify the HARQ feedback resource information field is not present in DCI N1, when the DCI schedules CB-Msg4.*

***Proposal 1-3****: Support OPPO R1-2505716 TP for TS 36.213 to* ***TS 36.213 Clause 10.1.2.1 FDD HARQ-ACK procedure for one configured serving cell*** *(for eMTC) and* ***TS 36.213 Clause 16.4.2 UE procedure for reporting ACK/NACK*** *(for NB-IoT) to add text “or in the CB-Msg4”, when the DCI schedules CB-Msg4.*

***Proposal 1-4****: For the determination of number of HARQ-ACK repetitions of CB-Msg4, consider one of the following two options:*

* *Reuse ack-NACK-NumRepetitions-Msg4 from NPUSCH-ConfigCommon-NB*
* *Define a separate RRC parameter via SIB2-NB*

## 3.2 Proposed reply to Q2 on TAC in MSG4

***Proposal 2-1****: RAN1 has no issue on TAC in MSG4 (i.e., CB-msg3 response)*

# 4. Appendix A – RAN2 Agreements

## RAN2#130

|  |
| --- |
| Agreements regarding HARQ feedback for MSG4 (i.e., CB-msg3 response):   * The HARQ feedback resource information can be included in the CB-Msg4 together with contention resolution ID which identity the specific UE. RAN2 could revisit this proposal if RAN1 has some concern. * Whether to send the HARQ feedback for CB-Msg4 can be controlled by NW. UE does not send HARQ NACK. * For NB-IoT, the SubCarrierSpacing of the HARQ feedback for CB-Msg4 is same as the CB-Msg3. * Reuse the existing format of HARQ ACK allocation signalling in the DCI. There is 2-bit HARQ ACK resource for eMTC and 4-bit HARQ ACK resource for NB-IoT. Reuse the meaning of DCI field in R1 SPEC. * Introduce a new CB-Msg3 Response (CBR) MAC sub-header in CB-Msg4. It has 1bit E for sub-header/payload indication, 2 bits T for sub-header type, 1bit T2 for HARQ ACK resource present, 1 bit T3 for TAC present, 1 bit T4 for C-RNTI present and 2bit R for reservation |

|  |
| --- |
| Agreements regarding TAC in MSG4 (i.e., CB-msg3 response):   * The TAC is optionally used in the CB-Msg3 response. * RAN2 assumes that NTA=0 for initial CB-msg3 transmission. * RAN2 assumes the length of the TAC field is 6 bits (we can revisit this if there is major R1 impact on TA calculation) |

## RAN2#129bis

Agreements;

4. We don’t introduce support for eMTC CE mode B case (it will not be possible to signal resources to be used for this case)

5. We specify support for NB-IoT with 15kHz with no specific enhancements, leaving to NW implementation whether to implement this or not, accepting potential performance degradation.

7. The start of CB-msg3 EDT transmission window is aligned with the start of time domain (N)PUSCH resource.

8. The CB-msg3 EDT transmission window length and periodicity may be different. FFS on possible signalling optimization in case the length and periodicity are the same.

9. RAN2 assumes power ramping should be supported for CB-msg3-EDT (for both eMTC and NB-IoT) should be supported and will ask RAN1 for confirmation and in case which parameters should apply

(CB-Msg3-EDT configuration for eMTC)

10. For eMTC, introduce a new IE (e.g. CB-Msg3-ConfigSIB-r19) for shared resources configuration of CB-Msg3 in SIB2.

11. For eMTC, introduce MPDCCH configuration in shared resources configuration. The fields in IE PUR-MPDCCH-Config-r16 could be reused as baseline. Confirm with RAN1 on the detail parameters (e.g. whether additional narrow band is needed).

12. We will not support TDD related parameters.

13. For eMTC, introduce PUSCH configuration in shared resources configuration. The fields in IE PUR-PUSCH-Config-r16 could be reused as baseline. Confirm with RAN1 on the detail parameters. (e.g. whether pusch-CyclicShift-r16, pusch-NB-MaxTBS-r16 are needed, whether prb-AllocationInfo should be defined as a “set” format with intention to provide a set of shared frequency-domain resources).

14. For eMTC, check with RAN1 if anything is needed for PDSCH configuration in shared resources configuration

15. For eMTC, introduce PUCCH configuration in shared resources configuration. The fields in IE PUR-PUCCH-Config-r16 could be reused as baseline. Confirm with RAN1 on the detail parameters.

(CB-Msg3 configuration for NB-IoT)

16. For NB-IoT, introduce a new IE (e.g. CB-Msg3-ConfigSIB-NB-r19) for shared resources configuration of CB-Msg3 in SIB2-NB and SIB22-NB for non-anchor carrier.

17. For NB-IoT, introduce below physical layer parameters in shared resources configuration as below:

- Number of resource units for NPUSCH (as in npusch-NumRUsIndex-r16)

- Number of repetitions for NPUSCH (as in npusch-NumRepetitionsIndex-r16)

- Set of subcarriers (similar to npusch-SubCarrierSetIndex but change it to a “set”), FFS whether subcarriers are provided as a contiguous set.

- MCS configuration for NPUSCH (as in npusch-MCS-r16).

- PDCCH parameters (as in NPDCCH-ConfigDedicated-NB-r13)

- The non-anchor carrier index for monitoring Msg4. If this field is absent, anchor carrier is assumed to be used.

NOTE: confirm with RAN1 is needed

Agreements (part3):

1. The CB-msg3-EDT configuration (e.g., number of replicas, number of time resources and number of frequency resources) is CE level specific.

## RAN2#129

RAN2 #129 Agreements:

1. RAN2 assumes that at least the following will be part of the shared resources configuration for CB-msg3 (FFS on other aspects)

- Time domain resources for (N)PUSCH occasions: periodicity and start time (e.g., start subframe, start SFN)

- Frequency domain resources for (N)PUSCH occasions

- repetition number

- (N)PDCCH resource

- MCS

6. As Signalling design Baseline RAN2 assumes the PUR config and the NPRACH config for shared (N)PUSCH config can be used and some of the parameters can be included in a new CB EDT config.

# 5. Appendix B – Draft CRs

## Nokia R1-2505862

|  |  |
| --- | --- |
| **Reason for change**: | The UE shall not use the HARQ feedback resource information field of DCI format N1, when CB-Msg4 provides the same information per UE. |
| **Summary of change**: | The description of the HARQ feedback resource information field is marked not to be present, when the DCI is scheduling CB-Msg4 i.e. the CRC of the DCI is scrambled with CB-RNTI. |
| **Consequences if not approved**: | UEs may use the wrong HARQ feedback resource if they rely on the information in the DCI instead of the CB-Msg4. |

**6.4.3.2 DCI Format N1**

DCI format N1 is used for the scheduling of one NPDSCH codeword per TTI in one cell, random access procedure initiated by a NPDCCH order, notifying SC-MCCH change, and operation on preconfigured UL resources. The DCI corresponding to a NPDCCH order is carried by NPDCCH.

The following information is transmitted by means of the DCI format N1:

--------------------- Omitted text ---------------------

HARQ-ACK resource – 4 bits as defined in clause 16.4.2 of [3]. If *downlinkHARQ-FeedbackDisabledDCI-NB* is configured, or if *downlinkHARQ-FeedbackDisabledBitmap-NB* and *downlinkHARQ-FeedbackDisabledDCI-NB* are configured, and the value is ‘15’, it functions as a HARQ feedback disabled indicator. This field is not present if the format N1 CRC is scrambled by CB-RNTI.

--------------------- Omitted text ---------------------

## OPPO R1-2505716

TP#1 for TS 36.213 Clause 10.1.2.1 (eMTC)

|  |
| --- |
| -------------------- start of TP#1 for 36.213 --------------------  **10.1.2.1 FDD HARQ-ACK procedure for one configured serving cell**  \*\*\* Unchanged parts are omitted \*\*\*   * for a PDSCH transmission indicated by the detection of a corresponding MPDCCH, or for an MPDCCH indicating downlink SPS release (defined in Clause 9.2) where subframe is the last subframe in which the PDSCH is transmitted, or for HD-FDD HARQ-ACK bundling, subframe is the last subframe in which the PDSCH is detected, the UE shall use   - if MPDCCH-PRB-set is configured for distributed transmission  - if MPDCCH-PRB-set is configured for localized transmission  for antenna port , where  is the number of the first ECCE (i.e. lowest ECCE index used to construct the MPDCCH) used for transmission of the corresponding DCI assignment in MPDCCH-PRB-set , or for HD-FDD HARQ-ACK bundling  is the number of the first ECCE (i.e. lowest ECCE index used to construct the MPDCCH) in the last detected MPDCCH used for transmission of the corresponding DCI assignment in MPDCCH-PRB-set ,  is determined from the HARQ-ACK resource offset field in the DCI format of the corresponding MPDCCH or in the CB-Msg4 as given in Table 10.1.2.1-1,  for MPDCCH-PRB-set  is configured  - by the higher layer parameter *n1PUCCH-AN-r13*, if configured; otherwise:  - by the higher layer parameter *n1PUCCH-AN-InfoList-r13* for the corresponding CE level*,*  \*\*\* Unchanged parts are omitted \*\*\*  -------------------- end of TP#1 --------------------------------- |

TP#1 for TS 36.213 Clause 16.4.2 (NB-IoT)

|  |
| --- |
| -------------------- start of TP#2 for 36.213 --------------------  **16.4.2 UE procedure for reporting ACK/NACK**  \*\*\* Unchanged parts are omitted \*\*\*  The UE shall upon detection of a NPDSCH transmission ending in NB-IoT subframe *n* intended for the UE and for which an ACK/NACK shall be provided, start, after the end of  -  DL subframe for FDD or NTN TDD,  -  NB-IoT UL subframes following the end of n+12 subframe for TN TDD,  transmission of the NPUSCH carrying ACK/NACK response, and SR (if any) if the serving cell is FDD or NTN TDD and the UE is configured with higher layer parameter *sr-with-HARQ-ACK-Config*, using NPUSCH format 2 in *N* consecutive NB-IoT UL slots, where  - , where  - the value of is given by the higher layer parameter *ack-NACK-NumRepetitions-Msg4* configured for the associated NPRACH resourcefor Msg4 NPDSCH transmission, and higher layer parameter *ack-NACK-NumRepetitions* otherwise,  - the value of  is the number of slots of the resource unit (defined in clause 10.1.2.3 of [3]), and  - if the UE is configured with higher layer parameter *harq-ACK-Bundling* in *npdsch-MultiTB-Config*, or if the UE is in a NTN serving cell and multiple TB are scheduled in the NPDCCH corresponding to the NPDSCH and the UE is not configured with higher layer parameter *downlinkHARQ-FeedbackDisabledDCI-NB* and configured with higher layer parameter *downlinkHARQ-FeedbackDisabledBitmap-NB* indicating disabled HARQ-ACK information for a HARQ process associated with a transport block in the NPDSCH, then , otherwise , where the value of is determined by the Number of scheduled TB for Unicast field if present in the NPDCCH corresponding to the NPDSCH, otherwise ,  - allocated subcarrier for ACK/NACK and value of *k0* is determined by the ACK/NACK resource field in the DCI format of the corresponding NPDCCH or in the CB-Msg4 according to Table 16.4.2-1, and Table 16.4.2-2,  - for FDD or NTN TDD, .  - for TN TDD, .  \*\*\* Unchanged parts are omitted \*\*\*  -------------------- end of TP#1 --------------------------------- |

# 6. Appendix C

According to the specifications in TS 36.213 Clause 16.5.1.1 Resource allocation

* The resource allocation information in uplink DCI format N0 for NPUSCH transmission or configured by higher layers for NPUSCH transmission using preconfigured uplink resource indicates to a scheduled UE
* a set of contiguously allocated subcarriers () of a resource unit determined by the Subcarrier indication field, or by the higher layer parameter *npusch-SubCarrierSetIndex* in *PUR-Config-NB*
* a number of resource units () determined by the resource assignment field according to Table 16.5.1.1-2, or by the higher layer parameter *npusch-NumRUsIndex* in *PUR-Config-NB*
* a repetition number () determined by the repetition number field according to Table 16.5.1.1-3, and for a NPUSCH transmission using preconfigured uplink resource, the UE shall use the repetition number configured by higher layers; except for NPUSCH with 16QAM where .
* For NPUSCH transmission with subcarrier spacing, where  is the subcarrier indication field and is reserved, or *n*sc is configured by higher layers parameter *npusch-SubCarrierSetIndex* in *PUR-Config-NB* for NPUSCH transmissions using preconfigured uplink resources.
* For NPUSCH transmission with subcarrier spacing, the subcarrier indication field () in the DCI or *npusch-SubCarrierSetIndex* in *PUR-Config-NB* for NPUSCH transmissions using preconfigured uplink resources determines the set of contiguously allocated subcarriers () according to Table 16.5.1.1-1.

Table 16.5.1.1-1: Allocated subcarriers for NPUSCH with .

|  |  |
| --- | --- |
| Subcarrier indication field () | Set of Allocated subcarriers () |
| 0 – 11 |  |
| 12-15 |  |
| 16-17 |  |
| 18 |  |
| 19-63 | Reserved |

Table 16.5.1.1-2: Number of resource units () for NPUSCH.

|  |  |
| --- | --- |
|  |  |
| 0 | 1 |
| 1 | 2 |
| 2 | 3 |
| 3 | 4 |
| 4 | 5 |
| 5 | 6 |
| 6 | 8 |
| 7 | 10 |

Table 16.5.1.1-3: Number of repetitions () for NPUSCH.

|  |  |
| --- | --- |
|  |  |
| 0 | 1 |
| 1 | 2 |
| 2 | 4 |
| 3 | 8 |
| 4 | 16 |
| 5 | 32 |
| 6 | 64 |
| 7 | 128 |

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