**3GPP TSG RAN WG1 Meeting #101-e R1-2004734**

e-Meeting, May 25th – June 5th, 2020

Source: Moderator (vivo)

Title: Summary of [101-e-NR-L1enh-URLLC-InterUE-01]

Agenda Item: 7.2.5.5

Document for: Discussion and Decision

# Introduction

The document provides a summary of RAN1#101-e email discussion thread [101-e-NR-L1enh-URLLC-InterUE-01]

# Email discussion outcome

**Agreement**

* + (Alt 1): A DCI format 2\_4 is only applicable to an uplink grant scheduling PUSCH/SRS if the ending symbol of the PDCCH carrying the UL grant is earlier than the first symbol of the PDCCH carrying DCI format 2\_4.

**Agreement**

* + (Alt1) If the UE does not cancel a transmission in resources indicated by DCI format 2\_4, the UE can receive an UL grant scheduling a transmission on the resource indicated by the DCI format 2\_4, if the **ending** symbol the PDCCH carrying UL grant is no earlier than the **first** symbol of the PDCCH carrying DCI format 2\_4.
    - The above applies regardless whether RRC parameter applicabilityforCI is configured or not.

**Agreement**

* + (Alt 1) If UE has to cancel a DG-PUSCH1 based on the detected UL CI, another DG-PUSCH2 can **NOT** be scheduled on cancelled symbols of DG-PUSCH1
    - The cancelled symbols of DG-PUSCH1 include  the symbols within and outside the resource indicated by the UL CI
    - The above applies regardless whether RRC parameter applicabilityforCI is configured or not.

Agreement

* (Alt 1) If UE has to cancel a PUSCH transmission or an SRS transmission based on the detected UL CI, another DG-PUSCH2 **CAN** be scheduled on the resource indicated by the UL CI but not overlapping with cancelled symbols, if the ending symbol of the PDCCH carrying the 2nd UL grant is  **no earlier** than the  first symbol of the PDCCH carrying the UL CI.
  + The above applies regardless whether RRC parameter *applicabilityforCI* is configured or not
  + No additional spec impact expected.

**Agreement**

* + (Alt 1) For a UE configured with behaviour#2 (i.e. RRC parameter applicabilityforCI not provided), if a PUCCH/SRS is cancelled by another PUSCH of higher priority, the prioritized PUSCH can be cancelled by UL CI
    - No spec impact

Adopt the following 38.213 TP

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| **11.2A     Cancellation indication** =====omitted text ======  An indication by a DCI format 2\_4 for a serving cell is applicable to a PUSCH transmission or an SRS transmission on the serving cell. If the PUSCH transmission or the SRS transmission is scheduled by a DCI format, the DCI format 2\_4 is applicable to the PUSCH transmission or SRS transmission only if the last symbol of the PDCCH providing the DCI format is earlier than the first symbol of the PDCCH providing DCI format 2\_4.  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 obtained from for PUSCH processing capability 2 [6, TS 38.214] assuming , being the smallest SCS configuration between the SCS configuration of the PDCCH and the smallest SCS configuration provided in *scs-SpecificCarrierList* of *FrequencyInfoUL* or *FrequencyInfoUL-SIB*. 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.  A UE that detects a DCI format 2\_4 for a serving cell cancels a PUSCH transmission or a repetition of a PUSCH transmission [6, TS 38.214] if the PUSCH transmission is with repetitions, as determined in Clauses 9 and 9.2.5, or an SRS transmission on the serving cell if, respectively,  - the transmission is PUSCH with priority 0, if the UE is provided *applicabilityforCI*,  - a group of symbols, from the symbols, has at least one bit value of '1' in the corresponding set of bits in the DCI format 2\_4 and includes a symbol of the (repetition of the) PUSCH transmission or of the SRS transmission, and  - a group of PRBs, from the PRBs, has a corresponding bit value of '1' in the set of bits corresponding to the group of symbols in the DCI format 2\_4 and includes a PRB of the (repetition of the) PUSCH transmission or of the SRS transmission,  where  - the cancellation of the (repetition of the) PUSCH transmission includes all symbols from the earliest symbol of the (repetition of the) PUSCH transmission that is in a group of symbols having corresponding bit values of '1' in the DCI format 2\_4;  - the cancellation of the SRS transmission includes only symbols that are in one or more groups of symbols having corresponding bit values of '1' in the DCI format 2\_4.  If, based on an indication by a DCI format 2\_4, a UE cancels a PUSCH transmission or an SRS transmission, the UE does not expect to be scheduled by a second DCI format to transmit a PUSCH or a SRS over symbols that include symbols of the cancelled PUSCH transmission or SRS transmission, where the last symbol of the PDCCH providing the second DCI format is later than the first symbol of the PDCCH providing DCI format 2\_4.  =====omitted text ====== |

Reason for the change: the above TP is to implement the first and third agreements above

# Discussions

## **Issue 1: Handling of UL grant no earlier than UL CI, and whether another UL transmission can be scheduled on the cancelled symbols [1][2][4][5][6][7][8][9][10][11][12][13][14][15][16][17][18][19][20]**

There are following discussion points

### **Discussion point #1:**

UL CI is applicable to UL grant sent earlier than the UL CI

There seems to be a general consensus on this aspect, a slight difference is whether UL CI is applicable to an overlapping UL grant

* Alt 1: A DCI format 2\_4 is only applicable to an uplink grant scheduling PUSCH/SRS if the ending symbol of the PDCCH carrying the UL grant is earlier than the **first** symbol of the PDCCH carrying DCI format 2\_4. (i.e. UL CI is not applicable to an overlapping UL grant) [2][4][5][6][7][9][12][15][16][17]
* Alt 2: A DCI format 2\_4 is only applicable to an uplink grant scheduling PUSCH/SRS if the ending symbol of the PDCCH carrying the UL grant is earlier than the **last** symbol of the PDCCH carrying DCI format 2\_4. (i.e. UL CI is applicable to an overlapping UL grant) [11]

**Question:**

* Q1: Is it generally agreeable that “UL CI is applicable to UL grant sent **earlier than** the UL CI”
* Q2: Do you prefer alt 1 or alt 2 and why?

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| Company | Comment |
| Nokia, NSB | Q1: Agree Q2: Alt. 2, as this will increase the UL CI operation possibilities (slightly) and we get the decision boundary if to cancel (or re-scheduling, discussion point#2) closer to the end of the UL DCI format 2\_4. |
| HW/HiSi | Q1: Yes  Q2: Alternative 1 is from the proposal that was achieved after long discussions during last meeting and that we assumed would be the assumption to resolve the remaining FFS. Alternative 1 is workable. In our view, we should respect the efforts that have been done carried out last meeting and we should stick to this and move on.  Alt1 uses the ending symbol of the UL grant and the starting symbol of the DCI 2\_4 as reference. Alt2 uses the ending symbols of both DCIs as reference. In Alt 2, for an overlapping grant, the UE would in some situations cancel the scheduled PUSCH and in some other situations not.    If the discussion from last meeting about the timing relationship is re-opened again, then we think it would be more natural to consider the starting symbols of UL grant and DCI 2\_4 instead. We would prefer an alternative 3, to use the starting symbols as a reference.  *The Alt 3: A DCI format 2\_4 is only applicable to an uplink grant scheduling PUSCH/SRS if the* ***starting*** *symbol of the PDCCH carrying the UL grant is earlier than the* ***starting*** *symbol of the PDCCH carrying DCI format 2\_4. (i.e. UL CI is* ***not*** *applicable to an overlapping UL grant).*    Alternative 3 would allow to send the UL CI and the UL grant to an URLLC UE as early as possible.  All three alternatives are workable. In our view Alt3 gives the best performance, while for Alt2 seems a bit more complicated to realize than Alt1 without giving significant gain.  Our preference would be alternative 3, followed by Alternative 1. |
| Sony | Q1: Agree  Q2: Alt-1.  Share same view with Huawei. Alt-1 was the result of a very long discussion and effort. In addition to the scenarios provided by Huawei, Alt-2 would also mean that the UL-Grant can start **AFTER** the UL CI but ends before the UL CI as shown below, which would not make any sense as to why the gNB would schedule a PUSCH if it wants to cancel it. |
| Samsung | Alt. 2.  Alt.1 is inconsistent with every other such timing relation defined for NR. Unless a technical justification is provided for the need to introduce a different UE behaviour for this aspect, existing timing relations are default.  There is no practical case where the UL grant starts after the UL CI. Otherwise, the time should be defined relative to the ‘starting symbol’ for both UL grant and UL CI (but this was not done for other similar cases). |
| CATT | To be honest, we don’t see much difference from all the proposed solutions. Any of them is workable and the only thing we need to do is to define the rule. We slightly prefer alt-1 as it is cleaner. |
| ZTE | Q1:YES  Q2: Alt 1 is preferable.  As same as Huawei, alt 1 is regarded as a result for a long time at the last meeting. There is no strong need to change this assumption.  For avoiding 'self cancellation' issue, the ending position of UL grant should be restricted to 'point B'(i.e., can be transmitted after point B) for alt 2, while the restriction of that can be extended to 'point A' in alt 1, which is more flexible. So alt 1 is preferable. |
| Qualcomm | Q1: Yes.  Q2: Alt1 seems to be simpler. |
| DOCOMO | Q1: Agree  Q2: Alt.1. The use case of Alt.2 is not reasonable since gNB transmits UL grant after the decision of transmission of UL CI. |
| Intel | Q.1 Agree  Q.2 Alt. 1  The main difference between Alt 1 and 2 is whether MOs of the PDCCHs corresponding to UL CI and DCI scheduling PUSCH/SRS where PUSCH/SRS can be cancelled by the UL CI overlap or not. Alt 2 slightly increases the scope of which transmission can be cancelled (two overlapping MOs may have up to 2 symbols between the last symbols of PDCCHs). In our view, it is expected that the gNB would know if it is going to transmit UL CI (i.e., in upcoming couple of symbols) and would not probably schedule anything anyways that maybe eventually be cancelled for the case of overlapping MOs. Hence, justification seems unclear and more importantly, this case should not be linked to other case for deriving reference for timing relations. The main reason being following discussion points are on the subject whether overlapping MOs can be used to schedule a transmission that may not be canceled. Hence, it only helps from UE perspective, to have a clear boundary which transmissions belong to which category, and in our view, the boundary should be the first symbol of PDCCH of UL CI. |
| Ericsson | Q1: Yes  Q2: Alt 3 followed by 1. |
| OPPO | Q1:Yes  Q2: Alt 1 |
| InterDigital | Q1: Yes  Q2: Alt 3, otherwise Alt 1. |
| Motorola Mobility / Lenovo | Q1: Yes  Q2: in our view, both Alternatives work. Alt2 is more flexible. |
| Apple | Q1: Yes  Q2: Alt 1 seems sufficient enough, and it was the outcome of the long discussion from last meeting. |
| Panasonic | Q1: Yes  Q2: We share the same view with Huawei that to use the starting symbol seems more natural, i.e., Alt.3, otherwise Alt.1 is preferred. |
| LG | Q1: Agree  Q2: We don’t see big difference between alternatives. Alt 1 is clearer and simpler. |

* Summary of discussion point#1

All companies are fine with “UL CI is applicable to UL grant sent **earlier than** the UL CI”, for the detailed alternatives:

* + Alt 1: A DCI format 2\_4 is only applicable to an uplink grant scheduling PUSCH/SRS if the **ending** symbol of the PDCCH carrying the UL grant is earlier than the **first** symbol of the PDCCH carrying DCI format 2\_4. (i.e. UL CI is not applicable to an overlapping UL grant)
    - (14) Huawei (2nd preference), Sony, CATT, ZTE, Qualcomm, DOCOMO, Intel, Ericsson(2nd preference), OPPO, InterDigital (2nd preference), Apple, Panasonic (2nd preference), LG, vivo
  + Alt 2: A DCI format 2\_4 is only applicable to an uplink grant scheduling PUSCH/SRS if the **ending** symbol of the PDCCH carrying the UL grant is earlier than the **last** symbol of the PDCCH carrying DCI format 2\_4. (i.e. UL CI is applicable to an overlapping UL grant)
    - (3) Nokia, Samsung, Motorola
  + The Alt 3: A DCI format 2\_4 is only applicable to an uplink grant scheduling PUSCH/SRS if the **starting** symbol of the PDCCH carrying the UL grant is earlier than the **starting** symbol of the PDCCH carrying DCI format 2\_4. (i.e. UL CI is not applicable to an overlapping UL grant).
    - (4) Huawei (1st preference), Ericsson (1st preference), InterDigital (1st preference), Panasonic (1st preference)
* **Proposed agreement:**
  + (Alt 1): A DCI format 2\_4 is only applicable to an uplink grant scheduling PUSCH/SRS if the **ending** symbol of the PDCCH carrying the UL grant is earlier than the **first** symbol of the PDCCH carrying DCI format 2\_4.

### **Discussion point #2**:

If UE does not cancel a DG-PUSCH based on the detected UL CI, whether another DG-PUSCH can be scheduled on the resource indicated by UL CI if the 2nd UL grant is received **no earlier** than the UL CI (i.e. Case 1)

* + Yes: [1][2][5][7][10][11][12][15][16][17]
  + No: [4] [20]

Case 1:



* FL Proposal:
* To consider the following alternatives
  + Alt1: If the UE does not cancel a transmission in resources indicated by DCI format 2\_4, the UE can receive an UL grant scheduling a transmission in any resources and transmit accordingly, if the ending symbol the PDCCH carrying UL grant is no earlier than the **first** symbol of the PDCCH carrying DCI format 2\_4.
  + Alt 2: If the UE does not cancel a transmission in resources indicated by DCI format 2\_4, the UE can receive an UL grant scheduling a transmission in any resources and transmit accordingly, if the ending symbol the PDCCH carrying UL grant is no earlier than the **last** symbol of the PDCCH carrying DCI format 2\_4.
* To discuss if the above only applies to UE behaviour #2 or both UE behaviour#1 (HP PUSCH) and UE behaviour #2
  + Note: UE behaviour#1 – UL CI only applicable to low priority transmissions, UE behaviour#2- UL CI applicable irrespective of transmission priority

**Question:**

* Q1: Is the following agreeable, i.e. case 1?
  + If UE does not cancel a DG-PUSCH based on the detected UL CI, another DG-PUSCH **can** be scheduled on the resource indicated by UL CI if the 2nd UL grant is received **no earlier** than the UL CI
* If yes,
  + Q2-1: you prefer alt 1 or alt 2, and why?
  + Q2-2 Does the behaviour apply to UE beahvior#2 only or both behavior#1 and #2?

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| Company | Comment |
| Nokia, NSB | Q1: Agree  Q2-1: Alt.2 – same reasoning as for point#1. As Alt. 2 is preferred there, Alt. 2 needs to be selected here (i.e. the timing is related between these two points).  Q2-2: Both (behaviour #1 & behaviour #2), no need for separate handling |
| HW/HiSi | Q1: Yes. In our view, if the PUSCH2 comes after PUSCH1 and does not overlap in time with PUSCH1 it can be scheduled on resources indicated by the UL CI.  Q2-1:  This question is linked to the preference in discussion point 1.  In our view, the ideal situation would be that the PUSCH2 can be scheduled if the grant 2 is received at the same time or later than DCI format 2\_4. This would be an Alternative 3.  *Alt3: If the UE does not cancel a transmission in resources indicated by DCI format 2\_4, the UE can receive an UL grant scheduling a transmission in any resources and transmit accordingly, if the starting symbol the PDCCH carrying UL grant is no earlier than the* ***first*** *symbol of the PDCCH carrying DCI format 2\_4.*    But from the given options, we prefer alternative 1. Which would mean that UL CI is applicable only if scheduling grant and UL CI do not overlap.  Q2-2: Applies regardless of the configured behavior. |
| Sony | Q1: Yes. This gives the basis to prevent self-pre-emption especially for UE configured with Behaviour 2. This is also beneficial for Behaviour 1 UEs because there can still be different levels of priorities even among Low L1 priority PUSCHs (NOTE: Logical level has 16 priority levels whereas Physical layer has only 2 levels). This should be applicable only if DG-PUSCH1 and DG-PUSCH2 do NOT overlap in time.  Q2-1: Alt-1 was the result of a long discussion. However, Alt-2 also makes sense as it means that the UE would have finished decoding/receiving the UL CI first before finish decoding/receiving the UL Grant. We are fine with either alternatives but a slight preference for Alt-1.  Q2-2: Apply to both behaviours for the reasons described in Q1. |
| Samsung | Q1: Agree  Q2 – 1: Alt. 2 (same motivation as for discussion point 1)  Q2 – 2: Apply to both ‘behaviours’ – multiple priorities can exist from the NW perspective. |
| CATT | Q1: Agree  Q2 – 1: Alt. 1  Q2 – 2: Apply to both ‘behaviours’. |
| ZTE | Q1: YES.  Q2-1: Alt 1 is preferable for the same reason as point #1.  Q2-2: both behavior#1 and #2.  Regardless of behavior#1 or #2, a PUSCH can be scheduled on resource indicated by a UL CI as long as the priority of the PUSCH is higher than UL transmission corresponding to UL CI. |
| Qualcomm | Q1: No, as the benefits are unclear.  Q2: Neither of options is similar to Alt1 under the previous question. Under the earlier Alt1, the grants are non-overlapping in time; however, under Alt1 of this question, that is not the case. |
| DOCOMO | Q1: Agree  Q2-1: Alt.1 with the same reason for discussion point 1.  Q2-2: Apply to both behaviours. Different handling is not needed. |
| Intel | Q.1: Yes  Q2 – 1: Alt 1: As mentioned in our response to DP # 1, cancellable transmission is not expected to be scheduled in overlapping MOs with UL CI and first symbol of PDCCH of UL CI provides a clear boundary so that anything scheduled on or after cannot be cancelled, subject to some conditions, such as whether UE cancelled any DG-PUSCH based on UL CI or not.  Q2- 2: Applies to both behaviors |
| Ericsson | Q1: Yes.  Q2-1: Alt-3 followed by alt. 1. Depends on outcome from discussion point 1. Whatever alternative is agreed in discussion point 1, here there will be a negation of that.  Q2-2. For both behaviours. |
| OPPO | Q1: Agree  Q2-1: Alt.1 with the same reason for discussion point 1.  Q2-2: Both behaviours. Different handling is not needed. |
| InterDigital | Q1: Yes  Q2-1: Same rule as decided in Discussion point #1 (our preference is Alt. 3)  Q2-2: Both behaviours. |
| Motorola Mobility / Lenovo | Q1: Yes (ok to us to even have a broader statement: “If UE does not cancel a ~~DG-~~PUSCH based on the detected UL CI, another DG-PUSCH **can** be scheduled on the resource indicated by UL CI if the 2nd UL grant is received **no earlier** than the UL CI”)  Q2-1: both Alternatives work, we can use Alt2  Q2-2: both behaviours |
| Apple | Q1: Yes  Q2-1: Alt 1 – same as discussion point #1  Q2-2: it should be applicable to both UE behaviors. |
| Panasonic | Q1: Yes  Q2-1: Alt.3 or Alt. 1 (depending on the conclusion in Discussion point #1)  Q2-2: Apply to both behavior#1 and #2 |
| LG | Q1: We do not have strong view. No reason to support and to preclude.  Q2: Alt 1. If supported.  Q3: should be applicable to UL grant which UL CI can be applied. |

* Summary of discussion point#2
  + Alt1: If the UE does not cancel a transmission in resources indicated by DCI format 2\_4, the UE can receive an UL grant scheduling a transmission on the resource indicated by the DCI format 2\_4, if the **ending** symbol the PDCCH carrying UL grant is no earlier than the **first** symbol of the PDCCH carrying DCI format 2\_4.
    - (13) Huawei (2nd preference), Sony, CATT, ZTE, DOCOMO, Intel, Ericsson (2nd preference), OPPO, InterDigital (2nd preference), Apple, Panasonic (2nd preference), LG, vivo
  + Alt 2: If the UE does not cancel a transmission in resources indicated by DCI format 2\_4, the UE can receive an UL grant scheduling a transmission on the resource indicated by the DCI format 2\_4, if the **ending** symbol the PDCCH carrying UL grant is no earlier than the **last** symbol of the PDCCH carrying DCI format 2\_4.
    - (3) Nokia, Samsung, Motorola
  + Alt3: If the UE does not cancel a transmission in resources indicated by DCI format 2\_4, the UE can receive an UL grant scheduling a transmission on the resource indicated by the DCI format 2\_4, if the **starting** symbol the PDCCH carrying UL grant is no earlier than the **first** symbol of the PDCCH carrying DCI format 2\_4.
    - (4) Huawei (1st preference), Ericsson (1st preference), InterDigital (1st preference), Panasonic (1st preference)
  + Alt 4: If the UE does not cancel a transmission in resources indicated by DCI format 2\_4, the UE does not expect to receive an UL grant scheduling a transmission on the resource indicated by the DCI format 2\_4, if the **ending** symbol the PDCCH carrying UL grant is no earlier than the **first** symbol of the PDCCH carrying DCI format 2\_4.
    - Qualcomm
* **Proposed agreement:**
  + (Alt1) If the UE does not cancel a transmission in resources indicated by DCI format 2\_4, the UE can receive an UL grant scheduling a transmission on the resource indicated by the DCI format 2\_4, if the **ending** symbol the PDCCH carrying UL grant is no earlier than the **first** symbol of the PDCCH carrying DCI format 2\_4.
    - The above applies regardless whether RRC parameter applicabilityforCI is configured or not.

### **Discussion point #3:**

If UE has to cancel a DG-PUSCH1 based on the detected UL CI, whether another DG-PUSCH can be scheduled on cancelled symbols of DG-PUSCH1, if the 2nd UL grant is received **no earlier** than the UL CI? The cancelled symbol may (case 3) or may not (case 2) within the resource indicated by the UL CI

* + Yes under some condition
    - Condition 2 [7]: The offset between the end of PDCCH carrying UL grant and the start of its scheduling transmission is no less than Tproc,2 +d1, where Tproc,2 is determined by UE processing time capability for the carrier, and d1 is the time duration corresponding to 0,1,2 symbols reported by UE capability.
    - Condition 3 [19]: If DG-PUSCH2 is of high priority
    - Condition 4 [11]: if the gap between the 2nd UL grant and the DG-PUSCH2 is at least and is the gap between the ending symbol of the UL CI and the ending symbol of the 2nd UL grant
      * Similar to condition #1
    - Condition 6 [9][10][19]: if DG-PUSCH2 does not include resource indicated by the UL CI (i.e. case 2)
  + No: [1][2][4] [5][6][8] [11][12][13][14][15][16][17][18][20]

Case 2:



Case 3:



* FL proposal:
* If UE has to cancel a DG-PUSCH1 based on the detected UL CI, another DG-PUSCH2 can **NOT** be scheduled on cancelled symbols of DG-PUSCH1, [if the 2nd UL grant is received **no earlier** than the UL CI]
  + The cancelled symbols of DG-PUSCH1 include the symbols within and outside the resource indicated by the UL CI
* To discuss if the above only applies to UE behaviour #2 or both UE behaviour#1 (HP PUSCH) and UE behaviour #2
  + Note: UE behaviour#1 – UL CI only applicable to low priority transmissions, UE behaviour#2- UL CI applicable irrespective of transmission priority

**Question:**

* Q1: Is the following agreeable (and if the part in bracket is needed or not)?
  + If UE has to cancel a DG-PUSCH1 based on the detected UL CI, another DG-PUSCH2 can **NOT** be scheduled on cancelled symbols of DG-PUSCH1, [if the 2nd UL grant is received **no earlier** than the UL CI]
    - The cancelled symbols of DG-PUSCH1 include the symbols within (i.e. case 3) and outside (i.e. case 2) the resource indicated by the UL CI
* Q2: Does the above only apply to UE behaviour #2 or both UE behaviour#1 (HP PUSCH) and UE behaviour #2

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| Company | Comment |
| Nokia, NSB | Q1: Agree / OK  Q2: Both (behaviour #1 & behaviour #2), no need for separate handling |
| HW/HiSi | Q1: Yes, it is agreeable. Both the main bullet and the sub-bullet are agreeable.  Q2: Regardless the UE behaviour which priority transmission to cancel. |
| Sony | Q1: Yes.  Q2: Applicable to both behaviours. |
| Samsung | Q1: No, it is not agreeable.  No justification has been provided for prohibiting a network from scheduling a UE on cancelled symbols. From a UE perspective, the only thing that matters is if the timeline is met. Conversely, a reason to allow that scheduling can be as in the following example. UE 1 has (from a network perspective) priorities 0 and 2 and receives UL CI to cancel PUSCH with priority 0 because UE 2 needs to transmit PUSCH with priority 1. The network should be able to later schedule on the cancelled symbols PUSCH with priority 2 for UE 1 (if the timeline is satisfied). It is noted that an RRC parameter was introduced for UL CI applicability in order to enable scenarios such as the above (multiple priorities from a network perspective).  Q2: Both ‘behaviours’ (although a restriction could be argued, there is no need). |
| CATT | Q1: No  If timeline is satisfied, we don’t see any issue for scheduling on the cancelled symbols. It’s beneficial for gNB scheduling.  Q2: Both behaviours. |
| ZTE | Q1: YES.  If the UE fails to receive the ULCI, two DG PUSCHs will overlap with each other, which is not allowed by current protocol.  Q2: both behavior#1 and #2. |
| Qualcomm | Q1: Yes. Scheduling another PUSCH on the cancelled resources have the same impact as handling DG-PUSCH+DG-PUSCH overlap in terms of UE implementation (which is not supported in Rel-16.) The same behaviour is also adopted in case of intra-UE cancellation for the exact same reason, i.e., making UE complexity manageable.  Q2: Both cases. |
| DOCOMO | Q1: No  Share similar view as CATT for case 2. Case 3 seems not reasonable since gNB transmits UL grant after the decision of transmission of UL CI. In other words, the PUSCH after UL CI should not overlap with the resources indicated by the UL CI. For case 2, the potential problem is that scheduling condition may meet the scheduling restriction defined in Rel-15, i.e. PUSCH overlapping in symbols, if UE miss-detects the UL CI. In that case, UE could transmit only the 2nd PUSCH considering it would have higher priority compared to the 1st PUSCH.  Q2: Both behaviours |
| Intel | Q1: Agree. We think it makes UE implementations simpler. We do not think the condition in bracket is necessary.  Q2: Applicable to both behaviors. |
| Ercsson | Q1: Agree.  Q2: Both. No need to separate. |
| OPPO | Q1: Agree. No strong reason to support out-of-order scheduling which is not supported in Rel-16.  Q2: Both behaviours. Different handling is not needed. |
| InterDigital | Q1: Yes  Q2: Both |
| Motorola Mobility / Lenovo | Agree with Qualcomm on responses to Q1 (“Yes”), and Q2 (“both”).  In addition, we think there is No need to have the phrase in brackets |
| Apple | Q1: Yes, and the text in the bracket should be removed. Agree with QC’s arguments.  Q2: Both |
| Panasonic | Q1: Agree  Q2: Apply to both behaviour #1 and #2. |
| LG | Q1: Agree. To align with intra-UE behavior.  Q2: should be applicable to UL grant which UL CI can be applied. |

* Summary of discussion point #3
  + Alt 1: If UE has to cancel a DG-PUSCH1 based on the detected UL CI, another DG-PUSCH2 can **NOT** be scheduled on cancelled symbols of DG-PUSCH1
    - The cancelled symbols of DG-PUSCH1 include the symbols within (i.e. case 3) and outside (i.e. case 2) the resource indicated by the UL CI
    - (13) Nokia, Huawei, Sony, Qualcomm, Intel, Ericsson, OPPO, InterDigital, Motorola, Apple, Panasonic, LG, vivo
  + Alt 2: If UE has to cancel a DG-PUSCH1 based on the detected UL CI, another DG-PUSCH2 **can** be scheduled on cancelled symbols of DG-PUSCH1 **if a specified timeline condition is met**
    - **What timeline condition?**
    - The cancelled symbols of DG-PUSCH1 include the symbols within (i.e. case 3) and outside (i.e. case 2) the resource indicated by the UL CI
    - (3) Samsung, CATT, DOCOMO

**Agreement**

* + (Alt 1) If UE has to cancel a DG-PUSCH1 based on the detected UL CI, another DG-PUSCH2 can **NOT** be scheduled on cancelled symbols of DG-PUSCH1
    - The cancelled symbols of DG-PUSCH1 include  the symbols within and outside the resource indicated by the UL CI
    - The above applies regardless whether RRC parameter applicabilityforCI is configured or not.

Proposed 38.213 TP (to implement the agreement for discussion point#1 and #3)

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| **11.2A     Cancellation indication** =====omitted text ======  An indication by a DCI format 2\_4 for a serving cell is applicable to a PUSCH transmission or an SRS transmission on the serving cell. If the PUSCH transmission or the SRS transmission is scheduled by a DCI format, the DCI format 2\_4 is applicable to the PUSCH transmission or SRS transmission only if the last symbol of the PDCCH providing the DCI format is earlier than the first symbol of the PDCCH providing DCI format 2\_4.  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 obtained from for PUSCH processing capability 2 [6, TS 38.214] assuming , being the smallest SCS configuration between the SCS configuration of the PDCCH and the smallest SCS configuration provided in *scs-SpecificCarrierList* of *FrequencyInfoUL* or *FrequencyInfoUL-SIB*. 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.  A UE that detects a DCI format 2\_4 for a serving cell cancels a PUSCH transmission or a repetition of a PUSCH transmission [6, TS 38.214] if the PUSCH transmission is with repetitions, as determined in Clauses 9 and 9.2.5, or an SRS transmission on the serving cell if, respectively,  - the transmission is PUSCH with priority 0, if the UE is provided *applicabilityforCI*,  - a group of symbols, from the symbols, has at least one bit value of '1' in the corresponding set of bits in the DCI format 2\_4 and includes a symbol of the (repetition of the) PUSCH transmission or of the SRS transmission, and  - a group of PRBs, from the PRBs, has a corresponding bit value of '1' in the set of bits corresponding to the group of symbols in the DCI format 2\_4 and includes a PRB of the (repetition of the) PUSCH transmission or of the SRS transmission,  where  - the cancellation of the (repetition of the) PUSCH transmission includes all symbols from the earliest symbol of the (repetition of the) PUSCH transmission that is in a group of symbols having corresponding bit values of '1' in the DCI format 2\_4;  - the cancellation of the SRS transmission includes only symbols that are in one or more groups of symbols having corresponding bit values of '1' in the DCI format 2\_4.  If, based on an indication by a DCI format 2\_4, a UE cancels a PUSCH transmission or an SRS transmission, the UE does not expect to be scheduled by a second DCI format to transmit a PUSCH or a SRS over symbols that include symbols of the cancelled PUSCH transmission or SRS transmission, where the last symbol of the PDCCH providing the second DCI format is later than the first symbol of the PDCCH providing DCI format 2\_4.  =====omitted text ====== |

### **Discussion point #4:**

If UE has to cancel a DG-PUSCH1 based on the detected UL CI, whether another DG-PUSCH can be scheduled on the resource indicated by the UL CI but not overlapping with cancelled symbol of DG-PUSCH1, if the 2nd UL grant is received **no earlier** than the UL CI?

* + Yes under some conditions
    - Condition 1 [1]: if the start of DG-PUSCH2 is 2\*Tproc,2 after the end of the UL CI
    - Condition 2 [7]: The offset between the end of PDCCH carrying UL grant and the start of its scheduling transmission is no less than Tproc,2 +d1, where Tproc,2 is determined by UE processing time capability for the carrier, and d1 is the time duration corresponding to 0,1,2 symbols reported by UE capability.
    - Condition 3 [19]: If DG-PUSCH2 is of high priority
    - Condition 4 [11]: if the gap between the 2nd UL grant and the DG-PUSCH2 is at least and is the gap between the ending symbol of the UL CI and the ending symbol of the 2nd UL grant
      * Similar to condition#1
    - Condition 5 [15]: if the 2nd UL grant is at least X=1 slot after the ending symbol of UL CI, and the DG-PUSCH2 does not overlap with the cancelled symbols of DG-PUSCH1
  + Yes without condition
    - [2][6][10]
  + No: [5][12][13][14][15][17][20]

Case 4:



* FL proposal:
* To decide one between the following
  + Alt 1: If UE has to cancel a DG-PUSCH1 based on the detected UL CI, another DG-PUSCH2 **CAN** be scheduled on the resource indicated by the UL CI but not overlapping with cancelled symbol of DG-PUSCH1, if the 2nd UL grant is received **no earlier** than the UL CI and if a specified condition is satisfied
    - Condition to be decided
  + Alt 2: If UE has to cancel a DG-PUSCH1 based on the detected UL CI, another DG-PUSCH2 **CANNOT** be scheduled on the resource indicated by the UL CI but not overlapping with cancelled symbol of DG-PUSCH1, [if the 2nd UL grant is received **no earlier** than the UL CI]
* To discuss if the above only applies to UE behaviour #2 or both UE behaviour#1 (HP PUSCH) and UE behaviour #2
  + Note: UE behaviour#1 – UL CI only applicable to low priority transmissions, UE behaviour#2- UL CI applicable irrespective of transmission priority

**Question:**

* Q1: which of the following alternatives do you support, and why?
  + Alt 1: If UE has to cancel a DG-PUSCH1 based on the detected UL CI, another DG-PUSCH2 **CAN** be scheduled on the resource indicated by the UL CI but not overlapping with cancelled symbol of DG-PUSCH1, if the 2nd UL grant is received **no earlier** than the UL CI and if a specified condition is satisfied
    - Condition to be decided
  + Alt 2: If UE has to cancel a DG-PUSCH1 based on the detected UL CI, another DG-PUSCH2 **CANNOT** be scheduled on the resource indicated by the UL CI but not overlapping with cancelled symbol of DG-PUSCH1, [if the 2nd UL grant is received no earlier than the UL CI]
* Q2: If you support alt 1 above, what condition (including but not limited to the following) should be specified
  + - Condition 1 [1]: if the start of DG-PUSCH2 is 2\*Tproc,2 after the end of the UL CI
    - ~~Condition 2 [7]: The offset between the end of PDCCH carrying UL grant and the start of its scheduling transmission is no less than Tproc,2 +d1, where Tproc,2 is determined by UE processing time capability for the carrier, and d1 is the time duration corresponding to 0,1,2 symbols reported by UE capability.~~
    - Condition 3 [19]: If DG-PUSCH2 is of high priority
    - Condition 4 [11]: if the gap between the 2nd UL grant and the DG-PUSCH2 is at least and is the gap between the ending symbol of the UL CI and the ending symbol of the 2nd UL grant
      * Similar to condition#1
    - Condition 5 [15]: if the 2nd UL grant is at least X=1 slot after the ending symbol of UL CI, and the DG-PUSCH2 does not overlap with the cancelled symbols of DG-PUSCH1
* Q3: Does above only apply to UE behaviour #2 or both UE behaviour#1 (HP PUSCH) and UE behaviour #2

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| Company | Comment |
| Nokia, NSB | Q1: Alt. 1 – as the UL CI not applicable for DG PUSCH scheduled after the UL CI, so no need to differentiate between this case here and discussion point #2 /case 1. Therefore, we don’t even think any condition is needed.  Q2: No condition needed. As the UL CI (which is not applicable for PUSCH grants after the reception) should not change the behaviour. So for the companies supporting some condition (at least time-wise) would be nice to know why any specific timing condition is required here (if DG PUSCH2 is overlapping with UL CI resources or not, should not change the processing at all) Addition in v06:  *To explain this a bit better – let’s consider the following figure with two options for UL CI indicated, Case A has no overlap with the new scheduled PUSCH 2 and Case B where there is an overlap. Why do we need for Case B an additional condition, if there is no need for any additional scheduling condition required for Case A?*  Q3: Both (behaviour #1 & behaviour #2), no need for separate handling |
| HW/HiSi | In the FL summary we were listed as proponents of Alt2  The view expressed in our paper has been captured correctly. However, we want to emphasize that the main reason is the need for progress on this issue. We are concerned that a detailed discussion about possible conditions would become too lengthy and would not be suitable at this stage of Rel-16.  Technically, we think it should be possible and would make sense in some situations to schedule a new PUSCH/SRS that is not overlapping in time with the previous PUSCH/SRS, even if the new PUSCH/SRS is overlapping with resources indicated by UL CI.  This could help like in the following situation and would allow for better resource utilization. Otherwise, the PUSCH2 could first be transmitted after the resources indicated by UL CI.    Q1: Alt 2, but open to Alt 1. The discussion of the conditions required for Alt1 should have less priority than the previous discussion points, though.  Q2: Open to discuss. Not sure if conditions are needed.  Q3: Regardless of the UE behaviour |
| Sony | Q1: Alt-1. This is useful for very long UL CI monitoring period.  Q2: We believe this is used for long UL CI monitoring period, for example in figure below where UL CI monitoring period = 5 slots. Here, UE1’s eMBB PUSCH is being cancelled by UL CI in slot *n*+1. However, in slot *n*+3, the gNB may want to use some of the indicated resources for UE1 again for URLLC purpose. The indicate resources was originally intended to cancel ANOTHER UE, e.g. UE3. Since UE1 already processed the cancellation of the PUSCH in slot *n*+1, we believe UE1 can now transmit another PUSCH at a later slot. That is as long as there is sufficient time, i.e. *X* symbols, after the UE had received the UL CI, it should be able to do this. NOTE: Since this is intended for long periodicity, the two PUSCHs of UE1 do NOT overlap in time.  Here we expect X=1 slot. However, we are also fine if X=0, which means no conditions if chipset vendors are ok with it. *That is we support Condition 5 with X=1 slot or no condition.*    Q3: Both behaviours. |
|  | Q1: Alt -1.  There is no reason to prohibit a network from performing such scheduling as previously explained. Also, there is no reason for different conditions/conclusions for discussion points 3 and 4 – UE implementation does not care if the symbols are ‘overlapping’ or ‘non-overlapping’, it only cares if the required timeline is satisfied.  Q2: Condition 4 provides the timeline available to the UE – as with everything else, a timeline is needed.  Q3: Both. |
| CATT | Q1: Alt.1  Q2: The condition we proposed in our contribution is only needed for discussion point #3 in our opinion. For case#4, we don’t think any condition is necessary as it is similar as normal scheduling, e.g. scheduling two back-to-back PUSCH transmission in a slot. So our position is updated accordingly under Q2.  Q3: Both |
| ZTE | Q1: Alt 1 is preferable.  It is helpful to improve the scheduling flexibility of gNB and the resource utilization by supporting case 4. From a network perspective, there are more than two levels of priorities among different UEs in a cell. When the 2nd UL grant is received no earlier than the UL CI, it’s reasonable that the priority of the transmission corresponding to the 2nd UL grant is higher than that of the transmission corresponding to UL CI.  Q2: Condition 1 is preferable.  When a UE has to cancel a DG-PUSCH1 based on the detected UL CI, in order to prevent the complexity of implementation caused by UE executing cancellation and scheduling at the same time, the previous cancelation action should be completed before transmitting the PUSCH2. So a timeline between UL CI and PUSCH2 needs to meet for processing the scheduling DCI decoding, ULCI decoding, cancelation of DG-PUSCH1 and DG-PUSCH2 preparing.  The most direct way is to define the timeline between UL CI and PUSCH2. As shown in the following Figure, t1 is the processing time for UE to decode UL CI and cancel the previous transmission, which has already been defined in inter-UE multiplexing as Tproc,2. While t2 is the processing time for decoding UL grant and preparing corresponding PUSCH, and the value of t2 is at least equals to Tproc,2.  In summary, the start of DG-PUSCH2 should be 2\*Tproc,2 after the end of the UL CI.    Q3: both behavior#1 and #2. |
| Qualcomm | Q1: Alt2.  Q2: N/A  Q3: Both. |
| DOCOMO | Q1: Alt.1  Q2: No condition is needed. UL CI does not affect the 2nd PUSCH preparation/transmission.  Q3: Both behaviours |
| Intel | Q.1: Alt – 1,  Q. 2 Only condition is the timeline condition that needs to be met for scheduling DG PUSCH2. The minimum PUSCH preparation time from end of PDCCH carrying UG#2 to start of DG PUSCH2, Tproc,2, which is already applicable, is sufficient. Also, note that DG PUSCH2 cannot start before DG PUSCH1 ends. Hence, special considerations such as Condition 4 are not necessary. Fundamentally there is no difference between the example in Case 4 and the case wherein the DG PUSCH2 starts right after the resources indicated to be canceled by UL CI (the turquoise region).  Q3: Both behaviours. |
| Ericsson | Q1: Alt-1  Q2: No condition is needed.  Q3: Applicable for both. |
| OPPO | Q1: Alt-1  Q2: No condition is needed  Q3: Both behaviours. Different handling is not needed. |
| InterDigital | Q1: Alt-1. As explained by Nokia, we need to be consistent with outcome of first discussion point.  Q2: No condition is needed.  Q3: Both. |
| Motorola Mobility / Lenovo | Q1: Alt 1. We think the UE behaviour should be the same for case 1 and case 4.  Q2: No condition is needed.  Q3: Both |
| Apple | Q1: we think Alt 1 is fine, but would not be against Alt 2 either.  Q2: For Alt 1, we don’t seem to see the need for any condition.  Q3: both |
| Panasonic | Q1: Alt.1  Q2: No condition is needed.  Q3: Apply to both behaviour #1 and #2. |
| LG | Q1: slightly prefer Alt.2. Since UE not assume self-cancelation.  Q3: both. |

* **Summary of Discussion point#4**
  + Alt 1: If UE has to cancel a DG-PUSCH1 based on the detected UL CI, another DG-PUSCH2 **CAN** be scheduled on the resource indicated by the UL CI but not overlapping with cancelled symbol of DG-PUSCH1, if the 2nd UL grant is received **no earlier** than the UL CI
    - Alt 1-1 With no condition:
      * (13) Nokia, Huawei, Sony, CATT, DOCOMO, Intel, Ericsson, OPPO, InterDigital, Motorola, Apple, Panasonic, vivo
    - Alt 1-2 Under the condition if the 2nd UL grant is at least X=1 slot after the ending symbol of UL CI, and the DG-PUSCH2 does not overlap with the cancelled symbols of DG-PUSCH1
      * Sony
    - Alt 1-3 under the condition if the gap between the 2nd UL grant and the DG-PUSCH2 is at least and is the gap between the ending symbol of the UL CI and the ending symbol of the 2nd UL grant
      * Samsung
    - Alt 1-4 under the condition if the start of DG-PUSCH2 is 2\*Tproc,2 after the end of the UL CI
      * ZTE
  + Alt 2: If UE has to cancel a DG-PUSCH1 based on the detected UL CI, another DG-PUSCH2 **CANNOT** be scheduled on the resource indicated by the UL CI but not overlapping with cancelled symbol of DG-PUSCH1
    - Qualcomm, LG

**Possible Agreement**

* (Alt 1) If UE has to cancel a dynamically scheduled PUSCH transmission or an SRS transmission based on the detected UL CI, another DG-PUSCH2 **CAN** be scheduled on the resource indicated by the UL CI but not overlapping with cancelled symbols, if the ending symbol of the PDCCH carrying the 2nd UL grant is **no earlier** than the  first symbol of the PDCCH carrying the UL CI.
  + The above applies regardless whether RRC parameter applicabilityforCI is configured or not
  + No additional spec impact expected.

### **Discussion point #5:**

For a UE configured with behaviour#2, if a PUCCH/SRS is cancelled by another PUSCH of higher priority, can the prioritized PUSCH be cancelled by UL CI?

Case 5:



**Question:**

* Q1: which of the following alternatives do you support, and why?
  + Alt 1: For a UE configured with behaviour#2, if a PUCCH/SRS is cancelled by another PUSCH of higher priority, the prioritized PUSCH can be cancelled by UL CI?
  + Alt 2: For a UE configured with behaviour#2, if a PUCCH/SRS is cancelled by another PUSCH of higher priority, the prioritized PUSCH cannot be cancelled by UL CI?

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| Company | Comment |
| Nokia, NSB | Alt. 1~~2~~ – no need for specific restrictions here (just follow the overall behaviour#2 operation, and leave it to gNB) |
| HW/HiSi | Q1: Alt1. When the UE is configured with behaviour #2, it should cancel any transmission that overlaps with resources indicated by UL CI. |
| Sony | Q1: Alt 1. The UE should cancel any PUSCH indicated by the UL CI as per behaviour 2. |
| Samsung | Alt. 1. UL CI applies as usual. |
| CATT | Alt 1. UL CI applies to PUSCH transmission despite of priority for behaviour 2. |
| ZTE | Support alt 1.  For UE behaviour#2, UL CI applies to any PUSCH irrespective of transmission priority. The behaviour should not depend on whether a PUCCH/SRS is cancelled by the PUSCH. |
| Qualcomm | Alt. 2. The cancellation chain increases UE complexity. |
| DOCOMO | Alt 1. UL CI should be applied for this case too as used for other cases. No need different handling. |
| Intel | Alt 1. For behaviour 2, UL CI is applicable to any transmission irrespective of priority. |
| Ericsson | Alt 1  Note: We don’t understand why we discuss this as a separate case. It doesn’t matter what has happened during intra-UE prioritization => CI should be used as usual based on the configured behavior |
| OPPO | Alt 1 Follow the overall behaviour#2 operation |
| InterDigital | Alt. 1 |
| Motorola Mobility / Lenovo | Alt 1 |
| Apple | Alt 1. To be more accurate, there is no special handling needed for this case. |
| Panasonic | Alt.1 |
| LG | Alt. 1 |

* Summary of discussion point #5
  + Alt 1: For a UE configured with behaviour#2, if a PUCCH/SRS is cancelled by another PUSCH of higher priority, the prioritized PUSCH can be cancelled by UL CI
    - (16) Nokia, Huawei, Sony, Samsung, CATT, ZTE, DOCOMO, Intel, Ericsson, OPPO, InterDigital, Motorola, Apple, Panasonic, LG, vivo
  + Alt 2: For a UE configured with behaviour#2, if a PUCCH/SRS is cancelled by another PUSCH of higher priority, the prioritized PUSCH cannot be cancelled by UL CI
    - Qualcomm,
* **Proposed agreement:** 
  + (Alt 1) For a UE configured with behaviour#2 (i.e. RRC parameter applicabilityforCI not provided), if a PUCCH/SRS is cancelled by another PUSCH of higher priority, the prioritized PUSCH can be cancelled by UL CI
    - No spec impact

### **Discussion point #6**

processing order of UL cancellation by TDD configuration/SFI and other UL multiplexing/cancellation.

This issue was raised by [22] under UCI agenda item, but offloaded to inter-UE mux agenda item. The proponent would like to clarify the UE processing order of UL cancellation due to dynamic SFI/semi-static TDD configuration, and the intra-UE multiplexing/prioritization. Some discussion of the issue was also provided in R1-2002060 from last meeting

Note that in RAN1#100bis-e, we concluded the UE processing order between UL CI and intra-UE multiplexing/prioritization, with following agreement, which means the UL CI will be applied after intra-UE multiplexing/prioritization.

Agreements:

  UE behavior of handling intra-UE prioritization/multiplexing for overlapping UL transmissions is not affected by UL CI.

Therefore it seems natural to extend the agreement to the dynamic SFI case, which means the UL cancellation due to dynamic SFI will be applied after intra-UE multiplexing/prioritization. Therefore suggest to consider the following proposed conclusion

* Propose conclusion:
* UE behaviour of handling intra-UE prioritization/multiplexing for overlapping UL transmissions on semi-static flexible symbols is not affected by UL cancellation due to dynamic SFI or DL grant

As discussed in R1-2002060, a semi-static UL transmission (or PUSCH repetition) can be configured to be collided with DL symbols configured by semi-static TDD configuration, or SSB symbols and in such cases the semi-static UL transmission (or PUSCH repetition) is cancelled. It is proposed to clarify whether such cancellation due to semi-static DL symbols is processed before or after intra-UE prioritization/multiplexing. Suggest to consider the following alternatives

* Alt 1: UL cancellation due to collision with DL symbols configured by semi-static TDD configuration, or SSB symbols is processed **before** the intra-UE prioritization/multiplexing for overlapping UL transmissions
* Alt 2: UL cancellation due to collision with DL symbols configured by semi-static TDD configuration, or SSB symbols is processed **after** the intra-UE prioritization/multiplexing for overlapping UL transmissions

Question:

* Q1: Is the following proposed conclusion agreeable?
  + UE behaviour of handling intra-UE prioritization/multiplexing for overlapping UL transmissions on semi-static flexible symbols is not affected by UL cancellation due to dynamic SFI or DL grant
* Q2: Which of the following do you prefer and why?
  + Alt 1: UL cancellation due to collision with DL symbols configured by semi-static TDD configuration, or SSB symbols is processed **before** the intra-UE prioritization/multiplexing for overlapping UL transmissions
  + Alt 2: UL cancellation due to collision with DL symbols configured by semi-static TDD configuration, or SSB symbols is processed **after** the intra-UE prioritization/multiplexing for overlapping UL transmissions

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| Company | Comment |
| Nokia, NSB | Q1: OK  Q2: Alt. 1, to prevent unnecessary dropping |
| HW/HiSi | Q1: Yes.  Q2: Alt 1. Because semi-static TDD configuration or SSB symbols can be known in advance while UL CI intra-UE prioritization/multiplexing may be triggered dynamically |
| Sony | Q1: Yes  Q2: Alt 1. This can avoid unnecessary dropping of UL transmission and this shouldn’t affect UE timeline as noted by Huawei, semi-static DL symbols & SSB are known in advance. |
| Samsung | Q1: No - follow Rel-15 behaviour prior to Rel-16 behaviour  Q2: Alt. 1 - follow Rel-15 behaviour prior to Rel-16 behaviour |
| CATT | Q1: OK  Q2: To achieve uniform solution for Q1 and Q2, we slightly prefer alt.2. It seems no additional benefits from alt.1. |
| ZTE | Q1: YES.  Then, another issue may be processing order of SFI and UL CI. In our view, the result will be the same irrespective of different processing orders. So processing according to the time order of DCI for SFI and UL CI should be a common way (no impact to current specification).  Q2: Alt 1.  Share similar views with Huawei. Because semi-static TDD configuration or SSB have been known in advance, it is reasonable for UE to process them based on the known information first. |
| Qualcomm | Q1: Yes; it would be good to clarify the behaviour.  Q2: Alt2, which is consistent with the earlier agreements too, i.e., the cancellation does not change the decision for multiplexing. |
| DOCOMO | Q1: OK  Q2: We are fine with both alternatives in general but we slightly prefer Alt.2 to have consolidated solution for Q1 and UL CI case agreed at the last meeting. |
| Intel | Q.1 Yes. Behavior should be consistent for any DCI format causing cancelation.  Q2: Alt 1. Agree with the comments above made in favour of Alt 1 |
| Ericsson | Q1: ok  Q2: Alt-1 is more optimal from spectral efficiency perspective (avoid unnecessary dropping) |
| OPPO | Q1: Yes  Q2: Alt-1 Because semi-static TDD configuration or SSB symbols can be known in advance |
| InterDigital | Q1: Yes  Q2: Alt. 1 |
| Motorola Mobility / Lenovo | Q1: good to clarify. We agree with Samsung  Q2: Alt 1, semi-static TDD configuration or SSB symbols are known in advance |
| Apple | Q1: it is good to clarify, but we are not sure the exact meaning of the proposed conclusion (similar question for the agreements last time). I could see two potential interpretation:  #1: the UE does all the intra-UE prioritization/multiplexing first before doing any cancellation due to dynamic SFI or DL grant, regardless of the order of the DCIs. For example, even if there is a 2nd grant that comes AFTER the dynamic SFI or DL grant that causes cancellation and it affects the intra-UE prioritization/multiplexing behaviour, the UE needs to hold on the cancellation until the intra-UE prioritization/multiplexing is done.  #2: the UE follows its own implementation in terms when/how to perform intra-UE prioritization/multiplexing, and this doesn’t get affected by dynamic SFI or DL grant. For example, if dynamic SFI or DL grant comes before intra-UE prioritization/multiplexing is done, the dynamic SFI or DL grant cancels whatever is impacted, and intra-UE prioritization/multiplexing will be done later on. If dynamic SFI or DL grant comes after intra-UE prioritization/multiplexing, there is no problem or ambiguity anyway.  Would be clarify which one is the correct understanding of the proposal.  Q2: Alt 1 seems to make more sense. Because this is based on semi-static TDD configuration, it may not be necessary to follow the same principle as the cases in Q1. |
| Panasonic | Q1: Yes  Q2: Alt.1. Considering PUSCH repetition Type B, segmentation occurs around semi-static TDD configuration or SSB symbols and it creates actual repetitions. The processing of intra-UE prioritization/multiplexing for overlapping UL transmissions should be after the segmentation. |
| LG | Q1. Yes  Q2: Alt.1. PUCCH resource would be determined with consideration of semi-static configuration. Of course, there is no issue since the configuration is known in advance. |

* Summary of discussion point#6
  + UE behaviour of handling intra-UE prioritization/multiplexing for overlapping UL transmissions on semi-static flexible symbols is not affected by UL cancellation due to dynamic SFI or DL grant
    - Support: (14) Nokia, Huawei, Sony, CATT, ZTE, Qualcomm, DOCOMO, Intel, Ericsson, OPPO, InterDigital, Panasonic, LG, vivo
    - Not support: Samsung, Motorola,

UE processing order

* Alt 1: UL cancellation due to collision with DL symbols configured by semi-static TDD configuration, or SSB symbols is processed **before** the intra-UE prioritization/multiplexing for overlapping UL transmissions
  + (14) Nokia, Huawei, Sony, Samsung, ZTE, DOCOMO (2nd preference), Intel, Ericsson, OPPO, Motorola, Apple, Panasonic, LG, vivo
* Alt 2: UL cancellation due to collision with DL symbols configured by semi-static TDD configuration, or SSB symbols is processed **after** the intra-UE prioritization/multiplexing for overlapping UL transmissions
  + (3) CATT, Qualcomm, DOCOMO (1st preference)

**Possible agreement**

* The UE processing order between the handling of intra-UE prioritization/multiplexing for overlapping UL transmissions, and the UL cancellation due to dynamic SFI or DL grant on semi-static flexible symbols is determined by the order between the ending symbol of PDCCH carrying the DL/UL grant scheduling the overlapping UL transmission and the ending symbol of PDCCH carrying the dynamic SFI or DL grant indicating the cancellation
  + If the ending symbol of PDCCH carrying the DL/UL grant scheduling the overlapping UL transmission is earlier than the ending symbol of PDCCH carrying the dynamic SFI or DL grant indicating the cancellation,
    - UE performs UL multiplexing first.
  + Otherwise,
    - UE performs UL cancellation due to dynamic SFI or DL grant first.

**Possible agreement**

* (Alt 1) UL cancellation due to collision with DL symbols configured by semi-static TDD configuration, or SSB symbols is processed before the intra-UE prioritization/multiplexing for overlapping UL transmissions
  + A UE does not expect to be indicated to transmit on the resources colliding with semi-static DL symbols and SSB.

# 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.

## **RAN1#100bis-e**

Agreements:

  UE behavior of handling intra-UE prioritization/multiplexing for overlapping UL transmissions is not affected by UL CI.

Agreeement:

* If both UL CI and intra-UE priority indicator are configured for a given UE, support a new RRC parameter to configure Behavior #1
  + Behaviour #1: UL CI is only applicable to the UL transmissions indicated/configured as low priority level
* When the RRC parameter is not provided to the UE, behaviour #2 is used
  + Behaviour #2: UL CI is applicable to UL transmission irrespective of its priority level
* Note: the RRC signaling details will be decided by RAN2

Agreement:

* Up to X BDs can be configured per UL CI monitoring occasion
  + For ULCI monitoring occasion determination, search space sets start at a same OFDM symbol correspond to a same monitoring occasion
  + X=1

Agreement:

* UE uses the smallest SCS configuration between the SCS configurations of the PDCCH for DCI format 2\_4 detection and the SCS configurations in *scs-SpecificCarrierList*of UL carrier to determine the RUR starting symbol.
* UE uses the smallest SCS configurations in *scs-SpecificCarrierList*of UL carrier to determine offset d.
* Adopt the TP below for 38.213 section 11.2A

TP for 38.213 section 11.2A

|  |
| --- |
| **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 cid:image001.png@01D61F9F.E92893A0 symbols to be the first symbol that is after cid:image002.png@01D61F9F.E92893A0 from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where cid:image003.png@01D61F9F.E92893A0 is provided by XXX with the smallest SCS configuration~~between the SCS configurations of the PDCCH and the SCS configurations~~ provided in scs-SpecificCarrierList of UL carrier. cid:image004.png@01D61F9F.E92893A0 corresponds to the PUSCH processing capability 2 [6, TS 38.214] assuming cid:image005.png@01D61F9F.E92893A0 with cid:image006.png@01D61F9F.E92893A0 being the smallest SCS configuration between the SCS configurations of the PDCCH and the SCS configurations provided in scs-SpecificCarrierList of UL carrier~~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 cid:image004.png@01D61F9F.E92893A0 after a last symbol of a CORESET where the UE detects the DCI format 2\_4.  <---------------------------Other   parts are omitted -------------------------------> |

Agreements:

To adopt the following TP for 38.213

|  |
| --- |
| **11.2A     Cancellation indication** =====omitted text ======  For a serving cell having an associated field in DCI format 2\_4, for the field denote by  -    *N*CI a number of bits provided by CI-PayloadSize  -    *B*CI a number of PRBs provided by frequencyRegionforCI in timeFrequencyRegion  -    *T*CI a number of symbols, excluding symbols for reception of SS/PBCH blocks and DL symbols indicated bytdd-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.  -      *G*CI a number of partitions for the *T*CI symbols provided by timeGranularityforCI in timeFrequencyRegion  =====omitted text ====== |

**Agreement: Adopt the following text proposal for TS38.213 section 11.2A**

|  |
| --- |
| ----------------------------- **Text proposal starts for TS 38.213, v16.1.0, Section 11.2A** -----------  A UE that detects a DCI format 2\_4 for a serving cell cancels a PUSCH transmission, or a repetition of a PUSCH transmission [6, TS 38.214] if the PUSCH transmission is with repetitions, or an SRS transmission on the serving cell if, respectively,  -     a group of symbols, from the symbols, has ~~a corresponding~~ at least one bit value of '1' in the corresponding set of *N*BI bits in the DCI format 2\_4 and includes a symbol of the (repetition of the) PUSCH transmission or of the SRS transmission, and  -     a group of PRBs, from the PRBs, has a corresponding bit value of '1' in the set of bits corresponding to the group of symbols in the DCI format 2\_4 and includes a PRB of the (repetition of the) PUSCH transmission or of the SRS transmission,  where  -     the cancellation of the (repetition of the) PUSCH transmission includes all symbols from the earliest symbol of the (repetition of the) PUSCH transmission that ~~are~~ is in ~~one~~ ~~or more~~ a group~~s~~ of symbols having corresponding bit values of '1' in the DCI format 2\_4;  -     the cancellation of the SRS transmission includes only symbols that are in one or more groups of symbols having corresponding bit values of '1' in the DCI format 2\_4.  ----------------------------- **Text proposal ends for TS 38.213, v16.1.0, Section 11.2A** ------------- |

**Agreement**

•          When UE is configured with both DCI format 0\_1 and 0\_2 with SRI presents in only one of the DCI formats, then for the DCI format without SRI field

  For 1 bit OLPC parameter indication, if OLPC parameter set indication in DCI is set to ‘1’

  P0-PUSCH-Set having the lowest p0-PUSCH-SetId is used.

  For 2 bit OLPC parameter indication, if OLPC parameter set indication in DCI is set to ‘01’ or ‘10’

  P0-PUSCH-Set having the lowest p0-PUSCH-SetId is used.

**Agreement: Adopt the following text proposal for TS38.213 section 7.1.1**

|  |
| --- |
| TP for 38.213 16.1.0 Section 7.1.1  **<**Unchanged text is omitted>  -     If the PUSCH transmission is scheduled by a DCI format that does not include a SRI field, or if *SRI-PUSCHPowerControl* is not provided to the UE, cid:image003.png@01D61B4C.5453A280,  -     If *P0-PUSCH-Set* is provided to the UE and the DCI format includes an open-loop power control parameter set indication field, the UE determines a value of cid:image004.png@01D61B4C.5453A280 from  -     a first *P0-PUSCH-AlphaSet* in *p0-AlphaSets* if a value of the open-loop power control parameter set indication field is '0' or '00'  -     a first value in *P0-PUSCH-Set* with the lowest *p0-PUSCH-SetId* value if a value of the open-loop power control parameter set indication field is '1' or '01'  -     a second value in *P0-PUSCH-Set* with the lowest *p0-PUSCH-SetId* value if a value of the open-loop power control parameter set indication field is '10'  -     else, the UE determines cid:image005.png@01D61B4C.5453A280 from the value of the first *P0-PUSCH-AlphaSet* in *p0-AlphaSets*  **<**Unchanged text is omitted> |

Agreement: Adopt the following text proposal for 38.213 section 11.2A

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| --- |
| 11.2A Cancellation indication If a UE is provided *UplinkCancellation*, the UE is provided a CI-RNTI by *ci-RNTI* for monitoring PDCCH candidates for a DCI format 2\_4 [5, TS 38.212]. *UplinkCancellation* additionally provides to the UE  -     a set of serving cells, by *ci-ConfigurationPerServingCell*,that includes a set of serving cell indexes and a corresponding set of locations for fields in DCI format 2\_4 by *positionInDCI*  -     a number of fields in DCI format 2\_4, by *positionInDCI-forSUL*, for each serving cell for a SUL carrier ~~for a SUL carrier~~, if the serving cell is configured with a SUL carrier  ~~for SUL of a serving cell if the serving cell configured with SUL~~  -     an information payload size for DCI format 2\_4 by *dci-PayloadSize-forCI*  -     an indication for time-frequency resources by *timeFrequencyRegion*  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*  -     a number of partitions for the symbols provided by *timeGranularityforCI* in *timeFrequencyRegion*  sets of bits from the MSB of the bits have a one-to-one mapping with groups of symbols where each of the first groups includes symbols and each of the remaining groups includes symbols. A UE determines a symbol duration with respect to a SCS configuration of an active DL BWP where the UE monitors PDCCH for DCI format 2\_4 detection.  For a group of symbols, bits from MSB of 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.  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~~* higher layer parameter *delta\_offset\_d*. 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.  A UE that detects a DCI format 2\_4 for a serving cell cancels a PUSCH transmission, or a repetition of a PUSCH transmission [6, TS 38.214] if the PUSCH transmission is with repetitions, or an SRS transmission on the serving cell if, respectively,  -     a group of symbols, from the symbols, has a corresponding bit value of ‘1’ in the DCI format 2\_4 and includes a symbol of the (repetition of the) PUSCH transmission or of the SRS transmission, and  -     a group of PRBs, from the PRBs, has a corresponding bit value of ‘1’ in the DCI format 2\_4 and includes a PRB of the (repetition of the) PUSCH transmission or of the SRS transmission,  where  -     the cancellation of the (repetition of the) PUSCH transmission includes all symbols from the earliest symbol of the (repetition of the) PUSCH transmission that are in one or more groups of symbols having corresponding bit values of ‘1’ in the DCI format 2\_4;  -     the cancellation of the SRS transmission includes only symbols that are in one or more groups of symbols having corresponding bit values of ‘1’ in the DCI format 2\_4. |

Agreement: Adopt the following text proposal for 38.212 section 7.3.1.3.5

|  |
| --- |
| 7.3.1.3.5                       Format 2\_4 DCI format 2\_4 is used for notifying the PRB(s) and OFDM symbol(s) where UE cancels the corresponding UL transmission from the UE according to Clause 11.2A~~5~~ of [5, TS 38.213].  The following information is transmitted by means of the DCI format 2\_4 with CRC scrambled by CI-RNTI:  -     Cancellation indication 1, Cancellation indication 2, …, Cancellation indication indication *N*.  The size of DCI format 2\_4 is configurable by higher layers parameter *dci-PayloadSize-forCI* up to 126 bits, according to Clause 11.2A~~5~~ of [5, TS 38.213]. The number of bits for each cancellation indication is configurable by higher layer parameter *CI-PayloadSize*. For a UE, there is at most one cancellation indication for an UL carrier.  <Unchanged text is omitted> |

## **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

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| 1 | [**R1-2003321**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003321.zip) | Remaining issues on UL inter-UE multiplexing between eMBB and URLLC | ZTE |
| 2 | [**R1-2003391**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003391.zip) | UL inter UE Tx prioritization for URLLC | vivo |
| 3 | R1-2003394 | Summary of UL inter UE Tx prioritization | Moderator (vivo) |
| 4 | [**R1-2003443**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003443.zip) | Remaining Issue of Inter-UE Prioritization and Multiplexing of  UL Transmissions | Ericsson |
| 5 | [**R1-2003527**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003527.zip) | Corrections on UL inter-UE multiplexing | Huawei, HiSilicon |
| 6 | [**R1-2003581**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003581.zip) | Maintenance of Rel-16 URLLC Enhanced inter UE Tx prioritization/multiplexing | Nokia, Nokia Shanghai Bell |
| 7 | [**R1-2003623**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003623.zip) | Remaining issues on inter-UE UL multiplexing | CATT |
| 8 | [**R1-2003686**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003686.zip) | Remaining issues on enhanced inter-UE Tx prioritization/multiplexing | MediaTek Inc. |
| 9 | [**R1-2003709**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003709.zip) | Remaining Issues on Enhanced Inter-UE Tx Prioritisaion / Multiplexing | NEC |
| 10 | [**R1-2003740**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003740.zip) | Remaining issues on enhanced inter-UE multiplexing | Intel Corporation |
| 11 | [**R1-2003868**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003868.zip) | Remaining issues for inter-UE multiplexing | Samsung |
| 12 | [**R1-2003981**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003981.zip) | Remaining issues of enhanced inter UE Tx prioritization/multiplexing | Spreadtrum Communications |
| 13 | [**R1-2004032**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004032.zip) | Remaining issues of UL inter UE Tx prioritization | LG Electronics |
| 14 | [**R1-2004118**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004118.zip) | Inter UE Tx prioritization and multiplexing | OPPO |
| 15 | [**R1-2004185**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004185.zip) | Remaining issues on Inter-UE Multiplexing for eURLLC | Sony |
| 16 | [**R1-2004225**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004225.zip) | Remaining Issues on Inter-UE Cancellation for eURLLC | Apple |
| 17 | [**R1-2004272**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004272.zip) | Inter-UE prioritization/multiplexing | InterDigital, Inc. |
| 18 | [**R1-2004371**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004371.zip) | Remaining issues of enhanced inter UE Tx prioritization/multiplexing | Motorola Mobility, Lenovo |
| 19 | [**R1-2004393**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004393.zip) | Remaining issue on inter-UE Tx multiplexing/prioritization | NTT DOCOMO, INC |
| 20 | [**R1-2004460**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004460.zip) | Remaining issues on uplink Inter-UE Tx Multiplexing and Prioritization | Qualcomm Incorporated |
| 21 | [**R1-2004525**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004525.zip) | Remaining issues on inter-UE multiplexing for NR URLLC | WILUS Inc. |
| 22 | [**R1-2004390**](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004390.zip) | Remaining issues for UCI enhancement for Rel-16 URLLC | NTT DOCOMO, INC |