**3GPP TSG-RAN WG4 Meeting # 109 R4-2321736**

**Chicago, US, November 13 – 17, 2023**

**Agenda item: 8.30.6**

**Source:** Moderator (OPPO)

**Title:** WF for [109][143] NR\_SL\_enh2\_UERF\_part1

**Document for:** Approval

# Introduction

Based on the offline discussion, below issues on MPR, A-MPR for PSSCH/PSCCH and S-SSB, and the Reply LS is provided for all the companies to check.

# MPR/A-MPR for SL-U

### Sub-topic 2-2 MPR requirement

#### Issue 2-2-1: MPR requirement structure

* Agree on below Outer/Inner sub-band configuration
* Table: Outer/Inner sub-band configuration for SL-U wideband operation

|  |  |  |
| --- | --- | --- |
| Wideband operation channel bandwidth (MHz) | Contiguous sub-band configuration | Non-contiguous sub-band configuration |
| Outer  | Inner  | Outer  | Inner  |
| 40 | 11, 10, 01 | N/A | N/A | N/A |
| 60 | 111, 110, 011, 100, 001 | 010 | 101 | N/A |
| 80 | 1111, 1110, 0111, 1100, 0011, 1000, 0001 | 0110, 0100, 0010 | 1101, 1011, 1010, 0101, 1001 | N/A |
| 100 | 11111, 11110, 01111, 11100, 00111, 11000, 00011, 10000, 00001  | 01110, 01100, 00110, 01000, 00010, 00100 | 11011, 11010, 01011, 11001, 10011, 10101, 10110, 01101, 10100, 00101, 10010, 01001, 11101, 10111, 10001 | 01010 |
| NOTE 1: The sub-band configuration is represented as a bitmap where ‘1’ indicates that a sub-band is transmitted and ‘0’ indicates a sub-band is not transmitted. The bitmap is ordered with MSB mapped to the lowest frequency sub-band and LSB mapped to highest frequency sub-band within the wideband channel. |

#### Issue 2-2-2: MPR simulatrion results for PSSCH/PSCCH:

* Agreement:
	+ Agree on below table for MPR for PSSCH/PSCCH

|  |  |  |
| --- | --- | --- |
| Pre-coding | Modulation | Proposed MPR |
|  |  | Outer RB set configuration5 | Inner RB set configuration5 |
|  |  | Full2 (dB) | Partial3 (dB) | Full2 (dB) | Partial3 (dB) |
| CP-OFDM | QPSK | ≤ 3.5 | ≤ 3.5 | ≤ 3.5 | ≤ 2 |
|  | 16 QAM | ≤ 4.0 | ≤ 4.0 | ≤ 4.0 | ≤ 3.0 |
|  | 64 QAM | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 |
|  | 256 QAM | ≤ 7.5 | ≤ 7.5 | ≤ 7.5 | ≤ 7.5 |

#### Issue 2-2-4: MPR simulatrion results for S-SSBs:

* Agreement:
	+ Agree on below table for MPR for S-SSB

|  |  |
| --- | --- |
|  | **RB Allocation** |
| **Outer RB set configuration** | **Inner RB set configuration** |
| Contiguous/Non-contiguous sub-band RB sets | ≤ 12.5 | ≤ 9.5 |
| NOTE 1: Outer sub-band configuration and inner sub-band configuration in issue 2-2-1 apply. |

### Sub-topic 2-3 A-MPR

#### Issue 2-3-1: A-MPR simulatrion results for PSSCH/PSCCH:

##### Issue 2-3-1-1: NS\_31 A-MPR simulatrion results for PSSCH/PSCCH:

* Agreement:
	+ Agree on below table for A-MPR for PSSCH/PSCCH for NS\_31

|  |  |  |  |
| --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation (Note 4) | RB Allocation (Note 3) |
|  |  | Outer RB set configuration5 | Inner RB set configuration5 |
|  |  | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full/Partial |
| CP-OFDM | QPSK | ≤ 5.5 | ≤ 6.5 | ≤ 4.5 | ≤ 6.5 | Follow SL-U MPR table |
|  | 16 QAM | ≤ 5.5 | ≤ 7.0 | ≤ 4.5 | ≤ 7.0 |
|  | 64 QAM | ≤ 5.5 | ≤ 7.0 | ≤ 4.5 | ≤ 7.0 |
|  | 256 QAM | ≤ 7.5 | ≤ 7.5 | ≤ 7.5 | ≤ 7.5 |

##### Issue 2-3-1-2: NS\_53 A-MPR simulatrion results for PSSCH/PSCCH:

* Agreement:
	+ Agree on below table for A-MPR for PSSCH/PSCCH for NS\_53

|  |  |  |
| --- | --- | --- |
|  **Pre-coding** | **Modulation** | **Channel bandwidth (Sub-band allocation) / RB Allocation** |
| **20MHz** | **40MHz** | **60MHz** | **80MHz** | **100MHz** |
| **Full (dB)** | **Partial (dB)** | **Full (dB)** | **Partial (dB)** | **Full (dB)** | **Partial (dB)** | **Full (dB)** | **Partial (dB)** | **Full (dB)** | **Partial (dB)** |
| CP-OFDM | QPSK | ≤ 9.0 | ≤ 12.0 | ≤ 6.5 | ≤ 8.5 | ≤ 4.5 | ≤ 6.5 | ≤ 4.0 | ≤ 5.5 | ≤ 4.0 | ≤ 4.5 |
| 16 QAM | ≤ 9.0 | ≤ 12.0 | ≤ 6.5 | ≤ 8.5 | ≤ 4.5 | ≤ 6.5 | ≤ 4.0 | ≤ 5.5 | ≤ 4.0 | ≤ 4.5 |
| *64 QAM* | ≤ 9.0 | ≤ 12.0 | ≤ 6.5 | ≤ 8.5 | ≤ 5.5 | ≤ 6.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 |
| 256 QAM | ≤ 9.0 | ≤ 12.0 | ≤ 8.0 | ≤ 8.5 | ≤ 8.0 | ≤ 7.0 | ≤ 8.0 | ≤ 7.0 | ≤ 8.0 | ≤ 7.0 |

##### Issue 2-3-1-3: NS\_58 A-MPR simulatrion results for PSSCH/PSCCH:

* Agreement:
	+ Agree on below table for A-MPR for PSSCH/PSCCH for NS\_58

|  |  |  |
| --- | --- | --- |
| Pre-coding | Modulation | RB Allocation (Note 4) |
|  |  | Outer RB set configuration5 | Inner RB set configuration5 |
|  |  | Full (dB)2 | Partial (dB)3 | Full (dB) 2 | Partial (dB) 3 |
| CP-OFDM | QPSK | ≤ 3.5 | ≤ 4.5 | ≤ 3.5 | ≤ 2.5 |
|  | 16 QAM | ≤ 4.0 | ≤ 4.5 | ≤ 4.0 | ≤ 3.0 |
|  | 64 QAM | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 |
|  | 256 QAM | ≤ 8.0 | ≤ 8.0 | ≤ 8.0 | ≤ 8.0 |

##### Issue 2-3-1-4: NS\_60 A-MPR simulatrion results for PSSCH/PSCCH:

* Agreement:
	+ Agree on below table for A-MPR for PSSCH/PSCCH for NS\_60

|  |  |  |
| --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation |
| 20 MHz | 40 MHz | 60 MHz | 80 MHz | 100 MHz |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| CP-OFDM | QPSK | ≤ 6.0 | ≤ 8.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.0 | ≤ 5.5 | ≤ 4.5 | ≤ 5.5 | ≤ 4.5 | ≤ 5.5 |
| 16 QAM | ≤ 6.0 | ≤ 8.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.0 | ≤ 5.5 | ≤ 4.5 | ≤ 5.5 | ≤ 4.5 | ≤ 5.5 |
| 64 QAM | ≤ 6.0 | ≤ 8.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 |
| 256 QAM | ≤ 8.0 | ≤ 8.5 | ≤8.0 | ≤ 7.0 | ≤ 8.0 | ≤ 7.0 | ≤ 8.0 | ≤ 7.0 | ≤ 8.0 | ≤ 7.0 |

##### Issue 2-3-1-5: NS\_61 A-MPR simulatrion results for PSSCH/PSCCH:

* Agreement:
	+ Agree on below table for A-MPR for PSSCH/PSCCH for NS\_61

|  |  |  |
| --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation |
| 20 MHz | 40 MHz | 60 MHz | 80 MHz | 100 MHz |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| CP-OFDM | QPSK | ≤ 7.5 | ≤ 10.0 | ≤ 6.5 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 16 QAM | ≤ 7.5 | ≤ 10.5 | ≤ 6.5 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 64 QAM | ≤ 7.5 | ≤ 10.5 | ≤ 6.5 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 256 QAM | ≤ 8 | ≤ 10.5 | ≤ 8 | ≤ 7.0 | ≤ 8 | ≤ 7.0 | ≤ 8 | ≤ 7.0 | ≤ 8.0 | ≤ 7.0 |

#### Issue 2-3-3: A-MPR simulatrion results for S-SSB:

##### Issue 2-3-3-1: NS\_31 A-MPR simulatrion results for S-SSB:

* Agreement
* Agree on below table for A-MPR for S-SSB for NS\_31
* Table 2-55: NS\_31 S-SSB A-MPR for SL-U UE power class 5

|  |  |
| --- | --- |
|  | RB Allocation  |
| Outer RB set configuration | Inner RB set configuration |
| # of S-SSB repetition/RBset | > 2 | 2 | > 2 | 2 |
| Contiguous/Non-contiguous sub-band RB sets | ≤ 13.5 | ≤ 10.0 | ≤ 10.0 | ≤ 10.0 |
| NOTE 1: The A-MPR shall apply to all SCS in all active 20 MHz sub-bands contiguously or non-contiguously allocated in the channel.NOTE 2: Applicable for 20 MHz channels centered at the nearest NR-ARFCN corresponding to 5180, 5200, 5220, 5280, 5300, 5320, 5500, 5520, 5540, 5560, 5580, 5600, 5620, 5640, 5660, 5680, 5745, 5765, 5785, and 5805 MHz.NOTE 3: Applicable for all valid channels and bandwidths other than those enumerated in NOTE 2. |

##### Issue 2-3-3-2: NS\_53 A-MPR simulatrion results for S-SSB:

* Agreement
* Agree on below table for A-MPR for S-SSB for NS\_53
* Table 2-59: NS\_53 S-SSB A-MPR for SL-U UE power class 5

|  |  |
| --- | --- |
| RB set configuration | Channel bandwidth (Sub-band allocation) / RB Allocation |
| 20MHz | 40MHz | 60MHz | 80MHz | 100MHz |
| # of S-SSB repetition/RBset | > 2 | 2 | > 2 | 2 | > 2 | 2 | > 2 | 2 | > 2 | 2 |
| Contiguous/Non-contiguous | ≤13.5 | ≤17.5 | ≤13.5 | ≤17.5 | ≤13.5 | ≤14.5 | ≤13.5 | ≤14.5 | ≤13.5 | ≤13.5 |
| NOTE 1: The A-MPR shall apply to all SCS in all active 20 MHz sub-bands contiguously or non-contiguously allocated in the channel. |

##### Issue 2-3-3-3: NS\_58 A-MPR simulatrion results for S-SSB:

* Agreement
* Agree on below table for A-MPR for S-SSB for NS\_58
* Table 2-63: NS\_58 S-SSB A-MPR for SL-U UE power class 5

|  |  |
| --- | --- |
|  | RB Allocation  |
| Outer RB set configuration | Inner RB set configuration |
| # of S-SSB repetition/RBset | > 2 | 2 | > 2 | 2 |
| Contiguous/Non-contiguous sub-band RB sets | ≤ 13.5 | ≤ 10.0 | ≤ 9.5 | ≤ 7.5 |
| NOTE 1: The A-MPR shall apply to all SCS in all active 20 MHz sub-bands contiguously or non-contiguously allocated in the channel.NOTE 2: The A-MPR applies instead of MPR for 20 MHz channel centered at the nearest NR-ARFCN corresponding to 5955 MHz, 40 MHz channel at the nearest NR-ARFCN corresponding to 5965 MHz, 60 MHz channel at the nearest NR-ARFCN corresponding to 5975 MHz, and 80 MHz channel at the nearest NR-ARFCN corresponding to 5985 MHz. For all other channels, A-MPR is zero and MPR applies. |

##### Issue 2-3-3-4: NS\_60 A-MPR simulatrion results for S-SSB:

* Proposals
* Agree on below table for A-MPR for S-SSB for NS\_60
* Table 2-67: NS\_60 S-SSB A-MPR for SL-U UE power class 5

|  |  |
| --- | --- |
| RB set configuration | Channel bandwidth (Sub-band allocation) / RB Allocation |
| 20MHz | 40MHz | 60MHz | 80MHz | 100MHz |
| # of S-SSB repetition/RBset | > 2 | 2 | > 2 | 2 | > 2 | 2 | > 2 | 2 | > 2 | 2 |
| Contiguous/Non-contiguous | ≤13.5 | ≤14.5 | ≤13.5 | ≤14.5 | ≤13.5 | ≤13.5 | ≤13.5 | ≤13.5 | ≤13.5 | ≤13.5 |
| NOTE 1: The A-MPR shall apply to all SCS in all active 20 MHz sub-bands contiguously or non-contiguously allocated in the channel. |

##### Issue 2-3-3-5: NS\_61 A-MPR simulatrion results for S-SSB:

* Proposals
* Agree on below table for A-MPR for S-SSB for NS\_61
* Table 2-71: NS\_61 S-SSB A-MPR for SL-U UE power class 5

|  |  |
| --- | --- |
| RB set configuration | Channel bandwidth (Sub-band allocation) / RB Allocation |
| 20MHz | 40MHz | 60MHz | 80MHz | 100MHz |
| # of S-SSB repetition/RBset | > 2 | 2 | > 2 | 2 | > 2 | 2 | > 2 | 2 | > 2 | 2 |
| Contiguous/Non-contiguous | ≤13.5 | ≤15.5 | ≤13.5 | ≤15.5 | ≤13.5 | ≤13.5 | ≤13.5 | ≤13.5 | ≤13.5 | ≤13.5 |
| NOTE 1: The A-MPR shall apply to all SCS in all active 20 MHz sub-bands contiguously or non-contiguously allocated in the channel. |

#  Reply LS on PSFCH power control

Background: RAN1 LS is captured as below:

Regarding PSFCH power control for “*Alt 1-1b: each PSFCH transmission occupies 1 common interlace and K3 dedicated PRB(s)*”, RAN1#114bis made the following working assumption.

|  |
| --- |
| **Working assumption*** In “*Alt 1-1b: each PSFCH transmission occupies 1 common interlace and K3 dedicated PRB(s)*”:
	+ Assume the UE transmits N PSFCH
		- Denote the final Tx power on one common PRB is P\_common
		- Denote the final Tx power on one dedicated PRB is P\_dedicated
		- P\_common <= P\_dedicated
			* (pre-)configure an offset between P\_common and P\_dedicated
	+ Send an LS to RAN4 asking whether there is any difficulty for supporting the following cases
		- P\_common < P\_dedicated
		- P\_common = P\_dedicated
 |

# Actions:

**To RAN4:**

RAN1 respectfully requests RAN4 to take the above information into account, and provide feedback to RAN1 whether there is any difficulty for supporting the following cases

* P\_common < P\_dedicated
* P\_common = P\_dedicated

Proposed WF:

Below Reply LS is proposed:

|  |
| --- |
| The SL-U PSFCH MPR requirements do not limit the power control design for PSFCH transmission. It is up to RAN1. RAN4 applies same SL-U PSFCH MPR requirements for all PSFCH transmissions, i.e, Alt 1-1b, Alt 2-3a, and NR SL legacy RB allocation method. P\_common < P\_dedicated is feasible given that the evaluated MPR value is no higher than that for P\_common= P\_dedicated for all PSFCH transmissions with Alt 1-1b based on RAN4’s current understanding in Rel-18. |

Agreement:

Below Reply LS is agreed:

|  |
| --- |
| The SL-U PSFCH MPR requirements do not limit the power control design for PSFCH transmission. It is up to RAN1. RAN4 applies same SL-U PSFCH MPR requirements for all PSFCH transmissions, i.e, Alt 1-1b, Alt 2-3a, and NR SL legacy RB allocation method. P\_common < P\_dedicated is feasible given that the evaluated MPR value is no higher than that for P\_common= P\_dedicated for all PSFCH transmissions with Alt 1-1b based on RAN4’s current understanding in Rel-18. |

Agreement: Update the simulation assupmtions for PSFCH power control under the section for Huawei’s simulation results in TR.

# General topics

#### Issue 1-1-1: UE feature list

* Proposals

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | **Need of FDD/TDD differentiation** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 45.NR\_SL\_enh2 | 45-1 | SL reception in intra-carrier guard band | Capability of reception in the non-zero intra-cell guardband between contiguous RB sets in SL wideband carrier operation wider than 20MHz when LBT is successful only in a subset of RB sets |  | **Yes** | **Yes** | UE cannot receive in the intra-cell guard band specified in 38.101-1 | **Per band** | **No** | **No** |  |  | Optional with capability signalling |
| 45-2 | Power class for sidelink CA | power class the UE supports when operating according to this band combination used for sidelink. If the field is absent, the UE supports the default power class. If this power class is higher than the power class that the UE supports on the individual bands of this band combination (*ue-PowerClassSidelink-r16* in *BandNR*), the latter determines maximum TX power available in each band. The UE sets the power class parameter only in band combinations that are applicable as specified in TS 38.101-1. |  | **Yes** | **Yes** | UE cannot transmit in proper power class as specified in 38.101-1 | **Per BC** | **No** | **No** |  |  | Optional with capability signalling |

* Moderator WF:
	+ To agree on the UE features

Meta: do we need treat the feature group in RAN4?

Moderator: the second one is according to RAN4 LS to RAN1. The first one is the similar to NR-U. We do the similar thing.

Meta: in the previous sidelink, there are multiple power classes. RAN4 had no discussions.

LGE: This is the last meeting for sending LS to RAN2.

Meta: It can depend on RAN1 feature list.

Agreement:

* Include 45-1 and 45-2 in the RAN4 Rel-18 feature list

#### Issue 1-1-2: IntraCellGuardBandSL-List correction

* Proposals: (CATT)
	+ For a UE supporting wideband operation, the nominal intra-cell guard bands and the corresponding sizes of the RB sets separated by the said guard bands are as specified in Table 5.3.3-2 for each UE channel bandwidth and sub-carrier spacing for the downlink, uplink and sidelink. The nominal intra-cell guard bands in Table 5.3.3-2 are applicable when the respective IE *intraCellGuardBandsUL-List,* *intraCellGuardBandsDL-List* [7] and *intraCellGuardBandsSL-List* for the uplink, downlink and sidelink are not provided, as specified in [10] clause 7.
	+ If the UE is configured with zero width intra-cell guard bands for the uplink, downlink and sidelink by the IE *intraCellGuardBandsUL-List,* *intraCellGuardBandsDL-List* [7] and *intraCellGuardBandsSL-List* on a carrier greater than 20 MHz, the maximum transmission bandwidth configuration for the uplink, downlink and sidelink shall be in accordance with clause 5.3.2 with a minimum inter-cell guard band of the UE channel bandwidth as specified in Table 5.3.3-1.
* Moderator WF:
	+ Further discuss

OPPO: for second paragraph, we had commen on zero width.