**3GPP TSG RAN WG1 #104-e R1-21xxxxx**

**e-Meeting, January 25th – February 5th, 2021**

**Agenda Item: 6.1**

**Source: Moderator (ZTE)**

**Title: Summary of email discussion [104-e-LTE-6.1CRs-02] on R1-2100559 (NB-IoT)**

**Document for: Discussion and Decision**

# Introduction

This contribution provides discussion on clarification on power control for NB-IoT:

 [104-e-LTE-6.1CRs-02] Email discussion/approval on R1-2100559 (NB-IoT) by Jan-28 – Huiying (ZTE)

# Discussion

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| ***Reason for change:*** | In RAN1 #84bis, it was agreed that:MNPUSCH,c(i): {1/4, 1, 3, 6,12} (reflecting UL transmission resource bandwidth normalized by 15 kHz).However, in 16.2.1.1.1 of 36.213, the way for a NB-IoT UE to derive the value of  from {1, 3, 6, 12} is not clearly defined for the case of 15kHz subcarrier spacing. |
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| ***Summary of change:*** |  equals to the number of subcarriers of the allocated NPUSCH RUs for 15kHz subcarrier spacing. |
|  |  |
| ***Consequences if not approved:*** | A NB-IoT UE may not correctly derive the value of  |

***Change to TS 36.213:***

**<Unchanged parts are omitted>**

16.2.1.1.1 UE behaviour

The setting of the UE Transmit power for a Narrowband Physical Uplink Shared Channel (NPUSCH) transmission is defined as follows.

The UE transmit power  for NPUSCH transmission in NB-IoT UL slot *i* for the serving cell is given by

If the number of repetitions of the allocated NPUSCH RUs is greater than 2

[dBm]

otherwise

 [dBm]

where,

- is the configured UE transmit power defined in [6] in NB-IoT UL slot *i* for serving cell .

- is {1/4} for 3.75 kHz subcarrier spacing and {1, 3, 6, 12}for 15kHz subcarrier spacing. For 15kHz subcarrier spacing,  is the number of subcarriers of the allocated NPUSCH RUs.

- is a parameter composed of the sum of a component  provided from higher layers and a component  provided by higher layers for *j=1* andfor serving cell where . For NPUSCH (re)transmissions corresponding to a dynamic scheduled grant then *j=1* and for NPUSCH (re)transmissions corresponding to the random access response grant then *j=2*.  and , where the parameter *preambleInitialReceivedTargetPower* [8] () and  are signalled from higher layers for serving cell .

- For *j*=*1*, for NPUSCH format 2, =1; for NPUSCH format 1, is provided by higher layers for serving cell. For *j*=2, 

-  is the downlink path loss estimate calculated in the UE for serving cell  in dB and  = *nrs-Power* + *nrs-PowerOffsetNonAnchor* – NRSRP, where *nrs-Power* is provided by higher layers and Subclause 16.2.2, and *nrs-powerOffsetNonAnchor* is set to zero if it is not provided by higher layers and NRSRP is defined in [5] for serving cell .

**<Unchanged parts are omitted>**

Please input your comments to the proposed CR:

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| --- | --- |
| **Companies** | **Comments** |
| Ericsson | The multi-tone allocation in NB-IoT utilizes 15 KHz as subcarrier spacing, whereas for single-tone 15KHz and 3.75KHz are the available subcarrier spacings.[1] mentions that in RAN1 #84bis, the following agreement was reached:

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| * MNPUSCH,c(i): {1/4, 1, 3, 6,12} (reflecting UL transmission resource bandwidth normalized by 15 kHz)
 |

In our understanding the set above without normalization is {3.75, 15, 45, 90, 180}, which when normalized by 15 provides {3.75, 15, 45, 90, 180}./15 = {1/4, 1, 3, 6, 12} as in the cited agreement.[1] proposes the following change:

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| --- |
| - is {1/4} for 3.75 kHz subcarrier spacing and {1, 3, 6, 12}for 15kHz subcarrier spacing. For 15kHz subcarrier spacing,  is the number of subcarriers of the allocated NPUSCH RUs. |

It seems that is not really correct to say that “For 15kHz subcarrier spacing,  is the number of subcarriers” since even for the 15 KHz subcarrier spacing the set corresponds to the normalized bandwidth.Thus, the clarification should cover both subcarrier spacings and should reflect the agreement from RAN1 #84bis for example as follows:- $M\_{NPUSCH,c}(i)$ is the UL transmission resource bandwidth normalized by 15 kHz, where {1/4} is used for 3.75 kHz subcarrier spacing and {1, 3, 6, 12} are used for 15kHz subcarrier spacing |
| Qualcomm | It should be more or less clear that {1,3,6,12} depends on the number of allocated subcarriers, but we are OK to correct it if there is a majority view.Regarding the wording, we would prefer Ericsson’s text. |
| Nokia, NSB | We think the specification is clear and this clarification is not necessary. |
| ZTE | By current specification, the meaning and how to use the value of {1, 3, 6, 12} are not clear. Therefore, a clarification is necessary.Regarding the wording, we are fine with Ericsson’s text except for the ‘UL’. A small update is as follows:- $M\_{NPUSCH,c}(i)$ is the NPUSCH transmission resource bandwidth normalized by 15 kHz, where {1/4} is used for 3.75 kHz subcarrier spacing and {1, 3, 6, 12} are used for 15kHz subcarrier spacing |
| Huawei, HiSilicon | In our understanding the current spec is clear on the setting of $M\_{NPUSCH,c}(i)$ since Rel-13, thus no clarification is needed. |
| Moderator (ZTE) | Companies not supporting this CR may have concern that this is a Rel-13 CR and Rel-13 NB-IoT products have already been in the market. But without the background of agreement in RAN1 #84bis, current spec does not clearly define the meaning of value {1, 3, 6, 12}. For compromise, it is proposed to consider the following change in a later release (Rel-15 or later):- $M\_{NPUSCH,c}(i)$ is the NPUSCH transmission resource bandwidth normalized by 15 kHz, where {1/4} is used for 3.75 kHz subcarrier spacing and {1, 3, 6, 12} are used for 15kHz subcarrier spacing |

# Summary

To be added

**References**

[1] 3GPP, R1-2100559, Clarification on power control for NB-IoT, RAN1 #104-e, ZTE