**3GPP TSG RAN WG1 Meeting #110 R1-220xxxx**

**Toulouse, France, August 22nd – 26th, 2022**

**Source: Moderator (Samsung)**

**Title:** **Moderator Summary [110-LTE-Maintenance] of Reply LS on the CSI periodic reporting for Dormant SCell state**

**Agenda Item:** **6**

**Document for:** **Discussion and Decision**

# **Introduction**

This document is the summary of LS on the CSI periodic reporting for Dormant SCell state from RAN2 [1]. Detail LS is as follow:

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| 1. **Overall Description:**

RAN2 discussed the following misalignment between RAN1 and RAN2 specifications:In current TS 36.213, clause 7.2.2 describes the parameters for periodic CSI reporting using PUCCH. In detail, RAN1 specification describes that the separate configuration of single CSI subframe set and multiple CSI subframe sets regarding *cqi-pmi-ConfigIndexDormant*/ *cqi-pmi-ConfigIndex2Dormant* and *ri-ConfigIndexDormant*/ *ri-ConfigIndex2Dormant* is allowed. However, RRC only allows to configure *cqi-pmi-ConfigIndexDormant* and *ri-ConfigIndexDormant* i.e. no RRC signaling has been specified in TS 36.331 to configure *cqi-pmi-ConfigIndex2Dormant* and *ri-ConfigIndex2Dormant*.This functional misalignment between the RAN1 and RAN2 specifications creates confusion with respect to implementation, so it needs to be clearly clarified whether the separate configuration of single CSI subframe set and multiple CSI subframe sets is supported or not. In order to solve this misalignment, RAN2 discussed the solution in which the missing parameters are introduced in RRC signaling and a new UE capability is introduced to indicate support of different configuration for multiple CSI subframe sets. However, this solution requires late changes to frozen Rel-15/Rel-16 ASN.1 and RAN2 prefer to avoid such late changes unless they are essential. In order to make final decision on this feature, RAN2 would like to ask RAN1 the following questions:**Question 1:**Are there significant impacts to performance of CA operation if separate configuration of single CSI subframe set and multiple CSI subframe sets cannot be supported in Rel-15 or Rel-16?If this feature is essential from RAN1 perspective:**Question 2-1:**From which release should it be supported? **Question 2-2:**With regards to the UE capability for indicating support of this feature: should it be defined per UE or per band? Is FDD/TDD differentiation required? If this feature is not essential from RAN1 perspective:**Question 3:**Is it possible to change the RAN1 specification to revert the support of this feature? Or should RAN2 assume that same configuration of “subframe set 1” is always applied to “subframe set 2” without explicit configuration? |

# **Background**

In TS 36.213 [2], the configuration for the second subframe set is specified as follow:

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| -- omitted--If a UE is configured to report for more than one CSI subframe set then parameter *cqi-pmi-ConfigIndex*, *ri-ConfigIndex*, *periodicityOffsetIndex,* and *cri-ConfigIndex* respectively correspond to the CQI/PMI, RI, PMI/RI, and CRI periodicity and relative reporting offset for subframe set 1 and *cqi-pmi-ConfigIndex2*, *cqi-pmi-ConfigIndex2Dormant,* *ri-ConfigIndex*2,*ri-ConfigIndex2Dormant, periodicityOffsetIndex2,* and *cri-ConfigIndex*2 respectively correspond to the CQI/PMI, RI, PMI/RI, and CRI periodicity and relative reporting offset for subframe set 2. For a UE configured with transmission mode 10, the parameters *cqi-pmi-ConfigIndex* , *ri-ConfigIndex*, *periodicityOffsetIndex, cri-ConfigIndex*, *cqi-pmi-ConfigIndex2*, *ri-ConfigIndex*2, *periodicityOffsetIndex2,* and *cri-ConfigIndex*2 can be configured for each CSI process. A BL/CE UE is not expected to be configured with the parameter *ri-ConfigIndex*.-- omitted-- |

As specification, RRC parameter *cqi-pmi-ConfigIndex2Dormant* and *ri-ConfigIndex2Dormant* are configured when multiple CSI subframe sets are configured for the UE. The issue is that the RRC configuration for pattern of second CSI subframe set is configured but there is no RRC parameter to determine the periodicity and offset for CSI reporting which is related to the second CSI subframe set, i.e., *cqi-pmi-ConfigIndex2Dormant* and *ri-ConfigIndex2Dormant* are not configured as follow in TS 36.331 [3]:

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| CQI-ReportPeriodicSCell-r15 ::= CHOICE { release NULL, setup SEQUENCE { cqi-pmi-ConfigIndexDormant-r15 INTEGER (0..1023), ri-ConfigIndexDormant-r15 INTEGER (0..1023) OPTIONAL, -- Need OR csi-SubframePatternDormant-r15 CHOICE { release NULL, setup SEQUENCE { csi-MeasSubframeSet1-r15 MeasSubframePattern-r10, csi-MeasSubframeSet2-r15 MeasSubframePattern-r10 } } OPTIONAL, -- Need ON cqi-FormatIndicatorDormant-r15 CHOICE { widebandCQI-r15 SEQUENCE { csi-ReportMode-r15 ENUMERATED {submode1, submode2} OPTIONAL -- Need OR }, subbandCQI-r15 SEQUENCE { k-r15 INTEGER (1..4), periodicityFactor-r15 ENUMERATED {n2, n4} } } OPTIONAL -- Need OR }} |

As seen as above, the misalignment between RAN1 and RAN2 occurs. To resolve this misalignment, RAN1 can discuss how to handle those two RRC parameters.

# **Companies’ view**

Some companies shared views in the contribution. Summary is as below:

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| Contributions | Views |
| [4] ZTE | Multiple CSI subframe sets are helpful for acquiring CSI with different situation. Prefer to keep it in RAN1 spec. |
| [5] Samsung | Current stage is too late to capture this misalignment in RAN2 spec. Instead of adding RRC parameters, RRC parameters for the first CSI subframe set can be reused for the second CSI subframe set.  |
| [6] Qualcomm | Multiple CSI subframe sets are not essential. Suggest to remove the misaligned RRC parameters and add that ‘A UE is not expected to be configured to report more than one CSI subframe set in a cell configured with dormant state’ in RAN1 spec.  |
| [7] Huawei | Multiple CSI subframe sets are not essential. Share the concern on reusing the configuration for first CSI subframe set. Suggest to remove misaligned RRC parameters in RAN1 spec. |

# **1st round discussion**

The Moderator kindly requests companies to provide their views on the issue.

**Question 1. Please share the preference between following alternatives:**

* **Alt 1: Using the same configuration for both CSI subframe sets**
* **Alt 2: removing the non-aligned RRC parameters in TS 36.213**
* **Note: if you concern NBC issue, please share your concern**

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| Company | Alt1/Alt2 | Comments |
| Qualcomm | Alt2 | There cannot be an NBC issue since the specification right now is broken (i.e., any vendor implementing the specification as it is would have realized that the parameters are missing). |
| Samsung | Slightly Alt 1 | We are fine with both Alt 1 and Alt 2. However, Alt 1 can solve this issue without any RAN1 spec impact. However, if the majority supports Alt 2, we can be fine with Alt 2.  |
| Nokia, Nokia Shanghai Bell | Alt 2 | We prefer to solve the problem in RAN1 by removing the non-aligned parameters. Modification of Rel-15 ASN.1 should be avoided. |
| ZTE | Alt.3 | Alt.3: Adding the missing RRC parameters and potential UE FG to address the NBC issue.As we indicated in our tdoc, multiple CSI subframe sets allow UE to report different CSI for subfames with different interference situation. Hence it helps the network to acquire CSI for dormant SCell state which could help the process of SCell activation under the scenarios with different interference situation in different subframe sets. It is expected to have some performance impact for these scenarios if this cannot be supported in Rel-15 or Rel-16.Based on our understanding, both Alt.1 and Alt.2 will have NBC issue. If we want to address this issue, we prefer a clean solution, i.e., adding the missing RRC parameters. The NBC issue can be addressed by adding new FG for this.Thus, we propose the Alt.3 above. |

# **2nd round discussion**

According to the inputs of first round discussion, the following is summary:

* Support Alt 1 (1): Samsung (first)
* Support Alt 2 (3): Qualcomm, Samsung (second), Nokia (no ASN.1 impact)
* Support Alt 3 (1): ZTE

As companies’ inputs, the majority can support Alt 2. However, ZTE has a concern on removing those parameters and wants to make more clear solution, i.e. adding missing RRC parameters. However, as Nokia mentioned, the current stage is too late to make ASN.1 impact for Rel-15/16. We can consider to add the missing RRC parameters for later release (e.g. Rel-17 or Rel-18) instead of Rel-15/16. Therefore, for Rel-15/16, we can consider to make a conclusion for this misalignment without any spec change and RAN1 can ask RAN2 whether to add missing parameters for later release.

Considering companies’ inputs, moderator kindly requests companies to provide views on two options for the second round.

**Option 1**: remove the non-aligned RRC parameters *cqi-pmi-ConfigIndex2Dormant* and *ri-ConfigIndex2Dormant* in TS 36.213

**Option 2**: make a conclusion as follow without any spec impact and add the missing RRC parameters in later release (e.g. Rel-17 or Rel-18)

Conclusion

There is a misalignment on RRC parameters *cqi-pmi-ConfigIndex2Dormant* and *ri-ConfigIndex2Dormant* between TS 36.213 and TS 36.331.

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| Company | Opt1/Opt2  | Comments |
| ZTE | Opt2 | Thanks moderator for the summary.Note that this misalignment is due to missing the RRC parameters somehow instead of technical concerns. Companies have agreed to introduce multiple CSI subframe sets in Rel-15, it is just to fix a bug in the specification without introducing any new behaviors that have not been agreed in RAN1. If companies have concern on the potential NBC issue, we can compromise to introduce the missing RRC parameters in later release. |
| QC | Opt1 | We would also be OK with introducing the RRC parameters in a later release (e.g. Rel-18?) if this can solve the issue. |

# **Reference**

[1] R1-2205729 “LS on the CQI periodic reporting for Dormant SCell state,” RAN2, Samsung

[2] TS 36.213 v15.15.0, “E-UTRA Physical layer procedures”.

[3] TS 36.331 v15.13.0, “E-UTRA RRC Protocol specification”.

[4] R1-2205944 “[DRAFT] Reply LS on the CQI periodic reporting for Dormant SCell state,” ZTE

[5] R1-2206777 “Draft Reply LS on the CQI periodic reporting for Dormant SCell state,” Samsung

[6] R1-2207164 “Discussion on dormant SCell CQI,” Qualcomm Incorporated

[7] R1-2207652 “Discussion on CSI periodic reporting for Dormant SCell state,” Huawei, HiSilicon