**3GPP TSG RAN WG1 Meeting #108-e R1-2202526**

**e-Meeting, February 21st – March 3rd, 2022**

**Agenda Item: 8.4.1**

**Source: Moderator (Huawei, HiSilicon)**

**Title: Feature lead summary#1 on timing relationship enhancements**

**Document for: Discussion**

# Introduction

The Rel-17 work item on solutions for NR to support NTN was approved at RAN#86 and the first Rel-17 specifications were submitted to RAN#94e. RAN WG1 has entered the Rel-17 maintenance stage of this work item where one focus area are the timing relationship enhancements for NTN.

In this contribution, we summarize the related issues and proposals based on the contributions submitted to RAN1#108-e under agenda item 8.4.1 [4] – [18].

[108-e-R17-NR-NTN-01] Email discussion for maintenance on timing relationship enhancements – Jussi (Huawei)

* 1st check point: February 25
* Final check point: March 3

Since we have the first GTW on NR-NTN on Wednesday, during this round of the email discussion, please comment on the issues and text proposals before Feb, 23rd, Wednesday, UTC 16:59.

Particularly, the LS in issue#9 benefits from quick convergence regarding whether and what kind of response we would draft to RAN2. Early comments would be greatly appreciated.

# 1 [ACTIVE] Issue#1: K\_offset update

## 1.1 On the update of cell specific K\_offset during SIB modification period

During RAN WG1#107e there was a long discussion on whether there is a need to resolve ambiguity of which cell-specific K\_offset value to use during the SIB modification period [1]. At that meeting 15 companies considered that there is no need for specification enhancement and two companies saw a need for further study. There are eight input contributions to this meeting that address this issue.

**[CATT]**

Proposal 2: There is no need of specification enhancement for the ambiguity of which cell-specific K\_offset value to use during the SIB modification period.

**[Spreadtrum]**

Proposal 1: There is no ambiguity of which cell-specific K\_offset value to use during the SIB modification period.

**[Xiaomi]**

Proposal 1: The ambiguity issue on the update of cell-specific K\_offset can be handled by the network implementation.

**[ZTE]**

Proposal-1: The ambiguity of which cell-specific K\_offset value to use during the SIB modification period can be resolved by gNB implementation without specification impact

**[Baicells]**

Proposal 1: Define the application time of the updated cell-specific K\_offset to be the end of the modification period that contains the SIB for cell-specific K\_offset update.

**[NEC]**

Proposal 1. There is no ambiguity of which cell-specific K\_offset value to use during the SIB modification period. It could be handled by gNB implementation as legacy.

**[CMCC]**

Proposal 1: To address the ambiguity issue during the SIB modification period, it is preferred to leave to gNB implementation, e.g., scheduling restriction.

**[Nokia]**

Proposal 1: The application time of the updated cell-specific K\_offset shall be the same for a UE acquiring the new SI via RRC or via SIB acquisition.

Proposal 2: The application time of the updated K\_offset at cell level needs to pre-defined and different from the first SIB occasion in the modification period.

Proposal 3: RAN1 shall discuss the rules for the application time of cell-specific K\_offset.

Proposal 4: As options for the application time of the recently acquired updated K\_offset we propose one of the following alternatives with a slight preference for (B):

1. The end of the first (or the n-th) SI-window for the SIB containing K\_offset in the modification period
2. The end of the first modification period after the update
3. A specific SFN.

Proposal 7: RAN1 shall discuss UE behavior if UE fails to acquire updated K\_offset within valid time.

Proposal 8: RAN1 to consider alternative procedures for restoring K\_offset before declaring radio link failure.

We continue to have a large number of companies that do not consider it necessary to introduce any specification enhancement to address the potential ambiguity regarding which cell-specific K\_offset value to use during the SIB modification period.

**Initial proposal 1.1 (Moderator)**

Moderator recommendation is not to address this in Rel-17 maintenance, but please provide your opinion below.

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | We believe this topic is related to **maintenance** rather than **optimization** of current agreements. Mediatek and Spreadtrum argue that there is no ambiguity. But in their documents, they both provide different understanding of the point of application. Which is exactly what we want to avoid. Other companies understand that there is such ambiguity. CATT, Xiaomi, ZTE and CMCC seem to argue in favor of scheduling restrictions. This would cause the network to waste considerable amount of resources, as no user could be allocated in UL for the whole duration of the ambiguity period. In NTN coverage may be scarce in time, and the PHY efficiency is already lower. Leaving this for NW implementation may cause more harm than just deciding the point of application. Baicells propose a point of application in their document. We think we should discuss this approach. This is not the same as legacy updates. Any mismatch before would not be so damaging for PHY allocation resources. This time, a misunderstanding between gNB and UE will cause the UE to use the wrong UL transmit timing and hence create unwanted interference.  |
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## 1.2 On the update of UE specific K\_offset with MAC CE

Two companies point out the potential ambiguity occurring when UE specific K\_offset is updated with MAC CE command.

**[CMCC]**

***Proposal 2:*** In order to address the ambiguity period issue for MAC CE updating UE specific K\_offset, support if cell-specific K\_offset is always used for the additional transmission timings related to fallback DCI format, use fallback DCI in the ambiguity period.

***Proposal 3:*** Support always use the cell-specific K\_offset for the additional transmission timings related to fallback DCI format.

**[Nokia]**

Proposal 5: K\_offset component updated via MAC-CE to be valid from the start of the beggining of the slot , where n is the uplink slot where the MAC-CE command was received.

Proposal 6: UEs configured for using UE-specific K\_offset should update the cell-specific component of the UE-specific K\_offset using the same procedure and point of application that will be specified for the cell-specific K\_offset

The problem is identified to exist in between the times when the gNB can be certain that the UE applies either the old or new UE specific K\_offset as shown in the figure below.



**Initial proposal 1.2 (Moderator)**

The moderator would like to get companies thoughts on whether this is a topic we need to address at the maintenance phase or whether the impact can be mitigated by gNB implementation. In particular, what is the thinking regarding the use of cell-specific K\_offset for the additional transmission timings related to fallback DCI format?

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | Fallback DCI formats should be using the cell specific value for K\_offset. But we need to clarify Nokia‘s position: we are not claiming ambiguity or a problem. We just want to have captured in specificiation from what slot this new value will be valid. The UE will receive a MAC-CE command and will apply it. For all MAC-CE commands that alter DL or UL behavior, similar actions are described in the specs. This is even more drastic in terms of interference than a Timing Advance command, and even for timing advance command the specifications have decided where it should be accounted as valid.  |
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# 2 [ACTIVE] Issue#2: MAC CE timing relationships

We have an agreement from several meetings ago that K\_mac update is carried in system information. Proposals for additional mechanisms did not receive any support at RAN WG1#107e meeting, either. Two companies have proposals related to this issue of K\_mac update.

**[CATT]**

Proposal 3: Support the update of K\_mac with MAC CE.

**[Spreadtrum]**

Proposal 2: K\_mac can be update based on SIB update mechanism

The moderator observes that CATT repeats the proposal from #107e meeting where it did not get support. Also the lack of input contributions on this topic would indicate that companies are indeed fine with only providing K\_mac update via system information.

**Initial proposal 2 (Moderator)**

Moderator recommendation is not to address this issue in Rel-17 maintenance.

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | We agree with moderator.  |
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# 3 [ACTIVE] Issue#3: K1 range extension

At RAN WG1#107e meeting no agreements were reached on K1 range extension enhancements beyond the already agreed range extension itself. Three companies contributed to this meeting and these proposals are in alignment what was already concluded last time about keeping the PDSCH-to-HARQ feedback timing indicator unchanged.

**[Xiaomi]**

Proposal 2: The bit-length of PDSCH-to-HARQ\_feedback timing indicator field in the fallback DCI is kept unchanged.

**[NEC]**

Proposal 2. There is no need to extend the size of the PDSCH-to-HARQ\_feedback timing indicator field in DCI when the range of the K1 value is extended

**[Apple]**

Proposal 2: The range extension in unpaired spectrum does not change the PDSCH-to-HARQ\_feedback timing indicator field size in DCI.

For non-fallback DCI, only extend the value range of entries in the configured dl-DataToUL-ACK table.

For fallback DCI, introduce a scaling factor when determining value.

**Initial proposal 3 (Moderator)**

Moderator recommendation is not to address this issue in Rel-17 maintenance.

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | We agree with moderator. |
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# 4 [ACTIVE] Issue#4: Configured grant type 1 timing relationship

At RAN1#108e, two companies provide proposals on this topic:

**[Samsung]**

Proposal 3: The timing relationship for Configured Grant Type 1 should be left to Network implementation.

**[Baicells]**

Proposal 3: In case of PUSCH transmission with configured grant and if K\_offset is updated or will be updated,

- Option1: Release configured grant before the application of new K\_offset.

- Option2: Continue the PUSCH transmission with configured grant based on the new K\_offset but conflict zone should be avoided.

At RAN1#107e there was also this single proposal from Samsung on the topic and the moderator recommendation back then was not to discuss further the introduction of K\_offset for type 1 configured grant. Baicells proposal apparently addresses the same issue with respect to how to continue configure grant assignment when K\_offset is updated. Companies views are requested on whether it is sufficient to retain the conclusion from RAN1#107e and leave the timing relationship for network implementation or consider the options proposed by Baicells.

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | We support Option 2 as proposed by Baicells.  |
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# 5 [ACTIVE] Issue#5: UE reporting of information about the UE specific TA pre-compensation

At RAN1#107e the RAN2 LS indicating RAN2 agreements on UE specific TA reporting. RAN1 replied indicating that event-triggers can be supported and that these event-triggers can be based on TA values. One company continues discussion on the topic at this meeting.

**[CATT]**

Proposal 4: On UE-specific TA reporting, periodic reporting can be supported.

Proposal 5: Using RRC signaling to report TA can be supported.

Proposal 6: Reporting differential TA between current TA and previous TA is preferred.

RAN1 already concurred with the RAN2 agreements concluding to adopt event-triggered reporting. At the maintenance phase on Rel-17 specifications it likely is not feasible for RAN1 to add reporting mechanisms above and beyond what has been communicated between the two Working Groups.

**Initial proposal 5 (Moderator)**

Moderator recommendation is not to address periodic UE-specific TA reporting in Rel-17 maintenance.

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | Agree with moderator. |
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# 6 [ACTIVE] Issue#6: Beam-specific K\_offset in initial access

Three companies provided proposals on K\_offset in initial access, with particular focus on beam-specific K\_offset.

**[Samsung]**

Proposal 1: Only Cell-specific K\_offset in initial access is supported.

Proposal 2: More than one of above Koffset configurations can be supported, and using which one is dependent on gNB configuration.

**[InterDigital]**

Proposal-1: beam-specific K-offset indication is also supported optionally.

**[CMCC]**

***Proposal 4:*** gNB has the flexibility of configuring cell-specific or beam specific value of K\_offset.

* Beam specific SIB can be supported, i.e., different beam specific SIB may carry different beam specific values (e.g., K\_offset).

It was already observed by the previous moderator at RAN1#107e that this issue has been discussed at many RAN1 meetings with several rounds of email discussion and debated at GTW sessions. The pros and cons of supporting beam specific K\_offset configured in system information and used in initial access are clear to the group – same comments have been made by both sides over the meetings.

**Initial proposal 6 (Moderator)**

At this stage of Rel-17 where we already entered maintenance stage, the moderator recommendation is not to consider beam-specific K\_offset for initial access.

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | Agree with moderator |
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# 7 [ACTIVE] Issue #7: Beam application timing for PUCCH in BFR

Two companies provided proposals on beam failure recovery procedure which was discussed at RAN1#107-e meeting.

**[InterDigital]**

Proposal-2: specify UE assumption of the beam application timing for PUCCH based on any of interpretations adopted.

Proposal-3: K-offset enhancement is supported for beam application timing for PUCCH (i.e., Interpretation-1).

**[Apple]**

Proposal 3: RAN1 to introduce to enhance the timing relationship on the PUCCH transmission with new beam in the beam failure recovery procedure.

At the previous meeting we reached the following agreement:

**Agreement**

On beam failure recovery procedure, for PRACH transmission in uplink slot n, UE monitors the corresponding PDCCH starting from downlink slot “n + K\_mac + 4” within a corresponding RAR window.

There was also a long discussion on two different interpretations on the delay between PDCCH reception and application of new PUCCH beam. The majority of companies considered interpretation 1 being the correct one

* Interpretation 1: “28 symbols” is the absolute time between the time UE receives PDCCH and the time UE applies new PUCCH beam

and no enhancement would be needed.

The moderator invites companies to give their views on whether this issue should be revisited now in Rel-17 maintenance phase or close the issue for beam application timing for PUCCH with an understanding that no enhancement is needed.

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | We agree with moderator  |
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# 8 [ACTIVE] Issue #8: Timing relationship of random access response

Huawei [3] points out a problem that emerges from the agreement reached on NR NTN to introduce an additional delay for the starts of *ra-ResponseWindow* and *msgB-ResponseWindow*, which is equal to sum of UE’s TA and K\_mac.

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| Agreement:The starts of ra-ResponseWindow and msgB-ResponseWindow are delayed by an estimate of UE-gNB RTT. * The estimate of UE-gNB RTT is equal to the sum of UE’s TA and K\_mac.

Note 1: The UE’s TA is based on the RAN1#104bis-e agreement on Timing Advance applied by an NR NTN UE given by  . The estimate of gNB-satellite RTT is equal to the sum of and K\_mac.  How to treat and can be further discussed.Note 2: According to the RAN1#104bis-e agreement: When UE is not provided by network with a K\_mac value, UE assumes K\_mac = 0.Note 3: The accuracy of the estimated UE-gNB RTT with respect to the true UE-gNB RTT can be further discussed.Note 4: Other options of determining the estimate of UE-gNB RTT can be further discussed. |

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The concern is that this agreement unintentionally changes the behaviour for a terrestrial UE. In particular, for a terrestrial UE, , , and *kmac* can be set to zero. However, the value of may be non-zero and the value of is provided by *n-TimingAdvanceOffset* for the serving cell. The proponent identifies three options, one of which changes the behaviour for terrestrial UEs, one of which would require a modification of the NTN agreement, and one which both retains the legacy behaviour for terrestrial UEs and does not revert the NTN agreement. This approach is adopted in the TPs proposed in [2], where the additional delay is only applicable to NR NTN UEs.

**Clause 8.2 of TS38.213**

============================ Unchanged Text Omitted ===================================

In response to a PRACH transmission, a UE attempts to detect a DCI format 1\_0 with CRC scrambled by a corresponding RA-RNTI during a window controlled by higher layers [11, TS 38.321]. The window starts at the first symbol of the earliest CORESET the UE is configured to receive PDCCH for Type1-PDCCH CSS set, as defined in clause 10.1, that is at least one symbol, after the last symbol of the PRACH occasion corresponding to the PRACH transmission, where the symbol duration corresponds to the SCS for Type1-PDCCH CSS set as defined in clause 10.1. If , the window starts after an additional msec where is defined in [4, TS 38.211] and is provided by *K-Mac* or if *K-Mac* is not provided.The length of the window in number of slots, based on the SCS for Type1-PDCCH CSS set, is provided by *ra-ResponseWindow*.

============================ Unchanged Text Omitted ===================================

**Clause 8.2A of TS38.213**

============================ Unchanged Text Omitted ===================================

In response to a transmission of a PRACH and a PUSCH, or to a transmission of only a PRACH if the PRACH preamble is mapped to a valid PUSCH occasion, a UE attempts to detect a DCI format 1\_0 with CRC scrambled by a corresponding MsgB-RNTI during a window controlled by higher layers [11, TS 38.321]. The window starts at the first symbol of the earliest CORESET the UE is configured to receive PDCCH for Type1-PDCCH CSS set, as defined in clause 10.1, that is at least one symbol, after the last symbol of the PUSCH occasion corresponding to the PRACH transmission, where the symbol duration corresponds to the SCS for Type1-PDCCH CSS set. If , the window starts after an additional msec where is defined in [4, TS 38.211] and is provided by *K-Mac* or if *K-Mac* is not provided. The length of the window in number of slots, based on the SCS for Type1-PDCCH CSS set, is provided by *msgB-ResponseWindow*.

============================ Unchanged Text Omitted ===================================

Feedback from companies on this approach to resolve the problem is requested below.

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | For different reasons and based on flexibility of future applications, we prefer to say: “***If, or ,***  is different of zero, the window starts…” |
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# 9 [ACTIVE] Issue#9: RAN2 LS on NTN-SIB

RAN1 received an LS from RAN2 on NTN-specific SIB [2], which was assigned to be discussed in AI 8.4.1. The input contributions related to this topic can be found in [20], [21], [22], [23].

**[CMCC]**

Proposal 1:Update of assistance information in SIB will not trigger system information modification procedure.

* It is up to RAN2 to determine detailed solutions for updating the assistance information. (e.g., Changes of the assistance information should neither result in system information change notifications nor in a modification of valueTag in SIB1, just like “timeInfoUTC” field acts in SIB9.)

**[MediaTek Inc]**

Observation 5: It may be more flexible to have parameters like cell-specific Koffset, k\_mac, Indication for network enabled/disabled TA report, Cell reference location, t-Service, Validity duration for UL sync information in NTN-specific SIB in case it is beneficial for the network to update these within the system information notification period.

**[Panasonic R&D Center]**

Proposal 2: Add to SIB-NTN a counter with at least 5 bits for the SFN-cycles which have elapsed since the first instance of the SIB-NTN in each validity period.

**[Nokia]**

Observation 7: RAN1 and RAN2 have different understandings of the applicability of the validity timer/validity duration.

Proposal 12: Inform RAN2 that the validity duration is only intended to be applicable for serving satellite ephemeris and common TA related parameters.

Observation 8: Is seems that RAN1 and RAN2 have different understandings of UE actions prior to the validity timer expiry.

Observation 9: There may be periods with uncertainty related to UE’s UL synchronization status if the UE is allowed to read serving satellite ephemeris and Common TA related parameters after the expiry of the validity timer.

Proposal 13: Inform RAN2 that under normal operation, a UE is expected to have read new and updated serving satellite ephemeris information prior to the expiry of the validity timer.

**[Apple]**

Proposal 1: For UEs updating the timing relationship enhancement parameters, down select one of the following two alternatives:

Alt 1: Update of cell-specific or in NTN-specific SIB affects the value tag and triggers SI modification procedure.

Alt 2: Introduce additional validity duration for timing relationship enhancement parameters in NTN-specific SIB.

The moderator would like to start discussion on the RAN2 LS in order to identify whether at RAN1 we can identify any problems with the RAN2 agreements.

RAN2 informed RAN1 of the following regarding the NTN-specific SIB:

And at least the following serving cell information will be broadcast by SIBx:

1) Ephemeris;

2) Common TA parameters;

3) Validity duration for UL sync information;

4) t-Service (the timing information on when the serving cell is going to stop serving the area);

5) Cell reference location;

6) Epoch time;

7) K\_mac;

8) Cell-specific Koffset;

9) Indication for network enabled/disabled TA report.

RAN2 also agreed that the validity duration for UL sync information applies to the whole SIBx and UE acquires the updated SIBx when the timer expires (FFS if this applies only to RRC\_CONNECTED mode or to RRC\_IDLE UEs as well).

First we need to establish whether RAN1 is in agreement that all the above serving cell information is sent in the NTN-specific SIB. From input contributions it appears that some companies support this approach whereas it is also pointed out that some parameters do not need to be updated as frequently as e.g. ephemeris and common TA parameters.

Is the list of serving cell information (9 items) provided by RAN2 acceptable to RAN1 or is there a need to make adjustments, and if so, what changes are considered necessary?

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | The list is acceptable, and we do not see any need for adjustments.  |
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One input contribution points out that there would appear to be different understanding between RAN1 and RAN2 on the applicability of the validity timer and validity duration. This follows from the fact that most of the parameters do not need to be updated as frequently as the validity timer for serving satellite ephemeris and common TA related parameters.

What are companies views on this generalised statement by RAN2 that the validity duration applies to the whole NTN-specific SIB?

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | We disagree with this view. This would cause unnecessary waste of power in NTN users. If the expiration is for the whole SIB, it means that after the validity timer expires (e.g. 10 s), all the SIB is considered not valid. It means all UEs would need to reacquire the SIB, including IDLE mode UEs (first paragraph of Section 5.2.2.2.1, on TS 38.331: ***“and whenever the UE does not have a valid version of a stored SIB“.***The validity of ephemeris and common TA are only required at the UE side for the occasion of UL transmissions. So, it seems that this would cause unnecessary trigger for re-acaquistion of SIB for most UEs (idle and inactive).The validity timer should only apply for the fully dynamic elements of the NTN specific SIB. That is, for the Serving satellite ephemeris and the Common TA related parameters. |
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# 10 Text proposals to specifications

## 10.1 TPs for TS38.213

#### 10.1.1 TP #1

Ericsson [11] points out that the RRC parameter for is not called *Koffset* but *CellSpecific\_Koffset.* They recommend adopting the approach used in TS38.214 where the is referred to as *CellSpecific\_Koffset.* There are five such occurrences in TS38.213 and the proposal is to replace each occasion as follows:

Adopt the following TP for 38.213: “where is provided by *CellSpecific\_Koffset”*

The moderator believes this is a sensible correction recommends adopting the TP in the four occurrences within TS 38.213. Please provide your opinion below.

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | We agree with moderator.  |
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#### 10.1.2 TP #2

OPPO has three text proposals addressing a clarification of the particular slot in question through stating that no timing advance is taken into account.

10.1 UE procedure for determining physical downlink control channel assignment

\*\*\* < Unchanged parts are omitted> \*\*\*

For a CORESET other than a CORESET with index 0, if a UE is provided a single TCI state for a CORESET, or if the UE receives a MAC CE activation command for one or two of the provided TCI states for a CORESET, the UE assumes that the DM-RS antenna port associated with PDCCH receptions in the CORESET is quasi co-located with the one or more DL RS configured by the TCI states. For a CORESET with index 0, the UE expects that a CSI-RS configured with *qcl-Type* set to 'typeD' in a TCI state indicated by a MAC CE activation command for the CORESET is provided by a SS/PBCH block

- if the UE receives a MAC CE activation command for one of the TCI states, the UE applies the activation command in the first slot that is after slot where is the slot where the UE would transmit a PUCCH with HARQ-ACK information for the PDSCH providing the activation command without taking into account timing advance, is the SCS configuration for the PUCCH in the slot when the activation command is applied, and is a number of slots for SCS configuration provided by *K-Mac* or if *K-Mac* is not provided.

\*\*\* < Unchanged parts are omitted> \*\*\*

7 Uplink Power control

\*\*\* < Unchanged parts are omitted> \*\*\*

A UE does not expect to simultaneously maintain more than four pathloss estimates per serving cell for all PUSCH/PUCCH/SRS transmissions as described in clauses 7.1.1, 7.2.1, and 7.3.1, except for SRS transmissions configured by *SRS-PosResourceSet* as described in clause 7.3.1. If the UE is provided a number of RS resources for pathloss estimation for PUSCH/PUCCH/SRS transmissions that is larger than 4, the UE maintains for pathloss estimation RS resources corresponding to RS resource indexes as described in clauses 7.1.1, 7.2.1, and 7.3.1. If an RS resource updated by MAC CE, as described in clauses 7.1.1, 7.2.1 and 7.3.1, is one from the RS resources the UE maintains for pathloss estimation for PUSCH/PUCCH/SRS transmissions, the UE applies the pathloss estimation based on the RS resources starting from the first slot that is after slot where is the slot where the UE would transmit a PUCCH or PUSCH with HARQ-ACK information for the PDSCH providing the MAC CE without taking into account timing advance, is the SCS configuration for the PUCCH or PUSCH, respectively, that is determined in the slot when the MAC CE command is applied and is a number of slots for SCS configuration provided by *K-Mac* or if *K-Mac* is not provided*.*

\*\*\* < Unchanged parts are omitted> \*\*\*

6 Link recovery procedures

\*\*\* < Unchanged parts are omitted> \*\*\*

For the PCell or the PSCell, the UE can be provided, by *PRACH-ResourceDedicatedBFR*, a configuration for PRACH transmission as described in Clause 8.1. For PRACH transmission in slot  and according to antenna port quasi co-location parameters associated with periodic CSI-RS resource configuration or with SS/PBCH block associated with index  provided by higher layers [11, TS 38.321], the UE monitors PDCCH in a search space set provided by *recoverySearchSpaceId* for detection of a DCI format with CRC scrambled by C-RNTI or MCS-C-RNTI starting from slot n without taking into account timing advance, where 𝜇 is the SCS configuration for the PRACH transmission and 𝑘mac is a number of slots provided by *K-Mac* [12, TS 38.331] or 𝑘mac =0 if *K-Mac* is not provided, within a window configured by *BeamFailureRecoveryConfig*. For PDCCH monitoring in a search space set provided by *recoverySearchSpaceId* and for corresponding PDSCH reception, the UE assumes the same antenna port quasi-collocation parameters as the ones associated with index  until the UE receives by higher layers an activation for a TCI state or any of the parameters *tci-StatesPDCCH-ToAddList* and/or *tci-StatesPDCCH-ToReleaseList*. After the UE detects a DCI format with CRC scrambled by C-RNTI or MCS-C-RNTI in the search space set provided by *recoverySearchSpaceId*, the UE continues to monitor PDCCH candidates in the search space set provided by *recoverySearchSpaceId* until the UE receives a MAC CE activation command for a TCI state or *tci-StatesPDCCH-ToAddList* and/or *tci-StatesPDCCH-ToReleaseList.*

\*\*\* < Unchanged parts are omitted> \*\*\*

The moderator requests companies indicate whether this clarification is needed.

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | The current specification text does not imply or indicate that timing advance is taken into account, so we do not see a big benefit from putting this clarification. Suggest to not introduce this clarification. |
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#### 10.1.3 TP #3

OPPO proposes a change in how the slot where the UE applies the MAC command has removed from the offset.

9 UE procedure for reporting control information

\*\*\* < Unchanged parts are omitted> \*\*\*

For the remaining of this clause, if a UE is provided by *Koffset* in *ServingCellConfigCommon* or by a MAC CE command, reference to a slot for a PUCCH transmission or PUSCH transmission corresponds to a slot for the PUSCH or the PUCCH transmission, where is the SCS configuration for the PUCCH transmission or PUSCH transmission. If *Koffset* or if the MAC CE command is not provided, or , respectively. If the PUCCH transmission or the PUSCH transmission is scheduled by a DCI format with CRC scrambled by TC-RNTI, . If the UE is provided a value by a MAC CE command, the UE applies the MAC command in the first slot that is after slot where is the slot where the UE would transmit a PUCCH with HARQ-ACK information for the PDSCH providing the MAC CE command, is the SCS configuration for the PUCCH transmission that is determined in the slot when the MAC CE command is applied, and is a number of slots for SCS configuration provided by *K-Mac* or if *K-Mac* is not provided.

\*\*\* < Unchanged parts are omitted> \*\*\*

The moderator requests companies indicate whether this clarification is needed.

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | We do not see a need for this clarification. Current text is sufficient.  |
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#### 10.1.4 TP #4

LGE provides an TP to the same section as above in TP #3, but it is related to the definition of Koffset. Section 4.2 of TS38.213 defines that K\_offset is determined based on the cell-specific K\_offset – UE-specific K\_offset.

9 UE procedure for reporting control information

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

For the remaining of this clause, if a UE is provided by *Koffset* in *ServingCellConfigCommon* or by a MAC CE command, reference to a slot for a PUCCH transmission or PUSCH transmission corresponds to a slot for the PUSCH or the PUCCH transmission, where is the SCS configuration for the PUCCH transmission or PUSCH transmission and . If *Koffset* or if the MAC CE command is not provided, or , respectively. If the PUCCH transmission or the PUSCH transmission is scheduled by a DCI format with CRC scrambled by TC-RNTI, . If the UE is provided a value by a MAC CE command, the UE applies the MAC command in the first slot that is after slot where is the slot where the UE would transmit a PUCCH with HARQ-ACK information for the PDSCH providing the MAC CE command, is the SCS configuration for the PUCCH transmission that is determined in the slot when the MAC CE command is applied, and is a number of slots for SCS configuration provided by *K-Mac* or if *K-Mac* is not provided.

The moderator thinks that this clarification makes sense and comments from companies are requested whether this TP is agreeable.

|  |  |
| --- | --- |
| Company | Comments |
| Nokia, Nokia Shanghai Bell | We agree with moderator and support the TP.  |
|  |  |
|  |  |

## 10.2 TPs for TS38.214

#### 10.2.1 K\_offset configuration in TS38.214

MediaTek points out that TS 38.213 specifies K\_offset configuration and it is preferable to only refer to TS38.213 rather than repeat the K\_offset configuration in TS38.214.

4.2 Transmission timing adjustments

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

For a timing advance command received on uplink slot and for a transmission other than a PUSCH scheduled by a RAR UL grant or a fallbackRAR UL grant as described in clause 8.2A or 8.3, or a PUCCH with HARQ-ACK information in response to a successRAR as described in clause 8.2A, the corresponding adjustment of the uplink transmission timing applies from the beginning of uplink slot where , is a time duration in msec of symbols corresponding to a PDSCH processing time for UE processing capability 1 when additional PDSCH DM-RS is configured, is a time duration in msec of symbols corresponding to a PUSCH preparation time for UE processing capability 1 [6, TS 38.214], is the maximum timing advance value in msec that can be provided by a TA command field of 12 bits, is the number of slots per subframe, is the subframe duration of 1 msec, and , where is provided by *Koffset* in *ServingCellConfigCommon* and is provided by a MAC CE command; otherwise, if not respectively provided,  or . and are determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the TAG and of all configured DL BWPs for the corresponding downlink carriers. For , the UE assumes [6, TS 38.214]. Slot and are determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the TAG. is determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the TAG and for all configured initial UL BWPs provided by *initialUplinkBWP*. The uplink slot is the last slot among uplink slot(s) overlapping with the slot(s) of PDSCH reception assuming , where the PDSCH provides the timing advance command and is defined in [4, TS 38.211].

Ericsson has a text proposal in the same section 5.2.2.5 which only moves one section of text, but it is appended to a section proposed to be deleted by the MediaTek TP.

**5.2.2.5 CSI reference resource definition (MediaTek**)

The CSI reference resource for a serving cell is defined as follows:

- In the frequency domain, the CSI reference resource is defined by the group of downlink physical resource blocks corresponding to the band to which the derived CSI relates.

- In the time domain, the CSI reference resource for a CSI reporting in uplink slot *n'* is defined by a single downlink slot *,* if UE is configured with the higher layer parameter *CellSpecific\_Koffset, n*-*nCSI\_ref*, where Koffset is a parameter consigured by higher layer as specified in [TS 36.213 Section 4.2]and where is the subcarrier spacing configuration for ,

- where  and and  are the subcarrier spacing configurations for DL and UL, respectively, and and  are determined by higher-layer configured *ca-SlotOffset* for the cells transmitting the uplink and downlink, as defined in clause 4.5 of [4, TS 38.211]

**[Section 5.2.2.5, TS 38.214, v17.0.0] (Ericsson)**

*-* In the time domain, the CSI reference resource for a CSI reporting in uplink slot *n'* is defined by a single downlink slot *,* if UE is configured with the higher layer parameter *CellSpecific\_Koffset, n*-*nCSI\_ref*, otherwise,

*-*  is provided with a value of ms for frequency range 1 and is equal to *CellSpecific\_Koffset - UESpecific\_Koffset* if *UESpecific\_Koffset* is provided in MAC CE and *CellSpecific\_Koffset,* otherwise. is the subcarrier spacing configuration for ;

MediaTek proposes similar changes to sections 6.1.2.1 and 6.2.1.

**6.1.2.1 Resource allocation in time domain (MediaTek)**

/\* No change to Omitted Text ---\*/

in *CSI-ReportConfig* for the  triggered CSI Reporting Settings and  is the *(m+1)*th entry of .

- The slot *Ks* where the UE shall transmit the PUSCH is determined by *K2* as *Ks* =, if UE is configured with ca-SlotOffset for at least one of the scheduled and scheduling cell, , where Koffset is a parameter consigured by higher layer as specified in [TS 36.213 Section 4.2], and where is the subcarrier spacing configuration for , *n* is the slot with the scheduling DCI, K*2* is based on the numerology of PUSCH,  and  are the subcarrier spacing configurations for PUSCH and PDCCH, respectively, and the scheduling DCI is other than DCI format 0\_0 with CRC scrambled by TC-RNTI.

/\* No change to Omitted Text ---\*/

**6.2.1 UE sounding procedure (MediaTek)**

/\* No change to Omitted Text ---\*/

If the UE receives the DCI triggering aperiodic SRS in slot *n* and except when SRS is configured with the higher layer parameter *SRS-PosResource*, the UE transmits aperiodic SRS in each of the triggered SRS resource set(s) in slot , if UE is configured with ca-SlotOffset for at least one of the triggered and triggering cell, , where Koffset is a parameter consigured by higher layer as specified in [TS 36.213 Section 4.2], and where

*- k* is configured via higher layer parameter *slotOffset* for each triggered SRS resources set and is based on the subcarrier spacing of the triggered SRS transmission, *µSRS* and *µPDCCH* are the subcarrier spacing configurations for triggered SRS and PDCCH carrying the triggering command respectively;

*-* is the subcarrier spacing configuration for .

- and are the and the, respectively, which are determined by higher-layer configured ca-SlotOffset for the cell receiving the PDCCH, and are the  and the , respectively, which are determined by higher-layer configured ca-SlotOffset for the cell transmitting the SRS, as defined in [4, TS 38.211] clause 4.5.

- If the UE receives the DCI triggering aperiodic SRS in slot *n* and when SRS is configured with the higher layer parameter *SRS-PosResource*, the UE transmits every aperiodic SRS resource in each of the triggered SRS resource set(s) in slot , if UE is configured with ca-SlotOffset for at least one of the triggered and triggering cell, , where Koffset is a parameter consigured by higher layer as specified in [TS 36.213 Section 4.2], and where

*- k* is configured via higher layer parameter *slotOffset* for each aperiodic SRS resource in each triggered SRS resources set and is based on the subcarrier spacing of the triggered SRS transmission, *µSRS* and *µPDCCH* are the subcarrier spacing configurations for triggered SRS and PDCCH carrying the triggering command respectively;

- and are the and the, respectively, which are determined by higher-layer configured ca-SlotOffset for the cell receiving the PDCCH, and are the  and the , respectively, which are determined by higher-layer configured ca-SlotOffset for the cell transmitting the SRS, as defined in [4, TS 38.211] clause 4.5.

/\* No change to Omitted Text ---\*/

**[Section 6.2.1, TS 38.214, v17.0.0] (Ericsson)**

- If the UE receives the DCI triggering aperiodic SRS in slot *n* and at least one resource set is configured with parameter *availableSlotOffset* across all configured BWPs in a component carrier except when SRS is configured with the higher layer parameter *SRS-PosResource*, the UE transmits aperiodic SRS in each of the triggered SRS resource set(s) in the (*t* + 1)-th available slot counting from slot if ca-SlotOffset is configured, the UE transmits aperiodic SRS in each of the triggered SRS resource set(s) in the (*t* + 1)-th available slot counting from slot , if UE is configured with the higher layer parameter *CellSpecific\_Koffset*, otherwise the UE transmits aperiodic SRS in each of the triggered SRS resource set(s) in the (t + 1)-th available slot counting from slot , where

*- k* is configured via higher layer parameter *slotOffset* for each triggered SRS resources set and is based on the subcarrier spacing of the triggered SRS transmission, *µSRS* and *µPDCCH* are the subcarrier spacing configurations for triggered SRS and PDCCH carrying the triggering command, respectively;

*-* is the subcarrier spacing configuration for , and is provided with a value of ms for frequency range 1 and is equal to *CellSpecific\_Koffset - UESpecific\_Koffset* if *UESpecific\_Koffset* is provided in MAC CE and *CellSpecific\_Koffset* otherwise.

The moderator merges the text proposals from MediaTek and Ericsson to the three TPs below.

##### 10.2.1.1 TP #5

5.2.2.5 CSI reference resource definition

The CSI reference resource for a serving cell is defined as follows:

- In the frequency domain, the CSI reference resource is defined by the group of downlink physical resource blocks corresponding to the band to which the derived CSI relates.

- In the time domain, the CSI reference resource for a CSI reporting in uplink slot *n'* is defined by a single downlink slot *,* if UE is configured with the higher layer parameter *CellSpecific\_Koffset, n*-*nCSI\_ref*, where Koffset is a parameter configured by higher layer as specified in [TS 36.213 Section 4.2], and where is the subcarrier spacing configuration for ,

- where  and and  are the subcarrier spacing configurations for DL and UL, respectively, and and  are determined by higher-layer configured *ca-SlotOffset* for the cells transmitting the uplink and downlink, as defined in clause 4.5 of [4, TS 38.211]

##### 10.2.1.2 TP #6

6.1.2.1 Resource allocation in time domain

<<< unchanged paragraphs omitted >>>

in *CSI-ReportConfig* for the  triggered CSI Reporting Settings and  is the *(m+1)*th entry of .

- The slot *Ks* where the UE shall transmit the PUSCH is determined by *K2* as *Ks* =, if UE is configured with ca-SlotOffset for at least one of the scheduled and scheduling cell, , where Koffset is a parameter consigured by higher layer as specified in [TS 36.213 Section 4.2], and where is the subcarrier spacing configuration for , *n* is the slot with the scheduling DCI, K*2* is based on the numerology of PUSCH,  and  are the subcarrier spacing configurations for PUSCH and PDCCH, respectively, and the scheduling DCI is other than DCI format 0\_0 with CRC scrambled by TC-RNTI.

##### 10.2.1.3 TP #7

6.2.1 UE sounding procedure

- If the UE receives the DCI triggering aperiodic SRS in slot *n* and none of the resource sets is configured with parameter *availableSlotOffset* across all configured BWPs in a component carrier, and if the UE is configured with ca-SlotOffset for at least one of the triggered and triggering cell, except when SRS is configured with the higher layer parameter *SRS-PosResource*, the UE transmits aperiodic SRS in each of the triggered SRS resource set(s) in slot , otherwise, the UE transmits aperiodic SRS in each of the triggered resource set(s) in slot , where Koffset is a parameter consigured by higher layer as specified in [TS 36.213 Section 4.2], and where

*- k* is configured via higher layer parameter *slotOffset* for each triggered SRS resources set and is based on the subcarrier spacing of the triggered SRS transmission, *µSRS* and *µPDCCH* are the subcarrier spacing configurations for triggered SRS and PDCCH carrying the triggering command respectively;

*-* is the subcarrier spacing configuration for .

- and are the and the, respectively, which are determined by higher-layer configured ca-SlotOffset for the cell receiving the PDCCH, and are the  and the , respectively, which are determined by higher-layer configured ca-SlotOffset for the cell transmitting the SRS, as defined in [4, TS 38.211] clause 4.5.

- If the UE receives the DCI triggering aperiodic SRS in slot *n* and when SRS is configured with the higher layer parameter *SRS-PosResource*, the UE transmits every aperiodic SRS resource in each of the triggered SRS resource set(s) in slot , if UE is configured with ca-SlotOffset for at least one of the triggered and triggering cell, , where Koffset is a parameter consigured by higher layer as specified in [TS 36.213 Section 4.2], and where

*- k* is configured via higher layer parameter *slotOffset* for each aperiodic SRS resource in each triggered SRS resources set and is based on the subcarrier spacing of the triggered SRS transmission, *µSRS* and *µPDCCH* are the subcarrier spacing configurations for triggered SRS and PDCCH carrying the triggering command respectively;- is the subcarrier spacing configuration for .

- and are the and the, respectively, which are determined by higher-layer configured ca-SlotOffset for the cell receiving the PDCCH, and are the  and the , respectively, which are determined by higher-layer configured ca-SlotOffset for the cell transmitting the SRS, as defined in [4, TS 38.211] clause 4.5.

<<< unchanged paragraphs omitted >>>

Companies are requested to indicate whether the TPs #5, #6 and #7 are agreeable.

|  |  |
| --- | --- |
| Company | Comments |
| Nokia, Nokia Shanghai Bell | We agree with these TPs (#5, #6 and #7).  |
|  |  |
|  |  |

#### 10.2.2 TP #8

Both Ericsson and MediaTek propose a correction in section 6.2.1 by replacing parameter K2 with k. Note that this change was present in some of the text proposals in section 10.2.3 but the intent is to address it separately here as an independent correction.

Adopt the following TP for Section 6.2.1, 38.214: “, if UE is configured with the higher layer parameter *CellSpecific\_Koffset*, *Ks* =, otherwise,*”*

This looks like a sensible fix and the moderator requests companies to indicate whether they agree with this correction.

|  |  |
| --- | --- |
| Company | Comments |
| Nokia, Nokia Shanghai Bell | We agree with moderator.  |
|  |  |
|  |  |

#### 10.2.3 K\_mac timing offset

Three companies [3, 5, 14] have identified that an agreement from RAN1#105-e is not reflected in the first Rel-17 specifications.

|  |
| --- |
| Agreement:If a UE is provided with a K\_mac value, when the UE would transmit a PUCCH with HARQ-ACK information in uplink slot *n* corresponding to a PDSCH carrying a MAC CE command on a downlink configuration, the UE action and assumption on the downlink configuration shall be applied starting from the first slot that is after slot , where µ is the SCS configuration for the PUCCH.Note: Here K\_mac is assumed to have the unit of the PUCCH slot. This can be revisited after the K\_mac signaling design is finalized. |

##### 10.2.3.1 Huawei, HiSilicon TPs

|  |
| --- |
| * **TP#3 for Clause 5.1.4.2 of TS38.214** (Huawei, HiSilicon)

============================ Unchanged Text Omitted ===================================For a UE configured with a list of semi-persistent *ZP-CSI-RS-ResourceSet(s)* provided by higher layer parameter *sp-ZP-CSI-RS-ResourceSetsToAddModList*: - when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the activation command, as described in clause 6.1.3.19 of [10, TS 38.321], for ZP CSI-RS resource(s), the corresponding action in [10, TS 38.321] and the UE assumption on the PDSCH RE mapping corresponding to the activated ZP CSI-RS resource(s) shall be applied starting from the first slot that is after slot where ** is the SCS configuration for the PUCCH.- when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the deactivation command, as described in clause 6.1.3.19 of [10, TS 38.321], for activated ZP CSI-RS resource(s), the corresponding action in [10, TS 38.321] and the UE assumption on cessation of the PDSCH RE mapping corresponding to the de-activated ZP CSI-RS resource(s) shall be applied starting from the first slot that is after slot where ** is the SCS configuration for the PUCCH.============================ Unchanged Text Omitted =================================== |
| * **TP#4 for Clause 5.1.5 of TS38.214** (Huawei, HiSilicon)

============================ Unchanged Text Omitted ===================================When the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the activation command, the indicated mapping between TCI states and codepoints of the DCI field *'Transmission Configuration Indication'* should be applied starting from the first slot that is after slot where ** is the SCS configuration for the PUCCH. If *tci-PresentInDCI* is set to 'enabled' or *tci-PresentDCI-1-2* is configured for the CORESET scheduling the PDSCH, and the time offset between the reception of the DL DCI and the corresponding PDSCH is equal to or greater than *timeDurationForQCL* if applicable, after a UE receives an initial higher layer configuration of TCI states and before reception of the activation command, the UE may assume that the DM-RS ports of PDSCH of a serving cell are quasi co-located with the SS/PBCH block determined in the initial access procedure with respect to *qcl-Type* set to 'typeA', and when applicable, also with respect to *qcl-Type* set to 'typeD'. ============================ Unchanged Text Omitted =================================== |
| * **TP#5 for Clause 5.2.1.5 of TS38.214** (Huawei, HiSilicon)

============================ Unchanged Text Omitted ===================================A trigger state is initiated using the *CSI request* field in DCI.- When all the bits of *CSI request* field in DCI are set to zero, no CSI is requested.- When the number of configured CSI triggering states in *CSI-AperiodicTriggerStateList* is greater than , where  is the number of bits in the DCI *CSI request* field, the UE receives a subselection indication, as described in clause 6.1.3.13 of [10, TS 38.321], used to map up to  trigger states to the codepoints of the *CSI request* field in DCI.  is configured by the higher layer parameter *reportTriggerSize* where . When the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the subselection indication, the corresponding action in [10, TS 38.321] and UE assumption on the mapping of the selected CSI trigger state(s) to the codepoint(s) of DCI CSI request field shall be applied starting from the first slot that is after slot where ** is the SCS configuration for the PUCCH.============================ Unchanged Text Omitted =================================== |

##### 10.2.3.2 OPPO TPs

5.1.4.2 PDSCH resource mapping with RE level granularity (OPPO)

\*\*\* < Unchanged parts are omitted> \*\*\*

For a UE configured with a list of semi-persistent *ZP-CSI-RS-ResourceSet(s)* provided by higher layer parameter *sp-ZP-CSI-RS-ResourceSetsToAddModList*:

- when the UE would transmit a PUCCH with HARQ-ACK information in uplink slot *n* corresponding to the PDSCH carrying the activation command, as described in clause 6.1.3.19 of [10, TS 38.321], for ZP CSI-RS resource(s), the corresponding action in [10, TS 38.321] and the UE assumption on the PDSCH RE mapping corresponding to the activated ZP CSI-RS resource(s) shall be applied starting from the first slot that is after slot + *K\_mac* where ** is the SCS configuration for the PUCCH and *K\_mac* is a number of slots provided by *K-Mac*[12, TS 38.331] or *K\_mac*=0 if *K\_mac* is not provided.

- when the UE would transmit a PUCCH with HARQ-ACK information in uplink slot *n* corresponding to the PDSCH carrying the activation command, as described in clause 6.1.3.19 of [10, TS 38.321], for activated ZP CSI-RS resource(s), the corresponding action in [10, TS 38.321] and the UE assumption on cessation of the PDSCH RE mapping corresponding to the de-activated ZP CSI-RS resource(s) shall be applied starting from the first slot that is after slot + *K\_mac* where ** is the SCS configuration for the PUCCH and *K\_mac* is a number of slots provided by *K-Mac*[12, TS 38.331] or *K\_mac*=0 if *K\_mac* is not provided.

\*\*\* < Unchanged parts are omitted> \*\*\*

5.1.5 Antenna ports quasi co-location (OPPO)

\*\*\* < Unchanged parts are omitted> \*\*\*

When the UE would transmit a PUCCH with HARQ-ACK information in uplink slot *n* corresponding to the PDSCH carrying the activation command, the indicated mapping between TCI states and codepoints of the DCI field *'Transmission Configuration Indication'* should be applied starting from the first slot that is after slot + *K\_mac* where ** is the SCS configuration for the PUCCH and *K\_mac* is a number of slots provided by *K-Mac*[12, TS 38.331] or *K\_mac*=0 if *K\_mac* is not provided. If *tci-PresentInDCI* is set to 'enabled' or *tci-PresentDCI-1-2* is configured for the CORESET scheduling the PDSCH, and the time offset between the reception of the DL DCI and the corresponding PDSCH is equal to or greater than *timeDurationForQCL* if applicable, after a UE receives an initial higher layer configuration of TCI states and before reception of the activation command, the UE may assume that the DM-RS ports of PDSCH of a serving cell are quasi co-located with the SS/PBCH block determined in the initial access procedure with respect to *qcl-Type* set to 'typeA', and when applicable, also with respect to *qcl-Type* set to 'typeD'.

\*\*\* < Unchanged parts are omitted> \*\*\*

5.2.1.5.1 Aperiodic CSI Reporting/Aperiodic CSI-RS when the triggering PDCCH and the CSI-RS have the same numerology (OPPO)

\*\*\* < Unchanged parts are omitted> \*\*\*

A trigger state is initiated using the *CSI request* field in DCI.

- When all the bits of *CSI request* field in DCI are set to zero, no CSI is requested.

- When the number of configured CSI triggering states in *CSI-AperiodicTriggerStateList* is greater than , where  is the number of bits in the DCI *CSI request* field, the UE receives a subselection indication, as described in clause 6.1.3.13 of [10, TS 38.321], used to map up to  trigger states to the codepoints of the *CSI request* field in DCI.  is configured by the higher layer parameter *reportTriggerSize* where . When the UE would transmit a PUCCH with HARQ-ACK information in uplink slot *n* corresponding to the PDSCH carrying the subselection indication, the corresponding action in [10, TS 38.321] and UE assumption on the mapping of the selected CSI trigger state(s) to the codepoint(s) of DCI CSI request field shall be applied starting from the first slot that is after slot + *K\_mac* where ** is the SCS configuration for the PUCCH and *K\_mac* is a number of slots provided by *K-Mac*[12, TS 38.331] or *K\_mac*=0 if *K\_mac* is not provided.

\*\*\* < Unchanged parts are omitted> \*\*\*

5.2.1.5.2 Semi-persistent CSI/Semi-persistent CSI-RS (OPPO)

\*\*\* < Unchanged parts are omitted> \*\*\*

For semi-persistent reporting on PUCCH, the PUCCH resource used for transmitting the CSI report are configured by *reportConfigType*. Semi-persistent reporting on PUCCH is activated by an activation command as described in clause 6.1.3.16 of [10, TS 38.321], which selects one of the semi-persistent Reporting Settings for use by the UE on the PUCCH. When the UE would transmit a PUCCH with HARQ-ACK information in uplink slot *n* corresponding to the PDSCH carrying the activation command, the indicated semi-persistent Reporting Setting should be applied starting from the first slot that is after slot + *K\_mac* where ** is the SCS configuration for the PUCCH and *K\_mac* is a number of slots provided by *K-Mac*[12, TS 38.331] or *K\_mac*=0 if *K\_mac* is not provided.

\*\*\* < Unchanged parts are omitted> \*\*\*

5.2.1.5.2 Semi-persistent CSI/Semi-persistent CSI-RS (OPPO)

\*\*\* < Unchanged parts are omitted> \*\*\*

For a UE configured with CSI resource setting(s) where the higher layer parameter *resourceType* set to 'semiPersistent'.

- when a UE receives an activation command, as described in clause 6.1.3.12 of [10, TS 38.321], for CSI-RS resource set(s) for channel measurement and CSI-IM/NZP CSI-RS resource set(s) for interference measurement associated with configured CSI resource setting(s), and when the UE would transmit a PUCCH with HARQ-ACK information in uplink slot *n* corresponding to the PDSCH carrying the selection command, the corresponding actions in [10, TS 38.321] and the UE assumptions (including QCL assumptions provided by a list of reference to *TCI-State's,* one per activated resource) on CSI-RS/CSI-IM transmission corresponding to the configured CSI-RS/CSI-IM resource configuration(s) shall be applied starting from the first slot that is after slot + *K\_mac* where ** is the SCS configuration for the PUCCH and *K\_mac* is a number of slots provided by *K-Mac*[12, TS 38.331] or *K\_mac*=0 if *K\_mac* is not provided. If a *TCI-State* referred to in the list is configured with a reference to an RS configured with *qcl-Type* set to '*typeD*', that RS can be an SS/PBCH block, periodic or semi-persistent CSI-RS located in same or different CC/DL BWP.

- when a UE receives a deactivation command, as described in clause 6.1.3.12 of [10, TS 38.321], for activated CSI-RS/CSI-IM resource set(s) associated with configured CSI resource setting(s), and when the UE would transmit a PUCCH with HARQ-ACK information in uplink slot *n* corresponding to the PDSCH carrying the deactivation command, the corresponding actions in [10, TS 38.321] and UE assumption on cessation of CSI-RS/CSI-IM transmission corresponding to the deactivated CSI-RS/CSI-IM resource set(s) shall apply starting from the first slot that is after slot + *K\_mac* where ** is the SCS configuration for the PUCCH and *K\_mac* is a number of slots provided by *K-Mac*[12, TS 38.331] or *K\_mac*=0 if *K\_mac* is not provided.

\*\*\* < Unchanged parts are omitted> \*\*\*

5.2.4 CSI reporting using PUCCH (OPPO)

\*\*\* < Unchanged parts are omitted> \*\*\*

A UE shall perform semi-persistent CSI reporting on the PUCCH applied starting from the first slot that is after slot + *K\_mac* when the UE would transmit a PUCCH with HARQ-ACK information in uplink slot *n* corresponding to the PDSCH carrying the activation command described in clause 6.1.3.16 of [10, TS 38.321]where ** is the SCS configuration for the PUCCH and *K\_mac* is a number of slots provided by *K-Mac*[12, TS 38.331] or *K\_mac*=0 if *K\_mac* is not provided. The activation command will contain one or more Reporting Settings where the associated CSI Resource Settings are configured. Semi-persistent CSI reporting on the PUCCH supports Type I CSI. Semi-persistent CSI reporting on the PUCCH format 2 supports Type I CSI with wideband frequency granularity. Semi-persistent CSI reporting on PUCCH formats 3 or 4 supports Type I CSI with wideband and sub-band frequency granularities and Type II CSI Part 1.

\*\*\* < Unchanged parts are omitted> \*\*\*

##### 10.2.3.3 Lenovo, Motorola Mobility TPs

5.1.4.2 PDSCH resource mapping with RE level granularity (Lenovo, Motorola Mobility)

<Unrelated parts omitted>

For a UE configured with a list of semi-persistent *ZP-CSI-RS-ResourceSet(s)* provided by higher layer parameter *sp-ZP-CSI-RS-ResourceSetsToAddModList*:

- when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the activation command, as described in clause 6.1.3.19 of [10, TS 38.321], for ZP CSI-RS resource(s), the corresponding action in [10, TS 38.321] and the UE assumption on the PDSCH RE mapping corresponding to the activated ZP CSI-RS resource(s) shall be applied starting from the first slot that is after slot , where ** is the SCS configuration for the PUCCH, .and is a number of slots for SCS configuration provided by *K-Mac* or if *K-Mac* is not provided

- when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the deactivation command, as described in clause 6.1.3.19 of [10, TS 38.321], for activated ZP CSI-RS resource(s), the corresponding action in [10, TS 38.321] and the UE assumption on cessation of the PDSCH RE mapping corresponding to the de-activated ZP CSI-RS resource(s) shall be applied starting from the first slot that is after slot , where ** is the SCS configuration for the PUCCH, .and is a number of slots for SCS configuration provided by *K-Mac* or if *K-Mac* is not provided.

<Unrelated parts omitted>

5.1.5 Antenna ports quasi co-location (Lenovo, Motorola Mobility)

<Unrelated parts omitted>

When the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the activation command, the indicated mapping between TCI states and codepoints of the DCI field *'Transmission Configuration Indication'* should be applied starting from the first slot that is after slot, where ** is the SCS configuration for the PUCCH, .and is a number of slots for SCS configuration provided by *K-Mac* or if *K-Mac* is not provided.. If *tci-PresentInDCI* is set to 'enabled' or *tci-PresentDCI-1-2* is configured for the CORESET scheduling the PDSCH, and the time offset between the reception of the DL DCI and the corresponding PDSCH is equal to or greater than *timeDurationForQCL* if applicable, after a UE receives an initial higher layer configuration of TCI states and before reception of the activation command, the UE may assume that the DM-RS ports of PDSCH of a serving cell are quasi co-located with the SS/PBCH block determined in the initial access procedure with respect to *qcl-Type* set to 'typeA', and when applicable, also with respect to *qcl-Type* set to 'typeD'.

<Unrelated parts omitted>

5.2.1.5.1 Aperiodic CSI Reporting/Aperiodic CSI-RS when the triggering PDCCH and the CSI-RS have the same numerology (Lenovo, Motorola Mobility)

<Unrelated parts omitted>

A trigger state is initiated using the *CSI request* field in DCI.

- When all the bits of *CSI request* field in DCI are set to zero, no CSI is requested.

- When the number of configured CSI triggering states in *CSI-AperiodicTriggerStateList* is greater than , where  is the number of bits in the DCI *CSI request* field, the UE receives a subselection indication, as described in clause 6.1.3.13 of [10, TS 38.321], used to map up to  trigger states to the codepoints of the *CSI request* field in DCI.  is configured by the higher layer parameter *reportTriggerSize* where . When the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the subselection indication, the corresponding action in [10, TS 38.321] and UE assumption on the mapping of the selected CSI trigger state(s) to the codepoint(s) of DCI CSI request field shall be applied starting from the first slot that is after slot , where ** is the SCS configuration for the PUCCH, .and is a number of slots for SCS configuration provided by *K-Mac* or if *K-Mac* is not provided .

<Unrelated parts omitted>

5.2.1.5.2 Semi-persistent CSI/Semi-persistent CSI-RS (Lenovo, Motorola Mobility)

For semi-persistent reporting on PUSCH, a set of trigger states are higher layer configured by *CSI-SemiPersistentOnPUSCH-TriggerStateList,* where the CSI request field in DCI scrambled with SP-CSI-RNTI activates one of the trigger states. A UE is not expected to receive a DCI scrambled with SP-CSI-RNTI activating one semi-persistent CSI report with the same *CSI-ReportConfigId* as in a semi-persistent CSI report which is activated by a previously received DCI scrambled with SP-CSI-RNTI.

For semi-persistent reporting on PUCCH, the PUCCH resource used for transmitting the CSI report are configured by *reportConfigType*. Semi-persistent reporting on PUCCH is activated by an activation command as described in clause 6.1.3.16 of [10, TS 38.321], which selects one of the semi-persistent Reporting Settings for use by the UE on the PUCCH. When the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the activation command, the indicated semi-persistent Reporting Setting should be applied starting from the first slot that is after slot where ** is the SCS configuration for the PUCCH.

For a UE configured with CSI resource setting(s) where the higher layer parameter *resourceType* set to 'semiPersistent'.

- when a UE receives an activation command, as described in clause 6.1.3.12 of [10, TS 38.321], for CSI-RS resource set(s) for channel measurement and CSI-IM/NZP CSI-RS resource set(s) for interference measurement associated with configured CSI resource setting(s), and when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the selection command, the corresponding actions in [10, TS 38.321] and the UE assumptions (including QCL assumptions provided by a list of reference to *TCI-State's,* one per activated resource) on CSI-RS/CSI-IM transmission corresponding to the configured CSI-RS/CSI-IM resource configuration(s) shall be applied starting from the first slot that is after slot , where ** is the SCS configuration for the PUCCH, .and is a number of slots for SCS configuration provided by *K-Mac* or if *K-Mac* is not provided. If a *TCI-State* referred to in the list is configured with a reference to an RS configured with *qcl-Type* set to '*typeD*', that RS can be an SS/PBCH block, periodic or semi-persistent CSI-RS located in same or different CC/DL BWP.

- when a UE receives a deactivation command, as described in clause 6.1.3.12 of [10, TS 38.321], for activated CSI-RS/CSI-IM resource set(s) associated with configured CSI resource setting(s), and when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the deactivation command, the corresponding actions in [10, TS 38.321] and UE assumption on cessation of CSI-RS/CSI-IM transmission corresponding to the deactivated CSI-RS/CSI-IM resource set(s) shall apply starting from the first slot that is after slot , where ** is the SCS configuration for the PUCCH, .and is a number of slots for SCS configuration provided by *K-Mac* or if *K-Mac* is not provided .

##### 10.2.3.4 Discussion

OPPO proposes adding a clarification that “*K\_mac* is a number of slots provided by *K-Mac*[12, TS 38.331] or *K\_mac*=0 if *K\_mac* is not provided”. Lenovo, Motorola Mobility make similar kind of addition. We can find this statement in section 8.2 of TS 36.213 so it is probably not necessary to repeat it in each respective section of TS 36.213.

8.2 Random access response - Type-1 random access procedure

In response to a PRACH transmission, a UE attempts to detect a DCI format 1\_0 with CRC scrambled by a corresponding RA-RNTI during a window controlled by higher layers [11, TS 38.321]. The window starts at the first symbol of the earliest CORESET the UE is configured to receive PDCCH for Type1-PDCCH CSS set, as defined in clause 10.1, that is at least one symbol, after the last symbol of the PRACH occasion corresponding to the PRACH transmission, where the symbol duration corresponds to the SCS for Type1-PDCCH CSS set as defined in clause 10.1. The window starts after an additional msec where is defined in [4, TS 38.211] and is provided by *K-Mac* or if *K-Mac* is not provided.The length of the window in number of slots, based on the SCS for Type1-PDCCH CSS set, is provided by *ra-ResponseWindow*.

The moderator would also draw attention to the fact that the agreement quoted above had this note:

*Note: Here K\_mac is assumed to have the unit of the PUCCH slot. This can be revisited after the K\_mac signaling design is finalized.*

Thus, the moderator is of the opinion that it is not necessary to clarify that Kmac is a number of slots in the equations.

This would leave the clarifications of “uplink” we can find in the OPPO text proposals to address.

As a first proposal, the moderator provides five TPs (#9, #10, #11, #12 and #13) below where only the Kmac summand is retained according to the discussion above. Companies are invited to indicate whether

1. they support the simplified text of only reflecting the addition of Kmac, and
2. whether there is a need to reflect the clarification of *uplink* slot from OPPO

|  |  |
| --- | --- |
| Company | Comments |
| Nokia, Nokia Shanghai Bell | 1. For consistence, as we have done for K\_offset, we think we should add the scaling factor to the K\_mac factor. The logic applied to K\_offset seems the same to be applied over here, with K\_mac unit also being slots over a reference unit.

We believe the “uplink“ clarification may be useful to avoid misinterpretations.  |
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##### 10.2.3.5 TP #9

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| --- |
| 5.1.4.2 PDSCH resource mapping with RE level granularity<<< unchanged paragraphs omitted >>>For a UE configured with a list of semi-persistent *ZP-CSI-RS-ResourceSet(s)* provided by higher layer parameter *sp-ZP-CSI-RS-ResourceSetsToAddModList*: - when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the activation command, as described in clause 6.1.3.19 of [10, TS 38.321], for ZP CSI-RS resource(s), the corresponding action in [10, TS 38.321] and the UE assumption on the PDSCH RE mapping corresponding to the activated ZP CSI-RS resource(s) shall be applied starting from the first slot that is after slot where ** is the SCS configuration for the PUCCH.- when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the deactivation command, as described in clause 6.1.3.19 of [10, TS 38.321], for activated ZP CSI-RS resource(s), the corresponding action in [10, TS 38.321] and the UE assumption on cessation of the PDSCH RE mapping corresponding to the de-activated ZP CSI-RS resource(s) shall be applied starting from the first slot that is after slot where ** is the SCS configuration for the PUCCH.<<< unchanged paragraphs omitted >>> |
|  |

##### 10.2.3.6 TP #10

5.1.5 Antenna ports quasi co-location

<<< unchanged paragraphs omitted >>>

When the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the activation command, the indicated mapping between TCI states and codepoints of the DCI field *'Transmission Configuration Indication'* should be applied starting from the first slot that is after slot where ** is the SCS configuration for the PUCCH. If *tci-PresentInDCI* is set to 'enabled' or *tci-PresentDCI-1-2* is configured for the CORESET scheduling the PDSCH, and the time offset between the reception of the DL DCI and the corresponding PDSCH is equal to or greater than *timeDurationForQCL* if applicable, after a UE receives an initial higher layer configuration of TCI states and before reception of the activation command, the UE may assume that the DM-RS ports of PDSCH of a serving cell are quasi co-located with the SS/PBCH block determined in the initial access procedure with respect to *qcl-Type* set to 'typeA', and when applicable, also with respect to *qcl-Type* set to 'typeD'.

<<< unchanged paragraphs omitted >>>

##### 10.2.3.7 TP #11

5.2.1.5.1 Aperiodic CSI Reporting/Aperiodic CSI-RS when the triggering PDCCH and the CSI-RS have the same numerology

<<< unchanged paragraphs omitted >>>

A trigger state is initiated using the *CSI request* field in DCI.

- When all the bits of *CSI request* field in DCI are set to zero, no CSI is requested.

- When the number of configured CSI triggering states in *CSI-AperiodicTriggerStateList* is greater than , where  is the number of bits in the DCI *CSI request* field, the UE receives a subselection indication, as described in clause 6.1.3.13 of [10, TS 38.321], used to map up to  trigger states to the codepoints of the *CSI request* field in DCI.  is configured by the higher layer parameter *reportTriggerSize* where . When the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the subselection indication, the corresponding action in [10, TS 38.321] and UE assumption on the mapping of the selected CSI trigger state(s) to the codepoint(s) of DCI CSI request field shall be applied starting from the first slot that is after slot where ** is the SCS configuration for the PUCCH.

<<< unchanged paragraphs omitted >>>

##### 10.2.3.8 TP #12

5.2.1.5.2 Semi-persistent CSI/Semi-persistent CSI-RS

For semi-persistent reporting on PUSCH, a set of trigger states are higher layer configured by *CSI-SemiPersistentOnPUSCH-TriggerStateList,* where the CSI request field in DCI scrambled with SP-CSI-RNTI activates one of the trigger states. A UE is not expected to receive a DCI scrambled with SP-CSI-RNTI activating one semi-persistent CSI report with the same *CSI-ReportConfigId* as in a semi-persistent CSI report which is activated by a previously received DCI scrambled with SP-CSI-RNTI.

For semi-persistent reporting on PUCCH, the PUCCH resource used for transmitting the CSI report are configured by *reportConfigType*. Semi-persistent reporting on PUCCH is activated by an activation command as described in clause 6.1.3.16 of [10, TS 38.321], which selects one of the semi-persistent Reporting Settings for use by the UE on the PUCCH. When the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the activation command, the indicated semi-persistent Reporting Setting should be applied starting from the first slot that is after slot where ** is the SCS configuration for the PUCCH.

For a UE configured with CSI resource setting(s) where the higher layer parameter *resourceType* set to 'semiPersistent'.

- when a UE receives an activation command, as described in clause 6.1.3.12 of [10, TS 38.321], for CSI-RS resource set(s) for channel measurement and CSI-IM/NZP CSI-RS resource set(s) for interference measurement associated with configured CSI resource setting(s), and when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the selection command, the corresponding actions in [10, TS 38.321] and the UE assumptions (including QCL assumptions provided by a list of reference to *TCI-State's,* one per activated resource) on CSI-RS/CSI-IM transmission corresponding to the configured CSI-RS/CSI-IM resource configuration(s) shall be applied starting from the first slot that is after slot where ** is the SCS configuration for the PUCCH. If a *TCI-State* referred to in the list is configured with a reference to an RS configured with *qcl-Type* set to '*typeD*', that RS can be an SS/PBCH block, periodic or semi-persistent CSI-RS located in same or different CC/DL BWP.

- when a UE receives a deactivation command, as described in clause 6.1.3.12 of [10, TS 38.321], for activated CSI-RS/CSI-IM resource set(s) associated with configured CSI resource setting(s), and when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the deactivation command, the corresponding actions in [10, TS 38.321] and UE assumption on cessation of CSI-RS/CSI-IM transmission corresponding to the deactivated CSI-RS/CSI-IM resource set(s) shall apply starting from the first slot that is after slot where ** is the SCS configuration for the PUCCH.

<<< unchanged paragraphs omitted >>>

##### 10.2.3.9 TP #13

5.2.4 CSI reporting using PUCCH

A UE is semi-statically configured by higher layers to perform periodic CSI Reporting on the PUCCH. A UE can be configured by higher layers for multiple periodic CSI Reports corresponding to multiple higher layer configured CSI Reporting Settings, where the associated CSI Resource Settings are higher layer configured. Periodic CSI reporting on PUCCH formats 2, 3, 4 supports Type I CSI with wideband granularity.

A UE shall perform semi-persistent CSI reporting on the PUCCH applied starting from the first slot that is after slot when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the activation command described in clause 6.1.3.16 of [10, TS 38.321]where ** is the SCS configuration for the PUCCH. The activation command will contain one or more Reporting Settings where the associated CSI Resource Settings are configured. Semi-persistent CSI reporting on the PUCCH supports Type I CSI. Semi-persistent CSI reporting on the PUCCH format 2 supports Type I CSI with wideband frequency granularity. Semi-persistent CSI reporting on PUCCH formats 3 or 4 supports Type I CSI with wideband and sub-band frequency granularities and Type II CSI Part 1.

#### 10.2.4 TP #14

OPPO has two further text proposals for TS 38.214 where it is again proposed to add clarification that *uplink* slots are being addressed in the specification text.

As a first proposal, companies are invited to indicate whether

1. there is a need to reflect the clarification of *uplink* slot from OPPO

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| Company | Comments |
| Nokia, Nokia Shanghai Bell | We believe the clarification may help avoiding ambiguity.  |
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6.2.1 UE sounding procedure (OPPO)

\*\*\* < Unchanged parts are omitted> \*\*\*

For a UE configured with one or more SRS resource configuration(s), and when the higher layer parameter *resourceType* in *SRS-Resource* or *SRS-PosResource* is set to 'semi-persistent':

- when a UE receives an activation command, as described in clause 6.1.3.17 or 6.1.3.36 of [10, TS 38.321], for an SRS resource, and when the UE would transmit a PUCCH with HARQ-ACK information in uplink slot *n* corresponding to the PDSCH carrying the activation command, the corresponding actions in [10, TS 38.321] and the UE assumptions on SRS transmission corresponding to the configured SRS resource set shall be applied starting from the first uplink slot that is after uplink slot where ** is the SCS configuration for the PUCCH. The activation command also contains spatial relation assumptions provided by a list of references to reference signal IDs, one per element of the activated SRS resource set.

\*\*\* < Unchanged parts are omitted> \*\*\*

- when a UE receives a deactivation command [10, TS 38.321] for an activated SRS resource set, and when the UE would transmit a PUCCH with HARQ-ACK information in uplink slot *n* corresponding to the PDSCH carrying the deactivation command, the corresponding actions in [10, TS 38.321] and UE assumption on cessation of SRS transmission corresponding to the deactivated SRS resource set shall apply starting from the first uplink slot that is after uplink slot where ** is the SCS configuration for the PUCCH.

\*\*\* < Unchanged parts are omitted> \*\*\*

6.2.1 UE sounding procedure (OPPO)

For a UE configured with one or more SRS resource configuration(s), and when the higher layer parameter *resourceType* in *SRS-Resource* or *SRS-PosResource* is set to 'aperiodic':

- the UE receives a configuration of SRS resource sets,

\*\*\* < Unchanged parts are omitted> \*\*\*

- when a UE receives an spatial relation update command, as described in clause 6.1.3.26 of [10, TS 38.321], for an SRS resource configured with the higher layer parameter *SRS-Resource*, and when the HARQ-ACK corresponding to the PDSCH carrying the update command is transmitted in uplink slot *n*, the corresponding actions in [10, TS 38.321] and the UE assumptions on updating spatial relation for the SRS resource shall be applied for SRS transmission starting from the first uplink slot that is after uplink slot where ** is the SCS configuration for the PUCCH. The update command contains spatial relation assumptions provided by a list of references to reference signal IDs, one per element of the updated SRS resource set. Each ID in the list refers to a reference SS/PBCH block, NZP CSI-RS resource configured on serving cell indicated by *Resource Serving Cell ID* field in the update command if present, same serving cell as the SRS resource set otherwise, or SRS resource configured on serving cell and uplink bandwidth part indicated by *Resource* *Serving Cell ID* field and *Resource BWP ID* field in the update command if present, same serving cell and bandwidth part as the SRS resource set otherwise. When the UE is configured with the higher layer parameter *usage* in *SRS-ResourceSet* set to 'antennaSwitching', the UE shall not expect to be configured with different spatial relations for SRS resources in the same SRS resource set.

\*\*\* < Unchanged parts are omitted> \*\*\*

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