**3GPP TSG-RAN WG4 Meeting #94-e R4-200xxxx**

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

**Agenda item: 8.4.5**

**Source: Moderator (LG Electronics)**

**Title:** Email discussion summary for RAN4#94e\_#51\_5G\_V2X\_NRSL\_RRM\_Part\_1

**Document for:** Information

# Introduction

In this e-mail discussion following open issues will be discussed for NR V2X RRM in yellow-highlighted agenda below.

* 8.4.5 RRM core requirements (38.133) [5G\_V2X\_NRSL-Core]
	+ 8.4.5.1 Transmit timing requirements [5G\_V2X\_NRSL-Core]
	+ 8.4.5.2 Synchronization requirements [5G\_V2X\_NRSL-Core]
	+ 8.4.5.3 Measurement requirements [5G\_V2X\_NRSL-Core]
	+ 8.4.5.4 Interruption requirements [5G\_V2X\_NRSL-Core]
	+ 8.4.5.5 Unicast, groupcast related [5G\_V2X\_NRSL-Core]
	+ 8.4.5.6 Others [5G\_V2X\_NRSL-Core]

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

* 1st round: Focus remaining issues in following Topics and makes tentative agreements
	+ Topic #1: Transmit timing requirements
		- CR comment collection
			* 12.1 Introduction & 12.8 Reliability of GNSS signal(R4-2000943)
			* 12.2 UE Transmit Timing (R4-2001575)
	+ Topic #2: Synchronization requirements
		- 2-1 : Rx Dropping Rate for selection/reselection of NR V2X synchronization reference source
		- 2-2 : Ping-Pong effect when gNB is timing reference source
		- 2-3 : S-RSRP measurement for initiation/cease SLSS transmissions
			* 2-3-1 : Side condition of S-RSRP measurement for initiation/cease SLSS transmissions
			* 2-3-2 : Terminology ‘S-RSRP’ vs ‘PSBCH-RSRP’
		- 2-4 : Terminology ‘V2X’ vs ‘SideLink’ in Rel-16 RAN4’s all requirements
		- 2-5 : CR for 12.4 Selection / Reselection of V2X Synchronization Reference Source
		- CR comment collection
			* 12.3 Initiation/Cease of SLSS Transmissions(R4-2001032)
	+ Topic #3: Unicast, groupcast related
		- 3-1 : Distance-based HARQ feedback option 1
		- 3-2 : Sidelink RLM requirement
	+ Topic #4: Others(Annex for side condition)
		- 4-1 : Annex.B.4 for NR V2X RRM side conditions
* 2nd round: TBA

# Topic #1: Transmit timing 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** |
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## Open issues summary

## Companies views’ collection for 1st round

### Open issues

### 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** |
| R4-2000943 | Ericsson: Depending on whether or not band combinations are agreed, the note related to “PCell on WAN” carrier needs to be updated. |
| LG : Regarding 2nd round RF session’s draft WF(currently compromised version below), it’s better to keep. * **WF:** Create generic requirements for these cases in Rel16 timeframe (by June 2020)
	+ NR Uu + NR SL (1st priority)
	+ LTE Uu + NR SL (1st priority)
	+ NR Uu + LTE SL (2nd priority, depend on RAN1/RAN2 specification progress)
	+ LTE/NR Uu + LTE SL + NR SL (2nd priority, depend on RAN1/RAN2 specification progress and discussion on slide 5)
		- LTE SL and NR SL on same unlicensed band
 |
|  |
| R4-2001575 | Ericsson: We have concern on this CR as it introduces requirements related to gNB/eNB for which there are no supporting band combination agreed in RF yet. One option is to exclude section 12.2.3 and 12.2.4, in this case this CR can be approved. |
| LG : Regarding 2nd round RF session’s draft WF(currently compromised version below), there is no problem to keep 12.2.3 and 12.2.4. |
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## Summary for 1st round

### Open issues

### 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**  |
| R4-2001575 | *Agreeable based on no objection in 1st round* |
| R4-2000943 | *To be revised, based on 1st round comment on issue 2-5 (add 12.4 Selection / Reselection of V2X Synchronization Reference Source based on the endorsed draft CR(R4-1915922) in RAN4#93)*  |

## Discussion on 2nd round (if applicable)

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
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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”* |

# Topic #2: Synchronization 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** |
| R4-2000768 | Qualcomm | Proposal 1: Set the following requirement for NR-V2X synchronization source search:* When GNSS synchronization reference source is configured as the highest priority, and UE is not synchronized to any of the following sources (1) GNSS (2) a SyncRef UE that is synchronized to GNSS directly or in-directly
* UE is allowed to drop up to 2 slots of its V2X data reception per PSBCH monitoring occasion and overall drop rate shall not exceed 0.2% of its V2X data reception during Tdetect,SyncRef UE\_V2X for the purpose of selection / reselection to the SyncRef UE
* When serving cell/PCell synchronization reference source is configured as the highest priority
* UE is allowed to drop up to 2 slots of its V2X data reception per PSBCH monitoring occasion and overall drop rate shall not exceed 0.2% of its V2X data reception during Tdetect,SyncRef UE\_V2X for the purpose of selection / reselection to the SyncRef UE

Proposal 2: The following limitations should be considered when designing the test to verify Rx dropping requirement:* Interruption due to AGC gain state change: if receive power from new synchronization source is much different from the simultaneously received data, gain state adjustment for S-SSS and PSBCH decoding might be needed, which can introduce interruption to SL data reception.
* Decoding capability: when UE is required to simultaneous detect/decode SLSS while decoding data on SL, the number of SL decoding that UE can support might be reduced.
* Prior knowledge on frequency domain: if UE needs to search for SyncRef UEs on both frequency and time domain (for asynchronized SyncRef UEs), S-PSS/S-SSS may take too much computation resources and may interrupt demodulation functions. However, since we consider n47 band only in Rel-16, as long as the UE is currently communicating with another SL UE, it has full knowledge of carrier frequency to correct its XO drift

Observation 1: With 5% false alarm rate, Rx dropping rate during 8 second detection time is 0.2%. |
| R4-2000770 | Qualcomm | Proposal 1: No additional handling is needed for decision of initiation/cease of SLSS Tx to avoid ping-pong between gNB synchronization sourceProposal 2: Follow LTE to apply side conditions from Uu cell (re)selection to SL synchronization source measurement when gNB is the synchronization sourceProposal 3: Follow LTE to apply side conditions from SyncRef UE selection/reselection to SL synchronization source measurement when SyncRef UE is the synchronization source |
| R4-2001027 | MediaTek inc. | Proposal 1: Use terminology ‘sidelink’ to replace ‘V2X’ in all RAN4’s sidelink requirementProposal 2: Similar to NR IDLE mode, the measurement margin should be introduced when reselecting the sync. reference source and initiation of SLSS transmission.Proposal 3: UE is allowed to drop up to 2 slots of its V2X data reception per PSBCH monitoring occasion and overall drop rate shall not exceed [0.3%] of its V2X data reception during Tdetect,SyncRef UE\_V2X for the purpose of selection / reselection to the SyncRef UE. Tdetect,SyncRef UE\_V2X is defined as follow

|  |  |
| --- | --- |
| SCS(KHz) | Tdetect,SyncRef UE\_V2X(s) |
| 15 | 8 |
| 30 | 4 |
| 60 | 2 |
| 120 | 1 |

Proposal 4: The same side conditions -6dB as NR Uu and LTE V2X measurements shall be used in NR sidelink.Observation 1: From RAN4’s view, the measurement uncertainty will result in ping-pong initiation of SLSS transmissionObservation 2: In NR IDLE mode, a measurement margin is added to the RSRP velue to avoid the ping-pong selection between serving cell and target best cell.Observation 3: In LTE V2X, 2 subframes data reception dropping is permitted when UE is monitoring the PSBCH of potential SyncRef source. |
| R4-2001576 | Huawei | Proposal 1: The UE is allowed to drop up to 2 slots of its V2X data reception per PSBCH monitoring occasion for SyncRef UE identificationProposal 2: The side condition of S-RSRP measurement for initiation/cease SLSS transmissions is defined as -6dB |
| R4-200939 | LG Electronics | Proposal 1: Do not specify Ping-Pong effect for transmitting SLSS when gNB is timing reference sourceProposal 2: UE is allowed to drop up to 2 slots of its V2X data reception per PSBCH monitoring occasion.Proposal 3: Reuse -6dB same as LTE-V2X for SL-RSRP related side condition |
| R4-200940 | LG Electronics | Proposal 1: Replace S-RSRP with PSBCH-RSRP.Proposal 2: Reuse -6dB same as LTE-V2X for PSBCH-RSRP side condition. |

## 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 2-1

*Sub-topic description:* Rx Dropping Rate for selection/reselection of NR V2X synchronization reference source

RAN4#93 agreements:

* UE is allowed to drop up to X slots of its V2X data reception per PSBCH monitoring occasion and overall drop rate shall not exceed Y% of its V2X data reception during Tdetect,SyncRef UE\_V2X for the purpose of selection / reselection to the SyncRef UE
* Y = [0.3]
* Define X value in next meeting

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

**Issue 2-1: Rx drop rate for selection/reselection of NR V2X synchronization reference source**

* Proposals

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| --- | --- | --- | --- | --- |
|  | X (slots) | Y(%) | SCS(kHz) | Tdetect,SyncRef UE\_V2X(sec) |
| Option 1 | 2 | 0.3 | 15/30/60 | 8/8/8 |
| Option 2 | 2 | 0.3 | 15/30/60 | 8/4/2 |
| Option 3 | 2 | 0.2 | 15/30/60 | 8/8/8 |
| Option 4 | 2 | 0.2 | 15/30/60 | 8/4/2 |

* Recommended WF
	+ TBA

### Sub-topic 2-2

*Sub-topic description:* Ping-Pong effect when gNB is timing reference source

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

**Issue 2-2: Ping-Pong effect when gNB is timing reference source**

* Proposals
	+ Option 1: Not specify related RRM requirement
	+ Option 2: Specify related RRM requirement
* Recommended WF
	+ TBA

### Sub-topic 2-3

*Sub-topic description:* S-RSRP measurement for initiation/cease SLSS transmissions

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

**Issue 2-3-1: Side condition of S-RSRP measurement for initiation/cease SLSS transmissions**

* Proposals
	+ Option 1: Reuse -6dB same as LTE-V2X
* Recommended WF
	+ Reuse -6dB same as LTE-V2X

**Issue 2-3-2: Terminology ‘S-RSRP’ vs ‘PSBCH-RSRP’**

* Proposals
	+ Option 1: Replace S-RSRP with PSBCH-RSRP
* Recommended WF
	+ Replace S-RSRP with PSBCH-RSRP

### Sub-topic 2-4

*Sub-topic description:* Terminology V2X vs SideLink

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

**Issue 2-4: Terminology ‘V2X’ vs ‘SideLink’ in Rel-16 RAN4’s all requirements**

* Proposals
	+ Option 1: use V2X
	+ Option 2: use SideLink instead of V2X
* Recommended WF
	+ TBA

### Sub-topic 2-5

*Sub-topic description:* Related CR

In RAN4#93 meeting, draft CR(R4-1915922(QC)) was endorsed. Based on it, CR needs to be requested.

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

**Issue 2-5: CR for 12.4 Selection / Reselection of V2X Synchronization Reference Source**

* Proposals
	+ Option 1: Request CR based on endorsed draft CR(R4-1915922) and agreement of Rx dropping(Issue2-1) for 2nd Round Email discussion.
* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

**Issue 2-1: Rx drop rate for selection/reselection of NR V2X synchronization reference source**

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| **Company** | **Comments** |
| MTK | It is suggested to re-use the dropping rate of legacy LTE V2X because there is no difference for PSBCH decoding and data reception between LTE and NR V2X. Considering the different numerology, it’s better to extend the LTE V2X requirement (which is based on 15KHz SCS) with the same dropping rate but shorten the overall evaluation time. Thus, our suggestion is Option 2. |
| CATT | Support option 1 |
| LG | Preference is Option2 |
| QC | We can support option 1. Comment for option 2: T\_detect also determines Tx dropping rate, have to keep it as 8 seconds. |
| Huawei | Support option 1.Tdetect,SyncRef UE\_V2X is defined as the SyncRef UE detection time, which shall not be scaled by SCS. |
| LG | Option 1 is acceptable  |
| MTK | In our understanding, if we define Tdetect=8s for both SCS=15KHz and SCS=60KHz, it means the total number of slots will be 8000 and 32000 slots. Considering the dropping rate will always be 0.3%, it means the dropping slots will be 24 and 96. However, the SLSS periodicity is always 160ms for both SCS=15KHz and SCS=60KHz, it means the number of PSBCH collision is the same for different SCS. Could any company explain why to choose different dropping slot number for different SCS cases?  |
| LG | How about 24 slots during Tdetect=8s for SCS=15kHz, 30kHz and 60kHz ? |
| QC | Our analysis is from false alarm rate perspective, in 160ms period, if slot-based detection is used, with the same false alarm rate, 30kHz SCS has twice number of slot than 15kHz SCS, therefore twice number of slots are being decoded for PSBCH, then we end up with the same dropping rate. Hence, we still support 0.3% dropping rate as LTE. |

**Issue 2-2: Ping-Pong effect when gNB is timing reference source**

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| **Company** | **Comments** |
| MTK | The reason why UE can avoid the ping-pong affection in gNB deployment is the measurement margin is added.In IDLE mode inter-frequency, there is an additional margin already added for both relative and absolute accuracy.

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| 4.2.2.4….the reselection criteria is met by a margin of at least 5 dB in FR1 or 6.5 dB in FR2 for reselections based on ranking or 6 dB in FR1 or 7.5 dB in FR2 for SS-RSRP reselections based on absolute priorities or 4 dB in FR1 and 4 dB in FR2 for SS-RSRQ reselections based on absolute priorities. |

 |
| CATT | Support option 1 |
| LG | Preference is Option 1(Not specify related RRM requirement) |
| QC | We support option 1, do not introduce margin. Handover ping pong in Uu has much larger system performance impact than initiation/cease of SLSS Tx. With the requirement agreed in previous meeting, UE can take up to 10 measurement to average, ping-pong happens only when SNR is right one the threshold and SNR still fluctuate with 10 measurement average. From channel statistic perspective, 400ms is much larger than coherence time in vehicular scenario, 10 measurement average is more than enough to prevent fluctuation. We can’t guarantee that ping-pong doesn’t happen, but since the system performance impact is small, we don’t think it worth the implementation complexity to add the margin. |
| Huawei | Support option 1.Keep the same processing as LTE V2X, and not specify related RRM requirement. |
| Ericsson | RRM requirements for V2X involving NR or LTE bands for Uu shall only be defined provided corresponding band combinations are supported in the UE RF specification (TS 38.101-1/38.101-3). No band combinations are defined for supporting such scenario in the UE RF specifications. Therefore RAN4 shall not define any requirements related to gNB/eNB. Thus the CRs should be revised accordingly. |
| MTK | To QC, if we base on the requirement for 10 shots measurement, it’s correct to prevent fluctuation, but it imply that all the UEs shall execute the SLSS transmission based on this minimum requirement defined in RAN4. This is unfair to the UE which can do fast. If the UE measure faster, it will have much opportunity suffering the Ping-Pong issue. We don’t think this is reasonable. In legacy LTE and NR Uu, or even in 3G, this margin solution is already there. We don’t see any technically reason to preclude this. |
| LG | In IDLE mode inter-frequency, reselection is considered based on 2 cells. But, in V2X, UE consider only single serving cell’s RSRP. Ping pong is not necessary to be considered in V2X. |

**Issue 2-3-1: Side condition of S-RSRP measurement for initiation/cease SLSS transmissions**

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| **Company** | **Comments** |
| MTK | Reuse -6dB same as LTE-V2X |
| CATT | -6dB |
| LG | Reuse -6dB same as LTE-V2X |
| QC | WF of following LTE V2X is agreeable to us |
| Huawei | Reuse -6dB same as LTE-V2X |

**Issue 2-3-2: Terminology ‘S-RSRP’ vs ‘PSBCH-RSRP’**

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| **Company** | **Comments** |
| MTK | RAN1 hasn’t finished the final definition of SSB-RSRP. Based on RAN1 FL, this issue will be discussed in this RAN1. Thus, it is suggested RAN4 don’t need to make any change so urgent. Just wait RAN1’s final agreement.

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| RAN1 FL comments:* Okay, will capture the SSB-RSRP measurement as an open issue for further discussion during the following meetings.
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| CATT | Question for clarification:There is no S-RSRP definition?S-RSRP is measured on SSSS signal? PSBCH-RSRP is measured on DMRS signal? |
| LG  | Currently, according to RAN1 agreements, NR SL related RSRP and RSSI were defined as belowPSBCH-RSRP (based on PSBCH DMRS)PSSCH-RSRP (based on PSSCH DMRS)PSCCH-RSRP (based on PSCCH DMRS)SL-RSSILTE V2X S-RSRP is based on PSBCH DMRS. The terminology ‘S-RSRP’ needs to be replace with ‘PSBCH-RSRP’ based on the current RAN1 definition. |
| QC | Need more discussion, but suggest to focus on other more critical issue than terminology |
| Huawei | Align with RAN1’s definition in TS38.215 when it has been finalized. |
| MTK | RAN1 didn’t have final decision on whether use SSSS or PSBCH DMRS to calculate the SSB-RSRP.We suggest to wait the final agreement from RAN1, otherwise, we had to change again and again.Technically, the performance of using SSSS to calculate the RSRP is enough (already evaluated by simulation). Using PSBCH just result in over design in UE side. |

**Issue 2-4: Terminology ‘V2X’ vs ‘SideLink’ in Rel-16 RAN4’s all requirements**

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| **Company** | **Comments** |
| MTK | It’s better to follow RAN1. |
| CATT |  No strong view |
| LG | Preference is Option1(V2X), because this Rel-16 WI is 5G V2X and ‘V2X’ is aligned with LTE V2X in RAN4 specification. It should be discussed with RF session together. |
| QC | Need more discussion, but suggest to focus on other more critical issue than terminology |
| Huawei | We suggest to use the terminology “V2X sidelink” in R16 NR V2X requirements, which is the same terminology used in LTE V2X requirements. |
| Ericsson | Follow LTE approach, see section 13 in TS 36.133. |
| MTK | Agree with QC. We can at first focus on more critical issue. For the terminology, we can further check and wait other WG’s spec. If RAN1 and RAN2 change the terminology, we don’ think RAN4 will follow the old way. |

**Issue 2-5: CR for 12.4 Selection / Reselection of V2X Synchronization Reference Source**

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| **Company** | **Comments** |
| LG | There are 2 options to cover the missed CR for 12.4. Option1 is to request new CR for it in second round.Option 2 is to add this section in LG’s CR and to revise the LG’s CR. |
| QC | Both are fine for us, thanks for the help |
| LG | With Option2, we’ll revise our CR. For it, we request revision T-doc number.  |

### 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** |
| R4-2001032 | LG : need editorial change1. Replace S-RSRP with PSBCH-RSRP
2. Correct referenced section number below : 13.4🡪12.4

- S-RSRP related side conditions given in Section 13.4 for a corresponding Band are fulfilled,1. Annex [B.6.4] 🡪 Annex[B.4]
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## 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**  |
| **Issue 2-1** | *Candidate options:** *Option 1 : CATT, LG, QC, Huawei*
* *Option 2 : MTK*

*Tentative agreements : Option 1(X=2slots, Y=0.3%, Tdetect,SyncRef UE\_V2X = 8sec for FR1 all SCS)**Recommendations for 2nd round: Decide one option between option1 and option 2* |
| **Issue 2-2** | *Candidate options:** *Option 1 : CATT, LG, QC, Huawei*
* *Option 2 : MTK*

*Tentative agreements: Option 1(Not define related RRM requirement)**Recommendations for 2nd round: Decide one option between option1 and option 2* |
| **Issue 2-3-1** | *Tentative agreements: Reuse -6dB same as LTE-V2X**Recommendations for 2nd round: no further discussion* |
| **Issue 2-3-2** | *Tentative agreements: Align with RAN1’s definition in TS38.215 when it has been finalized**Recommendations for 2nd round: Continue after RAN1’s definition is finalized* |
| **Issue 2-4** | *Tentative agreements: Focus on other more critical issue than terminology* *Recommendations for 2nd round: no further discussion* |
| **Issue 2-5** | *Tentative agreements: Revise LG’s CR(R4-200943) to add 12.4 Selection / Reselection of V2X Synchronization Reference Source based on the endorsed draft CR(R4-1915922) in RAN4#93**Recommendations for 2nd round: Collect comments for revised CR* |

*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**  |
| R4-2001032 | *To be revised based on 1st round of comments collection* |

## Discussion on 2nd round (if applicable)

### Open issues

**Issue 2-1: Rx drop rate for selection/reselection of NR V2X synchronization reference source**

*Candidate options:*

* *Option 1 : CATT, LG, QC, Huawei*
* *Option 2 : MTK*

*1st round tentative agreements: Option 1(X=2slots, Y=0.3%, Tdetect,SyncRef UE\_V2X = 8sec for FR1 all SCS)*

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| **Company** | **Comments** |
| LG | We’ve same view with QC’s 1st round comment. |
| MTK | 1. We want to further clarify the scenario in this requirement:

When we discuss this Rx dropping requirement, it means the new SyncRef UE is not aligned with communication UE in time domain. It implies that SL UE shall stay on an async. network. Based on our understanding, we had precluded the async. scenario discussion in RRM. So how does this scenario happen?1. If agreed on async. scenario communication and this scenario happened. For example, UE 1 is communicating with UE 2. If UE 1 want to detect a new async source(this will result in Rx dropping), then UE1 will lost the communication with UE 2 because UE2 doesn’t know the information of new sync source timing from UE1. So what’s the usage for this requirement?

Since Ericsson proposed that RF session still not agree on SL+Uu band combination, a new Issue 2-2-1 is added. We suggest we shall add some prerequisites to say that “If RF session agrees on the SL+Uu band combination, then we can agree on …” to move forward. |
| CATT | Support option 1 |
| Huawei | Support option 1.To MTKAccording to my understanding, UE has not been prohibited to identify a detectable SyncRef UE which is asynchronous with the timing reference source. Besides, the Rx dropping rate is very small, (<=0.3%), which is acceptable for LTE V2X and can also be acceptable for NR V2X. |
| MTK | To Huawei,In our example, if UE1 can identify and reselect to an async. timing reference source, but UE2 doesn’t know the information of new sync source timing from UE1. Then UE1 cannot communicate with UE2(because of the timing mismatch). The total communication link will be dropped. So why we need to discuss the Rx dropping rate? |

**Issue 2-2: Ping-Pong effect when gNB is timing reference source**

*Candidate options:*

* *Option 1 : CATT, LG, QC, Huawei*
* *Option 2 : MTK*

*1st round tentative agreements: Option 1(Not define related RRM requirement)*

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| **Company** | **Comments** |
| MTK | To LG,We have already captured the requirement in IDLE mode inter-frequency in our 1st round comments.We captured again the requirement in NR Uu and highlight the absolute accuracy part which is related to comparison with a threshold. In our analysis, this threshold can make the overall performance more robust. We don’t see any technical reason to preclude this proposal which is the same as NR Uu.

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| 4.2.2.4….the reselection criteria is met by a margin of at least 5 dB in FR1 or 6.5 dB in FR2 for reselections based on ranking or 6 dB in FR1 or 7.5 dB in FR2 for SS-RSRP reselections based on absolute priorities or 4 dB in FR1 and 4 dB in FR2 for SS-RSRQ reselections based on absolute priorities. |

To Ericsson,Since Ericsson proposed that RF session still not agree on SL+Uu band combination, a new Issue 2-2-1 is added. We suggest we shall add some prerequisites to say that “If RF session agrees on the SL+Uu band combination, then we can agree on …” to move forward. |
| CATT | Prefer option 1 |
| LG | Even though LTE has comparison with a threshold in IDLE mode, LTE-V2X did not consider it. Because comparison is done between serving cell and neighboring as below figure in LTE. However, LTE-V2X is under only serving cell.4.2.2.4 in TS36.133the reselection criteria is met by a margin of at least 5dB for reselections based on ranking or 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities. |
| Ericsson | To the option from Mediatek (issue 2-2-1), it is not an option. It should apply to all parts of requirements that relates to gNB and eNB. Small change to this option:  *“*Define any requirements related to gNB/eNB only after corresponding band combinations are supported in the UE RF specification (TS 38.101-1/38.101-3). Thus the CRs should be revised accordingly.”  |
| MTK | To LG, We agree on your explanation for comparison between serving cell and neighboring cells(equal priority scenario).However, in inter-frequency measurement, it still has another comparison is to a threshold only(see highlight below), not to other cells(higher priority scenario), just a threshold.

|  |
| --- |
| 5.2.4.5 TS 36.304If *threshServingLowQ* is provided in *SystemInformationBlockType3* and more than 1 second has elapsed since the UE camped on the current serving cell, cell reselection to a cell on a higher priority E-UTRAN frequency or inter-RAT frequency than the serving frequency shall be performed if:- A cell of a higher priority EUTRAN, NR or UTRAN FDD RAT/ frequency fulfils Squal > ThreshX, HighQ during a time interval TreselectionRAT; or- A cell of a higher priority UTRAN TDD, GERAN or CDMA2000 RAT/ frequency fulfils Srxlev > ThreshX, HighP during a time interval TreselectionRAT.…Cell reselection to a cell on an equal priority E-UTRAN frequency shall be based on ranking for Intra-frequency cell reselection as defined in sub-clause 5.2.4.6. |

This aligns the requirement in TS36.133(highlight below).

|  |
| --- |
| 4.2.2.4 in TS36.133the reselection criteria is met by a margin of at least 5dB for reselections based on ranking or 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities. |

 |
| LG | To MTK, Thank you for explanation. As you mentioned, higher priority is for reselection to other frequency cell than serving cell frequency. Initiation/cease of SLSS transmission is done based on just serving cell’s RSRP.  |
| Huawei | We support option 1. |

**Issue 2-2-1: Any requirements related to gNB/eNB**

*Candidate options*

* *Option 1 :* Define any requirements related to gNB/eNB
* *Option 2 :* Define any requirements related to gNB/eNB after corresponding band combinations are supported in the UE RF specification (TS 38.101-1/38.101-3). Thus the CRs should be revised accordingly.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| LG | In RF session, some operators provided SL+Uu band combination and related WF and CR have been discussed. Regarding these, RRM session needs to include any requirements related to gNB/eNB.  |
| QC | 1. In absence of agreed band combination doesn’t prevent SL UE from using Uu as synchronization source, as long as Uu and SL are not transmitting data simultaneously. So far the discussion in RRM is focusing on eNB/gNB as a synchronization source, not data source, except interruption on Uu link requirement. The requirement related to using gNB/eNB as synchronization sources can be introduced.
2. For requirements related to the scenario with data transmission on both Uu and SL, since operators are proposing SL+Uu band combinations in RF session (e.g., R4-1915419 from Vodafone), the requirements should also to be included.
 |
| MTK | Generally, we agree with Ericsson’s rule in defining RRM requirement following RF’s agreement, but from LG’s information, RAN4 RF session already have the discussion on SL+Uu band combination.Thus, we suggest RRM session can continue our discussion and add some prerequisites to say that “If RF session agrees on the SL+Uu band combination, then RRM session can agree on …” to move forward.To QC,We think whether band combination prevents SL UE from using Uu as synchronization source or not is also a RF session’s issue. (If RF session agrees on NR SL only, we think there is also no gNB/eNB sync. source.) We suggests to pending on the discussion in RRM session and wait on RF session’s progress. We can continue our discussion with some prerequisites, otherwise we cannot finish the RRM spec. on time. |
| CATT | gNB or eNB using as synchronization source does not depend on the band combination. Similar to LTE V2X, RRM requirements defined for LTE V2X only applies to single SL carrier or SL CA. There is no SL+Uu band combination, but eNB can be used as the synchronization source. So, there is no need to discuss whether gNB or eNB can be used as synchronization source.Regarding SL+Uu band combination is introduced in RF session, I think this is the case that V2X UE can schedule data on both Uu and SL. For this case, we prefer not to define RRM requirement due to time limit. |
| Ericsson | This new issues should not be an option. It should apply to all parts of requirements that relates to gNB and eNB. Small change to this option:  *“*Define any requirements related to gNB/eNB only after corresponding band combinations are supported in the UE RF specification (TS 38.101-1/38.101-3). Thus the CRs should be revised accordingly.” Once the band combinations are agreed, we are fine to define the requirements related to gNB/eNB.  |
| LG | Regarding 2nd round RF session’s draft WF(currently compromised version below), there is no problem for RRM to include gNB/eNB as synchronization source . * **WF:** Create generic requirements for these cases in Rel16 timeframe (by June 2020)
	+ NR Uu + NR SL (1st priority)
	+ LTE Uu + NR SL (1st priority)
	+ NR Uu + LTE SL (2nd priority, depend on RAN1/RAN2 specification progress)
	+ LTE/NR Uu + LTE SL + NR SL (2nd priority, depend on RAN1/RAN2 specification progress and discussion on slide 5)
		- LTE SL and NR SL on same unlicensed band
 |
| QC | We agree with CATT’s view. Use gNB/eNB as synchronization source and transmitting data on Uu link are completely different operations. Requirement related to gNB/eNB as synchronization source should be specified, but requirement related to transmission on Uu link to gNB/eNB can be pushed out from this release.When SL UE only uses gNB/eNB as synchronization source, it only receives/detect signal on the Uu band, an Rx-only function, it doesn’t transmit anything on the Uu band. In this case, no band combination is needed. In fact, an SL UE uses GNSS as synchronization source while there is a gNB or eNB transmitting SSB next to the SL UE is exactly the same as an SL UE uses that SSB from eNB or gNB as synchronization source from RF activity point of view. Therefore, requirement related to gNB/eNB as synchronization source should be specifiedHowever, for requirement involving transmission on Uu link, we can agree to not defining requirement in this release due to lack of agreed band combination. |
| Huawei | We support option 1.Currently, RAN4 assume that UE has separate Tx/Rx chains for SL operation and Uu operation. Based on this assumption, it is sufficient to discuss RRM requirement for NR V2X even without inputs of SL+Uu band combination from RF session. V2X RRM requirements for gNB/eNB as synchronization source do not rely on SL+Uu band combinations. Besides, most RRM requirements related to gNB/eNB as synchronization source have achieved the agreements.  |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2002229 | Ericsson: CR to be reviewed as this revision has been sent out for review. |
|  |
|  |
| R4-2002228 | Ericsson: CR to be reviewed as this revision has been sent out for review. |
| LG : This revision is to make consensus through review. |
|  |

## 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**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #3: Unicast, groupcast related

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000769 | Qualcomm | Proposal 1: Introduce the following requirement for distance-based HARQ feedback option 1:* NACK based PFSCH demod requirement: under FRC with MCS x, SL Rx UE has decoding failure rate > y % when SNR is z dB.
* When groupcast HARQ feedback option 1 is configured, the Rx UE shall be capable of extract the Tx Zone ID and communication range from successfully decoded SCI, compare the Rx UE’s own Zone ID with Tx Zone ID to derive the distance, and compare the distance with communication range to decide whether to transmit NACK when the receiver UE fails to decode the corresponding data.
* Test requirement: Set SNR as z dB. With performance requirement of decoding failure rate > y%, when Rx UE is inside the communication range, the NACK transmission rate should be > y%; on the other hand, when Rx UE is outside of the communication range, the NACK transmission rate should be 0%.

Proposal 2: Introduce the following test procedure and requirement to verify distance-based HARQ procedure:* 1. Initially, Tx UE and Rx UE are within communication range. Only two SL UEs (Tx and Rx) are in the system, TE emulates the Tx SL UE.
* 2. T1: Tx UE transmission to Rx UE is with good SNR and low MCS, Rx can successfully decode both SCI and data. Requirement in T1: no feedback is sent.
* 3. T2: Tx UE transmission to Rx UE is with SNR z dB and x MCS, Rx can successfully decode SCI but fails to decode data. Requirement: NACK is sent with rate > y%.
* 4. T3: TE changes Tx UE Zone ID, now Tx UE and Rx UE are out of communication range. Tx UE transmission to Rx UE is with SNR z dB and MCS x, same as T2, Rx UE can successfully decode SCI but fails to decode data. Requirement: no feedback is sent

Observation 1: Requirement and corresponding test for this HARQ feedback mechanism is needed to ensure UE follows HARQ feedback procedures to avoid too many simultaneous transmissionsObservation 2: The following feedback actions are taken in different cases when implementing distance-based HARQ feedback option 1:* When receiver UE successfully decodes the data, no feedback is transmitted, since option 1 is configured.
* When receiver UE fails to decode the data, and receiver UE and transmitter UE are within communication range, NACK is transmitted on PSFCH.
* When receiver UE fails to decode the data, and receiver UE and transmitter UE are outside of communication range, no feedback is transmitted.
 |
| R4-2001030 | MediaTek | Proposal 1: RAN4 doesn’t define core requirement for HARQ feedback on sidelink and HARQ feedback on uplink, but RAN4 can discuss whether and how to define the Demod test cases to verify these proceduresProposal 2: RAN4 won’t define sidelink RLM requirement on R16 if RAN1/RAN2 cannot finalize the sidelink RLM procedure before April’s meeting.Observation 1: RAN1 had introduced the new HARQ procedure on sidelink for groupcast, unicast sidelink communication.Observation 2: RAN1 had introduced the new HARQ procedure on Uu uplink for groupcast, unicast sidelink communication in NR sidelink mode 1 UE |
| R4-2000939 | LG Electronics | Proposal 5: Specify RRM requirements for Tx-Rx distance based HARQ feedback for groupcast with general behavior. |

## 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 3-1

*Sub-topic description:* Distance-based HARQ feedback option 1

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

**Issue 3-1: Distance-based HARQ feedback option 1**

* Proposals

|  |  |  |  |
| --- | --- | --- | --- |
|  | RRM core | RRM TestCase | Demod. TestCase |
| Option 1 | Define | Define | Define |
| Option 2 | Not Define | Define | Define |
| Option 3 | Not Define | Define | Not Define |
| Option 4 | Not Define | Not Define | Define |

* Recommended WF
	+ TBA

### Sub-topic 3-2

*Sub-topic description:* Sidelink RLM requirement

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

**Issue 3-2: Sidelink RLM requirement**

* Proposals
	+ Option 1: Not define sidelink RLM requirement on R16 if RAN1/RAN2 cannot finalize the sidelink RLM procedure before April’s meeting
* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

**Issue 3-1: Distance-based HARQ feedback option 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MTK | Firstly, We agree that the new HARQ based procedure is important in sidelink, but it’s not suitable to define a HARQ related requirement in a RRM spec. It’s actually a demod topic. Secondly, both HARQ feedback on sidelink and HARQ feedback on uplink are important features introduced by RAN1. It’s better to consider to define the test cases for both of them. But whether need to define the test cases depends on the discussion in performance part. It’s too early to discuss the test cases now. |
| CATT | Not define for RRM Core and RRM test cases, FFS for Demod test case. |
| LG | RRM Test Case needs to be defined |
| QC | Our proposal is option 4, would like to know if companies can agree to option 4 and collect companies’ view on defining demod requirement |
| Huawei | Do not define RRM core requirements and RRM test cases. |
| Ericsson | Performance part (test case and demod) should not be discussed not. We should focus only on the core part, and here we support option 1 for RRM core. |
| MTK | Agree with CATT, Huawei and Ericsson. Performance part (test case and demod) should not be discussed this time. Can we just agree on not to define RRM core requirements in this e-meeting? From Mediatek’s view, both HARQ feedback on sidelink and HARQ feedback on uplink test cases shall be defined. We can discuss this later. |

**Issue 3-2: Sidelink RLM requirement**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MTK | Generally, RRM will define the requirement for RLM, but currently RAN1 and RAN2 still on-going the discussion. If they can’t finish the procedure design before the Apr’s meeting, there is no enough time for RAN4 to define this requirement. Thus, it’s better to not define RLM requirement in R16.  |
| CATT | Not define RLM requirement in Rel-16 V2X. |
| LG | Not define RLM requirement in Rel-16 V2X. |
| QC | Option 1, not defining RLM requirement, is fine to use |
| Huawei | Do not define RLM requirement in Rel-16 V2X. |
| Ericsson | RLM is an important core feature for which RAN4 needs to define requirements. If RAN1/RAN2 agrees to introduce SL RLM, RAN4 shall define corresponding requirements. |
| MTK | To Ericsson, we fully agree RLM is an important feature in RAN4. Currently RAN1 and RAN2 still on-going the discussion. If they can’t finish the procedure design before the Apr’s meeting, there is no enough time for RAN4 to define this requirement. |

### 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** |
| XXX | 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.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Issue 3-1** | *Tentative agreements: Option 4 (define Demod.test case), but related discussion is deferred to performance part.**Recommendations for 2nd round: no further discussion* |
| **Issue 3-2** | *Tentative agreements: Not define sidelink RLM requirement on R16 if RAN1/RAN2 cannot finalize the sidelink RLM procedure before April’s meeting**Recommendations for 2nd round: no further discussion* |

*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**  |
| 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)

## 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**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #4: Others(Annex for side condition)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000942 | LG Electronics | Proposal 1: Introduce Annex.B.4 for NR V2X RRM side conditions.Proposal 2: Consider the following Annex.B. for NR V2X RRM side conditions *(only capture skeleton below, see T-doc for details)* * B.4 Conditions for V2X
* B.4.1 Test parameters for GNSS signals
* B.4.2 Conditions for Absolute PSBCH-RSRP Accuracy Requirements
* B.4.3 Conditions for Relative PSBCH-RSRP Accuracy Requirements
* B.4.4 Conditions for Absolute PSSCH-RSRP Accuracy Requirements
* B.4.5 Conditions for Absolute PSCCH-RSRP Accuracy Requirements
* B.4.6 Conditions for Selection/Reselection to Intra-frequency SyncRef UE
 |

## 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 4-1

*Sub-topic description:* Annex.B.4 for NR V2X RRM side conditions

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

**Issue 4-1: Annex.B.4 for NR V2X RRM side conditions**

* Proposals
	+ Option 1: Introduce Annex.B.4 for NR V2X RRM side conditions
* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

**Issue 4-1: Annex.B.4 for NR V2X RRM side conditions**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MTK | 1. It’s too early to change S-RSRP to PSBCH-RSRP;
2. Please add the bracket to the values. The detail values needs to be further check.
 |
| LG | Fine to add the bracket to the values. |
| QC | Can LG explain why we choose band group A and G to define side conditions for S-RSRP? The methodology of deriving the conditions make sense to us since it follows LTE, but would like to know how the band groups are chosen. |
| Huawei | We suggest to update the current definition of band groups to add n47. A note shall be clarified that n38 is dedicated for SL operation. |
| LG | @QC, in RF session, n47 and n38 were agreed to be used for NR V2X SL operation. n47 and n38 correspond to band group G and A respectively.@ HW, note example is,Table 3.5.2-1: NR frequency band groups for FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Group | NR FDD | NR TDD | NR SDL |
| Band group notation | Operating bands | Band group notation | Operating bands | Band group notation | Operating bands |
| A | NR\_FDD\_FR1\_A | n1, n70, n744 | NR\_TDD\_FR1\_A | n34, n387, n39, n40, n50, n51 | NR\_SDL\_FR1\_A | n75, n76 |
| B | NR\_FDD\_FR1\_B | n66, n743 | NR\_TDD\_FR1\_B | - | NR\_SDL\_FR1\_B | - |
| C | NR\_FDD\_FR1\_C | - | NR\_TDD\_FR1\_C | n771, n78, n79 | NR\_SDL\_FR1\_C | - |
| D | NR\_FDD\_FR1\_D | n28 | NR\_TDD\_FR1\_D | n772 | NR\_SDL\_FR1\_D | - |
| E | NR\_FDD\_FR1\_E | n2, n5, n7 | NR\_TDD\_FR1\_E | n41 | NR\_SDL\_FR1\_E | - |
| F | NR\_FDD\_FR1\_F | - | NR\_TDD\_FR1\_F | - | NR\_SDL\_FR1\_F | - |
| G | NR\_FDD\_FR1\_G | n3, n8, n12, n20, n71 | NR\_TDD\_FR1\_G | n476 | NR\_SDL\_FR1\_G | - |
| H | NR\_FDD\_FR1\_H | n25 | NR\_TDD\_FR1\_H | - | NR\_SDL\_FR1\_H | - |
| NOTE 1: Except 3.8 GHz to 4.2 GHz.NOTE 2: Only 3.8 GHz to 4.2 GHz.NOTE 3: Except 1475.9 MHz to 1510.9 MHz.NOTE 4: Only when the band is confined in 1475.9 MHz to 1510.9 MHz.NOTE 5: These bands are used only in NR carrier aggregation with other NR bands according to NR CA band combinations specified in TS 38.101-1 [18] and TS 38.101-3 [20].NOTE 6: This band is used only for V2X sidelink operation.NOTE 7: This band is applicable for V2X sidelink operation as specified in TS38.101-1[18]. |

 |
| QC | As commented above, the methodology seems ok when comparing to LTE. However, checked with RF colleagues, receiver sensitivity is still under discussion in this meeting. The minimum RSRP side condition is dependent to receiver sensitivity, we suggest to come back to this issue after RF discussion on receiver sensitivity is finalized. |

### 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** |
| XXX | 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.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Issue 4-1** | *Tentative agreements: Specify Annex B.4 for NR V2X RRM side conditions, but values will come back after RF discussion on receiver sensitivity* *Recommendations for 2nd round: no further discussion* |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF for RAN4#94e\_#51\_5G\_V2X\_NRSL\_RRM\_Part\_1 | LG Electronics |

### 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**  |
| 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)

## 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**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |