**3GPP TSG-RAN WG4 Meeting # 104-e R4-2214349**

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

**Agenda item:** 11.17.3

**Source:** Moderator (vivo)

**Title:** WF on RRM requirements for Rel-17 MUSIM gaps

**Document for:** Approval

# Introduction

This is the WF to capture all agreements and open issues in email thread [104-e][238] NR\_DualTxRx at RAN4 #104.

# Topic #1: Work plan

### 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)

*Tentative agreements: Endorse the work plan*

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

### 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 (Apple Ericsson MTK CMCC Huawei Xiaomi Charter Qualcomm Oppo vivo Nokia)
  + Option 2: Keep it open

*Tentative agreements: option 1 is agreed*

**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. (Apple MTK CMCC Huawei xiaomi Charter Qualcomm oppo Ericsson vivo Nokia)
    - 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)
  + Option 3: Open to option 2 in case that measurements configured by NW-A is fully overlapped with MUSIM gap (oppo)

*Tentative agreements: Option 1 is agreed*

### 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)

*Tentative agreement: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 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)
  + Option 3: On top of option 1, the impact on UL related requirements/procedure can be added. (CMCC)
  + Option 4: Focus on scenario where NW A is impacted (Ericsson Apple oppo Huawei MTK)

*Tentative agreements: No*

**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 (Apple xiaomi oppo MTK vivo)
    - Option 1a: re-use the ‘counting’ approach defined for Rel-17 concurrent MGs to define scaling factor for the impacts of MUSIM gaps (Apple xiaomi vivo)
  + Option 2: Define requirements after solving gap collision issue (CMCC Huawei vivo MTK Qualcomm Nokia)
  + Option 3: Too early to discuss this issue (Ericsson)

*Tentative agreements: No*

**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 (Apple 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 (Apple xiaomi oppo)
  + Option 2: Define requirements after solving gap collision issue (CMCC xiaomi vivo Huawei Qualcomm Nokia)
  + Option 3: Too early to discuss this issue (Ericsson)

*Tentative agreements: No*

### 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 (Apple Huawei Xiaomi vivo)
    - 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 (Ericsson Charter)
    - Option 3: Agree at high-level that applying priority rule to handle collisions, but the way how to apply it can be FFS (oppo MTK CMCC vivo)
    - Option 4: priority-based scheme for (a) Collisions between a MUSIM gap and measurement gaps and (b) Collisions between MUSIM gaps, but the definition of collisions may be different for cases a and b. (Qualcomm)
    - Option 5: FFS (Nokia)

*Tentative agreements: No*

**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 Apple Ericsson Huawei QC oppo vivo)
    - Option 2: Clarification is needed for option 1 (Nokia)

*Tentative agreements: Further study on the issue in option 1.*

**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 (MTK Apple Charter CMCC Huawei vivo xiaomi Qualcomm oppo)
      * Option 2a (Ericsson): Use Option 2 with the following note: Note 1: The group needs to further consider how to handle Pre-MG/NCSG and MUSIM gaps. Note 2: The Pre-MG/NCSG and concurrent gaps are discussed in parallel in Rel-18 WI further MG enh.

*Tentative agreements: No*

**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 Apple CMCC Xiaomi oppo Qualcomm vivo Huawei MTK Ericsson Nokia)
    - Option 1a: Request RAN2 to introduce optional signalling 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. (Charter Apple CMCC Xiaomi oppo Qualcomm vivo Huawei MTK Ericsson Nokia)

*Tentative agreements: Option 2 is agreed; Option 1 is agreed with the clarification that “legacy measurement gaps” in option 1 includes all measurement gaps in Rel-17.*

**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 Qualcomm)
    - 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 ()
    - Option 3: Up to NW configuration (Apple CMCC Huawei Xiaomi Charter oppo vivo)
    - Option 3a: Up to UE request (MTK)
    - Option 4: FFS (Ericsson Nokia)

*Tentative agreements: No*

**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)
    - Option 2: The gap with the highest priority is kept when colliding (Apple vivo)
    - Option 3: FFS (Apple Ericsson MTK Huawei xiaomi QC Nokia)

*Tentative agreements: FFS*

**Issue 2-3-2-5: Definition on MUSIM gap collides with legacy gaps**

* Proposals:
  + - Option 1: The gap proximity condition of concurrent gap collision could be reused for MUSIM gap collision with other gaps (Ericsson Apple Charter Huawei Qualcomm Xiaomi MTK vivo)
    - Option 2: FFS (Nokia)

*Tentative agreements: No*

**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 (Apple)
    - Option 2: “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. (MTK Huawei xiaomi)
    - Option 3: RAN4 to discuss the proximity condition for the following cases: “SMTC is overlapping with MG” and “L1 measurement resource is overlapping with MG” (Ericsson oppo Nokia)
    - Option 4: FFS (Huawei Qualcomm Xiaomi MTK vivo)
    - Option 5: Further consider the proximity discussed in NTN other than only the fully/partially overlapping case (Ericsson)

*Tentative agreements: No*

**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 (Apple xiaomi oppo Qualcomm Huawei MTK vivo)
    - Option 2: NW-A’s RRM procedure, including DL SMTC 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 oppo xiaomi)
    - Option 4: FFS (Ericsson Nokia CMCC vivo)

*Tentative agreements: No*

**Issue 2-3-3-3: Priority of MUSIM against uplink signals, such as PRACH, CSI-RS reporting etc.**

* Proposals:
  + - Option 1: NW-A’s RRM procedure, including 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 2: PRACH procedure can be higher priority than MUSIM gaps (MTK)
    - Option 3: FFS (Huawei Ericsson Apple Nokia CMCC Qualcomm Xiaomi MTK vivo)

*Tentative agreements: No*

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

* Proposals:
  + - Option 1: priority rule can be used as baseline (Apple oppo CMCC Huawei Xiaomi MTK vivo)
    - Option 2: RAN4 will discuss separately how to define and resolve collisions between MUSIM gaps (Ericsson Huawei Qualcomm)
    - Option 2a: When the time duration between the two closest gap occasions within the two measurement gap patterns is shorter than [4]ms and the second gap occasion is for paging, UE should keep both gap occasions instead of dropping any of them. (Ericsson)
    - Option 3: Aperiodic gap should have higher priority than periodic gaps once collision happens within MUSIM gaps. (Ericsson MTK)
    - Option 4: It is UE’s responsibility not to request colliding MUSIM gaps from NW-A (Ericsson Nokia)
    - Option 5: Option 2 can be discussed if option 1 is agreed (Charter MTK)
      * Option 5a: Option 3 can be discussed if option 1 is agreed (Charter)

*Tentative agreements: No*

**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 (Apple Ericsson Huawei Xiaomi Charter MTK vivo)
    - Option 2: RAN4 should consider different definition/handling of collisions between MUSIM gaps (Qualcomm)
    - Option 3: FFS (Nokia vivo)

*Tentative agreements: No.*

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

**Issue 2-3-5-1: On aperiodic gap priority**

* Proposals:
  + - Option 1: UE can request aperiodic MUSIM gap with a higher priority. (Ericsson Charter)
    - Option 2: Option 1 is up to UE implementation (vivo)
    - Option 3: FFS (Apple CMCC Huawei Qualcomm Xiaomi MTK)

*Tentative agreements: No*

**Issue 2-3-5-2: On the time window W for 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: W could be the largest periodicity among all the periodic gaps + Time margin [M] for the one-shot aperiodic gap (MTK)
    - Option 3: FFS (oppo Ericsson Apple Nokia Charter CMCC Huawei Qualcomm xiaomi MTK vivo)

*Tentative agreements: No*

### 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 (Ericsson)
    - Option 2: No measurement requirements in network B will be defined by RAN4 (Apple Nokia Huawei Qualcomm MTK vivo)
    - Option 3: 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 (Apple vivo)

*Tentative agreements: No*

**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
    - Option 2: Depending on issue 2-4-1 and FFS (MTK Huawei vivo Nokia Ericsson)

*Tentative agreements: No*

**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)
    - Option 2: Depending on issue 2-4-1 and FFS (MTK Huawei vivo Nokia Ericsson)

*Tentative agreements: No*

### 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)
    - Option 2: wait for concurrent gap conclusion (Nokia)
    - Option 3: FFS (Apple oppo Nokia Charter Huawei Qualcomm Xiaomi MTK vivo)
    - Option 4: Reuse conclusion in concurrent gap if MUSIM gaps can be viewed as “one gap”(Ericsson)

*Tentative agreements: No*

**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 (Ericsson Nokia)
    - Option 2: Not necessary (Apple MTK Huawei Qualcomm vivo)

*Tentative agreements: No*

**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.

*Tentative agreements: RF issue, out of scoope*

**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.

*Tentative agreements: RF issue, out of scope*

**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)

*Tentative agreement: The issue is addressed in the work plan.*

# Reference