**3GPP TSG-RAN WG4 Meeting # 104-e R4-22XXXX**

**Electronic Meeting, 15th – 26th August, 2022**

**Agenda item:** 11.17.3

**Source:** Moderator (vivo)

**Title:** Email discussion summary for [238] NR\_DualTxRx\_MUSIM

**Document for:** Information

# Introduction

This email discussion is for Rel-18 Dual Transmission/Reception (Tx/Rx) Multi-SIM for NR WI and the scope covers the following agenda items:

* AI 11.17.1 General and work plan
* AI 11.17.2 RRM requirements for Rel-17 MUSIM gaps

Based on the latest approved WI in [RP-220955], the objectives of the WI for the above AIs are duplicated as below:



During email discussion companies are encourages to:

* Provide comments on all interested topics/sub-topics at one time
* Ensure that comments are based on the latest version of the document by checking the folder before uploading
* Use “Track changes” to help identify added comments/changes
* Based on meeting guidance from RAN4 chair when changing the file name, adding your company name

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1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)

# Topic #1: Work plan

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| T-doc number | Company | Proposals / Observations |
| [R4-2213450](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213450.zip) | vivo | Work Plan |
|  |  |  |

## Open issues summary

### Sub-topic 1-1

**Issue 1-1-1: Work Plan**

* + Work plan is provided at [R4-2213450](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213450.zip)
* Recommended WF
  + Suggest to agree the work plan

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| --- | --- |
| **Company** | **Comments** |
| Ericsson | Fine |
| MTK | Fine with the work plan. |
| Xiaomi | Fine with the work plan |
| Qualcomm | The work plan only mentions the WID objective about requirements for Rel-17 MUSIM gaps. There is another objective for MUSIM enhancements in Rel-18.  We assume the proposed timeline includes both WID objectives. Correct?  In our view, RAN4 should not need 9 meetings to define requirements for Rel-17 MUSIM gaps.  Also, allocating only one meeting for the performance part seems aggressive. |
| vivo | @QC. Thanks for the comments. Regarding the Rel-18 MUSIM WI impact, at [RP-220955] it mentions “The work item shall identify whether the WI will have RAN3 or RAN4 impacts by RAN#99 [RAN2]. Hence in this work plan it indicated that the work plan will be updated at RAN4 #106 to address the according to RANP #99 decision. Currently the work plan is based on identified target and it is impossible to plan on objectives which still does not exist right now.  Regarding performance part, thanks for the careful review. The performance part will be finished at June 2024. However the current work plan ends at Dec.2023, based on the timetable according to [RP-221060]. Hence there will be 2 extra meetings (0.25 TU each meeting) between Jan 2024 to June 2024 for perf part. |
| Nokia | Fine with work plan |
|  |  |

## Companies views’ collection for 1st round

### Open issues

*One of the two formats, i.e. either example 1 or 2 can be used by moderators.*

### CRs/TPs comments collection

*For close-to-finalize Wis and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing Wis, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| CR/TP number | Comments collection |
|  | Company A |
| Company B |
|  |
|  | Company A |
| Company B |
|  |
|  | Company A |
| 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 |
| Sub-topic #1 | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

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

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| CR/TP number | CRs/TPs Status update recommendation |
| 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)

# Topic #2: RRM requirements for Rel-17 MUSIM gaps

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| T-doc number | Company | Proposals / Observations |
| [**R4-2211591**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211591.zip) | Charter Communications, Inc | **Observation 1: No additional impacts to collect L1 and L3 measurements and RLM/BFD for MUSIM gaps as for legacy measurement gaps.**  **Proposal 1: Apply the framework agreements from concurrent gaps to define priority rules, collision between gaps and the definition of a collision for MUSIM.**  **Proposal 2: MUSIM gaps should have high priority in the event of a collision** |
| [**R4-2211912**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211912.zip) | Apple | **Proposal 1: priority-based gap collision handling introduced in concurrent gaps design can be reused for collisions between MUSIM gap and legacy measurement gap.**  **Proposal 2: RAN4 can further study gap-sharing based collisions handling in R18.**  **Proposal 3: as baseline solution, UE can only perform gap-less L3 measurement and L1 operation outside MUSIM gap. Other solutions are not precluded to handle collision between MUSIM gap and SMTC/RS for L1 operation.** |
| [**R4-2211939**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211939.zip) | CMCC | ***Proposal 1: it is necessary to discuss whether MUSIM gap patterns can be used for RRM measurement or only used for MUSIM:***   * ***MUSIM gap pattern #0 ~#13, more discussion is needed on whether can be used for RRM measurement, since these MUSIM gap patterns are same as legacy gap patterns.*** * ***MUSIM gap pattern #14 ~ #26, not suitable for RRM measurement*** * ***MUSIM gap pattern # 27 and #28, cannot be used for RRM measurement***   ***Proposal 2: for collision between different MUSIMs, priority rule can be used as baseline.***  ***Proposal 3: for collision between MUSIM gap and legacy measurement gap, priority rule can be used as baseline.*** |
| [**R4-2211969**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211969.zip) | Xiaomi | **Observation 1:** **MUSIM gaps can only be used for MUSIM operations and cannot be used for measurements configured for Network A.**  **Proposal 1: Priority based gap collision handling introduced in Rel-17 for concurrent gap could be used as baseline for collision handling between MUSIM gap and legacy measurement gap, and between different MUSIM gaps, i.e. case 1 and case 3.**  **Proposal 2: The gap proximity condition of concurrent gap collision could be reused for MUSIM gap collision.**  **Proposal 3: The principle of defining scaling factor Kp and Kgap for multi-concurrent gaps are applied to the calculation of Kp and Kgap in case 1 and case 3.**  **Proposal 4: The principle of defining P value for L1 measurement and RLM/BFD measurement in Rel-17 is applied to the calculation of P value in case 1 and case 3.**  **Proposal 5: RAN4 to define MUSIM gap overhead for MUSIM gap(s).**  **Proposal 6: RAN4 to define the requirements for Network B in RRC idle/inactive.** |
| [**R4-2212061**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212061.zip) | OPPO | **Proposal-1: Define the extended measurement period in NW-A due to the collision with MUSIM gap.**  **Proposal-2: Define the measurement period in NW-B when MUSIM gap is not dropped, and deprioritize the scenario when MUSIM gap is dropped due to collision.**  **Proposal-3: The condition “distance between the two occasions is equal to or smaller than 4m” could be used as baseline to define MUSIM gap collision in case 1 and case 3.**  **Proposal-4: The condition “SMTC is overlapping with MUSIM gap” could be used as baseline for MUSIM gap collision in case 2.**  **Proposal-5: The condition “L1 measurement resource is overlapping with MUSIM gap” could be used as baseline for MUSIM gap collision in case 4.**  **Proposal-6: Reuse priority rule to handle gap collision in case 1 and case 3, and inform RAN2 to design signalling for the association between MUSIM gaps and priority information.**  **Proposal-7: In case 2 and case 4, MUSIM gap should be prioritized over SMTC/L1 resource by default.**  **Proposal-8: For defining requirements in NW-A, update the following scaling factor by considering the collision with MUSIM gaps:**   * **Type 1: the scaling factor Kp for L3 measurements without gap** * **Type 2: the scaling factor Kgap for L3 measurements with gap** * **Type 3: the scaling factor P for L1 measurements**.   **Proposal-9: Discuss whether and how to determine the time window W when aperiodic MUSIM gap with higher priority is involved in collision.** |
| [**R4-2212209**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212209.zip) | Qualcomm Incorporated | **Observation 1: MUSIM gaps do not fulfil any measurement objectives on network A.**  **Proposal 1: Leverage the priority rule approach developed for Rel-17 concurrent MG enhancement to resolve collisions between MUSIM gaps and measurement gaps.**   * **FFS: Discuss the relative priority of MUSIM gaps vs. legacy (pre Rel-17) measurement gaps** * **FFS: Discuss the relative priority of MUSIM gaps vs. Rel-17 measurement gap enhancements (concurrent MG, pre-configured MG, NCSG)**   **Proposal 1a: Request RAN2 to introduce optional ignalling so that the UE can request the priority level of MUSIM gaps (relative to measurement gaps) via UAI.**  **Proposal 2: RAN4 will discuss separately how to define and resolve collisions between MUSIM gaps.**  **Proposal 3: No measurement requirements in network B will be defined by RAN4** |
| [**R4-2212343**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212343.zip) | Apple | Proposal 1: Address the MUSIM related RF issue when for the uninterrupted operation a UE should use particular band/carrier combinations for two SIM cards.  Proposal 2: Address the MUSIM related RF issue when for the uninterrupted operation a UE should apply power back-off larger than existing MPR/A-MPR limits. |
| [**R4-2212687**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212687.zip) | Nokia, Nokia Shanghai Bell | 1. MUSIM gaps provide enough room for Ues to perform idle/inactive measurements in Network B. 2. RAN4 not to change idle/inactive requirements on Network B for a UE configured with MUSIM gaps. 3. RAN4 to specify that all the requirements outside MUSIM gaps for Network A are not impacted by the MUSIM operation. 4. RAN4 needs to define the conditions in which the UE is considered to be in MUSIM operation mode.   Single SIM requirements do not consider the case of measurement gaps overlapping SMTCs during interruption times for RRC\_Connected state mobility.  MUSIM gaps may overlap with SMTCs during handover and re-establishment.   1. RAN4 to discuss how to handle overlap in SMTC and between MUSIM gaps for RRC connected mobility procedures in Network A. 2. Discuss if concurrent MUSIM and other Rel17/18 measurement gap types is in the scope of this WID or NR\_MG\_enh2. 3. RAN4 to start work on simultaneous RRC connected networks once RAN2 have progressed on the topic. |
| [**R4-2212765**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212765.zip) | Ericsson | ***Observation 1: Two periodic gaps are used in MUSIM as one for measurement and one for paging monitoring.***  ***Observation 2: There is no MUSIM periodic gap collision if the distance between the SSB for AGC and PO is larger than 5ms.***  ***Proposal 1: Sharing the gap between network A’s mobility measurements and the MUSIM measurements is precluded.***  ***Proposal 2: Concurrent gaps framework can be reused for MUSIM gaps.***  ***Proposal 3: MUSIM gaps can be believed as a gap set with a specific usage and priority within the ConMGs.***  ***Proposal 4: UE has the responsibility to avoid the gap collision between MUSIM gaps with other MGs for NW-A.***  ***Proposal 5: MUSIM gaps can be defined as the lowest priority, and periodic MUSIM gaps will be dropped once the gap dropping rule defined in Con-MGs is met.***  ***Proposal 6: UE can request aperiodic MUSIM gap with a higher priority. In this case, aperiodic MUSIM gap should be prioritized.***  ***Proposal 7: NW-A’s RRM procedure, including DL SMTC and UL CSI-RS, PRACH, should have higher priority than MUSIM gaps. The MUSIM periodic gaps should be dropped once the gap proximity rule is met.***  ***Proposal 8: To avoid the collision within MUSIM gaps, UE should request a single periodic gap instead of two separate periodic gaps provided that the distance between these two gaps is shorter than 5ms.***  ***Proposal 9: Aperiodic gap should have higher priority than periodic gaps once collision happens within MUSIM gaps.***  ***Proposal 10: RAN4 to define measurement requirement for NW-B Idle mode which is helpful for both NW-A and NW-B.*** |
| [**R4-2213451**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213451.zip) | vivo | **Proposal 1: All specification work listed in the 2nd item “Define RRM requirements for Rel-17 MUSIM gaps” are based on existing Rel-17 MUSIM gap patterns defined in Table 9.1.10-1 of [4] and based on corresponding RAN2’s signalling structure defined at Rel-17. All MUSIM gaps cannot be used by any measurements configured for network A and all network A measurements are carried out outside MUSIM gaps.**  **Proposal 2: Regarding network A measurement with measurement gaps or without measurement gaps, the corresponding measurement requirements on network A should be extended in order to address the impacts of MUSIM gaps due to the collision between MUSIM gaps with other gaps or occasions for measurement.**  **Proposal 3: when the MUSIM gap neither collides with any Rel-17 legacy gap nor collide with any SMTC/SSB or any resources for L1 measurement; or only MUSIM gaps are configured and the MUSIM gap does not collide with any SMTC/SSB or any resources for L1 measurement, network A measurement requirements can be reused.**  **Proposal 4: For the scenario where the MUSIM gap collides only with Rel-17 legacy gap, gap collision issue between MUSIM gap and Rel-17 legacy gaps should be solved firstly. For the gap collision rules, Rel-17 priority based gap handling rules can be considered as one possible solution besides other enhanced solutions.**  **Proposal 5: when MUSIM gap collides only with SMTC/SSB or any resource for L1 measurement, collision handling rules should be defined before measurement requirements specification.**  **Proposal 6: when MUSIM gap collides with both legacy gaps and SMTC/SSB or any resource for L1 measurement, the 1st step is to resolve the collision between gaps. After finishing gap collision handling, principles used for scenario 3 can be reused**  **Proposal 7: The necessity to define network B requirements should be discussed further. If there is a consensus to specify network B requirement, its priority should be lower compared with the work for network A requirements and could be carried out at the second phase in the WI time frame**  **Proposal 8: If there is a consensus on defining network B requirements, the following requirements are purposed to be defined for network B idle/inactive state. Requirements are not needed for other “best effort” based functions.**   * **UE measurement capability** * **Measurement and evaluation of serving cell** * **Measurements of intra-frequency NR cells** * **Measurements of inter-frequency NR cells** * **Measurements of inter-RAT E-UTRAN cells** * **Maximum interruption in paging reception** * **Measurements for UE configured with relaxed measurement criterion**   **Proposal 9: In case 1, gaps to be considered include all gaps defined till Rel-17 including Pre-MG, NCSG, concurrent gap, ePos, gaps for NTN and legacy gaps for measurement.**  **Proposal 10: For gap collision case 1 and 3, priority based solution can be considered. Enhanced solutions on gap collision beyond priority based solution are also open for discussion.**  **Proposal 11: For priority based solution, priorities can be allocated to each gap patterns and when two or more gap collide, only the highest priority gap is kept and all other gaps are dropped.** |
| [**R4-2213562**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213562.zip) | Huawei, HiSilicon | **Proposal 1: For collisions between MUSIM gap and legacy measurement gap (i.e. Rel-15 to Rel-17 measurement gaps), re-use the priority rule as defined for Rel-17 concurrent MGs.**  **Proposal 2: For collisions between MUSIM gap and legacy measurement gap (i.e. Rel-15 to Rel-17 measurement gaps), RAN4 to discuss the order for applying the priority when number of colliding MGs is larger than 2.**  **Proposal 3: For collisions between MUSIM gap and measurement outside MG (including both L1 and L3), MUSIM gap should apply, and the L1 or L3 measurement resources colliding with MUSIM gaps are dropped.**  **Proposal 4: For collisions between MUSIM gaps, re-use the priority rule as defined for Rel-17 concurrent MGs as baseline. FFS whether and how to address the scenario where MUSIM gaps are of same priority is considered.**  **Proposal 5: For measurements configured by NW A, re-use the ‘counting’ approach defined for Rel-17 concurrent MGs to define scaling factor for the impacts of MUSIM gaps**  **Proposal 6: If requirements for measurements in NW B are to be defined, re-use the existing requirements for IDLE/INACTIVE as baseline with DRX cycle replaced by max(DRX cycle, MGRP)** |
| [**R4-2213748**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213748.zip) | MediaTek inc. | **Observation #1:** NW A can reconfigure the UE with up to 4 MUSIM gaps (3 periodic and 1 aperiodic).  **Observation #2:** In Rel-17, when the UE is configured with Concurrent measurement gaps, two measurement gap occasions are considered colliding if at least one of the following conditions is met:   * the two occasions are fully or partially overlapping in time domain, or * the distance between the two occasions is equal to or smaller than [4] ms.   **Observation #3:** MUSIM gaps could collide with a single legacy MG (e.g., Rel-15/16 MG) or multiple legacy MGs (e.g., Rel-17 Concurrent MGs).  **Observation #4:** MUSIM gaps periodicity can be larger than SMTC window periodicity, i.e., SMTC occasions can occur more often than MUSIM gaps occasions.  Furthermore, the following proposals have been introduced:  **Proposal #1:** Introduce new requirements for intra-/inter-frequency and inter-RAT measurements in NW A when the UE is configured with MUSIM gaps.  **Proposal #2:** No new requirements to be introduce for NW B measurements in RRC\_IDLE/\_INACTIVE state, however, further study the impact on NW B measurement requirements considering different scenarios.  **Proposal #3:** MUSIM gap is considered colliding with the legacy measurement gaps or other MUSIM gaps if at least one of the following conditions is met:   * the two occasions are fully or partially overlapping in time domain, or * the distance between the two occasions is equal to or smaller than [4] ms.   **Proposal #4:** Apply priority rule for handling MUSIM gaps collision with the legacy MGs, where:   * UE only performs the measurements associated to a higher priority gap. * The lower priority gap occasions are considered as dropped. * Data scheduling is resumed on the dropped gap occasions.   **Proposal #5:** Method 1: First, apply gap-group priority to handle collisions between different gaps groups (i.e., MUSIM gaps group and legacy MGs group). Then, within each gap group, apply different priorities to handle the collision between the gaps within the same group.  **Proposal #6:** Method 2: Define individual priorities for all the gaps, regardless of their related gaps-group (i.e., MUSIM gaps group or legacy MGs group). Only a single list of priorities is required.  **Proposal #7:** RAN4 to study the issue when the priority is all assigned by NW A, under the current signalling framework, which might lead to missing significant activities in NW B due to MUSIM gap collision handling (e.g., reading the paging in NW B, which are unknown to NW A).  **Proposal #8:** MUSIM gaps collision with the SMTC window can be handled by puncturing the collided SMTC occasions with the non-dropped MUSIM gaps. |
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## 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 General aspects

**Issue 2-1-1: On MUSIM gap patterns**

* Proposals
  + Option 1: All specification work listed in the 2nd item of WI “Define RRM requirements for Rel-17 MUSIM gaps” are based on existing Rel-17 MUSIM gap patterns defined in Table 9.1.10-1 of TS38.133 (vivo)
* Recommended WF
  + Suggest to agree option 1

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| **Company** | **Comments** |
| Apple | Fine with option 1. |
| Ericsson | Fine with option 1. |
| MTK | Fine with option 1. |
| CMCC | OK with option 1. |
| Huawei | Fine with option 1. |
| Xiaomi | Fine with option 1. |
| Charter | Fine with option 1. |
| Qualcomm | Support option 1. |
| OPPO | Fine with option 1. |
| vivo | Ok with option 1 |
| Nokia | We prefer to keep open so that gap length can also be further discussed. |

**Issue 2-1-2: On MUSIM gap pattern purpose**

* Proposals
  + Option 1: All MUSIM gaps cannot be used by any measurements configured by network A and all network A measurements are carried out outside MUSIM gaps. (xiaomi Ericsson vivo)
    - Option 1a: MUSIM gaps do not fulfil any measurement objectives on network A (Qualcomm)
  + Option 2: it is necessary to discuss whether MUSIM gap patterns can be used for RRM measurement or only used for MUSIM (CMCC)
* Moderator note: In Note 1 of Table 9.1.10-2 of TS38.133 the purpose of MUSIM gap is only for target network.
* Recommended WF
  + Suggest to agree option 1.

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| **Company** | **Comments** |
| Apple | Support option 1, considering the scope is limited to R17 functionality. |
| Ericsson | Option 1.  Once the meas. gap will be reused for MUSIM measurements, network A doesn’t know how many MOs will be measured in the gap. Thus, these configured MUSIM gaps should be used by MUSIM measurement exclusively other than sharing with other MOs for NW-A. On the other hand, the configured legacy MG also cannot be used for MUSIM measurements. |
| MTK | Support option 1. The purpose of MUSIM gaps is to monitor NW B only. All the measurements performed in NW A should be outside MUSIM gaps. The purpose of MUSIM gaps also captured in 9.1.10 of 38.133:  “If the UE requires gap patterns for MUSIM purpose, such as cell identification and measurement, paging monitoring, SIB acquisition, and/or on-demand SI request of the target cell in the target network, then the network may provide one or more per-UE MUSIM gap pattern(s) for concurrent monitoring of all frequency layers for MUSIM via MUSIM-GapConfig [2].” |
| CMCC | The motivation we propose option 2 is that MUSIM gap pattern #0 ~#13 are same as legacy gap patterns, it may be necessary to discuss whether they are only for MUSIM or can be used for the measurement of network A. According to companies’ clarification, we are also fine with option 1. |
| Huawei | Option 1.  The applicability of MUSIM gaps is already defined in Rel-17. Technically, we also think using MUSIM gaps for NW A measurements can cause additional complexity in the spec and implementation. |
| Xiaomi | Support option 1. |
| Charter | Support option 1. |
| Qualcomm | Support Option 1/1a. |
| OPPO | Support option 1, and we are also open to option 2 in case that measurements configured by NW-A is fully overlapped with MUSIM gap. |
| vivo | Support option 1. To us option 1a is the same as option 1. |
| Nokia | We support Option 1.  MUSIM gaps used only used for MUSIM, and if gap collision occurs gap priority scheme should apply. |

### Sub-topic 2-2 On network A requirements

**Issue 2-2-1: Principle on network A requirements**

* Proposals
  + Option 1: Define the extended measurement period in NW-A due to the collision with MUSIM gap (oppo vivo)
  + Option 2: Introduce new requirements for intra-/inter-frequency and inter-RAT measurements in NW A when the UE is configured with MUSIM gaps (MTK)
* Recommended WF
  + Topic is covered by following items, no need to discuss here.

**Issue 2-2-2:** **Scenario where network A requirement can be directly reused**

* Proposals
  + Option 1: when the MUSIM gap neither collides with any Rel-17 legacy gap nor collide with any SMTC/SSB or any resources for L1 measurement; or only MUSIM gaps are configured and the MUSIM gap does not collide with any SMTC/SSB or any resources for L1 measurement, network A measurement requirements can be reused. (vivo)
  + Option 2: RAN4 to specify that all the requirements outside MUSIM gaps for Network A are not impacted by the MUSIM operation. (Nokia)
* Moderator: Option 1 and 2 may not be exclusive each other. Proponent could check whether they are identical or not.
* Recommended WF

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| **Company** | **Comments** |
| Apple | To our understanding option 1 and 2 are similar. They are both for non-overlapping scenario. We are fine with both. |
| Ericsson | **Issue 2-2-1: Principle on network A requirements**  Agree with the recommended WF.  **Issue 2-2-2: Scenario where network A requirement can be directly reused**  Option 2.  Option 1 is incomplete which only considers the DL SSB other than UL signals, such as PRACH. |
| MTK | Two notes for option 1:   * In the first line, Rel -17 should be removed as “when the MUSIM gap neither collides with any ~~Rel-17~~ legacy gap nor collide…” * We are not sure if the scenarios specified in Option 1 are the only ones when the requirements for NW A will not be impacted, for example, what if collision happens between MUSIM gaps and RACH procedure in NW A?   Option 2 is not very clear.  In our opinion, we should specify the requirements which are impacted by MUSIM operation not the other way around. We cannot list all the 38.133 requirements which may not be impacted by MUSIM. |
| CMCC | For Option 1, we share similar view with MTK that “~~Rel-17~~ legacy gap” is better. And in our understanding option 1 targets for the DL related requirements/procedure. And we agree with Ericsson and MTK that the impact on UL related requirements/procedure, i.e. RACH procedure, also need to be considered.  Option 2 is more general, but it is not clear enough. For example, “outside MUSIM gaps” includes two cases: fully non-overlap, partial overlap. For the case with partial overlap, the requirements of network A are impacted, may be a factor is needed to xclude the gap occasions which are overlap with MUSIM gaps.  One suggestion is that on top of option 1, the impact on UL related requirements/procedure can be added. |
| Huawei | On option 1, we can understand the intention, and we also agree that if MUSIM gaps do not overlap with any measurement resource (SSB, CSI-RS) in NW A, the current measurement requirements would apply. On the other hand, we are not sure if we need a specific agreement for this scenario, i.e. the requirements with MUSIM gaps will be generic and this is just a special case. For example, in Rel-15 in the requirements for measurement without MG we also consider the impacts of MG with Kp, but if the SMTC is fully non-overlapped with MG, then Kp=1 would apply.  On option 2, it is not fully clear to us, e.g. we are not sure how it works with partial overlapping case as mentioned by CMCC. |
| Xiaomi | For option 1, we agree that under the scenarios listed in this proposal, the existing requirements could be reused. We can further check the RACH procedure impacts mentioned by companies.  From our understanding, option 2 is more generic proposal that may not be limited to the scope of scenario where network A requirement can be directly reused. Further clarification is needed. |
| Charter | For option 2, we believe it is good to identify when Network A is impacted or not. However, we would prefer to specify when Network A is impacted though. |
| Qualcomm | For option 1, we think “legacy gap” should be replaced with “measurement gap” (including NCSG). Similar to MTKs comment, it is good to have a baseline understanding about when requirements are not affected but the discussion should focus how to handle cases where requirements would be affected. E.g. MUSIM collisions with SMTC vs. measurements gaps may be defined differently.  Option 2 seems too broad. Many RRM requirements are defined over long periods of time and there may be some impact from MUSIM gaps, e.g. if occasional/partial collisions occur. |
| OPPO | We agree with the principles behind the two proposals. |
| vivo | We agree most comments regarding option 1 and 2 and agree that the focus should be network A requirement being impacted. |
| Nokia | We prefer Option 2, but agree that both options are similar (different wording).  We think that once MUSIM gaps are assigned by network A, the UE should perform measurements regarding Network B using the gaps. Hence, outside the gaps network A is under normal (non-MUSIM) condition and legacy measurement requirements apply (option1). |

**Issue 2-2-3: Principle on layer 3 measurement requirements after gap collision handling**

* Proposals
  + Option 1: The principle of defining scaling factor Kp and Kgap for multi-concurrent gaps are applied to the calculation of Kp and Kgap for layer 3 measurement (xiaomi oppo)
    - Option 1a: re-use the ‘counting’ approach defined for Rel-17 concurrent MGs to define scaling factor for the impacts of MUSIM gaps (Huawei)
  + Option 2: Define requirements after solving gap collision issue (vivo)
* Recommended WF

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| **Company** | **Comments** |
| Apple | Fine with option 1/1a. |
| Ericsson | It’s too early to discuss this issue. If the agreement follows ConMGs dropping rule, it’s easy to derive the conclusion. |
| MTK | Option 1 seems fine, but we also agree with option 2, i.e., we should first agree on how to handle the collisions, then we can decide on how to define these requirements. |
| CMCC | Agree with option 2, firstly discuss how to solve the collision issue, then we can discuss the detailed requirements. |
| Huawei | We can support option 2 at this stage.  If the collision handling from Rel-17 con-MG is re-used, then Option 1 and 1a can be applied. |
| Xiaomi | We support option 1 and 1a.  Also can accept option 2 to discuss the collision handling issue first. |
| Qualcomm | Agree to address collisions first. |
| OPPO | Option 1. The current priority rules and scaling factors Kp/Kgap defined for concurrent gaps could be considered as the starting point for MUSIM gap. We can also discuss this issue after the solutions to handle gap collision are agreed. |
| vivo | Ok with option 2. Same view as Huawei that is if Rel-17 con-MG is reused, Option 1 and 1a is ok. |
| Nokia | We can agree with Option 2 as a first step. The exact scaling factor definition should be FFS at this stage of the work. |

**Issue 2-2-4: Principle on L1 measurement requirements after gap collision handling**

* Proposals
  + Option 1: The principle of defining P value for L1 measurement and RLM/BFD measurement in Rel-17 cam be reused (xiaomi oppo)
    - Option 1a: re-use the ‘counting’ approach defined for Rel-17 concurrent MGs to define scaling factor for the impacts of MUSIM gaps (Huawei)
  + Option 2: Define requirements after solving gap collision issue (vivo)
* Recommended WF

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| **Company** | **Comments** |
| Apple | Fine with option 1/1a. |
| Ericsson | It’s too early to discuss this issue. If the agreement follows ConMGs dropping rule, it’s easy to derive the conclusion. |
| MTK | Option 1 seems fine, but we also agree with option 2, i.e., we should first agree on how to handle the collisions, then we can decide on how to define these requirements. |
| CMCC | Same comments as for Issue 2-2-3, agree with option 2, firstly discuss how to solve the collision issue, then we can discuss the detailed requirements. |
| Huawei | Same comment as for issue 2-2-3. |
| Xiaomi | We support option 1 and 1a.  Also can accept option 2 to discuss the collision handling issue first. |
| Qualcomm | Same comments as in issue 2-2-3. |
| OPPO | Support option 1/1a. Different from the collision between MUSIM gaps and other gaps in issue 2-2-3, this issue is talking about the collision between L1 measurement configured by NW-A and MUSIM gap, we think the MUSIM gap should be prioritized by default. |
| vivo | FFS |
| Nokia | We can agree with Option 2 as a first step. The exact scaling factor definition should be FFS at this stage of the work. |
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### Sub-topic 2-3 Gap collision handling

**Issue 2-3-1: General principles on gap collision handling**

* Proposals:
  + - Option 1: For priority based solution, priorities can be allocated to each existing gap patterns and when two or more gap collide, only the highest priority gap is kept and all other gaps are dropped (vivo MTK)
    - Option 2: Apply gap-group priority to handle collisions between different gaps groups (i.e., MUSIM gaps group and legacy MGs group). Then, within each gap group, apply different priorities to handle the collision between the gaps within the same group (MTK, Ericsson)
    - Option 2a: MUSIM gaps can be believed as a gap set with a specific usage and priority within the ConMGs (Ericsson)
* Recommended WF

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| **Company** | **Comments** |
| Apple | Support option 1 for simplicity. |
| Ericsson | Option 2.  From our understanding, option 1 will make the issue too complex. We need to further discuss the max gap number and the additional overhead, gap dropping rule due to multiple gaps.  If we go option 2, all the things will be easy. MUSIM gap will be one of the gap in ConMGs. We can inherit the agreements for the max gap number and RAN4 can avoid the discussion for overhead, gap dropping tule due to multiple gaps.  Especially, from NW’s perspective, all MUSIM periodic gaps have no any difference and should apply the same priority. How to handle the UE’s behaviours in each MUSIM gap is a black box and fully up to UE. There is no any further impact except the overall interruption to NW-A. |
| MTK | Maybe further clarification on these two options, as discussed in our paper, gap priority can be applied in two different ways:   * Method 1 (same as Option 1): Apply priority individually for each gap, regardless which gap group they belong to (e.g., MUSIM gap group or legacy MG group)      * Method 2 (same as Option 2): Apply gap-group priority to handle collisions between different gaps groups (i.e., MUSIM gaps group and legacy MGs group). Then apply different priority to handle the collision in each group.     In our view both methods in Option 1 and 2 have their own pros and cons which can be further studied. Maybe we can have a high-level agreement on applying priority rule to handle collisions, but the way how to apply it can be FFS. |
| CMCC | For option 2, two questions for clarification:   1. According to RAN2 design, up to 4 gaps can be configured for MUSIM. We would like to know whether these MUSIM gaps have same priority or different priority? In our understanding, these MUSIM gaps can have different priority. We would like to hear companies’ views. 2. According to concurrent MG, different priority applies for different MG. When we handle collisions between different gaps groups (i.e., MUSIM gaps group and legacy MGs group), since there is different priority among legacy gaps, how to determine the priority of legacy MGs group? Or does it mean a group level priority will be configured additionally? |
| Huawei | We support option 1, and FFS whether and how to address the scenario where MUSIM gaps are of same priority is considered.  In our understanding, in Rel-17 the priority can be configured for each individual gap. Assuming the priority configuration can be extended to MUSIM gaps, would this provide a more flexible framework than group based priority as in option 2? For example, if NW A configures same priority for the MUSIM gaps, then it is effectively same as a group priority. Not sure if we missed some point here, so clarification from proponents of option 2 is appreciated.  As discussed in our paper, for concurrent MGs, all the MGs are configured by NW A, and NW A can well determine the priority for each MG based on the measurement purpose. On the other hand, MUSIM gaps are based on UE requests, and it may be difficult for NW A to determine the priority between different MUSIM gaps, so we may need to consider the scenario where MUSIM gaps are configured with same priority. |
| Xiaomi | Support option 1.  From our perspective, we prefer all the gaps, i.e. legacy measurement gaps and MUSIM gaps, have different priority. Open to further study. |
| Charter | We prefer option 2. |
| Qualcomm | In our view, RAN4 should consider two separate cases:   * 1. Collisions between a MUSIM gap and measurement gaps   2. Collisions between MUSIM gaps   We support adopting a priority-based scheme for both cases but the definition of collisions may be different for cases a and b.  For option2, we don’t see a clear need to introduce group-level priorities.  With respect to assigning priorities, see our comment under issue 2-3-1-1. |
| OPPO | Support option 1, a unified priority should be associated to each MUSIM gap. |
| vivo | For the gap collision generally we have two different way to move forward :  1. Define a priority to each gap no matter the gap belongs to which feature or for which purpose. With this priority and after solving ordering issue below then theoretically, only one gap will be left if multiple gaps (more than 2) collide.  2. Solve the gap collision within each feature (group) firstly, for example when MUSIM gap collides, resolving the collision based on priority (or other) rules. Then solve the gap collision between different feature (groups). We think this method is a little bit complicated and the result could be the same as that of method 1.  Hence we prefer option 1. |
| Nokia | We share the view from MTK, Each gap may have different priority depending on the importance of the procedure to run (e.g. paging monitoring in RRC\_IDLE/RRC\_INACTIVE may be more critical than measurements in certain conditions), However, a group priority may also be needed in case gaps from two groups collide w/ same procedure priority. Hence, we prefer to keep this as FFS |

**Issue 2-3-1-1: On network A priority assignment scheme**

* Proposals:
  + - Option 1: RAN4 to study the issue when the priority is all assigned by NW A, under the current signalling framework, which might lead to missing significant activities in NW B due to MUSIM gap collision handling (e.g., reading the paging in NW B, which are unknown to NW A) (MTK).
* Recommended WF

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| **Company** | **Comments** |
| Apple | We are open for further study. According to current design UE can provide MUSIM gap preference. Eventually it is still under control of NW A. |
| Ericsson | We think RAN4 can further discuss this paging handling issue for NW-B. Furthermore, we also need to consider the paging collision between NW-A and NW-B. |
| Huawei | We are open to further study, and we have same view as Apple that the configuration of MUSIM gaps is controlled by NW A, including their priorities compared to other MGs. |
| Qualcomm | MUSIM gaps are requested by the UE via UAI and network A can either configure at least one of the requested gaps or no gaps at all, according to RAN2 agreement. So network A does not have complete freedom when it comes to configuring MUSIM gaps.  Network A does not know exactly how MUSIM gaps will be used by the UE, except that they are used for MUSIM support. Therefore, network A does not have full context to prioritize MUSIM gaps vs. measurement gaps. Our proposal (option 1a under issue 2-3-2-2) is to allow the UE to optionally request priorities for MUSIM gaps via UAI. If no priority is requested by the UE then a default priority would apply. |
| OPPO | Open to discuss. We think UE could indicate the preferred priority for MUSIM gap, based on the target task/activities in NW-B. RAN2’s work is also needed for signaling design and the request/configure mechanism. |
| vivo | We have similar understanding as Apple and Huawei that UE can provide some preference when applying MUSIM gaps. Open for discussion |
| Nokia | Not clear  Can the proponent company clarify if the priority on the proposal is between 2 MUSIM gaps or 1 MUSIM gap and one NetA related gap?   In principle this discussion should be taken after the priorities (based on procedure and/or group), and corresponding levels are settled. At procedure level the priorities should be specified, hence, not decided by NWA and corresponding test case can be agreed. |

**Issue 2-3-2: Collisions between MUSIM gap and legacy measurement gap (i.e., Rel-15 to Rel-17 measurement gaps)**

**Issue 2-3-2-1: Clarification on the scope of Rel-17 legacy gap**

* Proposals:
  + - Option 1: Discuss if concurrent MUSIM and other Rel17/18 measurement gap types is in the scope of this WID or NR\_MG\_enh2 (Nokia)
    - Option 2: In case 1, gaps to be considered include all gaps defined till Rel-17 including Pre-MG, NCSG and legacy gaps for measurement and other purposes (vivo)
* Recommended WF

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| **Company** | **Comments** |
| Apple | Concurrent MUSIM and other R17 gaps are in the scope. However, potential new R18 gap is not in current scope. We shall focus on R17 gaps first. If time allows we can further consider new R18 gaps if any. |
| Ericsson | We support option 2.  R18 gap is unclear and should be deprioritized. |
| MTK | Option 2. |
| CMCC | OK with option 2. |
| Huawei | On option 1, we think it is a valid question, and we understand concurrent MUSIM and other Rel17 (but not R18) measurement gap types is in the scope of this WID.  We are fine with option 2. |
| Xiaomi | Fine with option 2. |
| Qualcomm | Option 2 |
| OPPO | Option 2. |
| vivo | Option 2. For option 1, R17 gaps are fine however R18 gap is not clear and is out of the scope of this study. |
| Nokia | I understand that Rel 17 do no specify collisions with PreMG, NCSG, that is the scope of Rel 18 MG\_Enh2.  How do we use Rel 17 as baseline and also define requirements for colisions with PreMG and NCSG? |

**Issue 2-3-2-2: Collisions handling rules between MUSIM gap and legacy measurement gap**

* Proposals:
  + - Option 1: Priority-based gap collision handling introduced in concurrent gaps design can be used as a base for collisions between MUSIM gap and legacy measurement gap (Charter communications Apple CMCC Xiaomi oppo Qualcomm vivo Huawei MTK Ericsson)
    - Option 1a: Request RAN2 to introduce optional signaling so that the UE can request the priority level of MUSIM gaps (relative to measurement gaps) via UAI (Qualcomm)
    - Option 2: Other enhanced gap collision solutions are open for study. (Apple vivo)
    - Option 3: UE has the responsibility to avoid the gap collision between MUSIM gaps with other MGs for NW-A. (Ericsson)
* Moderator: Option 1 and option 2 are not exclusive each other
* Recommended WF

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| **Company** | **Comments** |
| Apple | Option 1 and 2 are not mutual exclusive. We support starting from option 1 and further consideration option 2. |
| Ericsson | We support option 1 and 2.  For option 1a, we need to check it carefully since RAN2 had already agreed no priority indication from UE in R17. |
| MTK | Support Option 1. We can further discuss option 1a.  For Option 3, is up to UE implementation. |
| CMCC | Support option 1, and open to other solutions. |
| Huawei | Support option 1. Option 2 is also fine.  On option 1a, we need more time to check. In our view, the configuration of MUSIM gaps is still controlled by NW A, including their priorities compared to other MGs.  On option 3, we agree with MTK that this should be up to UE implementation. |
| Xiaomi | Support option 1, and open to other solutions. |
| Charter | We agree with Apple, option 1 and 2 are not exclusive. We support option 1 and happy to study option 2 further. |
| Qualcomm | Support option 1 with the clarification that “legacy measurement gaps” includes all measurement gaps is Rel-17.  Regarding option 1a (we support), please see our comment under issue 2-3-1-1.  We do not support option 3 as a mandate to the UE. E.g. say the UE requests MUSIM gaps which are configured by network A. Then, later on, network A configures a gap that overlaps with one of the MUSIM gaps. The UE cannot be responsible for avoiding collisions in such case. |
| OPPO | Support option 1. |
| vivo | As indicated option 1 and option 2 are not exclusive each other.  Support option 1 and 2.  Option 3 is up to UE implementation and we cannot see there is any directly impact from option 3 on specs. |
| Nokia | We agree that priority-based handling will be necessary (option 1&2). This question should be part of the discussion on priorities (based on procedure and/or group), and corresponding levels which has the purpose to resolve potential collision. |

**Issue 2-3-2-3: Priority of MUSIM against other legacy gaps**

* Proposals:
  + - Option 1: MUSIM gaps should have high priority in the event of a collision (Charter communications)
    - Option 2: MUSIM gaps can be defined as the lowest priority, and periodic MUSIM gaps will be dropped once the gap dropping rule defined in Con-MGs is met (Ericsson)
* Recommended WF

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| **Company** | **Comments** |
| Apple | For the sake of flexibility, we can leave it to network control. After receiving MUSIM gap preference, it is up to NW A how to configure the priority level. Option 1 may result in NW A degradation. To avoid that, NW A may choose to configure non-overlapped MUSIM gap which may not be the same as preferred by the UE. Furthermore, NW A may even choose not to configure MUSIM gap just to avoid degradation. |
| Ericsson | Option 2  From our understanding, all MUSIM gap procedures are best effort. Thus, the simplest way is setting the lower priority for MUSIM periodic gaps.  We’re open to further check the potential impact based on this priority setting, such as paging dropping for NW-B. |
| MTK | For these options, we don’t think we should have a fixed priority for MUSIM gaps group (i.e., onetime MUSIM gap can be higher priority than legacy MG, another time legacy MG can be higher priority than MUSIM gap). In other words, MUSIM gaps priority should be configurable not fixed. |
| CMCC | Similar view as Apple. It is up to network configuration. |
| Huawei | Same view as Apple, MTK and CMCC, i.e. it may be straightforward to follow Rel-17 where the gap priority is configured by the NW. |
| Xiaomi | We prefer to leave it to network control. |
| Charter | We are willing to compromise to leave it to network control. |
| Qualcomm | We support Option 1 as the default relative priority of MUSIM gaps vs. measurement gaps. i.e. by default, MUSIM gaps would have higher priority than measurement gaps.  We also support having flexibility to choose different priority level(s). However, we do not think it should be entirely up to network A to select the priority, for the reasons mentioned before (see issue 2-3-1-1). |
| OPPO | It is up to NW-A configuration and UE request to indicate the preferred priority for MUSIM gap.  In case of R15 legacy gap without priority, we are fine to discuss default priority. |
| vivo | For this issue we think we only define the scheme where priority can be assigned to a gap. Regarding whether MUSIM gap or other gaps have a relative high or low priority could be up to network implementation. |
| Nokia | Better to keep as FFS: This needs further discussion to evaluate the impact in details |

**Issue 2-3-2-4: Order for applying the priority when number of colliding MGs is larger than 2**

* Proposals:
  + - Option 1: For collisions between MUSIM gap and legacy measurement gap (i.e. Rel-15 to Rel-17 measurement gaps), RAN4 to discuss the order for applying the priority when number of colliding MGs is larger than 2. (Huawei)
* Recommended WF

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| **Company** | **Comments** |
| Apple | The simplest solution could be to drop all gaps except the one with highest priority. We are open for further study. |
| Ericsson | Postpone the discussion.  We can further check whether this issue is valid based on the conclusion for issue 2-3-1. |
| MTK | Further study the issue. |
| Huawei | We are fine with FFS. The point is that the number of gaps that may collide can be larger than 2. |
| Xiaomi | Fine to further study. |
| Qualcomm | Agree this issue should be discussed. There was discussion related to this issue in Rel-17 MG\_enh. |
| OPPO | Open to study. |
| vivo | If only one gap is left no matter how many gaps (>2) collide based on priority rules, we think different order will lead to the same result. |
| Nokia | Should be FFS |

**Issue 2-3-3: Collisions between MUSIM gap and SMTC and other L3/L1 measurement resources**

**Issue 2-3-3-1: Definiton of collisions between MUSIM gap and SMTC and other L3/L1 measurement resources**

* Proposals:
  + - Option 1: Condition “SMTC is overlapping with MUSIM gap“ and “L1 measurement resource is overlapping with MUSIM gap” could be used as baseline for MUSIM gap collision with SMTC an L1 measurement resources (oppo)
* Recommended WF

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| **Company** | **Comments** |
| Apple | Fine with option 1. |
| Ericsson | Don’t understand the proposal. Does any special thing need to be further clarification? |
| MTK | Option 1 maybe should be:  Condition “SMTC is overlapping with MG“ and “L1 measurement resource is overlapping with MG”could be used as baseline for MUSIM gap collision with SMTC and L1 measurement resources.  Given the above correction, we are fine with this proposal. |
| Huawei | We are fine with option 1 based on MTK’s clarification. |
| Xiaomi | We are fine with option 1 based on MTK’s clarification. |
| Qualcomm | We can agree with option 1 assuming MTKs clarification is correct. |
| OPPO | Support option 1 and MTK’s clarification.  To Ericsson, the collision between two gaps is discussed for concurrent gaps in Rel17 and is defined as <=4m. Here we are considering a new collision type between SMTC/measurement resource for NW-A and MUSIM gap for NW-B, we think the definition for collision should be specified at first. |
| vivo | For the condition on collision between MUSIM gap and SMTC, the conditions should be the same as that of legacy conditions when SMTC collides with legacy Rel-16 MG.  Support MTK’s update. |
| Nokia | Proposal is unclear. |

**Issue 2-3-3-2: Priority of MUSIM against SMTC and other L3/ L1 measurement resources**

* Proposals:
  + - Option 1: MUSIM gaps should have high priority against SMTC and L1 measurement resources (oppo Huaewi MTK)
    - Option 2: NW-A’s RRM procedure, including DL SMTC and UL CSI-RS, PRACH, should have higher priority than MUSIM gaps. The MUSIM periodic gaps should be dropped once the gap proximity rule is met. (Ericsson)
    - Option 3: As baseline solution, UE can only perform gap-less L3 measurement and L1 operation outside MUSIM gap. Other solutions are not precluded to handle collision between MUSIM gap and SMTC/RS for L1 operation. (Apple)
* Recommended WF

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| **Company** | **Comments** |
| Apple | Support option 3.  Option 1 is identical to the first sentence of option 3. We are open to further discussion on possible optimization. |
| Ericsson | We think it’s too early to have any conclusion.  Before the group to further discuss this issue, we want to clarify the following scenarios for further discussion.   * MUSIM gaps collide with SSB/SMTC for L1/L3 measurement * MUSIM gaps collide with SSB/SMTC for RRC CONNECTED mobility procedures, such as Handover, SCell activation, TCI state switching, etc. * MUSIM gaps collide with Paging and system info. update for NW-A * MUSIM gaps collide with important uplink signals, such as PRACH, CSI-RS reporting which is used to indicate the completion of any RRC CONNECTED mobility procedure for NW-A |
| MTK | Support Option 1, which follows the same principle when collision happens between legacy MGs and SMTC.  For option 2, PRACH procedure can be higher priority than MUSIM gaps, but not for the other mentioned procedures.  Option 3, maybe further clarification is required. |
| Huawei | Support option 1 which is same as for normal MG.  In our view, the final control on MUSIM gap is still at NW A, so NW A could consider its impacts as it does for normal MG.  Option 2 can be FFS. |
| Xiaomi | Generally fine with option 1, which is the same way as legacy MG requiremnt. |
| Qualcomm | Support Option 1.  Regarding option 3, we believe this is already addressed by issue 2-1-2. i.e. no measurements for network A are performed inside MUSIM gaps. |
| OPPO | Support option 1 as the baseline. |
| vivo | OK with option 1 |
| Nokia | We agree with Ericsson that it is too early to define priorities.  For Option 1 we think it is not ok to assign higher priority for MUSIM in comparison to L1 measurements as default.  For Option 2 it might be ok, since it prioritizes RRC connected procedures in Network A in comparison to RRC idle procedures in Network B. |

**Issue 2-3-4: Collisions between different MUSIM gaps**

* Proposals:
  + - Option 1: priority rule can be used as baseline (Charter CMCC Xiaomi oppo vivo Huawei)
    - Option 2: RAN4 will discuss separately how to define and resolve collisions between MUSIM gaps (Qualcomm)
    - Option 3: To avoid the collision within MUSIM gaps, UE should request a single periodic gap instead of two separate periodic gaps provided that the distance between these two gaps is shorter than 5ms (Ericsson)
    - Option 4: Aperiodic gap should have higher priority than periodic gaps once collision happens within MUSIM gaps. (Ericsson)
    - Option 5: It is UE’s responsibility not to request colliding MUSIM gaps from NW-A (Nokia)
* Recommended WF

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| **Company** | **Comments** |
| Apple | Support option 1. Meanwhile, so far we don’t see necessity to handle this collision differently on top of collision between MUSIM gaps and legacy gaps. |
| Ericsson | Firstly, we want to point out the fundamental different between ConMGs and MUSIM gaps.  In ConMGs, UE will use the MG only to perform measurement. The reason to define the gap dropping rule is UE cannot switch too fast between different gaps for different frequency’s measurement.  However, in MUSIM gaps, one periodic gap will be used for measurement, one periodic gap for paging reception and another periodic gap for SIB decoding. We don’t think any issue for UE to perform these procedures in sequentially. On the contrary, UE should perform some procedures together. For example, UE should retune the AGC before the paging reception which had already agreed in Idle mode.  In this case, we think both gaps(one for measurement and AGC; one for paging) shouldn’t be dropped. Instead, UE should use a single gap to handle them together. Thus, we don’t see any MUSIM gaps dropping rule need to be defined. On the contrary, if the two gaps meet the proximity rule, UE should request a single periodic gap instead of two separate periodic gaps. Or we can call it as a MUSIM gap merge rule. |
| MTK | As a high-level agreement Option 1 is fine. Option 2 can be discussed next after agreeing on Option 1.  For option 3, we should not define the requirement on how UE should request the gap. This is not the scope of the issue.  For Option 4, we also agree that aperiodic gap can be higher priority than the periodic ones. |
| CMCC | Prefer option 1. |
| Huawei | Support option 1, and option 2 is also fine. The point raised up by Ericsson can also be considered in option 2.  On option 3, we understand it is up to UE implementation to request MUSIM gaps.  Option 4 can be FFS, we think the issue of handling aperiodic gap is valid. |
| Xiaomi | Prefer option 1. |
| Charter | We support option 1, but we see option 2 and option 4 as options going forward if an agreement of option 1 is reached. |
| Qualcomm | We agree with the point made by Ericsson that there are differences between MUSIM gaps and measurement gaps. That’s why we proposed (Option 2) to consider different definition and handling of collisions between MUSIM gaps, instead of applying the same approach applied for concurrent MGs. |
| OPPO | Support option 1. |
| vivo | Prefer option 1. Priority based rule should be used as like a final backup to resolve collision between MUSIM gaps. Of course other optimization on gap handing solution between MUSIM could be studied. For option 3, it is reasonable however it is up to UE implementation. |
| Nokia | Option 5 added. We like to question how likely is this scenario?  It should be UE’s responsibility that the MUSIM gaps corresponding to its actions on NW-B are not colliding.” |

**Issue 2-3-4-1: On MUSIM gap collision definition**

* Proposals:
  + - Option 1: The gap proximity condition of concurrent gap collision could be reused for MUSIM gap collision (Xiaomi oppo MTK Ericsson)
* Recommended WF

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| **Company** | **Comments** |
| Apple | Support option 1. |
| Ericsson | We agree to reuse the proximity condition, but to define the merge rule instead of dropping rule. |
| MTK | Support Option 1. But this should be more precise to define MUSIM gap collision with other gaps (e.g., not with SMTC). |
| CMCC | The principle in general is fine. To make it more clear, one question for clarification: for “MUSIM gap collision” in option 1, does it mean collision between ifferent MUSIM gaps? Or it means the collision between MUSIM gaps with other gaps? Or both? |
| Huawei | Support option 1. |
| Xiaomi | Support option 1. From our side, the “MUSIM gap collision” cover both conllision between ifferent MUSIM gaps and collision between MUSIM gaps and other gaps. |
| Charter | We support option 1. |
| Qualcomm | We think RAN4 should consider different definition/handling of collisions between MUSIM gaps. See our comment under issue 2-3-4. |
| OPPO | Support option 1, and we think it should apply for collision between two different MUSIM gaps, and collision between MUSIM gaps and other legacy gaps. |
| vivo | Support option 1 to be used as the condition for the collision between MUSIM gap and other gaps. |
| Nokia | FFS |

**Issue 2-3-5: On aperiodic gap**

* Proposals:
  + - Option 1: Discuss whether and how to determine the time window W when aperiodic MUSIM gap with higher priority is involved in collision (oppo)
    - Option 2: UE can request aperiodic MUSIM gap with a higher priority. In this case, aperiodic MUSIM gap should be prioritized. ~~And aperiodic gap should have higher priority than periodic gaps~~ (Ericsson)
* Moderator Note: Option 1 and 2 are not exclusive.
* Recommended WF

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| **Company** | **Comments** |
| Ericsson | As we proposed before, dropping MUSIM gaps may have some issues for some important procedure for NW-B. Thus, we think aperiodic gap can be a good complementation for these cases. UE can request an aperiodic gap which can have higher priority. There is not too much performance impact to NW-A since it’s a one shot gap. |
| MTK | For Option 1, W can be defined to be the largest periodicity among all the periodic gaps + Time margin [M] for the one-shot aperiodic gap. M can be FFS.  For Option 2, whether and how to capture this in the specs, we need to discuss the priority framework first. |
| Huawei | On option 1, we think it is a valid issue, but since it is related to how we define the detailed requirements in the spec, it can be FFS and discussed later after RAN4 has conclusion on the principle for handling aperiodic gap.  On option 2, we understand it is related to option 4 in issue 2-3-4, so we can we can first focus on the principle for handling aperiodic gap. |
| Qualcomm | Regarding option 2, how will this be requested? See our proposal about UAI signalling (issue 2-3-2-2).  FFS on option 1. |
| OPPO | For option 2, higher for aperiodic MUSIM gap is reasonable for some emergency activities in NW-B. but it is up to UE implementation and NW-A configuration.  For option 1, if this scenario is reasonable, we should discuss the solution for time window W. |
| vivo | For option 1, we also think it is a valid issue. Same view as HW that we can discuss it later when we define requirements.  For option 2, we think it is related to Issue 2-3-4 (Collisions between different MUSIM gaps) and also related to Issue 2-3-2-3 (Priority of MUSIM against other legacy gaps). Basically our understanding is the priority is allocated by the network and UE could provide some assistance information. |
| Nokia | FFS |

### Sub-topic 2-4 Network B requirements

**Issue 2-4-1: Whether to define network B requirements**

* Proposals:
  + - Option 1: Define the requirements for Network B in RRC idle/inactive (xiaomi Ericsson)
    - Option 2: No measurement requirements in network B will be defined by RAN4 (Qualcomm)
    - Option 3: No impact on Network B requirements provided that the gaps are configured in Network A. and RAN4 not to change idle/inactive requirements on Network B (Nokia)
    - Option 4: If there is a consensus to specify network B requirement, its priority should be lower compared with the work for network A requirements and could be carried out at the second phase in the WI time frame (vivo)
    - Option 5: If requirements for measurements in NW B are to be defined, re-use the existing requirements for IDLE/INACTIVE as baseline with DRX cycle replaced by max(DRX cycle, MGRP) (Huawei)
    - Option 6: No new requirements to be introduce for NW B measurements in RRC\_IDLE/\_INACTIVE state, however, further study the impact on NW B measurement requirements considering different scenarios. (MTK)
* Recommended WF

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| --- | --- |
| **Company** | **Comments** |
| Apple | We consider requirements for NW B as low priority, i.e. option 4. |
| Ericsson | Option 1.  We think it’s important to define UE’s requirement for NW B. Otherwise, the whole MUSIM gaps will be a black box for both NW-A and NW-B. For example, UE should follow the cell evaluation requirement for NW-B to guarantee the performance in NW-B’s Idle mode. |
| MTK | We are fine with Option 2 since it is not straight forward to identify the new requirements in NW B (in IDLE/INACTIVE) when we could have different configurations for MUSIM gaps. |
| Huawei | Option 2 is our first preference. Same reason as mentioned by MTK. |
| Xiaomi | Support option 1. From our perspective, the measurements on Network B are conducted based on the throughout loss performance of Network A, so it is fair to define RRM requirements for Network B.  We can also accept option 4 to deprioritize the NW B requirements |
| Charter | We support option 1. We think Network B should be able to always guarantee receiving transmission, and thus need to ensure to be with the best cell in the network. Therefore, although in idle mode, measurement requirement should be needed to fulfill the guarantee. |
| Qualcomm | We support option 2. From our discussion paper:  “Any new requirements would likely be dependent on the combination of MUSIM gaps that are requested by the UE. Since there are more than twenty MUSIM gap patterns and the UE can request up to 3 periodic gaps (plus one aperiodic gap), there are many such combinations. Additionally, there are no mandatory gap patterns for MUSIM so it would not be possible to define a test case configuration featuring specific gap patterns. All these factors would make the requirements hard to verify.” |
| OPPO | Support option 2 and 4. |
| vivo | To our understanding the intention of MUSIM gaps is to guarantee network A performance. For the network B requirements, if it will be defined, the items needs be defined could be the same as that of network A idle state, if not less.  Ok with option 2 and 4. |
| Nokia | We prefer Option 3, which we believe is equivalent to Option 2. |

**Issue 2-4-2: Scope of network B requirements**

* Proposals:
  + - Option 1: If there is a consensus on defining network B requirements, the following requirements are purposed to be defined for network B idle/inactive state. Requirements are not needed for other “best effort” based functions. (vivo)
    - UE measurement capability
    - Measurement and evaluation of serving cell
    - Measurements of intra-frequency NR cells
    - Measurements of inter-frequency NR cells
    - Measurements of inter-RAT E-UTRAN cells
    - Maximum interruption in paging reception
    - Measurements for UE configured with relaxed measurement criterion
* Recommended WF

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| **Company** | **Comments** |
| Ericsson | FFS |
| MTK | This issue should be based on the conclusion of Issue 2-4-1, whether we want to define network B requirements. |
| Huawei | Pending on issue 2-4-1. |
| vivo | Depending on issue 2-4-1 |
| Nokia | Agree with MTK. No need to discuss scope before Issue 2-4-1 is resolved. |
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**Issue 2-4-3:Principles on network B requirements**

* Proposals:
  + - Option 1: Define the measurement period in NW-B when MUSIM gap is not dropped, and deprioritize the scenario when MUSIM gap is dropped due to collision (oppo)
* Recommended WF

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| --- | --- |
| **Company** | **Comments** |
| Ericsson | We can further check this issue later. |
| MTK | This issue should be based on the conclusion of Issue 2-4-1, whether we want to define network B requirements. |
| Huawei | Pending on issue 2-4-1. |
| OPPO | We are also fine to not define requirements for NW-B. |
| vivo | We understand the logic of this proposal however it depends on issue 2-4-1 |
| Nokia | No need to discuss principles before Issue 2-4-1 is resolved |
|  |  |

### Sub-topic 2-5 Others

**Issue 2-5-1: MUSIM overhead**

* Proposals:
  + - Option 1: RAN4 to define MUSIM gap overhead for MUSIM gap(s) (Xiaomi)
* Recommended WF

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| **Company** | **Comments** |
| Ericsson | We don’t think it’s necessary to define the overhead for MUSIM gaps.  We need to wait the agreement in Rel-17 ConMGs. |
| MTK | This issue is already discussed in Concurrent Gap email thread [211], we can wait for their conclusion. |
| Huawei | We think it is a valid issue, but it may not be urgent. Suggest FFS. |
| Xiaomi | UE data transmission in NW A would be interrupted during the MGL of the MUSIM gap(s). To avoid high throughput degradation of Network A, we think the gap overhead threshold should be defined for UE configured with MUSIM gap(s).  We are fine to refer to the conclusion in concurrent gap. |
| Qualcomm | FFS for now. It can be discussed further once more progress is made. |
| OPPO | Not define MUSIM gap overhead unless it is agreed in concurrent gaps. |
| vivo | To our understanding this one is out of scope of WI. Suggest FFS |
| Nokia | Still under discussion in Rel 17 , suggest FFS. |

**Issue 2-5-2: Conditions in which the UE is allowed to request MUSIM gaps**

* Proposals:
  + - Option 1: RAN4 needs to define the conditions in which the UE is considered to be in MUSIM operation mode (Nokia)
* Recommended WF

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| **Company** | **Comments** |
| Ericsson | Fine with option 1. |
| MTK | This might not be necessary. |
| Huawei | We understand we are considering the scenario where a MUSIM UE is in CONNECTED under NW A and in IDLE in NW B. Not sure if anything further needs to be defined. |
| Qualcomm | We do not think RAN4 needs to define such conditions. |
| vivo | Same view as QC, do not think we need define such conditions. |
| Nokia | We agree with Option 1.  We think it is good to clarify those conditions. |
|  |  |

**Issue 2-5-3: Conflicting bands and band combinations for MUSIM**

* Proposals:
  + - Option 1: Address the MUSIM related RF issue when for the uninterrupted operation a UE should use particular band/carrier combinations for two SIM cards. (Apple)
* Moderator Note: The option is out of the scope however it is ok to collect comments here this meeting. And no official decisions on this issue will be made in this meeting.
* Recommended WF

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| **Company** | **Comments** |
| Ericsson | We don’t think this is a RRM issue. It should be discussed in RF session. |
| MTK | This is an RF related issue, and I think it is related to when UE is in Connected state on NW A and NW B simultaneously, which should not be discussed in this meeting. |
| Apple | @**all**: It is the RF related issue as indicated in the paper. Unfortunately, we do not have a dedicated RF agenda item, but that does not mean that the issue is not there. So, one the intentions behind this paper was raise the awareness of this problem and that RAN4 should consider it to enable proper Dual-Rx/Dual-Tx functionality. |
| Huawei | Suggest FFS |
| vivo | Suggest FFS |
| Nokia | Dual-RX/Dual-Tx case belongs to Rel. 18 UEs. Moderator notes under 2-5-5 also applies here.  “ In [RP-220955] it mentions “The work item shall identify whether the WI (Enhancements for MUSIM procedures to operate in RRC\_CONNECTED state simultaneously in NW A and NW B) will have RAN3 or RAN4 impacts by RAN#99”   * Recommended WF   Depending on conclusion of RAN#99 and not necessary to have further discussion |
|  |  |

**Issue 2-5-4: Power back-off for MUSIM**

* Proposals:
  + - Option 1: Address the MUSIM related RF issue when for the uninterrupted operation a UE should apply power back-off larger than existing MPR/A-MPR limits (Apple)
* Moderator Note: The option is out of the scope however it is ok to collect comments here this meeting. And no official decisions on this issue will be made in this meeting.
* Recommended WF

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| **Company** | **Comments** |
| Ericsson | We don’t think this is a RRM issue. It should be discussed in RF session. |
| MTK | This is an RF related issue, and I think it is related to when UE is in Connected state on NW A and NW B simultaneously, which should not be discussed in this meeting. |
| Apple | @**all**: It is the RF related issue as indicated in the paper. Unfortunately, we do not have a dedicated RF agenda item, but that does not mean that the issue is not there. So, one the intentions behind this paper was raise the awareness of this problem and that RAN4 should consider it to enable proper Dual-Rx/Dual-Tx functionality. |
| Huawei | Suggest FFS |
| vivo | We think this RF issue could be valid. Suggest FFS |
| Nokia | Should be RF discussion |
|  |  |

**Issue 2-5-5: On the impact of item 1 of WI (simultaneously RRC connected operation)**

* Proposals:
  + - Option 1: RAN4 to start work on simultaneous RRC connected networks once RAN2 have progressed on the topic (Nokia)
* Moderator Note: In [RP-220955] it mentions “The work item shall identify whether the WI (Enhancements for MUSIM procedures to operate in RRC\_CONNECTED state simultaneously in NW A and NW B) will have RAN3 or RAN4 impacts by RAN#99”
* Recommended WF
  + Depending on conclusion of RAN#99 and not necessary to have further discussion

## 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.*

|  |  |
| --- | --- |
| CR/TP number | Comments collection |
|  | Company A |
| Company B |
|  |
|  | Company A |
| Company B |
|  |
|  | Company A |
| Company B |
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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.*

|  |  |
| --- | --- |
|  | Status summary |
| Sub-topic#1 | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

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

|  |  |
| --- | --- |
| CR/TP number | CRs/TPs Status update recommendation |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| Title | Source | Comments |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Tdoc number | Title | Source | Recommendation | Comments |
| [**R4-2211591**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211591.zip) | Discussion on RRM requirements for Rel-17 MUSIM gaps | Charter Communications, Inc |  |  |
| [**R4-2211912**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211912.zip) | RRM requirements for Rel-17 MUSIM gaps | Apple |  |  |
| [**R4-2211939**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211939.zip) | Discussion on RRM requirements for Rel-17 MUSIM gaps | CMCC |  |  |
| [**R4-2211969**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211969.zip) | Discussion on RRM requirements for Rel-17 MUSIM gaps | Xiaomi |  |  |
| [**R4-2212061**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212061.zip) | Discussion on RRM requirements for Rel-17 MUSIM gaps | OPPO |  |  |
| [**R4-2212209**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212209.zip) | On requirements for Rel-17 MUSIM gaps | Qualcomm Incorporated |  |  |
| [**R4-2212343**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212343.zip) | Potential RF related issues for the MUSIM enhancements | Apple |  |  |
| [**R4-2212687**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212687.zip) | Discussion on Rel 18 RRM requirements for MUSIM | Nokia, Nokia Shanghai Bell |  |  |
| [**R4-2212765**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212765.zip) | Discussion on MUSIM gaps | Ericsson |  |  |
| [**R4-2213450**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213450.zip) | Work plan for Dual Transmission Reception (Tx Rx) Multi-SIM for NR WI. | Vivo |  |  |
| [**R4-2213451**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213451.zip) | Initial consierations on RRM requirements for Rel-17 MUSIM gaps | vivo |  |  |
| [**R4-2213562**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213562.zip) | Discussion on RRM requirements for MUSIM gaps | Huawei, HiSilicon |  |  |
| [**R4-2213748**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213748.zip) | Discussion on RRM requirements for MUSIM gaps | MediaTek inc. |  |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Tdoc number | Title | Source | Recommendation | Comments |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents