**3GPP TSG RAN WG1 Meeting #106-e R1-21xxxxx**

**E-Meeting, August 16th – August 27th, 2021**

**Agenda Item: 6**

**Source: Moderator (Huawei)**

**Title: Feature lead summary on 106-e-LTE-6CRs-04**

**Document for: Discussion and Decision**

# Introduction

This documents provides the summary of discussions on the corresponding email discussion, regarding the proposed CR in [1].

[106-e-LTE-6CRs-04] Email discussion/approval on distinguishing between PUR and SPS PUSCH for eMTC ([R1-2108194](file:///C:\\Users\\Docs\\R1-2108194.zip)) – Yubo (Huawei)

* Issue 5: distinguishing between PUR and SPS PUSCH for eMTC
* Discussion and decision by August 18, CR by August 20, final check by August 24

# Discussion

In [1], a correction to distinguish between PUSCH in PUR and SPS PUSCH for eMTC is proposed, with following motivation.

*When PUR was introduced, the term “PUSCH transmission using a preconfigured uplink resource” is used to refer to a PUR PUSCH. However, as there is no corresponding MPDCCH for a PUR PUSCH either, the term “PUSCH without a corresponding MPDCCH” also covers the PUR PUSCH. As a result, there is ambiguity between PUR PUSCH and SPS PUSCH in the spec.*

A TP is proposed:

=========================**Text proposal to TS 36.213**==============================

8.0 UE procedure for transmitting the physical uplink shared channel

<Unchanged part omitted>

For BL/CE UEs, the set of BL/CE UL subframes is indicated as follows

- If UL resource reservation is enabled for the UE as specified in [11],

- for PUSCH transmission associated with C-RNTI or SPS C-RNTI using UE-specific MPDCCH search space including PUSCH transmission without a corresponding MPDCCH or preconfigured uplink resource,

- if the Resource reservation field in the DCI is set to 0, then the set of BL/CE UL subframes corresponds to all uplink subframes during the PUSCH transmission;

- if the Resource reservation field in the DCI is set to 1, then the set of BL/CE UL subframes corresponds to all uplink subframes that are not fully reserved according to higher layer parameters (a subframe is considered fully reserved if and only if all SC-FDMA symbols of the PUSCH transmission are reserved in the subframe);

- for PUCCH transmission associated with C-RNTI or SPS C-RNTI using UE-specific MPDCCH search space including PUSCH transmission without a corresponding MPDCCH,

- the set of BL/CE UL subframes corresponds to all uplink subframes that are not fully reserved according to higher layer parameters (a subframe is considered fully reserved if and only if all SC-FDMA symbols of the PUCCH transmission are reserved in the subframe).

<Unchanged part omitted>

For BL/CE UEs, and for a PUSCH transmission starting in subframe *n+ k0* without a corresponding MPDCCH or preconfigured uplink resource, the UE shall adjust the PUSCH transmission in subframe(s) *n+ki* with *i = 0, 1, …, N-1,* where

*- 0≤k0<k1<…,kN-1* and the value of  is determined by the *repetition number* field in the activation DCI, where are given in Table 8-2b and Table 8-2c; and

- if the UE is configured with higher layer parameter *ce-PUSCH-SubPRB-Config-r15*, and the PUSCH resource assignment in the activation DCI is using uplink resource allocation type 5,  where  is defined in [3] and  is determined according to procedure in clause 8.1.6,  otherwise

- in case *N>1*, subframe(s) *n+ki* with *i=0,1,…,N-1* are *N* consecutive BL/CE UL subframe(s), and in case *N=1*, *k0=0*;

<Unchanged part omitted>

If a UE is configured by higher layers to decode MPDCCHs with the CRC scrambled by the SPS C-RNTI, the UE shall decode the MPDCCH according to the combination defined in Table 8-5B and transmit the corresponding PUSCH if a transport block corresponding to the HARQ process of the PUSCH transmission is generated as described in [8].   
The scrambling initialization of this PUSCH corresponding to these MPDCCHs and PUSCH retransmission for the same transport block is by SPS C-RNTI. The scrambling initialization of initial transmission of this PUSCH without a corresponding MPDCCH or preconfigured uplink resource and the PUSCH retransmission for the same transport block is by SPS C-RNTI.

======================**End of Text proposal to TS 36.213**===========================

Please input your comment on the motivation and TP above:

|  |  |
| --- | --- |
| Companies | Comments |
| Nokia, NSB | We are OK in principle with the changes. Suggest changing the wording to “or using preconfigured uplink resource”. |
| Ericsson | I think we should add “PUR-RNTI”, I also suggest other updates to cover missing updates (e.g., on PUCCH paragraph) and to make the text more backward compatible:  =========================**Text proposal to TS 36.213**==============================  8.0 UE procedure for transmitting the physical uplink shared channel  <Unchanged part omitted>  For BL/CE UEs, the set of BL/CE UL subframes is indicated as follows  - If UL resource reservation is enabled for the UE as specified in [11],  - for PUSCH transmission associated with C-RNTI or SPS C-RNTI or PUR-RNTI using UE-specific MPDCCH search space including PUSCH transmission without a corresponding MPDCCH or PUSCH (re)transmission corresponding to preconfigured uplink resource,  - if the Resource reservation field in the DCI is set to 0, then the set of BL/CE UL subframes corresponds to all uplink subframes during the PUSCH transmission;  - if the Resource reservation field in the DCI is set to 1, then the set of BL/CE UL subframes corresponds to all uplink subframes that are not fully reserved according to higher layer parameters (a subframe is considered fully reserved if and only if all SC-FDMA symbols of the PUSCH transmission are reserved in the subframe);  - for PUCCH transmission associated with C-RNTI or SPS C-RNTI or PUR-RNTI using UE-specific MPDCCH search space including PUSCH transmission without a corresponding MPDCCH or PUSCH (re)transmission corresponding to preconfigured uplink resource,  - the set of BL/CE UL subframes corresponds to all uplink subframes that are not fully reserved according to higher layer parameters (a subframe is considered fully reserved if and only if all SC-FDMA symbols of the PUCCH transmission are reserved in the subframe).  <Unchanged part omitted>  For BL/CE UEs, and for a PUSCH transmission starting in subframe *n+ k0* without a corresponding MPDCCH or PUSCH (re)transmission corresponding to preconfigured uplink resource, the UE shall adjust the PUSCH transmission in subframe(s) *n+ki* with *i = 0, 1, …, N-1,* where  *- 0≤k0<k1<…,kN-1* and the value of  is determined by the *repetition number* field in the activation DCI, where are given in Table 8-2b and Table 8-2c; and  - if the UE is configured with higher layer parameter *ce-PUSCH-SubPRB-Config-r15*, and the PUSCH resource assignment in the activation DCI is using uplink resource allocation type 5,  where  is defined in [3] and  is determined according to procedure in clause 8.1.6,  otherwise  - in case *N>1*, subframe(s) *n+ki* with *i=0,1,…,N-1* are *N* consecutive BL/CE UL subframe(s), and in case *N=1*, *k0=0*;  <Unchanged part omitted>  If a UE is configured by higher layers to decode MPDCCHs with the CRC scrambled by the SPS C-RNTI, the UE shall decode the MPDCCH according to the combination defined in Table 8-5B and transmit the corresponding PUSCH if a transport block corresponding to the HARQ process of the PUSCH transmission is generated as described in [8].  The scrambling initialization of this PUSCH corresponding to these MPDCCHs and PUSCH retransmission for the same transport block is by SPS C-RNTI. The scrambling initialization of initial transmission of this PUSCH without a corresponding MPDCCH or this PUSCH transmission corresponding to preconfigured uplink resource and the PUSCH retransmission or PUSCH retransmission corresponding to preconfigured uplink resource for the same transport block is by SPS C-RNTI or PUR-RNTI.  ======================**End of Text proposal to TS 36.213**=========================== |
| Lenovo, MotoM | We agree the CR with update from E/// in general except the following one.   1. N should be determined by higher layer, which is specified in   For a PUSCH transmission using preconfigured uplink resource, the UE shall use the repetition number configured by higher layers.  *0≤k0<k1<…,kN-1* and the value of  is determined by the *repetition number* field in the activation DCI, where are given in Table 8-2b and Table 8-2c; and   1. It seems the PUSCH is associated with SPS C-RNTI, so the PUSCH in PUR is excluded.   If a UE is configured by higher layers to decode MPDCCHs with the CRC scrambled by the SPS C-RNTI, the UE shall decode the MPDCCH according to the combination defined in Table 8-5B and transmit the corresponding PUSCH if a transport block corresponding to the HARQ process of the PUSCH transmission is generated as described in [8].  The scrambling initialization of this PUSCH corresponding to these MPDCCHs and PUSCH retransmission for the same transport block is by SPS C-RNTI. The scrambling initialization of initial transmission of this PUSCH without a corresponding MPDCCH |
| Qualcomm | We are a bit confused with the intention of this CR. The authors argue that “without a corresponding MPDCCH” includes PUR, but we do not share that view. Following the same logic, you could argue that msg3 is also included in “without a corresponding MPDCCH”, since it is scheduled from RAR.  In more details:  - The first change, regarding resource reservation, seems unnecessary, since the following is always false: *If UL resource reservation is enabled for the UE as specified in [11]* (in our understanding, there is no support of resource reservation during PUR procedure, since the configuration is only in unicast RRC).  - The second change is incorrect, since there is no activation DCI.  - The third change essentially says that we should use SPS C-RNTI for the scrambling of PUR transmission, which is obviously incorrect. |
| Ericsson v006 | We think Qualcomm has raised good points. It seems that a good starting point is to answer the question on whether the statement “*without a corresponding MPDCCH*” encompasses PUR or not. Maybe the proponent can comment on it. |
| ZTE, Sanechips | 3 paragraphs above can be marked as TP1, TP2, TP3 for discussion convenience.  For the TP1, UL resource reservation is not supported for PUR. Therefore, ‘If UL resource reservation is enabled’ indicates the following description actually exclude the PUR case. TP1 only refers to the non-PUR case.  For the TP2, before this, the spec actually specified the PUR repetition case:   |  | | --- | | For BL/CE UEs, PUSCH transmission can be scheduled by a MPDCCH with DCI format 6-0A/6-0B, or the transmission can correspond to using preconfigured uplink resource configured by higher layers. Transmission using preconfigured uplink resource is initiated by higher layers as specified in [14], while retransmission of transport blocks transmitted using preconfigured uplink resource are scheduled by a MPDCCH with DCI format 6-0A/6-0B.  For a PUSCH transmission using preconfigured uplink resource, the UE shall use the repetition number configured by higher layers. |   Moreover, the *repetition number* field in the activation DCI actually refers to the SPS and would not refer to PUR case.  *- 0≤k0<k1<…,kN-1* and the value of  is determined by the *repetition number* field in the activation DCI, where are given in Table 8-2b and Table 8-2c; and  Therefore, the explicit modification to exclude the PUR case here is not needed.  For the TP3, there already exist the scrambling initialization description for PUR in subclause8.0 of TS36.213 as following   |  | | --- | | A UE may transmit PUSCH on preconfigured uplink resources as configured by higher layers. The scrambling initialization of PUSCH transmission using preconfigured uplink resource is by PUR-RNTI. |   Moreover, similar with Lenovo and Qualcomm, the current spec refers to the SPS-C-RNTI, which is quite clear. Therefore we do not need a modification here. |
| Huawei, HiSilicon | Regarding QC’s comment, I think msg3 is different with PUR that although msg3 is scheduled by RAR, but it does have a related MPDCCH scheduling the RAR.  On the comments for the TP from QC/ZTE, the behavior is specified by the spec, if we didn’t exclude PUR from the proposed changes, then there would be ambiguity on PUR behavior on the following aspects:   * TP1: PUR doesn’t support resource reservation, then without the change it would imply PUR does; * TP2: PUR doesn’t have activation DCI, then without the change it would imply PUR does   Regarding TP3, as pointed by ZTE, the PUR behavior has been specified, so the change may not be needed. |
| Lenovo, MotoM | Based on the discussion above, we prefer to keep the original text.  We have definition of PUSCH without a corresponding MPDCCH in TS36.213 section 8.0, this PUSCH is scrambled by SPS C-RNTI. So PUSCH without a corresponding MPDCCH is not related to PUR at all.  *If a UE is configured by higher layers to decode MPDCCHs with the CRC scrambled by the SPS C-RNTI, the UE shall decode the MPDCCH according to the combination defined in Table 8-5B and transmit the corresponding PUSCH if a transport block corresponding to the HARQ process of the PUSCH transmission is generated as described in [8]. The scrambling initialization of this PUSCH corresponding to these MPDCCHs and PUSCH retransmission for the same transport block is by SPS C-RNTI. The scrambling initialization of initial transmission of this PUSCH without a corresponding MPDCCH and the PUSCH retransmission for the same transport block is by SPS C-RNTI.* |
| Qualcomm | To reply to Huawei’s comments:  “TP1: PUR doesn’t support resource reservation, then without the change it would imply PUR does”  [QC] If you execute the instructions in the spec “line by line”, the UE will never reach the modified text in the spec. The format of that clause is:  *If (resource reservation){*  *// Changes are here*  *}*  Since the condition is always false for PUR, there is no need to modify anything.  *TP2: PUR doesn’t have activation DCI, then without the change it would imply PUR does*  [QC] Following a similar logic, the modified text now is  *if (SPS or PUR){*  *N = value in activated DCI*  *}*  So, with the change, the condition will evaluate to “true” in the case of PUR, and then we would need to use the value in the activation DCI, which does not exist for PUR.  In our view, the CR in its current state is not only not needed, but would make things worse. |
| ZTE, Sanechips | For TP1, according to the current spec description, the resource reservation only can be enabled by the high layer parameter for the UE in connected mode. Additionally, it is no where to be found that the resource reservation can be configured by PUR configuration. Therefore, the spec actually explicitly indicates the resource reservation is note supported for PUR. And this change of TP is not needed.  For TP2, similarly, the SPS is scheduled in the connected model. However, the PUR is transmitted in the idle mode. Obviously, the SPS related description would not include PUR case.  Therefore, TP1 and TP2 also are not needed. |

# Summary

# References

1. R1-2108194 Discussion on distinguishing between PUR and SPS PUSCH for eMTC Huawei, HiSilicon