**3GPP TSG-RAN WG2 Meeting #118-e R2-2206171**

**Electronic, 09 – 20 May 2022**

**Agenda item: 6.3.3**

**Source: Qualcomm Incorporated**

**Title: [AT118-e][232][** **MUSIM] Corrections to MUSIM gap configuration aspects**

**Document for: Discussion and decision**

# Introduction

This document will capture the open issues and corrections for Rel-17 MUSIM gap configurations per the email discussion below:

**[AT118-e][232][MUSIM] Corrections to MUSIM gap configuration aspects (Qualcomm)**

      Scope: Discuss corrections for MUSIM gap configurations to determine which are agreaable. Should focus on essential corrections.

 Intended outcome: Discussion report in [R2-2206171](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2206171.zip).

 Deadline: Deadline 4

Please provide your contact information in the table below.

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# Discussion

The following papers were submitted to RAN2#118-e for the Rel-17 MUSIM gap corrections:

*Duration of MUSIM gaps:*

[R2-2205964](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2205964.zip) Configuration of MUSIM Gaps Qualcomm Incorporated discussion

**Only P2 and P3 discussed (P1 has been concluded earlier)**

*Gap priority and alignment with other gap types:*

[R2-2204896](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2204896.zip) Discussion on MUSIM gap priority vivo discussion Rel-17 LTE\_NR\_MUSIM-Core

[R2-2205755](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2205755.zip) Mandatory values for Multi-USIM gap patterns Ericsson discussion

[R2-2205758](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2205758.zip) Alignment between RAN2 and RAN4 Multi-USIM gap Ericsson discussion

[R2-2205759](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2205759.zip) IE harmonization for MUSIM UAI and gap configuration Ericsson discussion

[R2-2204618](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2204618.zip) On remaining issues for UAI related to MUSIM Nokia, Nokia Shanghai Bells discussion

*MUSIM gap configuration:*

[R2-2204614](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2204614.zip) Alternative ASN.1 for MUSIM Gap Configuration Nokia, Nokia Shanghai Bells discussion Rel-17

[R2-2204615](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2204615.zip) Alignment of text for MUSIM gap configuration Nokia, Nokia Shanghai Bells discussion Rel-17

[R2-2204895](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2204895.zip) Discussion on handling of MUSIM gaps vivo discussion Rel-17 LTE\_NR\_MUSIM-Core

[R2-2205322](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2205322.zip) Further consideration on the MUSIM gaps ZTE Corporation, Sanechips discussion Rel-17 LTE\_NR\_MUSIM-Core

[R2-2205197](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2205197.zip) Corrections to NW switching procedure without leaving RRC\_CONNECTED Huawei, HiSilicon discussion Rel-17

*MAC behaviour during MUSIM gaps:*

[R2-2205042](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2205042.zip) Clarification on MAC behaviour during MUSIM gaps NEC CR Rel-17 38.321 17.0.0 1248 - F LTE\_NR\_MUSIM-Core

[R2-2205120](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_118-e%5CR2-2205120.zip) Stop using of MUSIM Gap requested to be released Sharp discussion

## A. Duration of MUSIM gaps

In R2-2205964, it is argued that the existing number and durations of gaps are not sufficient for Idle/Inactive mode activites on the other USIM.

The Chair Notes has the following guideline on this:

[R2-2205964](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2205964.zip) Configuration of MUSIM Gaps Qualcomm Incorporated discussion

1. Only P2 and P3 discussed (P1 can be discussed online with RAN4 LS [R2-2204481](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2204481.zip))

P2 here is for extending the gap duration to 30ms. The contribution assumes that one periodic gap pattern is used for inter-frequency measurements and the remaining gap will need to be used for paging reception. However, if SSB and PO are far apart, then a duration of 20ms will not be sufficient to measure SSB and then receive paging. If RAN2 agrees to support more than two periodic gap patterns, this proposal may not be needed.

**Question A1: Do you support extending the MUSIM gap duration beyond 20ms if RAN2 keeps the current limit of two for periodic gap patterns?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

P3 in the paper is to clarify UE behavior for RLM and BFD during MUSIM gaps. For legacy gaps, RAN4 specification 38.133 Section 8.1.2 and 8.1.3 allow some relaxation when gaps are overlapping with SSB or CSI-RS. Then the question is whether the same can be applied to MUSIM or not, which can be up to RAN4 and will likely have to wait for Rel-18. Alternavively, RAN2 can make the decision in Rel-17. Thus, there can be two options:

1. Option 1: The UE suspends RLM/BFD and any associated recovery procedures during MUSIM gaps
2. Option 2: Leave the decision to RAN4 and wait for Rel-18

**Question A2: Which option do you prefer for RLM and BFD during MUSIM gaps? A different option can be suggested.**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

## B. Gap priority and alignment with other gap types

R2-2204618 proposes that the UE signals a “gap priority” in UAI for MUSIM gap preference. The justification is that the activities performed on the other USIM during the gap may have different levels of importance and latency sensitivity, e.g. paging reception is more critical than measurements. The TP for ASN.1 is shown in the paper where the new IE would be as follows:

“Musim-GapPriority ENUM(high) -- OPTIONAL”

There were related discussions in RAN2 on this topic previously where signaling of a “gap cause” was discussed but this was not adopted.

In R2-2204896, Rel-17/18 MUSIM WI rapporteur suggests to postpone any discussion on gap priority to Rel-18 WI. However, the priority in this paper is in regards to the collision between different types of gaps which is being discussed in RAN4.

**Question B1: Do you support introducing a “gap priority” in UAI as proposed in R2-2204618?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

R2-2204618 proposes to “to support UE behaviour to retry sending the UAI not configured in response to earlier UAI transmission”. This considers the scenario where the NW has not configured the UE according to the earlier request. Then the UE should have the option to indicate the same preference. However, in the current specification, the UE is only allowed to send a gap preference if it is different than the previous one. The TP for the RRC procedure is shown in the contribution.

**Question B2: Do you support UE behavior to retry sending the UAI not configured in response to earlier UAI transmission as proposed in R2-2204618?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

R2-2204618 also proposes that the UE does not need to stop prohibit timer if the NW disables MUSIM assistance for gap preference. The suggested change is as follows:

1> if the received *otherConfig* includes the *musim-GapAssistanceConfig*:

2> if *musim-GapAssistanceConfig* is set to *setup*:

3> consider itself to be configured to provide MUSIM assistance information without leaving RRC\_CONNECTED in accordance with 5.7.4;

2> else:

3> consider itself not to be configured to provide MUSIM assistance information without leaving RRC\_CONNECTED in accordance with 5.7.4;

The rapporteur thinks that this does not change the observable UE behavior since the UE will not send a request when the configuration is released. The existing text is also aligned with other legacy UAI procedures.

**Question B3: Do you support the change for T346h as proposed above?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

R2-2205755 proposes to “introduce mandatory values for Multi-USIM gap patterns” where the patterns are as defined in TS 38.133 9.1.10. RAN2 has previously agreed that this was not needed since the UE will request a gap pattern and the NW will either accept or reject it. The contribution argues that “Mandatory gap patterns increase the chances of the UE request to be attended and may facilitate the testing of the feature”.

**Question B4: Do you support introducing mandatory values for Multi-USIM gap patterns and the proposed UE capability for this?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

R2-2205758 discusses the signaling of MUSIM gap preferences. It is pointed out that the current signaling allows combinations of gap durations and cycles which are not listed in RAN4 specifications. Therefore, it proposes to “limit the UE report values defined by RAN4”. The suggested TP is to add text to the field description as follows:

***musim-GapPreferenceList***

Indicates the MUSIM gap(s) that the UE prefers to be configured with. The UE indicates preference for MUSIM gap(s) in accordance with clause 9.1.10 of TS 38.133.

**Question B5: Do you support the proposal in R2-2205758 to limit the UE MUSIM gap preferences to the values defined by RAN4 and the related TP above?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

## C. MUSIM gap configuration

In R2-2205759, it is observed that both *UEAssistanceInformation* message and *MUSIM-GapConfig* information element contain the same information in *MUSIM-GapInfo-r17* and *MUSIM-Starting-SFN-AndSubframe-SFN-AndSubframe-r17.* To eliminiate this repetition, it is proposed to “Harmonize the structure of the MUSIM *UEAssistanceInformation* and *MUSIM-GapConfig* information element”. The suggested changes are shown in the contribution, where *MUSIM-GapInfo* IE is defined separately and referred by both UAI and *MUSIM-GapConfig.*

**Question C1: Do you support the harmonization of MUSIM gap signaling as proposed in R2-2205759?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

R2-2204614 also proposes improvements to ASN.1 for MUSIM gap configurations. Here the basic idea is to “clearly isolate the periodic and aperiodic gap configurations into separate IEs”. Therefore, instead of the current common *MUSIM-GapInfo*, separate *MUSIM-PeriodicGapInfo* and *MUSIM-AperiodicGapInfo* IEs are introduced.

**Question C2: Do you support introducing separate periodic and aperiodic MUSIM gap information IEs as proposed in R2-2204614?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

R2-2204614 has the following two editorial-type corrections for MUSIM gaps:

Proposal 1: Introduce text to describe the purpose of MUSIM measurement gaps.

Proposal 2: RAN2 to consider to align terminology where transmission of MUSIM assistance information without leaving RRC\_CONNECTED is replaced with gap preference.

The related TPs are also shown in the contribution. Since these are straight-forward changes with no impact to ASN.1 or functionality, they can be treated together.

**Question C3: Do you support Proposal 1 and 2 in R2-2204614 and the suggested changes shown in the contribution?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

R2-2205322 has several proposals to clarify the usage of MUSIM gap parameters as follows, based on earlier RAN2 agreements.

Proposal 1: The network configured *musim-GapRepetitionAndOffset* shall be aligned with the UE requested.

Proposal 2: If the UE indicates the *musim-PrefStarting-SFN-AndSubframe*, the network can only configure the aperiodic Gap with the same start point or no aperiodic gap.

Proposal 2a: If the UE doesn’t indicate the *musim-PrefStarting-SFN-AndSubframe*, the network can configure the start point for the aperiodic gap flexibly.

Proposal 3: For the aperiodic Gap configuration, the *musim-Starting-SFN-AndSubframe* and *musim-GapLength* shall be mandatory present.

The only impact of these proposals are the following changes in field descriptions:

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| ***musim-GapRepetitionAndOffset***Indicates the gap repetition period in ms and gap offset in number of subframes for the periodic MUSIM gap without leaving RRC\_CONNECTED state as specified in TS 38.133 section 9.1.2D. It shall be aligned with the UE requested *musim-GapRepetitionAndOffset* in the *UEAssistanceInformation.* |
| ***musim-Starting-SFN-AndSubframe***Indicates gap starting position for the aperiodic MUSIM gap without leaving RRC\_CONNECTED state. This field is only used for aperiodic gap. It shall be aligned with the UE requested *musim-PrefStarting-SFN-AndSubframe (if present)* in the *UEAssistanceInformation.* |

**Question C4: Do you support the proposals and associated changes in R2-2205322?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

R2-2205197 proposes to capture, either in 38.300 or 38.331, the following agreement by RAN2#117-e:

*Network should always provide at least one of the requested gap pattern or no gaps. Network providing an alternative gap pattern instead of the one requested by the UE is not supported in this release*

The contribution has TPs for 38.300 and 38.331.

**Question C5: Do you support capturing that RAN2 agreement on NW always providing one of the requested gap pateterns or no gaps? If yes, please indicate preference 38.300 or 38.331 and if the TP in R2-22051971 is acceptable.**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

## D. MAC behaviour during MUSIM gaps

Several contributions have proposals on the UE MAC behavior during MUSIM gaps. In particular, these are for restrictring UE transmission during gap times.

A related issue was discussed in RAN2#116 in the context of early termination of MUSIM gaps where the UE finishes the activity before the gap time (e.g. no paging) and whether the UE can then use the existing uplink signals, e.g. send SR, in the remaining time of the gaps. The following was captured in the Chair Notes:

*RAN2 does not intend to specify any new signalling in Rel-17 for early return. If legacy signalling allows it, RAN2 does not intend to preclude it.*

Based on the above agreement, there is currently no restriction for UE uplink transmission during MUSIM gaps.

In R2-2205042, R2-2204895, and R2-2205120, it is proposed to apply the restrictions applicable to measurement gaps described in 38.321 Section 5.14 to also MUSIM gaps. R2-2204895 also observes that the UE may initiate RACH during measurement gaps and this should also be allowed for MUSIM gaps. R2-2205120 in addition clarifies that the restriction should only be applied if the gap release has not been requested.

**Question D1: Do you agree that RACH transmissions should be allowed during MUSIM gaps, similar to legacy gaps, and support the associated changes in R2-2204895 for 38.321 Section 5.1.2?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

**Question D2: Do you support restriction of other uplink transmission during MUSIM gaps and support the associated CR in R2-2205042?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

**Question D3: If uplink transmissions are restricted during MUSIM gaps, do you support the change in R2-2205120 to clarify the release status of the gaps?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

# Conclusion

Based on the discussion and the feedback from companies above, the following are proposed for the corrections of Rel-17 MUSIM gaps: