**3GPP TSG-RAN WG1 Meeting #118bis** **R1- 2409078**

Hefei, China, October 14th – 18th, 2024

Agenda Item: 8.1

Source: Moderator (Ericsson).

Title: Feature Lead summary #1 for Maintenance of Positioning for RedCap UEs

Document for: Discussion, Decision

# Introduction

This document summarizes the draft CRs received in RAN1#118b during the maintenance of NR positioning.

For Redcap positioning maintenance, the following draft CRs have been identified. The draft CRs identified as alignment CR candidates are treated by the general alignement CR discussion for positioning maintenance.

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| **Tdoc#** | **Title and proposal** | **Comments** |
| R1-2407841 | Draft CR on active semi-persistent SRS resource configuration, vivo | See issue 1 |
| R1-2408176 | Correction to the collision rule for RedCap SRS frequency hopping, Huawei, HiSilicon | See issue 2 |
| R1-2408288, | Corrections to TS 38.214 on SRS for positioning with frequency hopping, Intel Corporation | See issue 2 |
| R1-2408510, | Draft CR for collision handling of positioning SRS with Tx hopping in TDD system, ZTE Corporation, Sanechips | See issue 2 |
| R1-2408916 | Draft CR for correction to SRS for positioning with tx hopping in 38.214, Ericsson | See issue 2 |

# Maintenance for Redcap Positioning

## (Closed)Active semi-persistent SRS resource configuration

### Background

In x7841 it is proposed to clarify the UE behaviour when the SRS with Tx hopping transmitted via semi persistent activation is outside the active UL-BWP.

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| **Tdoc#** | **Title and proposal** |
| R1-2407841 | If the UE has an active semi-persistent SRS resource configuration configured by *SRS-Resource* and has not received a deactivation command, the semi-persistent SRS configuration is considered to be active in the UL BWP which is active, otherwise it is considered suspended. |

### First round

Companies are encouraged to provide their view on the draft CR in R1-2407841 below:

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| **Company** | **Comment** |
| Qualcomm | We need further discussion on this. The above statement is also be applicable for SRS for positioning without frequency hopping that is configured within a BWP. With the suggested change, it appears as if all SRS for positioning resources are excluded. |
| Intel | Agree with Qualcomm’s observation. Perhaps we should implement the update to *exclude only* the positioning SRS with FH case. Thus, the following is suggested for consideration:  If the UE has an active semi-persistent SRS resource configuration that is not configured via SRS-PosTx-Hopping and has not received a deactivation command, the semi-persistent SRS configuration is considered to be active in the UL BWP which is active, otherwise the semi-persistent SRS resource configuration that is not configured via SRS-PosTx-Hopping is considered suspended. |
| vivo | We are okay with the first modification with Intel, but we are not sure the secend modifcation by intel is necessary. |
| Huawei, HiSilicon | We do not support this change.  The procedure of positioning SRS with frequency hopping should be interpreted on top of the existing, which overrides the existing behaviour when applicable.  The proposed change potentially also extends other non-hopping positioning SRS being active on deactivated BWP, as QC mentioned, which is a new feature. |
| Ericsson | We agree that we may not need to repeat the wording twice as suggested by vivo. The statement should also capture the RRC\_INACTIVE SP SRS for positioning. Maybe the following change can be added:  If the UE has an active semi-persistent SRS resource configuration provided in RRC\_CONNECTED state, that is not configured via SRS-PosTx-Hopping and has not received a deactivation command, the semi-persistent SRS configuration is considered to be active in the UL BWP which is active, otherwise it is considered suspended. |
| CATT | Fine with the first modification from Intel. |
| Intel2 | To clarify in response to some of the comments above, the reason we included the apparently redundant wording in our proposed TP is since the first part of the sentence now includes multiple conditions: (1) configured via SRS-PosTx-Hopping or not; (2) received a deactivation command or not; and (3) if the UL BWP is the active UL BWP. Without the second part of the change, the statement „*otherwise it is considered suspended*“ can be interpreted to apply if any of these conditions are not true – which is not the intention for the first condition (the SRS is configured via SRS-PosTx-Hopping or not). |
| ZTE | We prefer not to pursue this CR, the text is applicable for Rel-15/16/17 UEs without any positioning frequency hopping configurations, the newly added section for RedCap UE positioning frequency hopping will not be affected. |
| FL | We will resume this discussion in RAN1#119 so that companies can think about how to capture all cases needed. |

## Collision handling of positioning SRS with Tx hopping in TDD

### Background

In x8176, x8288, x8510, x8916 the issue on collision handling for TDD is discussed. This issue was already tackled in RAN1#118 but did not converge.

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| **Tdoc#** | **Title and proposal** |
| R1-2408176 | If the SRS symbol(s), including the switching time to and from the active bandwidth part, of the transmit frequency hopping collides with PUSCH or PUCCH, and if the UE determines the SRS to be dropped, the colliding SRS symbol(s) are dropped. The UE is not expected to handle the collision between the SRS symbol(s) including the switching time to and from the active bandwidth part and DL signals and channels in the active bandwidth part. |
| R1-2408288, | When the reduced capability UE is configured by the higher layer parameter *SRS-PosTx-Hopping*, including a switching time to and from the active bandwidth part, the UE shall use the same priority rules as defined in Clause 6.2.1.  When the reduced capability UE is configured by the higher layer parameter *SRS-PosTx-Hopping*, if the SRS symbol(s), including a switching time to and from the active bandwidth part, of the transmit frequency hopping collides with other physical channels/signals or with downlink or flexible symbols or has insufficient time-gap relative to PRACH or SSB occasions, the UE shall use the same priority rules as defined in Clause 6.2.1 in this specification and Clauses 8.1, 11.1, and 17.2 in [6, TS38.213]. |
| R1-2408510, | If the SRS symbol(s), including the switching time to and from the active bandwidth part, of the transmit frequency hopping collides with PUSCH or PUCCH, and if the UE determines the SRS to be dropped, the colliding SRS symbol(s) are dropped. In unpaired spectrum, if the SRS symbol(s), including the switching time to and from the active bandwidth part, of the transmit frequency hopping collides with DL signals or channels on flexible symbols, and if the UE determines the SRS to be dropped, the colliding SRS symbol(s) are dropped.  When the reduced capability UE is configured by the higher layer parameter *SRS-PosTx-Hopping*, including a switching time to and from the active bandwidth part, the UE shall use the same priority rules as defined in Clause 6.2.1 and Clause 11.1, 11.2A and 17.2 in [6, TS38.213]. |
| R1-2408916 | When the reduced capability UE is configured by the higher layer parameter *SRS-PosTx-Hopping*, including a switching time to and from the active bandwidth part, the UE shall use the same priority rules as defined in Clause 6.2.1 as well as Clauses 7.5, 8.1,11.1, 11.2 and 17.2 in [6,38.213]. |

### First round

From the received draft CRs we can either:

(a) not support the case of collision in TDD, as proposed in x8176

(b) update the collision rules to include the rules set in 38.213 for transmission of PRACH and PUSCH/PUCCH/SRS (clause 8.1) and for the cases of group common transmission (clause 11) and half duplex (Clause 17.2). as proposed in x8288, x8510, x8916.

Companies are encouraged to provide their view on supporting option a) or option b) below. For option B, the draft CR in x8510 can be taken as a starting point:

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| **Company** | **Comment** |
| Qualcomm | Option B. Ok with the CR in x8510 |
| Intel | Option B.  As elaborated in R1-2408287, in addition to collision handling for DL channels/signals, we need to include clause 8.1 (insufficient time-gap with PRACH or SSB – *note: this includes cases in which PRACH/SSB may not actually overlap on the same symbols*) as well as cancellation of SRS in case of overlap with DL or Flexible systems indicated by dynamic SFI, which are not covered by Option A or the CR in x8510.  Thus, we prefer the version in x8288.  Also, strictly speaking, reference to clause 11.2A should be dropped as it’s not a case of collision handling but cancellation indication. However, we are okay to include it as well as it can be seen as an example of “collision handling” with the SRS and the UL CI time-frequency region. |
| vivo | We support option A, for the compromise, x8510 without 11.2A can be acceptable. |
| Huawei, HiSilicon | Option (a).  We would like clarify the understanding here:  For a DL symbol (also flexible symbol indicated as DL) without any DL signals and channels that UE is required to receive, can the switching period happen there?  We think if the rule should be specified, it should be fixed for good. |
| Ericsson | We prefer option B, using x8288 would be fine, alternatively the version from x8510 is also ok. |
| CATT | We prefer option A. |
| Intel2 | To the question from Huawei/HiSilicon, while the switching period can be accommodated in a DL/Flexible symbol in which the UE ultimately does not need to receive any DL, it may be preferable to keep the handling simpler by not separately optimizing for this case. |
| ZTE | Option B. We prefer 8510 with 11.2A deleted. It is important to keep the original text based on our agreement regarding per symbol drop SRS (instead of dropping the whole hop). |
| Intel3 | To ZTE: per-symbol dropping of SRS is the behavior in any case, starting with Rel-15. So, we don’t think there’s something new that cannot be inferred from current specs.  Based on further off-offline discussions with vivo, we converged to the following version that aims to clarify the exact cases further (in particular, (i) that the DL channels/signals are on Flexible symbols (not on DL symbols), and (ii) that the DL and Flexible symbols are those indicated by DCI 2\_0). We also drop the case of insufficient time-gap w.r.t. PRACH and SSB based on the understanding that the switching time can be absorbed within the currently-specified time-gaps w.r.t. PRACH/SSB.  Also, as explained in our discussion paper, the last „magic sentence“ needs to be updated since it is currently missing the context when UE uses priority rules as in the referred clauses. Accordingly, we have tried to capture all relevant cases (with the added clarifications explained above) in a single sentence.  **Updated TP:**  \*\*\*\*\*\*\*\*\*\*Unchanged parts omitted \*\*\*\*\*\*\*\*\*\*\*  When the reduced capability UE is configured by the higher layer parameter *SRS-PosTx-Hopping*, if the SRS symbol(s), including a switching time to and from the active bandwidth part, of the transmit frequency hopping collides with downlink physical channels/signals on flexible symbols, or with PUSCH or PUCCH, or with downlink or flexible symbols indicated by DCI format 2\_0, the UE shall use the same priority rules as defined in Clause 6.2.1 in this specification and Clauses 11.1 and 17.2 in [6, TS38.213].  \*\*\*\*\*\*\*\*\*\*Unchanged parts omitted \*\*\*\*\*\*\*\*\*\*\* |

### Second round

The discussion online left one point to clarify on the flexible symbol.

Proposal

* Endorse the TP below for clause 6.2.1.4.1 of TS 38.214

\*\*\*\*\*\*\*\*\*\*Unchanged parts omitted \*\*\*\*\*\*\*\*\*\*\*

When the reduced capability UE is configured by the higher layer parameter *SRS-PosTx-Hopping*, if the SRS symbol(s), including a switching time to and from the active bandwidth part, of the transmit frequency hopping collides with downlink physical channels/signals on flexible symbols, or with PUSCH or PUCCH, or with downlink or flexible symbols indicated by DCI format 2\_0, the UE shall use the same priority rules as defined in Clause 6.2.1 in this specification and Clauses 11.1 and 17.2 in [6, TS38.213].

\*\*\*\*\*\*\*\*\*\*Unchanged parts omitted \*\*\*\*\*\*\*\*\*\*\*

* RAN1 will not further discuss collision cases with PRACH and SSB.

From the FL side, I think we have the choice to either

* Option 1: further delay the discussion to the next meeting altogether
* Option 2 remove the highlighted part and leave the dynamic indication outside of the spec-covered collision case for now, and further discuss the case of dynamic indication in later meetings.

Please put below comments on the two options:

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| **Company** | **Comment** |
| Intel | Based on the comments during Wednesday online session, we can separate the case of handling collisions between DL/Flexible symbols indicated by DCI 2\_0 and (i) switching time to/from active BWP, and (ii) symbol(s) with actual SRS. Then, for the sub-case (i), we can allow such overlaps (switching time can overlap with DL/flexible symbols indicated by DCI 2\_0), while for sub-case (ii), we can rely on existing specs (no need to capture separately for SRSp with Tx FH).  However, as mentioned during the online session Wednesday evening, with this, we would miss the case where a semi-statically configured Flexible symbol is changed to a DL symbol by DCI 2\_0, and then subsequently, UE receives a DCI scheduling DL reception in the symbol since this case would not be covered by the case „collides with downlink physical channels/signals on flexible symbols“ as the symbol has been changed to DL symbol by dynamic SFI. A workaround could be to clarify the above case further to say „collides with downlink physical channels/signals on flexible symbols configured by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated*“. This would cover the case where a semi-statically configured Flexible symbol is converted to a DL symbol and DL reception is scheduled in such a symbol.  Accordingly, the TP is further updated as below.  **Updated TP (attempt #n):**  \*\*\*\*\*\*\*\*\*\*Unchanged parts omitted \*\*\*\*\*\*\*\*\*\*\*  When the reduced capability UE is configured by the higher layer parameter *SRS-PosTx-Hopping*, if the SRS symbol(s), including a switching time to and from the active bandwidth part, of the transmit frequency hopping collides with downlink physical channels/signals on flexible symbols configured by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated*, or with PUSCH or PUCCH, ~~or with downlink or flexible symbols indicated by DCI format 2\_0,~~ the UE shall use the same priority rules as defined in Clause 6.2.1 in this specification and Clauses 11.1 and 17.2 in [6, TS38.213].  \*\*\*\*\*\*\*\*\*\*Unchanged parts omitted \*\*\*\*\*\*\*\*\*\*\* |

# Offline Sessions

# Online sessions

## Wednesday Online session

Issue 1

No consensus so far.

Issue 2

Proposal for further discussion:

**Updated TP:**

\*\*\*\*\*\*\*\*\*\*Unchanged parts omitted \*\*\*\*\*\*\*\*\*\*\*

When the reduced capability UE is configured by the higher layer parameter *SRS-PosTx-Hopping*, if the SRS symbol(s), including a switching time to and from the active bandwidth part, of the transmit frequency hopping collides with downlink physical channels/signals on flexible symbols, or with PUSCH or PUCCH, or with downlink or flexible symbols indicated by DCI format 2\_0, the UE shall use the same priority rules as defined in Clause 6.2.1 in this specification and Clauses 11.1 and 17.2 in [6, TS38.213].

\*\*\*\*\*\*\*\*\*\*Unchanged parts omitted \*\*\*\*\*\*\*\*\*\*\*

# Conclusion

# References

1. R1-2407840, Draft CR on spatial relation of SRS for positioning in RRC\_INACTIVE Mode, vivo
2. R1-2407841, Draft CR on active semi-persistent SRS resource configuration, vivo
3. R1-2408174, Discussion on SRS configuration for BW aggregation in RRC\_INACTIVE, Huawei, HiSilicon
4. R1-2408175, Correction on SRS configuration for BW aggregation in RRC\_INACTIVE, Huawei, HiSilicon
5. R1-2408176, Correction to the collision rule for RedCap SRS frequency hopping, Huawei, HiSilicon
6. R1-2408180, Extend the measurement time window to TRP, Huawei, HiSilicon
7. R1-2408287, Discussion on collision handling for SRS for positioning with frequency hopping, Intel Corporation
8. R1-2408288, Corrections to TS 38.214 on SRS for positioning with frequency hopping, Intel Corporation
9. R1-2408510, Draft CR for collision handling of positioning SRS with Tx hopping in TDD system, ZTE Corporation, Sanechips
10. R1-2408511, Discussion on collision handling of positioning SRS with Tx hopping in TDD system, ZTE Corporation, Sanechips
11. R1-2408512, Corrections on positioning in TS 38.213, ZTE Corporation, Sanechips
12. R1-2408513, Correction on Pcmax of positioning SRS transmission for UE in validity area, ZTE Corporation, Sanechips
13. R1-2408812, Correction on BW aggregation based on positioning SRS, Nokia
14. R1-2408916, Draft CR for correction to SRS for positioning with tx hopping in 38.214, Ericsson