**3GPP TSG-RAN WG4 Meeting # 107 R4-23XXXXX**

**Incheon, KR, May 22nd – May 26th , 2023**

**Agenda item:** 8.31.4

**Source:** Moderator (Huawei, HiSilicon)

**Title:** Topic summary for [107][149] NR\_SL\_enh2 part 3

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion (e.g. list of treated agenda items) and provide some guidelines for email discussion if necessary.*

# Topic #1: Genaral for SL CA

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2307120 | Meta Ireland | Proposal #1: The 1LO/1 antenna RF architecture is baseline for NR SL intra-band contiguous CA operation in band n47. The SL CA UE does not support simultaneous SL-U and NR SL CA operation in band n47.  Proposal #2: For RF requirements for SL-MIMO and Tx diversity of NR SL intra-band contiguous CA UE, RAN4 can consider 2Tx antenna architecture in Rel-18.  Proposal #3: For the additional features e.g. SL-MIMO and/or Power class 2 of NR SL intra-band CA UE, these additional feature can be supported as 2nd priority for NR SL CA objectives. |
| R4-2308113 | Nokia, Nokia Shanghai Bell | Observation: From an emission point of view non-contiguous UL intra-band CA is equivalent to contiguous UL intra-band CA with non-contiguous resource allocations.   1. RAN4 needs to clarify whether the configurations which make contiguous UL intra-band CA equivalent to non-contiguous intra band CA are excluded. |
| R4-2308273 | vivo | Proposal 1: Arrange the requirements for NR SL CA as following sections：   * E.1 V2X operating bands * E.2 V2X operating bands for con-current operation * E.3 Sidelink CA |
| R4-2308607 | Huawei, Hisilicon | Proposal 1: The requirements for SL CA should be captured in new sub-chapter under suffix E.  Proposal 2: Capture the restriction on the same SCS among SL CA carriers in RAN4 specification. |

## Open issues summary

*Before Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1: The supported scenario for SL CA

*Sub-topic description:*

*Open issues and candidate options before meeting:*

* Proposals 1: Meta
  + Simultaneous SL-U and NR SL CA operation is not supported in Rel-18.
* Proposals 2: Meta
  + SL-MIMO and Tx diversity of NR SL intra-band contiguous CA can be considered as 2nd priority
  + Consider 2Tx antenna architecture in Rel-18
* Proposals 3: Nokia
  + RAN4 to clarify whether the scenario of intra-band contiguous CA with non-contiguous resource allocation is precluded.
* Recommended WF
  + TBA

### Sub-topic 1-2: The spec structure for SL CA

*Sub-topic description*

*Open issues and candidate options before meeting:*

* Proposals 1:
  + Option 1: vivo, Huawei
    - Allocate a new section for SL CA
  + Option 2: Others
* Recommended WF
  + TBA

# Topic #2: Requirements for SL intra-band contiguous CA

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4- 2307118 | Meta Ireland | TP for TR 38.786 on the updated TR structure for NR SL CA operation |
| R4-2307120 | Meta Ireland | Proposal #4: Based on the Table 2-1, RAN4 can define the Tx RF requirements for NR SL intra-band contiguous CA operation in n47. |
| R4-2307481 | LG Electronics | Proposal 1: Consider PC2 NR SL intra-band contiguous CA in Rel-18 along with PC3.  Proposal 2: Start SL CA MPR simulation on PSCCH and PSSCH by considering intra-band contiguous CA as starting point.  Proposal 3: Maximize reusing the existing requirements of NR intra-band contiguous CA. |
| R4-2308113 | Nokia, Nokia Shanghai Bell | 1. RAN4 should reuse the existing requirements of NR intra-band contiguous CA as baseline when specifying RF requirements for NR sidelink intra-band CA. |
| R4-2308273 | vivo | Proposal 2: Instead of saying reusing the requirements for LTE or NR intra-band contiguous CA, we need to study the Tx requirements case by case.  Proposal 3: It is suggested to study PC2 for SL\_n47B for SL CA in Rel-18.  Proposal 4: For SL\_n47B, the reference sensitivity defined for single carrier operation in n47 as shown in Table 7.3E.2-1 shall apply for each component carrier with two CCs are activated at the same time. |
| R4-2308607 | Huawei, Hisilicon | Proposal 3: The configurations and band combination sets defined for sidelink as shown in Table 1 can be considered.    Proposal 4: The specific channel bandwidths for SL\_n47B should be considered according to operators’ demand.  Proposal 5: The restrictions on the channel spacing is required for SL CA, to maintain the orthogonality for the intra-band two carriers with LTE-V.  Proposal 6: The switching between SL CA and LTE-V should be considered in Rel-18.  Proposal 7: The optimization for symbol-level switching time similar to that of Tx switching for SL CA and uplink transmission can be considered.  Proposal 8: Rel-18 support only PC3 for intra-band contiguous sidelink CA.  Proposal 9: Non-contiguous RB allocation of PSFCH for intra-band contiguous SL CA and the restriction on the number of PSFCH can be considered. |
| R4-2308984 | OPPO | Observation 1: For LTE V2X, even PC2 has already been defined for band 47, the intra-band CA of band 47 only define PC3 requirement.  Proposal 1: To agree on the configurations for sidelink CA as:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **NR V2X intra-band con-current operating configuration** | **NR Band** | **Interface** | **Channel bandwidth (MHz) (NOTE 1)** | **Maximum aggregated bandwidth (MHz)** | **Bandwidth combination set** | | **SL\_n47B** | **n47** | **PC5** | **10, 20, 30, 40** | **70** | **0** | |  | **n47** | **10, 20, 30** |  |  | | **NOTE 1: The SCS of each channel bandwidth for NR band refers to Table 5.3.5-1 in TS38.101-1.** | | | | | |   Proposal 2: Focus on PC3 intra-band contiguous SL CA in Rel-18.  Proposal 3: Further discuss the NR SL CA requirement based on existing NR intra-band contiguous CA requirement while the principle can follow LTE SL CA.  Proposal 4: For REFSENS requirement, NR SL CA can follow the LTE SL CA that the requirement apply for each CC with all CC active and specific RB configurations to be defined. |
| Qualcomm Incorporated | R4-2309023 | Proposal: Re-use the NR approach as the basis for SL CA as much as possible, for both the TX and the RX requirements. This will result in more consistency between the SL-CA and other CA requirements than taking LTE as the basis. |

## Open issues summary

*Before Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1: System parameter

*Sub-topic description:*

*Open issues and candidate options before meeting:*

#### **Issue 2-1-1: The SCS for SL CA.**

* Proposal 1: Huawei
  + Capture the restriction on the same SCS among SL CA carriers in section TS 38.101-1 section 4.2
  + f) All the requirements for intra-band contiguous CA apply under the assumption of the same subcarrier spacing in the PCell and SCells for SL SA.
* Recommended WF
  + TBA

#### **Issue 2-1-2: Channel BW and Channel raster for SL CA**

* Proposals 1: Huawei
  + Consider the restrictions on the channel spacing for SL CA, to maintain the orthogonality for the intra-band two carriers with LTE-V
* Proposals 2: Intra-band CA configurations and bandwidth combination sets defined for sidelink
  + Option 1: Huawei
    - The specific channel bandwidths for SL\_n47B should be considered according to operators’ demand

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sidelink CA configuration / Bandwidth combination set | | | | | | | | |
| Sidelink CA configuration | Sidelink CA configuration for TX | Component carriers in order of increasing carrier frequency | | | | | Maximum aggregated  bandwidth [MHz] | Bandwidth combination set |
| Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | **Channel bandwidths for carrier [MHz]** | **Channel bandwidths for carrier [MHz]** |
| SL\_n47B | SL\_n47B | [10] | [20,30] |  |  |  | 70 | 0 |
| [20] | [20,30] |  |  |  |
| 30 | [30,]40 |  |  |  |

* + Option 2: OPPO

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NR V2X intra-band con-current operating configuration** | **NR Band** | **Interface** | **Channel bandwidth (MHz) (NOTE 1)** | **Maximum aggregated bandwidth (MHz)** | **Bandwidth combination set** |
| SL\_n47B | n47 | PC5 | 10, 20, 30, 40 | 70 | 0 |
|  | n47 | 10, 20, 30 |  |  |
| NOTE 1: The SCS of each channel bandwidth for NR band refers to Table 5.3.5-1 in TS38.101-1. | | | | | |

* Recommended WF
  + TBA

### Sub-topic 2-2: Tx requirements for SL CA

#### **Issue 2-2-1: Methodology on Tx requirements for SL intra-band contiguous CA**

* Proposals
  + Option 1: Meta, LGE(Start MPR simulation for PSSCH and PSCCH with the agreed assumption), Nokia, OPPO, QCOM
    - The requirements for NR intra-band contiguous CA as baseline.
  + Option 2:
    - The requirements for LTE intra-band contiguous CA as baseline.
  + Option 3: vivo
    - Study the Tx requirements case by case
* Recommended WF
  + TBA

#### **Issue 2-2-2: Overview of Tx RF requirements for NR SL intra-band contiguous CA**

* Proposals
  + Option 1: Meta

|  |  |
| --- | --- |
| Tx requirements for SL CA in n47 | Comments for Requirements |
| 6.2E.1A MOP | Define CA MOP as total transmitted power (Per UE) for both PC3/PC2 SL CA UE  PC2 SL CA is 2nd priority |
| 6.2E.2A MPR | Need to MPR simulation campaign |
| 6.2E.3A A-MPR | Need to A-MPR simulation campaign for Europe. FFS in US until FCC final release the additional emission limits |
| 6.2E.4A Configured Tx power | NR V2X intra-band con-current operation can be referred to define the configured Tx power |
| 6.3E.1A minimum output power | The min power of NR SL in single carrier will be applied to each SL CC |
| 6.3E.2A Transmit OFF power | The transmit off power of NR SL in single carrier will be applied to each SL CC |
| 6.3E.3A Transmit On/OFF time mask | The transit on/off time mask of NR SL in single carrier will be applied to the aggregated CBW. |
| 6.3E.4A. Power control | Absolute power tolerance of NR SL in single carrier will be applied to each SL CC. |
| 6.4E.1A Frequency error | ±0.1 PPM observed over a period of 1 ms will be applied for the primary CC for all SL synchronous reference sources. |
| 6.4E.2A Transmit modulation quality | For EVM of NR SL in single carrier will be applied to each SL CC.  For In-band emission for NR intra-band contiguous CA will be applied to the aggregated transmission bandwidth.  For carrier leakage, only one uplink carrier is activated, the applicable LO leakage in clause 6.4.2 will be applied per the activated carrier. |
| 6.5E.1A Occupied bandwidth | The occupied bandwidth is a measure of the bandwidth containing 99 % of the total integrated power of the aggregated CBW. The occupied bandwidth shall be less than the aggregated channel bandwidth. |
| 6.5E.2A.2 out-of-band emission: General SEM | The general NR CA spectrum emission mask for CA Bandwidth Class B specified in subclause 6.6.2.1A shall applied to SL aggregated CBW. |
| 6.5E.2A.3 out-of-band emission: A-SEM | Do not need consider the A-SEM in Europe since the A-SEM in Table 6.5E.2.3.1-1 is only applied for the 10MHz CBW in Europe.  For US, RAN4 can reuse NS\_52, the detail can be further discussed with the final A-SEM or A-SE requirements from FCC. |
| 6.5E.2A.4 ACLR | The general NR CA ACLR requirements for CA Bandwidth Class B specified in subclause 6.5A.2.4.1.1-1 shall applied to SL aggregated CBW. |
| 6.5E.3A.1 General SE | The general NR CA general SE for CA Bandwidth specified in subclause 6.5A.3.1-1 shall applied to SL aggregated CBW. |
| 6.5E.3A.2 UE coexistence | The n47 protected operating bands will be used in Table 6.5.3.2-1 for UE coexistence for SL CA. |
| 6.5E.3A.3 A-SE | The A-SE in Table 6.5E.3.4.2-1 and CEN DSRC protection requirements in Table 6.5E.3.4.2-2 will be reconsidered for NR CA UE. |
| 6.5E.4A Transmit intermodulation | The general NR CA TIM requirements for CA Bandwidth Class B specified in subclause 6.5A.4.2.1-1 shall be applied to SL aggregated CBW. |

* + Option 2: Others
* Recommended WF
  + TBA

#### **Issue 2-2-3: UE maximum output power for SL CA**

* Proposals
  + Option 1: Huawei, OPPO
    - Only support PC3 in Rel-18
  + Option 2: LGE, vivo
    - support PC2 in Rel-18
  + Option 3: Meta
    - support PC2 as 2nd priority in Rel-18
* Recommended WF
  + TBA

#### **Issue 2-2-4: Transmit ON/OFF time mask for SL con-current operation with CA**

* Proposals 1: Huawei
  + Consider the switching between SL CA and LTE-V in Rel-18
* Proposals 2: Huawei
  + The optimization for symbol-level switching time similar to that of Tx switching for SL CA and uplink transmission can be considered.
* Recommended WF
  + TBA

#### **Issue 2-2-5: PSFCH for SL CA**

* Proposals 1: Huawei
  + Non-contiguous RB allocation of PSFCH for intra-band contiguous SL CA and the restriction on the number of PSFCH can be considered
* Recommended WF
  + TBA

### Sub-topic 2-3: Rx requirements for SL CA

*Sub-topic description*

*Open issues and candidate options before meeting:*

#### **Issue 2-3: Rx RF requirements for NR SL intra-band contiguous CA**

* Proposals
  + Option 1: vivo, OPPO (for specific RB configurations)
    - For SL\_n47B, the reference sensitivity defined for single carrier operation in n47 as shown in Table 7.3E.2-1 shall apply for each component carrier with two CCs are activated at the same time
* Recommended WF
  + TBA

### Sub-topic 2-4: TP for TR 38.786

*Sub-topic description*

*Open issues and candidate options before meeting:*

#### **Issue 2-4: TP in R4-2307118 (Meta)**

* Recommended WF
  + TBA