3GPP TSG-RAN WG1 Meeting #100-e draft R1-200NNNN

e-Meeting, May 25th –June 5th, 2020

Agenda Item: 7.2.8.2

Source: Moderator (Ericsson)

Title: Feature lead summary for UL Reference Signals for NR Positioning

Document for: Discussion

# 1 Introduction

This document contains the feature lead summary of critical issues related to maintenance of UL Reference Signals for NR Positioning. The purpose of the document and the accompanying email discussion thread is to support the preparation phase of the e-meeting (May 18-22) and identify the critical issues to treat in the upcoming email discussion/approval phase (May 25 – June 5).

By the end of Friday 5/22, once all critical issues have been identified and the group agrees the topics to be discussed over email a revised feature lead summary will be submitted.

# 2 UL Reference Signals maintenance issues and priority

The issues discussed in the submitted contributions (listed in reference [1-11]) have been grouped in

* High priority issues (i.e. issues leading to broken specifications)
* Editorial issues (e.g. typos, parameter names that are misaligned)
* Low priority issues (non critical enhancements) and issues belonging to capability discusssions

## 2.1 Issues with high priority

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| Issue # | Description | Tdoc | Email discussion thread |
| 1 | Parameter level of a reference signal of *spatialRelationInfo*Summary: Change ’DL-PRS-ResourceId’ to ’dl-PRS-r16’ in *spatialRelationInfo*TP: for 38.214 in section 2.1 of tdoc | R1- 2003407(prop. 1,2)  |  |
| 2 | Issue with Table 7.3.1.1.2-24 in TS 38.212Summary: parameter names for trigger list should be aligned with RAN2, trigger parameter *aperiodicSRS-ResourceTrigger* should be removed.TP: for 38.212 Table 7.3.1.1.2-24, in appendix of Tdoc.  | R1-2003473(prop. 1) |  |
| 3 | Aperiodic SRS for positioning in release 16Proposal 6: Remove AP SRS for positioning from Rel-16 specification. The existing agreement will be the starting point for future releases. Send an LS to RAN2 and RAN3. | R1-2003522 |  |
| 4 | Alignement between 38.214 and 38.321 for MAC CE indication/update of the spatial relation of SRS positioning. | R1-2003522(only Part B, T2+T3) |  |
| 5 | Issues related to SRS collisions:1. Clarification of SRSpos-PUSCH collision
2. Clarification for simultaneous SRS-Pos transmission in a single symbol
	* Text alignment from “single carrier operation” to “single carrier operations”
3. Intra-band collision between SRS-Pos and SRS-MIMO
	* Moderator summary: do not allow intra-band collision for SRS-Pos and SRS-MIMO
4. Collision handling between aperiodic SRS-Pos and PUSCH
 | R1-2003522(only Part B, T4)R1-2003633(proposal 1, TP-A)R1-2003633(proposal 2, TP-B)R1-2003633(proposal 3, TP-C) |  |
| 6 | Triggering of Aperiodic SRSProposal 1: Both Aperiodic SRS for antenna switching and SRS for positioning can be triggered with ‘DCI format 2\_3. Proposal 2 Discuss whether option 1 or option 2 apply for aperiodic SRS* Option 1: An aperiodic SRS code point can be configured to trigger both one or several *SRS-ResourceSet* AND one or several *SRS-PosResourceSet* with the same value. Both the SRS configured in *SRS-ResourceSet* and the SRS configured by *SRS-PosResourceSet* can be transmitted.
* Option 2: an aperiodic SRS code point can be configured to trigger either one or several *SRS-ResourceSet* OR one or several *SRS-PosResourceSet* with the same codepoint value. Either the SRS(s) configured by *SRS-ResourceSet* or the SRS configured by *SRS-PosResourceSet* are transmitted, but they cannot be configured to be transmitted from the same codepoint.

Proposal 3: Based on the chosen option, endorse the applicable TP2 or TP3. | R1-2004470(proposal 1)R1-2004644(proposal 2,3, TP2/3) |  |

**Feature lead proposal: prioritize / downscope inssues 1 to 6 for discussion in the UL RS maintenance thread**

## 2.2 Editorial issues

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| Issue # | Description | Tdoc | Email discussion thread |
| 7 | Editorial issues for 38.214:Change “associated SRS resources set” to “SRS resources set to which the SRS resource belongs”. In 38.214Editorial and name alignment changes in 38.214, Part A and Part B T1  | R1- 2003407(prop. 3,4)R1-2003522(part A, Part B T1) |  |
| 8 | Editorial issues for 38.211:Remove the redundant description on SRS-PosResourceSet-r16 from Section 6.4.1.4.4 of TS 38.211 | R1-2004053(proposal 1) |  |
| 9 | Editorial issues for 38.213:Proposal 2: Align the following RRC parameters in TS 38.213 with those in TS 38.331SRS-Positioning-Config -> SRS-PosResourceSet-r16Proposal 3: Use SRS-ResourceSet and SRS-PosResourceSet-r16 to differentiate the traditional SRS and SRS for positioningProposal 4: Correct the variables for the formula of power control for SRS for positioning | R1-2004053(proposal 2,3,4)R1-2004644(TP#1) |  |

 **Feature lead proposal: endorse editorial isssues 7,8,9:**

* **for 38.214**
	+ **The TPs in R1-2004644 (TP#1) R1-2003522 (part A, Part B T1)**
	+ **Change “associated SRS resources set” to “SRS resources set to which the SRS resource belongs”, according to TP in proposal 4 of R1-2003407**
* **For 38.211: Remove the redundant description on SRS-PosResourceSet-r16 from Section 6.4.1.4.4 of TS 38.211, according to TP in proposal 1 of R1-2004053**
* **For 38.213 , the TPs in R1-2004644 (TP#1), and TP corresponding to proposal 2,3,4 in R1-2004053**

## 2.3 Issue with low priority

This issues below are either enhancements of topics for discussions in other email discussion (e.g. UE feature email discussion), and are therefore down-prioritized.

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| Issue # | Description | Tdoc | note |
| 10 | Cyclic shifts for SRS for positioning: * Symbol-specific cyclic shifts for SRS-Pos

Proposal 1: For Rel-16 support at least:* a phase correction for the staggered SRS
* maintain the cyclic shift step size of Rel-15

Proposal 2: Extend the range of the cyclic shift by applying Option 2.Proposal 3: Endorse the text proposal in Annex for inclusion in TS 38.211. | R1-2003633(proposal 5, TP-D)R1-2004515(proposal 1,2,3) | Non-critical enhancements |
| 11 | Proposal 1: The spatial relation information fallback mechanism should be defined for the UL SRS for positioning.Proposal 2: For the UL SRS for positioning that transmitted towards the neighboring cell, the DL RS that can be detected with the highest RSRP from the same neighboring cell should be used as the fallback spatialRelationInfo RS.Proposal 3: For the UL SRS for positioning that transmitted towards the serving cell, the RS that obtaining MIB from the serving cell should be used as the fallback spatialRelationInfo RS.Proposal 2: Define the UE behaviour when the UE is not able to accurately measure a SSB or PRS resource transmitted from a neighbouring cell which is configured as a source of spatial relation information.Proposal 3: If the UE is not able to accurately measure a SSB or a PRS resource from a neighbor/physical cell which is configured as spatial relation information of a SRS resource for positioning, the UE can use the physical cell ID within the spatial relation information configuration to determine TX beam for transmission of the SRS resource. | R1-2003959(proposal 1,2,3)R1-2004135(proposal 2,3) | Topic already discussed during previous meeting without support to proceed to email discussion. Some companies commented it was a non essential improvement.  |

**Feature lead proposal: issues 10 and 11 and not treated during RAN1#101-e**

# 3 Capability issues

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| Issue # | Description | Tdoc | note |
| 12 | Simultaneous transmission of inter-band SRS for positioning * Proposal 1: The capability of number of simultaneous SRS transmission for inter-band CA is reported per band combination.
 | R1-2003522 | Suitable for capability discussions |
| 13 | SRS switching capability* Proposal 2: If carrier switching for SRS for positioning is supported, reuse current capabilities SRS-SwitchingTimeNR and srs-SwitchingTimesListNR to indicate carrier switching time capability for SRS for positioning.
* Proposal 3: If carrier switching for aperiodic SRS for positioning is supported, reuse current the capability tpc-SRS-RNTI to indicate support of aperiodic SRS for positioning with carrier switching triggered by DCI format 2\_3.
* Proposal 4: If carrier switching for SRS for positioning is supported, support UE capability reporting to indicate number of SRS resources for positioning per BWP and per BWP per slot on a cell in either FeatureSetUplink or FeatureSetDownlink.
* Proposal 5: The capability of SRS for positioning with carrier switching is only applicable to aperiodic SRS for positioning triggered by DCI format 2\_3, if it is introduced.
	+ Note: periodic SRS and semi-persistent SRS for positioning with carrier switching are implicitly supported if UE reports srs-SwitchingTimesListNR per band pair in a band combination, and reports supported SRS resources in the FeatureSet.
 | R1-2003522( | Discuss in UL thread |
| 14 | **Proposa1 1**: The values for the maximum number of supported SRS resource sets for positioning include {1, 16} only.**Proposa1 2**: The capability of UE for the number of SRS resources for positioning on a symbol should be extended to the intra-band CA case. | R1-2003887(proposal 1,2) | Suitable for capability discussion thread |
| 15 | Proposal 1: For intra-band and inter-band CA operations, support the simultaneous transmission of SRS resource for positioning and SRS resource for MIMO. For intra-band and inter-band CA operations, a UE can simultaneously transmit more than one SRS resources configured by SRS-PosResource-r16 and SRS-Resource on different CCs, subject to UE’s capability | R1-2004135(proposal 1) | Discuss in UL thread |
| 16 | Proposal 2: Introduce a FG bit for Aperiodic SRS for positioning triggered with DCI format 2\_3.  | R1-2004470(proposal 2) | Suitable for capability discussion thread |

**Feature lead proposal: prioritize / downscope among issues 13 and 15 for discussion in the UL RS maintenance thread. Issues 14 and 16 are treated in the UE capability thread in AI 7.2.11.8**

# 4 interim feature lead proposals and Companies comments

The following proposals have been made for scoping of the email discussion during the meeting week:

**Feature lead proposal: prioritize / downscope inssues 1 to 6 for discussion in the UL RS maintenance thread**

**Feature lead proposal: endorse editorial isssues 7,8,9.**

* **for 38.214**
	+ **The TPs in R1-2004644 (TP#1) R1-2003522 (part A, Part B T1)**
	+ **Change “associated SRS resources set” to “SRS resources set to which the SRS resource belongs”, according to TP in proposal 4 of R1-2003407**
* **For 38.211: Remove the redundant description on SRS-PosResourceSet-r16 from Section 6.4.1.4.4 of TS 38.211, according to TP in proposal 1 of R1-2004053**
* **For 38.213 , the TPs in R1-2004644 (TP#1), and TP corresponding to proposal 2,3,4 in R1-2004053**

**Feature lead proposal: issues 10 and 11 and not treated during RAN1#101-e**

**Feature lead proposal: prioritize / downscope among issues 13 and 15 for discussion in the UL RS maintenance thread. Issues 14 and 16 are treated in the UE capability thread in AI 7.2.11.8**

Companies are encouraged to give their view

* which high priority issues and capability issues to treat during the meeting week in the email discussion assigned to AI 7.2.8.2.
* whether the editorial issues can be endorsed as is or need a separate discussion next week (please mark which issue should be discussed, if any)
* whether any low priority issue should be considered for inclusion in the email discussion

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| Issue #/ Email Discussion | Company | Comment |
| Issue 1~6 | CATT | We support issue #1, #2, #4, #5, #6 to be included as high priority issues in this meeting.For issue #3, RAN1 had agreed that the Rel-15 aperiodic SRS framework is supported for SRS for positioning in RAN1#99. We don’t prefer to re-open the discussion on this issue in RAN1 scope, and inclined to leave the issue to RAN2/RAN3 for further discussion.Agreement:* The Rel-15 aperiodic SRS framework is supported for SRS for positioning. Transmission of aperiodic SRS for positioning is a UE capability. There is no impact on DCI design.
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|  | Qualcomm | Ok to discuss Issue #1, #2, #4, #6. We consider Issue #13 & #16 is also a high priority (related also to #6: Note that they are both related to SRS for positioning with carrier switching).Issue #3: We are not OK to discuss it.Issue #5: Not OK to discuss again 5c and 5d for the following reasons: * 5c was already concluded. They argue that: “SRS-MIMO may take up large proportion of Tx power on overlapping symbols, therefore will affect the transmission power of SRS-Pos”. This can be avoided by configuration since the serving cell makes the decision.
* For 5d, there was already an agreement, and we don’t see the need to revert it. We would like to ask the proponents to bring these enhancements in Rel-17.

Agreement:If the SRS for positioning collides with PUSCH, the SRS is dropped in the symbols where the collision occurs.* Note: The phase continuity between transmitted symbols on either side of a transmission gap may not be maintained.
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# 5 Conclusions

## 5.1 feature lead summary of comments:

TBD

## 5.2 Email discussion proposal:

TBD

# 6 References

1. [R1-2003407](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2003407.zip) Discussion on remaining issues on UL RS for NR positioning vivo
2. [R1-2003473](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2003473.zip) Maintenance of UL reference signals for NR positioning ZTE
3. [R1-2003522](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2003522.zip) Finalizing SRS for NR positioning Huawei, HiSilicon
4. [R1-2003633](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2003633.zip) Remaining issues on UL SRS for NR Positioning CATT
5. [R1-2003887](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2003887.zip) UL reference signals for NR Positioning Samsung
6. [R1-2003959](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2003959.zip) Remaining issues on UL SRS for positioning transmission CMCC
7. [R1-2004053](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2004053.zip) Remaining Issues on UL Positioning Reference Signal OPPO
8. [R1-2004135](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2004135.zip) Remaining details of UL Reference signals for NR positioning LG Electronics
9. [R1-2004470](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2004470.zip) Maintenance on UL Reference Signals for NR Positioning Qualcomm Incorporated
10. [R1-2004515](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2004515.zip) Discussion on staggered SRS for NR Positioning Fraunhofer IIS, Fraunhofer HHI
11. [R1-2004644](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2004644.zip) Maintenance of UL Reference Signals for NR Positioning Ericsson