3GPP TSG RAN WG1 #100bis R1-200xxxx

e-Meeting, April 20th – 30th, 2020

Source: vivo

Title: Summary of [100b-e-NR-L1enh-URLLC-InterUE-02]

Agenda Item: 7.2.5.5

Document for: Discussion and Decision

# Introduction

The document provides a summary for RAN1#100bis-e email discussion thread [100b-e-NR-L1enh-URLLC-InterUE-02].

The following issues are to be discussed in this email thread

* **Issue 6: BD limitations for UL CI monitoring**
* **Issue 7: Misaligned RUR start due to different UL SCS used by UEs monitoring the same UL CI**
* **Issue 8: Support of UL CI in the scenarios where processing capability #2 is not defined.**
* **Issue 9: UE deriving the time duration (i.e. ) when the RRC parameter timeDurationForCI-r16 is not provided.**

# Email discussion outcome

# Discussions.

## **Issue 6: BD limitations for UL CI monitoring**

Agreements:

* Up to X BDs can be configured per UL CI monitoring occasion, X to be decided between X=1 or X=2 in RAN1#100bis.

[1][3][4][[6][10][11][12][18] support X=2, [13] is fine with either X=1 or 2.

* **FL suggestion:** To discuss and decide if the following proposal is agreeable.
* Proposal: Up to 2 BDs can be configured per UL CI monitoring occasion

**Please share your views on the following aspects using the table format**

* Is the above proposal agreeable?
* Any other comments?

|  |  |
| --- | --- |
| Company | comments |
| Nokia, NSB | We are fine with the proposal above. |
| HW/HiSi | We support the proposal |
| Panasonic | We agree to the proposal. |
| CATT | We support the proposal. |
| Sony | We agree with the proposal. |
| Apple | We are fine with the proposal |
| Spreadtrum | We agree with the proposal |
| Samsung | Fine with the proposal. Also OK with X=1. |
| ZTE | We support the proposal. |
| LG | We are fine the proposal. |
| MediaTek | We are fine with the proposal. |
| Ericsson | Support the proposal |
| Sharp | We are OK with the proposal. |
| Qualcomm | We prefer X=1. |

## **Issue 7: Misaligned RUR start due to different UL SCS used by UEs monitoring the same UL CI.**

[2] [10] [19]raised the issue that the following highlighted part in specification will cause different RUR starting time when different UEs monitoring the same UL CI have different UL SCSs.

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| --- |
| **11.2A Cancellation indication**  <---------------------------Other parts are omitted ------------------------------->  An indication by a DCI format 2\_4 for a serving cell is applicable to a PUSCH transmission or a SRS transmission on the serving cell. For the serving cell, the UE determines the first symbol of the symbols to be the first symbol that is after from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where is provided by *XXX*. corresponds to the PUSCH processing capability 2 [6, TS 38.214] assuming with being the smallest SCS configuration between the SCS configurations of the PDCCH and of a PUSCH transmission or of an SRS transmission on the serving cell. The UE does not expect to cancel the PUSCH transmission or the SRS transmission before a corresponding symbol that is after a last symbol of a CORESET where the UE detects the DCI format 2\_4.  <---------------------------Other parts are omitted -------------------------------> |

As for solution, replace the “SCS of a PUSCH transmission or of an SRS transmission” by

* Option 1: UL SCS as indicated in *FrequencyInfoUL-SIB* [2]
* Option 2: SCS configuration of an active DL BWP where the UE monitors PDCCH for DCI format 2\_4 detection.[10]

[2] proposed that UE uses the common UL S..CS as indicated in *FrequencyInfoUL-SIB* to determine the RUR starting symbol. The issue seems valid and the proposed solution is straightforward.

Qualcomm has strong concern regarding changing reference SCS to derive the RUR start as there will be undesirable impact to UE timeline and think no change is needed.

TP for option 1

|  |
| --- |
| **11.2A Cancellation indication**  <---------------------------Other parts are omitted ------------------------------->  An indication by a DCI format 2\_4 for a serving cell is applicable to a PUSCH transmission or a SRS transmission on the serving cell. For the serving cell, the UE determines the first symbol of the symbols to be the first symbol that is after from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where is provided by *XXX*. corresponds to the PUSCH processing capability 2 [6, TS 38.214] assuming with being the smallest SCS configuration between the SCS configurations of the PDCCH and SCSs provided in *FrequencyInfoUL-SIB* on the serving cell. The UE does not expect to cancel the PUSCH transmission or the SRS transmission before a corresponding symbol that is after a last symbol of a CORESET where the UE detects the DCI format 2\_4.  <---------------------------Other parts are omitted -------------------------------> |

TP for option 2

|  |
| --- |
| **11.2A Cancellation indication**  <---------------------------Other parts are omitted ------------------------------->  An indication by a DCI format 2\_4 for a serving cell is applicable to a PUSCH transmission or a SRS transmission on the serving cell. For the serving cell, the UE determines the first symbol of the symbols to be the first symbol that is after from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where is provided by *XXX*. corresponds to the PUSCH processing capability 2 [6, TS 38.214] assuming with being the smallest SCS configuration between the SCS configurations of the PDCCH and the SCS configuration of an active DL BWP where the UE monitors PDCCH for DCI format 2\_4 detection on the serving cell. The UE does not expect to cancel the PUSCH transmission or the SRS transmission before a corresponding symbol that is after a last symbol of a CORESET where the UE detects the DCI format 2\_4.  <---------------------------Other parts are omitted -------------------------------> |

* **FL suggestion:** To discuss and decide whether any change is needed and if so option 1 or option 2 and the corresponding TP. To be included in the email discussion.

**Please share your views on the following aspects using the table format**

* Do you think there is an issue to be addressed as discussed above
* If so, which option do you prefer and any comments to the text proposal?
* Any other comments?

|  |  |  |
| --- | --- | --- |
| Company | | comments |
| Nokia, NSB | | As we already use the *FrequencyInfoUL-SIB* for the f-info – then it would make sense to use it equally also for the time-domain determination. So we are currently leaning towards Option 1 here. |
| HW/HiSi | | Is it really necessary to make any changes to specification? Would it be possible to use the UE specific value “d” to compensate for possible RUR starting times?  Otherwise, from the given options, we have a slight preference for Option 1. |
| Panasonic | | We think there is an issue. Our slight preference is Option 1, but OK with Option 2. In Option 2, the UEs who shared the same DCI format 2-4 have the same understanding of UL SCS for UL CI. In Option 1, the linkage to DL SCS is removed and specific SCS can be indicated by SIB. Therefore, Option 1 allows common understanding among UEs with some more flexibility. |
| CATT | | The misaligned RUR starting position is only possible when the SCS of PDCCH carrying CI is larger than that of UL BWP. I am wondering whether it is a typical case.  We slightly prefer to keep the spec as it is. |
| Sony | | We support Option 1. |
| Apple | | We do see that there could be a possible timeline issue at the UE with the solutions proposed (especially in the cross carrier cancellation case) and would prefer to keep the spec as it is. |
| Spreadtrum | | As same as Nokia, we slightly prefer Option 1.  Additionally, it never says “a UE does not expect DL SCS is smaller or equal to UL SCS” in the specification. So a stable method is supported. |
| Samsung | | The overall problem is marginal. It will not occur in practice and, even if it occurs, it can be accommodated by the NW with marginal impact on efficiency. Nevertheless, there is a flaw in the current descriptions and the fix is simple.  Slight preference for option 1. OK with no change. |
| WILUS | | We slightly prefer Option 1. |
| ZTE | We think it is a valid issue and should be addressed.  As mentioned by Spreadtrum, there is no such restriction on “DL SCS is smaller or equal to UL SCS”. Then, according to current description in 38.213, different SCSs will be determined by different UEs if UL SCS of part of UEs are lower than DL SCS. And there will be different understanding on starting point of RUR, which is not desired.  We prefer option 1.  The only question for reusing R15 rule, i.e, using the smallest SCS between DL and UL for timeline determination is that different understanding of UL SCS by different UEs sharing a same UL CI. For unifying the understanding, the smallest SCS of SCSs configured *FrequencyInfoUL-SIB*, which is commonly for all UE in one cell can be considered as UL SCS. Then, is determined as the smallest SCS configuration between the SCS configurations of the PDCCH and SCSs provided in *FrequencyInfoUL-SIB* on the serving cell. | |
| LG | | Why we used FrequencyInfoUL-SIB for frequency domain, there is no shared anchor point among different UEs. In the case of downlink, UE are monitoring same PDCCH in the same DL BWP. Moreover, The time gap between RUR and UL CI reception is derived by the processing time for PDCCH carrying UL CI. Thus, this RUR offset is highly dependent to DL SCS rather than UL SCS. In case of the lower UL SCS, UE may assume unnecessarily long time gap between RUR and UL CI reception, which is harmful in the perspective of URLLC.  In this point of view, we still prefer Option 2. |
| MediaTek | | We have concerns regarding the processing timeline. We believe the issue can be easily addressed by the gNB (e.g. by groping the UEs that configured with the same UL SCS). Thus, we don’t prefer to change the specs as proposed. |
| Ericsson | | We support option 1 and note that d value range should be increased to make option 1 work. Max d value is FFS.  We think that option 2 doesn’t solve the problem while Option 1 can lead to very aggressive RUR placement which cannot be compensated by current range of d value (max is 2 os). See example:   * UE config (UE doesn’t have 30 kHz UL carrier, but it is listed in SIB):   + DL carrier: 60 kHz ->Tproc2 =23os (FR2) ->410,714 µs (PDCCH) (one os = 17µs)   + UL carrier: 60 kHz -> Tproc2=23os (FR2) ->410,714 µs (PUSCH) (one os = 17µs)   + FrequencyInfoUL-SIBincludes 30 kHz SCS *=>* Tproc2 = 196,43 - min SCS (one os = 35,71µs)   Here, either we cannot use some RUR partitions or we need to delay RUR to place it at least 410,714 µs away from PDCCH. In order to shift it 410,714 µs – 196,43 µs = 214,284 µs. Now in 30 kHz SCS symbols: 214,284/35.71 = 6 symbols. |
| Sharp | | We support Option 1. |
| Qualcomm | | We prefer to keep the spec as is. Both Option 1 and Option 2 will have undesired impact on the UE processing timeline. |

## **Issue 8: Support of UL CI in the scenarios where processing capability #2 is not defined.**

**Text proposal 1:** [3][4] [6] proposed that whenever UE processing capability 2 is not defined (for the frequency range, or SCS), use UE processing capability 1 to derive the UL CI processing time. Please checkif the text proposal as in [6] is agreeable.

TP for section 11.2A of TS38.213

------------------------------------------ Start of proposed change ------------------------------------------

An indication by a DCI format 2\_4 for a serving cell is applicable to a PUSCH transmission or a SRS transmission on the serving cell. For the serving cell, the UE determines the first symbol of the symbols to be the first symbol that is after from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where is provided by *XXX*. corresponds to the PUSCH processing capability 2 [6, TS 38.214] assuming with being the smallest SCS configuration between the SCS configurations of the PDCCH and of a PUSCH transmission or of an SRS transmission on the serving cell. Processing capability 1 should be used if processing capability 2 is not defined for a pair of Frequency Range and SCS in [6, TS 38.214]. The UE does not expect to cancel the PUSCH transmission or the SRS transmission before a corresponding symbol that is after a last symbol of a CORESET where the UE detects the DCI format 2\_4.

------------------------------------------- end of proposed change   ------------------------------------------

* **FL suggestion:** To be included in the email discussion.

**Please share your views on the following aspects using the table format**

* Do you think UL CI should be supported for the frequency range/SCS where capability #2 is not defined
* If so, any comments to the text proposal above?
* Any other comments?

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| --- | --- | --- |
| Company | | comments |
| Nokia, NSB | | We think this should be supported.  We are fine with the TP. |
| HW/HiSi | | We are not convinced about the benefits of UL CI in these frequency ranges. At FR2, the eMBB transmission can be expected to be shorter. And in this case, it would be more efficient to schedule the URLLC and eMBB on orthogonal resources. For further discussion, we would like to hear the views of other companies on the applicability of UL CI in FR2. |
| Panasonic | | We agree to the TP. |
| CATT | | We share the same views as HW/HiSi. The only case where processing capability#2 is not defined is that both UL CI and PUSCH are transmitted with SCS=120 kHz on FR2. It’s better to justify what is the benefit of using UL cancellation in this case. |
| Sony | | We support the proposal and the TP. |
| Apple | | We agree with Huawei that the benefits of UL CI in these frequency ranges may not be much given the increased SCS (reduced symbol lengths) and increased bandwidths. |
| Spreadtrum | | If we can achieve a conclusion that UL CI only applied to FR1, it is OK to keep the spec as it is. Otherwise, it is better to accept the proposal and TP.  We don't have strong views for this issue, either way is fine. |
| Samsung | | Same views as HW/HiSi and CATT. |
| WILUS | | If UL CI is only applicable to FR1, then the current spec is enough, i.e., no spec update. Otherwise, agree with the TP. So, before discussing the TP, it would be better to discuss whether to use UL CI on FR2. From our perspective, we see no strong motivations/use cases/benefits of UL CI on FR2. |
| ZTE | We share the views from HW/HiSi. | |
| LG | | We don’t have strong view on applicability of UL CI on FR2. If it is applicable, we are fine with the TP. |
| MediaTek | | We don’t see the motivation for UL CI in FR2. We think it is better to exclude FR2 from UL CI feature. |
| Ericsson | | We support the TP |
| Qualcomm | | In our view, whether ULCI applies to FR2 should be discussed under UE feature. If indeed it is applicable, we are fine with the TP. |

## **Issue 9: UE deriving the time duration (i.e. ) when the RRC parameter timeDurationForCI-r16 is not provided.**

Based on the previous agreement and current RRC specification, RRC parameter *timeDurationForCI-r16* will not be provided if the UL CI monitoring periodicity is larger than 1 slot or 1 slot with only one monitoring occasion.

The following has been captured in RRC specification and it seems the intended behaviour has been captured already in RRC

|  |
| --- |
| ***timeDurationForCI***  Configures the duration of the reference time region in symbols where a detected UL CI is applicable of this serving cell (servingCellId) (see TS 38.213 [13], clause 11.5). If the configured UL CI monitoring periodicity is larger than 1 slot or 1 slot with only one monitoring occasion, the UE applies the same as the configured UL CI monitoring periodicity,  Editor 'note: FFS on n14 for *timeDurationForCI*. |

[2][3] [20] proposed to capture also in the RAN1 spec to avoid any misunderstanding. Please check if the following text proposal is agreeable.

|  |
| --- |
| ---------------------------------**Text proposal #1 starts for TS 38.213, Section 11.2A** --------------------------------  =====omitted text ======  For a serving cell having an associated field in DCI format 2\_4, for the field denote by  - a number of bits provided by *CI-PayloadSize*  - a number of PRBs provided by *frequencyRegionforCI* in *timeFrequencyRegion*  - a number of symbols, excluding symbols for reception of SS/PBCH blocks and DL symbols indicated by *tdd-UL-DL-ConfigurationCommon*, provided by *timeDurationforCI* in *timeFrequencyRegion* if the configured UL CI monitoring periodicity is 1 slot with more than one monitoring occasions, otherwise, the time duration equals to the PDCCH monitoring periodicity provided by the value of *monitoringSlotPeriodicityAndOffset,* as described in Clause 10.1.  - a number of partitions for the symbols provided by *timeGranularityforCI* in *timeFrequencyRegion*  =====omitted text ======  ------------------------------- **Text proposal #1 ends for TS 38.213, Section 11.2A** ----------------------------------- |

* **FL suggestion:** To discuss and decide if the above TP is agreeable. To be included in the email discussion.

**Please share your views on the following aspects using the table format**

* Do you think 38.213 should updated for this issue?
* If so, any comments to the text proposal above?
* Any other comments?

|  |  |
| --- | --- |
| Company | comments |
| Nokia, NSB | We think it would be good to clarify this (i.e. specs change needed).  On the details – some suggested editorial changes. Maybe worth splitting in two sentences would help to make clear and that we always refer here to T\_CI symbols.  Something like:  - a number of symbols, excluding symbols for reception of SS/PBCH blocks and DL symbols indicated by *tdd-UL-DL-ConfigurationCommon.* If the configured UL CI monitoring periodicity is 1 slot with more than one monitoring occasions, *TCI* is provided by *timeDurationforCI* in *timeFrequencyRegion*. Otherwise, *TCI* is given by the number of symbols of the PDCCH monitoring periodicity provided by the value of *monitoringSlotPeriodicityAndOffset,* as described in Clause 10.1. |
| Panasonic | We agree to the TP. |
| CATT | We are fine with the proposal and the update from Nokia. |
| Sony | We think this should be clarified. Nokia’s suggested text is clearer as there the word “time duration” can be misleading. |
| Apple | We are fine with Nokia’s update to the proposal. |
| Spreadtrum | We are fine with the proposal and the update from Nokia. |
| Samsung | OK with the proposal with some additional editorial revisions to the update from Nokia.  - a number of symbols, excluding symbols for reception of SS/PBCH blocks and DL symbols indicated by *tdd-UL-DL-ConfigurationCommon.* If the PDCCH monitoring periodicity provided by *monitoringSlotPeriodicityAndOffset* for detection of DCI format 2\_4 is 1 slot and there are more than one PDCCH monitoring occasions per slot, *TCI* is provided by *timeDurationforCI* in *timeFrequencyRegion*; otherwise, *TCI* is equal to the PDCCH monitoring periodicity. |
| WILUS | Note that the comments is based on the following updated TP from the feature leader (distributed in RAN1 reflector)  - a number of symbols, excluding symbols for reception of SS/PBCH blocks and DL symbols indicated by *tdd-UL-DL-ConfigurationCommon*, from the time duration provided by *timeDurationforCI* in *timeFrequencyRegion* if the configured UL CI monitoring periodicity is 1 slot with more than one monitoring occasions. Otherwise, the time duration is equal to the PDCCH monitoring periodicity provided by the value of *monitoringSlotPeriodicityAndOffset*, as described in Clause 10.1.  We think this clarification is necessary and agree to the updated TP from the feature leader.  Similarly as the feature leader mentioned in RAN1 e-main reflector, we have the same concern on the text proposals from Nokia/Samsung. If we say that “*TCI* is equal to the PDCCH monitoring periodicity,” it may make mis-leading that the reference UL region has *TCI* symbols after excluding SS/PBCH and DL symbols. Also, when considering UL SCS may be different from DL SCS, *TCI* symbols is NOT equal to the PDCCH monitoring periodicity. To avoid the mis-leading the update TP from the feature leader (see above) is to use “the time duration” as a set of symbols before excluding SS/PBCH and DL symbols. We think it is clearer. |
| ZTE | We think 38.213 should be updated as missing description on determination in some cases.  And we are fine with the updated TP from FL in the email. |
| LG | We are fine with the updated TP by feature lead which is distributed in RAN1 reflector (brought by WILUS). |
| MediaTek | We are fine with the proposed TP. |
| Ericsson | We support the intention of the TP and think that it is good to clarify this |
| Sharp | We support the updated TP by FL in the email reflector. |
| Qualcomm | We support the intention of the TP, and think it is useful to clarify what means in 38.213. |

# Previous agreements

## **RAN1#96bis**

Working assumption:

* PDCCH is used for UL cancelation indication
  + The Working assumption can be revisited if the DCI for cancelation indication only carry very small number of information bits, e.g. 1 bit.

Agreements:

* Upon detecting an UL cancelation indication, at least stop without resuming is supported
  + FFS whether and how to support stop with resume

Agreements:

* Further discuss which UL transmissions that can potentially be cancelled by the UL cancelation indication, including
  + Dynamic scheduled UL transmissions, including PUSCH, PUCCH, SRS
  + Semi-persistent UL transmissions, including PUSCH, PUCCH, SRS
  + Periodic UL transmissions, including configured grant PUSCH, PUCCH, SRS
  + PRACH

Agreements:

* Further discuss, aiming for down-selection, the group common DCI and UE-specific DCI for UL cancelation indication
  + For group common DCI (different from Rel-15 SFI)
    - UE is configured to monitor a group common DCI which indicates the time/frequency region on which the UL cancellation indication applies
  + For UE specific-DCI
    - When applicable, UE is configured to monitor a second UL grant for the same TB as an earlier PUSCH indicating UL cancellation before the end of the earlier PUSCH transmission. In this case, the UE follows the UL cancellation indication.

**Conclusion**:

* Further discuss the following power control enhancements
  + Increased TPC range
    - FFS details, e.g. supported value range, number of TPC bits, accumulated and/or absolute TPC, configurability of the TPC tables, applicability to SRS/PUCCH.
  + Indication of open-loop parameter sets based on scheduling DCI without using SRI
  + Indication of open-loop parameter sets based on GC-PDCCH

## **RAN1#97**

Agreements:

* Support at least group common DCI for cancelation indication
  + FFS whether or not to additionally support UE-specific DCI for cancelation indication

**Conclusion:**

To down-select from the following options for enhanced power control

* Option 1: Indication of open-loop parameter sets by DCI
* For DG-PUSCH, an open-loop parameter set indicated to the UE by scheduling DCI without using SRI is applied to the scheduled transmission
* FFS At least for single active CG-PUSCH, an open-loop parameter set is indicated to the UE by a UE-specific field in group common DCI
  + - FFS for the case of multiple active CG-PUSCH
* FFS For a UE, the open-loop parameter sets for DG-PUSCH and CG-PUSCH may be same or different
* Option 2: Indication of TPC with increased range by DCI
* For DG-PUSCH, a TPC with increased range is indicated to the UE by the TPC field in scheduling DCI
* FFS At least for single active CG-PUSCH (and potentially also for DG-PUSCH), a TPC with increased range is indicated to the UE by a UE-specific TPC field in group common DCI
  + - FFS for the case of multiple active CG-PUSCH
* At least for DG-PUSCH, for a UE, the number of TPC entries (4 or 8) and power adjustment value for each entry is higher layer configured
* FFS For a UE, the TPC configuration for DG-PUSCH and CG-PUSCH may be same or different
* Option 3:
* For DG-PUSCH, use either the solution from option 1 or option 2 for DG-PUSCH as above
  + - To down-select from option 1 and 2
* FFS At least for single active CG-PUSCH, UE derives the transmissions power based on the time/frequency resource indicated by a group common DCI
  + - If a CG-PUSCH transmission overlaps with the indicated time/frequency resource, UE use one open-loop parameter set with higher power for the transmission
    - If a CG-PUSCH transmission does NOT overlap with the indicated time/frequency resource, UE use another open-loop parameter set with lower power for the transmission
    - FFS for the case of multiple active CG-PUSCH
    - Note: some companies have concern that this was not captured in the TR as one potential solutions

## **RAN1#98**

Agreements:

* Reuse the existing methods for search space configuration to support UL CI monitoring
  + FFS possible restrictions
  + Note: this means both symbol level and slot level monitoring periodicities are possible from specification perspective

Agreements:

* The UE DCI size budget is not increased by UL CI monitoring
* Further discuss methods to reduce the UE monitoring for UL CI, e.g.
  + The number of aggregation levels and/or candidates for the UL CI monitoring should be limited
  + Conditions for eMBB UE UL CI monitoring:
    - For UL transmission with associated PDCCH,
      * Option 1: UE starts UL CI monitoring after the PDCCH is decoded
      * Option 2: UE monitors UL CI at least at the latest monitoring occasion ending no later than X symbols before the start of the UL transmission, and X is related to UL CI processing time.
    - For UL transmission without associated PDCCH, UE monitors UL CI at least at the latest monitoring occasion that ends no later than X symbols before the start of the UL transmission, and X is related to UL CI processing time.
    - Other conditions?
  + Others?
* FFS the enhancement of UE capability (number of non-overlapping CCE and/or blind decodes) for UL CI monitoring

Agreements:

* Upon detecting an UL cancelation indication, for the transmission of UL signal/channels, “stop with resuming” is not supported
  + Except:
    - SRS can still be transmitted on the non-cancelled symbols (conditioned on if SRS can be pre-empted)
    - FFS for the PUSCH repetition (Rel-15 & Rel-16) case
    - FFS for the PUCCH repetition case (conditioned on if PUCCH can be pre-empted)
  + FFS whether another PUSCH can be scheduled in non-pre-empted resource
  + FFS impact (e.g. phase continuity issue) to a different carrier due to UL cancelation

[**R1-1909774**](file:///E:\3GPP%20meetings\WG1_RL1\2019\RAN1%2398bis\R1-1909774.zip)

Agreements:

* The following UL channel/signals can be cancelled by UL cancelation indication
  + PUSCH (including DG-, CG- and SP-)
  + FFS for SRS
  + FFS for PUCCH
    - Option 1: PUCCH (all types) can be cancelled
    - Option 2: Some PUCCH can be cancelled, e.g. PUCCH carrying CSI
    - Option 3: PUCCH cannot be cancelled
  + FFS for PRACH (preamble and/or MSG 3 PUSCH)

Agreements:

* The UE processing time requirement for UL cancelation indication based on N2 defined in Rel-15 UE cap#2 is supported
  + FFS whether the processing time requirement for UL cancelation indication larger than N2 as defined in Rel-15 UE cap#2 can also be supported as an UE capability
  + FFS whether the processing time requirement for UL cancelation indication shorter than N2 as defined in Rel-15 UE cap#2 as can also be supported an UE capability

Agreements:

* For a DG-PUSCH, an open-loop parameter set indicated to the UE by scheduling DCI using a separate field than SRI is supported.
  + FFS number of bits for the indication

## **RAN1#98bis**

Agreements:

* Regarding UL CI monitoring, support the following:
  + A new RNTI (e.g. CI-RNTI) is used for UL CI
  + FFS: Monitoring periodicity larger than [5] slot is not supported for UL CI
  + The aggregation level(s) and the number of PDCCH candidates configured by RRC
    - FFS possible restrictions, e.g., the ones associated with SFI
  + The DCI payload size for UL CI is configured by RRC
    - FFS possible values

Agreements:

* SRS can be cancelled by UL CI
* PUCCH cannot be cancelled by UL CI
* RACH related UL transmissions cannot be cancelled by UL CI, including MSG 1/3 in case of 4-step RACH, MSG A in case of 2-step RACH.

Agreements:

* Cross-carrier UL cancelation indication is supported using the same way as Rel-15 SFI/DL PI
  + The indication field position in DCI for each cross-carrier indicated serving cell is configured by RRC

Agreements:

* Different UE processing time capability for UL CI (i.e. shorter or longer than T\_proc2 for cap#2 UE) is not considered in Rel-16
  + d2,1=0 also when DMRS and UL-SCH (for the PUSCH to be cancelled) are multiplexed in the 1st symbol

Agreements:

* In case of PUSCH repetitions, UL CI is applied to each repetition individually (actual repetition in case of Rel-16 PUSCH repetition) that overlaps with the resource (in time and frequency) indicated by UL CI.

Agreements:

* + The reference time region where a detected UL CI is applicable is determined by the following:
    - * The reference time region starts from X symbols after the ending symbol of the PDCCH CORESET carrying the UL CI, where X is at least equal to the minimum processing time for UL cancelation
        + FFS X can be configured to be larger than the minimum processing time for UL cancelation
      * The duration of the reference time region is configured by RRC
        + FFS Possible values (e.g. 2OS, 4OS, 7OS, 14OS, 28OS?)
      * FFS DL symbols are excluded from the reference time region

Agreements:

* + - The reference frequency region where a detected UL CI is applicable is configured by RRC

Agreements:

Support the following for UL CI

* + Each UL cancelation indicator per serving cell has a RRC configurable field size of X bits
    - * One value of X is 14
      * FFS other values (e.g. X can be N (N>0) times of 7)
  + The time domain granularity for the reference time region is configured by RRC
    - * FFS the possible values (e.g. the time region can be divided into [1],[2],[4],[7],[14],…portions)
      * FFS valid configurations according to the duration of the time reference region
  + The frequency domain granularity is determined based on the configured time domain granularity and the configured bit field size of each indicator
  + The time and frequency resource for cancellation is jointly indicated by a 2D-bitmap (i.e. similar as DL PI) over the time and frequency partitions within the reference region
    - * FFS dynamic 2D-bitmap

Agreements:

* For DG-PUSCH, one bit (separately from SRI) in UL grant is used to indicate the open loop power control parameter set
  + Introduce one new RRC parameter that contains one additional P0-PUSCH-Set per SRI
  + The one bit indication is present in the UL grant when the above new RRC parameter is configured
  + If present, the one bit in the DCI is used to switch between the P0 value from the existing P0-PUSCH-AlphaSet and the P0 value from the newly configured P0-PUSCH-Set

**Conclusion**:

No enhancement for CG-PUSCH power control in Rel-16 for inter-UE multiplexing

## **RAN1#99**

Agreements:

* There is no enhancement to PDCCH monitoring capability (number of BD and non-overlapping CCEs) specifically for UL CI monitoring purpose

Agreements:

* The maximum monitoring periodicity for UL CI is [5] slots

Agreements:

* Up to X BDs can be configured for UL CI
  + FFS per UL CI monitoring occasion or per span
  + The value of X is to be concluded during this week
  + Note: UE is not expected to be configured with search space configuration for UL CI with AL and number of candidates exceeding X BDs

Agreements:

* The maximum size for *dci-PayloadSize-forCI* is 126

Agreements:

* Possible values for RRC parameter *timedurationforCI* can be:
  + If the configured UL CI monitoring periodicity is >1 slot or 1-slot with only one monitoring occasion
    - At least the same as the configured UL CI monitoring periodicity
      * FFS whether or not to additionally support multiple of UL CI monitoring periodicity
  + Otherwise (i.e., >1 monitoring occasion within 1 slot when 1-slot is the configured UL CI monitoring periodicity)
    - {2, 4, 7, [14]} OS, which SCS is used when determine the time duration
      * SCS for the DL BWP carrying UL CI
    - FFS The UE is not expected to be configured with a time duration for CI less than the time different (in symbols) between any adjacent monitoring occasions in a slot

Agreements**:**

* + Possible values (16 values) for RRC parameter *CI-PayloadSize are* 
    - *{[1],2,4,[5],7,8,[10],14,16,[20],[25],28,32,[35],56,112}*
  + *timeGranularityforCI* is defined as number of partitions within the time region, and possible values are
    - *{1,2,4,7,14,28}*
  + The configured value of *CI-PayloadSize* shall be a multiple integer of the configured value of *timeGranularityforCI*

Agreements:

* + The frequency region for UL CI is derived by the following
    - A RIV indication configured by RRC within value range of (0..37949) (i.e. the same way as IE “locationAndBandwidth” for BWP configuration ), the configuration is per serving cell specific
      * The reference point is derived based on the RRC parameter *offsetToCarrier* (existing parameter, same way as BWP configuration)
    - A reference SCS (no RRC configuration) for a serving cell (to handle the case where a UE is configured with multiple BWPs using different SCSs on the serving cell),
      * Use the SCS for the DL BWP carrying UL CI as the reference SCS

Agreements:

* Support per serving cell configuration for the following parameters
* *CI-PayloadSize*
* *timedurationforCI*
* *timeGranularityforCI*
* *frequencyRegionforCI*

Agreements:

* If a serving cell is configured with SUL, each UL carrier (SUL and non-SUL) can be configured with different *positionInDCI.*

Agreements:

* The DL symbols indicated by *tdd-UL-DL-ConfigurationCommon* are excluded from the reference time region for UL CI
  + The partition of reference time region is done after excluding the DL symbols
  + The symbols used for SSB are also excluded

Agreements:

* Clarification of 2D-bitmap
  + 2D-bitmap is to use *X* bits for bitmap indication over a time/frequency region with M partitions in time and N partitions in frequency, and X=M x N

Agreements:

Regarding “FFS whether or not to additionally support multiple of UL CI monitoring periodicity”

* If the configured UL CI monitoring periodicity is >1 slot or 1-slot with only one monitoring occasion, no additionally support that the time duration to be multiple of UL CI monitoring periodicity

Agreement

To determine the P0 value in case SRI is not configured in the DCI

* Option 1A: The open-loop power control parameter set indication field in the DCI can be configurable to be 1 or 2bits
  + *P0-PUSCH-Set can* provide up to two P0 value*s*
    - UE uses the P0 values according to open loop power control indication field in DCI
    - UE use P0 from *P0-PUSCH-AlphaSet* when
      * open-loop power control parameter set indication field is 1bit and “0” is indicated, or
      * open-loop power control parameter set indication field is 2bits and “00” is indicated
  + Open-loop power control parameter set indication field can be separately configurable for DCI format 0\_1 and DCI format 0\_2
    - If open-loop power control parameter set indication field is not present for a DCI format, use P0 from *P0-PUSCH-AlphaSet*
  + A single configuration of P0-PUSCH-Set applies to both DCI format 0\_1 and DCI format 0\_2

## **RAN1#100-e**

Agreements:

* Confirm that 14OS can be configured for timedurationforCI (when 1-slot is the configured UL CI monitoring periodicity with more than one monitoring occasions within 1 slot)
* The possible values for *CI-PayloadSize*, are {1,2,4,5,7,8,10,14,16,20, 28,32,35,42,56,112}

The following TP is endorsed

------------------------------------ Start of TP for 38.213 --------------------------------------------

**11.2A Cancellation indication**

< Unchanged parts are omitted >

For a group of symbols, ** bits from each set of bits have a one-to-one mapping with  groups of PRBs where each of the first ** groups includes ** PRBs and each of the remaining ** groups includes ** PRBs. A UE determines a first PRB index as  and a number of contiguous RBs as  from frequencyRegionforCI that indicates an offset  and a length  as RIV according to [6, TS 38.214], and from offsetToCarrier in FrequencyInfoUL-SIB that indicates  for a SCS configuration of an active DL BWP where the UE monitors PDCCH for DCI format 2\_4 detection.

< Unchanged parts are omitted >

------------------------------------ End of TP for 38.213 --------------------------------------------

Agreements:

* The maximum UL CI monitoring periodicity is 10 slots.
* Up to X BDs can be configured per UL CI monitoring occasion, X to be decided between X=1 or X=2 in RAN1#100bis.

No RAN1 spec impact - RRC parameter update only.

Agreements:

* UE derives the RUR start based on “logical time” (i.e. assuming DL timing difference is 0 and TA=0) and the actual cancellation symbol based on “actual time” (i.e. assuming actual DL timing difference, actual TA)
* A new RRC parameter delta\_offset d having possible values {0, 1, 2} OFDM symbols is introduced, update the spec as the following

|  |
| --- |
| For the serving cell, the UE determines the first symbol of the symbols to be the first symbol that is after + d from the end of a PDCCH reception where the UE detects the DCI format 2\_4.corresponds to the PUSCH processing capability 2 [6, TS 38.214] assuming  with being the smallest SCS configuration between the SCS configurations of the PDCCH and of a PUSCH transmission or of an SRS transmission on the serving cell. |

* Clarify the following by a RAN1 spec update (see below)
  + UE is not expected to cancel the transmission of SRS or PUSCH before the first symbol that is T\_proc,2 after the end of the reception of the last symbol of the PDCCH carrying the ULCI including the effect of the timing advance.

38.213 Text proposal (maybe further refined by spec editor)

|  |
| --- |
| An indication by a DCI format 2\_4 for a serving cell is applicable to PUSCH or SRS transmissions on the serving cell. For the serving cell, the UE determines the first symbol of the symbols to be the first symbol that is after from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where *d* is provided by higher layer parameter [xxxx]. corresponds to the PUSCH processing capability 2 [6, TS 38.214] assuming with being the smallest SCS configuration between the SCS configurations of the PDCCH and of a PUSCH transmission or of an SRS transmission on the serving cell. UE is not expected to cancel the transmission of SRS or PUSCH before the first symbol that is after the end of the reception of the last symbol of the PDCCH carrying the ULCI including the effect of the timing advance. |

Agreements:

* UE performs the UL cancellation based on any detected UL CI, no additional specification for the case of overlapping reference time region for multiple UL CI occasions.
* A cancelled PUSCH transmission by a UE is counted towards the number of PUSCH that a UE can support per slot

Conclusion:

* It is possible for a UE to indicate both  *pa-PhaseDiscontinuityImpacts*  (i.e. 6-23) and the support of UL CI for intra-band UL CA
* For a UE indicates a capability to cancel overlapping PUSCHs on different intra-band serving cells (if any), and the capability of *pa-PhaseDiscontinuityImpacts*, and if the PUSCH on at least one serving cell is cancelled, the UE cancels the (repetition of the) PUSCHs transmission on all other intra-band serving cell(s). The cancellation of the (repetition of the) PUSCH transmission on a the set of intra-band serving cell(s) includes all symbols from the earliest symbol that is overlapping with the first cancelled symbol of the PUSCH on the serving cell for which the DCI format 2\_4 is applicable to.

## **TR 38.824**

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| --- |
| 7.2 Potential enhancements In the following sub-sections, potential enhancements for UL inter UE Tx prioritization/multiplexing are presented. It is recommended to specify both UL cancelation scheme and enhanced UL power control scheme in the work item phase. 7.2.1 UE UL cancelation mechanisms UE UL cancelation mechanisms are considered as one potential enhancement for UL inter-UE Tx prioritization/multiplexing and are studied from several aspects, including the potential mechanisms (e.g. UE UL cancelation/pausing indication, UL continuation indication, UL re-scheduling indication), physical channel/signal used for the UL cancelation indication, UE processing timeline for the UL cancelation indication, UE monitoring behaviours for the UL cancelation indication, UE PDCCH monitoring capability if the UL cancelation indication is by PDCCH, methods to ensure the reliability of the indication for UE UL cancelation.  Either PDCCH or sequence can be considered as potential options for the UL cancelation indication. If PDCCH is used, either group common DCI or UE-specific DCI can be considered as potential options. If sequence is used, either group common sequence or UE-specific sequence can be considered.  The monitoring periodicity for the UL cancelation indication should be configurable by the gNB and UE supporting UL cancelation indication should be able to support more than one monitoring occasions for the UL cancelation indication in a slot. If PDCCH is used, whether the UE PDCCH monitoring capability (number of CCEs/BDs per slot) should be increased is to be further investigated.  The UE processing time for UL cancelation indication should be equal or shorter than N2 defined in Rel-15 UE capability#2.  Upon detecting an UL cancelation indication, UE cancels the corresponding UL transmission. The corresponding UL transmission may include an on-going UL transmission, or an UL transmission that has not been started. After cancelation, the UE may resume the transmission afterwards as one option, or may not resume the transmission afterwards as another option. 7.2.2 Enhanced UL power control Enhanced UL power control is considered as one potential enhancement for UL inter-UE Tx prioritization/multiplexing and the study mainly focuses on enhanced dynamic power boost for URLLC UE, including dynamic change of power control parameters (e.g. P0 and alpha without SRI configured) and enhanced TPC (e.g. increased TPC range and finer granularity). The need of URLLC UE power change during one transmission instance is not envisioned. It is assumed that there is no change of eMBB UE power control scheme in this study item.  Enhanced dynamic power boost for URLLC UE are studied from several aspects, including feasibility of boosting UE power in power limited or interference limited scenarios, physical channel/signal used for the signalling, UE processing timeline for the signalling, UE monitoring behaviours for the signalling, UE PDCCH monitoring capability if the signalling is by PDCCH and methods to ensure the reliability of the signalling.  It is concluded that the potential enhanced UL power control may include UE determining the power control parameter set (e.g. P0, alpha) based on scheduling DCI indication without using SRI, or based on group-common DCI indication. Increased TPC range compared to Rel-15 may also be considered. Power boosting is not applicable to power limited UEs. |

# List of contributions and proposals

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | [**R1-2001547**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001547.zip) | Corrections on UL inter-UE multiplexing | Huawei, HiSilicon |
| 2 | [**R1-2001615**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001615.zip) | Remaining issues on UL inter-UE multiplexing between eMBB and URLLC | ZTE |
| 3 | [**R1-2001673**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001673.zip) | UL inter UE Tx prioritization for URLLC | vivo |
| 4 | [**R1-2001697**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001697.zip) | Maintenance of Rel-16 URLLC Enhanced inter UE Tx prioritization/multiplexing | Nokia, Nokia Shanghai Bell |
| 5 | [**R1-2001777**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001777.zip) | Inter UE Tx prioritization and multiplexing | OPPO |
| 6 | [**R1-2001788**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001788.zip) | Remaining Issue of Inter-UE Prioritization and Multiplexing of  UL Transmissions | Ericsson |
| 7 | [**R1-2001817**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001817.zip) | Remaining issues on inter-UE multiplexing | Sony |
| 8 | [**R1-2001841**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001841.zip) | Remaining issues on enhanced inter UE Tx prioritization/multiplexing | MediaTek Inc. |
| 9 | [**R1-2001873**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001873.zip) | Remaining issue on inter-UE prioritization | Panasonic Corporation |
| 10 | [**R1-2001923**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001923.zip) | Remaining issues of UL inter UE Tx prioritization | LG Electronics |
| 11 | [**R1-2002002**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002002.zip) | Remaining issues on enhanced inter-UE multiplexing | Intel Corporation |
| 12 | [**R1-2002086**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002086.zip) | Remaining issues on inter-UE UL multiplexing | CATT |
| 13 | [**R1-2002134**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002134.zip) | Remaining issues for inter-UE multiplexing | Samsung |
| 14 | [**R1-2002211**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002211.zip) | Remaining issues on inter UE Tx prioritization/multiplexing | CMCC |
| 15 | [**R1-2002252**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002252.zip) | Enhanced inter UE Tx prioritization/multiplexing | ETRI |
| 16 | [**R1-2002257**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002257.zip) | Remaining issues of enhanced inter UE Tx prioritization/multiplexing | Spreadtrum Communications |
| 17 | [**R1-2002307**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002307.zip) | Inter-UE prioritization/multiplexing | InterDigital, Inc. |
| 18 | [**R1-2002333**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002333.zip) | Remaining Issues on Inter-UE Cancellation for eURLLC | Apple |
| 19 | [**R1-2002548**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002548.zip) | Remaining issues on uplink Inter-UE Tx Multiplexing and Prioritization | Qualcomm Incorporated |
| 20 | [**R1-2002637**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002637.zip) | Remaining issues on inter-UE multiplexing for NR URLLC | WILUS Inc. |