3GPP TSG-RAN WG1 Meeting #102-e R1-20xxxxx

e-Meeting, October 26th – November 13th 2020

Agenda Item: 6.1

Source: Moderator (Ericsson)

Title: Moderator Summary [103-e-LTE-6.1CRs-03]

Document for: Discussion and Decision

# 1 Introduction

In Release-15 the Work Item (WI) on “Even Further Enhanced MTC for LTE (“efeMTC”)” [1], had as one of its objectives to specify “Increased PUSCH spectral efficiency”. As a result, the sub-PRB was specified making possible to possible to allocate either 6, 3, or 2-of-3 subcarriers for transmitting over PUSCH.

In [2], it was mentioned that “The subcarrier allocation for sub-PRB in CE mode A and CE mode B uses the same procedure, however such a procedure makes use of a variable that has been defined for CE Mode A but not for CE Mode B”. Based on it, [2] presents two possible ways of performing a clarification for CE Mode B.

# 2 Clarification on the subcarrier allocation for sub-PRB in CE Mode B

In [2] it was mentioned “For sub-PRB in both CE Mode A and CE Mode B, the allocated number of subcarriers is obtained using Table 8.1.6-1, which applies a modulo operation on the variable “”. The variable “” consists of 6-bits for CE Mode A and 4-bits for CE Mode B and is obtained respectively from the 'resource allocation' field in the scheduling grant. However, for CE Mode B, the variable “” is currently undefined”

Two alternatives were proposed in [2] to clarify the issue, which TPs are shown in sections 2.1 and 2.2 respectively to collect companies’ opinions.

* Alternative 1: In TS 36.213 clause 8.1.6, a complementary statement is added to define the variable “” also in the case of CE Mode B. See the suggested change in section 2.1.
* Alternative 2: In Table 8.1.6-1 of TS 36.213 where the variable “” is cited and refers to the “resource allocation field”, the corresponding clauses for CE Mode A and CE Mode are added. See the suggested change in section 2.2.

## 2.1 Alternative 1: Clarification on the subcarrier allocation for sub-PRB in CE Mode B

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### 8.1.6 Uplink resource allocation type 5

Uplink resource allocation type 5 is applicable for BL/CE UEs configured with higher layer parameter *ce-PUSCH-SubPRB-Config-r15* or *PUR-Config*.

The resource allocation information for uplink resource allocation type 5 indicates to a scheduled UE

- a set of contiguously allocated subcarriers within an allocated resource block of a narrowband,

- a number of resource units () determined by the 'number of resource units' field in the corresponding DCI or higher layer parameter *numRUs* in *PUR-Config* according to Table 8.1.6-2 for UE configured with CEModeA, and Table 8.1.6-3 for UE configured with CEModeB.

For a UE configured with CEModeA and the value of the 'number of resource units' field in the scheduling grant set to other than '00', the allocated resource block within a narrowband is given by  where  is the value of the 'resource allocation' field in the scheduling grant, and the allocated subcarriers within the allocated resource block is given in Table 8.1.6-1. For a UE configured with CEModeA and the value of higher layer parameter *numRUs* in *PUR-Config* set to other than '00', the allocated resource block within a narrowband is given by  where  is indicated by higher layer parameter *prb-AllocationInfo* in *PUR-Config*, and the allocated subcarriers within the allocated resource block is given in Table 8.1.6-1. For PUSCH sub-PRB allocation in CE Mode A, the UE shall consider the DCI valid even if the number of transmitted subframes is greater than *pusch-maxNumRepetitionCEmodeA*.

For a UE configured with CEModeB and the value of the 'sub-PRB allocation flag' field in the scheduling grant set to '1', the allocated resource block within a narrowband is given by the higher layer parameter *locationCE-ModeB*, and the allocated subcarriers within the allocated resource block is given in Table 8.1.6-1 using  which is the value of the 'resource allocation' field in the scheduling grant.

For a UE configured with CEModeB and the value of higher layer parameter *subPRB-Allocation* in *PUR-Config* set to '1', the allocated resource block within a narrowband is given by higher layer parameter *locationCE-ModeB* in *PUR-Config*, and the allocated subcarriers within the allocated resource block are indicated by the higher layer parameter *prb-AllocationInfo* in *PUR-Config* according to Table 8.1.6-1.

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| **Company** | **Agree?** | **Comments** |
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## 2.2 Alternative 2: Clarification on the subcarrier allocation for sub-PRB in CE Mode B

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Table 8.1.6-1: Subcarriers allocation for BL/CE UE.

|  |  |  |
| --- | --- | --- |
| = value of resource allocation field in clause 5.3.3.1.10 for CE Mode A and in clause 5.3.3.1.11 for CE Mode B [4] or indicated by higher layer parameter *prb-AllocationInfo* in *PUR-Config* | Modulation | Set of Allocated subcarriers |
| 0 | π/2-BPSK |  |
| 1 | π/2-BPSK |  |
| 2 | π/2-BPSK |  |
| 3 | π/2-BPSK |  |
| 4 | QPSK | 0,1,2 |
| 5 | QPSK | 3,4,5 |
| 6 | QPSK | 6,7,8 |
| 7 | QPSK | 9,10,11 |
| 8 | QPSK | 0,1,2,3,4,5 |
| 9 | QPSK | 6,7,8,9,10,11 |

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| **Company** | **Agree?** | **Comments** |
| Qualcomm | The change seems necessary | We prefer Alt. 1. We propose a minor editorial change as follows:  , and the allocated subcarriers within the allocated resource block is given in Table 8.1.6-1 where  is the value of the 'resource allocation' field in the scheduling grant. |
| Nokia, NSB | Agree that clarification is needed | We have no strong view and are fine with either alternative. |

# 5 References

1. [RP-171427](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_76/Docs/RP-171427.zip), “Revised WID on Even further enhanced MTC for LTE”, 3GPP TSG RAN Meeting #76, West Palm Beach, USA, June 5-8, 2017.
2. [R1-2008582](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008582.zip), “Clarification on the subcarrier allocation for sub-PRB in CE Mode B,” Ericsson, RAN1 #103-e, Electronic Meeting, October 26th – November 13th 2020.