**3GPP TSG RAN WG1 #112bis-e R1-23xxxxx**

**e-Meeting, April 17th – April 26th, 2023**

**Agenda item:** 7.2

**Source:** Moderator (ZTE)

**Title:** Moderator Summary#0 of Maintenance on Rel-17 SRS

**Document for:** Discussion and Decision

## Introduction

The moderator summary#0 on Rel-17 SRS maintenance is given below, which is based on the submitted contributions (three in total) in Reference. Please provide your comments of each issue, if any.

In addition, please note that FL’s initial assessment on each issue is given, and it can be revised based on the input from companies in this round of discussion).

* *High priority (H):* this includes high-priority item (essential, pending issues, broken spec components) and proposed editorial changes that either enhance the clarity of the specs or correct mistakes
* *Non-essential (N)*: this includes all other purposes such as spec optimization and low priority issues
* *Editorial (E)*: this includes editorial issues that will be handled as editorial CRs

## Maintenance Issues

### **Issue#1:** **TS 38.214, Correction on the UE capability name of triggering AP SRS in DCI 0\_1/0\_2 without data and without CSI (R1-2302425, R1-2303004)**

In TS 38.214, the UE capability parameter for aperiodic SRS without data and without CSI is described using the temporary name by “*[Triggering SRS* only in DCI 0\_1/0\_2*]*”. These temporary names should be replaced with the corresponding UE capability parameters as defined in TS 38.306, i.e., “***srs-TriggeringDCI-r17***”.

According to the above, two following draft CRs are provided in **R1-2302425** and **R1-2303004**, respectively.

**In R1-2302425:**

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<unchanged part is omitted>

**6.2.1 UE sounding procedure**

- When UE reporting *srs-TriggeringOffset-r17,* the UE can be indicated with DCI 0\_1 and 0\_2 to trigger aperiodic SRS without data and without CSI as described in clause 7.3.1.1 of TS38.212. Otherwise, except for DCI format 0\_1/0\_2 with CRC scrambled by SP-CSI-RNTI, a UE is not expected to receive a DCI format 0\_1/0\_2 with UL-SCH indicator of "0" and CSI request of all zero(s) as described in clause 7.3.1.1 of [5, TS 38.212].

<unchanged part is omitted>

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**In R1-2303004:**

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**6.2.1 UE sounding procedure**

<omitted text>

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,

- the UE receives a downlink DCI, a group common DCI, or an uplink DCI based command where a codepoint of the DCI may trigger one or more SRS resource set(s). For SRS in a resource set with usage set to 'codebook' or 'antennaSwitching', the minimal time interval between the last symbol of the PDCCH triggering the aperiodic SRS transmission and the first symbol of SRS resource is *N2*  symbols and an additional time duration *Tswitch*. Otherwise, the minimal time interval between the last symbol of the PDCCH triggering the aperiodic SRS transmission and the first symbol of SRS resource is *N2* +14 symbols and an additional time duration *Tswitch*. The minimal time interval unit of OFDM symbol is counted based on the minimum subcarrier spacing given by min(*µPDCCH, µUL*) where *µUL* is given by min(*µUL,carrier1, µUL,carrier2, µSRS*) when the UE is configured with the higher layer parameter *uplinkTxSwitchingOption* set to 'dualUL' for uplink carrier aggregation, and by *µSRS*otherwise. *µSRS* and *µPDCCH*are the subcarrier spacing configurations for triggered SRS and PDCCH carrying the triggering command respectively.

- *Tswitch*, *µUL,carrier1* and *µUL,carrier2* are defined in clause 6.4.

- A UE reporting its UE capability ‘srs-TriggeringDCI’ can be indicated with DCI 0\_1 and 0\_2 to trigger aperiodic SRS without data and without CSI as described in clause 7.3.1.1 of [5, TS 38.212]. Otherwise, except for DCI format 0\_1/0\_2 with CRC scrambled by SP-CSI-RNTI, a UE is not expected to receive a DCI format 0\_1/0\_2 with UL-SCH indicator of "0" and CSI request of all zero(s) as described in clause 7.3.1.1 of [5, TS 38.212].

- 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*,

- 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 ,

- 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 $\left⌊n⋅\frac{2^{μ\_{SRS}}}{2^{μ\_{PDCCH}}}\right⌋+k$, where

<omitted text>

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| **Company** | **Comments (if any)** |
| Mod | **FL note 1:** * This issue is editorial correction. Generally, either of the above two CRs can be used to address this issue, but it is proper to completely and accurately capture the UE capability name as defined in TS 38.306, i.e. ***srs-TriggeringDCI-r17***.

**TS 38.306, Section 4.2 UE capability Parameters**

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| ***srs-TriggeringDCI-r17***Indicates whether the UE supports triggering SRS in DCI 0\_1/0\_2 without data and without CSI. |

* Notably, this issue have NOT been discussed before.

**FL note 2:** FL’s assessment of this issue is “E”.Whether this issue should be “E”? If yes, please further provide your views of these two CRs. |
| Nokia | The issue is editorial and we think the alternative provided in **R1-2302425** is not correct, in fact there seems to be a mistake in the CR cover page as the document is discussing about the correct parameter but then proposing something else. Anyway, the solution we have in **R1-2303004** should be OK! |
| Samsung | We are fine as Editorial change. |
| Apple | We are fine with editorial change, and Nokia one can be used. |
| QC | We are fine with editorial change.  |
| vivo | We are fine with the editorial change, one minor comment is to remove prefix “-r17” from RRC parameter name. |
| Intel | Fine with editorial change. |
| LGE | Fine with editorial change. |
| NTT DOCOMO | Fine with editorial change.  |
| Ericsson | We are fine with the editorial change and agree with vivo that prefix should be removed. |

### **Issue#2:** **TS 38.214, Correction on the antenna switching capability indication for more than 4 Rx antenna (R1-2302531)**

In TS 38.306 and TS 38.331, the RRC parameters *supportedSRS-TxPortSwitch* and *supportedSRS-TxPortSwitchBeyond4Rx* are used to report the supported antenna switching. Moreover, the antenna switching corresponding to more than 4 Rx antennas can only be reported via *supportedSRS-TxPortSwitchBeyond4Rx*. However, the current TS 38.214 only says “the indicated UE capability *supportedSRS-TxPortSwitch*” that can only indicates antenna switching with up to 4 Rx antennas.

According to the above, the following draft CR is provided in **R1-2302531**.

**6.2.1.2 UE sounding procedure for DL CSI acquisition**

When the UE is configured with the higher layer parameter *usage* in *SRS-ResourceSet* set as ‘antennaSwitching’, the UE may be configured with only one of the following configurations depending on the indicated UE capability *supportedSRS-TxPortSwitch* or *supportedSRS-TxPortSwitchBeyond4Rx* (‘t1r2’ for 1T2R, ‘t1r1-t1r2’ for 1T=1R/1T2R, ‘t2r4’ for 2T4R, ‘t1r4’ for 1T4R, ‘t1r6’ for 1T6R, ‘t1r8’ for 1T8R, ‘t2r6’ for 2T6R, ‘t2r8’ for 2T8R, ‘t4r8’ for 4T8R, ‘t1r1-t1r2-t1r4’ for 1T=1R/1T2R/1T4R, ‘t1r4-t2r4’ for 1T4R/2T4R, ‘t1r1-t1r2-t2r2-t2r4’ for 1T=1R/1T2R/2T=2R/2T4R, ‘t1r1-t1r2-t2r2-t1r4-t2r4’ for 1T=1R/1T2R/2T=2R/1T4R/2T4R, ‘t1r1’ for 1T=1R, ‘t2r2’ for 2T=2R, ‘t1r1-t2r2’ for 1T=1R/2T=2R, ‘t4r4’ for 4T=4R, or ‘t1r1-t2r2-t4r4’ for 1T=1R/2T=2R/4T=4R):

- For 1T2R, if the UE is indicating *srs-AntennaSwitching2SP-1Periodic* and/or *srs-ExtensionAperiodicSRS*:

< omitted text>

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| **Company** | **Comments (if any)** |
| Mod | FL note 1: This issue is essential correction, which shall be discussed in RAN1#112 meeting. Notably, this issue have NOT been discussed before.FL note 2: FL’s assessment of this issue is “H”.Whether this issue should be “H”? If yes, please further provide your views of this CR. |
| Samsung | Support the intention of the proposal. We would like to suggest the following to separate the possible signaling between *supportedSRS-TxPortSwitch* (until Rel-16) and *supportedSRS-TxPortSwitchBeyond4Rx* (from Rel-17).**6.2.1.2 UE sounding procedure for DL CSI acquisition**When the UE is configured with the higher layer parameter *usage* in *SRS-ResourceSet* set as ‘antennaSwitching’, the UE may be configured with only one of the following configurations depending on the indicated UE capability *supportedSRS-TxPortSwitch* (‘t1r2’ for 1T2R, ‘t1r1-t1r2’ for 1T=1R/1T2R, ‘t2r4’ for 2T4R, ‘t1r4’ for 1T4R, ‘t1r1-t1r2-t1r4’ for 1T=1R/1T2R/1T4R, ‘t1r4-t2r4’ for 1T4R/2T4R, ‘t1r1-t1r2-t2r2-t2r4’ for 1T=1R/1T2R/2T=2R/2T4R, ‘t1r1-t1r2-t2r2-t1r4-t2r4’ for 1T=1R/1T2R/2T=2R/1T4R/2T4R, ‘t1r1’ for 1T=1R, ‘t2r2’ for 2T=2R, ‘t1r1-t2r2’ for 1T=1R/2T=2R, ‘t4r4’ for 4T=4R, or ‘t1r1-t2r2-t4r4’ for 1T=1R/2T=2R/4T=4R) or *supportedSRS-TxPortSwitchBeyond4Rx* (‘t1r2’ for 1T2R, ‘t1r1-t1r2’ for 1T=1R/1T2R, ‘t2r4’ for 2T4R, ‘t1r4’ for 1T4R, ‘t1r6’ for 1T6R, ‘t1r8’ for 1T8R, ‘t2r6’ for 2T6R, ‘t2r8’ for 2T8R, ‘t4r8’ for 4T8R, ‘t1r1-t1r2-t1r4’ for 1T=1R/1T2R/1T4R, ‘t1r4-t2r4’ for 1T4R/2T4R, ‘t1r1-t1r2-t2r2-t2r4’ for 1T=1R/1T2R/2T=2R/2T4R, ‘t1r1-t1r2-t2r2-t1r4-t2r4’ for 1T=1R/1T2R/2T=2R/1T4R/2T4R, ‘t1r1’ for 1T=1R, ‘t2r2’ for 2T=2R, ‘t1r1-t2r2’ for 1T=1R/2T=2R, ‘t4r4’ for 4T=4R, or ‘t1r1-t2r2-t4r4’ for 1T=1R/2T=2R/4T=4R): |
| Apple | We are fine with change. Either OPPO CR or Samsung’s TP above can be considered.  |
| QC | Support the CR. supportedSRS-TxPortSwitchBeyond4Rx is an 11-bit bitmap field (where each bit corresponds to {t1r1, t2r2, t1r2, t4r4, t2r4, t1r4, t2r6, t1r6, t4r8, t2r8, t1r8}. The listed combination by Samsung suggest text is not the comprehensive set of all combinations that UE can support. So, we prefer the original CR by OPPO. |
| Samsung | Thank QC for pointing out. As mentioned by QC, since the signaling principle of *supportedSRS-TxPortSwitchBeyond4Rx* is different with *supportedSRS-TxPortSwitch*, OPPO’s TP is also needed to be revised. Having said that, we suggest the following TP. Based on companies’ input, the exact wording could be further revised.**6.2.1.2 UE sounding procedure for DL CSI acquisition**When the UE is configured with the higher layer parameter *usage* in *SRS-ResourceSet* set as ‘antennaSwitching’, the UE may be configured with only one of the following configurations depending on the indicated UE capability *supportedSRS-TxPortSwitch* (‘t1r2’ for 1T2R, ‘t1r1-t1r2’ for 1T=1R/1T2R, ‘t2r4’ for 2T4R, ‘t1r4’ for 1T4R, ‘t1r1-t1r2-t1r4’ for 1T=1R/1T2R/1T4R, ‘t1r4-t2r4’ for 1T4R/2T4R, ‘t1r1-t1r2-t2r2-t2r4’ for 1T=1R/1T2R/2T=2R/2T4R, ‘t1r1-t1r2-t2r2-t1r4-t2r4’ for 1T=1R/1T2R/2T=2R/1T4R/2T4R, ‘t1r1’ for 1T=1R, ‘t2r2’ for 2T=2R, ‘t1r1-t2r2’ for 1T=1R/2T=2R, ‘t4r4’ for 4T=4R, or ‘t1r1-t2r2-t4r4’ for 1T=1R/2T=2R/4T=4R) or *supportedSRS-TxPortSwitchBeyond4Rx* indicating a combination of supported configuration(s) by 11-bit bitmap and each bit corresponds to {t1r1, t2r2, t1r2, t4r4, t2r4, t1r4, t2r6, t1r6, t4r8, t2r8, t1r8} where ‘t1r1’ for 1T=1R, ‘t2r2’ for 2T=2R, ‘t1r2’ for 1T2R, ‘t4r4’ for 4T=4R, ‘t2r4’ for 2T4R, ‘t1r4’ for 1T4R, ‘t2r6’ for 2T6R, ‘t1r6’ for 1T6R, ‘t4r8’ for 4T8R, ‘t2r8’ for 2T8R, ‘t1r8’ for 1T8R. |
| vivo | Looks like original CR from OPPO is sufficient |
| Intel | The update version from Samsung looks better.Just some wording comment on the update version from Samsung. The text “a combination of” could be removed. It could be covered by the following text “supported configuration(s)”. |
| LGE | OK to discuss, and slightly prefer OPPO’s version which is simple solution. |
| NTT DOCOMO | Support the intention. Either OPPO’s CR or Samsung’s suggestion is fine.  |
| Ericsson | OK to discuss and prefer Samsung’s version with Intel’s suggested change. Our understanding is that the original CR are missing some configurations which could be supported by the bitmap (e.g., t1r8-t2r8-t4r8). |

## Conclusion

TBD

# References

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| 1 | R1-2302425 | Draft CR on UE capability name alignment of AP SRS without data and without CSI in TS 38.214 | ZTE |
| 2 | R1-2302531 | Correction on the antenna switching capability indication for more than 4 Rx | OPPO |
| 3 | R1-2303004 | Correction of aperiodic SRS triggering without data and CSI | Nokia, Nokia Shanghai Bell |