3GPP TSG RAN WG1 #104-e R1-2101841

e-Meeting, January 25th – February 5th, 2021

Source: Moderator (OPPO)

Title: Summary#1 of email thread [104-e-NR-L1enh-URLLC-02]

Agenda Item: 7.2.5

Document for: Discussion and Decision

# Introduction

In this paper, discussions under the following email thread in RAN1#104-e are summarized.

[104-e-NR-L1enh-URLLC-02] Email discussion/approval on remaining issues on UCI enhancements – Jia (OPPO) by Feb 3

* Issue 1: Timing for secondary cell activation / deactivation
* Issue 2: Limitation on the number of PUCCHs carrying HARQ-ACK in a slot/subslot
* Issue 3: Conflict between the first PUCCH repetition and semi-static configuration
* Issue 5: Correction for sub-slot based PUCCH

# Remaining issues

## Issue#1: Timing for secondary cell activation / deactivation

## Inputs from Tdocs

This issue was discussed in last meeting. And two options were considered. But no agreement was reached.

* Option 1: Adopt the TP with changing the definition of the slot n
* Option 2: Adopt the TP without changing the definition of the slot n

The proposals submitted to this meeting are listed below:

*ZTE proposal:*

In our understanding, the slot with 2/7 OSs only exists in Clause 9 in TS 38.213, but in the other clauses, at least before Clause 9, a slot always contains 14 OSs. Therefore, even if a UE is provided *subslotLengthForPUCCH-r16*, the *k*1 in Clause 4 still should be a number of slots with 14 OSs for a PUCCH transmission with HARQ-ACK information for the PDSCH reception.

***Proposal 1:*** *The current spec about the timing for secondary cell activation or deactivation is clear, no changes are needed.*

*E/// proposal:*

[Observation 1 When an indicated PDSCH-to-HARQ\_feedback timing indicator field in the DCI format scheduling the PDSCH reception for SCell activation determines the number of sub-slots, inconsistency occurs in determination of *k* given by in Clause 4.3 of TS38.213 since *k1* is given in number of sub-slots while  in number of slots.](#_Toc61617964)

[Observation 2 Solutions to resolve the inconsistency in SCell activation timing due to sub-slot based PUCCH transmission, should maintain the slot granularity (i.e. slot constitute of 14 symbols) for reference slots for PUCCH transmissions and *n* and *k* indexes in Clause 4.3 of TS 38.213 to preserved alignment with timing granularity used in TS38.133 for SCell activation where NR slot length with respect to the numerology used in the SCell being activated is assumed.](#_Toc61617965)

Based on the discussion in the previous sections we propose the following:

[Proposal 1 Adopt the following Text Proposal for Clause 4.3 in TS38.213 resolve the inconsistency in SCell activation timing due to sub-slot based PUCCH transmission.](#_Toc61617966)

|  |
| --- |
| ---------------------------------Start of Text Proposal on TS 38.213 v16.4.0-----------------------  4.3 Timing for secondary cell activation / deactivation  With reference to slots for PUCCH transmissions each consisting of as defined in [4, TS 38.211],when a UE receives in a PDSCH an activation command [11, TS 38.321] for a secondary cell ending in slot *n*, the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133] and no earlier than slot , except for the following:  - the actions related to CSI reporting on a serving cell that is active in slot  - the actions related to the *sCellDeactivationTimer* associated with the secondary cell [11, TS 38.321] that the UE applies in slot  - the actions related to CSI reporting on a serving cell which is not active in slot that the UE applies in the earliest slot after  in which the serving cell is active.  The value of  is  ~~where  is a number of slots for~~ where it is assumed is the slot with a PUCCH transmission with HARQ-ACK information for the PDSCH reception ~~and is indicated by the PDSCH-to-HARQ\_feedback timing indicator field in the DCI format scheduling the PDSCH reception~~ as described in Clause 9.2.3 and  is a number of slots per subframe for the SCS configuration  of the PUCCH transmission as defined in [4, TS 38.211].  With reference to slots for PUCCH transmissions, if a UE receives a deactivation command [11, TS 38.321] for a secondary cell ending in slot , the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133], except for the actions related to CSI reporting on an activated serving cell which the UE applies in slot *.*  If the *sCellDeactivationTimer* associated with the secondary cell expires in slot , the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133], except for the actions related to CSI reporting on an activated serving cell which the UE applies in the first slot that is after slot  where  is the SCS configuration for PDSCH reception on the secondary cell.  ---------------------------------End of Text Proposal on TS 38.213 v16.4.0----------------------- |

*CATT proposal:*

***Proposal 2: Adopt the following TP for section 4.3 of TS38.213.***

-------------------------------------------------- Start of text proposal ------------------------------------------------------

**4.3 Timing for secondary cell activation / deactivation**

With reference to slots for PUCCH transmissions, when a UE receives in a PDSCH an activation command [11, TS 38.321] for a secondary cell ending in slot *n*, the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133] and no earlier than slot , except for the following:

- the actions related to CSI reporting on a serving cell that is active in slot 

- the actions related to the *sCellDeactivationTimer* associated with the secondary cell [11, TS 38.321] that the UE applies in slot 

- the actions related to CSI reporting on a serving cell which is not active in slot that the UE applies in the earliest slot after  in which the serving cell is active.

The value of  is where is a number of slots from slot n to a slot for a PUCCH transmission with HARQ-ACK information for the PDSCH reception ~~and is indicated by the PDSCH-to-HARQ\_feedback timing indicator field in the DCI format scheduling the PDSCH reception as described in Clause 9.2.3~~ and  is a number of slots per subframe for the SCS configuration  of the PUCCH transmission.



With reference to slots for PUCCH transmissions, if a UE receives a deactivation command [11, TS 38.321] for a secondary cell ending in slot , the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133], except for the actions related to CSI reporting on an activated serving cell which the UE applies in slot *.*

If the *sCellDeactivationTimer* associated with the secondary cell expires in slot , the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133], except for the actions related to CSI reporting on an activated serving cell which the UE applies in the first slot that is after slot  where  is the SCS configuration for PDSCH reception on the secondary cell.

----------------------------------------------------- End of text proposal ------------------------------------------------------

*vivo proposal:*

Proposal 1: Slot should be used when defining the effective time of MAC-CE when a UE is provided *subslotLength-ForPUCCH.*

Proposal 2: Adopt the following text proposal for timing for SCell activation/deactivation in 38.213.

-------------------------------------------------- Start of text proposal ------------------------------------------------------

4.3 Timing for secondary cell activation / deactivation

When a UE receives in a PDSCH an activation command [11, TS 38.321] for a secondary cell and would transmit a PUCCH with corresponding HARQ-ACK in slot *n*, the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133] and no earlier than slot , except for the following:

- the actions related to CSI reporting on a serving cell that is active in slot 

- the actions related to the *sCellDeactivationTimer* associated with the secondary cell [11, TS 38.321] that the UE applies in slot 

- the actions related to CSI reporting on a serving cell which is not active in slot that the UE applies in the earliest slot after  in which the serving cell is active.

The value of  is where  is a number of slots per subframe for the SCS configuration  of the PUCCH transmission.

If a UE receives a deactivation command [11, TS 38.321] for a secondary cell and would transmit a PUCCH with corresponding HARQ-ACK in slot , the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133], except for the actions related to CSI reporting on an activated serving cell which the UE applies in slot *.*

If the *sCellDeactivationTimer* associated with the secondary cell expires in slot , the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133], except for the actions related to CSI reporting on an activated serving cell which the UE applies in the first slot that is after slot  where  is the SCS configuration for PDSCH reception on the secondary cell.

\*\*\* Unchanged text is omitted \*\*\*

----------------------------------------------------- End of text proposal ------------------------------------------------------

Text proposal for correction for timing of applying spatial setting for a PUCCH transmission is provided in the following section 2.2.

*Nokia proposal:*

**Proposal 2: Adopt the following draft CR to clarify the SCell activation / deactivation timing with sub-slot PUCCH configuration (changes in green, to be shown as track changes in the final CR)**

<omitted text>

**4.3 Timing for secondary cell activation / deactivation**

With reference to slots for PUCCH transmissions, when a UE receives in a PDSCH an activation command [11, TS 38.321] for a secondary cell ending in slot *n*, the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133] and no earlier than slot , except for the following:

- the actions related to CSI reporting on a serving cell that is active in slot 

- the actions related to the *sCellDeactivationTimer* associated with the secondary cell [11, TS 38.321] that the UE applies in slot 

- the actions related to CSI reporting on a serving cell which is not active in slot that the UE applies in the earliest slot after  in which the serving cell is active.

The value of is defined as , where *m* is the slot where UE transmits PUCCH with HARQ-ACK for the PDSCH carrying the activation command  ~~is where, is a number of slots for a PUCCH transmission with HARQ-ACK information for the PDSCH reception and is indicated by the PDSCH-to-HARQfeedback timing indicator field in the DCI format scheduling the PDSCH reception~~ as described in Clause 9.2.3 and  is a number of slots per subframe for the SCS configuration  of the PUCCH transmission.

<omitted text>

*vivo proposal:*

Proposal 1: Slot should be used when defining the effective time of MAC-CE when a UE is provided *subslotLength-ForPUCCH.*

Proposal 2: Adopt the following text proposal for timing for SCell activation/deactivation in 38.213.

-------------------------------------------------- Start of text proposal ------------------------------------------------------

4.3 Timing for secondary cell activation / deactivation

With reference to slots for PUCCH transmissions, when a UE receives in a PDSCH an activation command [11, TS 38.321] for a secondary cell and transmits corresponding HARQ-ACK in slot *n*, the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133] and no earlier than slot , except for the following:

- the actions related to CSI reporting on a serving cell that is active in slot 

- the actions related to the *sCellDeactivationTimer* associated with the secondary cell [11, TS 38.321] that the UE applies in slot 

- the actions related to CSI reporting on a serving cell which is not active in slot that the UE applies in the earliest slot after  in which the serving cell is active.

The value of  is where  is a number of slots per subframe for the SCS configuration  of the PUCCH transmission.

With reference to slots for PUCCH transmissions, if a UE receives a deactivation command [11, TS 38.321] for a secondary cell and transmits corresponding HARQ-ACK in slot , the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133], except for the actions related to CSI reporting on an activated serving cell which the UE applies in slot *.*

If the *sCellDeactivationTimer* associated with the secondary cell expires in slot , the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133], except for the actions related to CSI reporting on an activated serving cell which the UE applies in the first slot that is after slot  where  is the SCS configuration for PDSCH reception on the secondary cell.

\*\*\* Unchanged text is omitted \*\*\*

----------------------------------------------------- End of text proposal ------------------------------------------------------

Text proposal for correction for timing of applying spatial setting for a PUCCH transmission is provided in the following section 2.2.

*Fujitsu proposal:*

**Observation: *According to the current specification, in the case of sub-slot based PUCCH transmission, there is a time unit mismatch in the equation for calculating the slot for applying SCell activation or deactivation.***

**Proposal 1: *In the case of sub-slot based PUCCH transmission, the timing for SCell activation or deactivation in Rel-16 shall be the same as the one in Rel-15.***

* ***E.g. the reference point for the 3 ms MAC CE processing gap for the SCell activation or deactivation shall be counted from the end of the slot containing the PUCCH transmission.***

**Proposal 2: *In the case of sub-slot based PUCCH transmission, the k*1 *for the determination of SCell activation or deactivation timing shall be***

* ***the slot offset between the PDSCH carrying the SCell activation or deactivation command and the PUCCH for the corresponding HARQ-ACK information.***

The corresponding text proposals are provided in Section 4.

Text proposal

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| 4.3 Timing for secondary cell activation / deactivation With reference to slots for PUCCH transmissions, when a UE receives in a PDSCH an activation command [11, TS 38.321] for a secondary cell ending in slot *n*, the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133] and no earlier than slot , except for the following:  - the actions related to CSI reporting on a serving cell that is active in slot  - the actions related to the *sCellDeactivationTimer* associated with the secondary cell [11, TS 38.321] that the UE applies in slot  - the actions related to CSI reporting on a serving cell which is not active in slot that the UE applies in the earliest slot after  in which the serving cell is active.  The value of  is  where  is a number of slots for a PUCCH transmission with HARQ-ACK information for the PDSCH reception and is indicated by the PDSCH-to-HARQ\_feedback timing indicator field in the DCI format scheduling the PDSCH reception as described in Clause 9.2.3 and  is a number of slots per subframe for the SCS configuration  of the PUCCH transmission. In the case that the PUCCH transmission is according to *subslotLength-ForPUCCH*, is a slot offset between the PUCCH transmission and the corresponding PDSCH reception.  With reference to slots for PUCCH transmissions, if a UE receives a deactivation command [11, TS 38.321] for a secondary cell ending in slot , the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133], except for the actions related to CSI reporting on an activated serving cell which the UE applies in slot *.*  If the *sCellDeactivationTimer* associated with the secondary cell expires in slot , the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133], except for the actions related to CSI reporting on an activated serving cell which the UE applies in the first slot that is after slot  where  is the SCS configuration for PDSCH reception on the secondary cell.  < Unchanged parts are omitted > |

*Nokia proposal:*

**Proposal 1: Adopt the following draft CR to clarify the SCell activation / deactivation timing with sub-slot PUCCH configuration (changes in green, to be shown as track changes in the final CR)**

<omitted text>

**4.3 Timing for secondary cell activation / deactivation**

With reference to slots for PUCCH transmissions, when a UE receives in a PDSCH an activation command [11, TS 38.321] for a secondary cell ending in slot *n*, the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133] and no earlier than slot , except for the following:

- the actions related to CSI reporting on a serving cell that is active in slot 

- the actions related to the *sCellDeactivationTimer* associated with the secondary cell [11, TS 38.321] that the UE applies in slot 

- the actions related to CSI reporting on a serving cell which is not active in slot that the UE applies in the earliest slot after  in which the serving cell is active.

The value of is where is a number of slots, composed of image005  symbols [4], from slot *n* to a slot for a PUCCH transmission with HARQ-ACK information for the PDSCH reception ~~and is indicated by the PDSCH-to-HARQ feedback timing indicator field in the DCI format scheduling the PDSCH reception as described in Clause 9.2.3~~ and  is a number of slots per subframe for the SCS configuration  of the PUCCH transmission.

<omitted text>

*Huawei proposal:*

***Observation 1: By changing the reference slot (slot n) for Scell activation or deactivation to the slot of the PUCCH transmission but not the slot of the PDSCH carrying the activation command, and modifying the value of k from  to , there remains no ambiguity in [1] and no NBC problem will occur.***

***Proposal 1: Change the referent slot for Scell activation or deactivation to the slot of the PUCCH transmission but not the slot of the PDSCH carrying the activation command in 38.213.***

## 1st round proposal and discussion

Considering the TP from Ericsson, companies are encouraged to express your views:

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| ---------------------------------Start of Text Proposal on TS 38.213 v16.4.0-----------------------  4.3 Timing for secondary cell activation / deactivation  With reference to slots for PUCCH transmissions each consisting of symbols as defined in [4, TS 38.211], when a UE receives in a PDSCH an activation command [11, TS 38.321] for a secondary cell ending in slot *n*, the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133] and no earlier than slot , except for the following:  - the actions related to CSI reporting on a serving cell that is active in slot  - the actions related to the *sCellDeactivationTimer* associated with the secondary cell [11, TS 38.321] that the UE applies in slot  - the actions related to CSI reporting on a serving cell which is not active in slot that the UE applies in the earliest slot after  in which the serving cell is active.  The value of  is  ~~where  is a number of slots for~~ where is a slot of a PUCCH transmission with HARQ-ACK information for the PDSCH reception ~~and is indicated by the PDSCH-to-HARQ\_feedback timing indicator field in the DCI format scheduling the PDSCH reception~~ as described in Clause 9.2.3 and  is a number of slots per subframe for the SCS configuration  of the PUCCH transmission as defined in [4, TS 38.211].  With reference to slots for PUCCH transmissions, if a UE receives a deactivation command [11, TS 38.321] for a secondary cell ending in slot , the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133], except for the actions related to CSI reporting on an activated serving cell which the UE applies in slot *.*  If the *sCellDeactivationTimer* associated with the secondary cell expires in slot , the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133], except for the actions related to CSI reporting on an activated serving cell which the UE applies in the first slot that is after slot  where  is the SCS configuration for PDSCH reception on the secondary cell.  ---------------------------------End of Text Proposal on TS 38.213 v16.4.0----------------------- |

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| Company | Comments |
| HW/HiSi | Fine with the intention of the TP. We suggest the following two minor modifications.   * In the insertion in the first row, could we add “symbols” after the , i.e. transmissions each consisting of **symbols** as defined in [4, TS 38.211],  * The second insertion, in the middle of the TP, maybe it is better to add “slot”, i.e. The value of  is  ~~where  is a number of slots for~~ where it is assumed **slot** is the slot with.. |
| CATT | We are fine with the TP in principle with the following comments.   1. We do not think the first change is needed but would also be fine if majority companies see the need. If it is the case, we need the same change for deactivation in the same clause and would like to add “symbols” in blue. Besides, we are wondering whether the similar clarification is needed for various MAC CE effective times defined in 38.214 which use the wording “the UE would transmit a PUCCH with HARQ-ACK information in slot *n*”   With reference to slots for PUCCH transmissions each consisting of symbols as defined in [4, TS 38.211],   1. We propose the following updates in blue considering that the HARQ-ACK may be multiplexed in a PUSCH if the PUCCH carrying the HARQ-ACK overlaps with PUSCH (similar wording as in 38.214). We do not think the last reference to 38.211 is needed.   The value of  is  ~~where  is a number of slots for~~ where ~~it is assumed~~slot is the slot ~~with~~in which the UE would transmit a PUCCH ~~transmission~~ with HARQ-ACK information for the PDSCH reception ~~and is indicated by the PDSCH-to-HARQ\_feedback timing indicator field in the DCI format scheduling the PDSCH reception~~ as described in Clause 9.2.3 and  is a number of slots per subframe for the SCS configuration  of the PUCCH transmission ~~as defined in [4, TS 38.211]~~.  Lastly, there are multiple proposals from vivo and Nokia in section 2.1.1. We would like to kindly request the FL to remove the redundancy to avoid confusion. |
| ZTE | The current spec about the timing for secondary cell activation or deactivation is clear, no changes are needed. The slot with 2/7 OSs only exists in Clause 9 in TS 38.213, but in the other clauses, at least before Clause 9, a slot always contains 14 OSs. Therefore, even if a UE is provided *subslotLengthForPUCCH-r16*, the k1 in Clause 4 still should be a number of slots with 14 OSs for a PUCCH transmission with HARQ-ACK information for the PDSCH reception. |
| Nokia | The TP is fine in principle but it would simplify the specification if we expressed directly what *m* is like it is done in our or CATT’s proposal. But this is a rather minor thing.  In the proposal, “assumed n+m” should be “assumed slot n+m” as well as the missing ‘symbol’ as pointed out by some companies already should be at least fixed. |
| vivo | For the first change, we share similar concern as CATT. Various MAC CE effective times are defined in 38.214, and slot of 14 symbols is used for MAC CE effective times defined in 38.214. We prefer to keep unity among different MAC CE effective times |
| Samsung | OK in principle with the TP. Some straightforward changes/corrections are made directly in the proposed TP for consideration in the final CR.  Regarding the applicability of this change to other occasions, we may consider a general statement at the next meeting such as “With respect to MAC CE activation/deactivation, a slot includes symbols as defined in [4, TS 38.211].” |
| DOCOMO | We are fine with the TP in principle and also fine with the modification from Huawei and Nokia |
| Qualcomm | OK with the principle of the TP. However, we think Fujitsu’s TP is cleaner: it keeps the current spec untouched (hance not changing any Rel-15 behavior for UE not support sub-slot PUCCH), but clarifies that K1 is measured in terms of slots instead of subslot for MAC-CE activation/deactivation. |
| Fujitsu | We are fine with the TP in principle. We share the same view with Qualcomm. It is better to keep the entire Rel-15 part untouched and clarify k1 in the case of sub-slot based PUCCH transmission. |
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## Issue#2: Limitation on the number of PUCCHs carrying HARQ-ACK in a slot/subslot

## Inputs from Tdocs

*Nokia proposal:*

**Proposal 2: Adopt the following draft CR to clarify that more than one PUCCH with HARQ-ACK information may be transmitted in a sub-slot by UE with two PUCCH-configs (changes in green, to be shown as track changes in the final CR).**

**9 UE procedure for reporting control information**

<omitted text>

If a UE is provided two *PUCCH-Config*

- if the UE is provided *subslotLengthForPUCCH-r16* in the first *PUCCH-Config*, the PUCCH resource for any SR configuration with priority index 0 or any CSI report configuration in any *PUCCH-Config* is within the *subslotLengthForPUCCH-r16* symbols in the first *PUCCH-Config*

- if the UE is provided *subslotLengthForPUCCH-r16* in the second *PUCCH-Config*, the PUCCH resource for any SR configuration with priority index 1 in any *PUCCH-Config* is within the *subslotLengthForPUCCH-r16* symbols in the second *PUCCH-Config*

- the UE shall separately apply the procedure described in Clause 9.2.3 for reporting HARQ-ACK information in a PUCCH resource of the first and second *PUCCH-Config*.

<omitted text>

*Xiaomi proposal:*

**9.2.3 UE procedure for reporting HARQ-ACK**

If UE is provided *subslotLengthForPUCCH* in *PUCCH-Config*, a UE does not expect to transmit more than one PUCCH with HARQ-ACK information in a subslot, otherwise, a UE does not expect to transmit more than one PUCCH with HARQ-ACK information in a slot

*DOCOMO proposal:*

---------------------------------Start of Text Proposal on TS 38.213 v16.4.0-----------------------

**9.2.3 UE procedure for reporting HARQ-ACK**

A UE does not expect to transmit more than one PUCCH with HARQ-ACK information in a slot per priority.

<Unchanged parts are omitted>

----------------------------------End of Text Proposal on TS 38.213 v16.4.0-------------------------

## 1st round proposal and discussion

Considering the TP from Nokia and DOCOMO, companies are encouraged to express your views:

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| ---------------------------------Start of Text Proposal on TS 38.213 v16.4.0-----------------------  **9 UE procedure for reporting control information**  <omitted text>  If a UE is provided two *PUCCH-Config*  - if the UE is provided *subslotLengthForPUCCH-r16* in the first *PUCCH-Config*, the PUCCH resource for any SR configuration with priority index 0 or any CSI report configuration in any *PUCCH-Config* is within the *subslotLengthForPUCCH-r16* symbols in the first *PUCCH-Config*  - if the UE is provided *subslotLengthForPUCCH-r16* in the second *PUCCH-Config*, the PUCCH resource for any SR configuration with priority index 1 in any *PUCCH-Config* is within the *subslotLengthForPUCCH-r16* symbols in the second *PUCCH-Config*  - the UE shall separately apply the procedure described in Clause 9.2.3 for reporting HARQ-ACK information in a PUCCH resource of the first and second *PUCCH-Config*.  <omitted text>  ---------------------------------End of Text Proposal on TS 38.213 v16.4.0----------------------- |

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| ---------------------------------Start of Text Proposal on TS 38.213 v16.4.0-----------------------  **9 9.2.3 UE procedure for reporting HARQ-ACK**  A UE does not expect to transmit more than one PUCCH with HARQ-ACK information in a slot per priority.  <Unchanged parts are omitted>  ---------------------------------End of Text Proposal on TS 38.213 v16.4.0----------------------- |

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| Company | Comments |
| HW/HiSi | Agree with both TPs |
| CATT | We prefer the TP from DOCOMO since the proposal from Nokia is already covered by the following texts in clause 9.1.   |  | | --- | | If a UE is provided *pdsch-HARQ-ACK-CodebookList*, the UE can be indicated by *pdsch-HARQ-ACK-CodebookList* to generate one or two HARQ-ACK codebooks. If the UE is indicated to generate one HARQ-ACK codebook, the HARQ-ACK codebook is associated with a PUCCH of priority index 0. If a UE is provided *pdsch-HARQ-ACK-CodebookList*, the UE multiplexes in a same HARQ-ACK codebook only HARQ-ACK information associated with a same priority index. If the UE is indicated to generate two HARQ-ACK codebooks  - a first HARQ-ACK codebook is associated with a PUCCH of priority index 0 and a second HARQ-ACK codebook is associated with a PUCCH of priority index 1  - the UE is provided first and second for each of {*PUCCH-Config*, *UCI-OnPUSCH*, *PDSCH*-*codeBlockGroupTransmission*} by {*PUCCH-ConfigurationList*, *UCI-OnPUSCH-ListDCI-0-1*, *PDSCH-CodeBlockGroupTransmissionList*} or {*PUCCH-ConfigurationList*, *UCI-OnPUSCH-ListDCI-0-2*, *PDSCH-CodeBlockGroupTransmissionList*}, respectively, for use with the first and second HARQ-ACK codebooks, respectively | |
| ZTE | Agree the intention of CR to align the agreement that a UE can be configured with two HARQ-ACK codebooks, one is for low priority and another is for high priority, and those two HARQ-ACK CBs can be transmitted in a same slot or sub-slot(if a UE is provided *subslotLengthForPUCCH*) by two PUCCH resources from two PUCCH-Configs. Then the simplest change could be considered as:  “A UE does not expect to transmit more than one PUCCH with HARQ-ACK information in a slot per priority index.” |
| Nokia | Agree with both TPs   * on the second one, agree with ZTE, that it should be per priority index.   As a **reply to ZTE**: We find it logical to place the note in Clause 9 as there is a similar note in Clause 9 for multi-DCI based multi-TRP reception concerning Clause 9.2.3. |
| OPPO | Agree with second TP with modification from ZTE.  “A UE does not expect to transmit more than one PUCCH with HARQ-ACK information in a slot per priority index.” |
| Xiaomi | Agree with Nokia’s TP.  But some discussion maybe needed for DOCOMO’s TP. For example, if priority 0 corresponds to a slot-based *PUCCH-config* 0, and priority 1 corresponds to a subslot-based *PUCCH-config* 1. Then for priority 0, a UE does not expect to transmit more than one PUCCH with HARQ-ACK information in a slot. But for priority 1, a UE does not expect to transmit more than one PUCCH with HARQ-ACK information in a subslot(instead of slot). The case for priority 1 is not correctly captured in the currentTP.  In fact, it seems DOCOMO’ proposal and Xiaomi’s proposal are trying to solve the same issue. From our opinion the two TPs can be combined. For example,  For priority index associated with slot-based *PUCCH-config,* a UE does not expect to transmit more than one PUCCH with HARQ-ACK information in a slot.  For priority index associated with subslot-based *PUCCH-config,* a UE does not expect to transmit more than one PUCCH with HARQ-ACK information in a subslot. |
| vivo | Agree with the intension of the TP. Agree with second TP with modification from ZTE |
| DOCOMO | Agree with both TPs and also agree with the modification from ZTE |
| Qualcomm | We understand the intention of the two TPs, however, we don’t see the need to have two TPs for essentially the same issue.  In particular, in Nokia’s TP, UE shall apply the procedure in 9.2.3 separately for each HARQ-ACK CB, and this covers the one PUCCH with HARQ-ACK rule in Section 9.2.3. Therefore, we don’t need DOCOMO’s TP if Nokia’s TP is added.  With this said, we are open to discuss which TP to keep. |
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## Issue#3: Conflict between the first PUCCH repetition and semi-static configuration

## Inputs from Tdocs

*CATT proposal:*

***Proposal 1: RRC configured UCI transmission with PUCCH repetition is dropped from the first slot if the PUCCH in the first slot collides with semi-static DL symbol(s) or SSB symbols.***

A text proposal is provided below for TS38.213.

-------------------------------------------------- Start of text proposal ------------------------------------------------------

9.2.6 PUCCH repetition procedure

<Unchanged text omitted>

For unpaired spectrum, the UE determines the slots for a PUCCH transmission starting from a slot indicated to the UE as described in Clause 9.2.3 for HARQ-ACK reporting, or a slot determined as described in Clause 9.2.4 for SR reporting or in Clause 5.2.1.4 of [6, TS 38.214] for CSI reporting and having

- an UL symbol, as described in Clause 11.1, or flexible symbol that is not SS/PBCH block symbol provided by *startingSymbolIndex* in *PUCCH-format1*, or in *PUCCH-format3*, or in *PUCCH-format4* as a first symbol, and

- consecutive UL symbols, as described in Clause 11.1, or flexible symbols that are not SS/PBCH block symbols, starting from the first symbol, equal to or larger than a number of symbols provided by *nrofsymbols* in *PUCCH-format1*, or in *PUCCH-format3*, or in *PUCCH-format4*

except that for repetitions of a PUCCH transmission which is not in response to a DCI format detection and a slot indicated to the UE as described in Clause 9.2.3 for HARQ-ACK reporting, or a slot determined as described in Clause 9.2.4 for SR reporting or in Clause 5.2.1.4 of [6, TS 38.214] for CSI reporting does not satisfy the above conditions, the UE does not transmit the PUCCH transmission.

For paired spectrum, the UE determines the slots for a PUCCH transmission as the consecutive slots starting from a slot indicated to the UE as described in Clause 9.2.3 for HARQ-ACK reporting, or a slot determined as described in Clause 9.2.4 for SR reporting or in Clause 5.2.1.4 of [6, TS 38.214] for CSI reporting.

----------------------------------------------------- End of text proposal ------------------------------------------------------

*Huawei proposal:*

***Observation 2: In order to transmit UCI,***

* ***Multiplexing before cancellation is better in case CSI overlaps with DL symbols and CG PUSCH, and CG PUSCH does not overlap with DL symbols (Example of Figure 1)***
* ***Cancellation before multiplexing is better when CG PUSCH overlaps with DL symbols and CSI, and CSI does not overlap with DL symbols (Example of Figure 2)***

***Observation 3: For the case when CSI 1 overlaps with DL symbols only, CSI 2 overlaps with HARQ-ACK only, in order to transmit UCI as much as possible, which of the options is better and should be used depends on whether the PUCCH carrying multiplexed PUCCH indicated by gNB can overlap with DL symbols or not.***

***Proposal 2: In Rel-16, RAN1 needs to consider collision cases e.g. PUCCH/PUCCH collision and PUCCH/PUSCH collision to decide the processing order between multiplexing and cancellation.***

***Proposal 3: In Rel-16, RAN1 shall first clarify the processing order of multiplexing and cancellation when PUCCH/PUSCH with same priority collides with semi-static DL symbols/SSBs, then clarify the different priority cases if necessary.***

## 1st round proposal and discussion

Considering the TP from CATT, companies are encouraged to express your views:

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| ---------------------------------Start of Text Proposal on TS 38.213 v16.4.0-----------------------  9.2.6 PUCCH repetition procedure  <Unchanged text omitted>  For unpaired spectrum, the UE determines the slots for a PUCCH transmission starting from a slot indicated to the UE as described in Clause 9.2.3 for HARQ-ACK reporting, or a slot determined as described in Clause 9.2.4 for SR reporting or in Clause 5.2.1.4 of [6, TS 38.214] for CSI reporting and having  - an UL symbol, as described in Clause 11.1, or flexible symbol that is not SS/PBCH block symbol provided by *startingSymbolIndex* in *PUCCH-format1*, or in *PUCCH-format3*, or in *PUCCH-format4* as a first symbol, and  - consecutive UL symbols, as described in Clause 11.1, or flexible symbols that are not SS/PBCH block symbols, starting from the first symbol, equal to or larger than a number of symbols provided by *nrofsymbols* in *PUCCH-format1*, or in *PUCCH-format3*, or in *PUCCH-format4*  except that for repetitions of a PUCCH transmission which is not in response to a DCI format detection and a slot indicated to the UE as described in Clause 9.2.3 for HARQ-ACK reporting, or a slot determined as described in Clause 9.2.4 for SR reporting or in Clause 5.2.1.4 of [6, TS 38.214] for CSI reporting does not satisfy the above conditions, the UE does not transmit the PUCCH transmission.  For paired spectrum, the UE determines the slots for a PUCCH transmission as the consecutive slots starting from a slot indicated to the UE as described in Clause 9.2.3 for HARQ-ACK reporting, or a slot determined as described in Clause 9.2.4 for SR reporting or in Clause 5.2.1.4 of [6, TS 38.214] for CSI reporting.  ---------------------------------End of Text Proposal on TS 38.213 v16.4.0----------------------- |

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| Company | Comments |
| HW/HiSi | We do not agree with the TP. In our view the gNB should guarantee that the first repetition doesn’t collide with DL also in the case of semi-static PUCCH transmission. |
| CATT | In response to Huawei’s comments, we do not think it feasible to ask gNB to guarantee that the first repetition doesn’t collide with DL considering the short periodicity of SPS/SR for URLLC. If it is feasible, why do we need to discuss SPS HARQ-ACK deferring in Rel-17 IIoT/URLLC WI?  As clarified in the preparation phase, there were different understandings on the intended UE behavior in case the first PUCCH repetition of a configured PUCCH transmission collides with semi-D/SSB symbol(s).   * Alternative 1: the UE does not transmit the PUCCH including the subsequent repetitions if the first PUCCH repetition collides with semi-static DL symbol(s) or SSB symbols * Alternative 2: the PUCCH repetitions are deferred to be started from the next available UL slot if the first PUCCH repetition collides with semi-static DL symbol(s) or SSB symbols   Some companies commented that Alt 2 is the expected UE behaviour according to current specification. Although we do not have a strong preference between the two alternatives, Alt 2 is not exactly clear to us. For example, for a PUCCH repetition for SPS HARQ-ACK, is Alt 2 HARQ-ACK deferring as discussed in Rel-17 IIoT/URLLC or the PUCCH channel deferring. We assume it is the latter one. But still it is not clear to us if a PUCCH transmission for SPS HARQ-ACK is deferred to a subsequent slot/sub-slot and if there is another PUCCH transmission for HARQ-ACK in the same slot/sub-slot which does not overlap with the deferred PUCCH, what would be the UE behaviour? Note that if the deferred PUCCH for SPS HARQ-ACK overlaps with another PUCCH for HARQ-ACK in a slot/sub-slot, it is our understanding that one of them is selected to be transmitted according to the rule defined in 38.213 Clause 9.2.6. We would like to hear companies’ views.  As clarified by the proponent in the preparation phase, Huawei’s proposal is for the other agenda item and we think it could be removed from section 2.3.1 to avoid confusion. |
| ZTE | This TP is not necessary, since the current Spec does not exclude the case that the first PUCCH repetition conflicting with a semi-static DL symbol. When the first PUCCH repetition conflicts with a semi-static DL symbol, the UE’s behavior is defined in section 11.1 of 38.213. i.e., the UE does not transmit the PUCCH with the set of symbols of slot.  “For a set of symbols of a slot that are indicated to a UE as downlink by *tdd-UL-DL-ConfigurationCommon*, or *tdd-UL-DL-ConfigurationDedicated*, the UE does not transmit PUSCH, PUCCH, PRACH, or SRS when the PUSCH, PUCCH, PRACH, or SRS overlaps, even partially, with the set of symbols of the slot.”  “For operation on a single carrier in unpaired spectrum, for a set of symbols of a slot indicated to a UE by *ssb-PositionsInBurst* in *SIB1* or *ssb-PositionsInBurst* in *ServingCellConfigCommon*, for reception of SS/PBCH blocks, the UE does not transmit PUSCH, PUCCH, PRACH in the slot if a transmission would overlap with any symbol from the set of symbols and the UE does not transmit SRS in the set of symbols of the slot. The UE does not expect the set of symbols of the slot to be indicated as uplink by *tdd-UL-DL-ConfigurationCommon*, or *tdd-UL-DL-ConfigurationDedicated*, when provided to the UE.”  “for a set of symbols of a slot that are indicated to the UE for reception of SS/PBCH blocks in any of multiple serving cells by *ssb-PositionsInBurst* in *SystemInformationBlockType1* or by *ssb-PositionsInBurst* in *ServingCellConfigCommon*, when provided to the UE, the UE does not transmit PUSCH, PUCCH, or PRACH in the slot if a transmission would overlap with any symbol from the set of symbols, and the UE does not transmit SRS in the set of symbols of the slot in any of multiple serving cells.” |
| Nokia | We should follow the simple Alternative 1 mentioned in CATT’s response. And based on ZTE’s input this is taking place without any specification changes. |
| OPPO | We share view with ZTE. |
| vivo | We do not agree with the TP. Based on our understanding it is Alternative 2 |
| DOCOMO | We share the same view with ZTE |
| Qualcomm | We do not agree with the TP.  In our view, the spec behavior is Alternative 2. As seen from Subclause 9.2.6, UE shall find *N* slots starting from the first slot indicated in RRC, **and** contains sufficient number of symbols.    “For unpaired spectrum, the UE determines the *N* slots for a PUCCH transmission starting from a slot indicated to the UE as described in Subclause 9.2.3 **and** having  -     an UL symbol, as described in Subclause 11.1, or flexible symbol that is not SS/PBCH block symbol provided by *startingSymbolIndex* in *PUCCH-format1*, or in *PUCCH-format3*, or in *PUCCH-format4* as a first symbol, and  -     consecutive UL symbols, as described in Subclause 11.1, or flexible symbols that are not SS/PBCH block symbols, starting from the first symbol, equal to or larger than a number of symbols provided by *nrofsymbols* in *PUCCH-format1*, or in *PUCCH-format3*, or in *PUCCH-format4”*  On the issue brought up by CATT, it is the gNB’s responsibility not to schedule any other HARQ-ACK feedback (including SPS HARQ-ACK for a next TB) before the UE finishes the current N repetitions of SPS HARQ-ACK. This is the same rule as for a dynamically scheduled PUCCH with repetition: gNB shall make sure that, no other dynamic HARQ-ACK or SPS HARQ-ACK are scheduled before the UE finishes the repetition. Also, this ”issue” is independent of whether the first repetition collides with semi-static DL symbol or not. Indeed, even if the first repetition is transmitted, the UE may still defer the rest of repetitions to avoid collision. In such cases, the gNB has to make sure not to shcedule any other HARQ-ACK (including SPS HARQ-ACK). |
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## Issue#5: Correction for sub-slot based PUCCH

## Inputs from Tdocs

Not all the slots in section 9 should be replaced by sub-slot when a UE is provided *subslotLength-ForPUCCH*

*CATT proposal:*

***Proposal 3: For SR reporting and the timing of applying spatial setting for a PUCCH transmission, slot should not be replaced by sub-slot.***

A text proposal is provided below for sub-slot based transmission in 38.213.

-------------------------------------------------- Start of text proposal ------------------------------------------------------

9 UE procedure for reporting control information

<Unchanged text omitted>

In the remaining of this Clause except for section 9.2.2 and 9.2.4, if a UE is provided *subslotLengthForPUCCH*, a slot for an associated PUCCH transmission includes a number of symbols indicated by *subslotLengthForPUCCH*.

----------------------------------------------------- End of text proposal ------------------------------------------------------

*vivo proposal:*

Proposal 3: Adopt the following text proposal for sub-slot based PUCCH transmission in 38.213.

-------------------------------------------------- Start of text proposal ------------------------------------------------------

9 UE procedure for reporting control information

\*\*\* Unchanged text is omitted \*\*\*

In the remaining of this Clause except for section 9.2.2, 9.2.4, 9.2.5 for multiple PUCCH resources in a slot to transmit CSI reports and 9.2.6, if a UE is provided *subslotLength-ForPUCCH*, a slot for an associated PUCCH transmission includes a number of symbols indicated by *subslotLength-ForPUCCH*.

\*\*\* Unchanged text is omitted \*\*\*

----------------------------------------------------- End of text proposal ------------------------------------------------------

## 1st round proposal and discussion

Considering the TP from vivo, companies are encouraged to express your views:

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| ---------------------------------Start of Text Proposal on TS 38.213 v16.4.0-----------------------  9 UE procedure for reporting control information  \*\*\* Unchanged text is omitted \*\*\*  In the remaining of this Clause except for section 9.2.2, 9.2.4, 9.2.5 for multiple PUCCH resources in a slot to transmit CSI reports and 9.2.6, if a UE is provided *subslotLength-ForPUCCH*, a slot for an associated PUCCH transmission includes a number of symbols indicated by *subslotLength-ForPUCCH*.  \*\*\* Unchanged text is omitted \*\*\*  ---------------------------------End of Text Proposal on TS 38.213 v16.4.0----------------------- |

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| Company | Comments |
| CATT | It is already specified in section 9.2.6 that “If a UE is provided a *PUCCH-config* that includes *subslotLengthForPUCCH,* the UE does not expect the *PUCCH-config* to include *nrofSlots*.” So we do not think 9.2.6 needs to be excluded.  For 9.2.5, it is not clear to us why it needs to be excluded and we would like to hear the reasons from the proponent. |
| ZTE | Fine with the proposal in principle. But ‘9.2.6’ is not needed here, because sub-slot repetition is not supported in Rel-16, if a UE is provided *subslotLength-ForPUCCH*, the clause 9.2.6 will not be touched any way. |
| Nokia | Agree with CATT and ZTE that Clause 9.2.6 does not need to be listed. It is not clear to us why 9.2.5 needs to be mentioned. |
| OPPO | We share view with Nokia |
| vivo | Based on CATT’s comment, we are ok to remove 9.2.6 here. Response to the second comment:  In the beginning of section 9.2.5, to handle multiple CSI PUCCHs, the followings are captured:  “This Clause is applicable to the case that a UE has resources for PUCCH transmissions or for PUCCH and PUSCH transmissions that overlap in time and each PUCCH transmission is over a single slot without repetitions. Any case that a PUCCH transmission is with repetitions over multiple slots is described in Clause 9.2.6. If a UE is configured with multiple PUCCH resources in a slot to transmit CSI reports  - if the UE is not provided *multi-CSI-PUCCH-ResourceList* or if PUCCH resources for transmissions of CSI reports do not overlap in the slot, the UE determines a first resource corresponding to a CSI report with the highest priority [6, TS 38.214]  - if the first resource includes PUCCH format 2, and if there are remaining resources in the slot that do not overlap with the first resource, the UE determines a CSI report with the highest priority, among the CSI reports with corresponding resources from the remaining resources, and a corresponding second resource as an additional resource for CSI reporting  - if the first resource includes PUCCH format 3 or PUCCH format 4, and if there are remaining resources in the slot that include PUCCH format 2 and do not overlap with the first resource, the UE determines a CSI report with the highest priority, among the CSI reports with corresponding resources from the remaining resources, and a corresponding second resource as an additional resource for CSI reporting  - if the UE is provided *multi-CSI-PUCCH-ResourceList* and if any of the multiple PUCCH resources overlap, the UE multiplexes all CSI reports in a resource from the resources provided by *multi-CSI-PUCCH-ResourceList*, as described in Clause 9.2.5.2. ”  This paragraph is to determine at most two PUCCHs for CSI reporting in a slot (consisting of 14 symbols) or multiplex all CSI reports in a slot (consisting of 14 symbols) in one PUCCH, then if a UE is provided *subslotLength-ForPUCCH,* this procedure should also be implemented in slot level rather than sub-slot level. |
| DOCOMO | We agree with the TP assuming Clause 9.2.6 will be removed |
| Qualcomm | Same view as other companies above, 9.2.5 and 9.2.6 should be excluded from the TP.  In addition, for 9.2.2, we would like to check if the intention is to clarify that spatial filter is updated 3ms after the slot in which the UE transmits the HARQ-ACK for the corresponding MAC-CE. The rest of the section seems to apply for both slot and sub-slot based PUCCH. |
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# Conclusions

# References

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10. [R1-2101584](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_103\Docs\R1-2008534.zip) Corrections on UCI enhancement for Rel-16 URLLC NTT DOCOMO, INC.