**3GPP TSG-RAN WG4 Meeting #94-e R4-2002686**

**Electronic Meeting, Feb.24th – Mar.6th 2020**

**Agenda item:** 8.4.3

**Source:** Moderator (vivo)

**Title:** Email discussion summary for RAN4#94e\_#13\_5G\_V2X\_NRSL\_SysParameters

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion and provide some guidelines for email discussion if necessary.*

*Background for System parameters*

*In RAN4#93 meeting, WF R4-1915987 on channel raster for NR V2X was approved. Some key progress was cited as follows:*

*Table 1: Applicable NR-ARFCN for band n47*

|  |  |  |  |
| --- | --- | --- | --- |
| *NR Operating Band* | *ΔFRaster*  *(kHz)* | *Uplink*  *Range of NREF*  *(First – <Step size> – Last)* | *Downlink*  *Range of NREF*  *(First – <Step size> – Last)* |
| *n47* | *15* | *790334-<1>-795000* | *790334-<1>-795000* |
| *[30]* | *790334-<2>-795000* | *790334-<2>-795000* |
| *[60]* | *790334-<4>-795000* | *790334-<4>-795000* |

* + *NR V2X RF reference frequency will be shifted by Δshift-V2X*

*FREF, shift = FREF + Δshift-V2X*

* + *Δshift-V2X = N\*5kHz + Δshift*
    - *Both N and Δshift are separately signaled by network configuration or pre-configuration.*
    - *N can be set as one of following values：[-1,0,1]*
    - *Δshift (0 or 7.5kHz) will be reused from existing IE(frequencyShift7p5khz) from NR Uu*

*Background for NR V2X licensed bands*

*In RAN4#92bis meeting, a TP R4-1913062 on NR V2X scenarios was approved. One of the following scenarios was rated as the first priority in RAN4:*

*– Specify RF core requirements for licensed bands in which the entire band is allocated for SL operation in a region.*

*- Sidelink operation in partial bandwidth in licensed band is not precluded in WI*

*In RAN4#93 meeting, a TP R4-1916144 on general Tx/Rx requirements for NR V2X at licensed bands was approved, in which licensed band n38 and its supported channel bandwidths were firstly introduced for NR V2X.*

***Table 7.2.1-1 NR V2X Communication channel bandwidth***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | ***NR V2X band / V2X channel bandwidth*** | | | | | | | | | |
| ***NR V2X***  ***Operating Band*** | ***SCS***  ***kHz*** | ***10 MHz*** | ***20 MHz*** | ***30 MHz*** | ***40 MHz*** | ***50 MHz*** | ***60 MHz*** | ***80 MHz*** | ***90 MHz*** | ***100 MHz*** |
| *n38* | *15* | *Yes* | *Yes* | *Yes* | *Yes* |  |  |  |  |  |
| *30* | *Yes* | *Yes* | *Yes* | *Yes* |  |  |  |  |  |
| *60* | *Yes* | *Yes* | *Yes* | *Yes* |  |  |  |  |  |

*Also, channel bandwidths for licensed band n38 were already defined in TS 38.101-1 as follows:*

***Table 5.3.5-1 Channel bandwidths for each NR band***

| ***NR band / SCS / UE Channel bandwidth*** | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***NR Band*** | ***SCS***  ***kHz*** | ***5 MHz*** | ***101,2 MHz*** | ***152 MHz*** | ***202 MHz*** | ***252 MHz*** | ***30 MHz*** | ***40 MHz*** | ***50 MHz*** | ***60 MHz*** | ***70 MHz*** | ***80 MHz*** | ***90 MHz*** | ***100 MHz*** |
| *n38* | *15* | *Yes* | *Yes* | *Yes* | *Yes* |  |  | *Yes* |  |  |  |  |  |  |
| *30* |  | *Yes* | *Yes* | *Yes* |  |  | *Yes* |  |  |  |  |  |  |
| *60* |  | *Yes* | *Yes* | *Yes* |  |  | *Yes* |  |  |  |  |  |  |

*There is a clear contradiction between the channel bandwidths in band n38 defined for NR V2X and NR. 30MHz channel bandwidth is not supported for n38 while it is added for NR V2X operation. This issue should be addressed in RAN4. In future, some principles of introducing NR licensed bands and their supported channel bandwidths should be discussed.*

*In this meeting, the open issues listed below will be discussed:*

1. *The necessary of introducing of ΔFRaster 30/60kHz and some corresponding consequences.*
2. *Whether to remove 30MHz channel bandwidth for NR V2X licensed band n38*
3. *Some principles for introducing NR licensed bands and channel bandwidths for NR V2X*
4. *TPs and CRs related to NR V2X system parameters should be checked.*

*List of candidate target of email discussion for 1st round and 2nd round*

* 1st round: Collect companies’ views on the open issues in the summary and at least some decisions on 1) and 2) should be reached.
* 2nd round: Final decisions and revisions should be reached for these issues. If these issues need further discussion, maybe a WF is needed. For 4), TPs and CRs should be revised according to the reasonable suggestions in this meeting. New Toc numbers will be needed according to the email discussion in this meeting.

# Topic #1: System parameters

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

## Companies’ contributions summary

**Band and channel bandwidth**

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000902 | CMCC | Proposal 1: Specify NR SL operation in licensed Bands n34, n39, n40, n41 and n79 with the conditions that the entire band is allocated for SL operation in a particular region or the SL operation is in sync with the non-V2X operation in the same band. |
| R4-2000570 | vivo | Observation 1: There is a clear contradiction between the channel bandwidths in band n38 defined for NR V2X and NR.  Proposal 1: Remove 30MHz channel bandwidth in NR V2X licensed band n38.  Proposal 2: Channel bandwidths defined for this NR V2X licensed band should be a subset of channel bandwidths already defined for this licensed band in NR. |
| R4-2000571 | vivo | According to discussion paper [R4-2000570], this TP removes 30MHz channel bandwidth for band n38. |

**Channel raster for band n47**

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000567 | vivo | Proposal 1: Two different solutions are summarized for channel raster for NR V2X band n47:  Solution 1: Only 15kHz ΔFRaster is used for band n47.  Solution 2: 15/30/60kHz ΔFRaster are used for band n47.  Observation 1: Different kinds of ΔFRaster (15/30/60kHz) should be supported in order to align the subcarrier grid between S-SSB and data for band n47 and ΔFRaster should be the same as the SCS the channel is using for both S-SSB and data.  Observation 2: Only 15kHz ΔFRaster used for band n47 does not ensure the alignment of subcarrier grid between S-SSB and data. The alignment issue can be left to other WGs or UE implementation.  Observation 3: For channel raster Solution 1, i.e. only 15kHz ΔFRaster is used, the current frequency shift design is enough. For channel raster Solution 2, i.e. 15/30/60kHz ΔFRaster are used for band n47, the current frequency shift design is not enough, N values should be {-4, -2, -1, 0, 1, 2, 4}.  Proposal 2: Only 15 kHz ΔFRaster is used for NR V2X band n47. |
| R4-2002028 | Huawei, HiSilicon | Proposal: It is proposed that only 15kHz channel raster is defined for NR V2X. |
| R4-2000607 | CATT | Proposal 1: To keep 15kHz/30kHz/60kHz as the channel raster for NR V2X band n47. |

**CRs and TPs**

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| --- | --- | --- |
| **T-doc number** | **Company** | **Summary of change** |
| R4-2000568 | vivo | **CR on UE system parameters for NR V2X UE for TS 38.101-1**  Add content of operating bands for NR V2X to Section 5.2E;  Add content of channel bandwidth for NR V2X to Section 5.3E;  Add content of channel raster and sync raster to Section 5.4E. |
| R4-2000569 | vivo | **CR on system parameters for NR V2X for TS 38.104**  Add operating band n47 to Section 5.2;  Add channel bandwidth supported by n47 to Section 5.3.5;  Add channel raster of band n47 to Section 5.4.2;  Add sync raster of band n47 to Section 5.4.3. |
| R4-2000606 | CATT | **CR for TS38.104, Introduce frequency band and channel arrangement for NR V2X**  Introduce band n47 for NR V2X to section 5.2.  Introduce channel bandwidth for NR V2X to section 5.3.5  Introduce channel raster for NR V2X to section 5.4.2.  Introduce synchronization raster for NR V2X to section 5.4.3. |
| R4-2001003 | vivo | **TP on channel arrangement for NR V2X** |

## Open issues summary

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

### Sub-topic 1-1 Band and channel bandwidth for NR V2X

*Sub-topic description: NR V2X operating bands should be proposed based on operators’ request. For NR V2X licensed bands, some channel bandwidths related issues should be discussed.*

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

**Issue 1-1-1: NR V2X licensed bands**

* Proposals
  + Proposal 1: Specify NR SL operation in licensed Bands n34, n39, n40, n41 and n79 with the conditions that the entire band is allocated for SL operation in a particular region or the SL operation is in sync with the non-V2X operation in the same band.
* Recommended WF
  + TBA

**Issue 1-1-2: Channel bandwidths for NR V2X licensed bands**

* Proposals
  + Proposal 1: Remove 30MHz channel bandwidth in NR V2X licensed band n38.
  + Proposal 2: Channel bandwidths defined for this NR V2X licensed band should be a subset of channel bandwidths already defined for this licensed band in NR.
* Recommended WF
  + TBA

### Sub-topic 1-2 Channel raster for band n47

*Sub-topic description: Channel raster for band n47 is not completed. Whether to introduced 30/60kHz ΔFRaster and corresponding consequences should be discussed.*

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

**Issue 1-2-1: channel raster for band n47**

* Proposals
  + Option 1: Only 15kHz ΔFRaster is used for band n47(supported by vivo, Huawei, HiSilicon, QC)
  + Option 2: 15/30/60kHz ΔFRaster are used for band n47(Supported by CATT, LGE)
* Recommended WF
  + TBA

### Sub-topic 1-3 CRs and TPs

*Sub-topic description: Interested companies are welcome to comment on the proposed CRs and TPs for NR V2X system parameters.*

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| LG Electronics | Sub topic 1-1: LGE support to specify NR SL operation in licensed Bands n34, n39, n40, n41 and n79 with the conditions that the entire band is allocated for SL operation in a particular region or the SL operation is in sync with the non-V2X operation in the same band.  For the removing of 30MHz of NR band n38, it is depend on operator preference. 30MHz channel BW can be supported evenif legacy NR Uu do not support the 30MHz channel bandwidth.  Sub topic 1-2: LGE prefer option2 to support 15/30/60kHz ΔFRaster are used for band n47. The flexibility of channel raster should be considered when LTE V2X do not deployed region or country. |
| vivo | Sub topic 1-1:  Issue 1-1-1: We can agree the proposed licensed bands for NR V2X.  Issue 1-1-2: From our perspective, even if the NR licensed bands are approved for V2X communication, regulatory requirements still apply for these bands. Channel bandwidths not supported by NR should not be supported by the same NR V2X licensed bands since there are no requirements defined for these channel bandwidths. Therefore, 30MHz should be removed.  For other licensed bands proposed for NR V2X communication, Proposal 2 should be used as a restriction introducing channel bandwidths.  Sub topic 1-2: In our understanding, Option 2 is technically better than Option1. But we need to revisit N values for N\*5kHz frequency shift. Considering the limited timeline, Option1 is preferred for the simplicity. |
| CATT | **Issue 1-1-1: NR V2X licensed bands**  CATT support proposal 1  **Issue 1-1-2: Channel bandwidths for NR V2X licensed bands**  No need to remove 30MHz CBW for band n38 for alignment with NR Uu. For NR V2X, the channel bandwidth mainly depends on the deployment scenario. If the 30MHz CBW for NR V2X band n38 has the practical deployment scenario, it should be introduced.  **Issue 1-2-1: channel raster for band n47**  The impact of 30kHz and 60kHz on the agreed frequency shift needs further evaluations. Based on the physical layer design, both data and S-SSB for NR V2X can support 15kHz/30kHz/60kHz SCS. So CATT prefer to keep 15kHz/30kHz/60kHz as the channel raster if the agreed frequency shift will not be impacted. |
| Huawei | Issue 1-1-1: The mechanism of synchronization between SL and Uu in the TDD has not been discussed, which may have impact to other working groups. Before we have a clear understanding of the mechanism, we cannot accept to introduce licensed bands for NR-V in this way, and the agreement for n38 for synchronization scenario should be reconsidered.  Issue 1-1-2: The discussion of introducing of 30MHz is specific to ITS spectrum with consideration of potential allocation scenario. For n38, if later on operators do have the request, it should be introduced in the new CBW WI.  Issue 1-2-1: Since the raster for S-SSB is configured, the position of S-SSB can be chosen for those without grid misalignment with data, thus there is no need to define 30kHz channel raster additionally. |
| CMCC | Issue 1-1-1: In Last meeting, RAN4 defined SL operating scenario for licensed band n38, we suggest apply the same operation scenarios for licensed band n34, n39, n40, n41 and n79.  Since RAN4 has not yet confirmed that there is a clear technical analysis shows that SL can’t operate in sync with Uu, we suggest first introduce these licensed bands as n38 for NR-V and then consider the mechanism of synchronization operation. If some technology analysis prove it’s unacceptable for the synchronization operation, we could emphasize this conclusion in the related specification, e.g. by adding the note that these licensed bands could be used for SL operation only when the entire band is used for SL operation. |
| OPPO | Issue 1-1-1: OK with specify NR SL operation in licensed Bands n34, n39, n40, n41 and n79 like n38. Conditions can be added like the entire band is allocated for SL or the SL operation is in sync with the non-V2X operation in the same band to make it clear.  Issue 1-1-2: There is no need to remove 30MHz since this is for SL operation rather than uu. |
| Qualcomm | Sub topic 1-2:  Issue 1-2-1: channel raster for band n47  • Option 1: Only 15kHz ΔFRaster is used for band n47 |
| FUTUREWEI | Issue 1-2-1: Only 15kHz considering that there could be potential impacts due to misalignment in other SCS. |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2000568 | LG Electronics: In Table 5.2-1, need to add n47. The NR V2X channel raster can support for all multiple SCS channel raster since 30kHz/60kHz channel raster will be supported in the region or country where LTE V2X is not deployed. |
| CATT: The channel raster will be derived based on discussion results. |
|  |
| R4-2000569 | Company A |
| Company B |
|  |
| R4-2000606 | LG Electronics : we are fine the draft CR |
| Vivo: we suggest combine this CR with R4-2000569. |
| CATT: It can be merged with R4-2000569.  The channel raster will be derived based on discussion results. |
| Ericsson: It is not clear to us we need CR on 38.104, V2X is UE feature thus this is no BS CR needed. |
| R4-2001003 | LG Electronics : we think that NR V2X channel raster can support for all multiple SCS channel raster since 30kHz/60kHz channel raster will be supported in the region or country where LTE V2X is not deployed. |
| CATT: The channel raster will be derived based on discussion results. |
| Huawei: fine with the TP |

## 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** | *Issue 1-1-1:* *NR V2X licensed bands*  *Tentative agreements:* *Principle to specify NR SL operation in licensed Bands is that the entire band is allocated for SL operation in a particular region. Whether TDD licensed bands can be used for SL in sync condition with the non-V2X operation UE in the same band shall be based on further discussion of synchronization mechanism between SL and Uu services.*  *Note:* *The mechanism of synchronization between SL and Uu in the TDD can be further discussed.*  *Issue 1-1-2:**Channel bandwidths for NR V2X licensed bands*  *Tentative agreements: Principles should be discussed when operators introducing new channel bandwidths for NR V2X licensed bands.*  *Recommendations for 2nd round: Further comments should be collected on the proposed licensed bands and principles when operators introducing new channel bandwidths for NR V2X.* |
| **Sub-topic#1-2** | *Candidate options:*  *Option1: Only 15kHz ΔFRaster is used for band n47(supported by vivo, Huawei, HiSilicon, QC, FUTUREWEI)*  *Option2: 15/30/60kHz ΔFRaster are used for band n47(Supported by CATT, LGE)*  *Recommendations for 2nd round: Whether to introduce 30/60kHz ΔFRaster can be further discussed by considering the impacts. Final agreements should be reached for channel raster for band n47 in this meeting.* |
| **Sub-topic#1-3** | *Recommendations for 2nd round:*  *CRs and TPs should be revised according to companies’ comments and final decisions made on channel raster.*  *Whether to introduce system parameters for NR V2X in TS38.104 needs confirmation.* |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2000568 | *CR on UE system parameters for NR V2X UE for TS 38.101-1 by vivo*  *To be revised. A new Tdoc number is needed.* |
| R4-2000569,  R4-2000606 | *CR on system parameters for NR V2X for TS 38.104 by CATT and vivo*  *These 2 CRs can be emerged based on R4-2000606. Only one Tdoc number is needed.* |
| R4-2001003 | *TP on channel arrangement for NR V2X by vivo*  *To be revised. A new Tdoc number is needed.* |
| R4-2000571 | *TP on channel bandwidths for NR V2X licensed band n38*  *This one can be noted.* |

## Discussion on 2nd round (if applicable)

***Baseline for the 2nd email discussion***

***Sub-topic 1-1 Band and channel bandwidth for NR V2X***

***Principles for introducing licensed bands for NR SL operation:***

* The entire licensed bands allocated for SL operation in a particular region.
  + Specify NR SL operation in licensed Bands n34, n39, n40, n41 and n79 with the conditions that the entire band is allocated for SL operation in a particular region.
* TDD licensed bands used for SL in sync with non-V2X operation
  + The mechanism of synchronization between SL and Uu in the TDD can be further discussed
  + Operators can propose TDD licensed bands for SL and non-V2X operation after the mechanism of synchronization is decided.

***Principles for introducing channel bandwidths for licensed bands for NR SL operation***

* In normal condition, channel bandwidths introduced for NR V2X in licensed bands should follow NR.
  + If operators do have the need to create a new channel bandwidth, necessary procedures should be followed like creating a new CHBW WI for this purpose.

***30MHz for NR V2X licensed band n38***

* Band n38 is still a licensed band even used for NR sidelink, new 30MHz channel bandwidths cannot be added skipping necessary procedures.
* Since no RF requirements defined for 30MHz in n38, at least we should put brackets for [30MHz] channel bandwidth.
* If operators do have request creating a new channel bandwidth, necessary procedures should be followed.

*Comments on principles for introducing licensed bands and channel bandwidths for NR V2X are collected for the 2nd round.*

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| --- | --- |
| **Company** | **Comments** |
| **CMCC** | **Since there are still comments about specifying NR SL operation in licensed bands n34, n39, n40, n41 and n79 in sync with the non-V2X operation in the same band, to proceed, we suggest at least conduct the technical analysis for synchronization operation with one licensed band as an example, e.g. n79.** |
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***Subtopic 1-2: Channel Raster for band n47***

*Candidate options:*

*Option1: Only 15kHz ΔFRaster is used for band n47(supported by vivo, Huawei, HiSilicon, QC, FUTUREWEI)*

*Option2: 15/30/60kHz ΔFRaster are used for band n47(Supported by CATT, LGE)*

*Comments on the necessity and impacts of introducing 30k/60kHz ΔFRaster are collected for the 2nd round. Hope we can reach an agreement for this issue in this meeting.*

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| --- | --- |
| **Company** | **Comments** |
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***Sub-topic 1-3 CRs and TPs***

*CRs and TPs for system parameters need revisions according to the agreement of channel raster for n47.*

*According to the agreed CR worksplit for NR V2X, CR on system parameters is needed for TS 38.104. If some companies do have issue about this, comments can be collected.*

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| --- | --- |
| **Company** | **Comments** |
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## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |