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

e-Meeting, August 17th – 28th, 2020

Agenda Item: 6.2.1

Source: Moderator (Ericsson)

Title: FL summary #1 for Multi-TB minor corrections for LTE-MTC

Document for: Discussion, Decision

# Introduction

This document provides a summary of the following RAN1 email discussion.

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| * [102-e-LTE-eMTC5-04] Email discussion #4: Multi-TB minor corrections – Johan (Ericsson)   + Correction of number of HARQ processes in TDD CE mode B ([R1-2005470](https://protect2.fireeye.com/v1/url?k=aead44cc-f37e1843-aeaccf83-0cc47a31ce52-30bf37a20506996d&q=1&e=35232f27-e789-49d1-b99b-5a16147b2dfd&u=http%3A%2F%2Fwww.3gpp.org%2Fftp%2FTSG_RAN%2FWG1_RL1%2FTSGR1_102-e%2FDocs%2FR1-2005470.zip) section 2.2)   + Editorial changes ([R1-2005470](https://protect2.fireeye.com/v1/url?k=ac0a7b72-f1d927fd-ac0bf03d-0cc47a31ce52-dddfc8c4b8127179&q=1&e=35232f27-e789-49d1-b99b-5a16147b2dfd&u=http%3A%2F%2Fwww.3gpp.org%2Fftp%2FTSG_RAN%2FWG1_RL1%2FTSGR1_102-e%2FDocs%2FR1-2005470.zip) section 2.3, not the TDD grouping related changes)   + Omission of multi-TB and PUR for spanning of PUSCH transmission ([R1-2006418](https://protect2.fireeye.com/v1/url?k=af1b444a-f2c818c5-af1acf05-0cc47a31ce52-18db3963eb1d79f9&q=1&e=35232f27-e789-49d1-b99b-5a16147b2dfd&u=http%3A%2F%2Fwww.3gpp.org%2Fftp%2FTSG_RAN%2FWG1_RL1%2FTSGR1_102-e%2FDocs%2FR1-2006418.zip) section 2)   + Editorial changes ([R1-2006418](https://protect2.fireeye.com/v1/url?k=0fdbeb3d-5208b7b2-0fda6072-0cc47a31ce52-aa3981c450f3c3ef&q=1&e=35232f27-e789-49d1-b99b-5a16147b2dfd&u=http%3A%2F%2Fwww.3gpp.org%2Fftp%2FTSG_RAN%2FWG1_RL1%2FTSGR1_102-e%2FDocs%2FR1-2006418.zip) section 3)   + Missing ‘else’ ([R1-2006471](https://protect2.fireeye.com/v1/url?k=1e379664-43e4caeb-1e361d2b-0cc47a31ce52-88781f51bbe10e1d&q=1&e=35232f27-e789-49d1-b99b-5a16147b2dfd&u=http%3A%2F%2Fwww.3gpp.org%2Fftp%2FTSG_RAN%2FWG1_RL1%2FTSGR1_102-e%2FDocs%2FR1-2006471.zip) issue #2)   + Discussions/Agreements by 8/19, TPs by 8/24 |

# Issue #1: Number of HARQ processes in TDD CE mode B

According to earlier RAN1 agreements [4], the maximum number of TBs that can be scheduled with a single DCI is 4 for CE mode B. Contribution [1] proposes that the specification text in 36.213 for the TDD case is updated to reflect this.

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| 8.0 UE procedure for transmitting the physical uplink shared channel **<Unchanged parts are omitted>**  For a BL/CE UE configured with CEModeA and for TDD, the maximum number of HARQ processes per serving cell shall be determined by the UL/DL configuration (Table 4.2-2 of [3]) according to the normal HARQ operation in Table 8-1. For TDD a BL/CE UE configured with CEModeB is not expected to support more than 4 uplink HARQ processes per serving cell if the UE is configured with higher layer parameter *multi-TB-UL-config,* 2 uplink HARQ processes per serving cell otherwise.  **<Unchanged parts are omitted>** |

Companies are invited to provide their comments on the text proposal.

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| **Company** | **Comments** |
| Lenovo&MotoM | We are OK with the proposal in general. Please note the parameter name  For a BL/CE UE configured with CEModeA and for TDD, the maximum number of HARQ processes per serving cell shall be determined by the UL/DL configuration (Table 4.2-2 of [3]) according to the normal HARQ operation in Table 8-1. For TDD a BL/CE UE configured with CEModeB is not expected to support more than 4 uplink HARQ processes per serving cell if the UE is configured with higher layer parameter *ce-PUSCH-MultiTB-Config,* 2 uplink HARQ processes per serving cell otherwise. |
| Qualcomm | Agree with Lenovo |
| Ericsson | Fine in principle, although it would be nice if the proposed text could be rephrased in a more reader-friendly way. |
| Nokia, NSB | Agree with Lenovo |
| ZTE, Sanechips | Fine with the further change from Lenovo. |
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# Issue #2: Editorial changes in DL TBS determination

Contribution [1] proposes some corrections of the specification text in 36.213 for the DL TBS determination.

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| 7.1.7.2 Transport block size determination **<Unchanged parts are omitted>**  For a BL/CE UE, if the UE is configured with higher layer parameter *multi-TB-DL-config* and multiple TB, , are scheduled in the corresponding DCI with CRC scrambled by C-RNTI, the HARQ process ID for each of the scheduled  TBs are determined from the value of the HARQ index field in the corresponding DCI which is a combinatorial index *r* defined as , where  **<Unchanged parts are omitted>** |

Companies are invited to provide their comments on the text proposal.

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| **Company** | **Comments** |
| Lenovo&MotoM | In TS36.212, HARQ process determination with  only for the case of N\_TB other than 1 and 8 are defined in TS36.213.  The HARQ process determination for case of N\_TB is defined in the following text in TS36.213  And we are OK to the typo of “corresponding”  - Scheduling TBs for Unicast – 12 bits. [...]  - If one TB is scheduled  - 5 bits set to zero  - HARQ process number – 3 bits  - If two TBs are scheduled  - 2 bits set to zero  - HARQ index with offset – 6 bits provide the HARQ index + offset, with an offset of +8 and HARQ index as defined in 7.1.7.2 of [3]  - If four TBs are scheduled  - 1 bit set to zero  - HARQ index with offset – 7 bits provide the HARQ index + offset, with an offset of +36 and HARQ index as defined in 7.1.7.2 of [3]  - If six TBs are scheduled  - HARQ index with offset – 6 bits provide the HARQ index + offset, with an offset of +27 and HARQ index as defined in 7.1.7.2 of [3]  - If eight TBs are scheduled  - 3 bits set to one |
| Qualcomm | We are a bit confused by this proposal – the TP with respect to x5470 is incomplete.  A couple of extra comments:   * The description of 8 TBs is in issue #4 (should not be deleted). The “<=” change is not needed. * The RRC parameter should be changed to *CE-PDSCH-MultiTB-Config*. * We are OK with the typo correction. * On the main change for this proposal (allowing overlapped set of HARQ processes for k=0 and k=1), we do not think it is an essential correction, although we agree with the proponent that it leads to a wastage of bits in the DCI. We are willing to go with the majority view on this change (note that, if this change is made, it should be also propagated to the case in Issue #4)   + Note that there are two issues #4, we refer to the 2nd one. |
| Ericsson | Since this specification text seems to cause some confusion (if memory serves right, we’ve discussed it also in previous meetings), perhaps it would be good to clarify in 36.213 that part of the behavior is specified in 36.212. |
| Nokia, NSB | We are OK with the typo correction on “corresponding”.  On the main issue, we don’t have a strong view here. The proposal is an optimization and therefore not really necessary. So our slight preference is that we don’t accept this proposal, but we are also willing to go with the proposal if that is the majority view. |
| ZTE,Sanechips | 1.First of all, the formula change  corresponds to TDD grouping. Note the second group contains the left HARQ processes is not consistent with the agreement description in RAN1 #99 meeting ‘*two groups with 8 HARQ process per each group’.* on the other hand, if each group contains 8 HARQ processes ,there are more scheduling flexibility, less DCI bits waste and PDCCH resource saving. This is shown in following figure  捕获2  2. We agree the RRC parameter should be *CE-PDSCH-MultiTB-Config*  3. The current way of description regarding maybe OK but this could create big confusion. |
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# Issue #3: Multi-TB and PUR spanning PUSCH transmission

Contribution [2] proposes to correct an omission of multi-TB and PUR for spanning of PUSCH transmission in the specification text in 36.211 for the mapping to physical resources for PUSCH.

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| 5.3.4 Mapping to physical resources **<Unchanged parts are omitted>**  - In case the UE is a BL/CE UE configured with higher layer parameter *ce-PUSCH-SubPRB-Config-r15* or *subPRB-Allocation* in *PUR-PUSCH-Config*, the PUSCH transmission spans consecutive subframes including subframes that are not BL/CE UL subframes where the UE postpones the PUSCH transmission.  **<Unchanged parts are omitted>** |

Companies are invited to provide their comments on the text proposal.

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| **Company** | **Comments** |
| Lenovo &MotoM | Agree with the TP |
| Qualcomm | Looks OK. |
| Ericsson | Fine with TP |
| Nokia, NSB | We are fine with the TP |
| ZTE,Sanechips | Agree the need to change here. However, it seems the parameter *NTB* is present only if *ce-PUSCH-MultiTB-Config* is configured. One possible change is as follows:  - In case the UE is a BL/CE UE configured with higher layer parameter *ce-PUSCH-SubPRB-Config-r15* or *subPRB-Allocation* in *PUR-PUSCH-Config*, the PUSCH transmission spans consecutive subframes including subframes that are not BL/CE UL subframes where the UE postpones the PUSCH transmission. If *ce-PUSCH-MultiTB-Config* is enabled and multiple TBs are scheduled, *H* is the number of scheduled TBs, otherwise . |
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# Issue #4: More editorial changes in DL TBS determination

Contribution [2] proposes some further corrections of the specification text in 36.213 for the DL TBS determination and PDSCH subframe assignment.

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| 7.1.7.2 Transport block size determination **<Unchanged parts are omitted>**  For a BL/CE UE, if the UE is configured with higher layer parameter *ce-PDSCH-MultiTB-Config* and multiple TB, , are scheduled in the corresponding DCI with CRC scrambled by C-RNTI, the HARQ process ID for each of the scheduled  TBs are determined from the value of the ‘HARQ index with offset’ in the ‘Scheduling TBs for Unicast’ field for CEmodeA or the HARQ index in the ‘Scheduling TBs for Unicast’ field for CEmodeB in the corresponding DCI which is a combinatorial index *r* defined as , where  - the set , () contains the sorted HARQ process IDs and  is the extended binomial coefficient, resulting in unique label ,  - is the offset value as defined in 5.3.3.1.12 of [4] for CE mode A, and for CEmodeB,  -  is the number of scheduled TB, and  -  if UE is configured with CEModeA, and  if UE is configured with CEModeB,  -  if UE is configured with CEModeA, and ‘Multi-TB HARQ processes group’ field is present and set to '1' in the corresponding DCI,  otherwise.  The NDI and HARQ process ID, as signalled on PDCCH/EPDCCH/MPDCCH/SPDCCH, and the TBS, as determined above, shall be delivered to higher layers.  **<Unchanged parts are omitted>** 7.1.11 PDSCH subframe assignment for BL/CE UE A BL/CE UE shall upon detection of a MPDCCH with DCI format 6-1A/6-1B/6-2 intended for the UE, decode the corresponding PDSCH in subframe(s) *n+ki* with *i = 0, 1, …, NTBN-1* according to the MPDCCH, where  - subframe *n* is the last subframe in which the MPDCCH is transmitted and is determined from the starting subframe of MPDCCH transmission and the DCI subframe repetition number field in the corresponding DCI;  - the value of is the number of scheduled TB determined in the corresponding DCI if present, otherwise;  - subframe(s) *ni* = *n+ki* with *i=0,1,…, NTBN-1* are *NTBN* consecutive BL/CE DL subframe(s) where,  , the value of  is determined by the repetition number field in the corresponding DCI, where  are given in Table 7.1.11-1, Table 7.1.11-2 and Table 7.1.11-3, respectively and subframe *n+x* is the second BL/CE DL subframe after subframe *n*.  - for ,  - if the UE is configured with higher layer parameter *interleaving* in *ce-PDSCH-MultiTB-Config*, and PDSCH corresponding to a MPDCCH with DCI CRC scrambled by C-RNTI and where  for BL/CE UE configured with CEModeA,  for BL/CE UE configured with CEModeB,  - BL/CE DL subframes  with  are associated with TB*r+*1 ,  - otherwise,  - BL/CE DL subframes  with  are associated with TB*r+*1 ,,  - for  and PDSCH corresponding to an MPDCCH with DCI CRC scrambled by G-RNTI,  - if higher layer parameter *multiTB-Gap* is configured*,* a scheduling gap with a length equal to the indicated value of *multiTB-Gap* is inserted between TB*r* and TB*r+*1, *r=*0,1,2.*..,NTB*-2.  **<Unchanged parts are omitted>** |

Companies are invited to provide their comments on the text proposal.

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| **Company** | **Comments** |
| Lenovo &MotoM | The text should be kept to define the HARQ process determination for N\_TB=8. We can also combine the text (the HARQ process determination for N\_TB=8) to the text (the HARQ process determination for N\_TB other than 1 and 8) if everyone believes that is more readable. |
| Qualcomm | See issue #2. |
| Ericsson | See issue #2 |
| Nokia, NSB | We should keep the text in 7.1.7.2 as it describes the case when maximum number of TBs is kept.  This is also related to issue #2. Currently we have a slight preference not to accept the main proposal in issue #2. Therefore, we need to keep the text in 7.1.7.2.  We are fine with the editorial change in 7.1.11. |
| ZTE,Sanechips | See issue #2. |
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# Issue #5: Missing ‘else’ in UL RV determination

Contribution [3] proposes to insert a missing ‘else’ in the specification text in 36.213 for the UL RV determination.

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| 8.6.1 Modulation order and redundancy version determination **<Unchanged parts are omitted>**  - if is indicated by the corresponding DCI,  for the TB is determined by the 'Redundancy version' in the ‘Scheduling TBs for Unicast’ field in DCI format 6-0A  - else if is indicated by the corresponding DCI, and the HARQ process IDs for each of the scheduled TBs are h1 and h2 (h1<h2),  of the scheduled TB with HARQ process ID h1 is determined by the ‘Redundancy version for TB 1’ in the ‘Scheduling TBs for Unicast’ field in DCI format 6-0A, and  of the scheduled TB with HARQ process ID h2 is determined by  - if the UE is configured with higher layer parameter *pusch-HoppingConfig* set to’on’ and the repetition number field in the DCI indicates PUSCH repetition, the ‘Redundancy version for TB 1’ in the ‘Scheduling TBs for Unicast’ field in DCI format 6-0A  - otherwise the ‘Redundancy version for TB 2’ in the ‘Scheduling TBs for Unicast’ field in DCI format 6-0A  - else if = 4 or 6,  for all schedueld TBs  - else  - if the UE is configured with higher layer parameter *pusch-HoppingConfig* set to 'on' and the repetition number field in the DCI indicates PUSCH repetition,  for all TBs  - otherwise  of all TBs is determined by the ‘Redundancy version for all TBs’ in the ‘Scheduling TBs for Unicast’ field in DCI format 6-0A.  **<Unchanged parts are omitted>** |

Companies are invited to provide their comments on the text proposal.

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| **Company** | **Comments** |
| Lenovo &MotoM | Agree with the TP |
| Qualcomm | Looks OK |
| Ericsson | Fine with TP |
| Nokia, NSB | We are fine with the TP |
| ZTE,Sanechips | Ok with the TP. |
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# References

1. [R1-2005470](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_102-e/Docs/R1-2005470.zip), “Remaining issues on scheduling enhancement for MTC”, ZTE

1. [R1-2006418](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_102-e/Docs/R1-2006418.zip), “Corrections on multi-TB scheduling for eMTC”, Huawei, HiSilicon

1. [R1-2006471](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_102-e/Docs/R1-2006471.zip), “Multi-TB maintenance issues for LTE-MTC”, Ericsson

1. [R1-1913594](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_99/Docs/R1-1913594.zip), “RAN1 agreements for Rel-16 Additional MTC Enhancements for LTE”