**3GPP TSG-RAN WG4 Meeting #106 bis-e R4-23xxxxx**

Electronic Meeting, April 17 -26, 2023

**Title:** WF on NR Dual TxRx Multi-SIM

**Agenda Item:** 5.26.3

**Source: vivo**

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# Topic #1: General aspects

### Sub-topic 1-1 General aspects

**Issue 1-1-1: Clarification on the scope**

* Proposals
  + P1: Add the following note for the sentence “Case 2: Collisions between MUSIM gap and SMTC”
    - Note: The scope collisions between MUSIM gap and SMTC will be limited to RRM procedures for which collisions between legacy measurement gaps and SMTC are taken into account in the existing requirements
  + Support (Qualcomm Huawei Nokia MTK xiaomi vivo)
  + Not support (Ericsson)
  + FFS (Apple)

*Agreements: No*

*Candidate options:*

*Recommendations: Discuss at next meeting*

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

* Proposals:
  + Option 1: Do not define overhead cap for MUSIM gaps (Qualcomm vivo CMCC Ericsson Huawei Nokia Apple)
  + Option 2: Define overhead cap for MUSIM gaps. (xiaomi oppo)
    - Option 2a: Measurement requirement does not apply when more than one MUSIM gap is configured with MGRP = [20] ms (xiaomi)

*Agreements: No*

*Candidate options:*

*Recommendations: Discuss at next meeting*

**Issue 1-1-3: Total number of gaps when MUSIM gaps are configured**

* Proposals:
  + P1: Consider only one Rel-17 legacy gap when MUSIM gaps are configured. (vivo)
  + P2: (Qualcomm vivo CMCC xiaomi Huawei Ericsson Apple)
    - When MUSIM gaps are configured and Rel-17 Con-MGs is not configured, the number of legacy MGs can be
      * Up to 1 per-UE MG, or
      * Up to 1 per-FR MG in each FR
    - When MUSIM gaps are configured, when Rel-17 con-MG is configured, the number of legacy MGs can optionally be
      * Up to 2 per-UE MGs
      * Up to 2 per-FR MGs in each FR and up to 3 per-FR MGs across FRs
      * Up to 1 per-UE MG and up to 1 per-FR MG in each FR
  + P3: Allocation of MUSIM gaps does not impact the non-MUSIM gap allocation capability. (Qualcomm MTK Nokia Apple)
  + P4: UE shall not request more MUSIM gaps than it is capable of handling with the current measurement gap allocation (Nokia)

*Agreement (1st round)*

*P2*

*Agreement (2nd round)*

*P2 with wording update as the following:*

* When MUSIM gaps are configured and Rel-17 Con-MGs is not configured or supported, the number of legacy MGs can be
  + Up to 1 per-UE MG, or
  + Up to 1 per-FR MG in each FR
* When MUSIM gaps are configured, when Rel-17 con-MG is configured, the number of legacy MGs can be one of the following cases:
  + Up to 2 per-UE MGs
  + Up to 2 per-FR MGs in each FR and up to 3 per-FR MGs across FRs
  + Up to 1 per-UE MG and up to 1 per-FR MG in each FR

P3: Allocation of MUSIM gaps does not impact the non-MUSIM gap allocation capability.

**Issue 1-1-4: Mandatory MUSIM gap patterns**

* Proposals
  + P1: No need to discuss further whether to introduce mandatory MUSIM gap patterns (Qualcomm vivo oppo Apple MTK Huawei)
  + P2: RAN4 to define the mandatory MUSIM gap patterns (Ericsson Nokia Chapter CMCC)

*Agreements: No*

*Candidate options:*

*Recommendations: Discuss at next meeting*

**Issue 1-1-5: General rule to handle NW-A and NW-B procedures**

* Proposals
  + P1: RAN4 to define the priorities for each procedure in either NW-A or NW-B in descending order as follow. The gaps or resources for higher priority procedures should be kept once the collision happens.
    - Level 1: One-shot RRM mobility procedures in NW-A, such as Handover/SCell activation/SI update;
    - Level 2: Periodic paging monitoring or one-shot procedure in NW-B Idle mode, such as On-demand SI reading;
    - Level 3: Measurements procedures for both NW-A and NW-B

*Agreements: No*

# Topic #2: Collisions between gaps and priority rules

### Sub-topic 2-1 MUSIM gap priority configuration

**Issue 2-1-2: Priority/usage indication on MUSIM gaps from UE side**

* Proposals
  + P1: No need to further discuss how “UE can optionally indicate its preferred priority for all or a subset MUSIM gaps (Qualcomm Apple ZTE oppo)
  + P2: Network A assigns priority levels to all configured periodic MUSIM gaps even if UE does not indicate preferred priority for one or some periodic MUSIM gaps (Huawei Qualcomm Nokia MTK xiaomi Ericsson Chapter vivo ZTE oppo Apple)
  + P3: If a UE has not indicated a priority, then the NW A shall set the priority to the lowest priority based on the gapPriority-r17 IE and the associated priority levels (16 levels defined in Rel-17) (Charter)
  + P4: If the UE requests priority for more than 1 MUSIM gap, priorities levels are different (Nokia Xiaomi MTK Ericsson)

*Agreements:*

*Agree P2 -* Network A assigns priority levels to all configured periodic MUSIM gaps even if UE does not indicate preferred priority for one or some periodic MUSIM gaps

*Recommendations: Close this issue.*

**Issue 2-1-2-1: On how to delivery priority/usage indication on MUSIM gaps from UE side**

* Proposals
  + P1: Introduce a new parameter (MUSIMGapPriority) in the assistance-information along with the existing parameters used by the UE to request MUSIM gap configuration from NW A (i.e., offset, MGL, MGRP and MUSIMGapPriority). (MTK)
  + P2: The requested priority (MUSIMGapPriority) for MUSIM can be designed using 2-bis to allow the UE suggesting priorities MUSIM gaps (MTK vivo Huawei)
  + P3: RAN4 can send the LS to RAN2 which shall design the UAI signaling (via MAC CE or RRC) to assist UE optionally indicates its preferred priority for all or a subset MUSIM gaps (ZTE)

GTW agreement:

* + It is RAN4 understanding that the signalling design of priority levels indication/configuration for MUSIM gaps is up to RAN2 decision.

*Recommendations: Close this issue.*

**Issue 2-1-4: Constraints on MUSIM gap priority configuration from NW A**

* Proposals
  + P1: NW A maintains the same relative priorities requested by the UE; The configured priority level may or may not be the same as that requested by UE. (vivo Apple MTK Xiaomi Huawei Qualcomm Nokia Charter ZTE)
    - P1-a: Based on P1, NW A is not required to keep the relative priority order for a particular MUSIM gap when the MGRP of that particular MUSIM gap is less than a threshold, in this scenario NW A will still keep the same relative order of the other MUSIM gaps except for that particular MUSIM gap (vivo)
  + P2: When MUSIM gaps with equal priority is allowed, if UE requests two MUSIM gaps with the same priority X and if the network configures both gaps, then both gaps must be assigned a common priority X’. X’ may or may not be equal to X. (vivo Apple Qualcomm oppo)
  + P3: When UE requests the MUSIM gaps, the MGRP of highest priority gap should be larger than 160ms; When UE requests only one MUSIM gap, the MGRP should be larger than 80ms (Ericsson ZTE)
  + P4: If the network cannot fulfill the UE priority requests the network may chose not to assign the requested MUSIM gaps (Nokia Qualcomm)
  + P6: In the special case when both one MUSIM gap and one other MG gap has set the highest priority level in gapPriority-r17 IE, then we propose that MUSIM gap has the ability to signal with an extra 1-bit to indicate higher priority than the highest level in gapPriority-r17 IE (Charter)

*Agreements: No*

*Candidate options:*

*Recommendations:* Continue discussion

**Issue 2-1-5: Priority setting for aperiodic MUSIM gaps**

Agreements from GTW

* + Option 1 (QC, Nokia, vivo, Charter, Xiaomi)
    - The priority level of aperiodic MUSIM gap can be configured by NW A
    - If the priority level is not configured by NW A then the aperiodic MUSIM gap by default has the highest priority level
    - The aperiodic MUSIM gap priority level can be optionally requested by UE from NW A
  + Option 2 (MTK, Huawei, Apple, Ericsson, OPPO):
    - Aperiodic MUSIM gap by default has the highest priority level.
    - The gap priority level is not explicitly configured by the NW

*Agreements: No*

*Candidate options:*

*Recommendations:* try to down select between option 1 and 2

**Issue 2-1-6: Order for applying the priority when number of colliding MGs is larger than 2**

* Proposals:
  + P1: Collisions between gaps are resolved sequentially in order of decreasing priority, starting with the gap that has the highest priority (vivo xiaomi Qualcomm MTK oppo Huawei Apple)
  + P2: RAN4 to postpone multiple gap collision issue until RAN4 has a clear understanding on MUSIM gaps’ priority. (Ericsson Nokia Chapter ZTE)

*Agreements: No*

*Candidate options:*

*Recommendations:* Discuss at the next meeting

**Issue 2-1-7: Further clarifications on MUSIM gap priority configuration**

* Proposals:
  + P1: MUSIM gaps and non-MUSIM gaps cannot have same priority (Nokia)
  + P2: RAN4 need to agree on enabling assignment of priority to all gaps. (Nokia)
  + P3: MUSIM priority levels and other MGs priority levels shall be comparable. (Charter)
  + P4: The priority rules shall be based on the gapPriority-r17 IE and the associated priority levels (16 levels defined in Rel-17). (Charter)

*Agreements: No*

*Candidate options:*

*Recommendations:* *Close this issue*

### Sub-topic 2-2 On collision between different MUSIM gaps

**Issue 2-2-1: Definition of the collision between different MUSIM gaps**

* Proposals
  + Option 1: The gap proximity condition for the Rel-17 concurrent gap collision should be reused for the collision between different MUSIM gap when priority rules are used to handle the collision between MUSIM gaps (Qualcomm Apple MTK xiaomi Ericsson CMCC ZTE oppo vivo)
  + Option 2: Postpone the discussion till issue 2-2-2 is stable (Huawei Qualcomm ZTE)
  + Option 3: A collision between MUSIM gaps means a physical overlap in time domain between two MUSIM gaps and RAN4 does not define ‘proximity’ for collisions between MUSIM gaps. (Nokia)

*Agreements: No*

*Candidate options:*

*Recommendations: Continue discussion.*

**Issue 2-2-2: Solutions for collision between different MUSIM gaps**

* Proposals
  + Option 1: Priority based solution is used for collision between different MUSIM gaps when these collided MUSIM gaps are assigned with different priority levels (vivo Apple Qualcomm)
  + Option 2: Priority based solution is used for collision between different MUSIM gaps (MTK xiaomi oppo Charter)
  + Option 2-1: The priority handling rule shall be used if it collides with the periodic gaps (except the paging gap) (ZTE)
  + Option 3: Keep solution (keep all collided MUSIM gap) is used when MUSIM gaps have same priority (Apple Qualcomm oppo vivo)
    - Option 3a: The overlapping MUSIM gap occasions under scenario of option 3 shall be merged. (Apple)
    - Option 3b: whether multiple MUSIM gaps can be assigned the same priority level or not subject to UE capability (Qualcomm vivo)
    - Option 3c: Up two periodic MUSIM gaps can be configured with the same priority and inform such the configuration to RAN2 (oppo)
  + Option 4: MUSIM gap ‘keep rule’ will be applied in some certain scenarios, such as Paging monitoring and AGC (Ericsson)
  + Option 4-1: The kept/merged solution is used if the second gap in collision is paging gap (ZTE)
  + Option 5: Keep solution (keep all collided MUSIM gap) is used when different MUSIM gaps collide (Huawei)
  + Option 6: For keep solution, UE shall under defined conditions not drop a colliding MUSIM gap of lower priority, provided the UE perform all actions related to the colliding MUSIM gaps of higher priority or priorities. RAN4 shall define these conditions. (Nokia)

*Agreements: No*

*Recommendations: Consider and down-select from the following options at the next meeting:*

* Option 1: Priority based solution is used for collision handling between different MUSIM gaps
* Option 2: Keep solution (keep all collided MUSIM gap) is used for collision handling between different MUSIM gaps
* Option 3a: Use both Priority based solution and Keep solution for collision handling between different MUSIM gaps
  + Priority based solution is used when collided MUSIM gaps have different priority levels
  + Conditions when Keep solution is used are FFS.
* Option 3b: Use both Priority based solution and Keep solution for collision handling between different MUSIM gaps
  + Conditions when priority based solution is used and conditions when Keep solution is used are FFS.

**Issue 2-2-3: Conditions on “keep solution” is used during collision between different MUSIM gaps**

* Proposals
  + Keep solution (keep all collided MUSIM gap) is used when
    - P1: RAN4 needs to further discuss the solution to indicate to the NW when gap keep rule will be applied within two MUSIM gaps.
    - P2: Both keep solution and priority solution could be supported. Whether keep solution or priority solution is used is based on UE request, i.e. UE can indicate whether all MUSIM gaps can be kept or not when there is collision between MUSIM gaps. FFS how to apply the priority solution when colliding MUSIM gaps are with equal preferred priority or without preferred priority
    - P3: Definition of colliding MUSIM gaps must be defined before agreement on the keep solution and related conditions can be agreed
    - P4: If RAN4 agree to consider kept solution during collision between different MUSIM gaps, we propose to take the condition that
      * the MUSIM gaps are regarded as collision based the collision definition, and
      * the collided MUSIM gaps are for paging reception, SSB measurement, or SI reading in the same frequency layer.
    - P5: Conditions when “keep solution” are used
      * when the collided MUSIM gaps are not physically overlapping and the distance between them is less than 4ms;
      * UE has the capability to handle the two collided MUSIM gaps when they are not overlapped however the distance between them is less than 4 ms
      * These “kept” MUSIM gaps measure Mos at the same frequency layer
    - P6: (from issue 2-2-2) Keep solution (keep all collided MUSIM gap) is used when these collided MUSIM gaps have the same priority

*Agreements: No*

*Candidate options:*

*Recommendations: continue discussion*

### Sub-topic 2-3 On collision between MUSIM and legacy gaps

**Issue 2-3-1: Solutions for collision between MUSIM gap and Type-2 MG**

* Note: Previous agreement: Priority-based gap collision handling introduced in concurrent gaps design can be used as a base for collisions between MUSIM gap and Type -2 MG (R4-2220443)
* Proposals
  + P1: The Rel-17 MG\_enh priority rule is reused to resolve collisions between MUSIM gaps and Type-2 MG. (Qualcomm)

*Agreements (1st round):*

Update previous agreement “Priority-based gap collision handling introduced in concurrent gaps design can be used as a base for collisions between MUSIM gap and Type -2 MG” in R4-2220443 as the following:

Priority-based gap collision handling rule introduced in Rel-17 MG\_enh WI is reused to solve collisions between MUSIM gap and Type -2 MG.

*Candidate options:*

*Recommendations: close this issue*

**Issue 2-3-2: Solutions for collision between MUSIM gap and Type-1 MG or gap configured without priority**

* Proposals
  + P1: When a MUSIM gap collides with a legacy MG, requirements shall not apply if any one of the collided gaps is not assigned a priority. (vivo Apple xiaomi oppo)
  + Against: (Nokia)
  + P2: No requirements apply if the two gaps have same MGRP (Huawei Ericsson)
  + Against: (Nokia)
  + P3: RAN4 to prioritize the gap with longer MGRP for the following MUSIM collision scenarios: Any of the collision gaps is Type-1 MG; NW-A doesn’t configure a priority associated with any of the collision gaps. (Ericsson Huawei ZTE MTK)
  + P4: MUSIM gaps are assumed to have higher priority than a Type-1 MG when either MUSIM gaps or Type-1 MG (or both) are not assigned priorities by the network. (Qualcomm)
  + Against: (Huawei xiaomi)
  + P5: Introduce priority for Type-1 MG when MUSIM gaps are configured when also having Type-1 measurement gaps allocated. (Nokia)
  + Against: (Qualcomm Huawei xiaomi)
  + P6: The sharing rule solution could be considered. (xiaomi)
  + Against: (Qualcomm Huawei)

*Agreements: No*

*Candidate options:*

*Recommendations: Suggest to focus on P1, P2 and P3 since they have relative more supporters and less objections.*

### Sub-topic 2-4 On collision between MUSIM gaps and NW A signals

**Issue 2-4-1: Definition of the collision between MUSIM gaps and L1/L3 measurement resources**

* Previous agreement at RAN4 105 [R4-2220443]
* Agreement
  + A L1/L3 measurement resource is considered to be [partially or fully] overlapped with a periodic MUSIM gap if it [partially or fully] overlaps a MUSIM gap occasion in time domain
  + A L1/L3 measurement resource is considered to be [partially or fully] overlapped with an aperiodic MUSIM gap if it [partially or fully] overlaps that aperiodic MUSIM gap occasion in time domain
* Proposals
  + P1-1: Update agreement at RAN4 105 as the following: (Huawei xiaomi)
    - A L1/L3 measurement resource is considered to be partially or fully overlapped with a periodic MUSIM gap if it partially or fully overlaps a MUSIM gap occasion in time domain
    - A L1/L3 measurement resource is considered to be partially overlapped with an aperiodic MUSIM gap if it partially overlaps that aperiodic MUSIM gap occasion in time domain
  + P1-2: A L1/L3 measurement resource is considered to be partially or fully overlapped with a MUSIM gap if it is partially or fully overlapping with a MUSIM gap occasion in time domain (Apple)
  + P1-3: A L1/L3 measurement resource is overlapped with a MUSIM gap if it fully or partially overlaps with a MUSIM gap occasion in time domain. (Ericsson)
  + P1-4: update agreement as (vivo) as:
    - A L1/L3 measurement resource occasion or an SMTC occasion is considered to be overlapped with a periodic MUSIM gap if it overlaps a periodic MUSIM gap occasion
    - A L1/L3 measurement resource or an SMTC occasion is considered to be overlapped with an aperiodic MUSIM gap if it overlaps that aperiodic MUSIM gap occasion
  + P2: Collision between MUSIM gaps and NW A signals is an overlap in time domain. Fully overlapping MUSIM gaps and network A signals is defined as: FO or FPO. Partially overlapping MUSIM gaps and network A signals is defined as: PFO or PPO (Nokia)
  + P3: RAN4 does not define proximity for MUSIM gaps and NW A signals *(Nokia)*

*Agreements:*

* A L1/L3 measurement resource is considered to be fully overlapped with a periodic MUSIM gap if all of the resource instances overlap with MUSIM gap occasions in the time domain
* A L1/L3 measurement resource is considered to be partially overlapped with a periodic MUSIM gap if some but not all of the resource instances overlap with MUSIM gap occasions in the time domain
* A L1/L3 measurement resource is considered to be overlapped with an aperiodic MUSIM gap if it at least one of its resource instances overlaps with the aperiodic MUSIM gap occasion in the time domain

**Issue 2-4-2: Priority of MUSIM against SMTC for L3/ L1 measurement**

* Proposals
  + P1: MUSIM gaps have higher priority when colliding with SMTC/SSB for L3/L1 measurement (collisions between L3/L1 measurement resources and MUSIM gaps are handled in the same way as collisions between L3/L1 measurement resources and measurement gaps) (vivo Apple MTK xiaomi Ericsson oppo Huawei Nokia)
  + P2: RAN4 to consider other options than only having a fixed MUSIM priority over SMTC, and other L3/ L1 measurement resources, when UE requests very dense MUSIM gaps (Nokia)

*Agreements (1st round):*

*P1 -* MUSIM gaps have higher priority when colliding with SMTC/SSB for L3/L1 measurement.

*Candidate options:*

*Recommendations: The issue is closed*

**Issue 2-4-3: Collision between SMTC and MUSIM gaps for handover and Scell activation**

* Proposals
  + P1: Collisions between other RRM procedures and MUSIM gaps are handled in the same way as collisions between RRM procedures and legacy MG, i.e., no special handling solution is defined. (Qualcomm MTK xiaomi Huawei Nokia vivo oppo)
  + P2: RAN4 to define requirements for the collision between MUSIM gaps with Handover, Scell activation and SI update. When NW-A’s RS resources for one-shot RRM procedure (Handover, Scell activation, SI update) collide with MUSIM gaps, MUSIM gaps should have lower priority; Periodic paging monitoring or one-shot procedure in NW-B Idle mode, such as On-demand SI reading have higher priority than Measurements procedures for both NW-A and NW-B (Ericsson)
  + P3: When NW-A’s uplink signals for one-shot RRM procedure(Handover, Scell activation) collide with MUSIM gaps, MUSIM gaps should have lower priority, such as NW-A’s PRACH and CSI-RS reporting for Scell activation should be prioritized. (Ericsson)
  + P4: Add a high-level clarification in RAN4 spec that during one-shot procedure such as Scell activation, SI update and so on, UE is not expected to enable MUSIM gaps unless existing RRM requirement for the corresponding one-shot procedure can be met. (Apple Ericsson)

*Agreements: No*

*Candidate options:*

*Recommendations: Discuss at next meeting*

# Topic #3: On network A requirements

### Sub-topic 3-1 On network A requirements

**Issue 3-1-1: Principle on layer 1 and layer 3 measurement requirements after gap collision handling**

* Proposals
  + P1: Frameworks of LBT failure in NR-U design can be used as starting point when discussing NW A L3/L1 requirement impact due to MUSIM gaps (Apple)
  + P2: Reuse the same principle of Rel-17 concurrent gaps WI to define network A L1/L3 measurement requirements when MUSIM gaps are configured, i.e., introduce a scaling factor like Kx = Ntotal /Navailable for network A requirements when MUSIM gaps are configured. (CMCC xiaomi vivo ZTE oppo Huawei Ericsson Qualcomm MTK Nokia)
  + P3: RAN4 to postpone the detail NW-A’s requirement discussion until RAN4 achieves the consensus on MUSIM gaps’ priority. (Ericsson Nokia)

*Agreements: No*

*Candidate options:*

*Recommendations: Discuss at the next meeting*

**Issue 3-1-2: On parameters for L1/L3 measurement requirements**

* Proposals
  + P1: (CMCC):
    - For L3 measurement, Navailable need to be updated to cover MUSIM gaps
    - For L1 measurement, Noutside\_MG and Navailable need to be updated to cover MUSIM gaps
  + P2: The following parameters need to be updated to account for collisions with MUSIM gaps (MTK):
    - Kp for intra-frequency and inter-frequency measurements without gaps (Xiaomi)
    - Kgap for intra-frequency and inter-frequency measurements with gaps (Xiaomi)
    - Kgap\_EUTRA for inter-RAT measurements
    - Kp\_CSI-RS for CSI-RS L3 measurements
    - Kp,PRS,I for NR positioning measurements
    - CSSFintra for intra-frequency measurements
    - CSSFinter for intra-frequency measurements
    - CSSFinterRAT for intra-RAT measurements
    - P scaling factor for L1-RSRP and L1-SINR measurements (xiaomi)
  + P3: Suggest the following update on parameters for L1/L3 measurement requirements (vivo ZTE)
    - For SSB based or CSI-RS based RLM, BFD and CBD, scaling factor P can be reused without any update, the definition of Ntotal, Noutside\_MG and Navailable need updated.
    - For intra-frequency and inter-frequency measurements without gaps, scaling factor Kp can be reused and the definition of Ntotal and Navailable will be updated.
    - For intra-frequency and inter-frequency measurements with gaps, scaling factor Kgap can be reused and the definition of Ntotal and Navailable will be updated.
    - For inter-RAT E-UTRAN TDD/FDD measurement, scaling factor Kgap\_EUTRA can be reused and the definition of Ntotal and Navailable will be updated.
    - For L1-RSRP/L1-SINR measurement, scaling factor P can be reused and the definition of Ntotal, Noutside\_MG and Navailable will be updated.
    - For NR measurement for positioning, scaling factor can be reused and the definition of Ntotal and Navailable will be updated.
    - For CSI-RS based L3 measurements, scaling factor Kp\_CSI-RS can be reused and the definition of Ntotal and Navailable will be updated.
  + P4: (Huawei)
    - For L3 measurement outside MG, Kp in the requirements is updated
      * Navailable is the number of SMTC occasions that are not overlapped with any non-dropped MG occasion or non-dropped MUSIM gap occasion within the window W.
    - For L3 and positioning measurement with MG, existing requirements can be re-used.
    - For L1 measurement outside MG, Navailable, Noutside\_MG in the requirements are updated
      * Noutside\_MG is the number of SSB resource occasions that are not overlapped with any MG nor MUSIM gap within the window W
      * Navailable is the number of SSB resource occasions that are not overlapped with any MG, MUSIM gap nor any SMTC occasion within the window W
  + P5: Clarification for L3 measurement without gap, SMTC should not be fully overlapping with MUSIM gap (oppo)
  + P6: (Qualcomm)

For intra-frequency and inter-frequency measurements without gaps in network A, modify the scaling factor Kp as follows:

* The duration of the window W is max(SMTC period, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps and MUSIM gaps, if any, and/or per-FR measurement gaps within the same FR as the SSB frequency layer
* Ntotal is the total number of SMTC occasions within the window W, including those overlapped with measurement gap and MUSIM gap occasions
* Navailable is the number of SMTC occasions that are not overlapped with any non-dropped MG and MUSIM gap occasions within the window W, after accounting for measurement gap and MUSIM gap collisions

For inter-frequency and inter-frequency measurements with gaps in network A, modify the scaling factor Kgap as follows:

* The duration of the window W is max(SMTC period, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps and MUSIM gaps, if any, and/or per-FR measurement gaps within the same FR as the SSB frequency layer
* Ntotal is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with measurement gap and MUSIM gap occasions
* Navailable is the number of SMTC occasions that are covered by non-dropped instances of the associated MG within the window W, after accounting for measurement gap and MUSIM gap collisions

For inter-RAT measurements with gaps in network A, modify the scaling factor Kgap\_EUTRA as follows:

* The duration of the window W is MGRP\_max, where MGRP max is the maximum MGRP across all configured per-UE measurement gaps and MUSIM gaps, if any, and/or per-FR measurement gaps within FR1
* Ntotal is the total number of associated measurement gap occasions within the window W, including those overlapped with other measurement gap and MUSIM gap occasions
* Navailable is the number of non-dropped associated measurement gap occasions within the window W, after accounting for measurement gap and MUSIM gap collisions

For CSI-RS L3 intra-frequency measurements without gaps modify the scaling factor Kp\_CSI-RS as follows:

* The duration of the window W is max(CSI-RS period, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps and MUSIM gaps, if any, and/or per-FR measurement gaps within the same FR as the CSI-RS frequency layer
* Ntotal is the total number of CSI-RS occasions within the window W, including those overlapped with measurement gap and MUSIM gap occasions
* Navailable is the number of CSI-RS occasions that are not overlapped with any non-dropped MG and MUSIM gap occasions within the window W, after accounting for measurement gap and MUSIM gap collisions

For CSI-RS L3 inter-frequency measurements with gaps modify the scaling factor Kp\_CSI-RS as follows:

* The duration of the window W is max(CSI-RS period, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps and MUSIM gaps, if any, and/or per-FR measurement gaps within the same FR as the CSI-RS frequency layer
* Ntotal is the total number of CSI-RS occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with measurement gap and MUSIM gap occasions
* Navailable is the number of CSI-RS occasions that are covered by non-dropped instances of the associated MG within the window W, after accounting for measurement gap and MUSIM gap collisions

For NR positioning measurements with gaps modify the scaling factor Kp,PRS,i as follows:

* The duration of the window W is max(, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps and MUSIM gaps, if any, and/or per-FR measurement gaps within the same FR as the positioning frequency layer
* Ntotal is the total number of associated measurement gap occasions covering PRS occasions within the window W, including those overlapped with other measurement gap and MUSIM gap occasions
* Navailable is the number of non-dropped associated measurement gap occasions covering PRS occasions within the window W, after accounting for measurement gap and MUSIM gap collisions

Clarify the definition of CSSFintra for intra-frequency measurements so that dropped measurement gap occasions due to collisions with MUSIM gaps are not counted.

Clarify the definition of CSSFinter for inter-frequency measurements so that dropped measurement gap occasions due to collisions with MUSIM gaps are not counted.

Clarify the definition of CSSFinterRAT for intra-RAT measurements so that dropped measurement gap occasions due to collisions with MUSIM gaps are not counted.

For L1-RSRP and L1-SINR measurements modify the scaling factor P as follows:

* The duration of the window W is max(, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps and MUSIM gaps, if any, and/or per-FR measurement gaps within the same FR as the serving cell
* Ntotal is the total number of SSB resource occasions within the window W, including those overlapped with measurement gap and MUSIM gap occasions
* Noutside\_MG is the total number of SSB resource occasions that do not overlap with measurement gap occasions, MUSIM gap occasions nor SMTC occasions within the window W
* Navailable is the number of SSB resource occasions that are not overlapped with any non-dropped MG and MUSIM gap occasions within the window W, after accounting for measurement gap and MUSIM gap collisions

*Agreements: No*

*Candidate options:*

*Recommendations: postpone the discussion until issue 3-1-1 is solved.*

**Issue 3-1-3: On the time window W for aperiodic gap**

* Proposals
  + P1: Not take aperiodic gap into account when determining the time window W, and clarify that the related measurement period will be longer. (vivo xiaomi oppo Huawei Nokia Qualcomm)
  + P2: max(SMTC period, MGRP\_max)+[M], where MGRP\_max is the largest periodicity among all the periodic gaps and [M] is a time margin for the one-shot aperiodic MUSIM gap. (MTK)

*Agreements:*

*P1 -* Not take aperiodic gap into account when determining the time window W, and clarify that the related measurement period will be longer

*Candidate options:*

*Recommendations: Close this issue.*

# Topic #4: On network B requirements

### Sub-topic 4-1 On network B requirements

**Issue 4-1-1: Network B requirements conditions**

* Proposals
  + P1: Update the agreement on NW B requirements to include inactive state as: Define NW B measurement/cell reselection requirements in IDLE/inactive mode only (vivo)
  + P2: Add the condition “MUSIM gaps will not collide with other MUSIM gaps” when defining NW B requirements. (vivo)
  + P3: Add the condition “No more stringent requirements when measurements are performed based on MUSIM gaps, or maximum one measurement per DRX cycle.” (vivo)
  + P4: Agree to continue discussion other conditions during or once NW B requirements are agreed (Nokia)

*Agreements: No*

*Candidate options:*

*Recommendations: Continue discussion*

**Issue 4-1-2: Network B requirements framework**

* Proposals
  + P1: Framework of idle/inactive mode RRM requirements for NR-U can be used as starting point to accommodate MUSIM gap cancellation.
  + P2: The measurement/cell reselection requirements in IDLE/inactive mode for NW B could reuse the existing idle/inactive requirements as the baseline (Qualcomm xiaomi CMCC ZTE Huawei Ericsson vivo Nokia oppo)
    - P2-1: With DRX cycle replaced by max(DRX cycle, MGRP\_max), where MGRP\_max is the maximum MGRP among all configured MUSIM gaps. FFS other adaptation (Qualcomm vivo Xiaomi Huawei)
    - P2-2: DRX cycle is replaced by max(DRX cycle, MGRP); For MUSIM gaps repetition period = 5120ms, requirements need to be added. (CMCC ZTE)
    - P2-3: When RAN4 reuses existing IDLE mode cell reselection requirements for NW-B, the UE shall request MUSIM gaps with MGRP larger than 160ms when NW-B configures DRX cycle larger than 640ms (Ericsson)
  + P3: The existing UE idle mode measurement and accuracy requirements can be re-used for Network B measurement requirements. (Nokia)

*Agreements (1st round):*

*P2*

*Candidate options:*

*Recommendations: Continue discussion P2-1; P2-2 and P2-3 and P3*

**Issue 4-1-3: MGRP for NW B network**

* Proposals
  + Option 1: RAN4 needs to study how the MGRP for a frequency layer is determined when the UE performs measurements on multiple frequency layers in NW B using multiple MUSIM gaps (MTK)

*Agreements: No*

*Candidate options:*

*Recommendations: Continue discussion*

**Issue 4-1-4: NW B network requirements:**

* Proposals

Option 1 (CMCC): **the NW B cell reselection requirements is proposed as following:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| max(DRX cycle, MGRP) [s] | Scaling Factor (N1) | | | Tdetect,NR\_Intra [s] (number of DRX cycles) | Tmeasure,NR\_Intra [s] (number of DRX cycles) | Tevaluate,NR\_Intra  [s] (number of DRX cycles) |
|  | FR1 | FR2-1Note1 | FR2-2 Note2 |  |  |  |
| 0.32 | 1 | 8 | 12 | 11.52 x N1 x M2 (36 x N1 x M2) | 1.28 x N1 x M2 (4 x N1 x M2) | 5.12 x N1 x M2 (16 x N1 x M2) |
| 0.64 |  | 5 | 8 | 17.92 x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 |  | 4 | 6 | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 |  | 3 | 5 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| 5.12 |  | TBA | TBA | TBA | TBA | TBA |
| Note 1: Applies for UE supporting FR2-1 power class 2&3&4. For UE supporting FR2-1 power class 1 or 5, N1 = 8 for all DRX cycle length.  Note 2: Applies for UE supporting FR2-2 power class 2&3. For UE supporting FR2-2 power class 1, N1 = 12 for all DRX cycle length.  Note 3: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer Tdetect, NR\_intra is expected. | | | | | | |

*Agreements: No*

*Candidate options:*

*Recommendations: Postpone until the conclusion of issue 4-1-2*

**Issue 4-1-5: Network B requirements test case**

* Proposals
  + Option 1: Do not define test cases to verify any new requirements in network B. (Qualcomm Huawei MTK vivo)

*Agreements: No*

*Candidate options:*

*Recommendations: Discuss at the next meeting*