**3GPP TSG RAN WG1 #118 R1-2407466**

**Maastricht, The Netherlands, August 19th – 23rd, 2024**

**Agenda item:** 9.2.2

**Source:** Moderator (Samsung)

**Title:** Moderator Summary on Thursday offline for Rel-19 CSI enhancements

**Document for:** Discussion and Decision

## Introduction

The following proposals were discussed.

## Summary of proposals

### Issue 1 (WID objective 2a and 2b): Type-I and Type-II codebook refinement for up to 128 CSI-RS ports

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| 1.3.1 | **[117] Agreement**For the Rel-19 Type-I codebook refinement for 48, 64, and 128 CSI-RS ports, for RI=v=1, support the following:* for each group of $X\_{1}X\_{2}$ SD basis vectors, a 3-bit scaling factor can be NW-configured via higher-layer (RRC) signalling, where the scaling factors are defined as scalings on the power control offset configured for the associated CSI-RS resources
	+ The values of $X\_{1}$ and $X\_{2}$ for this feature are separately configured from those for CBSR
	+ Separate configuration (RRC signalling) from CBSR
	+ The candidate values of $X\_{1}$ and $X\_{2}$ are the same as those agreed for CBSR
* The codepoints of each of the group-specific 3-bit scaling factors are mapped to values of $\left\{\sqrt{1}, \sqrt{1/2}, \sqrt{1/3} ,\sqrt{1/4},\sqrt{1/6},\sqrt{1/8},\sqrt{1/12},\sqrt{1/16}\right\}$
* Note: This feature is a separate UE capability

FFS: Whether this can be extended to RI=v>1 … **Proposal 1.C.1**: For the Rel-19 Type-I codebook refinement for 48, 64, and 128 CSI-RS ports, study, for RI=$ϑ$ >1, applying the 3-bit scaling factor(s) as agreed in RAN1#117, where a per-layer scaling factor applied to the $i^{th}$ selected SD basis vector is given by e.g. $min\left\{1,\frac{ϑs\_{i}^{2}}{r\_{i}}\right\}$, where unit scaling factor “1” is associated with the PDSCH-to-CSIRS EPRE offset “portion” contributed by the $i^{th}$ selected SD basis vector without the 3-bit scaling factor $s\_{i}$ configured, e.g. $s\_{i}\in \left\{\sqrt{1}, \sqrt{\frac{1}{2}}, \sqrt{\frac{1}{3}} ,\sqrt{\frac{1}{4}},\sqrt{\frac{1}{6}},\sqrt{\frac{1}{8}},\sqrt{\frac{1}{12}},\sqrt{\frac{1}{16}}\right\} $ is the scaling factor associated with the $i^{th}$ SD basis vector, and $r\_{i}\in \left\{1,2\right\}$ is the number of layers transmitted using the $i^{th}$ SD basis vector.* Note: This feature is a separate UE capability
* Study whether per-SD-basis-vector/layer power adjustment (including boosting) needs to be supported in addition

**FL assessment**: For the Rel-19 Type-I SP codebook refinement for 48, 64, and 128 CSI-RS ports, regarding the 3-bit scaling factor, please share your view whether this can be extended to RI=v>1 (and provide justification)**Yes**: Ericsson, Nokia/NSB, **No**: IDC, TCL, OPPO, Xiaomi, Huawei/HiSi, ZTE, Fujitsu, **Need more discussion/study**: Qualcomm, CMCC, Samsung, Apple, NTT DOCOMO, Xiaomi (ok), HONOR, Google, Lenovo/MotM, Fraunhofer IIS/HHI,  | **Support/fine:** Ericsson, MediaTek, NTT DOCOMO, Qualcomm, Spreadtrum, KDDI, ZTE, Samsung, Apple,Lenovo/MotM, Nokia/NSB, Xiaomi,**Not support:**  |

### Issue 2 (WID objective 2c): CRI-based CSI for hybrid beamforming (HBF)

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| 2.2 | **Proposal 2.B.3**: For the Rel-19 CRI-based CSI refinement for up to 128 CSI-RS ports, regarding resource-specific CBSR, Per resource (each of the Ks resources), Rel-16 eType-II based: Rel-16 eType-II CBSR* Just as Rel-18 Type-II CJT CBSR, decouple (N1,N2) from each of the Ks CBSR IEs
* This implies that it is possible not to configure CBSR for any of the KS resources
* Only 1-bit hard CBSR is supported

Per resource (each of the Ks resources), Rel-15 Type-I SP based: Rel-15 Type-I SP CBSR* Just as Rel-18 Type-II CJT CBSR, decouple (N1,N2) from each of the Ks CBSR IEs
* This implies that it is possible not to configure CBSR for any of the KS resources

**FL assessment**: This proposal is to finalize CBSR design for HBF. Other alternatives are, e.g. reuse Rel-18 Type-II CJT CBSR or Rel-15 CRI-based CBSR | **Support/fine**: Huawei/HiSi, ZTE, CATT, Lenovo/MotM, TCL, NTT DOCOMO, Nokia/NSB, Xiaomi, Ericsson, vivo, Samsung,**Not support**:  |

### Issue 3 (WID objective 3): CJT calibration reporting for non-ideal synchronization and backhaul

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# References