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 early termination aspects for LTE-MTC

Document for: Discussion, Decision

# 1 Introduction

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

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| * [102-e-LTE-eMTC5-03] Email discussion #3: Multi-TB early termination aspects – Johan (Ericsson)
	+ Alternative #1: Proposals and TPs in [R1-2005470](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_102-e/Docs/R1-2005470.zip) section 2.1
	+ Alternative #2: Proposals and TPs in [R1-2006188](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_102-e/Docs/R1-2006188.zip) sections 3 and 4
	+ Alternative #3: Proposal and TP in [R1-2006471](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_102-e/Docs/R1-2006471.zip) issue #1
	+ Other alternatives are not precluded.
	+ Discussions/Agreements by 8/21, TPs by 8/28
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# 2 Discussion

According to contributions [1][2][3], some corrections of the specifications for the Rel-16 LTE-MTC feature for UL multi-TB scheduling with early termination of UL transmission, and the contributions present 3 different alternative solutions:

* **Alternative #1: Individual TB feedback**
	+ According to this alternative, individual TB feedback for early termination should be adopted.
	+ Background and TPs for 36.212 and 36.213 are provided in [R1-2005470](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_102-e/Docs/R1-2005470.zip) section 2.1.
* **Alternative #2: Explicit or implicit TB feedback applies to all TBs**
	+ According to this alternative, the TB feedback is explicit or implicit and applies to all TBs.
	+ Background and TPs for 36.213 are provided in [R1-2006188](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_102-e/Docs/R1-2006188.zip) sections 3 and 4.
* **Alternative #3: Explicit TB feedback applies to all TBs**
	+ According to this alternative, the TB feedback is explicit and applies to all TBs.
	+ Background and TPs for 36.213 are provided in [R1-2006471](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_102-e/Docs/R1-2006471.zip) issue #1.

Companies are invited to provide their comments on the alternatives. Other alternatives than the ones listed above are not precluded.

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| **Company** | **Comments** |
| Lenovo&Moto | We prefer Alternative#1. Individual TB feedback can save more power in most cases, especially in interleave scenarios. We don’t think there is benefit of early termination if number of TB is equal to 8 and one TB feedback to all TBs. |
| Qualcomm | I think here we need to discuss two different things:1. Whether we support HARQ-ACK feedback for all TBs only, or also for a subset of TBs.
2. Whether we support HARQ-ACK feedback via explicit ACK only, or also by implicit ACK (i.e., with a new DCI)

For 2), we think both implicit and explicit ACK should be supported. As discussed in the past, the explicit ACK is only useful if the UE buffer is empty – for all other cases, it is more efficient to send a new DCI to schedule new TB(s) (with explicit ACK only, we would need to send a first DCI to ACK the first PUSCH and another one to schedule a second PUSCH).For 1), we think that ACK’ing all TBs should be supported. If ACK for a subset of TB is also supported, in our view, it should be supported by implicit ACK, and not by explicit ACK. Explicit ACK has the following issues:* Cannot schedule new TBs in the locations of the ACK’d TBs.
* There will be gaps in the location of the ACK’d TBs and, therefore, it will take a longer time for the UE to transmit the remaining TBs. Also, the eNB will not be able to do cross-subframe channel estimation.
* There are no DCI savings due to use of explicit ACK – in any case, we need to transmit a DCI to ACK a subset of the TBs. With the implicit ACK, we have full flexibility on scheduling (e.g. we could move to a different narrowband, change number of repetitions, etc.)

In summary, the implicit ACK offers much more flexibility than the explicit ACK, and has none of the drawbacks.So, in our view, the following should be agreed:* Explicit ACK applies to all TBs. Take as baseline for explicit ACK one of the TPs in x6188 (Section 3) or x6471.
* For implicit ACK:
	+ Alt A: Implicit ACK applies to all the TBs always – Take TP2 in x6188 as baseline.
	+ Alt B: Implicit ACK can apply to a subset of the TBs.

Although in our contribution we provided a TP for Alt A, we are open to Alt B as well. |
| ZTE,Sanechips | We have two issues here: 1. Explicit early termination for multiple TB (RAN1 already agree to support): Individual TB feedback or feedback applies to all TBs.
2. Implicit early termination for multiple TB, for this issue, RAN1 never discussed before, and of course never agree to support so far. So for this issue we need to first discuss if it is going to be supported.

We should not mix these two issues.For the first issue, we support individual feedback since the main benefit of this feature is power saving. If the feedback is applied to all TBs, either the use case is very rare, or some unexpected consequence (more RLC retransmission) will happen.For issue two, we are open to discuss it. There might be some benefit of supporting implicit early termination. But since this is the first time this issue has been brought up, we think it’s better to give companies more time to think about it. In anyway, this seems not an urgent issue. |
| Ericsson | (I took the liberty to change the names of Alt 1/2 in Qualcomm’s reply to Alt A/B in order to avoid confusion with the Alternatives 1/2/3 that we are discussing.)The main purpose of the UL scheduling gaps is to provide eNB with an opportunity to schedule other (LTE/NR) users. The UL early termination signal serves two purposes: first, it can be used to stop an UL transmission when eNB has decoded all TBs, and second, it can be used as an abort signal if needed (to quickly free up UL resources for other (LTE/NR) users.These purposes seemed to motivate the introduction of an UL early termination signal, so we agreed to the introduction of a positive HARQ-ACK codeword last year. We are hesitant whether introduction of more advanced functionality for UL early termination is motivated. Therefore, we think x6471 is enough clarification, and we assume that the only reasonable interpretation of current specifications if no change is agreed will anyway be according to x6471.We haven’t given the possibility of an implicit ACK much thought before though (in the multi-TB context), so we are open to discuss further. |
| Nokia, NSB | We don’t have a strong view here. We have a slight preference for Alternative 1 but would be fine also with Alternative 3. |
| Huawei, HiSilicon | We prefer option1 as the individual TB feedback is more beneficial in terms of UE power saving. Regarding implicit feedback, it has not been discussed in the discussion. It seems to me the benefits of UE power saving has already been achieved by explicit feedback, but we are open to discuss it. |
| SONY | In the context of MTBG, the motivation for early termination is for use as an “abort signal”, using Ericsson’s terminology. In earlier releases, we supported early termination of long repetitions for power saving purposes, but that was a different issue.Our view is that the early termination signal should be treated as a NACK: all of the TBs within the MTBG should stop transmission and the UE should not flush its UL buffers. The problem with treating the early termination signal as an ACK is that it would lead to RLC (or some form of higher layer) re-transmissions and we think that this is not desirable.So, in the context of the list of alternatives in the scope of the email discussion, we seem to be in the “other alternatives are not precluded” camp. |
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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. [R1-2006188](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_102-e/Docs/R1-2006188.zip), “Maintenance on multi-TB scheduling”, Qualcomm Incorporated

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