**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:

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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>

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Please input your comments regarding the above text proposals:

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# 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