**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: RAN4 continue discuss the following issues in 2nd round
  + Topic #1-1: General principle
  + Sub-Topic #1-1-1: Operating scenarios
  + Sub-Topic #1-1-4: How to apply Release independent principle
  + Topic #1-2: System parameters
  + Sub-Topic #1-2-2: Max. CBW for SL operating band

# 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

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| **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 V2X  For 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.** |
| R4-2106676  It 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**

**Moderator understanding: All SL enh. RF requirements are optional feature.**

* Proposals
  + Option 1: All of objectives (SL enh, & left over issues) for SL enh. operation in Rel-17, will be supported from Rel-16 as release independent principle.
  + Option 2: SL enh. operation in Rel-17 will be supported from Rel-17, and other left over issues will be supported from Rel-16 as release independent principle.
  + Option 3: All of objectives (SL enh, & left over issues) for SL enh. operation in Rel-17, will be supported from Rel-17 as release independent principle.
  + Option 4: 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**

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| **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?  LGE to vivo: we can remove con-current operation for SL enhancement. |
| Xiaomi | Thanks LG for providing the TP of operation scenario definition. We have concern on the 3 aspects. We prefer the way as listing the 3 different use scenarios as public use, V2X, other commercial use cases and detail study cases under each scenario. |
| LGE | Prefer option 1. If other companies propose to change some wording and sentence, we can allow to revise TP based on consensus. |
| CATT | Generally agree the TP. |
| Huawei | Aspects listed in the TP are not very clear.  For Public Safety, in Rel-17 we only have request for band n14 under out of coverage scenario so far, why gNB deployment and con-current operation for PS only need to be considered.  For other commercial use cases, no specific scenarios are identified for the time being.  LGE : to HW, based on WID & WF, the SL enh. operating band can request regardless of out-of-coverage and in-coverage NW. So, we follow same principle in RAN1. The n14 is just one example under out-of coverage NW. Hence, we prefer to keep gNB deployement scenarios but can remove con-current operation for PS.  In WID, other commercial use case also mentioned, we agree with HW comment for that. But need to follow agreed WID for the possible operating scenarios. RAN4 do not block the any SL operation. But the RF requirements will be supported the SL enhancement operation based on the proponent’ deployment scenarios. |
| Qualcomm | Option 1 |
| AT&T | Option 2. We can agree with the TP in option 1 as a starting point but updates may be required based on recent events and AT&T plans to bring a contribution to the May meeting. NR sidelink operation in Band n14 PS scenario may need to be updated to coexist with Uu operation to reflect migration efforts to allow sidelink operation during network availability and to account for the PS use cases related to the approved NR sidelink relay WI.  LGE: Yes, you can revise based on your deployment scenarios but the frame shall follow agreed WID. |

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

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| **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. |
| Xiaomi | We agree at least the public safety use is different UE features from V2X although same Sidelink “technology” is used. In general, we prefer option 2, to use suffix E as general sidelink feature while defining different bands for different usage under suffix E. |
| LGE | Prefer option 2 reuse ‘suffix E’ |
| CATT | Support to reuse suffix E. |
| Huawei | Prefer option 2. |
| Qualcomm | 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. |
| AT&T | Option 1. If Option 2 is used, the section titles need to be updated to be more generic and not refer to V2X specifically. |

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

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| **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. |
| Xiaomi | We are ok with option 1. |
| LGE | Prefer option 1 to use ‘intra-band con-current V2X operating bands’ |
| CATT | “Intra-band con-current V2X” can be used for FDM operation but it seems not appropriate for TDM operation. As specified in TS 38.101-3, con-current operation is as below:  **Con-current operation**: The simultaneous transmission and reception of sidelink and Uu interfaces while operation is agnostic of the service used on each interface. |
| Huawei | Similar view as CATT. Application of co-current operation may cause some ambiguity. |
| Qualcomm | Option 1 : Use the ‘intra-band con-current V2X operating bands’ instead of ‘licensed bands partially used for SL. |

**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**

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| **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. |
| Xiaomi | Option 2. |
| LGE | Left over issues can be supported from Rel-16. |
| CATT | We prefer leftover issues to be supported from Rel-16. Other SL enhancement can be supported from Rel-17. |
| OPPO | It is better to clarify “all of objectives for SL in Rel-17”, the objectives might keep changing, better to make the conclusion more specific.  Generally similar as LGE/CATT, the leftover issue is no signalling impact then release independent might be ok. |
| Huawei | Left over issues can be release independent from Rel-16. |
| Qualcomm | The wording of Issue 1-1-4 is different here compared to what is written in Sub-topic 1-1-4 in section 1.2.1. When it says inter-band concurrent operation are they referring to the new inter-band combinations that are being discussed in thread [114]? We believe that the question of release independence for these combinations should be handled in thread [114]. It should be clarified as to which wording is the correct one for this issue. Also, it is important that these features be specified as optional before discussing release independence. We support the following wording:  Option 3: All of objectives for SL enh. Operation in Rel-17 are **optional features** and will be supported from Rel-17 as release independent principle.  LGE: To QC: see the open issues in sub-topic 1-1. The open is **Issue from 1-1-1 to 1-1-4 are captured in the sub-topic.**  As QC proposal we revised the candidate options as follow  **Moderator understanding: All SL enh. RF requirements are optional feature.**   * Proposals   + Option 1: All of objectives (SL enh, & left over issues) for SL enh. Operation in Rel-17, will be supported from Rel-16 as release independent principle.   + Option 2: SL enh. Operation in Rel-17 will be supported from Rel-17, and other left over issues will be supported from Rel-16 as release independent principle.   + Option 3: All of objectives (SL enh, & left over issues) for SL enh. Operation in Rel-17, will be supported from Rel-17 as release independent principle.   + Option 4: Other option is not precluded |

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

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

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| **Company** | **Comments** |
| vivo | We support Option 1 as the baseline. We think Option 2 can be considered for the specific bands case by case. |
| Xiaomi | Option 2. As band n14 is for “stand-alone” use only as no co-exist issue with other bands, both option 1 and option 2 are feasible from co-exist perspective. But for public safety use, we believe more sync reference frequency point is preferred hence 15kHz is preferred. |
| LGE | Prefer option 1 |
| CATT | Support option 1. |
| OPPO | Option 1 |
| Huawei | For n14, prefer option 1. |
| Qualcomm | Option 1: Reuse the general channel raster and sync raster for NR Uu in Rel-16 for SL enhancement operation in licensed band. |
| AT&T | Option 1. |

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

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| **Company** | **Comments** |
| vivo | Currently, we support Option 1. If there is any new scenario requiring channel bandwidth larger than 40MHz, we can consider other options. |
| Xiaomi | Option 2. The 40MHz is based on the band n47 and n38 band definition. If we are introducing new bands, i.e. licensed bands of FR1 for SL enhancement, the max CBW need to be discussed per each specific band. |
| LGE | Prefer option 1 |
| CATT | We can support option 1. |
| OPPO | Option 2. Not clear why is restricted to 40MHz especially considering the License bands can be applied also to SL. |
| Huawei | Support option 1. Max CBW for SL is also based on service demanding from 5GAA, 40MHz can fulfill the requirement. |
| **Qualcomm** | Option 3: CBW of 40 MHz is OK for now. However, we should revisit this topic if new bands are introduced for SL in the future. |

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

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| **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. |
| Xiaomi | We believe the CBW will depend on operator’s request. |
| LGE | Prefer option 1 |
| CATT | Support option 1 based on operator’s request. |
| OPPO | Option 1 |
| Huawei | Depends on operator’s request. |
| Qualcomm | Option 1: It is suggested to support both 5MHz and 10MHz channel bandwidths in n14 for SL transmission. |
| AT&T | Option 1 matches our request in previous meeting. |

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

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| **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. |
| Xiaomi | Option 2. This might also depend on the frequency separation discussion outcome of the band n79 for FDM operation. |
| LGE | Prefer option 2 |
| CATT | Option 2 is OK with us. If option 2 is acceptable to companies, I will capture it in [135]NRSL\_enh\_part2 enh for further discussion. |
| Huawei | It also depends on conclusion on issue 1-2-2 |
| Qualcomm | Option 3: For V2X though it has been agreed that the SL BWs will be a subset of the Uu BWs the selection of the SL BW from the Uu values of 40/50/60/80/100 MHz means that the minimum BW for SL would be 40 MHz which may be too large for some SL applications leading to a wastage of spectrum. It would be good to support lower BWs for SL of 10/20 and 30MHz for n79 as well for n79 |

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

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

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| **Company** | **Comments** |
| vivo | We need more study on the basic principles for Rx requirements in R4-2104776. For now, Option 2 is OK. |
| Xiaomi | Option 2. All the RF core requirements might also need to be considered together with the partial licensed band use for SL. |
| LGE | Both options are OK to us. REFSENS will be updated based on TR38.886 for n14 SL operation. |
| CATT | We can capture part of Rx requirements based on RAN4 consensus in this meeting. The rest Rx requirements will be further discussed in future meetings. |
| Huawei | Option 1 is ok |
| Qualcomm | Option 3: A detailed analysis for each RX/TX requirement needs to be done for SL enhancements |
| AT&T | Option 2 or Option 3 as proposed by QC. In addition, it seems that the need to support both PC1 and PC3 for TX in band n14 SL operation has not been accounted for in the latest discussions. |

### 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.*

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| **CR/TP number** | **Comments collection** |
| R4-2104533  TP on operating bands & system parameters for SL transmission | Xiaomi: The channel raster part need to wait and see the issue 1-2-1 outcome. |
| LGE: do not need to add existing NR SL operating band in Table 7.1.1-1.  In table. 7.1.3-1, the V2X con-current notation is follow DC/CA rule. It means that V2X\_n38-n38 or V2X\_n79-n79 are used for intra-band con-current V2X operating band.  Channel raster for SL enh. UE is reuse the NR Uu in licensed band. So n14 can be reuse 100kHz channel raster. n79 can be reuse 15/30 kHz channel raster. |
| CATT:   1. The duplex mode for band n14 and n79 should be further discussed. 2. Intra-band con-current V2X\_n38 should be removed. 3. No need to cope the formula of channel raster here. |
| Qualcomm : In table 7.1.3-1 V2X n79 should be Uu is n79 and PC5 is n79 |
| AT&T: We would rather address the TP after oucome of the open issues discussions. |
| R4-2104775  TP 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. |
| Xiaomi: The channel raster part need to wait and see the issue 1-2-1 outcome. Also before adding band n79, a more general principle of licensed band partially used for SL might need to be agreed first. |
| LGE: Generally, NR V2X shall be changed as “NR SL enhancement”for all related clause. In table 7.1.1-1, we need to revised Note 1 as follow  NOTE 1: When this band is used for public safety service, the band is exclusively used for NR SL operation in out-of-coverage scenario.  In table 7.2.1-1, the n79 V2X CBW is up to 40MHz. and support 10/20/30/40MHz.  Need further improvement.  CATT: Thanks for all the comments. The TP will be revised based on agreements on associated issues. |
| AT&T: We would rather address the TP after oucome of the open issues discussions. |
| R4-2104776  TP on UE Rx RF requirement for NR SL enhancement | Vivo: This TP can wait until we figure out the basic principles for Rx requirements. |
| Xiaomi: Similar to the issue 1-3-1 discussion. |
| LGE: ‘NR V2X’ shall be changed as “NR SL enhancement” for all related clause.  In 8.2.3 ACS, 8.2.4 blcocking and 8.2.6 intermodulation requirements, the interfere BW and offset follow NR Uu due to licensed band.  CATT: Thanks for all the comments. The TP will be revised based on agreements on associated issues. In this TP, 8.2.3 ACS, 8.2.4 blcocking and 8.2.6 intermodulation requirements are aligned with band n38 for 10/20/30/40MHz CBW. |
| Qualcomm : Do not agree with this TP. The REFSENS sensitivity numbers in this document are more stringent than those given in 38.101-1 for n14 Uu. The understanding was that for a given band the specifications for SL should not be more stringent than those for Uu. This TP should be deferred until we figure out how to apply the basic principles for SL RX requirements |
| AT&T: We would rather address the TP after oucome of the open issues discussions. |
| R4-2104971  TP 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? |
| Xiaomi: Similar to the issue 1-1-1 discussion. |
| LGE: the contents can be acceptable to capture in TR38.785 |
| Huawei: revisions are needed according to discussion in issue 1-1-1. |
| AT&T: see comment on issue 1-1-1. |

## 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 #1-1: General principle for** **SL enh. Operation** | **Issue 1-1-1: TP on operating scenarios for SL enhancement**  In 1st round, TP contents can be revised based on interested companies comment. And the revised TP will be further discussed in 2nd round to determine the SL enhancement operating scenarios based on WID.  *Tentative agreements:*   * TP on operating scenarios for SL enhancement will be revised based on 1st round comments.   *Recommendations for 2nd round:*  **Based on the tentative agreement, TP (R4-2104971) will be revised and discussed in 2nd round.** |
| **Issue 1-1-2: How to define new operating bands for SL enhancement in Rel-17**  In 1st round discussion, majority view for the general principle to define new SL operating band is to reuse suffix E. But the public safety operating band can define in different table. So moderator propose the tentative agreements for general principle for new operating bands of SL enh. operation.  *Tentative agreements:*   * 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.   *Recommendations for 2nd round:*  **Completed. No more discussion for general principle for new operating band and RF requirements for SL enh. operation.** |
| **Issue 1-1-3: Terminology of partially used licensed band between SL and Uu operation**  In 1st round discussion, majority view for terminology of partially used licensed band is to revise as “Intra-band con-current V2X operating bands. For TDM operation in licensed band, RAN4 do not use the con-current operation since it is exactly same as single carrier operation in time domain. So TDM operation in licensed band shall use the “intra-band V2X bands” as in V2X\_n79-n79 like to V2X\_47\_n47. So moderator propose the tentative agreements for terminology alignment for V2X leftover issues.  *Tentative agreements:*   * Option 1: Use the **‘intra-band con-current V2X operating bands’** instead of ‘licensed bands partially used for SL.   *Recommendations for 2nd round:*  **Completed. No more discussion for the alignment of V2X terminology for partially used licensed band.** |
| **Issue 1-1-4: How to apply Release independent manner for public safety service, intra-band con-current operation and PC2 SL UE**  In 1st round, RAN4 did not make consensus on the release independent principle for public safety service and leftover issues in Rel-17. Moderator provide following revised options based on 1st round discussion comments as follow  *Candidate options:*  **Moderator understanding: All SL enh. RF requirements are optional feature.**   * Option 1: All of objectives (SL enh, & left over issues) for SL enh. Operation in Rel-17, will be supported from Rel-16 as release independent principle. * Option 2: SL enh. operation in Rel-17 will be supported from Rel-17, and other left over issues will be supported from Rel-16 as release independent principle. * Option 3: All of objectives (SL enh, & left over issues) for SL enh. Operation in Rel-17, will be supported from Rel-17 as release independent principle. * Option 4: Other option is not precluded   *Recommendations for 2nd round:*  **Based on the above options, RAN4 need further discussion in 2nd round** |
| **Sub-topic #1-2: System parameters for SL enh. operation** | **Issue 1-2-1: Channel raster & sync. raster**  In 1st round discussion, majority view for channel raster & sync. raster for SL enh. in licensed bands can follow the general NR Uu system requirements. So moderator propose the tentative agreements for channel raster & sync. Raster for SL enh. operation in licensed bands.  *Tentative agreements:*   * Option 1: Reuse the general channel raster and sync raster for NR Uu in Rel-16 for SL enhancement operation in licensed band.   *Recommendations for 2nd round:*  **Completed. No more discussion for the Channel raster & sync. raster for SL enh. operation in licensed band.** |
| **Issue 1-2-2: Max. CBW for SL operating band**  In 1st round discussion, majority view is 40MHz for max. CBW for SL operating band. However, two companies propose to further discussion to extend SL operating CBW in licensed band. So RAN4 need further discussion in 2nd round with following options.  *Candidate options:*   * Option 1: It is proposed that the max CBW for SL service for NR V2X in licensed band is limited to 40MHz * Option 2: The max. CBW for SL service is up to operator request in licensed bands * Option 3: other option is not precluded   *Recommendations for 2nd round:*   * **Based on the above options, RAN4 need further discussion in 2nd round** |
| **Issue 1-2-3: CBW for n14 SL operating band**  In 1st round discussion, RAN4 reach consensus with option 1. And AT&T confirmed that option 1 matched with their preference.  *Tentative agreements:*   * Option 1: It is suggested to support both 5MHz and 10MHz channel bandwidths in n14 for SL transmission.   *Recommendations for 2nd round:*  **Completed. No more discussion for the CBW for n14 SL operating band** |
| **Issue 1-2-4: CBW for n79 SL operating band**  In 1st round discussion, most companies support n79 CBW will be discussed in intra-band con-current V2X operation. Also, the larger CBW is not necessary for SL operation to meet SA V2X requirements. It will be further discussed in intra-band con-current V2X operation.  *Tentative agreements:*   * 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.   *Recommendations for 2nd round:*  **No more discussion for the CBW for n79 SL operating band in 2nd round. It will be treated in [135] NRSL\_enh\_part2 for n79 intra-band con-current V2X operating band.** |
| **Sub-topic #1-3: UE RF requirements** | **Issue 1-3-1: UE Rx requirements for SL enhancement**  In 1st round discussion, RAN4 do not make consensus on the contents for Rx requirements. The basic principle can be agreeable to all companies. Detail RX requirements will be further discussed in next RAN4 meeting.  *Tentative agreements:*   * Basic principle in Rx requirements for SL enhancement is to follow receiver requirements for NR Uu. * Detail Rx requirements will be further discussed with Tx requirements for both PC1 and PC3 SL enh. UE in May Meeting.   *Recommendations for 2nd round:*  **Based on the tentative agreement, TP (R4-2104776) will be revised and discussed in next RAN4 meeting.** |
| **Sub-topic #1-4: Others** | **Issue 1-4-1: A-MPR for NS\_33 and NS\_52 for 5G V2X UE**  **Issue 1-4-2: Switching period**  **It will be resubmitted and treated in Rel-16 V2X Maintenance session in RAN4 May meeting due to Chairman guidance** |

### 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** |
| R4-2104775 | *Based on 1st round of comments collection, moderator can recommend*  ***“to be revised” to capture channel raster and synch raster only.*** |
| R4-2104971 | *Based on 1st round of comments collection, moderator can recommend*  ***“to be revised” to reflect 1st round comment.*** |
|  |  |
|  |  |

## Discussion on 2nd round (if applicable)

### Open issues summary

*RAN4 need further discussion to complete the following UE general principle to support SL enhancement operation.*

* + Topic #1-1: General principle
  + Issue #1-1-1: Operating scenarios (revision of R4-2104971, LGE)
* Option 1: Based on revised TP (revision of 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
  + Issue #1-1-4: How to apply Release independent manner for SL enh. in Rel-17

**Moderator understanding: All SL enh. RF requirements are optional feature.**

* Option 1: All of objectives (SL enh, & left over issues) for SL enh. Operation in Rel-17, will be supported from Rel-16 as release independent principle.
* Option 2: SL enh. Operation in Rel-17 will be supported from Rel-17, and other left over issues will be supported from Rel-16 as release independent principle.
* Option 3: All of objectives (SL enh, & left over issues) for SL enh. Operation in Rel-17, will be supported from Rel-17 as release independent principle.
* Option 4: Other option is not precluded
  + Topic #1-2: System parameters
  + Issue #1-2-1: channel raster & sync. raster (revision of R4-2104775, CATT)
* Option 1: Based on revised TP (revision of R4-2104775) on channel raster & synch. raster for SL enh., RAN4 need to capture the system parameters for SL enhancement.
* Option 2: Other option is not precluded
  + Issue #1-2-2: Max. CBW for SL operating band
* Option 1: It is proposed that the max CBW for SL service for NR V2X in licensed band is limited to 40MHz
* Option 2: The max. CBW for SL service is up to operator request in licensed bands
* Option 3: other option is not precluded

### Companies views’ collection for 2nd round

#### Open issues

**Issue #1-1-4: How to apply Release independent manner for SL enh. in Rel-17**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| LGE | Prefer option 2 as release independent manners. Also support WF to capture the agreements |
| CATT | Support option 2. |
| Xiaomi | Agree with option 2. |
| Huawei | Option 2 is subjected to the clarification of Rel-16 left over issues in the background part. |
| Vivo | If most companies support Option 2, we are OK with Option 2. |
| Qualcomm | Option 2 is OK as long as all features for SL enhancement are optional as mentioned in the draft “WF on general principle for SL enh” |
| OPPO | Option2 with the precondition that leftover issues have no signaling impact then can be release independent to Rel-16, otherwise Rel-17.  We have another question on whether uu/SL works in the intra-band concurrent operation at license band should be considered as Rel-16 leftover or Rel-17. Although in Rel-16 this intra-band concurrent operation has been brought up, but no was postponed to Rel-17 and no corresponding requirements were defined at that time. Then consider it as a new feature in Rel-17 is more reasonable?? Besides, is there new signaling required for this intra-band concurrent operation at license band? If there is, then should be considered as Rel-17. |

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

|  |  |
| --- | --- |
| **Company** | **Comments** |
| LGE | Prefer option 2. The current 40MHz is max. CBW according to requested operating bands. But, it is up to operator decision point for V2X deployment in licensed bands. |
| CATT | Currently, Maximum 40MHz CBW is preferred. Larger CBW can be considered if operator has request. |
| Xiaomi | We share similar view as currently 40MHz as max CBW. |
| Huawei | Option 1. ITS band has 70MHz spectrum, but only 40MHz CBW is defined for NR V2X. The CBW is not only depends on the request from operator, it also depends on spectrum allocation for V2X by regulations as well as the needed CBW to fulfill the V2X service. According to 5GAA, 40MHz for SL is enough for the demanding of V2X SL service. Without new input from the industry as well the updated info from regulation, we think max 40MHz CBW for SL should be kept as Rel-16. |
| vivo | It seems that for now we don’t have operator’s request for Max CHBW larger than 40MHz. Option 1 is OK for now. |
| Qualcomm | Option 1: The max. CBW for SL service for NR V2X in licensed band is limited to 40 MHz |
| OPPO | Prefer Option 2, Option 1 is ok for the bands up to now, but question is do we need to cover larger CBW if other bands introduced? Maybe it is better to say 40MHz is the max CBW for the time being, but not preclude larger CBW if requested by operators in Rel-17 time frame. |

#### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2105402 (Revision of R4-2104971)  TP on operating scnearios | LGE: Revision TP is agreeable. |
| Xiaomi: TP is ok for us. |
| Huawei: Made some further revisions to list the Rel-16 left over issues and merge the operation aspects.  To HW: LGE can allow most revision from HW. But prefer to capture two aspect as follow to consist with Rel-16 5G V2X operation.   1. SL service and operating band perspectives 2. gNB deployment including network control possibility |
|  |
| R4-2105401 (Revision of R4-2104775)  TP on system parameters | LGE: Revision TP is agreeable |
| Xiaomi: TP is ok for us. |
| Vivo: Shouldn’t we include at least the operating bands first? Or the system parameters defined on what basis? |
|  |
| R4-2104969  TR update | LGE: The update TR is agreeable |
| Huawei: clause 4.3 should be updated based on the conclusion on the TP in rev R4-2104971.  LGE: Yes, the TR will be updated based on consensus of TP on revision of R4-2104971. |
| Vivo: In Chapter 5, the title ‘Partial used SL operation in a licensed band’ should be aligned as ‘intra-band con-current operation’ since we have an agreement in thread [134]. |
|  |
| R4-2105400  WF on general principle for SL operation | LGE: WF is agreeable |
| Xiaomi: After modification as capturing most companies concern, the WF is ok for us. |
| Huawei: Disagree with the WF for the max CBW for SL.  LGE: To HW, Yes, we can accept to consider max. CBW with 40MHz for SL in licensed band with option 1 in slide 7. It can be acceptable to all interested companies. |
| OPPO:  1. 40MHz is ok for the bands up to now, but question is do we need to cover larger CBW if other bands introduced? Maybe it is better to say 40MHz is the max CBW for the time being, but not preclude larger CBW if requested by operators in Rel-17 time frame.  2. We have another question on whether uu/SL works in the intra-band concurrent operation at license band should be considered as Rel-16 leftover or Rel-17. Although in Rel-16 this intra-band concurrent operation has been brought up, but no was postponed to Rel-17 and no corresponding requirements were defined at that time. Then consider it as a new feature in Rel-17 is more reasonable?? Besides, is there new signaling required for this intra-band concurrent operation at license band? If there is, then should be considered as Rel-17. |
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### Summary for 2st 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 #1-1: General principle for** **SL enh. Operation** | **Issue #1-1-4: How to apply Release independent manner for SL enh. in Rel-17** |
| **Sub-topic #1-2: system parameters** | **Issue #1-2-2: Max. CBW for SL operating band** |

#### 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** |
| R4-2105401 (Revision of R4-2104775) |  |
| R4-2105402 (Revision of R4-2104971) |  |
| R4-2104969 |  |

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on general principle for SL enhancements | LGE | To capture the agreeable principle |
|  |  |  |
|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-2104528 | General discussions on operating bands for SL transmission | vivo | Noted |  |
| R4-2104529 | Discussion on system parameters for newly introduced SL bands | vivo | Noted |  |
| R4-2104533 | TP for SL enhancements | vivo | Noted | *Covered in 4775. Other issue will further discuss in next RAN4 meeting* |
| R4-2104775 | TP on CBW and system parameters for newly introduced SL bands | CATT | To be revised | *Only capture system parameters* |
| R4-2104776 | TP on UE Rx RF requirement for NR SL enhancement | CATT | Noted | *Further discussion in next RAN4 meeting based on the basic principle* |
| R4-2104971 | TP on operating scenarios for NR SL enhancements in Rel-17 | LG Electronics France | To be revised | *Reflect 1st round comment* |
| R4-2107305 | On CBW for licensed band supporting NR V2X | Huawei | Noted |  |

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 |
| R4-2105400 | WF on general principle for SL enhancements | LG Electronics |  |  |
| R4-2105401 (Revision of R4-2104775) | TP on CBW and system parameters for newly introduced SL bands | CATT |  |  |
| R4-2105402 (Revision of R4-2104971) | TP on operating scenarios for NR SL enhancements in Rel-17 | LG Electronics France |  |  |

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