**3GPP TSG-RAN WG4 Meeting #94-e R4-20xxxxx**

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

**Agenda item:** 8.4.5.3, 8.4.5.4

**Source:** Mediatek

**Title:** Email discussion summary for RAN4#94e\_#52\_5G\_V2X\_NRSL\_RRM\_Part\_2

**Document for:** Information

# Introduction

This email discussion is to address the open issues in NR mobility enhancement RRM.

* Agree whether to define autonomous resource reselection related mechanism in core requirement.
* Downscale the issues related to L1 SL-RSRP measurement accuracy
* Agree the simulation assumption on L1 SL-RSRP
* Agree the requirement for interruption due to synchronization source change.

# Topic #1: Measurement

## Companies’ contributions summary

|  |  |  |
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| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2000771](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000771.zip) | Qualcomm, Inc. | Proposal 1: Define the following requirement to verify resource pre-emption mechanism:“For a UE operates in mode 2 and the pre-emption mechanism is enabled for the resource pool that UE is monitoring and selecting resource from:The UE shall be capable of triggering reselection of already signaled resource(s) as a resource reservation, when the UE decodes a higher priority reservation at least [x] slots before the already signalled resource(s), and the higher priority reservation satisfies all the following conditions:(1) It overlaps with the already signalled resource(s) (2) It has SL-RSRP larger than the associated SL-RSRP threshold.”Proposal 2: L1 SL-RSRP measurement period is 1 slot for measurement on both PSSCH DMRS and PSCCH DMRS. |
| [R4-2000](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000771.zip)939 | LG Electronics Inc. | Proposal 4: Specify RRM requirements for resource pre-emption mechanism with general behaviour. |
| [R4-2000](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000771.zip)940 | LG Electronics Inc. | Proposal 3: For PSSCH-RSRP measurement accuracy, use PSSCH-RSRP measurement accuracy in LTE-V2X as starting point.Proposal 4: For PSCCH-RSRP measurement accuracy, use PSSCH-RSRP measurement accuracy in LTE-V2X as starting point.Proposal 5: For SL RSSI measurement accuracy, reuse S-RSSI measurement accuracy in LTE-V2X. |
| [R4-2000](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000771.zip)941 | LG Electronics Inc. | NA |
| [R4-20010](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000771.zip)28 | MediaTek inc. | Proposal 1: Do not define S-RSSI measurement requirement for resource reselection in NR sidelink.Proposal 2: Do not explicitly define SL resource reselection, re-evaluation, and pre-emption procedures in RAN4 core requirement. RAN4 only needs to define the L1 SL-RSRP measurement requirement.Proposal 3: Introduce L1 SL-RSRP measurement requirements for both PSSCH-RSRP and PSCCH-RSRP.Proposal 4: Define PSCCH measurements requirement base on 10 PRBs.Proposal 5: Define PSSCH measurement requirement base on 10 PRBs.Proposal 6: Define PSCCH RSRP measurement requirement base on 2 symbols.Proposal 7: Define PSSCH RSRP measurement requirement base on 2 DMRS symbol pattern.Proposal 8: Send LS to RAN1 to clarify the PSSCH DMRS pattern when PSSCH sub-channel size equals PSCCH.Proposal 9: RAN4 should ask RAN1 to clarify the PSSCH-RSRP definition regarding different number of CDM groups and different number of antenna ports.Proposal 10: RAN4 shall evaluate the PSSCH-RSRP performance based on single antenna port as baseline.Proposal 11: The side condition for L1 SL-RSRP measurements shall guarantee successful decoding of 1st stage SCI.Proposal 12: RAN4 shall define the simulation assumption of 1st stage SCI to evaluate the side condition for L1 SL-RSRP measurements. |
| [R4-200](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000771.zip)1031 | MediaTek inc. | Proposal 1: RAN4 to agree on PSSCH-RSRP and PSCCH-RSRP simulation assumption in RAN4#94e. |
| [R4-200](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000771.zip)1577 | Huawei, HiSilicon | Proposal 1: For NR UE autonomous resource reselection, there is no need to define other measurement requirements for Step 2.Proposal 2: It is suggested to define the same measurement accuracy requirements for both PSSCH DMRS based L1 SL-RSRP and PSCCH DMRS based L1 SL-RSRP.Proposal 3: It is suggested to evaluate the L1 SL-RSRP measurement performance based on the assumption that 2-symbol PSCCH is transmitted within 10 PRBs.Proposal 4: The S-RSSI measurement accuracy requirements in LTE V2X can be reused for defining SL-RSSI measurement accuracy requirements in NR V2X.Proposal 5: It is suggested not to introduce new SL-RSRP measurement requirements for resource pre-emption mechanism. |

## Open issues summary

### Sub-topic 1-1: Autonomous Resource Reselection Requirement

RAN4 to discuss whether to define autonomous resource reselection related mechanism independently in core requirement, such as pre-emption, re-evalation.

Issue 1-1-1: Whether to define dedicated requirement for pre-emption behavior

* Proposals
	+ Option 1: Yes. Such as Proposal 1 in R4-2000771. (Qualcomm)
	+ Option 2: No, but mention together with other procedures in autonomous resource reselection.([LG], Mediatek, [Huawei])
* Recommended WF
	+ Need further discussion.

Issue 1-1-2: Whether to define dedicated requirement for re-evaluation behavior

* Proposals
	+ Option 1: No, but mention together with other procedures in autonomous resource reselection. (Mediatek)
* Recommended WF
	+ Need further discussion.

### Sub-topic 1-2 L1 SL-RSRP Measurement Accuracy

RAN4 to discuss the measurement accuracy of L1 SL-RSRP.

Issue 1-2-1: Scope of L1 SL-RSRP measurement requirement

* Proposals
	+ Option 1: For both PSSCH DMRS and PSCCH DMRS. (Qualcomm , Mediatek)
* Recommended WF
	+ Define L1 SL-RSRP measurement requirement for both PSSCH DMRS and PSCCH DMRS.

Issue 1-2-2: Number of slots for L1 SL-RSRP measurement requirement

* Proposals
	+ Option 1: 1 slot for both PSSCH DMRS and PSCCH DMRS (Qualcomm)
* Recommended WF
	+ 1 slot for both PSSCH DMRS and PSCCH DMRS

Issue 1-2-3: SNR side condition

* Proposals
	+ Option 1: follow LTE side condition.(LG)~~use PSSCH-RSRP measurement accuracy in LTE-V2X as starting point.(LG)~~
	+ Option 2: The side condition for L1 SL-RSRP measurements shall guarantee successful decoding of 1st stage SCI. The simulation assumption of 1st stage SCI to evaluate the side condition for L1 SL-RSRP measurements shall be defined. (Mediatek)
* Recommended WF
	+ Need further discussion.

Issue 1-2-4: PSCCH-DMRS measurement accuracy

* Proposals
	+ Option 1: Re-use PSSCH-RSRP measurement accuracy in LTE-V2X as starting point. (LG)
	+ Option 2: Define PSCCH measurement requirement based on 10 PRBs and 2 symbols. (Mediatek, Huawei)
* Recommended WF
	+ Need further discussion.

Issue 1-2-5: PSSCH-DMRS measurement accuracy

* Proposals
	+ Option 1: Re-use PSSCH-RSRP measurement accuracy in LTE-V2X as starting point. (LG)
	+ Option 2: Define PSSCH measurement requirement base on 10 PRBs, 2 symbols and single antenna port. (Mediatek)
	+ Option 3: Define the same measurement accuracy requirements with PSCCH DMRS. (Huawei)
* Recommended WF
	+ Need further discussion.

Issue 1-2-6: Collision between PSSCH-DMRS and PSCCH

* Proposals
	+ Option 1: Send LS to RAN1 to clarify the PSSCH DMRS pattern when PSSCH sub-channel size equals PSCCH (Mediatek)
* Recommended WF
	+ Need further discussion.

Issue 1-2-7: PSSCH-DMRS multiple antennas configuration

* Proposals
	+ Option 1: Ask RAN1 to clarify the PSSCH-RSRP definition regarding different number of CDM groups and different number of antenna ports. (Mediatek)
* Recommended WF
	+ Need further discussion.

### Sub-topic 1-3 Simulation assumption for L1 SL-RSRP

RAN4 to approve the simulation assumption for L1 SL-RSRP.

Issue 1-3-1: Simulation asusmption for L1 SL-RSRP

* Proposals
	+ Option 1: R4-2001031 (Mediatek)
	+ Option 2: R4-2000941 (LG)

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| --- | --- | --- |
| **Parameters** |  **Option 1** | **Option 2** |
| Duplex mode | TDD | TDD |
| Measurement bandwidth for PSSCH-RSRP | 10 resource blocks | 10 resource blocks |
| Measurement bandwidth for PSCCH-RSRP | 10 resource blocks | 10 resource blocks |
| Duration of the scheduled resources for transmission of PSSCH (*l*d) | 13 symbols | 9 symbols |
| Number of PSCCH symbol in a slot(*l* = PSCCH symbol position) | 2 symbols(*l*={1,2}) | 2 symbols(*l*={1,2}) |
| Number of PSSCH DMRS symbol in a slot(*l* = PSSCH DMRS position) | 2 symbols (*l*={3,10}) | 2 symbols (*l*={3,8}) |
| Sub Carrier Spacing | 15kHz, 30kHz, 60 kHz | 15kHz, 30kHz, 60 kHz |
| L1 measurement | 1 shot measurement | 1 shot measurement |
| L3 filtering | Disabled | Disabled |
| Transmit antenna | 1 | 1 |
| Receive antennas | 2 | 2 |
| Propagation conditions | AWGN,TDL- C with 30ns, 1400Hz,TDL- C with 100ns, 300Hz | AWGN,TDL- C with 30ns, 1400Hz,TDL- C with 100ns, 300HzTDL- C with 10ns, 1400Hz,TDL- C with 100ns, 150Hz |
| CP length | Normal | Normal |
| Carrier frequency | 5.9GHz | 5.9GHz |
| Frequency Offset relative to UE frequency reference | {0, 0.2ppm} | 0Hz |
| PSSCH\_Ec/Iot | {-6, -3, 0, 3} dB | {-6, -3, 0, 3} dB |
| PSCCH\_Ec/Iot | {-6, -3, 0, 3} dB | {-6, -3, 0, 3} dB |

* Recommended WF
	+ Choose one simulation asusmption as the baseline

### Sub-topic 1-4 S-RSSI measurement accuracy

S-RSSI measurement related issues

Issue 1-4-1: S-RSSI in autonomous resource reselection

* Proposals
	+ Option 1: No need to define. (Huawei)
* Recommended WF
	+ No need to define, because RAN1 doesn’t introduce this functionality

Issue 1-4-2: S-RSSI measurement accuracy in congestion control

* Proposals
	+ Option 1: reuse S-RSSI measurement accuracy in LTE-V2X. (LG, Huawei)
* Recommended WF
	+ Need further discussion.

## Companies views’ collection for 1st round

### Open issues

**Issue 1-1-1: Whether to define dedicated requirement for pre-emption behavior**

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| --- | --- |
| **Company** | **Comments** |
| MTK | Don’t needed1. RAN1 agrees two new procedures in resource reselection, pre-emption and re-evaluation.
2. RAN4 don’t repeat to define core requirements for both pre-emption and re-evaluation. Similar as legacy LTE, RAN4 just to mention L1 SL-RSRP measurement will be used in resource reselection, pre-emption and re-evaluation is fine.
 |
| CATT | Support option 2 |
| LG | Option2 seems to be possible, but needs to define separated test cases, for example, one test is for autonomous resource reselection and another test is for pre-emption UE behavior |
| QC | We prefer option 1, but can support option 2 as long as requirement is defined. Compromised proposal below:12.5.2 L1 SL-RSRP measurementsThe UE physical layer shall be capable of performing the L1 SL-RSRP measurements on the carrier operating V2X sidelink communication for determining the subset of resources to be excluded in PSSCH resource selection in sidelink transmission mode 2. The L1 SL-RSRP measurement period corresponds to [TBD] and the measurement shall meet the L1 SL-RSRP measurement accuracy requirement in Section [TBD].**When the pre-emption mechanism is enabled for the resource pool that UE is monitoring and selecting resource from:****After UE selects from the resource not excluded based on L1 SL-RSRP measurement procedure explained in this clause, the UE shall be capable of triggering reselection of already signalled resource(s) as a resource reservation, when the UE decodes a higher priority reservation at least [T3] slots before the already signalled resource(s), and the higher priority reservation satisfies all the following conditions:****(1) It overlaps with the already signalled resource(s).****(2) It has SL-RSRP larger than the associated SL-RSRP threshold.**We support LG’s proposal for introducing separate test. If the test is appended after the current test (LTE version) in A.12.6.1, i.e., TE sends a high priority reservation after UE selects resource in T2, TE can’t not verify whether UE is back-off because of high priority reservation is detected, or it actually fails the original test by not selecting the resource.  |
| Huawei | We support option 2.RAN4 may design two autonomous resource reselection tests separately for enable pre-emption and disable pre-emption. |
| MTK | We don’t think it needs too much detail in core requirement. All the related procedure was captured in RAN1 spec. We can further discuss how to capture the test case for pre-emption and re-evaluation later.12.5 L1 SL-RSRP measurements12.5.1 Introduction This section contains the measurement requirements related to resource reselection, resource re-evaluation and resource pre-emption of the UE capable of V2X sidelink communication. 12.5.2 PSCCH-RSRP measurements12.5.3 [PSSCH-RSRP measurements] |
| QC | If resource pre-emption is mentioned in introduction but not in 12.5.2, the spec is incomplete. Following MTK’s suggestion of eliminating some details, we propose the following version:12.5 L1 SL-RSRP measurements12.5.1 Introduction This section contains the measurement requirements related to resource reselection and resource pre-emption of the UE capable of V2X sidelink communication. 12.5.2 SL-RSRP measurementsThe UE physical layer shall be capable of performing the L1 SL-RSRP measurements on the carrier operating V2X sidelink communication for determining the subset of resources to be excluded in PSSCH resource selection in sidelink transmission mode 2. The L1 SL-RSRP measurement period corresponds to [TBD] and the measurement shall meet the L1 SL-RSRP measurement accuracy requirement in Section [TBD].**When the pre-emption mechanism is enabled for the resource pool that UE is monitoring and selecting resource from, after UE selects from the resource not excluded based on L1 SL-RSRP measurement procedure, the UE shall be capable of triggering reselection of already signalled resource(s) as a resource reservation when the conditions specified in [1] are satisfied.****[1] (corresponding RAN2 spec)** |

**Issue 1-1-2: Whether to define dedicated requirement for re-evaluation behaviour**

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| **Company** | **Comments** |
| MTK | Don’t neededThe comments is the same as above. |
| CATT | Not define requirement |
| LG | Don’t needed |
| QC | Same as above comments |
| Huawei | Do not define dedicated requirement for re-evaluation behavior |
| MTK | We suggest it should also capture the wording of re-evaluation in L1 SL-RSRP measurements requirement.Whether to define the test cases for both pre-emption and re-evaluation should be further studied in performance part. |
| QC | Our understanding of resource re-evaluation is the procedure triggered after resource pre-emption. Since it is identical to resource (re-)selection, we don’t think it is needed. |

**Issue 1-2-1: Scope of L1 SL-RSRP measurement requirement**

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| **Company** | **Comments** |
| MTK | Define L1 SL-RSRP measurement requirement for both PSSCH DMRS and PSCCH DMRS. |
| CATT | Define L1 SL-RSRP measurement requirement for both PSSCH DMRS and PSCCH DMRS |
| LG | Define L1 SL-RSRP measurement requirement for both PSSCH DMRS and PSCCH DMRS |
| QC | Support HW’s proposal of define one requirement based on PSCCH DMRS and this requirement applies to both PSCCH DMRS and PSSCH DMRS. From system performance perspective, it makes sense to define requirement based on PSCCH DMRS only. Since the overall system performance is bounded by the worst UE, if some UE are configured to measure CCH DMRS, better measurement accuracy on SCH DMRS (due to more available REs ) can’t improve system performance too much. Therefore, we support define one requirement based on PSCCH DMRS. |
| Huawei | Define general L1 SL-RSRP measurement requirements for both PSSCH DMRS and PSCCH DMRS. |
| MTK | We can start to evaluate both of PSSCH DMRS and PSCCH DMRS, whether to define both of them or only the worst case shall be left after the evaluation. |

**Issue 1-2-2: Number of slots for L1 SL-RSRP measurement requirement**

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| **Company** | **Comments** |
| MTK | 1 slot |
| CATT | single shot measurement for L1 SL-RSRP |
| LG | Support 1 slot for both PSSCH DMRS and PSCCH DMRS |
| QC | 1 slot |
| Huawei | 1 slot |

**Issue 1-2-3: SNR side condition**

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| **Company** | **Comments** |
| MTK | The side condition for L1 SL-RSRP measurements shall guarantee successful decoding of 1st stage SCI. The simulation assumption of 1st stage SCI to evaluate the side condition for L1 SL-RSRP measurements shall be defined at first. After evaluation, RAN4 can define a SNR side condition higher than 1st stage SCI decoding threshold. |
| CATT | support option 1 |
| LG | Option 1 |
| QC | MTK’s comment is needed to be taken into consideration. But the side condition for RSRP measurement accuracy, according to LG’s proposal in R4-2000942, is RSRP, not SNR. Our opinion is CCH decodability can leave to SNR condition discussion in simulation, here we only have to agree with RSRP side condition.  |
| Huawei | Support option 1 to use PSSCH-RSRP measurement accuracy in LTE-V2X as starting point. |
| MTK | Sorry for misunderstanding LG’s proposal. The PSSCH-RSRP measurement accuracy shall be discussed below in issue 1-2-4 and 1-2-5. I update the issue to only focus on the side condition of L1 SL-RSRP evaluation. |

**Issue 1-2-4: PSCCH-DMRS measurement accuracy**

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| **Company** | **Comments** |
| MTK | Define PSCCH measurement requirement based on 10 PRBs and 2 symbols. |
| CATT | support option 2, simulation shall be carried out based on the worst configuration. |
| LG | Support to define PSCCH measurement requirement based on 10 PRBs and 2 symbols |
| QC | Option 2 is good for us |
| Huawei | Support option 2. |

**Issue 1-2-5: PSSCH-DMRS measurement accuracy**

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| **Company** | **Comments** |
| MTK | RAN1 agrees to introduce multiple antenna configuration for PSSCH, but the detial configuration for CDM group number and precoding is unclear. Thus, RAN4 can define PSSCH measurement requirement base on single antenna as the baseline. For two antennas configuration, just wait RAN1’s input. |
| CATT | support option 2, simulation shall be carried out based on the worst configuration. |
| LG | Support to define PSSCH measurement requirement based on 10 PRBs and 2 symbols |
| QC | As explained in issue 1-2-1, we prefer to define DMRS measurement accuracy based on CCH only |
| Huawei | Support option 3 to define the same measurement accuracy requirements with PSCCH DMRS. |

**Issue 1-2-6: Collision between PSSCH-DMRS and PSCCH**

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| **Company** | **Comments** |
| MTK | RAN1 had agreed the PSSCH pattern in last meeting, but the pattern is unclear when PSSCH RBs=PSCCH RBs. However, RAN4 define the measurement accuracy for PSSCH and PSCCH will always use the minimum RB sizes(10 PRBs). It seems some PSSCH patterns can’t be used in this condition. |
| LG | We think that RAN1’s common understanding is, PSSCH is not assigned in overlapped RBs with PSCCH when PSSCH sub-channel size equals PSCCH. |
| QC | RAN1 design guarantees 2 complete DMRS symbol in all cases, as long as RAN4 defines the requirement based on “2” DMRS symbols, as the majority view in 1-2-5, overlapping CCH and SCH DMRS is not an issue for RAN4 requirement |
| Huawei | RAN1’s design shall guarantee at least 2 PSSCH DMRS symbols. PSCCH is allocated on the starting sub-channel used for that PSSCH. When PSSCH DMRS is FDMed with PSCCH, the number of PSSCH sub-channels shall be larger than 1. |
| MTK | If we agree to only define PSSCH measurement accuracy with 2 symbols, there is no issue here. |

**Issue 1-2-7: PSSCH-DMRS multiple antennas configuration**

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| **Company** | **Comments** |
| MTK | As we discussed in our tdoc, there are totally 5 different scenarios for PSSCH two antenna ports configuration. RAN1 just say to follow NR Uu, but no further clear rule described. At current stage, RAN4 don’t know how to handle multiple antennas’ configuration in PSSCH RSRP calculation. RAN4 should ask RAN1’s further clarification. |
| LG | PSSCH-RSRP definition is not related to Tx side. It is related to Rx side. So, current definition is clear |
| QC | We should defer this discussion until RAN1 finalizes power boosting for multiple ports. As long as there is no power boosting for multiple ports, as the Uu case cited in MTK’s contribution, calculating RSRP by summation of power from all ports can get consistent results. To MTK, do you agree that summation of power from all ports can get consistent results if Uu table is used? |
| Huawei | We should focus on how to define the measurement accuracy requirement, which could be based on single port case. |
| MTK | To QC, From our understanding, if power boosting is agreed as NR Uu, then the calculating will be the summation of power from all ports. It’s not necessary to discuss the detail solution here. Actually the definition depends on RAN1. To Huawei,We still need to consider whether power boosting is used or not and the number of CDM groups even in single Tx port based on current RAN1 description. To all, Our suggestion is we can start the simulation and discuss the measurement accuracy based on Tx single port in the beginning.At the same time do we agree to send a LS to RAN1 to ask further clarification of the definition on PSSCH RSRP? |

**Issue 1-3-1: Simulation assumption for L1 SL-RSRP**

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| **Company** | **Comments** |
| LG | Prefer Option2  |
| QC | We suggest to define test by AWGN, following LTE test. For simulation assumptions, TDL-C low Doppler is fine, but high Doppler is problematic from decoding perspective, if we use 2 DMRS symbol configuration. Hence we suggest to keep only low Doppler propagation conditions. |
| MTK | We check the difference between LG and ours.Duration of the scheduled resources for transmission of PSSCH -> Compromise to LGNumber of PSSCH DMRS symbol in a slot -> Compromise to LGPropagation conditions -> Follow QC’s comment, and merge with LG’s proposal. Can we agree to add the notes ‘AWGN is a mandatory propagation conditions. Whether other company want to submit the simulation with other channels is not precluded’.Frequency Offset-> We suggest LG to compromise with oursThen the potential simulation assumption is as follow.

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| **Parameters** | **Values** |
| Duplex mode | TDD |
| Measurement bandwidth for PSSCH-RSRP | 10 resource blocks |
| Measurement bandwidth for PSCCH-RSRP | 10 resource blocks |
| Duration of the scheduled resources for transmission of PSSCH (*l*d) | 9 symbols |
| Number of PSCCH symbol in a slot(*l* = PSCCH symbol position) | 2 symbols(*l*={1,2}) |
| Number of PSSCH DMRS symbol in a slot(*l* = PSSCH DMRS position) | 2 symbols (*l*={3,8}) |
| Sub Carrier Spacing | 15kHz, 30kHz, 60 kHz |
| L1 measurement | 1 shot measurement |
| L3 filtering | Disabled |
| Transmit antenna | 1 |
| Receive antennas | 2 |
| Number of DMRS CDM group(s) without data | 1 |
| DMRS port(s) | 0 |
| Ratio of PSSCH EPRE to DM-RS EPRE (dB) | 0 |
| Propagation conditions Note 1 | AWGN,TDL- C with 30ns, 1400Hz,TDL- C with 100ns, 300HzTDL- C with 10ns, 1400Hz,TDL- C with 100ns, 150Hz |
| CP length | Normal |
| Carrier frequency | 5.9GHz |
| Frequency Offset relative to UE frequency reference | {0, 0.2ppm} |
| PSSCH\_Ec/Iot | {-6, -3, 0, 3} dB |
| PSCCH\_Ec/Iot | {-6, -3, 0, 3} dB |
| Note 1: AWGN is a mandatory propagation conditions. The company is also encouraged to submit the simulation with other propagation condition. |

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| LG | To MTK, we’re fine your compromise including Frequency Offset.  |
| QC | We think more discussion is needed for frequency offset, however, we can agree on propagation condition first. |

**Issue 1-4-1: S-RSSI in autonomous resource reselection**

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| **Company** | **Comments** |
| MTK | No need to define. |
| CATT | Not define |
| LG | Not define |
| QC | Same as above |
| Huawei | No need to define |

**Issue 1-4-2: S-RSSI measurement accuracy in congenstion control**

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| **Company** | **Comments** |
| MTK | In legacy LTE sidelink, no PSFCH was introduced. Considering the new PSFCH is precluded in NR sidelink RSSI calculation, it means the RSSI calculation symbol number is less than legacy LTE. Basically, RAN4 will define the minimum requirement. Thus, re-use LTE RSSI requirement is not a good choice in NR sidelink.  |
| CATT | reuse S-RSSI measurement accuracy in LTE-V2X |
| LG | Reuse S-RSSI measurement accuracy in LTE-V2X |
| QC | RSSI computes only the signal on reference symbols, hence adding PSFCH doesn’t change RSSI measurement, LTE requirement can be reused. |
| Huawei | Reuse S-RSSI measurement accuracy in LTE-V2X |
| MTK | Based on RAN1’s definition, we don’t think RSSI calculation just focus on reference symbols.

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| --- |
| Sidelink Received Signal Strength Indicator (SL RSSI) is defined as the linear average of the total received power (in [W]) observed in the configured sub-channel in OFDM symbols of a slot configured for PSCCH and PSSCH, starting from the 2nd OFDM symbol. |

 In LTE,

|  |
| --- |
| Sidelink RSSI (S-RSSI) is defined as the linear average of the total received power (in [W]) per SC-FDMA symbol observed by the UE only in the configured sub-channel in SC-FDMA symbols 1, 2, …, 6 of the first slot and SC-FDMA symbols 0,1,…, 5 of the second slot of a subframe  |

We calculate the RSSI based on whole symbols in both LTE and NR. The symbol number is different when NR introduces the PSFCH. This will impact the performance. |

### CRs/TPs comments collection

No related CR on this topic.

## 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 1-1-1** | *Candidate options:*Option 1 : Define dedicated requirement for pre-emption behavior (QC)Option 2 : Do not define dedicated requirement for pre-emption behavior (LG, MTK, CATT, Huawei)*Tentative agreements:*Do not define dedicated requirement for pre-emption behavior, but mention together with other procedure in autonomous resource reselection.*Recommendations for 2nd round:*Decide one option between option1 and option 2 |
| **Issue 1-1-2** | *Candidate options:*Option 1 : Do not define dedicated requirement for re-evaluation behavior (MTK, CATT, LG, QC, Huawei)*Tentative agreements:*Do not define dedicated requirement for re-evaluation behavior*Recommendations for 2nd round:* no further discussion |
| **Issue 1-2-1** | *Candidate options:*Option 1 : Define L1 SL-RSRP measurement requirement for both PSSCH DMRS and PSCCH DMRS (LG, MTK, CATT) Option 2 : Define general L1 SL-RSRP measurement requirements for both PSSCH DMRS and PSCCH DMRS (QC, Huawei)*Recommendations for 2nd round:* RAN4 starts to evaluate both of PSSCH DMRS and PSCCH DMRS measurement accuracy based on the simulation. Whether to define both of them or only the worst case can be decided after the evaluation.  |
| **Issue 1-2-2** | *Candidate options:*Option 1: 1 shot for L1 SL-RSRP accuracy requirement (MTK, CATT, LG, QC, Huawei)*Tentative agreements:* Consider only 1 shot when defining the accuracy requirement for L1 SL-RSRP *Recommendations for 2nd round:* no further discussion |
| **Issue 1-2-3** | *Candidate options:*Option 1: Follow LTE side condition for L1 SL-RSRP measurements Option 2: The side condition for L1 SL-RSRP measurements shall guarantee successful decoding of 1st stage SCI. The simulation assumption of 1st stage SCI to evaluate the side condition for L1 SL-RSRP measurements shall be defined. *Recommendations for 2nd round:* Owing to moderator misunderstanding of LG’s proposal, please re-decide the new proposals between option1 and option 2. |
| **Issue 1-2-4** | *Candidate options:*Option 2 : Define PSCCH measurement requirement based on 10 PRBs and 2 symbols (MTK, CATT, LG, QC, Huawei)*Tentative agreements:* Define PSCCH measurement requirement based on 10 PRBs and 2 symbols*Recommendations for 2nd round:* no further discussion |
| **Issue 1-2-5** | *Candidate options:*Option 1 : Re-use PSSCH-RSRP measurement accuracy in LTE-V2X as starting point (NA)Option 2 : Define PSSCH measurement requirement base on 10 PRBs, 2 symbols and single antenna port. (LG, MTK, CATT)Option 3 : Define the same measurement accuracy requirements with PSCCH DMRS. (Huawei, QC)*Recommendations for 2nd round:* Postpone the discussion after reaching conclusion in Issue 1-2-1  |
| **Issue 1-2-6** | *Recommendations for 2nd round:* Postpone the discussion after reaching conclusion in Issue 1-2-1 and Issue 1-2-5. |
| **Issue 1-2-7** | *Tentative agreements:* * RAN4 can start the simulation and discuss the measurement accuracy based on single Tx port in the beginning.
* FFS whether to send a LS to RAN1 to ask further clarification of the definition on PSSCH RSRP

*Recommendations for 2nd round:* RAN4 to discuss the need to send LS to RAN1 |
| **Issue 1-3-1** | *Tentative agreements:*The potential simulation assumption is as follow.(LG, MTK, QC)

|  |  |
| --- | --- |
| **Parameters** | **Values** |
| Duplex mode | TDD |
| Measurement bandwidth for PSSCH-RSRP | 10 resource blocks |
| Measurement bandwidth for PSCCH-RSRP | 10 resource blocks |
| Duration of the scheduled resources for transmission of PSSCH (*l*d) | 9 symbols |
| Number of PSCCH symbol in a slot(*l* = PSCCH symbol position) | 2 symbols(*l*={1,2}) |
| Number of PSSCH DMRS symbol in a slot(*l* = PSSCH DMRS position) | 2 symbols (*l*={3,8}) |
| Sub Carrier Spacing | 15kHz, 30kHz, 60 kHz |
| L1 measurement | 1 shot measurement |
| L3 filtering | Disabled |
| Transmit antenna | 1 |
| Receive antennas | 2 |
| Number of DMRS CDM group(s) without data | 1 |
| DMRS port(s) | 0 |
| Ratio of PSSCH EPRE to DM-RS EPRE (dB) | 0 |
| Propagation conditions Note 1 | AWGN,TDL- C with 30ns, 1400Hz,TDL- C with 100ns, 300HzTDL- C with 10ns, 1400Hz,TDL- C with 100ns, 150Hz |
| CP length | Normal |
| Carrier frequency | 5.9GHz |
| Frequency Offset relative to UE frequency reference | {0} |
| PSSCH\_Ec/Iot | {-6, -3, 0, 3} dB |
| PSCCH\_Ec/Iot | {-6, -3, 0, 3} dB |
| Note 1: AWGN is a mandatory propagation conditions. The company is also encouraged to submit the simulation with other propagation condition. |

*Recommendations for 2nd round:* 1. Agree on the simulation assumption.
2. Further discuss the Frequency Offset value in simulation assumption.
3. Check if LG is ok to update their tdoc of simulation assumption based on current agreement.
 |
| **Issue 1-4-1** | *Candidate options:*Option 1: No need to define S-RSSI in autonomous resource reselection (MTK, CATT, LG, QC, Huawei)*Tentative agreements:* No need to define S-RSSI in autonomous resource reselection.*Recommendations for 2nd round:* no further discussion |
| **Issue 1-4-2** | *Candidate options:*Option 1: reuse S-RSSI measurement accuracy in LTE-V2X(CATT, LG, QC, Huawei)Option 2: Re-evaluate S-RSSI measurement accuracy because PSFCH was introduced in NR-V2X(MTK)*Recommendations for 2nd round:* Moderator would like to double confirm if companies are OK to re-use LTE V2X accuracy given that the number of symbols to be measured in NR V2X is less than those in LTE.  |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | Simulation assumption of PSSCH-RSRP and PSCCH-RSRP measurement | LGE |

### CRs/TPs

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

No CR in this topic.

## 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 #2: Interruption

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-200](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000771.zip)1029 | MediaTek inc. | Proposal 1: RAN4 only define the interruption requirement for synchronization source change between GNSS and eNB and between GNSS and gNB. |

## Open issues summary

### Sub-topic 2-1

RAN4 to discuss whether to define the interruption requirement due to synchronization source change for all the synchronization source scenarios.

Issue 2-1-1: Interruption due to Synchronization Source Change

* Proposals
	+ Option 1: Only define the interruption requirement between GNSS and eNB and between GNSS and gNB.(Mediatek)
	+ Option 2: Define the interruption requirement for all the scenarios.(CATT)
	+ Option 3: RAN4 shall not define any requirements related to gNB/eNB. (Ericsson)
* Recommended WF
	+ Need to further discussion.

## Companies views’ collection for 1st round

### Open issues

**Issue 2-1-1: Interruption due to Synchronization Source Change**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MTK | In legacy LTE, just the interruption between GNSS and eNB is defined because the timing drifting may happen for sync. source change. Thus, in NR sidelink, it’s the same situation. We just need to define the requirement between gNB and GNSS, eNB and GNSS. |
| CATT | To MediaTek: According to your proposal, I think it preclude the scenario where the synchronization source is changed from gNB to eNB, or vice versa. GNSS can be changed to gNB or eNB.Regarding our CR on interruption requirement, some revision is needed, par example,* From GNSS
	+ to syncRef UE that is synchronized to GNSS directly
	+ to syncRef UE that is synchronized to GNSS in-directly
	+ to gNB or eNB
	+ to syncRef UE that is synchronized to gNB or eNB directly
	+ to syncRef UE that is synchronized to gNB or eNB in-directly
	+ to syncRef UE that has the lowest priority
 |
| LG | Support not define the interruption requirement between gNB and eNB |
| QC | Our understanding is that interruption is from upper layer processing and slot boundary misalignment. Even for switching between eNB/gNB, they can be asynchronized and both slot boundary misalignment and upper layer processing delay can contribute to interruption, hence 1ms interruption is needed for all sync source changes, we support CATT’s original proposal.To moderator: RRM discussion should follow RF Tx/Rx switch delay requirement to define our interruption requirement for LTE/NR switch interruption, we have proposal in R4-2000471 discuss the corresponding RRM requirement, but we can wait RF room to conclude first then pick it up from there. |
| Huawei | Define the interruption requirement for the scenarios where source synchronization reference timing and target synchronization reference timing could be asynchronous, such as:* From GNSS
	+ to gNB/eNB
	+ to syncRef UE that is synchronized to gNB/eNB directly
	+ to syncRef UE that is synchronized to gNB/eNB in-directly
	+ to syncRef UE that has the lowest priority
* From syncRef UE that is synchronized to GNSS directly
	+ to gNB/eNB
	+ to syncRef UE that is synchronized to gNB/eNB directly
	+ to syncRef UE that is synchronized to gNB/eNB in-directly
	+ to syncRef UE that has the lowest priority
* From syncRef UE that is synchronized to GNSS in-directly
	+ to gNB/eNB
	+ to syncRef UE that is synchronized to gNB/eNB directly
	+ to syncRef UE that is synchronized to gNB/eNB in-directly
	+ to syncRef UE that has the lowest priority
* From gNB/eNB
	+ to GNSS
	+ to syncRef UE that is synchronized to GNSS directly
	+ to syncRef UE that is synchronized to GNSS in-directly
	+ to syncRef UE that is synchronized to gNB/eNB directly
	+ to syncRef UE that is synchronized to gNB/eNB in-directly
	+ to syncRef UE that has the lowest priority
* From syncRef UE that is synchronized to gNB/eNB directly
	+ to GNSS
	+ to syncRef UE that is synchronized to GNSS directly
	+ to syncRef UE that is synchronized to GNSS in-directly
	+ to gNB/eNB
	+ to syncRef UE that is synchronized to gNB/eNB in-directly
	+ to syncRef UE that has the lowest priority
* From syncRef UE that is synchronized to gNB/eNB in-directly
	+ to GNSS
	+ to syncRef UE that is synchronized to GNSS directly
	+ to syncRef UE that is synchronized to GNSS in-directly
	+ to gNB/eNB
	+ to syncRef UE that is synchronized to gNB/eNB directly
	+ to syncRef UE that has the lowest priority
* From syncRef UE that has the lowest priority
	+ to GNSS
	+ to syncRef UE that is synchronized to GNSS directly
	+ to syncRef UE that is synchronized to GNSS in-directly
	+ to gNB/eNB
	+ syncRef UE that is synchronized to gNB/eNB directly
	+ syncRef UE that is synchronized to gNB/eNB in-directly]
 |
| CATT | To Huawei: Why there is no interruption in case the synchronization source is changed from GNSS to syncRef UE that is synchronized to GNSS directly/ in-directly? |
| 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 also be revised accordingly. |
| MTK | To Qualcomm, We have already agreed the not applicable scenario in last meeting for RRM requirement. So we don’t think we need to define any requirement for changing sync. source between eNB and gNB.

|  |
| --- |
| * Not applicable scenarios
	+ Single carrier in NR V2X SL + EN-DC/NE-DC/NR-DC/NR-CA/LTE-CA/LTE-DC in Uu
		- NR V2X SL is dedicated to NR V2X SL and is not used for Uu link
 |

If we consider the slot level boundary misalignment here, for example, UE 1 is communicating with UE 2. If UE 1 change its sync source and will result in a larger timing drifting (as Qualcomm said), so UE 1 had to adjust the slot boundary. If this happens, then UE1 will lost the communication with UE 2 because UE2 don’t the information of timing from UE1. This will come back to the issue what we discussed several times in last year: how to solve the issue UEs can’t communicate with each other in async. network.In legacy LTE sidelink, UE can work very well based on the defined requirement. We never see any reason that the advanced NR UE needs to have more interruption time in some scenarios.Can Qualcomm further explain why the UE which sync. to syncRef UE that sync. to GNSS directly change the sync source to GNSS need an interruption, but the LTE V2X UE didn’t need? I’m not fully connect the tdoc R4-2000471’s issue with current sync source change interruption. In that paper, it studied the issue when UE supports both NR SL and LTE SL transmission. What we discussed here is the UE choose different sync source. Could you help to explain more?To Huawei, We support Huawei CR’s idea, but maybe we can simplify the requirement as legacy LTE as follow.* From GNSS
	+ to gNB/eNB
	+ to syncRef UE that is synchronized to gNB/eNB directly or in-directly
	+ to syncRef UE that has the lowest priority
* From syncRef UE that is synchronized to GNSS directly or in-directly
	+ to gNB/eNB
	+ to syncRef UE that is synchronized to gNB/eNB directly or in-directly
	+ to syncRef UE that has the lowest priority
* From gNB/eNB
	+ to GNSS
	+ to syncRef UE that is synchronized to GNSS directly or in-directly
	+ [to syncRef UE that is synchronized to gNB/eNB directly or in-directly]
	+ to syncRef UE that has the lowest priority
* From syncRef UE that is synchronized to gNB/eNB directly or in-directly
	+ to GNSS
	+ to syncRef UE that is synchronized to GNSS directly or in-directly
	+ to gNB/eNB
	+ [to syncRef UE that is synchronized to gNB/eNB in-directly or directly]
	+ to syncRef UE that has the lowest priority
* From syncRef UE that has the lowest priority
	+ to GNSS
	+ to syncRef UE that is synchronized to GNSS directly or in-directly
	+ to gNB/eNB
	+ syncRef UE that is synchronized to gNB/eNB directly or in-directly
 |

### 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** |
| [R4-2000](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000771.zip)579 | Ericsson1: 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. |
| Company B |
|  |
| YYY | 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 1-1-1** | *Candidate options:** Option 1: Only define the interruption requirement between GNSS and eNB and between GNSS and gNB.(Mediatek)
* Option 2: Define the interruption requirement for all the scenarios.(CATT)
* Option 3: RAN4 shall not define any requirements related to gNB/eNB. (Ericsson)

*Recommendations for 2nd round:* * RAN4 RRM to firstly confirm if any requirement related to gNB/eNB has already been precluded or will be precluded.
* RAN4 to discuss whether interruption is needed for the scenario that UE is changing its sync source from GNSS to a syncRef UE that is synchronized to GNSS directly or in-directly.
 |
| **Issue 1-1-2** | *Candidate options:*RAN4 RRM to discuss whether to define LTE/NR switch interruption(QC)*Tentative agreement:* RAN4 RRM shall wait RAN4 RF’s discussion on interruption due to switch between LTE SL and NR SL.*Recommendations for 2nd round:* no further discussion |

*Suggestion 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 provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2000579 | CATT shall revise their CR based on the agreement in this meeting, and add the bracket to the scenario which haven’t agreed in this meeting. |

## 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”* |