3GPP TSG-RAN WG3 #114-e R3-215808
Online, 1-11 November 2021

Agenda Item: 8.1

Source: Ericsson (moderator)

Title: CB: # 5\_PositioningSRS

Document for: Discussion

# Introduction

**CB: # 5\_PositioningSRS**

**- Whether the issue is acknowledged by RAN3? If yes, discuss the corrections on stage3.**

**- Reply LS to RAN2**

(E/// - moderator)

# To the chair’s notes

* **R3-216009 LS out to RAN2 agreed**
* **R3-216010 NRPPa correction CR (+E///, ZTE) agreed**
* **R3-216011 F1AP correction CR (+E///, ZTE) agreed**

# Introduction - RAN2 LS

RAN3 received an LS from RAN2 [1] in which they report finding a potential misalignment between the Spatial Relation Information sent over NRPPa within the LMF’s *Requested SRS Transmission Characteristics* IE, and the Spatial Relation Information in *SRS-PosResource* that is used for the RRC SRS configuration:

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| According to RRC spec. TS 38.331, the *spatialRelationInfoPos-r16* can be configured **per SRS resource level** by the gNB. On the other hand, in NRPPa spec. TS 38.455, the definition of *Requested SRS Transmission Characteristics* IE shows that the *Spatial Relation Information* is configured **only per SRS resource set level**, which means that LMF cannot recommend the spatial relation per SRS resource level for the gNB. In addition, the same misalignment exists also in the periodicity configuration of SRS resource. Therefore, RAN2 notice that there are misalignments between RRC and NRPPa in *SRS-PosResource* configuration and *Requested SRS Transmission Characteristics* IE, RAN2 would like to understand if that was an intended design from RAN3 or if a correction would be needed to align with RAN2 specification. |

Below the current *Requested SRS Transmission Characteristics* IE from TS 38.455:

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| 9.2.27 Requested SRS Transmission CharacteristicsThis IE contains the requested SRS configuration for the UE.

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| **IE/Group Name** | **Presence** | **Range** | **IE Type and Reference** | **Semantics Description** | **Criticality** | **Assigned Criticality** |
| Number Of Periodic Transmissions | C-ifResourceTypePeriodic |  | INTEGER (0..500,…) | The number of periodic SRS transmissions requested. The value of ‘0’ represents an infinite number of periodic SRS transmissions. |  |  |
| Resource Type | M |  | ENUMERATED (periodic, semi-persistent, aperiodic, …) |  |  |  |
| CHOICE *Bandwidth* | M |  |  |  |  |  |
| >FR1 |  |  | ENUMERATED (5mHz, 10mHz, 20mHz, 40mHz, 50mHz, 80mHz, 100mHz, ...) |  |  |  |
| >FR2 |  |  | ENUMERATED (50mHz, 100mHz, 200mHz, 400mHz,…) |  |  |  |
| **SRS Resource Set List** |  | *0.. 1* |  |  |  |  |
| **>SRS Resource Set Item** |  | *1..<* *maxnoSRS-ResourceSets>* |  |  |  |  |
| >>Number of SRS Resources Per Set | O |  | INTEGER (1..16,...) | The number of SRS Resources per resource set for SRS transmission.  |  |  |
| **>>Periodicity List** |  | *0.. 1* |  |  |  |  |
| **>>>Periodicity List Item** |  | *1..<maxnoSRS-ResourcePerSet>* |  |  |  |  |
| >>>>PeriodicitySRS | M |  | ENUMERATED (0.125, 0.25, 0.5, 0.625, 1, 1.25, 2, 2.5, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120, 10240, …) | Milli-seconds |  |  |
| **>>Spatial Relation Information** | **O** |  | **9.2.34** |  |  |  |
| >>Pathloss Reference Information | O |  | 9.2.53 |  |  |  |
| SSB Information | O |  | 9.2.54 |  |  |  |
| SRS Frequency | O |  | INTEGER(0..3279165) | NR ARFCN The carrier frequency of SRS transmission bandwidth. | YES | ignore |

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| **Condition** | **Explanation** |
| ifResourceTypePeriodic | This IE shall be present if the *Resource Type* IE is set to the value "Periodic". |

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| **Range bound** | **Explanation** |
| maxnoSRS-ResourceSets | Maximum no of requested SRS Resource Sets for SRS transmission. **Value is 16**. |
| maxnoSRS-ResourcePerSet  | Maximum no of SRS Resources per set. Value is 16. |

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And below the *SRS-PosResource* from TS 38.331:

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| SRS-PosResource-r16::= SEQUENCE { srs-PosResourceId-r16 SRS-PosResourceId-r16, transmissionComb-r16 CHOICE { n2-r16 SEQUENCE { combOffset-n2-r16 INTEGER (0..1), cyclicShift-n2-r16 INTEGER (0..7) }, n4-r16 SEQUENCE { combOffset-n4-r16 INTEGER (0..3), cyclicShift-n4-r16 INTEGER (0..11) }, n8-r16 SEQUENCE { combOffset-n8-r16 INTEGER (0..7), cyclicShift-n8-r16 INTEGER (0..5) }, ... }, resourceMapping-r16 SEQUENCE { startPosition-r16 INTEGER (0..13), nrofSymbols-r16 ENUMERATED {n1, n2, n4, n8, n12} }, freqDomainShift-r16 INTEGER (0..268), freqHopping-r16 SEQUENCE { c-SRS-r16 INTEGER (0..63), ... }, groupOrSequenceHopping-r16 ENUMERATED { neither, groupHopping, sequenceHopping }, resourceType-r16 CHOICE { aperiodic-r16 SEQUENCE { slotOffset-r16 INTEGER (1..32) OPTIONAL, -- Need S ... }, semi-persistent-r16 SEQUENCE { periodicityAndOffset-sp-r16 SRS-PeriodicityAndOffset-r16, ... }, periodic-r16 SEQUENCE { periodicityAndOffset-p-r16 SRS-PeriodicityAndOffset-r16, ... } }, sequenceId-r16 INTEGER (0..65535), spatialRelationInfoPos-r16 SRS-SpatialRelationInfoPos-r16 OPTIONAL, -- Need R ...} |

Then, the action from RAN3 in the LS is clarify if the above encompasses any misalignment(s) or not:

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| **2. Actions:**To RAN WG3**ACTION:** RAN2 respectfully requests RAN3 to provide clarification about these misalignments between RRC and NRPPa in *SRS-PosResource* configuration and *Requested SRS Transmission Characteristics* IE. |

# Discussion – first round

## Whether the misalignment is acknowledged?

Companies differ on the interpretation of the NRPPa and RRC specs and whether there is or not a misalignment. For instance, [8] claim that RAN2 understands that the LMF should provide spatial relation per SRS resource level instead of per SRS resource set level, otherwise there will be an ambiguity. Meanwhile, [2] claim that the spatial relation information per SRS resource set is enough for assisting the serving gNB to configure UE sending SRS, and that was an intended design in Release 16. Since companies differ on this fundamental aspect, it is proposed to discuss first whether the issue is acknowledged or not by companies in RAN3 before delving the stage 3 details?

* **Do companies consider that there is any misalignment between the Spatial Relation Information sent over NRPPa and the one used by gNB for the SRS PosResource Configuration?**

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| **Company** | **Comment** |
| Ericsson | We should discuss first whether RAN3 intentionally kept the spatial relations in resource set level instead of positioning resource level. In our understanding, there is no bijection between NRPPa and RRC, in the sense that the level of information granularity sent from LMF does not necessarily represent a 1:1 mapping to the RRC parameters. Instead, it could be that resource set may be enough for gNB to configure the SRS configuration |
| Samsung | We acknowledge this misalignment, and the corrections are needed.We still don’t understand the design intension of providing spatial relation information per SRS resource set instead of per SRS resource. We checked the history discussions in RAN3 108e and 109e meetings. RAN3 had only discussed whether to introduce spatial relation information in related NRPPa messages, but hadn’t discussed whether the spatial relation is per SRS resource set or per SRS resource. So we think RAN3 had wrong understanding on the granularity of spatial relation at the beginning but had never discussed in the past meetings.And according to RAN2 as discussed in [8], there will be an ambiguity problem, result in the LMF cannot provide the information necessary for the gNB to configure the proper spatial relation/periodicity of SRS resources. |
| Huawei | We believe that the LMF does not have enough information for the suggestion/configuration of each SRS resource. Then the suggestion for each SRS resource set is enough.In that sense we do agree the comment from Ericsson.Then the misalignment is more than questionable for us. |
| Nokia | Yes, we acknowledge there is misalignment and also believe it was not an intentional decision by RAN3. It is beneficial for the gNB to receive the spatial relation information per SRS resource. In our understanding, this was RAN1’s intention in recommending that the RRC configuration be done per resource for spatial relation. The LMF can know this information e.g. from prior measurement reports. |
| ZTE | Yes. The misalignment stated by RAN2 exists.And we have same concern as SS that RAN3 did not discuss whether the spatial relation is per SRS resource set or per SRS resource. Since RAN2 has indicated this issue, we prefer to correct the misalignment in RAN3 spec. |
| Qualcomm | We cannot recall a conscious decision on this. In that sense we would be fine to look for a way to enable request per SRS resource; of course in principle RRC and NRPPa are separate protocols, but we think the functionality should be supported. |
| CATT | We support the view that RAN3 was not designed this way on purpose and therefore this issue need to be resolved. |
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| **Moderator’s conclusion:*** Most companies acknowledge the misalignment of the Spatial Relation Information in NRPPa (and F1AP).
* Most companies think that the Spatial Relation Information provided by LMF is per SRS resource instead of per SRS resource set.
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## Stage 3 proposed corrections

If the issue is acknowledged, companies can discuss the proposed stage 3 corrections as described by the companies CRs below (taking NRPPa as example):

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| **[8]** | **[5]** | **[13]** |
| 1. Add the *Spatial Relation IE per SRS resource* IE both in Positioning Activation Request message and *Requested SRS Transmission Characteristics* IE.
2. Add description to clarify the relation between *Periodicity List Item* IE and *Spatial Relation per SRS Resource item* IE.
3. And Semantics Description for Spatial Relation Information IE
 | 1. Ignore the current *Spatial Relation information* and *Periodicity List* IEs in 9.2.27
2. Add a new *Positioning SRS Resource List* IE to be in-line with RRC description
 | 1. Introduce the *Spatial Resource Information* IE per SRS resource in the *Requested SRS Transmission Characteristics* IE.
2. Modify the *PeriodicitySRS* IE per SRS resource into the SRS Resource Set Item
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* **Do companies have any preference on the proposed correction CRs (ASN.1, NBC, etc.), provided that the issue has been acknowledged first?**

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| **Company** | **Comment** |
| Ericsson | Let’s see first if the issue is acknowledged or not. If yes, we would prefer a BC solution, which can be any of [8] or [5], or a merged solution. |
| Samsung | Either [5] or [8] or merged solution is fine for us |
| Huawei | As state above, we do understand there is nothing wrong in RAN3 specifications. Now seen a LS from RAN2, it might be beneficial to clarify something at least via LS and MCC minutes. We do not exclude CR.If any CR we would like a BC solution.There is a double structure list today and the Spatial Relation Information applies to the set, if the set contains a single Pos Resource in the second list, then the configuration is per Pos Resource… To better clarify and match the 64, we might just had the Spatial Relation Information at same level of *PeriodicitySRS* IE and clarify via Text Procedure or semantic which one applying. |
| Nokia | We are open to discuss any backwards compatible solution. |
| ZTE | Sorry for the NBC solution, and either [5] or [8] is fine. As the LS from RAN2 mentioned, the same misalignment exists also in the periodicity configuration of SRS resource, so we slightly prefer [5]. |
| Qualcomm | As others, we are fine to explore any BC solution i.e. [5] or [8] or merged. |
| CATT | Either [5] or [8] or merged solution. |
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| **Moderator’s conclusion:*** All companies want a BC solution to address the misalignment. The encoding details of the CRs to NRPPa and F1AP to be discussed in the second round of the SoD, with the reply LS to RAN2
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# Discussion - Second round

## NRPPa CR

To address the misalignment of signalling the Spatial relation information per SRS Resource in NRPPa, it is proposed to consider a BC solution. Considering that the issue has been initially detected by the proponents in [8], moderator proposes to analyse their CRs and discuss whether they can be revised to become agreeable.

* **Are there any comments on the NRPPa CR in [10] to be agreed?**

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| **Company** | **Comment** |
| Ericsson | On the CR cover page: Please tick the “Core Network” and “Other specs affected” cases.On the proposed procedural text, the *"Spatial Relation per SRS Resource Item*" IE is coded as mandatory present (the *1..*) in the *Spatial Relation Information per SRS Resource* IE, so we don’t need the first part of the proposed sentence. Instead, perhaps we can reformulate as follows:"If the *Spatial Relation Information per SRS Resource* IE and the *Periodicity List* IE are both included in *Requested SRS Transmission Characteristics* IE, the NG-RAN node shall consider that the *Spatial Relation per SRS Resource Item* IE and *the Periodicity List Item* IE have one-to-one mapping relation." |
| Samsung | Agree with E///’s revision and updated accordingly. The draft CR is uploaded in the draft folder, and companies are welcome to revise it directly.For ZTE’s concerns in 4.2, there is a description to clarify the relation between Periodicity List Item IE and Spatial Relation per SRS Resource item IE, in [8], [10] and [11], and it’s revised as E/// recommended above in the draft folder.There’s another change in [10] we hadn’t discussed in 1st round, i.e. **whether applied the same correction in Positioning Activation Request message**. We think it should be applied, we would like to know companies’ views. |
| Nokia | Some minor revisions directly to the draft CR. |
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## F1AP CR

* **Are there any comments on the F1AP CR in [11] to be agreed?**

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| **Company** | **Comment** |
| Ericsson | On the CR cover page: Please tick the “Other specs affected” case.Proposed rewording for the procedure text:"If the *Spatial Relation Information per SRS Resource* IE and the *Periodicity List* IE are both included in *Requested SRS Transmission Characteristics* IE, the gNB-DU shall consider that the *Spatial Relation per SRS Resource Item* IE and *the Periodicity List Item* IE have one-to-one mapping relation." |
| Samsung | Updated accordingly.  |
| Nokia | Some minor revisions directly to the draft CR. |
| Huawei | Well it might be better to proceed in 2 step, consider the the *Spatial Relation per SRS Resource Item* IE then talk of mapping"If the *Spatial Relation Information per SRS Resource* IE and the *Periodicity List* IE are both included in *Requested SRS Transmission Characteristics* IE, the gNB-DU shall consider the the *Spatial Relation per SRS Resource Item* IE then ~~that~~ the *Spatial Relation per SRS Resource Item* IE and *~~the~~* the  *Periodicity List Item* IE have one-to-one mapping relation."Please not the text is in red in the CRsPlease remove the empty row before the >>Spatial Relation Information in 9.2.27 Requested SRS Transmission Characteristics |
| Samsung | For the comment from HW, i.e. "Well it might be better to proceed in 2 step, consider the the *Spatial Relation per SRS Resource Item* IE then talk of mapping", I understand the intension, but there's already a description above states that NG-RAN node may consider the *Requested SRS Transmission Characteristics* IE, so we'd better not to mention the sub-IE again. Below is for your reference.

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"If the *Requested SRS Transmission Characteristics* IE is included in the POSITIONING INFORMATION REQUEST message, the NG-RAN node may take this information into account when configuring SRS transmissions for the UE, and it shall include the *SRS Configuration* IE and the *SFN Initialisation Time* IE in the POSITIONING INFORMATION RESPONSE message.If the *Spatial Relation Information per SRS Resource* IE and the *Periodicity List* IE are both included in the *Requested SRS Transmission Characteristics* IE, the NG-RAN node shall consider that the *Spatial Relation per SRS Resource Item* IE and the *Periodicity List Item* IE have one-to-one mapping relation." |
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## LS reply to RAN2

In [12], the following LS reply text to RAN2 is proposed:

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| **Attachments:** agreed RAN3 CRs1 Overall descriptionRAN3 would like to thank RAN2 for the LS onon the misalignment in SRS configuration. RAN3 acknowledges the misalginment and has agreed CRs attached to algin with RAN2 specification.2 Actions**To: RAN WG2****ACTION: RAN3 asks RAN2 group to take the above into account.** |

* **Any comments on the reply LS text and action?**

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| **Company** | **Comment** |
| Ericsson | LS reply is fine, to be updated with agreed correction CRs. Small typo “algin” => “align” |
| Samsung | Updated accordingly. |
| Huawei | We a probably the only company thinking there is no misalignment, I just update the LS to fit to the situation.  |
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# Conclusion (first round)

**Moderator’s conclusion:**

* Most companies acknowledge the misalignment of the Spatial Relation Information sent in NRPPa (and F1AP).
* Most companies think that the Spatial Relation Information provided by LMF is per SRS resource instead of per SRS resource set.
* All companies want a BC solution to address the misalignment. The encoding details of the CRs to NRPPa and F1AP to be discussed in the second round of the SoD, with the reply LS to RAN2

# Conclusion (Second round)

**Moderator’s conclusion:**

* R3-216009 LS out to RAN2 agreed
* R3-216010 NRPPa correction CR agreed
* R3-210601 F1AP correction CR agreed

# References

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| **Positioning** |
| **[1]** | [R3-214685](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214685.zip) | LS to RAN3 on the misalignment in SRS configuration (RAN2) | LS in |
| **[2]** | [R3-215379](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215379.zip) | Discussion on misalignment in SRS configuration (Huawei) | discussion |
| **[3]** | [R3-215380](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215380.zip) | Draft reply LS on alignment in SRS configuration (Huawei) | LS out To: RAN2 CC:  |
| **[4]** | [R3-215430](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215430.zip) | Discussion on the RAN2 LS about SRS configuration misalignment between NRPPa and RRC and other issues (Ericsson) | discussion |
| **[5]** | [R3-215431](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215431.zip) | Correction of Spatial Relation Information for SRS Configuration (Ericsson) | CR0048r, TS 38.455 v16.5.0, Rel-16, Cat. F |
| **[6]** | [R3-215432](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215432.zip) | Correction of Spatial Relation Information for SRS Configuration (Ericsson) | CR0825r, TS 38.473 v16.7.0, Rel-16, Cat. F |
| **[7]** | [R3-215433](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215433.zip) | draft reply LS to RAN2 on the misalignment in SRS configuration (Ericsson) | LS out To: RAN2 CC:  |
| **[8]** | [R3-215555](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215555.zip) | Discussion on misalignment between RRC and NRPPa in SRS configuration (Samsung) | discussion |
| **[9]** | [R3-215556](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215556.zip) | ReplyLS\_Misalignment between RRC and NRPPa in SRS configuration (Samsung) | LS out To: RAN2 CC: SA2 |
| **[10]** | [R3-215557](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215557.zip) | (CR for TS 38.455) spatial relation per SRS resource\_for NRPPa (Samsung) | CR0049r, TS 38.455 v16.5.0, Rel-16, Cat. F |
| **[11]** | [R3-215558](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215558.zip) | (CR for TS 38.473) spatial relation per SRS resource\_for F1AP (Samsung) | CR0827r, TS 38.473 v16.7.0, Rel-16, Cat. F |
| **[12]** | [R3-215638](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215638.zip) | Discussion on the SRS misalignment (ZTE Corporation) | discussion |
| **[13]** | [R3-215640](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215640.zip) | Correction to TS38.455 on misalignment in SRS configuration (ZTE Corporation) | CR0050r, TS 38.455 v16.5.0, Rel-16, Cat. F |
| **[14]** | [R3-215643](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215643.zip) | Correction to TS38.473 on misalignment in SRS configuration (ZTE Corporation) | CR0830r, TS 38.473 v16.7.0, Rel-16, Cat. F |