**3GPP TSG RAN WG1 Meeting #102-e R1-200xxxx**

**E-meeting, August 17–28, 2020**

**Agenda Item: 6.2.2**

**Source: Moderator (Huawei)**

**Title: Feature lead summary #1 on [102-e-LTE-NB\_IoTenh3-01]**

**Document for: Discussion and Decision**

# Introduction

This contribution provides discussion on the following issue:

[102-e-LTE-NB\_IoTenh3-01] Corrections regarding RAN2 LS reply on PUR – Xiang (Huawei)

* Issue#1: L1 adjustment on the NPUSCH repetition number
* Issue#2: PUR collision handling
* Discussions/Agreement by 8/21, TPs by 8/28

# Issues

## Issue#1: L1 adjustment on the NPUSCH repetition number

**Description**: In Rel-16 PUR, dedicated PUR ACK DCI is newly introduced, and a 3 bits “NPUSCH repetition adjustment” filed is included in this DCI. One remaining issue is whether the L1 adjustment on the NPUSCH repetition number is intended to update the higher layer (i.e. RRC) configuration or not.

RAN1 has discussed this issue in RAN1#100bis-e and RAN1#101-e, and the following conclusion was made in RAN1#101-e:

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| --- |
| *(copied from RAN1#101-e chairman notes)***Conclusion**Regarding L1 adjustment on the NPUSCH repetition number, one of the following TPs is the starting point for discussion for TS 36.213 based on the outcome of RAN2’s discussion* If the L1 adjustment on the (N)PUSCH repetition number is intended to update the higher layer (i.e. RRC) configuration, then it is RAN1 understanding the text proposal in [R1-2004897](file:///D%3A%5CMix-Local%5C001-Mix%20Working%20Folder%5C202008-RAN1%23102-France-Toulouse%20%28e-Meeting%29%5CDocs%5CR1-2004897.zip) will be endorsed
* If the L1 adjustment on the (N)PUSCH repetition number is to be used instead of the configuration provided by higher layers, then it is RAN1 understanding the text proposal in [R1-2004898](file:///D%3A%5CMix-Local%5C001-Mix%20Working%20Folder%5C202008-RAN1%23102-France-Toulouse%20%28e-Meeting%29%5CDocs%5CR1-2004898.zip) will be endorsed
 |

In RAN1#102-e, RAN2 sent a reply LS R1-2005205 to RAN1, and RAN2’s response is copied below for reference:

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| *(copied from RAN2’s reply LS R1-2005205)***RAN2 response:**RAN2 would like to inform RAN1 that RAN2 will update their specifications so that the adjustment on the (N)PUSCH repetition number provided with L1 ACK / fallback indicator updates the repetition number configuration in PUR configuration in RRC layer.RAN2 expects that PHY layer will provide a 3-bit repetition adjustment index to higher layers so that the value can be stored in the PUR configuration in RRC and expects that the format of the 3-bit information is same as RRC parameter *numRepetitions-r16* for eMTC CE Mode A and CE Mode B and *npusch-NumRepetitionsIndex-r16* for NB-IoT. Furthermore, RAN2 expects PHY layer to provide L1 ACK / fallback indication to higher layers. |

Based on RAN2’s reply LS, there are two sub-issues that RAN1 needs to address:

* **Issue#1-1**: update RAN1 specification to capture that the adjustment on the (N)PUSCH repetition number provided with L1 ACK / fallback indicator updates the repetition number configuration in PUR configuration in RRC layer
* **Issue#1-2**: update RAN1 specification to capture that PHY layer provides a 3-bit repetition adjustment index to higher layers
	+ Note: PHY layer already provided the PUR ACK/fallback indication to higher layers (see Section 16.6.4 of TS 36.213)

Companies’ views collected from the contributions are listed as follows:

**Regarding Issue#1-1**

Huawei/HiSilicon [3] points out that the first bullet in the RAN1 conclusion is aligned with RAN2’s reply LS, i.e., L1 adjustment on the (N)PUSCH repetition number is intended to update the higher layer (i.e. RRC) configuration, so proposes that the TP in R1-2004897 can be endorsed according to the RAN1 conclusion.

ZTE [1], Ericsson [2], Qualcomm [4] shares similar view that the text proposal in R1-2004897 can be endorsed.

TP in R1-2004897 (copied below for reference):

|  |
| --- |
| ------------------------------------- Start of Text Proposal for TS 36.213-------------------------------------------------------------------------- Unchanged parts omitted --------------------------------------16.5.1.1 Resource allocationThe 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,
* a number of resource units () determined by the resource assignment field according to Table 16.5.1.1-2,
* a repetition number () determined by the repetition number field according to Table 16.5.1.1-3. For a NPUSCH transmission using preconfigured uplink resource, the UE shall use the repetition number configured by higher layers.

-------------------------------------------- Unchanged parts omitted ----------------------------------------------------------------------------------- End of Text Proposal ---------------------------------------- |

ZTE [1] further points out currently in TS36.213 section 16.5.1.1, ‘Subcarrier indication field’ and ‘resource assignment field’ are used. However, this is different from the name in *PUR-config-NB*. TP provided by ZTE [1] is:

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| --- |
| **TS36.213****16.5.1.1 Resource allocation****<Unchanged parts are omitted>**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 high layer ‘npusch-SubCarrierSetIndex-r16’
* a number of resource units () determined by the resource assignment field or by high layer ‘npusch-NumRUsIndex-r16’ according to Table 16.5.1.1-2,
* a repetition number () determined by the repetition number field according to Table 16.5.1.1-3. For a NPUSCH transmission using preconfigured uplink resource, the UE shall use the repetition number configured by higher layers.

**<Unchanged parts are omitted>** |

Based on the input from companies, the FL suggests the following TP:

**TP#1-1**

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| --- |
| ------------------------------------- Start of Text Proposal for TS 36.213-------------------------------------------------------------------------- Unchanged parts omitted --------------------------------------16.5.1.1 Resource allocationThe 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 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 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. For a NPUSCH transmission using preconfigured uplink resource, the UE shall use the repetition number configured by higher layers.

-------------------------------------------- Unchanged parts omitted ----------------------------------------------------------------------------------- End of Text Proposal ---------------------------------------- |

### Q1-1

**Potential Agreement: TP#1-1 is endorsed for TS 36.213.**

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| --- | --- | --- |
| **Company** | **Agree?** | **Comments** |
| Ericsson | Ok | On ZTE’s TP, I was about to suggest the complementary wording added by the Feature Lead. So, is fine now, just as a minor request please add “the” in the following sentence “or by the higher layer parameter …”, which appears in the first two changes. |
| Qualcomm |  | The TP is overall OK, but it reads a bit strange, since for n\_sc and N\_RU we are providing a reference to the upper layer parameter and “PUR-Config-NB”, while for N\_Rep we use a completely different sentence. Could it be possible to align the three bullets to be similar? Otherwise they give the impression that they refer to different cases. |
| Lenovo&MotoM |  | To address the concern of QC, how about the following update:* a repetition number () determined by the repetition number field according to Table 16.5.1.1-3 or by the higher layer parameter *npusch-NumReptitionsIndex* in *PUR-Config-NB*
 |
| Huawei/HiSilicon | Ok | Regarding Qualcomm’s comment and Lenovo/MotoM’s suggestion, we agree it would be nice if the three bullets could look similar. However, we have some concerns here.As RAN2 replied in the LS, RAN2 will update their specifications so that the adjustment on the (N)PUSCH repetition number provided with L1 ACK / fallback indicator updates the repetition number configuration in PUR configuration in RRC layer. For now, we are not clear how RAN2 will implement this in their spec.If we use “…, or by the higher layer parameter *npusch-NumReptitionsIndex* in *PUR-Config-NB*” as suggested by Lenovo/MotoM, it might be unclear whether this *npusch-NumReptitionsIndex* is before or after updating by L1 adjustment, i.e., this is the originally RRC configured one, or the one after updating by L1 adjustment.So we prefer TP#1-1, which is decoupled from RAN2’s implementation. We are also ok to add “the” as suggested by Ericsson. |
| ZTE,Sanechips | OK | In principle we are fine with TP#1-1.Regarding the concern from QC, one possible change could be:* a repetition number () determined by the repetition number field according to Table 16.5.1.1-3 or by high layer parameter *npusch-NumRepetitionsIndex-r16* in *PUR-config-NB*.

Note it seems RAN2 has decided that before each PUR transmission the PUR-config-NB will be send to MAC from RRC. Based on this information, PHY can use *npusch-NumRepetitionsIndex-r16* directly since it has the latest repetition information. |

**Regarding Issue#1-2**

Huawei/HiSilicon [3] provided the following TP:

**TP#1-2**

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| --- |
| ------------------------------------- Start of Text Proposal for TS 36.213-------------------------------------------------------------------------- Unchanged parts omitted --------------------------------------16.6.4 Preconfigured uplink resource ACK/fallback procedureIf a UE has initiated a NPUSCH transmission using preconfigured uplink resource on a given serving cell, and upon detection of a NPDCCH with DCI format N0 with CRC scrambled by PUR C-RNTI intended for the UE within the PUR search space window as defined in Subclause 16.6, and the value of "modulation and coding scheme" field () in the corresponding DCI set to '14', the UE shall deliver the PUR ACK/fallback indication and NPUSCH repetition adjustment, as signaled on the NPDCCH, to the higher layers.-------------------------------------------- Unchanged parts omitted ----------------------------------------------------------------------------------- End of Text Proposal ---------------------------------------- |

Qualcomm [4] provided the following TP:

**TP#1-3**

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| --- |
| **<TS 36.213>****<Unchanged parts are omitted>**16.6.4 Preconfigured uplink resource ACK/fallback procedureIf a UE has initiated a NPUSCH transmission using preconfigured uplink resource on a given serving cell, and upon detection of a NPDCCH with DCI format N0 with CRC scrambled by PUR C-RNTI intended for the UE within the PUR search space window as defined in Subclause 16.6, and the value of "modulation and coding scheme" field () in the corresponding DCI set to '14', the UE shall deliver the PUR ACK/fallback indication and the PUSCH repetition adjustment, as signaled on the NPDCCH, to the higher layers. **<Unchanged parts are omitted>** |

### Q1-2

FL’s comment: Since the filed name in DCI format N0 is “NPUSCH repetition adjustment”, the FL suggests to endorse TP#1-2.

**Potential Agreement: TP#1-2 is endorsed for TS 36.213.**

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| --- | --- | --- |
| **Company** | **Agree?** | **Comments** |
| Ericsson | Ok | TP#1-2 and TP#1-3 are identical in content, what is missing in TP1-3 was just a typo. To me, in terms of readability the missing article “the” in TP#1-2 is something good to have, so the TPs can complement each other on what they have missed as to have as update “and the NPUSCH repetition adjustment,” |
| Qualcomm |  | We agree with FL that the name should be “NPUSCH” instead of “PUSCH”. However, could we add “the” before “NPUSCH” as follows?the UE shall deliver the PUR ACK/fallback indication and the NPUSCH repetition adjustment, |
| Lenovo&MotoM | OK | Agree with the update from QC above |
| Huawei/HiSilicon | Ok | Ok with Ericsson/Qualcomm’s revision, i.e., use “and the NPUSCH repetition adjustment,” |
| ZTE,Sanechips | OK | Fine with further update from Ericsson/Qualcomm. |

## Issue#2: PUR collision handling

**Description**: Regarding PUR collision handling, the following WA was made in RAN1#100bis-e, and an LS was sent to RAN2 for confirmation.

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| --- |
| Working Assumption* When PUR transmission overlaps with WUS, PUR transmission is prioritized
	+ For eMTC, this applies only to HD-FDD UEs
* When PUR SS monitoring overlaps with Paging CSS, PUR SS monitoring is prioritized
* When PUR SS monitoring overlaps with WUS, PUR SS monitoring is prioritized

If it is concluded by RAN2 that the working assumption is feasible, the working assumption will be automatically confirmed.[**R1-2002944**](file:///D%3A%5CMix-Local%5C001-Mix%20Working%20Folder%5C202005-RAN1%23101-Greece-Athens%20%28e-Meeting%29%5CDocs%5CR1-2002944.zip) **LS on PUR working assumption for NB-IoT and eMTC RAN1, Huawei**AgreementThe LS to RAN2 on PUR working assumption for NB-IoT and eMTC is approved. |

RAN1 have further discussed this issue in RAN1#101-e, and the following conclusion was made in RAN1#101-e:

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| --- |
| *(copied from RAN1#101-e chairman notes)***Conclusion**The text proposal in [R1-2004896](file:///D%3A%5CMix-Local%5C001-Mix%20Working%20Folder%5C202008-RAN1%23102-France-Toulouse%20%28e-Meeting%29%5CDocs%5CR1-2004896.zip) is the starting point for discussion for TS 36.213 based on the outcome of RAN2’s discussion and it is RAN1 understanding it will be endorsed unless it is concluded by RAN2 that the working assumption in [R1-2002944](file:///D%3A%5CMix-Local%5C001-Mix%20Working%20Folder%5C202008-RAN1%23102-France-Toulouse%20%28e-Meeting%29%5CDocs%5CR1-2002944.zip) is infeasible. |

In RAN1#102-e, RAN2 sent a reply LS R1-2005205 to RAN1, and RAN2’s response is copied below for reference:

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| *(copied from RAN2’s reply LS R1-2005205)***RAN2 response:**RAN2 would like to inform RAN1 that the working assumption is feasible from RAN2 point of view and can be confirmed.  |

Companies’ views collected from the contributions are listed as follows:

Huawei/HiSilicon [3] points out that based on RAN2’s reply LS, the working assumption above is feasible and can be automatically confirmed, and the text proposal in R1-2004896 can be endorsed according to the RAN1 conclusion.

Ericsson [2] shares similar view that the text proposal in R1-2004896 can be endorsed.

**TP in R1-2004896** (copied below for reference)

|  |
| --- |
| ------------------------------------- Start of Text Proposal for TS 36.213-------------------------------------------------------------------------- Unchanged parts omitted --------------------------------------16.6 Narrowband physical downlink control channel related procedures…Until UE receives higher layer configuration of NPDCCH UE-specific search space, the UE monitors NPDCCH according to the same configuration of NPDCCH search space as that for NPDCCH scheduling Msg4.A UE is not required to monitor Type1-NPDCCH common search space or NWUS if the set of subframes comprising the NPDCCH candidates or the set of subframes where NWUS may be received include any subframes in which the UE has initiated an NPUSCH transmission using preconfigured uplink resource on a given serving cell.…If the UE has initiated a NPUSCH transmission using preconfigured uplink resource ending in subframe *n*, the UE shall monitor the NPDCCH UE-specific search space in a search space window starting in *n+4* subframewith duration given by higher layer parameter *pur-SS-window-duration*. Upon detection of a NPDCCH with DCI format N0 with CRC scrambled by PUR C-RNTI intended for the UE within the search space window and the value of "modulation and coding scheme" field () in the corresponding DCI is set to '14', the UE is not required to monitor the NPDCCH UE-specific search space for the remaining search space window duration. The UE is not required to monitor Type1-NPDCCH common search space or NWUS on the set of subframes where it may be received, in case any of these overlaps with any of the subframes comprising the NPDCCH UE-specific search space within the search space window.-------------------------------------------- Unchanged parts omitted ----------------------------------------------------------------------------------- End of Text Proposal ---------------------------------------- |

Qualcomm [4] proposed the following TP, which contains a modification on top of the proposal in x4896 (essentially changing the placement of the second change so that all requirements on simultaneous monitoring are at the beginning of the subclause, and simplifying that change).

**TP#2-1**

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| **<TS 36.213>**16.6 Narrowband physical downlink control channel related procedures**<Unchanged parts are omitted>**A UE is not required to monitor Type1A-NPDCCH common search space or Type2A-NPDCCH common search space in subframes in which the UE monitors a Type1-NPDCCH common search space or in subframes in which the UE receives NPDSCH assigned by NPDCCH with DCI CRC scrambled by P-RNTIA UE is not required to monitor Type1A-NPDCCH common search space or Type2A-NPDCCH common search space in subframes in which the UE monitors a Type2-NPDCCH common search space or in subframes in which the UE receives NPDSCH assigned by NPDCCH with DCI CRC scrambled by C-RNTI or Temporary C-RNTI.A UE is not required to monitor Type2A-NPDCCH common search space in the same subframe in which it monitors Type1A-NPDCCH common search space.UE is not required to monitor Type1A-NPDCCH common search space in subframes in which the UE receives NPDSCH assigned by NPDCCH with DCI CRC scrambled by SC-RNTI.UE is not required to monitor Type2A-NPDCCH common search space in subframes in which the UE receives NPDSCH assigned by NPDCCH with DCI CRC scrambled by G-RNTI or SC-RNTI.Until UE receives higher layer configuration of NPDCCH UE-specific search space, the UE monitors NPDCCH according to the same configuration of NPDCCH search space as that for NPDCCH scheduling Msg4.A UE is not required to monitor Type1-NPDCCH common search space or NWUS if the set of subframes comprising the NPDCCH candidates or the set of subframes where NWUS may be received include any subframes in which the UE has initiated an NPUSCH transmission using preconfigured uplink resource on a given serving cell.A UE is not required to monitor Type-1 NPDCCH common search space or NWUS in subframes in which the UE monitors a UE-specific NPDCCH search space given by PUR C-RNTI.**<Unchanged parts are omitted>** |

ZTE [1] provided the following TP:

**TP#2-2**

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| **TS 36.213****16.6 Narrowband physical downlink control channel related procedures****<Unchanged parts are omitted>**If the UE has initiated a NPUSCH transmission using preconfigured uplink resource ending in subframe *n*, the UE shall monitor the NPDCCH UE-specific search space in a search space window starting in subframe *n+4* with duration given by higher layer parameter *pur-SS-window-duration*. Upon detection of a NPDCCH with DCI format N0 with CRC scrambled by PUR C-RNTI intended for the UE within the search space window and the value of "modulation and coding scheme" field () in the corresponding DCI is set to '14', the UE is not required to monitor the NPDCCH UE-specific search space for the remaining search space window duration. The UE is not required to monitor Type1-NPDCCH common search space if it overlaps with the NPDCCH UE-specific search space within the search space window.**<Unchanged parts are omitted>****16.9 UE procedure for receiving narrowband wake up signal****<Unchanged parts are omitted>**A NB-IoT UE using NWUS can assume there are at least 10 NB-IoT DL subframes between the end of the maximum duration of NWUS and the first associated NB-IoT paging occasion subframe.For a NB-IoT UE, the UE is not required to monitor NWUS if the set of subframes in which NWUS is configured include any subframes in which the UE has initiated a NPUSCH transmission using preconfigured uplink resource on a given serving cell, or include any subframes in which a NPDCCH with DCI format N0 with CRC scrambled by PUR C-RNTI is configured for the UE on a given serving cell.**<Unchanged parts are omitted>** |

### Q2-1

**Potential Agreement: Confirm the Working Assumption in RAN1#100bis-e**

* **When PUR transmission overlaps with WUS, PUR transmission is prioritized**
	+ **For eMTC, this applies only to HD-FDD UEs**
* **When PUR SS monitoring overlaps with Paging CSS, PUR SS monitoring is prioritized**
* **When PUR SS monitoring overlaps with WUS, PUR SS monitoring is prioritized**

**Question: Regarding the TP, which one of the following should be endorsed for TS 36.213?**

* **TP in R1-2004896**
* **TP#2-1**
* **TP#2-2**

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| --- | --- | --- | --- |
| **Company** | **Agree with the potential agreement?** | **Answer to the question above?** | **Comments** |
| Ericsson | Ok | TP#2-1 | * Given the RAN2 response and that the Working Assumption stated: “If it is concluded by RAN2 that the working assumption is feasible, the working assumption will be automatically confirmed.”, we are Ok with the Potential Agreement.
* About the TP, TP#2-1 only modifies the last paragraph with respect to R1-2004896 making it simpler. We think the change adds a value in terms of readability and for that reason we support TP#2-1.
 |
| Qualcomm | Yes | TP2-1 | We have a preference for 2-1 (it seems to be simpler and more in line with previous text). But if companies have a strong view for other TPs, we can also live with that.We have one comment on 2-2, this text seems to be incorrect (or at least it is unclear to us what “NPDCCH with DCI format […] is configured”):* include any subframes in which a NPDCCH with DCI format N0 with CRC scrambled by PUR C-RNTI is configured for the UE on a given serving cell
 |
| Lenovo&MotoM | OK | TP2-1 | TP2-1 is simpler to read and align with legacy text.Note: the “PUR C-RNTI” may be updated accordingly based on the discussion of Email #3 |
| Huawei/HiSilicon | Ok | TP#2-1 | TP#2-1 seems better in terms of readability, and is more aligned with other parts in TS 36.213. |
| ZTE,Sanechips | OK |  | We had thought about this before and in fact our first draft is same as TP2-1. The reason we changed our mind is we checked and it seems chapter 16.6 is for NPDCCH procedure and the chapter dedicated to NWUS is in chapter 16.9.This is not a fundamental issue , we certainly can go with the majority, but we want to caution that once it starts, in the future content about NWUS could be littered everywhere . |

# Summary

# Reference

1. R1-2005471 Remaining issues for transmission in preconfigured UL resources for NB-IoT ZTE

1. R1-2005556 PUR maintenance issues for Rel-16 NB-IoT Ericsson

1. R1-2005816 Corrections regarding RAN2 LS reply on PUR Huawei, HiSilicon

1. R1-2006189 Maintenance on PUR Qualcomm Incorporated
2. [R1-2006419](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006419.zip) Corrections on transmission in preconfigured UL resources for NB-IoT Huawei, HiSilicon