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

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

**Source: Moderator (Intel Corporation)**

**Title: Moderator Summary for Rel. 17 NR FeMIMO –**

**Maintenance on HST-SFN (Round 0)**

**Agenda item: 8.1**

**Document for: Discussion and Decision**

# Introduction

A moderator summary of maintenance issues related to Rel-17 FeMIMO HST-SFN based on contributions submitted to RAN1#110 is provided below. A total of 5 issues have been identified. Along with the issue summaries, an initial moderator assessment on which topics should be discussed in RAN1#110 is also provided. The initial assessment is based on discussions from previous meetings, if any, and can be further updated based on company inputs.

Since there is no preparation phase in RAN1#110 as per Mr. Chairman’s guidance, companies are requested to **provide their inputs on Issues 1-5 by 3pm (Toulouse local time) on Monday, August 22, 2022.** Based on the inputs, the issues to be treated in RAN1#110 can be finalized.

# Maintenance Issues

* 1. Issue 1: CORESET#0 Activated with 2 TCI States

Three companies ZTE [1], Lenovo [2] and vivo [3] have provided draft CRs for this issue. The issue is related to UE behavior for PDCCH reception in Type 0/0A/2 CSS sets associated with CORESET#0 which has been activated with two TCI states. The proposals in [2, 3] suggest using the first TCI state, while the proposal in [1] suggests using both TCI states. If this issue is treated in RAN1#110, companies need to decide between two alternatives as summarized below.

Table 1: Summary of Issue 1

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| **Issue (summary of CR proposal)** | **Initial FL assessment**  | **Company inputs (if any)** |
| When Type 0/0A/2-PDCCH CSS is associated with CORESET#0 which is activated with two TCI states:* **Alt-1**: the first TCI state should be applied for PDDCH reception (Draft CRs in [2], [3])
* **Alt-2**: both TCI states should be applied for PDCCH reception (Draft CR in [1])
 | Discuss in RAN1#110 | * **Discuss:**
* **Not Discuss:**

Additional company views on listed alternatives - **Alt-1:*** **Support:**
* **Not Support:**

**Alt-2:*** **Support:**
* **Not Support:**
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| **Company Name** | **Company inputs (if any)** |
| Mod | This issue was extensively discussed in the last two meetings, but no consensus was reached. Several companies commented that no specification change is necessary. On the other hand, one company commented that the following agreement will be reverted if UE behavior for this case is not defined. **Agreement**For the response to RAN2 LS (in R1-2200886), the following is agreed

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| Question: RAN2 would like to ask whether “Enhanced TCI state indication for UE specific PDCCH MAC CE” can be applied to CORESET zero or not. |

RAN1 response: There is no restriction in RAN1 on whether enhanced TCI state indication for UE specific PDCCH MAC CE can be applied to CORESET zero.Mr. Chairman recommended this to be considered in RAN1#110. Keeping previous discussion in mind, initial FL recommendation is to discuss and conclude on this issue in RAN1#110. This assessment can be updated based on company inputs. Furthermore, companies are encouraged to provide additional feedback on the listed alternatives as well as their view on whether the above agreement is indeed reverted if no additional UE behavior is defined.  |
| Google | Support to discuss this issue. But we would like to clarify the UE behavior for Type3 CSS and USS as well. It seems unreasonable to apply different UE behaviors for different types of SSs as the SSs may overlap. |
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* 1. Issue 2: Default QCL Assumption

One company, Samsung, has provided a draft CR on default QCL assumptions for prioritizing PDCCH reception when associated CORESET overlaps with SFN-PDSCH [4]. The summary of proposed changes is provided below.

Table 2: Summary of Issue 2

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| **Issue (summary of CR proposal)** | **Initial FL assessment**  | **Company inputs (if any)** |
| Draft CR for TS 38.214 Section 5.1.5 provided in [4]:**Summary of change**: For the SFN PDSCH received by two default beams, if the 'QCL-TypeD' in both of the TCI states corresponding to the lowest codepoint among the TCI codepoints containing two different TCI states is different from that of the PDCCH DM-RS with which they overlap in at least one symbol, the UE is expected to prioritize the reception of PDCCH associated with that CORESET. This also applies to the intra-band CA case (when PDSCH and the CORESET are in different component carriers). | Discuss in RAN1#110 | * **Discuss:**
* **Not Discuss:**
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| **Company Name** | **Company inputs (if any)** |
| Mod | This issue was discussed in the preparation phase of RAN1#109e and was designated as non-essential. Majority of the companies commented that specification change is not needed and legacy rules from Rel-15/16 for COREST overlapping with PDSCH can be reused. Since this issue was first brought up in RAN1#109e, initial FL assessment is to discuss the issue in RAN1#110. However, the initial assessment can be updated based on inputs from companies. |
| Google | It seems capture spec already suggests such behavior. If necessary, a conclusion can be considered. |
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* 1. Issue 3: Replace “SFN-PDSCH and non-SFN-PDSCH” in TS 38.214

One company, Ericsson, has submitted a draft CR to align terminology of TS 38.214 with UE capability parameters in TS 38.306 [5]. The summary of proposed changes is provided below.

Table 3: Summary of Issue 3

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| **Issue (summary of CR proposal)** | **Initial FL assessment**  | **Company inputs (if any)** |
| Draft CR for TS 38.214 Section 5.1.5 provided in [5]:**Summary of change**: Replace undefined terminology and acronym “SFN PDSCH and non-SFN PDSCH” with proper UE capability parameters from 38.306.The description “dynamic switching between SFN PDSCH and non-SFN PDSCH” is unclear and can be replaced by UE capability indication ***sfn-SchemeA-DynamicSwitching-r17*** and ***sfn-SchemeB-DynamicSwitching-r17*** defined in 38.306 | Editorial - Discuss in RAN1#110 | * **Discuss:**
* **Not Discuss:**
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| **Company Name** | **Company inputs (if any)** |
| Mod | This is a valid issue and should be editorial. Initial FL assessment is to discuss this issue in RAN1#110. |
| Google | OK to discuss it. |
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* 1. Issue 4: BFD-RS Selection for SFN Mode

One company, Nokia/NSB, has submitted a draft CR for TS 38.213 for BFD-RS selection when operating in SFN mode [6]. The summary of the issue is provided below.

Table 4: Summary of Issue 4

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| **Issue (summary of CR proposal)** | **Initial FL assessment**  | **Company inputs (if any)** |
| Draft CR for TS 38.213 Section 6 provided in [6]:**Summary of change**: For implicit configuration of BFD-RS, if the UE is configured with a CORESET with two TCI states and CORESET with single TCI state, and the number of determined BFD-RS exceed the maximum number, UE determines to select one BFD-RS (corresponding to TCI states) for each CORESET | Do not discuss in RAN1#110 | * **Discuss:**
* **Not Discuss:**
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| **Company Name** | **Company inputs (if any)** |
| Mod | This issue has been discussed in previous meetings with no consensus among companies. Therefore, initial FL assessment is to not treat this issue in RAN1#110. The initial assessment can be updated based on company inputs. |
| Google | This looks to be an optimization. |
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* 1. Issue 5: NBI Resource Pair for SFN Mode

One company, Nokia/NSB, has submitted a draft CR for TS 38.213 for NBI-RS configuration for SFN operation [7]. The summary of proposed changes is provided below.

Table 5: Summary of Issue 5

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| **Issue (summary of CR proposal)** | **Initial FL assessment**  | **Company inputs (if any)** |
| Draft CR for TS 38.213 Section 6 provided in [7]:**Summary of change**: The UE can be configured with additional information for an SCell that indicates a candidate beam or a candidate beam pair (pairs) that support SFN operation. If the UE indicates candidate beam pair for beam failure that supports SFN operation, the UE can continue with SFN operation after BFR | Do not discuss in RAN1#110 | * **Discuss:**
* **Not Discuss:**
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| **Company** | **Company inputs (if any)** |
| Mod | This issue has been discussed in previous meetings with no consensus among companies. Therefore, initial FL assessment is to not treat this issue in RAN1#110. The initial assessment can be updated based on company inputs.  |
| Google | This looks to be an optimization. |
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# References

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|  | R1-2205934 | Draft CR on CSS for Multi-TRP HST-SFN | ZTE |
|  | R1-2206222 | Draft CR on monitoring Type0/0A/1/2 PDCCH CSS with HST deployment in TS38.213 | Lenovo |
|  | R1-2206717 | Draft CR on SFN-based CORESET#0 issue for HST-SFN | vivo |
|  | R1-2206787 | Draft CR on default QCL assumption in HST-SFN | Samsung |
|  | R1-2207133 | Draft CR on QCL assumption for SFN PDSCH  | Ericsson |
|  | R1-2207539 | Draft CR 38.213 BFD-RS Selection in SFN Operation Mode | Nokia, Nokia Shanghai Bell |
|  | R1-2207540 | Draft CR 38.213 New Beam Identification Resource Pair for SFN Operation Mode | Nokia, Nokia Shanghai Bell |