**3GPP TSG-RAN WG4 Meeting # 98-bis-e R4-210XXXX**

**Electronic Meeting, 12th – 20th April, 2021**

**Agenda item:** 8.10.1, 8.10.2, 8.10.3, 8.10.4, 8.10.7

**Source:** Moderator (LG Electronics)

**Title:** Email discussion summary for [98-bis-e][134] NRSL\_enh\_Part\_1

**Document for:** Information

# Introduction

In this paper, RAN4 treat the SL enhancement in Rel-17 for operating bands, system parameters and UE transmitter/Receiver requirements for SL enhancement including 5G V2X enhancement and Public safety using PC5 operation.

The provided technical docs list of email discussion are shown in Reference in the end of the paper.

Candidate target of email discussion for 1st round are listed as following

* 1st round: RAN4 discuss operating scenarios, operating bands and the related system parameters and SL UE Tx/Rx requirements for SL enhancement.
* Topic #1: UE RF requirements for SL enhancement
	+ Topic #1-1: General principle
	+ Sub-Topic #1-1-1: Operating scenarios
	+ Sub-Topic #1-1-2: How to define SL enh. Operating band
	+ Sub-Topic #1-1-3: Terminology on partially used licensed band
	+ Sub-Topic #1-1-4: How to apply Release independent principle
	+ Topic #1-2: System parameters
	+ Sub-Topic #1-2-1: Channel raster & sync. raster
	+ Sub-Topic #1-2-2: Max. CBW for SL operating band
	+ Sub-Topic #1-2-3: CBW for n14 SL operation
	+ Sub-Topic #1-2-4: CBW for n79 SL operation
	+ Topic #1-3: UE RF requirements
	+ Sub-Topic #1-3-1: Rx RF requirements
	+ Topic #1-4: Others **🡪 It will be treated in 5G V2X maintenance session in next RAN4 meeting**
	+ Sub-Topic #1-4-1: A-MPR for NS\_33 and NS\_52 for 5G V2X UE
	+ Sub-Topic #1-4-2 : switching period
* 2nd round: TBA

# Topic #1: UE RF requirements for SL enhancement

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2104528 | vivo | General discussions on operating bands for SL transmission **Observation 1: The newly introduced band n14 can be classified into general V2X operating band.****Proposal 1: Align the technical term ’intra-band con-current bands’ instead of ‘licensed bands partially used for SL.****Observation 2: The V2X operating bands n38 and n79 are introduced as intra-band con-current bands in Rel-17.****Proposal 2: It is suggested to introduce the operating bands defined in Rel-16 in the new created TR for SL enhancement,** **along with newly introduced bands in Rel-17.**Table 1 V2X operating bands in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| V2X Operating Band | Sidelink (SL) Transmission operating band | Sidelink (SL) Reception operating band | Duplex Mode | Interface |
|  | FUL\_low – FUL\_high | FDL\_low – FDL\_high |  |  |
| n381 | 2570 MHz | - | 2620 MHz | 2570 MHz | - | 2620 MHz | HD | PC5 |
| n47 | 5855 MHz | - | 5925 MHz | 5855 MHz | - | 5925 MHz | HD | PC5 |
| n142 | 788 MHz | - | 798 MHz | 758 MHz | - | 768 MHz | HD | PC5 |
| Note 1: When this band is used for V2X SL service, the band is exclusively used for NR V2X in particular regions.Note 2: This band is only used for SL transmission for public safety services when UE is out of coverage of LTE/NR. |

Table 2 Intra-band con-current operating bands

|  |  |  |
| --- | --- | --- |
| V2X con-current operating Band | NR or V2X Operating Band | Interface |
| V2X\_n38A | n38 | Uu |
|  | n38 | PC5 |
| V2X\_n79 | n79 | Uu |
|  | n79 | PC5 |

**Proposal 3: It is suggested to note the intra-band con-current bands as ‘V2X\_nX’.****Proposal 4: The newly introduced bands in Rel-17 SL enhancements should be supported in a release independent manner from Rel-16.****Proposal 5: Add the impacted spec TS 38.807 in the WID for SL enhancements.** |
| R4-2104529 | vivo | Discussion on system parameters for newly introduced SL bands**Observation 1:** **The newly introduced operating bands for SL in Rel-17 can naturally support the general channel raster and sync raster design defined in Rel-16.****Observation 2: Since there is no co-existence scenario,** **n14 used for public safety though SL interface is totally independent with the LTE/NR band (n)14.****Proposal 1: It is suggested to support both 5M and 10M channel bandwidths in n14 for SL transmission.****Proposal 2: Channel raster of 15kHz is preferred for n14 and the frequency raster shift can be configured.*** **Table 2: Applicable NR-ARFCN for band n14 for SL transmission**

|  |  |  |  |
| --- | --- | --- | --- |
| **NR Operating Band** | **ΔFRaster** **(kHz)** | **Uplink****Range of NREF****(First – <Step size> – Last)** | **Downlink****Range of NREF****(First – <Step size> – Last)** |
| n14 | 15kHz | 157600 – <3> – 159598 | 151600 – <3> – 153598 |

 |
| R4-2104533 | vivo | It is TP to capture the contents in R4-2104528 and R4-2104529 to add operating bands and intra-band con-current operating bands.Also proposed to reuse channel raster and syn. Raster in Rel-16 for SL enhancement UE. |
| R4-2107305 | Huawei | On CBW for licensed band supporting NR V2XFor the Uu and SL sharing scenario, the max CBW for Uu service would be less than that defined in the spec***Observation: Max 40MHz CBW for NR licensed band can meet the capacity requirement for NR SL service.******Proposal: It is proposed that the max CBW for SL service for NR V2X in licensed band is limited to 40MHz.*** |
| R4-2104775 | CATT | **TP on CBW and system parameters for newly introduced SL bands*** **Band n14**

**CBW for SL operation****Proposal 1: To specify 5MHz and 10MHz CBW in band n14 for SL operation based on operator’s request.****Channel raster for SL operation****Proposal 2: To reuse NR Uu channel raster (100kHz) for NR V2X in band n14.**Observation 1: Based on operator’s clarification, only NR SL operation is allowed in band n14 so that no frequency shift will be applied.* **Band n79**

**CBW for SL operation**Observation 2: Based on the principle, the CBWs in band n79 for SL operation shall be chosen from the set of 40/50/60/80/100MHz. The detailed CBWs in band n79 should be based on operator’s request if any.**Channel raster for SL operation****Proposal 3: Considering the relatively large frequency range of band n79, it is proposed to define 15kHz and 30kHz channel raster (same as NR Uu) to enable more flexibility.**Observation 3: No frequency shift will be applied in band n79 providing that NR V2X channel raster reuses that of NR Uu. |
| R4-2104776 | CATT | **TP on UE Rx RF requirement for NR SL enhancement****Proposal 1: To specify the REFSENS of band n14 in Table 1 and Table 2 by adopting the principle specified in TR 38.886.****Proposal 2: To specify the maximum input level of band n14 in Table 3 by reusing that of NR Uu.****Proposal 3: To specify the ACS requirements of band n14 in Table 4 by reusing that of NR Uu.****Proposal 4: To specify the blocking requirements of band n14 in Table 7 and Table 9 by reusing that of NR Uu.****Proposal 5: To specify the spurious response requirement of band n14 in Table 11 by reusing that of NR Uu.****Proposal 6: To specify the intermodulation requirement of band n14 in Table 13 by reusing that of NR Uu.** |
| R4-2104971 | LG Electronics | **TP on operating scenarios for NR SL enhancements in Rel-17****Provide TP on operating scenarios according to operating band perspective, gNB deployment perspective and con-current operation perspective.****The con-current operation for public safety and other commercial use cases could be deprioritized in Rel-17.** |
| R4-2106676It will be resubmitted and treated in Rel-16 V2X Maintenance session in RAN4 May meeting due to Chairman guidance | Huawei | **Discussion on Rel-16 NR V2X AMPR value for both NS\_33 and NS\_52****Proposal 1: It’s proposed to correct the AMPR requirements as 16dB for NS\_52 region 1 as below.****Observation 1: The specified emissions limits in FCC regulation are not what RAN4 specified in clause 6.5E.2.3.2 from TS 38.101-1.****Observation 2: Currently, there is no 40MHz ITS spectrum allocation based on FCC regulatory.****Proposal 2: Companies are encouraged to further check the FCC regulation. It’s up to RAN4 how to address this mismatching issue.****Proposal 3: It’s proposed to further update the AMPR requirements for NS\_33 PSSCH/PSCCH (at Fc =5860MHz).** |
| R4-2106297 & Two CRs (R4-2106291, 6292)It will be resubmitted and treated in Rel-16 V2X Maintenance session in RAN4 May meeting due to Chairman guidance | Xiaomi | **On switching period****Observation 1: RAN1 has clearly defined the NR SL and LTE SL priority.****Observation 2: The value of priority filed for NR SL and LTE SL are directly comparable.****Observation 3: Scheduling restriction has defined an “empty” slot/sub-frame due to the SL switching between NR and LTE, but the location of the “empty” slot/sub-frame is not decided.****Observation 4: The SL switching between NR and LTE should occur in the “empty” slot/sub-frame.****Proposal 1: To locate the switching period in the lower priority sub-frame or slot.****Proposal 2: In case priority information is missing or the priority is the same for both LTE and NR SL, leave up to UE implementation to decide the switching period location.****Proposal 3: To capture the above statement in TS 38.101-3.** |

## Open issues summary

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

*Based on provided contributions, RAN4 mainly treat the following UE general parameters (operating bands, system parameters) and RF requirements for SL enhancement WI to support public safety and other SL operation.*

* + Topic #1-1: General principle
	+ Sub-Topic #1-1-1: Operating scenarios
	+ Sub-Topic #1-1-2: How to define SL enh. Operating band
	+ Sub-Topic #1-1-3: Terminology of partially used licensed band
	+ Sub-Topic #1-1-4: How to apply Release independent manner for partial
	+ Topic #1-2: System parameters
	+ Sub-Topic #1-2-1: Channel raster & sync. raster
	+ Sub-Topic #1-2-2: Max. CBW for SL operating band
	+ Sub-Topic #1-2-3: CBW for n14 SL operation
	+ Sub-Topic #1-2-4: CBW for n79 SL operation
	+ Topic #1-3: UE RF requirements
	+ Sub-Topic #1-3-1: Rx RF requirements
	+ Topic #1-3: Others
	+ Sub-Topic #1-3-1: A-MPR for NS\_33 and NS\_52 for 5G V2X UE
	+ Sub-Topic #1-3-2 : switching period

### Sub-topic 1-1

*Sub-topic description:* **General principle for** **SL enh. Operation**

*Open issues and candidate options before e-meeting:*

**Issue 1-1-1: TP on operating scenarios for SL enhancement**

* Proposals
	+ Option 1: Based on provided TP (R4-2104971) on Operating scenarios for SL enh., RAN4 need to capture the operating scenarios for SL enhancement.
	+ Option 2: Other option is not precluded
* Recommended WF
	+ TBA

**Issue 1-1-2: How to define new operating bands for SL enhancement in Rel-17**

* Proposals
	+ Option 1: Make new suffix to define new operating bands for SL enhancement service including Public safety service and other commercial SL operation.
	+ Option 2: Reuse suffix E to add new operating bands for SL enhancement. Also add general descriptions to cover all SL operation in suffix E in clause 4.3 in TS38.101-1.
* Recommended WF
	+ TBA

**Issue 1-1-3: Terminology of partially used licensed band between SL and Uu operation**

* Proposals
	+ Option 1: Use the **‘intra-band con-current V2X operating bands’ instead of ‘licensed bands partially used for SL.**
	+ Option 2: Other option is not precluded
* Recommended WF
	+ Agreeable to use **intra-band con-current V2X operating bands’**

**Issue 1-1-4: How to apply Release independent manner for public safety service, intra-band con-current operation and PC2 SL UE**

* Proposals
	+ Option 1: All of objectives for SL enh. operation in Rel-17, will be supported from Rel-16 as release independent principle.
	+ Option 2: All of objectives for SL enh. operation in Rel-17, will be supported from Rel-17 as release independent principle.
	+ Option 3: Other option is not precluded
* Recommended WF
	+ TBA

### Sub-topic 1-2

*Sub-topic description:* **System parameters for SL enh. operation**

*Open issues and candidate options before e-meeting:*

**Issue 1-2-1: Channel raster & sync. raster**

* Proposals
	+ Option 1: Reuse the general channel raster and sync raster for NR Uu in Rel-16 for SL enhancement operation in licensed band.
	+ Option 2: Follow NR SL channel raster (15kHz channel raster in n47) in SL enh. NR operating band.
* Recommended WF
	+ TBA

**Issue 1-2-2: Max. CBW for SL operating band**

* Proposals
	+ Option 1: It is proposed that the max CBW for SL service for NR V2X in licensed band is limited to 40MHz
	+ Option 2: Other option is not precluded
* Recommended WF
	+ TBA

**Issue 1-2-3: CBW for n14 SL operating band**

* Proposals
	+ Option 1: It is suggested to support both 5MHz and 10MHz channel bandwidths in n14 for SL transmission.
	+ Option 2: Only support 10MHz Channel bandwidth
* Recommended WF
	+ TBA

**Issue 1-2-4: CBW for n79 SL operating band**

* Proposals
	+ Option 1: The CBWs in band n79 for SL operation shall be chosen from the set of 40/50/60/80/100MHz. The detailed CBWs in band n79 should be based on operator’s request if any.
	+ Option 2: This band is requested to support NR V2X intra-band con-current operation. So it will be treated in [135]NRSL\_enh\_part2 enh.
	+ Option3: Other option is not precluded
* Recommended WF
	+ TBA

### Sub-topic 1-3

*Sub-topic description:* **UE RF requirements**

**The following issues will be treated for SL enhancement operation in Rel-17.**

**Issue 1-3-1: UE Rx requirements for SL enhancement**

* Proposals
	+ Option 1: Basic principle for Rx requirements is to follow receiver requirements for NR Uu based on TP (R4-2104776, CATT)
	+ Option 2: Detail Rx requirements will be further discussed with Tx requirements in May Meeting
	+ Other option is not precluded.
* Recommended WF
	+ TBA

### Sub-topic 1-4

*Sub-topic description:* **Others**

**The following open issues will be treated in 5G V2X Maintenance session in next RAN4 meeting based on Chairman Guidance.**

**Issue 1-4-1: A-MPR for NS\_33 and NS\_52 for 5G V2X UE**

**Issue 1-4-2: Switching period**

## Companies views’ collection for 1st round

### Open issues

*One of the two formats, i.e. either example 1 or 2 can be used by moderators.*

Sub topic 1-1: **General principle for** **SL enh. Operation**

**Issue 1-1-1: TP on operating scenarios for SL enhancement**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| vivo | Vivo: We are confusing about Aspect 2 gNB deployment including network control possibility. If gNB is involved, does this mean that Uu and SL are in a con-current manner? In this way, Aspect 2 and 3 are overlapping. And what are other commercial use cases? |
| YYY |  |

**Issue 1-1-2: How to define new operating bands for SL enhancement in Rel-17**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| vivo | We prefer Option 2. If con-current band combinations are introduced in Rel-17, we may also need to add general descriptions to cover all SL operation in suffix E in TS38.101-3. |
| YYY |  |

**Issue 1-1-3: Terminology of partially used licensed band between SL and Uu operation**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| vivo | We support Option 1. We think the terminology as ‘intra-band con-current operation’ would be more technically accurate. It is also beneficial to use the unified terminology in our later discussion to avoid confusion. When we confirm the release independent issue, we may need to add the impacted spec TS 38.807 in the WID for SL enhancements. |
| YYY |  |

**Issue 1-1-4: How to apply Release independent manner according to single carrier operation, inter-band con-current operation and intra-band con-current operation**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| vivo | We support Option 1. We’d better clarify ‘all of the objectives’. In our understanding, the operating bands, their supported channel bandwidth, system parameters, and their core requirements introduced in Rel-17 should all be independent from Rel-16. |
| YYY |  |

Sub topic 1-2: **System parameters for SL enh. operation**

**Issue 1-2-1: Channel raster & sync. raster**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | We support Option 1 as the baseline. We think Option 2 can be considered for the specific bands case by case. |
| YYY |  |

**Issue 1-2-2: Max. CBW for SL operating band**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Currently, we support Option 1. If there is any new scenario requiring channel bandwidth larger than 40MHz, we can consider other options. |
| YYY |  |

**Issue 1-2-3: CBW for n14 SL operating band**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| vivo | Option 1. To ensure the flexibility of supported channel bandwidths and avoid unnecessary troubles, we suggest to introduce all the possible channel bandwidths in the first place. |
| YYY |  |

**Issue 1-2-4: CBW for n79 SL operating band**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| vivo | The wording of option 1 is OK, we also need to consider the conclusion on Issue 1-2-2 Max. CBW for SL operating band. |
| YYY |  |

Sub topic 1-3: **UE RF requirements**

**Issue 1-3-1: UE Rx requirements for SL enhancement**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| vivo | We need more study on the basic principles for Rx requirements in R4-2104776. For now, Option 2 is OK. |
| YYY |  |

### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2104533TP on operating bands & system parameters for SL transmission | Company A |
| Company B |
| Company C |
| R4-2104775TP on CBW and system parameters for newly introduced SL bands | Vivo: If n14 is used for SL, the duplex mode ‘FDD’ would be impropriate. The supported channel bandwidths for n14 and n79 need more discussion. |
| Company B |
| Company C |
| R4-2104776TP on UE Rx RF requirement for NR SL enhancement | Vivo: This TP can wait until we figure out the basic principles for Rx requirements. |
| Company B |
| Company C |
| R4-2104971TP on operating scenarios | Vivo: We are confusing about Aspect 2 gNB deployment including network control possibility. If gNB is involved, does this mean Uu and SL are in a con-current manner? In this way, Aspect 2 and 3 are overlapping. And what are other commercial use cases? |
| Company B |
| Company C |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic #1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-2104528 | General discussions on operating bands for SL transmission | vivo |  |  |
| R4-2104529 | Discussion on system parameters for newly introduced SL bands | vivo |  |  |
| R4-2104533 | TP for SL enhancements | vivo |  |  |
| R4-2104775 | TP on CBW and system parameters for newly introduced SL bands | CATT |  |  |
| R4-2104776 | TP on UE Rx RF requirement for NR SL enhancement | CATT |  |  |
| R4-2104971 | TP on operating scenarios for NR SL enhancements in Rel-17 | LG Electronics France |  |  |
| R4-2107305 | On CBW for licensed band supporting NR V2X | Huawei |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-2104969 | TR38.xxx v0.1.0 TR Update for SL enhancement in Rel-17  | LG Electronics France |  | To capture the approved TPs in this meeting |
| R4-210xxxx | WF on … | YYY |  |  |
| R4-210xxxx | LS on … | ZZZ |  |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents