**3GPP TSG RAN WG1 Meeting #104bis-e R1-210xxxx**

**E-Meeting, April 12th – April 20th, 2021**

**Agenda Item: 6.2.2**

**Source: Moderator (Huawei)**

**Title: Feature summary on 104b-e-LTE-NB\_IoTenh3-01**

**Document for: Discussion and Decision**

# Introduction

This documents provides the proposals and summary of discussions of the following email discussion:

[104b-e-LTE-NB\_IoTenh3-01] PUR issues – Xiang (Huawei)

* Issue 1: Clarification on subcarrier indication for PUR. ([R1-2103722](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104b%5CDocs%5CR1-2103722.zip))
* Issue 2: Clarification on scheduling/processing gaps for NB-IoT. ([R1-2102850](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104b%5CDocs%5CR1-2102850.zip), [R1-2103762](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104b%5CDocs%5CR1-2103762.zip))
* Discussion and decision by April 15, TPs by April 20

# Discussion

Issue 1: Clarification on subcarrier indication for PUR

* As explained in [2], the the set of contiguously allocated subcarriers () is missed for PUR cases.
* Proposal: Endorse one of the following text proposal

------------------------------------------------- Text omitted (TS 36.213 Clause 16.5.1.1)---------------------------------------

For NPUSCH transmission with subcarrier spacing, where  is the subcarrier indication field or *n*sc = *npusch-SubCarrierSetIndex* in *PUR-Config-NB* in case of NPUSCH transmissions using preconfigured uplink resources. is reserved.

For NPUSCH transmission with subcarrier spacing, the subcarrier indication field () in the DCI or *npusch-SubCarrierSetIndex* in *PUR-Config-NB* in case of NPUSCH transmissions using preconfigured uplink resources determines the set of contiguously allocated subcarriers () according to Table 16.5.1.1-1.

---------------------------------------------------- Text end (TS 36.213 Clause 16.5.1.1)-----------------------------------------

Please input your comments in the following table:

|  |  |
| --- | --- |
| Companies | Comments |
| Lenovo, MotoM | We are fine with the CR in general. Hope to consider the following update. since we can’t use n\_sc = a RRC parameter.For NPUSCH transmission with subcarrier spacing, where  is the subcarrier indication field, is reserved, or *n*sc equals to the value of parameter *npusch-SubCarrierSetIndex* in *PUR-Config-NB* in case of NPUSCH transmissions using preconfigured uplink resources. |
| Qualcomm | Although the TP is technically correct, we are a bit concerned about the “double specification” that we are introducing by these changes:In TS 36.331, the following is mentioned:***npusch-SubCarrierSetIndex***For NPUSCH transmission with subcarrier spacing 3.75 kHz, indicates the subcarrier used for PUR specified in TS 36.213 [23].For NPUSCH transmission with subcarrier spacing 15 kHz, index to a table specified in TS 36.213 [23], Table 16.5.1.1-1, that defines the set of subcarriers for NPUSCH for PUR.We are just repeating the same specification now in TS 36.213. If in the future we need to make a change to this behavior, we would need to change both 36.213 and 36.331.Either way, we can go with the majority view. One intermediate approach would be to modify as follows:For NPUSCH transmission with subcarrier spacing, where  is the subcarrier indication field or is configured by higher layers for a NPUSCH transmissions using preconfigured uplink resources. is reserved.For NPUSCH transmission with subcarrier spacing, the subcarrier indication field () in the DCI, or configured by higher layers for a NPUSCH transmissions using preconfigured uplink resources, determines the set of contiguously allocated subcarriers () according to Table 16.5.1.1-1. |
| Ericsson | We are fine with the “intermediate approach” proposed by Qualcomm, the important thing is to incorporate into the sentences that for PUR the information is obtained via HL and not via DCI.To the Moderator, for some reason the letter “F” at the very beginning of the clause under discussion is shown in track changes, which is not the case in our T-doc: [**R1-2103722**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_104b-e/Docs/R1-2103722.zip). |
| ZTE,Sanechips | Considering the following:* *“n*sc is configured by higher layers” looks better than “ *n*sc equals to the value of parameter”
* Reserved *ISC* is indicated by the DCI and it can be described together with “ is the subcarrier indication field”
* The revision of capital F in ‘For’ is not needed
* We agree that “double specification” should be avoided. However, the subject in the sentence from Qualcomm is not very clear.

Based on the above contributions and considering the above factors, we think the following is more correct.For NPUSCH transmission with subcarrier spacing, where  is the subcarrier indication field and is reserved, or *n*sc is configured by higher layers 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. |
| Nokia, NSB | We agree with the intention of the CR, however we prefer an “intermediate approach” to minimize duplication. Of the Qualcomm and ZTE wordings, we have a slight preference for the ZTE wording, though we will support the majority view. |
| Ericsson v007 | The suggested update by ZTE adds clarity and is fine with us, it just needs to incorporate “*PUR-Config-NB*” in the first sentence. Similar view as Nokia “*Of the Qualcomm and ZTE wordings, we have a slight preference for the ZTE wording*”.------------------ Text omitted (TS 36.213 Clause 16.5.1.1)---------------For NPUSCH transmission with subcarrier spacing, where  is the subcarrier indication field andis reserved, or *n*sc is configured by higher layers 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.-------------------- Text end (TS 36.213 Clause 16.5.1.1)------------------ |
|  |  |
| Huawei, HiSilicon | We are fine with the version of Ericsson v007. |
| FL proposal | For 3.75kHz subcarrier spacing, it may be better to give the parameter name also, to be aligned with the 15khz subcarrier spacing. Therefore, we have the following proposal:Proposal: Agree on the following changes, and draft a corresponding CR.------------------ Text omitted (TS 36.213 Clause 16.5.1.1)---------------For NPUSCH transmission with subcarrier spacing, where  is the subcarrier indication field andis 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.-------------------- Text end (TS 36.213 Clause 16.5.1.1)------------------ |

Issue 2: Clarification on scheduling/processing gaps for NB-IoT.

* As explained in [1][3], in current spec, the consecutive subframes for multicast does not consider the scheduling gaps or processing gaps.
* In [1], the following is proposed:

---------------------------------------------- Start of Text Proposal to 36.213 ------------------------------

16.4.1 UE procedure for receiving the narrowband physical downlink shared channel

**<Unchanged parts are omitted>**

A UE shall upon detection on a given serving cell of a NPDCCH with DCI format N1, N2 ending in subframe *n* intended for the UE, decode, starting in

*- n+5* DL subframe for FDD,

*- n+5* subframefor TDD,

the corresponding NPDSCH transmission in *N* NB-IoT DL subframe(s) *ni* with *i = 0, 1, …, N-1* according to the NPDCCH information, where

- subframe *n* is the last subframe in which the NPDCCH is transmitted and is determined from the starting subframe of NPDCCH transmission and the DCI subframe repetition number field in the corresponding DCI;

- , where the value of  is determined by the repetition number field in the corresponding DCI (see Clause 16.4.1.3), the value of is determined by the resource assignment field in the corresponding DCI (see Clause 16.4.1.3), and the value of is determined by the Number of scheduled TB for Unicast field or Number of scheduled TB for SC-MTCH field, if present, in the corresponding DCI,  otherwise,

- *k0* is the number of NB-IoT DL subframe(s) starting in DL subframe *n*+5 for FDD or subframe *n*+5 for TDD, until DL subframe *n0*, where *k0* is determined by the scheduling delay field () for DCI format N1, and *k0* = 0 for DCI format N2. For DCI CRC scrambled by G-RNTI, *k0* is determined by the scheduling delay field () according to Table 16.4.1-1a, otherwise *k0* is determined by the scheduling delay field () according to Table 16.4.1-1. The value of is according to Clause 16.6 for the corresponding DCI format N1,

- if  and NPDSCH corresponding to an NPDCCH with DCI CRC scrambled by G-RNTI,

- if *multiTB-Gap* is not configured and , subframe(s) *ni* isthe first NB-IoT DL subframe after subframe , where  is processing gap with 20 subframes, $δ\left(d\right)=\left\{\begin{matrix}1, d=0\\0,d\ne 0\end{matrix}\right.$, and  is the number of overlapped subframes if the *j*th processing gap overlaps with the NPDSCH transmission gap defined in [3] and .

- otherwise, subframe(s) *ni* isthe first NB-IoT DL subframe after subframe , where is given by higher layer parameter *multiTB-Gap*, $δ\left(d\right)=\left\{\begin{matrix}1, d=0\\0,d\ne 0\end{matrix}\right.$, and  is the number of overlapped subframes if the *j*th scheduling gap overlaps with the NPDSCH transmission gap defined in [3] and .

- otherwise, subframe(s) *ni* with *i=0,1,…,N-1* are *N* consecutive NB-IoT DL subframe(s) excluding subframes used for SI messages where, *n0<n1<…,nN-1* ,

- for ,

- if the UE is configured with higher layer parameter *multiTB-Config* in *npdsch-MultiTB-Config* set to '*interleaved*', and NPDSCH corresponding to a NPDCCH with DCI CRC scrambled by C-RNTI, and 

- NB-IoT DL subframes  with  are associated with TB*r+*1 ,

- otherwise,

- NB-IoT DL subframes  with  are associated with TB*r+*1 ,

**<Unchanged parts are omitted>**

----------------------------------------------- End of Text Proposal to 36.213 ------------------------------

* In [3], the following is proposed:

---------------------------------------------- Start of Text Proposal to 36.213 ------------------------------

<Unchanged part omitted>

16.4.1 UE procedure for receiving the narrowband physical downlink shared channel

A UE shall upon detection on a given serving cell of a NPDCCH with DCI format N1, N2 ending in subframe *n* intended for the UE, decode, starting in

*- n+5* DL subframe for FDD,

*- n+5* subframefor TDD,

the corresponding NPDSCH transmission in *N* consecutive NB-IoT DL subframe(s) *ni* with *i = 0, 1, …, N-1* according to the NPDCCH information, where

- subframe *n* is the last subframe in which the NPDCCH is transmitted and is determined from the starting subframe of NPDCCH transmission and the DCI subframe repetition number field in the corresponding DCI;

- subframe(s) *ni* with *i=0,1,…,N-1* are *N* consecutive NB-IoT DL subframe(s) excluding subframes used for SI messages or scheduling gap (if any) or processing gap (if any) where, *n0<n1<…,nN-1* ,

- , where the value of  is determined by the repetition number field in the corresponding DCI (see Clause 16.4.1.3), the value of is determined by the resource assignment field in the corresponding DCI (see Clause 16.4.1.3), and the value of is determined by the Number of scheduled TB for Unicast field, if present, in the corresponding DCI,  otherwise,

- *k0* is the number of NB-IoT DL subframe(s) starting in DL subframe *n*+5 for FDD or subframe *n*+5 for TDD, until DL subframe *n0*, where *k0* is determined by the scheduling delay field () for DCI format N1, and *k0* = 0 for DCI format N2. For DCI CRC scrambled by G-RNTI, *k0* is determined by the scheduling delay field () according to Table 16.4.1-1a, otherwise *k0* is determined by the scheduling delay field () according to Table 16.4.1-1. The value of is according to Clause 16.6 for the corresponding DCI format N1,

- for ,

- if the UE is configured with higher layer parameter *multiTB-Config* in *npdsch-MultiTB-Config* set to '*interleaved*', and NPDSCH corresponding to a NPDCCH with DCI CRC scrambled by C-RNTI, and 

- NB-IoT DL subframes  with  are associated with TB*r+*1 ,

- otherwise,

- NB-IoT DL subframes  with  are associated with TB*r+*1 ,

- for  and NPDSCH corresponding to an NPDCCH with DCI CRC scrambled by G-RNTI,

- if *multiTB-Gap* is not configured and , a processing gap of 20ms is inserted after every 2 TBs

- otherwise, a scheduling gap with a length equal to the indicated value of *multiTB-Gap* is inserted between TB*r* and TB*r+*1,.

- If the scheduling gap or the processing gap overlaps with the NPDSCH transmission gap defined in [3], the overlapped part of the scheduling gap or processing gap is also counted as the part of NPDSCH transmission gap.

<Unchanged part omitted>

----------------------------------------------- End of Text Proposal to 36.213 ------------------------------

Please input your comments regarding the above text proposals:

|  |  |
| --- | --- |
| Companies | Comments |
| Lenovo, MotoM | We agree the issue proposed by ZTE and Huawei.Consider the difference between NBIoT and eMTC, there is NPDSCH transmission gap in NBIoT, so we think it is not clear to specify the subframes used for NPDSCH transmission as ZTE proposal, especially why do we have shorter gaps if there is overlapped NPDSCH transmission gap.subframe(s) *ni* isthe first NB-IoT DL subframe after subframe To make things easier, we agree to simply use the general description as Huawei proposal.  |
| Qualcomm | We think the Huawei TP is enough in this case, as mentioned by Lenovo. |
| Ericsson | We are fine with Huawei’s TP. |
| ZTE,Sanechips | This issue should be addressed at least. As the spec description, the scheduling gap or processing gap is also counted as the part of NPDSCH transmission gap, and this is why we have shorter gaps, since the overlapped part is excluded from the scheduling gap or processing gap and counted as the transmission gap. As for the wording, we have no strong view actually. The motivation for the CR in [1] is to keep alignment with MTC and describe the gap and MTB position correctly.  |
| Nokia, NSB | We are fine with the Huawei TP. |
| Huawei, HiSilicon | We prefer the second version for readability and easy tracking with previous releases. |
| FL proposal | Proposal: agree the draft CR in R1-2103762. |

# Summary

To be added.

# References

1. R1-2102850 Correction on multi-TB gap for multicast in NB-IoT ZTE
2. R1-2103722 PUR maintenance issues for Rel-16 NB-IoT Ericsson
3. R1-2103762 Correction on multi-TB scheduling for NB-IoT Huawei, HiSilicon