3GPP TSG RAN WG1 #102 R1-200xxxx

e-Meeting, August 17th – 28th, 2020

Source: Moderator (OPPO)

Title: Discussion in Email Thread #4

Agenda Item: 7.2.6

Document for: Discussion and Decision

1. Introduction

Rel-16 enhancement on MIMO WID includes objectives of enhancing multi-TRP/Panel transmission with ideal and non-ideal backhaul. During the work of rel-16, designs for multiple-PDCCH based and single-PDCCH based multi-TRP/Panel transmission were discussed and specified. This document provides the discussion eMIMO email thread#4:

* [102-e-NR-eMIMO-04] Email thread#4 Processing time for URLLC scheme 3:

# Processing Time for URLLC scheme 3

Huawei [1] and Qualcomm [2] discussed issues related with processing time for URLLC scheme 3. Apple and MediaTek suggested to further relaxation of UE processing time for URLLC scheme 3 if some clarification is agreeable and Lenovo/MOT commented to support clarification on PDSCH processing time for scheme3 during the email discussion [3].

Huawei [1] explained that current spec may cause different UE/gNB behavior due to a potential ambiguity. Based on the current spec, the processing time is counted starting from the end of the last PDSCH occasion for scheme 3, but we actually have two interpretations of d1,1:

* Alt-1: The number of allocated PDSCH symbols and overlapping symbols between PDCCH and PDSCH only take into count one of the two PDSCH transmission occasions, i.e. the first PDSCH occasion.
* Alt-2: The number of allocated PDSCH symbols and overlapping symbols between PDCCH and PDSCH take into count the two PDSCH transmission occasions.

Those two alts can give rise to different values of *d1,1*  in both cases a and b explained in the figure below

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Huawei explained that especially for case a with Alt 1, a delay can be larger than an 8-symbol PDSCH in R15 and HARQ-ACK message can be postponed into next slot in Rel-16. Similar observation can be seen for case b. Huawei proposed to go with the understanding of Alt2 and a TP is proposed.

Qualcomm [2] explained that In scheme 3 (‘TDMSchemeA’), there are two repetitions in one slot and it is not clear in current spec that how PDSCH allocation length for the purpose of determining , and the number of overlapping symbols of the scheduling PDCCH and the scheduled PDSCH are determined. They noted that represents “additional delay” for PDSCH processing time with respect to , and due to soft combining in scheme 3, if the processing for the first repetition is delayed, processing of the second repetition should be also delayed. Qualcomm [2] suggested that should be calculated separately for the two repetitions, and the maximum value should be considered. If there is a gap between first repetition and second repetition, StartingSymbolOffsetK can be subtracted from for the first repetition. Denoting and the values calculated for the first and second repetitions, respectively, and the value of StartingSymbolOffsetK, is calculated as .

Apple commented in phase 1 email discussion [3] that:

* based on the current specification, it is based on the first PDSCH occasion. This is the similar issue as scheme 4. The specification is not broken.
* If we discuss the issue, we need to ensure two things
  + There is no discussion for CAP#2, since there is no related capability
  + The outcome needs to be further relaxation of UE processing compared to the current specification instead of tightening the requirement

MediaTek [3] inputted the same view as Apple and they commented that not tightening of processing time.

Based on the comments/explanation inputted by the companies, we have 4 different understanding/proposals on the PDSCH processing time of URLLC scheme 3: no need for clarification and the time is based on the first PDSCH occasion and three different proposals on how to further clarify the PDSCH processing time.

Draft Proposal: About the PDSCH processing time of URLLC scheme 3, down-select one from the following 4 Alts

* **Alt1: no further clarification for URLLC scheme 3 in the Spec is needed, and the PDSCH processing time is based on the first PDSCH occasion in URLLC scheme 3.**
* **Alt-2: The number of allocated PDSCH symbols and overlapping symbols between PDCCH and PDSCH take into count the two PDSCH transmission occasions (proposed by Huawei). The following TP draft proposed by Huawei is sued as starting point.**

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| < Start of the text proposal >  5.3 UE PDSCH processing procedure time  If the first uplink symbol of the PUCCH which carries the HARQ-ACK information, as defined by the assigned HARQ-ACK timing *K1* and the PUCCH resource to be used and including the effect of the timing advance, starts no earlier than at symbol *L1*, where *L1* is defined as the next uplink symbol with its CP starting after after the end of the last symbol of the PDSCH carrying the TB being acknowledged, then the UE shall provide a valid HARQ-ACK message.  *- N1* is based on *µ* of table 5.3-1 and table 5.3-2 for UE processing capability 1 and 2 respectively, where *µ* corresponds to the one of (*µPDCCH*, *µPDSCH*, *µUL*) resulting with the largest *Tproc,1*, where the *µPDCCH* corresponds to the subcarrier spacing of the PDCCH scheduling the PDSCH, the *µPDSCH* corresponds to the subcarrier spacing of the scheduled PDSCH, and *µUL* corresponds to the subcarrier spacing of the uplink channel with which the HARQ-ACK is to be transmitted, and κ is defined in clause 4.1 of [4, TS 38.211].  *-* If the PDSCH DM-RS position for the additional DM-RS in Table 7.4.1.1.2-3 in clause 7.4.1.1.2 of [4, TS 38.211] is then *N1,0=14* inTable 5.3-1*,* otherwise *N1,0=13.*  - If the UE is configured with multiple active component carriers, the first uplink symbol which carries the HARQ-ACK information further includes the effect of timing difference between the component carriers as given in [11, TS 38.133].  - For the PDSCH mapping type A as given in clause 7.4.1.1 of [4, TS 38.211]: if the last symbol of PDSCH is on the *i-*th symbol of the slot where *i* < 7, then *d1,1 = 7 - i*, otherwise *d1,1 = 0*  - The number of PDSCH symbols allocated is 2ⅹL to determine *d1,1* when a UE is configured by higher layer parameter *RepSchemeEnabler* set to *'TDMSchemeA'*, and the UE is indicated with two TCI states in a codepoint of the DCI field '*Transmission Configuration Indication*' and DM-RS port(s) within one CDM group in the DCI field "*Antenna Port(s)*".  - For UE processing capability 1: If the PDSCH is mapping type B as given in clause 7.4.1.1 of [4, TS 38.211], and  - if the number of PDSCH symbols allocated is *L* ≥ 7, then *d1,1* = 0,  - if the number of PDSCH symbols allocated is *L* ≥ 4 and *L* ≤ 6, then *d1,1* = 7- *L.*  - if the number of PDSCH symbols allocated is *L* = *3* then *d1,1 = 3 +* min *(d,1)*, where *d* is the number of overlapping symbols of the scheduling PDCCH and the scheduled PDSCH.  - if the number of PDSCH symbols allocated is 2, then *d1,1* = 3*+d*, where *d* is the number of overlapping symbols of the scheduling PDCCH and the scheduled PDSCH.  < End of the text proposal > |

* **Alt-3: is calculated separately for the two repetitions, and the maximum value is used. If there is a gap between first repetition and second repetition, *StartingSymbolOffsetK* is subtracted from for the first repetition (proposed by Qualcomm [2]). The following TP draft proposed by Qualcomm is used as the starting point.**

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| ============TP for 38.214 Section 5.3====================================  If the first uplink symbol of the PUCCH which carries the HARQ-ACK information, as defined by the assigned HARQ-ACK timing *K1* and the PUCCH resource to be used and including the effect of the timing advance, starts no earlier than at symbol *L1*, where *L1* is defined as the next uplink symbol with its CP starting after  after the end of the last symbol of the PDSCH carrying the TB being acknowledged, then the UE shall provide a valid HARQ-ACK message.  *- N1* is based on *µ* of table 5.3-1 and table 5.3-2 for UE processing capability 1 and 2 respectively, where *µ* corresponds to the one of (*µPDCCH*, *µPDSCH*, *µUL*) resulting with the largest *Tproc,1*, where the *µPDCCH* corresponds to the subcarrier spacing of the PDCCH scheduling the PDSCH, the *µPDSCH* corresponds to the subcarrier spacing of the scheduled PDSCH, and *µUL* corresponds to the subcarrier spacing of the uplink channel with which the HARQ-ACK is to be transmitted, and κ is defined in clause 4.1 of [4, TS 38.211].  *-* If the PDSCH DM-RS position for the additional DM-RS in Table 7.4.1.1.2-3 in clause 7.4.1.1.2 of [4, TS 38.211] is then *N1,0=14* inTable 5.3-1*,* otherwise *N1,0=13.*  - If the UE is configured with multiple active component carriers, the first uplink symbol which carries the HARQ-ACK information further includes the effect of timing difference between the component carriers as given in [11, TS 38.133].  - For the PDSCH mapping type A as given in clause 7.4.1.1 of [4, TS 38.211]: if the last symbol of PDSCH is on the *i-*th symbol of the slot where *i* < 7, then *d1,1 = 7 - i*, otherwise *d1,1 = 0*  - For UE processing capability 1: If the PDSCH is mapping type B as given in clause 7.4.1.1 of [4, TS 38.211], and  - if the number of PDSCH symbols allocated is *L* ≥ 7, then *d1,1* = 0,  - if the number of PDSCH symbols allocated is *L* ≥ 4 and *L* ≤ 6, then *d1,1* = 7- *L.*  - if the number of PDSCH symbols allocated is *L* = *3* then *d1,1 = 3 +* min *(d,1)*, where *d* is the number of overlapping symbols of the scheduling PDCCH and the scheduled PDSCH.  - if the number of PDSCH symbols allocated is 2, then *d1,1* = 3*+d*, where *d* is the number of overlapping symbols of the scheduling PDCCH and the scheduled PDSCH.  - For UE processing capability 2: If the PDSCH is mapping type B as given in clause 7.4.1.1 of [4, TS 38.211],  - if the number of PDSCH symbols allocated is *L* ≥ 7, then *d1,1* = 0,  - if the number of PDSCH symbols allocated is *L* ≥ 3 and *L* ≤ 6, then *d1,1* is the number of overlapping symbols of the scheduling PDCCH and the scheduled PDSCH,  - if the number of PDSCH symbols allocated is 2,  - if the scheduling PDCCH was in a 3-symbol CORESET and the CORESET and the PDSCH had the same starting symbol, then *d1,1* = 3,  - otherwise *d1,1* is the number of overlapping symbols of the scheduling PDCCH and the scheduled PDSCH.  - For a PDSCH that consists of two PDSCH transmission occasions in one slot, , where  - is determined by considering the first PDSCH transmission occasion in the slot, and as described above.  - is determined by considering the second PDSCH transmission occasion in the slot, and as described above.  - is the higher layer parameter *StartingSymbolOffsetK,* if configured; else = 0.  - For UE processing capability 2 with scheduling limitation when *µPDSCH* = 1, if the scheduled RB allocation exceeds 136 RBs, the UE defaults to capability 1 processing time. The UE may skip decoding a number of PDSCHs with last symbol within 10 symbols before the start of a PDSCH that is scheduled to follow Capability 2, if any of those PDSCHs are scheduled with more than 136 RBs with 30kHz SCS and following Capability 1 processing time.  - For a UE that supports capability 2 on a given cell, the processing time according to UE processing capability 2 is applied if the high layer parameter *processingType2Enabled* in *PDSCH-ServingCellConfig* is configured for the cell and set to *enable*.  - If this PUCCH resource is overlapping with another PUCCH or PUSCH resource, then HARQ-ACK is multiplexed following the procedure in clause 9.2.5 of [6, TS 38.213], otherwise the HARQ-ACK message is transmitted on PUCCH.  Otherwise the UE may not provide a valid HARQ-ACK corresponding to the scheduled PDSCH. The value of *Tproc,1* is used both in the case of normal and extended cyclic prefix.  --Unchanged part omitted------------------------ |

* **Alt-4: Further relax the PDSCH processing time for URLLC scheme 3 (proposed by Apple). The following TP draft proposed by Apple is the starting point:**

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| ============================ 38.214 Section 5.3 ============================ 5.3 UE PDSCH processing procedure time < Unchanged parts are omitted >  If the first uplink symbol of the PUCCH which carries the HARQ-ACK information, as defined by the assigned HARQ-ACK timing *K1* and the PUCCH resource to be used and including the effect of the timing advance, starts no earlier than at symbol *L1*, where *L1* is defined as the next uplink symbol with its CP starting after  after the end of the last symbol of the PDSCH carrying the TB being acknowledged, then the UE shall provide a valid HARQ-ACK message.  *- N1* is based on *µ* of table 5.3-1 and table 5.3-2 for UE processing capability 1 and 2 respectively, where *µ* corresponds to the one of (*µPDCCH*, *µPDSCH*, *µUL*) resulting with the largest *Tproc,1*, where the *µPDCCH* corresponds to the subcarrier spacing of the PDCCH scheduling the PDSCH, the *µPDSCH* corresponds to the subcarrier spacing of the scheduled PDSCH, and *µUL* corresponds to the subcarrier spacing of the uplink channel with which the HARQ-ACK is to be transmitted, and κ is defined in clause 4.1 of [4, TS 38.211].  *-* If the PDSCH DM-RS position for the additional DM-RS in Table 7.4.1.1.2-3 in clause 7.4.1.1.2 of [4, TS 38.211] is then *N1,0=14* inTable 5.3-1*,* otherwise *N1,0=13.*  - If the UE is configured with multiple active component carriers, the first uplink symbol which carries the HARQ-ACK information further includes the effect of timing difference between the component carriers as given in [11, TS 38.133].  - For the PDSCH mapping type A as given in clause 7.4.1.1 of [4, TS 38.211]: For a PDSCH that does not consist of two PDSCH transmission occasions in one slot, if the last symbol of PDSCH is on the *i-*th symbol of the slot where *i* < 7, then *d1,1 = 7 - i*, otherwise *d1,1 = 0*  - For UE processing capability 1: For a PDSCH that does not consist of two PDSCH transmission occasions in one slot, if the PDSCH is mapping type B as given in clause 7.4.1.1 of [4, TS 38.211], and  - if the number of PDSCH symbols allocated is *L* ≥ 7, then *d1,1* = 0,  - if the number of PDSCH symbols allocated is *L* ≥ 4 and *L* ≤ 6, then *d1,1* = 7- *L.*  - if the number of PDSCH symbols allocated is *L* = *3* then *d1,1 = 3 +* min *(d,1)*, where *d* is the number of overlapping symbols of the scheduling PDCCH and the scheduled PDSCH.  - if the number of PDSCH symbols allocated is 2, then *d1,1* = 3*+d*, where *d* is the number of overlapping symbols of the scheduling PDCCH and the scheduled PDSCH.  - For UE processing capability 2: For a PDSCH that does not consist of two PDSCH transmission occasions in one slot, if the PDSCH is mapping type B as given in clause 7.4.1.1 of [4, TS 38.211],  - if the number of PDSCH symbols allocated is *L* ≥ 7, then *d1,1* = 0,  - if the number of PDSCH symbols allocated is *L* ≥ 3 and *L* ≤ 6, then *d1,1* is the number of overlapping symbols of the scheduling PDCCH and the scheduled PDSCH,  - if the number of PDSCH symbols allocated is 2,  - if the scheduling PDCCH was in a 3-symbol CORESET and the CORESET and the PDSCH had the same starting symbol, then *d1,1* = 3,  - otherwise *d1,1* is the number of overlapping symbols of the scheduling PDCCH and the scheduled PDSCH.  - For a PDSCH that consists of two PDSCH transmission occasions in one slot, , where  - *N1* is based on *µ* of table 5.3-1, where *µ* corresponds to the one of (*µPDCCH*, *µPDSCH*, *µUL*) resulting with the largest *Tproc,1*, where the *µPDCCH* corresponds to the subcarrier spacing of the PDCCH scheduling the PDSCH, the *µPDSCH* corresponds to the subcarrier spacing of the scheduled PDSCH, and *µUL* corresponds to the subcarrier spacing of the uplink channel with which the HARQ-ACK is to be transmitted.  - is determined by considering the first PDSCH transmission occasion in the slot, and as described above for UE processing capability 1.  - is determined by considering the second PDSCH transmission occasion in the slot, and as described above for UE processing capability 1.  - is the higher layer parameter *StartingSymbolOffsetK-r16,* if configured; else = 0.  - For UE processing capability 2 with scheduling limitation when *µPDSCH* = 1, if the scheduled RB allocation exceeds 136 RBs, the UE defaults to capability 1 processing time. The UE may skip decoding a number of PDSCHs with last symbol within 10 symbols before the start of a PDSCH that is scheduled to follow Capability 2, if any of those PDSCHs are scheduled with more than 136 RBs with 30kHz SCS and following Capability 1 processing time.  < Unchanged parts are omitted > |

Please input your views and comments on these four alternatives:

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| Company | Views and comments |
| QC | We support Alternative 3. Here are the reasons and examples why other alternatives are not preferred or may not work:  The description of Alt1 is not clear. Obviously, the T\_proc,1 does not start after the first repetition (it starts after the last symbol of the second repetition). So, we assume that intention of Alt 1 is to consider the first repetition only for the purpose of d\_1,1 calculation. Assuming this, the issue with Alt1 is that =“*StartingSymbolOffsetK-r16*” is not taken into account. For example, if , then the timeline is not the same as in the case of . In other words, Alt1 results in the same timeline for the following two cases, which is counter-intuitive (UE has more time to process the first repetition in the second case):    Having said that, Alt1 can work, but it is not optimized.  Alt2 is even more problematic as it can actually decrease the d\_1,1 value compared to only processing the first repetition. For example, if L=4, then with Alt2, 2\*L=8 symbols is assumed, which means that d\_1,1=0 always irrespective of number of overlapping symbols of the scheduling PDCCH and the scheduled PDSCH. Then, it is not clear how the UE can process both the first repetition and the second repetition.  Alt4 double counts N1, which is not clear why. N1 is already counted as part of T\_proc,1. Then it is counted again as part d\_1,1. Is this a typo?  Overall, we think Alt3 and Alt1 (based on the above interpretation of Alt1) can both work, but Alt3 is more aligned with the actual UE processing of the two repetitions. Both Alt1 and Alt3 require clarifications in the spec (i.e. not clear why for Alt1, it is mentioned “**no further clarification**”). |
| Apple | First of all, we strongly prefer to leave specification as it is. The specification is not broken, it is the same issue as scheme 4, which is based on the first PDSCH transmission occasion. For TDMSchemeA, the timeline might need further refinement. But this needs commitment from the product team. However, there is no commercial deployment plan for TDMSchemeA, hence there is no reason for UE to even support it due to the lack of IoDT. Discussing this at this stage is not needed.  Secondly, the true issue is not TDMSchemeA, but FDMSchemeB since this time, the UE processing timeline requirement is more problematic. However, this is not to push a design, it is to solve product implementation issue. If there is no product implementation due to the lack of deployment, there is no reason to discuss this at this stage  Lastly, we support Alt 4 next to Alt 1. We have two PDSCH, one is the retransmission of the other. For the PDSCH processing and HARQ-ACK generation, we need N1 and d\_{1,1}. We do not fully understand why for processing the second PDSCH, we do not need N1 anymore.  In summary   * Our first preference Alt 1 (nothing needs to be done) * Our second preference Alt 4 (N1 needs to be counted for both PDSCH occasions) |
| ZTE | For intra-slot TDMed PDSCH repetition, we have already limited the TBS, the maximum layers to simplify UE complexity. Then UE will be able to process the first PDSCH occasion before receiving the second occasion. That is, UE doesn’t need to wait the second occasion when processing the first one.  If d\_1,1 of two repetitions are separately calculated, the the processing time T can also be calculated separately. Thus, for first repetition, the processing timing should count from the last symbol of the first repetition; for the second repetition, the processing timing should count from the last symbol of the second repetition. Then, we can see, the final timing of the second repetition is always after the first one. So for simplicity, it is enough to just base on the last PDSCH occasion:  **Alt.5: the PDSCH processing time is based on the last PDSCH occasion in URLLC scheme 3**  Here one sentence can be included in the end of section 5.3 as  *If two PDSCH occasions are transmitted in one slot, the above procedure is based on the last PDSCH occasion.*  In addition, our second preference is Alt.1. |
| Spreadtrum | Support Alt.3 as our first preference. Our second preference is Alt.1.  Considering soft combing requirement for TDMschemeA, from the perspective of UE, Alt.2 and Alt.5 are not preferred for the reason that they don’t provide enough processing time for the first PDSCH occasion and/or the second PDSCH occasion. For Alt.4, indeed it provides enough processing time for two PDSCH occasions respectively for UE. However, it will enlarge the latency, and may loss the benefit for TDMschemeA. In some degree, Alt.3 is one good tradeoff between UE processing complexity and performance. |
| QC2 | Response to Apple: If the intention of Alt4 is to determine N1 and d\_1,1 separately for the two repetitions, then not sure how the suggested formula in Alt4 works. Note that T\_proc,1 starts after “end of the last symbol of the PDSCH carrying the TB being acknowledged”. It means that with this approach, we should have , which means that . This is different than Alt4 and is more demanding compared to Alt3. If the intention of Alt4 is adding two separate processing times sequentially starting from the end of the first repetition, then it still seems that L (duration of one repetition) is missing from the formula if T\_proc,1 reference start time is end of the second repetition.  However, the above ( based on first interpretation of Alt4 intention explained above) does not take in to account soft combining. The logic behind Alt3 is as follows: If d\_1,1 allows some relaxation for processing timeline for the first repetition, it should be reflected also in the final d\_1,1 relaxation value as it eats into the time processing for the second repetition. It does not mean that 2\*N1 symbols are needed (otherwise for 8 repetitions in Rel. 15 slot aggregation, the timeline should have been 8\*N1).  Response to ZTE: For the reason mentioned above, Alt5 cannot work as number of overlapping symbols of the scheduling PDCCH and the scheduled PDSCH can be much smaller for the second repetition. This means that the relaxation in terms of d\_1,1 (e.g. due to processing DCI when overlaps with PDSCH) is not reflected in the final number. |
| CATT | As mentioned by Apple and Spreadtrum, without any modification, current spec. may not be perfect, but it still works. Therefore, Alt. 1 is our first preference.  However, considering the cases raised by QC, intuitively, timeline for different values of *StartingSymbolOffsetK* should be different. If optimization is to be introduced to reflect such difference, the following approach can be considered as our secondary preference:  **Alt. 6: The number of PDSCH symbols allocated is 2*L*+*StartingSymbolOffsetK* to determine *d1,1* when a UE is configured by higher layer parameter RepSchemeEnabler set to 'TDMSchemeA', and the UE is indicated with two TCI states in a codepoint of the DCI field 'Transmission Configuration Indication' and DM-RS port(s) within one CDM group in the DCI field "Antenna Port(s)".** |
| vivo | We share the same view as most companies that Alt.1 as current spec can work. |
| NEC | If optimization is applied, we think it’s OK to calculate d1,1 separately for each repetition, and we share similar view with ZTE that separate processing time can be calculated and judged for each repetition. For example, if only the processing time for first repetition satisfies, UE is also able to provide a valid HARQ-ACK information. Following alternative can be considered:  **Alt. 7: The PDSCH processing time is based on the first and second PDSCH occasion in URLLC scheme 3 separately, and UE shall provide a valid HARQ-ACK message if at least one processing time for first and second PDSCH occasion satisfies.**  And then, we can discuss how to calculate d1,1 for each repetition separately.  While we also agree current spec (Alt 1) can work, which is our second preference. |
| HW | The processing procedure is almost same between R15 and R16 such as channel estimation and demodulation procedure for each transmission occasion, except that R16 needs an additional processing for soft combining in the decoding procedure of the second transmission occasion. In our view, the main benefit of scheme 3 (i.e. within one slot) compared with scheme 4 (i.e. with two slots) is low latency. So a UE supporting scheme 3 should support efficient HARQ-ACK feedback, e.g. soft combing would not cost too much time so that HARQ-ACK will not be postponed to next slot. That’s the motivation of Alt.2.  Alt 2 is our first preference since the overall processing time is aligned with R15 when the total number of allocated symbols is same. Of cause it will cost some UE implementation complexity for the benefit of URLLC.  As also mentioned by ZTE, the processing of 1st transmission occasion won’t affect the processing of the second one. Therefore Alt.1 is not preferred by adding the impact of processing of 1st transmission on top of the second one. However, Alt 5 can be our second preference. No matter Alt 2 or Alt 5, in our view, at least spec needs to be updated. Based on Alts so far, companies seem to have different interpretations for “the number of PDSCH symbols”. |
| MediaTek | We prefer Alt. 1 as optimization is undesirable at the maintenance stage. Alt. 2 may be too aggressive because it treats processing two transmission occasions equivalent to processing one PDSCH with duration. For Alt. 3, we fail to see the motivation of calculating *d1,1* separately for the second PDCCH transmission occasion, which is more distant from its scheduling PDCCH comparing with the first transmission occasion. Even if optimization is to be considered, we prefer to specify additional processing delay on top of Alt. 2 or Alt.6 from CATT. |
| Ericsson | We agree with HW’s comment that the main benefit of scheme 3 is low latency and to be able to have HARQ ACK feedback in the same slot as the corresponding PDSCH. We also understand QC’s concern on extra UE complexity to achieve this in some cases. As ZTE and some others have pointed out, the TBS size and number of MIMO layers are already constrained for scheme 3, which could perhaps compensate for the extra UE complexity. For that reason, we support Alt. 1.  But one question on Alt. 1. Alt. 1 says ‘the PDSCH processing time is based on the first PDSCH occasion in URLLC scheme 3’. But this needs to be clarified in the specs right? |

1. Reference
2. [R1-2006395](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_102\Docs\R1-2006395.zip) Remaining issues for Multi-TRP in Rel-16 Huawei, HiSilicon
3. [R1-2006781](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_102\Docs\R1-2006781.zip) Multi-TRP Enhancements Qualcomm Incorporated
4. R1-2006979 Summary#2 for Rel.16 NR eMIMO maintenance Moderator (Samsung)