**3GPP TSG-RAN WG2 Meeting #121bis-e R2-2304398**

**Online, April 17-26, 2023**

**Agenda item: 7.17.4**

**Source: Samsung**

**Title: Report of [AT121bis-e][231][MUSIM] RAN4 aspects of MUSIM (Samsung)**

**Document for: Discussion**

# 1 Introduction

This document is the report of the following offline discussion:

* [AT121bis-e][231][MUSIM] RAN4 aspects of MUSIM (Samsung)

Scope: Discuss what to do in RAN2 for MUSIM gap priorities (based on RAN4 LS): Can UE indicate gap priority preference? Is the gap priority applicable to aperiodic gaps? What is the network behaviour (i.e. accept/reject/change priority)? Are there any RAN4 impacts on maximum UL power change?

Intended outcome: Discussion report in [R2-2304398](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2304398.zip)

Deadline: Deadline 2 (Friday W1, 0900 UTC)

# 2 Contact information

|  |  |
| --- | --- |
| Company | Contact person (email address) |
| Samsung | Sangyeob Jung (sy0123.jung@samsung.com) |
| vivo | Boubacar, kimba@vivo.com |
| Huawei/HiSilicon | Rama Kumar Mopidevi (rama.kumar@huawei.com) |
| Intel Corporation | Seau Sian Lim (seau.s.lim@intel.com) |
| Nokia | Srinivasan Selvaganapathy([srinivasan.selvaganapathy@nokia.com](mailto:srinivasan.selvaganapathy@nokia.com)) |
| Apple | Sethuraman Gurumoorthy (sethu@apple.com) |

# 3 Discussion

### 3.1 MUSIM gap priorities

In [1, 4, 5, 10], it mentions that there is a need to introduce new UE capability to indicate whether UE supports providing MUSIM gap priority preference and its related configuration.

**Q1: Do you agree to introduce a per-UE capability bit to indicate support of MUSIM gap priority configuration and preference?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/disagree | Comments (if any) |
| vivo | Agree | It’s natural to introduce a per-UE capability bit to indicate support of MUSIM gap priority configuration and preference. |
| Huawei/HiSilicon | Agree |  |
| Intel | Agree | We can even include that there is no need for xDD and FRx differentiation. |
| Nokia | Agree |  |
| Apple | Agree | We think that a per UE capability is a natural requirement for this gap priority feature |

Summary:

It is mentioned in [4, 9, 10] that MUSIM gap priority preference can be reported if UE is configured to do so i.e. explicit network configuration in the OtherConfig.

**Q2: Do you agree to introduce a new indication in the OtherConfig to indicate whether UE is allowed to report MUSIM gap priority preference via UAI?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/disagree | Comments (if any) |
| vivo | Agree | Similar to the legacy UAI mechanism. |
| Huawei/HiSilicon | Agree |  |
| Intel | Agree |  |
| Nokia | Agree |  |
| Apple | Agree |  |

Summary:

According to RAN4’s agreement [13], UE can also provide an assistance information for the periodic MUSIM gap priority selection by indicating its preferred priority for all or a subset MUSIM gaps. The rapporteur thinks that the following feasible options need to be discussed as proposed in [6, 9, 12]:

* Option 1: UE indicates an absolute priority for all or a subset periodic MUSIM gaps by taking into account of the Type-2 MG gap priority
* Option 2: UE indicates a relative priority for all or a subset periodic MUSIM gaps, i.e. the priority is relative just among the MUSIM gaps

Note that it is mentioned in [6] that RAN2 may wait for RAN4 feedback for which option to be supported.

**Q3: Which of the following options do you prefer for indicating periodic MUSIM gap priority preference?**

* **Option 1: UE indicates an absolute priority for all or a subset periodic MUSIM gaps by taking into account of the Type-2 MG gap priority**
* **Option 2: UE indicates a relative priority for all or a subset periodic MUSIM gaps, i.e. the priority is relative just among the MUSIM gaps**
* **Option 3: wait RAN4 progress/feedback**

|  |  |  |
| --- | --- | --- |
| Company | Preferred Option(s) | Comments (if any) |
| vivo | Option 2 | Option 2 relative priority is preferred.  Firstly, it’s sufficient for the UE to report the relative priority values among the periodic MUSIM gaps and it’s up to the network how to configure the relationship of MUSIM gap priorities and MG gap priorities. The value range of relative priority is smaller than the absolute ones, which helps minimize the ASN.1 size.  Secondly, in option 1, if the highest priority has been used for configured measurement gap, e.g. priority 0-3. How does UE report one absolute gap priority for paging usage in value range [0-3]? The priority preference is not clear if priority preference value equals to configured gaps.  We are fine with option-1 as well if majority prefers it. |
| Huawei/HiSilicon | Option 2 | Currently, the Type-2 MG gap priority is decided by NW without UE providing any preference, we can follow this principle and the UE does not need to consider the priority between Type-2 MG and MUSIM gap. Furthermore, when the NW reconfigures the Type-2 MG priority for the UE, the UE does not need to re-initiate the UAI procedure to update the MUSIM gap priority. |
| Intel | Option 1 or 3 | Based on the following in the LS:   * + The priority level of MUSIM gap(s) shall be configured to be comparable to priority level of NW A’s Type-2 MGs     - MUSIM gap and Type-2 MG cannot be configured with the same priority   Our understanding is leaning more to Option 1. However, we are fine to check with RAN4 or wait for further progress in RAN4. Particularly, it is unclear to us why it is optional for the UE to not indicate its preferred priority for a MUSIM gap in the prefereince indication. Does it mean that it is lowest priority (or highest priority)? |
| Nokia | Option 1 is preferred. | RAN4 LS indicates the NW assigned priority should be unique across MUSIM gaps and Type-2 gaps. If the UE intend to have better priority over Type-2 gaps for some of its gaps, it is good to indicate the same for NW to consider in its assignment. Otherwise NW may allocate lower priority than Type-2 which is not preferred for UE. |
| Apple | Option 1 or 3 | Option 1 in our view results in unambiguous priority setting. At the same time, we are fine to wait for RAN4 input if any on this. |

Summary:

Regardless of the outcome of Q3, the rapporteur understands that most companies propose that the existing IE *GapPriority-r17* can be re-used to configure the priority for periodic MUSIM gap, regardless of the outcome of Q3.

**Q4: Do you agree that the existing IE GapPriority-r17 is re-used to configure the priority for periodic MUSIM gap?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/disagree | Comments (if any) |
| vivo | Agree | The existing IE *GapPriority-r17* can be re-used by the network to configure the priority for periodic MUSIM gap.  However, the value range of gap priority preference relies on the outcome of Q3. |
| Huawei/HiSilicon | Agree |  |
| Intel | Agree |  |
| Nokia | Agree |  |
| Apple | Agree |  |

Summary:

In Rel-17, RAN2 has agreed that network should always provide at least one of the requested gap pattern or no gaps i.e. network is NOT allowed to provide an alternative gap pattern instead of the one requested by the UE. Thus, it is proposed in [3] that network should accept the MUSIM gap priorities requested by the UE. The rapporteur understands that the intent is for network to assign the priority which is equal to the absolute value provided by the UE (if Option 1 is agreed in Q3) or is aligned with the relative value provided by the UE (if Option 2 is agreed in Q3) [9].

**Q5: When network accepts gap priority preference for a periodic MUSIM gap, do you agree that network configures the priority which is equal to the absolute value provided by the UE (if Option 1 is agreed in Q3) or is aligned with the relative value provided by the UE (if Option 2 is agreed in Q3)?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/disagree | Comments (if any) |
| vivo | Agree (aligned with the relative value provided by the UE) | Considering network may configure new measurement gaps, it’s impossible for network to always accept the absolute priority value provided by the UE.  No matter Option-1 or Option-2 is agreed in Q3, we think network configures the MUSIM priority which is aligned with the relative priority relationship among MUSIM gaps provided by the UE. |
| Huawei/HiSilicon | Agree (Aligned with the relative value provided by the UE) | Based on existing mechanism, for UE suggested MUSIM gaps, if the gNB decides to configure the MUSIM gaps, the gap patterns configured should be the same as the UE’s preference, to match the activities in SIM B. The same motivation applies for UE suggested priority for MUSIM gaps, since only the UE knows the intention (e.g. for paging reception, or RRM measurements, or SI reception) for different MUSIM gaps.  Besides, since only relative priority for MUSIM gap should be aligned, the NW still has flexibility for configure priority between Type-2 MG and MUSIM gap. |
| Intel | Agree (Option 1 in Q3) |  |
| Nokia | Agree (with Option 1 in Q3) |  |
| Apple | Agree (with Option 1 in Q3) |  |

Summary:

If network can't accept MUSIM gap priority preference, simplest options may be not to assign any priority for a requested periodic MUSIM gap or not to configure a periodic MUSIM gap at all. But further question is raised in [3] whether a fallback option could be for network to follow the relative priorities among periodic MUSIM gaps i.e. assign different priorities for periodic MUSIM gaps while still following the relative ordering between them. The rapporteur understands that this fallback option is valid if the outcome of Q3 is Option 1.

**Q6: When network can't accept MUSIM gap priority preference for a periodic MUSIM gap, which of the following options do you support for network behavior?**

* **Option A: does not configure a periodic MUSIM gap at all**
* **Option B: does not assign any priority while configuring a periodic MUSIM gap**
* **Option C: use fallback option as in [3]**
* **Others**

|  |  |  |
| --- | --- | --- |
| Company | Preferred Option(s) | Comments (if any) |
| vivo | Option C | RAN4 LS has concluded that “It is up to NW A on how to use this (preference) information.”  If NW A cannot accept the priority level indicated by a UE, network configures the MUSIM priority which is aligned with the relative priority relationship among MUSIM gaps provided by the UE. |
| Huawei/HiSilicon | See comment | As commented in Q3, we prefer the UE to indicate a preference for a relative priority for all or a subset periodic MUSIM gaps. In this case, we cannot imagine for what reasons the NW cannot accept such relative priority preference of the UE. |
| Intel | Others | It is unclear to us why network cannot provide a priority when the UE has requested a priority preference. |
| Nokia | See comment | As the NW may decide on relative priority across Type-2 Gaps and MUSIM gaps, we should allow network to change the priority. This is needed at least for the priority across MUSIM and Type-2 priority. Within MUSIM gap priority the NW should attempt to keep the same order.  Also RAN2 need to discuss the UE behaviour if priority is not assigned or not accepted to all the requested priority. In such cases the Type 2 gaps of NW-A should be given higher priority by default. The priority handling among MUSIM gaps can be left to UE implementation |
| Apple | See comment | Our understanding is that the NW if it is not able to provide the UE requested priority, should atleast provide a default priority. Otherwise, the UE would be force to retrigger this signalling request again, which should be avoided. |

Summary:

According to RAN4 LS [13], it is stated that each periodic MUSIM gap can be assigned with a different priority. But two companies in [2, 10] would like to discuss whether network can configure the same priority to the periodic MUSIM gaps.

**Q7: Do you agree that network can configure the same priority to more than one periodic MUSIM gap?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/disagree | Comments (if any) |
| vivo | See comment | Whether different periodic MUSIM gaps can have same priority or not, it is under discussion in RAN4 for a few meetings already, we suggest to wait for RAN4 progress. |
| Huawei/HiSilicon | See comment | Wait RAN4 progress  In our view, the issue of same priority is not only about NW configured priority, but also UE reported priority. As we mentioned above, we think the NW configured priority should be aligned with UE reported relative priority, if UE can report same priority, then the NW can configure same priority. Whether UE can report same priority is being discussed in RAN4 so we can wait for RAN4 progress. |
| Intel | Check with RAN4 | We can check with RAN4 whether collision handling needs to be performed among the MUSIM gaps. |
| Nokia | No | Same priority across the gaps is not allowed as per RAN4 LS. |
| Apple | See comment | Based on our contribution in [8] we feel RAN4 should clarify this part. Currently it is not clear if different periodic gaps can have the same priority. |

Summary:

According to RAN4 agreement [13], it is optional for UE to indicate its preferred priority for a periodic MUSIM and it is up to network to decide how to use such information. Thus, it seems quite natural that network can configure a periodic MUSIM gap without any assigned priority, which is related with the following highlighted agreement is made:

* RAN2 will aim to address the RAN4 LS in Rel-18 signalling. Should discuss how to handle Rel-17 gaps without priority (e.g. lowest, highest, network-decided somehow, etc.). Handled in email [231]

Note that the focus here is to handle periodic MUSIM gaps without priority i.e. the applicability of priority for aperiodic MUSIM gap will be discussed later on.

In [1], it is suggested that a default priority level should be used for periodic MUSIM gaps which do not have an assigned priority. In [5], it is proposed that absence of configured priority indicates the lowest priority for the gap when there is conflict with other NW-A Type-2 gaps or other MUSIM gaps.

**Q8: How UE supporting to indicate periodic MUSIM gap priority preference handles a configured periodic MUSIM gap without priority?**

* **Option 1: UE uses a default priority value**
* **Option 2: UE considers a configured periodic MUSIM gap without priority to be the lowest priority gap i.e. lower than any of the network configured priority values**
* **Others**

|  |  |  |
| --- | --- | --- |
| Company | Preferred Option(s) | Comments (if any) |
| vivo | others | Based on RAN4 discussion, we may assume that, 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. Then, the case of this question is impossible. |
| Huawei/HiSilicon | See comment | Wait RAN4 progress.  RAN4 is discussing “Solution for collision between MUSIM gap and Type-1 MG or gap configured without priority” hence we can wait for RAN4 progress. |
| Intel | Others | It is unclear to us why it is optional for the UE to not indicate its preferred priority for a MUSIM gap in the preference indication. Does it mean that it is lowest priority (or highest priority)? If we can decide on that, this can also be addressed? |
| Nokia | O1 or O2 | By default MUSIM gaps should have lowest priority compared to Type-2 gaps. So if NW does not assign priority to the MUSIM gap it should be considered as lowest priority than the Type-2 Gap priority values. |
| Apple | See Comment | As stated earlier, if UE supports priority for periodic gap, we exepct the NW to assign atleat a default priority level. We are not clear on what circumstances, NW will NOT assign any priority ? |

Summary:

It is indicated in [13] that RAN4 is still discussing whether priority for aperiodic MUSIM gap needs to be introduced. In [5], it is proposed that RAN2 can indicate its preference to assign explicit priority for aperiodic gaps in RAN4 LS Response, considering that potential overlap between periodic MUSIM gaps and aperiodic MUSIM gap as well as between aperiodic MUSIM gap and NW-A Type-2 MG may occur. On the contrary, one company [8] mention that aperiodic MUSIM gap can be the highest priority implicitly.

**Q9: Which of the following options do you prefer for handling of aperiodic MUSIM gap priority preference/configuration?**

* **Option 1: wait RAN4 progress**
* **Option 2: assign explicit priority for aperiodic MUSIM gap**
* **Option 3: aperiodic MUSIM gap is the highest priority gap implicitly**
* **Others**

|  |  |  |
| --- | --- | --- |
| Company | Preferred Option(s) | Comments (if any) |
| vivo | Option 1 | We’d better wait RAN4 progress since they are discussing this. |
| Huawei/HiSilicon | Option 1 |  |
| Intel | Option 1 | As mentioned in the RAN4 LS below:  RAN4 is still discussing whether priority for aperiodic MUSIM gap needs to be introduced. |
| Nokia | Option 1 with comments | To have UE to have some preference for aperiodic gaps, we prefer to have priority for aperiodic gap. We can indicate the same in RAN2-LS indicating the cases where it will be beneficial. |
| Apple | Option 3 (See comments) | The reason we indicated aperiodic gaps to have the highest priority is because they are one time gaps. If for some reason, this gap gets scheduled out, UE has to re-request this gap again. This is not the case with periodic gaps, as they repeat in time domain. Our preference is to treat them at highest priority. At the same time, we understand this is for RAN4 to discuss and confirm. So in that sense option 1 for now is fine. |

Summary:

### 3.2 RAN4 impacts on Maximum UL power change

In RAN2#121 meeting, The following agreement on maximum UL power change has made:

* 2: RAN2 considers that there may be RAN4 impact on the maximum UL power change due to R18 MUSIM. However, RAN2 needs to analyze the power issue more before asking RAN4 specifically.

Two companies suggest to study/analyze maximum UL power change due to R18 MUSIM operation from RAN2 perspective first. In [11], it is suggested to study when to trigger PHR given that UE reports PHR to NW A due to events occurred in NW B. In [5], it is proposed to support NW control on the uplink-power sharing for MUSIM operation (e.g. static and dynamic sharing mode) should be supported, which may require RAN4 analysis based on RAN2 conclusion.

On the other hand, three companies express that no RAN4 impact is expected from RAN2 point of view. In [2], it is mentioned that RAN2 does not need to study PHR triggering without any RAN4 input since how to calculate maximum UL power is defined in RAN4. In [9], similar view is stated and UE implementation can also handle the concerned scenario. In [5], the band conflict solution discussed in RAN2 can avoid any potential maximum UL power change issues without RAN4 involvement.

Based on companies' views above, it is still not clear yet what exact RAN4 impacts (if any) are expected from RAN2 point of view. Thus, the rapporteur would like to ask the following question:

**Q10: Do you agree that "RAN2 assumes no RAN4 impact is expected on maximum UL power change due to R18 MUSIM. Can re-discuss if critical issues are found in RAN2"?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/disagree | Comments (if any) |
| vivo | agree | RAN2 need not request RAN4 handling on maximum UL power change due to R18 MUSIM. Can re-discuss if critical issues are found in RAN2. |
| Huawei/HiSilicon | Agree |  |
| Intel | Agree |  |
| Nokia | See comments | How the concurrent transmission in NW-A and NW-B can be handled using PHR is not clear. There may be some delay in indicating PHR to NW that will have impact on transmission in other NW. Moreover how the power sharing works for other channels such as PUCCH and RACH in Dual active MUSIM operation also require some analysis. PHR cannot resolve this problem |
| Apple | Agree |  |

Summary:

### 3.3 Others

For any **critical** other **stage-2** issues not covered above, please feel free to indicate them into the following table.

|  |  |  |
| --- | --- | --- |
| Company | Discussion points | Comments |
|  |  |  |
|  |  |  |

# 4 Conclusion

TBD:

# 5 Reference

[1] [R2-2303641](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2303641.zip) MUSIM gap priorities Ericsson discussion Rel-18 NR\_DualTxRx\_MUSIM-Core

[2] [R2-2303828](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2303828.zip) Discussion on MUSIM gap priorities and maximum UL power change Samsung

Electronics Austria discussion Rel-18 NR\_DualTxRx\_MUSIM-Core

[3] [R2-2302724](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2302724.zip) Remaining issues for MUSIM gaps Qualcomm Incorporated discussion

[4] [R2-2302783](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2302783.zip) Gap collision handling for Rel-17 gaps Intel Corporation discussion Rel-18 NR\_DualTxRx\_MUSIM-Core

[5] [R2-2303190](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2303190.zip) On MUSIM gap priority and uplink power sharing aspects of MUSIM operation Nokia,

Nokia Shanghai Bell discussion

[6] [R2-2303269](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2303269.zip) Discussion on MUSIM gap priorities vivo discussion Rel-18

[7] [R2-2303352](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2303352.zip) Discussion on MUSIM gap priorities Xiaomi discussion Rel-18

NR\_DualTxRx\_MUSIM-Core

[8] [R2-2303411](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2303411.zip) Views on RAN4 LS for MUSIM gap priorities Apple discussion Rel-17

LTE\_NR\_MUSIM-Core

[9] [R2-2303471](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2303471.zip) Discussion on MUSIM gaps and other RAN4 topics Huawei, HiSilicon discussion Rel-

18 NR\_DualTxRx\_MUSIM-Core

[10] [R2-2303875](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2303875.zip) Consideration on the Scheduling Gap Priority ZTE Corporation, Sanechips discussion

Rel-18 NR\_DualTxRx\_MUSIM-Core

[11] [R2-2303937](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2303937.zip) Discussion on maximum UL power change for Dual Tx/Rx Multi-SIM ASUSTeK discussion Rel-18 NR\_DualTxRx\_MUSIM-Core

[12] [R2-2304028](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2304028.zip) MUSIM Gap Priority LG Electronics discussion Rel-18 NR\_DualTxRx\_MUSIM-

Core

[13] [R2-2302430](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_121bis-e/Docs/R2-2302430.zip) LS on priority for MUSIM gaps (R4-2303249; contact: vivo) RAN4 LS in Rel-18 NR\_DualTxRx\_MUSIM-Core To:RAN2