**3GPP TSG RAN WG1 Meeting #110bis-e R1-22xxxxx**

**e-Meeting, October 10th – 19th, 2022**

**Source: Moderator (vivo)**

**Title: FL summary #1 of PDSCH/PUSCH enhancement (RS and timeline)**

**Agenda item: 8.2**

**Document for: Discussion and decision**

# Introduction

In this contribution, we summarize issues regarding PDSCH/PUSCH enhancements for new SCSs on supporting NR from 52.6 GHz to 71 GHz in RAN1 #110bis-e.

Note that only issues related to time line related aspects adapted to each of the new numerologies 480kHz and 960kHz and reference signals are summarized here based on contributions to AI 8.2.

# Remaining issues

## 2.1. Frequency resource for CSI-RS for tracking

In [1, ZTE], it is pointed out that Rel-16 NR-U supports wide-band operation and it can perform LBT and subsequent transmission in one or more RB sets. The size of each RB set is from 50 to 55/56 RBs. So Rel-16 NR-U defines a range for freqBand configuration for CSI-RS that is different from licensed spectrum operation. However, Rel-17 FR2-2 NR-U does not support wide-band operation and corresponding RB set, thus it is unnecessary for shared and licensed spectrum operation in FR2-2 to define different ranges for freqBand configuration for CSI-RS.

Moderator’s comment:

The proposal seems very straightforward and is formulated below for discussion.

##### Proposal 1-1

Endorse in principle the corresponding CR to TS38.214 in [1] (TP copied below for convenience).

========================= Start of TP #1-1 for TS 38.214, clause 5.1.6.1.1===================

5.1.6.1.1 CSI-RS for tracking

**<Unchanged parts are omitted>**

- if carrier $N\_{grid}^{size,μ}=52$, $N\_{BWP,i}^{size}=52$, $μ=0$ and the carrier is configured in paired spectrum, the bandwidth of the CSI-RS resource, as given by the higher layer parameter *freqBand* configured by *CSI-RS-ResourceMapping*, is *X* resource blocks, where $X \geq 28$ resource blocks if the UE indicates *trs-AddBW-Set1* for the *trs-AdditionalBandwidth* capability for CSI-RS for tracking or *addBW-Set1* for the *aperiodicCSI-RS*-*AdditionalBandwidth* capability for aperiodic CSI-RS for fast SCell activation and $X \geq 32$ if the UE indicates *trs-AddBW-Set2* for the *AdditionalBandwidth* capability for CSI-RS for tracking or *addBW-Set2* for the *aperiodicCSI-RS*-*AdditionalBandwidth* capability for aperiodic CSI-RS for fast SCell activation; in these cases, if the UE is configured with CSI-RS comprising X<52 resource blocks, the UE does not expect that the total number of PRBs allocated for DL transmissions but not overlapped with the PRBs carrying CSI-RS for tracking is more than 4, where all CSI-RS resource configurations shall span the same set of resource blocks; otherwise, the bandwidth of the CSI-RS resource, as given by the higher layer parameter *freqBand* configured by *CSI-RS-ResourceMapping*, is the minimum of 52 and $N\_{BWP,i}^{size}$ resource blocks, or is equal to $N\_{BWP,i}^{size}$ resource blocks. For operation with shared spectrum channel access in FR1, *freqBand* configured by *CSI-RS-ResourceMapping*, is the minimum of 48 and $N\_{BWP,i}^{size}$ resource blocks, or is equal to $N\_{BWP,i}^{size}$ resource blocks.

**<Unchanged parts are omitted>**

Companies are encouraged to provide comments.

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## 2.2. UE PUSCH preparation procedure time

In [2, ZTE], it is pointed out that for operation with shared spectrum channel access in FR2-2, cyclic prefix extension specified in Re-16 NR-U is not supported, thus  for calculating UE PUSCH preparation procedure time should be equal to 0. In order to avoid ambiguity, calculated according to TS 38.211 should be restricted to be applicable to Rel-16 NR-U in FR1.

Moderator’s comment:

Note that, a CR to TS 38.214 has been approved in R1-2208008 in RAN1#110 to correct descriptions for UE PDSCH preparation procedure time calculation for the same reason. The proposed draft CR in [2, ZTE] is essentially addressing a similar problem for UE PUSCH preparation procedure time calculation. The following proposal is formulated for discussion.

##### Proposal 1-2

Endorse in principle the corresponding CR to TS38.214 in [2] (TP copied below for convenience).

========================= Start of TP #1-2 for TS 38.214, clause 6.4===================

6.4 UE PUSCH preparation procedure time

If the first uplink symbol in the PUSCH allocation for a transport block, including the DM-RS, as defined by the slot offset *K2* and Koffset, if configured, and the start *S* and length *L* of the PUSCH allocation indicated by '*Time domain resource assignment*' of the scheduling DCI and including the effect of the timing advance, is no earlier than at symbol *L2*, where *L2* is defined as the next uplink symbol with its CP starting  after the end of the reception of the last symbol of the PDCCH carrying the DCI scheduling the PUSCH, then the UE shall transmit the transport block. When the PDCCH reception includes two PDCCH candidates from two respective search space sets, as described in clause 10.1 of [6, TS 38.213], for the purpose of determining the last symbol of the PDCCH carrying the DCI scheduling the PUSCH, the PDCCH candidate that ends later in time is used.

*- N2* is based on *µ* of Table 6.4-1 and Table 6.4-2 for UE processing capability 1 and 2 respectively, where *µ* corresponds to the one of (*µDL*, *µUL*) resulting with the largest *Tproc,2*, where the *µDL* corresponds to the subcarrier spacing of the downlink with which the PDCCH carrying the DCI scheduling the PUSCH was transmitted and *µUL* corresponds to the subcarrier spacing of the uplink channel with which the PUSCH is to be transmitted, and *κ* is defined in clause 4.1 of [4, TS 38.211].

*-* For operation with shared spectrum channel access in FR1, is calculated according to [4, TS 38.211], otherwise =0.

- If the first symbol of the PUSCH allocation consists of DM-RS only, then *d2,1* = 0*,* otherwise *d2,1* = 1.

**<Unchanged parts are omitted>**

Companies are encouraged to provide comments.

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## 2.3. RRC parameter to disable FD-OCC

It is pointed out in [3, LG] that RRC parameter *dmrs-FD-OCC-DisabledForRank1-PDSCH* to disable FD-OCC is described in 38.331, but this has not been exactly implemented in 38.214 specification.

Moderator’s comment:

The following proposal is formulated below for discussion.

##### Proposal 1-3

Endorse in principle the corresponding CR to TS38.214 in [3] (TP copied below for convenience).

========================= Start of TP #1-3 for TS 38.214, clause 5.1.6.2===================

5.1.6.2 DM-RS reception procedure

\*\*\* Unchanged text is omitted \*\*\*

If a UE is configured with higher layer parameter *dmrs-FD-OCC-DisabledForRank1-PDSCH* and the UE is scheduled with PDSCH with single DM-RS port, the UE may assume that set of orthogonal DM-RS antenna ports from the same CDM group using different set of *w*f(*k*') codes are not associated with the transmission of PDSCH to another UE.

\*\*\* Unchanged text is omitted \*\*\*

Companies are encouraged to provide comments.

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# Conclusion

TBD

# Reference

1. R1-2208708 Correction on frequency resource for CSI-RS for tracking in TS 38.214 ZTE, Sanechips
2. R1-2208709 Correction on UE PUSCH preparation procedure time in TS 38.214 ZTE, Sanechips
3. R1-2209440 Draft CR for RRC parameter to disable DMRS FD-OCC in FR2-2 LG Electronics