**3GPP TSG-RAN WG4 Meeting # 97-e R4-200xxxx**

**Electronic Meeting, 2-13 November, 2020**

**Agenda item:** 7.3.4

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

**Title:** Email discussion summary for [97e][109] 5G\_V2X\_NRSL\_UE\_Concurrent

**Document for:** Information

# Introduction

This email thread discuss NR V2X con-current operation. The contributions are scattered in agenda 7.3.4, which includes:

* Topic #1: Switching period between NR SL and LTE SL in ITS band
* Topic #2: Con-current band combination requirements:
  1. MSD for V2X\_20A\_n38A
  2. delta Tib
  3. delta Rib

# Topic #1: Switching period between NR SL and LTE SL in ITS band

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2014321**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014321.zip) | LGE | First Priority is still option 1a as shown in candidate options. Can compromise not to specify the RF requirements as option3 and just decide the switching position in RF session. Also the switching position shall be aligned slot boundary to reduce resource waste.  **Option 6**: Decide switching position in RF session to inform to RRM session + Option 3 |
| [**R4-2014414**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014414.zip) | CATT | **Observation 1**: The length of switching time is no longer crucial as the switching time 150us is much less than one NR slot or LTE subframe.  **Observation 2**: The cross-boundary switching time is not preferred as it will restrict both the last subframe/slot of the UE switching from and the first slot/subframe of the UE switching to.  **Proposal 1**: To eliminate the performance impact, it is proposed to place the switching time including transient periods in one separate slot between LTE subframe and NR slot. The separate slot is dedicated to the switching time with each transient period located at the head part and tail part of the slot. The switching period 120 us is placed within the slot excluding where the transient periods are located.  **Proposal 2**: To specify the time masks for the switching between LTE SL and NR SL in Figure 1 and Figure 2. |
| [**R4-2014415**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014415.zip) | CATT | CR for TS 38.101-3, Time mask for TDM between NR V2X and LTE V2X in ITS band |
| [**R4-2014416**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014416.zip) | CATT | CR for 38.886, Time mask for TDM between NR V2X and LTE V2X in ITS band |
| [**R4-2014641**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014641.zip) | Qualcomm | * For switching time, there are two options:   Option 1: Do not specify switching time requirement in RF   * [QC view] As explained above, RRM agreement requires UE to have one slot or one subframe scheduling restriction when performing the switch, specifying RF requirement with smaller switching time doesn’t improve system performance. RRM requirement is sufficient. * Our understanding is that note 2 in WF implies option 1: “The switching time in RF session is seemingly not a crucial issue because the switching time 150us is much less than one NR slot / LTE subframe. The switching time in RF session can be considered as satisfied when the scheduling restriction in RRM session applies.”   Option 2: Specify switching time requirement [in TR or TS]   * Switching time:   Option 2-1.1: 150us  Option 2-1.2: 210us   * Corresponding test   Option 2-2.1: Do not define RF test based on RF requirement, capture switching time in TR   * [QC view] Option 1 is preferred, but can compromise with option 2 with option 2-2.1. With option 2-2.1, both options 2-1.1 and option 2-1.2 are fine for us. * For switching position:   Option 1: Use agreed RRM requirement, up to UE implementation   * [QC view]: we support this option.   Option 2: Always in NR slot  Option 3: Always in LTE subframe  Option 4: Always in the RAT UE switches to  Option 5: Always in the RAT UE switches from |
| [**R4-2014971**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014971.zip) | vivo | **Observation 1**: NR V2X can also support basic safety services as well as advanced services.  **Proposal 1**: Send an LS to RAN1 for advice on the priority of LTE SL and NR SL transmission if no consensus is reached in this meeting.  **Observation 2**: The cross-boundary switching time can cause the waste of scheduling resources according to the scheduling restriction defined in RRM session.  **Observation 3**: The switching restriction defined in RRM session can cover the switching period time. However, the switching period position needs to be specified in RF session.  **Observation 4**: No need to consider this feature ‘Support of fewer than 14 consecutive sidelink symbols in a slot’ when defining switching requirement in ITS band.  **Proposal 2**: Option 2 is preferred. |
| [**R4-2015257**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015257.zip) | Xiaomi | **Proposal**: To agree the switching period location with the usage of priority determined by the SCI formats scheduling the transmission as following：  1, If the UE has known the priority of LTE sidelink and NR sidelink before the switching then the switching period can be located in the slot/sub-frame of the lower priority sidelink.  2, If the UE doesn’t know the priority of the two sidelink or the priority is the same, then it is up to UE implementation to chose where to locate the switching period. |
| [**R4-2015267**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015267.zip) | Xiaomi | CR for TS 38.101-3 switching period for V2X con-current operation |
| [**R4-2016475**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016475.zip) | Huawei, HiSilicon | **Observation 1**: No clear benefit for a longer switching time under the scheduling restriction condition.  **Observation 2**: The whole switching period together with transient period should be put on one side on LTE subframe or NR slot to avoid more wasted resource.  **Observation 3**: It’s not reasonable to put the switching period only at the NR V2X side.  **Observation 4**: Due to the scheduling restriction, no essential difference for options to put the switching period at either LTE sub-frame or NR slot.  **Proposal**: It is proposed to agree on the time masks for switching between E-UTRA SL and NR SL in the slot/SF on the RAT UE switches from. |
| [**R4-2016476**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016476.zip) | Huawei, HiSilicon | Correction CR to TS 38.101-3: NR-V2X con-current operation |

## Open issues summary

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

### Issue 1-1: switching period position

***Candidate options based on contributions in this meeting***

* ***Option 1****: The whole switching time including transient period should be placed at NR slot. (LGE R4-2014321)*
* ***Option 2****: The whole switching time including switching period as well as transient periods shall be placed at the previous E-UTRA sub-frame or NR slot (vivo R4-2014971, Huawei R4-2016475)*
* ***Option 3****: Determine the switching period location based on priority information (Xiaomi R4-2015257)*
* ***Option 4****: Decide switching position in RF session to inform to RRM session (LGE R4-2014321)*
* ***Option 5****: Leave to UE implementation (Qualcomm)*
* ***Option 6****: Place the switching time including transient periods in one separate slot between LTE subframe and NR slot. The switching period is placed within the separate slot excluding where the transient periods are located. (CATT R4-2014414)*

***Moderator’s recommendation:***

* Recommended WF
  + Focus on the options listed above and try to converge to a single option in this meeting
  + TBA based on 1st round discussion

### Issue 1-2: RF requirement

* ***Option 1****: Capture switching period placement (in which RAT) in RF requirement without switching and transient period (in ns) specified, but restrict the length within the allocated slot/subframe (Qualcomm R4-2014641).*
* ***Option 2:*** *Specify time mask with switching and transient period (in us) for switching between E-UTRA V2X SL and NR V2X SL*
* ***Option 3:*** *Do not**specify any RF requirements. Only need to inform to RRM session for the switching position of TDM operation between E-UTRA V2X SL and NR V2X SL.*

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on conclusion of issue 1-1.

## Companies views’ collection for 1st round

### Open issues

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| --- | --- |
| **Issues** | **Company Comments** |
| 1-1: Switching period position | LGE:  We prefer option1 and option4. I suggest to each company provide multiple preference.  And RAN4 can decide one option as majority view for the switching position.  Xiaomi:  For Option 1 and 2, as it is pointed out in our contribution, the priority of NR SL and LTE SL is not fixed. So it is not fare to always put the switching period in NR slot or in the previous slot of the switching.Option 4 seems to be a “to do” after we decide the requirement and we believe it is agreeable for the communication with RRM session.  Option 6 is a good point by indicating both transient period for LTE and NR can be located in one slot/sub-frame but it doesn’t solve the question how to choose the switching period location as in LTE or NR. This “all in one” method can be a complementary method when we decide the switching period position.  We would also like to give further clarification on option 3 as the switching period can be located based on the priority from SCI as indicated in TS 38.213. And if there is no priority information or the priority is the same for LTE and NR SL, it is up to UE implementation to choose where to locate the switching period.:  CATT: Prefer Option 6 and Option 1.  As pointed out by Xiaomi, there is no fixed priority between LTE V2X and NR V2X to indicate which RAT should be sacrificed more by the switching. The intention of Option 6 is to avoid further pursuing the priority between such two RATs and to figure out a fresh idea based on RRM agreements. Option 6 seems to be a much fairer solution in which both the performance of LTE V2X and NR V2X are not impacted. The detailed switch period position is not that important when placed in the separate slot excluding where the transient periods are located.  Vivo: Prefer Option 2.  For Option 1, about the priority issue between LTE SL and NR SL, we have discussed for several meetings and still have no consensus. It is suggested to send an LS to RAN1 about this issue.  For Option 3, we are not sure whether this priority information can apply to the switching case in RAN4. Still further check with RAN1 is needed.  For Option 4, we agree with the meaning of it. The switching period should be specified in RAN4. Only the switching restriction defined in RRM is not enough. As for Option 5, leaving the switching period to UE implementation is not acceptable to us. This may result different UEs have different switching period positions implementations.  For Option 6, we are confused. Which RAT does this separate slot belong to, LTE sidelink or NR sidelink? How does this separate slot mechanism work?  As for switching period time, it is not that important to agree on a specific value.  OPPO: Option 2 is simple way and also could avoid the debate on the priority, Option 3 is also a good idea if the priority indicated by SCI is doable in RAN4 requirements and the complexity in NW scheduling.  Huawei: Prefer Option 2.  For Option 1, in our understanding there is no higher priority for LTE SL than NR SL, if no consensus in RAN4, we are also fine to send an LS to RAN1 for clarification.  For Option 4, the common understanding is to determine the switching position in RF session, as RRM only defines switching to and switching from requirements.  Open to the idea that specifying the time mask requirement but no need to be verified due to the loose RRM requirement. |
| 1-2: RF requirement | Hold on the discussion of issue 1-2 until there is a conclusion of issue 1-1. |
| Others |  |

### 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.*

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| **CR/TP number** | **Comments collection** |
| [**R4-2014415**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014415.zip)  CR 38.101-3  CATT | Company A |
| Company B |
|  |
| [**R4-2014416**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014416.zip)  CR 38.886  CATT | Company A |
| Company B |
|  |
| [**R4-2015267**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015267.zip)  CR 38.101-3  Xiaomi | Company A |
| Company B |
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| [**R4-2016476**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016476.zip)  CR 38.101-3  Huawei | Company A |
| Company B |
|  |

## 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.*

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|  | **Status summary** |
| **Topic#1** | **Issue 1-1: Con-current operation definition**  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |
| #2 |  |  |

### CRs/TPs

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

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| **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)

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| **T-doc number** | **Company** | **Proposals / Observations** |
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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** |
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# Topic #2: Con-current band combination requirements

*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** |
| [**R4-2014321**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014321.zip) | LGE | UE-to-UE coexistence and other remaining issues for V2X operation |
| [**R4-2014322**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014322.zip) | LGE | MSD Analysis results and harmonic reduction filter for V2X\_20A\_n38A |
| [**R4-2014324**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014324.zip) | LGE | Correction on NR V2X inter-band con-current UE RF requirements in TS38.101-3 |
| [**R4-2014325**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014325.zip) | LGE | Correction on TR38.886 for V2X UE Tx and Rx requirements |
| [**R4-2014596**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014596.zip) | Qualcomm | General corrections for V2X sections in 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.*

### Issue 2-1: MSD for V2X\_20\_n38

***Proposals in R4-2014322***

***Proposal 1: RAN4 need to align the RF architecture for DC\_20\_n38 and V2X\_20\_n38. Based on the aligned RF architecture, RAN4 can decide the same additional ILs for both DC\_20\_n38 UE and V2X\_20\_n38 UE.***

***Proposal 2: RAN4 specify MSD levels for 10MHz CBW with 10.7dB = (10.3dB + 11.0dB)/2 based on shared antenna RF architecture with HTF for both DC\_20\_n38 UE and V2X\_20\_n38 UE.***

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion

### Issue 2-2: Spurious emission band UE co-existence for V2X UE

***Proposals in R4-2014324***

Table 6.5E.3.2.2-1: Requirements for inter-band con-current V2X operation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| V2X con-current operating band cofiguration | Spurious emission | | | | | | |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| V2X\_20\_n38 | E-UTRA Band 1, 3, 8, 22, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 68, 72, 74, 75, 76 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 38, 42, 52 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
| E-UTRA Band 20 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
| V2X\_n71\_47 | E-UTRA Band 5, 26, 53 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 41 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
| NR Band n47, n71, n77 | FDL\_low | - | FDL\_high | -38 | 1 | 2 |
|  |  |  |  |  |  |  |
| Frequency range | 5925 | - | 5950 | -30 | 1 | 3, 4 |
| Frequency range | 5815 | - | 5855 | -30 | 1 | 3 |

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion

### Issue 2-3: General correction of NR-V2X

***General corrections for V2X sections in 38.101-3 (******R4-2014596)***

* *Some NR V2X section numbers have been denoted with suffix C. It was agreed that all NR V2X sections numbers will be denoted with suffix E. Also, in some instances the cross-referencing between NR V2X sections in 38.101-3 and 38.101-1 is not correct and needs to be fixed.*

***Moderator’s recommendation:***

* Recommended WF
  + Agree with the correction CR

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Issues** | **Company Comments** |
| 2-1: MSD for V2X\_20\_n38 | LGE: we need to align the RF architecture between DC\_20A\_n38A and V2X\_20A\_n38A UE.  And the MSD level 10.7 dB (average MSD value) is applied to both DC\_20\_n38 UE and V2X\_20\_n38 UE.  Xiaomi: We prefer not to touch the DC\_20A\_n38A as already agreed MSD level.  CATT: We share the similar view with Xiaomi to not touch the MSD level for DC\_20A\_n38A. The MSD level for V2X\_20\_n38 can be specified based on the potential RF architecture.  OPPO: Similar discussion happens in email thread [116] Issue 3-2-1, triggered by R4-2014317 and R4-2014318. Hope same conclusion could be drawn.  Huawei: It would be better to align the architecture assumption for DC\_20A\_n38A and V2X\_20A\_n38A. Averaged MSD is ok for us. |
| 2-2: Spurious emission band UE co-existence for V2X UE | LGE: proposed Table 6.5E.3.2.2-1 will be decided for the protect band lists for V2X\_n71\_47 UE and V2X\_20\_n38 UE.  CATT: Support the correction on the protected bands. To LGE, could you check if band 53 for V2X\_n71\_47 should be protected?  Huawei: the changes are based on the principle of common set for the two bands. If some bands need to be considered additionally, the basic issue is to check the protected bands for single NR band. |
| 2-3: General correction of NR-V2X | LGE support the CR to correct suffix “E” for V2X con-current operation.  Xiaomi: The CR looks fine.  CATT: Ok with this CR.  Huawei: OK with the CR. |
| Others |  |

### 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** |
| [**R4-2014325**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014325.zip)  CR 38.886  LGE | Company A |
| Company B |
|  |
| [**R4-2014324**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014324.zip)  CR 38.101-3  LGE | Company A |
| Company B |
|  |
| [**R4-2014596**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014596.zip)  CR 38.101-3  Qualcomm | Company A  Vivo: agree with this CR. |
| Company B |
|  |
|  |

## 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** |
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*Suggestion on WF/LS assignment*

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

### CRs/TPs

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

|  |  |
| --- | --- |
| **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)

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
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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*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
|  |  |