3GPP TSG-RAN WG2 #118e R2-220xxxx

2022 eMeeting, 09th May – 20th May, 2022

Agenda Item: 6.22.3.2

Source: MediaTek Inc.

**Title: Report of [AT118-e][059][MGE] Concurrent MG (MediaTek)**

Document for: Discussion and decision

# 1 Introduction

This is report for the following AT118-e mail discussion.

* [AT118-e][059][MGE] Concurrent MG (MediaTek)

 Scope: Based on the on-line agreements progress the related details, Progress remaining issues, and attempt to converge

 Intended outcome: Report, TP if needed.

 Deadline: for online CB W2 TUE

Deadline – Please provide comments before W2 Monday May 16th 1000 UTC

The online discussion note is copied below for reference.

[R2-2205229](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CTSGR2_118-e%5CDocs%5CR2-2205229.zip) [E033][E034][H652][M604][M605][M606] Correction on ToAddModList and Gap ID for multiple gap configurations MediaTek Inc. draftCR Rel-17 38.331 17.0.0 F NR\_MG\_enh-Core Late

DISCUSSION points 1 and 2

* ZTE wonder whether the new list can be used to configure legacy gaps. Ericsson think that legacy patterns can be configured with the new list. MTK agrees.
* Huawei think that concurrent gaps is applicable to the new list but think that for e.g. NCSG also legacy extension makes sense and is simpler (it applies to legacy configs). Ericsson think it is cleaner to use the new list and think any restrictions can be handled in the field descriptin. MTK think that if we use the new list we use it for all cases.
* Samsung think there are benefits e.g. wrt signalling overhead if using the legacy gaps. Think there are no issues with ambiguity for reusing legacy gaps. MTK think we didn’t discuss the implicit association without ID, and this isn’t preferred
* Intel prefer the current structure, but is ok with the new proposal, but not sure about legacy gaps what it means. If we go with this, legacy gaps remain in the old configuration.
* Nokia think that legacy gaps can e.g. be for all freqs etc, Think that legacy gaps shall be possible with concurrent gaps, and can use the legacy gap configuration for legacy gaps.
* ZTE think the difference between concurrent and legacy gaps is just whether there is one or more. Think it is easier to just assume the new list, then can add and legacy gaps becomes concurrent gaps.
* Vivo think legacy configuration can be used together with the new Rel17 configuration.
* CATT support that concurrent gaps doesn’t reuse the legacy configuration.
* Apple point out that concurrent gaps is used as baseline for other
* QC has the same understanding as Ericsson. Same configuration as legacy can be provided with the new structure.
* Huawei think R2 need to figure out whether legacy gaps and concurrent gaps can be configured together with concurrent gaps. R4 has replied that for concurrent gaps association need to be ensured. Think the main point is the association with frequency .. Ericsson agrees the association is mandatory.
* MTK think the new configuration applies the association and it is required, and indeed think that the new list can configure legacy gaps, without association.
* Apple point out that preconfig MG and NCSG uses concurrent gaps as framework

Chair: Assume that if we go with new list a E033, then the new list/new configuration will be used for all cases that go beyond R15 R16 supported cases.

* We go with E033 E034, assuming that new list/new configuration will be used for all cases that go beyond R15 R16, continue offline (if issues are found can still CB and revert)

# 2 Contact Points

Respondents to the email discussion are kindly asked to fill in the following table.

|  |  |  |
| --- | --- | --- |
| Company | Name | Email Address |
| MediaTek (Rapp) | Felix Tsai | chun-fan.tsai@mediatek.com |
| Intel (Rapp) | Candy Yiu | Candy.yiu@intel.com |
| Apple | Yuqin Chen | yuqin\_chen@apple.com |
| LGE | SangWon Kim | sangwon7.kim@lge.com |
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# 3 Discussion

## 3.1 Clarification on E033/E034 approach

During the online discussion, it was agreed that we adopt E033/E034 and check whether there is concern on this direction. The CR [R2-2205229](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CRAN2%5C2205_R2_118-e%5CDocs%5CR2-2205229.zip) is written with the assumption that E033/E034 were agreed. Rapporteur would like to explain the operation of this approach to see if companies are okay with this.

The following is the resultant ASN.1 code assuming that R2-2205229 is agreed.

MeasGapConfig ::= SEQUENCE {

 gapFR2 SetupRelease { GapConfig } OPTIONAL, -- Need M

 ...,

 [[

 gapFR1 SetupRelease { GapConfig } OPTIONAL, -- Need M

 gapUE SetupRelease { GapConfig } OPTIONAL -- Need M

 ]],

 [[

 gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 OPTIONAL, -- Need N

 gapToReleaseList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF MeasGapId-r17 OPTIONAL, -- Need N

 ]]

}

GapConfig ::= SEQUENCE {

 gapOffset INTEGER (0..159),

 mgl ENUMERATED {ms1dot5, ms3, ms3dot5, ms4, ms5dot5, ms6},

 mgrp ENUMERATED {ms20, ms40, ms80, ms160},

 mgta ENUMERATED {ms0, ms0dot25, ms0dot5},

 ...,

 [[

 refServCellIndicator ENUMERATED {pCell, pSCell, mcg-FR2} OPTIONAL -- Cond NEDCorNRDC

 ]],

 [[

 refFR2ServCellAsyncCA-r16 ServCellIndex OPTIONAL, -- Cond AsyncCA

 mgl-r16 ENUMERATED {ms10, ms20} OPTIONAL -- Cond PRS

 ]]

}

GapConfig-r17 ::= SEQUENCE {

 measGapId-r17 MeasGapId-r17,

 gapType-r17 ENUMERATED {perUE, perFR1, perFR2},

 gapOffset-r17 INTEGER (0..159),

 mgl-r17 ENUMERATED {ms1, ms1dot5, ms2, ms3, ms3dot5, ms4, ms5, ms5dot5, ms6},

 mgrp-r17 ENUMERATED {ms20, ms40, ms80, ms160},

 mgta-r17 ENUMERATED {ms0, ms0dot25, ms0dot5, ms0dot75},

 refServCellIndicator-r17 ENUMERATED {pCell, pSCell, mcg-FR2} OPTIONAL, -- Cond NEDCorNRDC

 refFR2ServCellAsyncCA-r17 ServCellIndex OPTIONAL, -- Cond AsyncCA

 preConfigInd-r17 ENUMERATED {true} OPTIONAL, -- Need R

 nscgInd-r17 ENUMERATED {true} OPTIONAL, -- Need R

 gapAssociationPRS-r17 ENUMERATED {true} OPTIONAL, -- Need R

 gapSharing-r17 MeasGapSharingScheme OPTIONAL, -- Need R

 gapPriority-r17 GapPriority-r17 OPTIONAL, -- Need R

 ...

}

With this ASN.1 code

* **Understating 1** - The legacy fields (*gapFR2*, *gapFR1*, *gapUE*) could configure R15/R16 gap with legacy IE *GapConfig*. The legacy fields CANNOT be used to configure any of the R17 MGE features
* **Understating 2** - The new fields (*gapToAddModList-r17* and *gapToReleaseList-r17*) could configure one or multiple gaps with the new IE *GapConfig-r17*. All new R17 MGE gap features should be configured by these new fields.
* **Understating 3** – The new fields could still configure “legacy*”* gap.

During the online discussion, it was confusing while companies talking about the “legacy” gap. It may be good to clarify what kind of gap configuration we are talking about.

There could be two kind of configuration

* Type 1 gap configuration - A gap is setup by legacy fields (*gapFR2*, *gapFR1*, *gapUE*)
* Type 2 gap configuration - A gap is setup by new fields (*gapToAddModList-r17*). However, this gap is NOT configured with pre-MG indicator (*preConfigInd-r17*) and is NOT configured as NCSG (*nscgInd-r17*). In addition, this gap is not associated with specific frequencies. (It is the only per UE gap or FR1 gap or FR2 gap)
	+ In this case, this “legacy” gap will be configured with a gap ID which is used for release purpose only.

The question is that do we consider Type 2 gap configuration as “legacy” gap and is it allowed to be configured as understanding 3. Please also note that Type 2 gap configuration is already possible (from ASN.1 signaling point of view) in current v17.0.0.

**Question 1: Companies are invited to provide comments on above understandings 1-3 based on the ASN.1 code from R2-2205229. In particular, do you think we should allow type 2 gap configuration for a UE supports any of R17 MGE features?**

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| --- | --- |
| **Company** | **Comments** |
| Intel | We have the same understanding 1 and 2. As for understanding 3, in term of signaling POV, it is feasible to do. However, as in discussion do we want to have type 2 to be configured in gapConfig-r17. It seems like it is matter of taste. However, if we separate the gapConfig between legacy and r17, we have slightly preference to not allow legacy to configure in gapConfig-r17. In this case, gap ID is mandatory. |
| Apple | Our preference is to only allow understanding 1 and 2. It is not clear to us, if to allow using the new list to configure legacy, why do we need to change the structure?  |
| LGE | Regarding understanding 3, we cannot see any reason to use the new fields to configure the legacy gap, though it is possible from signalling perspective. If different fields are used for the legacy gap configuration between the source and target gNB, the delta configuration cannot be used, and it may bring possible confusion. |
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Rapporteur does not really see the need to mix the usage of legacy field and new field. Based on the online agreement the new field is assumed to be **“used for all cases that go beyond R15 R16”**. Mixing usage of legacy and new field may just bring additional confusion. Either the NW setup a gap using the new field or using the legacy field. In the CR R2-2205229, this is clarified as below.

|  |
| --- |
| ***gapToAddModList***A list of of measurement gap configuration to be added or modified. The network does not setup a measurement gap using this field together with *gapFR1*, *gapFR2*, or *gapUE*. In this version of the specification, the network configures this field only in NR standalone. |

With above understandings, let’s clarify on how to use the ASN.1 code.

* Case 1 – For R15/R16 UE or UE does not support the new R17 MGE features
	+ The NW use legacy field to configure the R15/R16 gap
* Case 2 – For UE supports any of the R17 MGE features
	+ Case 2.1 (For NW does not support R17 MGE features)
		- The NW use legacy field to configure the R15/R16 gap
	+ Case 2.2 (For NW supports R17 MGE features)
		- The NW could still use legacy field to configure the R15/R16 gap.
		- The legacy field should not be setup together with the new field, but
			* The NW could release the R15/R16 gap via legacy field and setup new gaps via new field. (For example, while handover from R15/R16 gNB to new gNB)
			* The NW could release gaps configured by new field using *gapToReleaseList-r17* and setup R15/R16 via legacy field (Not sure the use case though)
		- It would be easier for the NW to just use the new field to configure different kinds of gap scenario including the “legacy” gap scenario as in understanding 3.
			* For example, the NW can reconfigure between pre-MG gap and “legacy” gap (or between NCSG and “legacy” gap) by using *gapToAddModList-r17* with corresponding ID.
			* If there is only one “legacy” gap configured via *gapToAddModList-r17*, it also easy to add a second gap via the new field and set the corresponding association to make it concurrent gap configuration.

**Question 2: Companies are invited to comment whether they have concern or different view on above usage of the new ASN.1 code? Please also comment on whether there is concern on restriction of setup a gap using new field and legacy filed simultaneously.**

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| **Company** | **Comments** |
| Intel | Case 1 okCase 2.1 okCase 2.2: since it is possible to configure legacy gap and r17 gap simultaneously (e.g. legacy and pre-configured gap and legacy and NCSG gap), we think it is cleaner if legacy gap (always on and no association to frequency or purpose) is always configured in the legacy field. Similarly, r17 gaps will be configured in the new list.  |
| Apple | Case 1 and 2.1 OKFor Case 2.2, as I explained in online session, legacy gap and R17 gap can be configured together for NCSG and Pre-MG. For original concurrent gap, we agree it is indeed debatable as discussed online. Please see below agreement from RAN4 LS(s):R4-2202616 (Pre-MG):* + Independent of whether the UE supports concurrent measurement gaps, the following operations are supported (subject to UE capabilities for per-FR gap and pre-configured gap):
		- legacy FR1 gap + pre-configured FR2 gap
		- legacy FR2 gap + pre-configured FR1 gap

R4-2206890 (NCSG):* RAN4 confirms the following combinations are supported:
1. NCSG FR1 gap + NCSG FR2 gap
2. Legacy FR1 gap + NCSG FR2 gap
3. Legacy FR2 gap + NCSG FR1 gap

R4-2202604 (Original concurrent gap for association between MO/freq and gap):**Q1 –** Can Rel-17 concurrent gaps be configured together with legacy gap? If ‘yes’, what would be the UE behavior? * RAN4 response: From RAN4 requirement perspective, RAN4 would like to ensure that the association of frequency layers or dedicated use cases to measurement gaps shall be clearly understood by both UE and Network for all configured measurements. How the association is up to RAN2.
 |
| LGE | For case 2.2:We slightly prefer not to allow the NW to use the new fields to configure the legacy gap. If so, the NW should be able to configure the legacy field together with the new fields.  |
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**Summary: TBD**

In addition, it seems quite straightforward that we define measurement gap ID as mandatory field if we agreed E033/E034. As in other list, the ID is always needed to identify an entry. In this way, we avoid the complex conditional code specified for *measGapId-r17* as in current v17.0.0.

**Question 3: Do companies agree to define gap ID as mandatory field in the new R17 IE *GapConfig-r17* (as in R2-2205229)?**

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| **Company** | **Agree or not** | **Comments** |
| Intel | Agree if | If the new IE gapConfig-r17 only for r17 MGE gaps. |
| Apple | Agree | It should be mandatory with E033/E034 agreed. And does this also justify the legacy gap should not be configured by Rel-17 field? |
| LGE | Yes | Even if the understanding 3 in Q1 is agreed, it does no harm to have. |
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## 3.2 Configuration limitation of NCSG and pre-MG

The configuration limitation on combination of legacy gap and NCSG gap was mentioned by [R2-2205692](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2205_R2_118-e/Docs/R2-2205692.zip) and also discussed during the online session. The intention (based on RAN4 LS [R2-2204474](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2205_R2_118-e/Docs/R2-2204474.zip)) is to clarify that the following case 1), 2), 3) are supported and there is configuration limitation on case 4), 5) and 6).

[R2-2204474](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2205_R2_118-e/Docs/R2-2204474.zip) LS on R17 MG enhancement - NCSG (R4-2206890; contact: Apple) RAN4 LS in Rel-17 To:RAN2 Cc:RAN1

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| RAN4 reached the following agreements:* RAN4 confirms the following combinations are supported:
1. NCSG FR1 gap + NCSG FR2 gap
2. Legacy FR1 gap + NCSG FR2 gap
3. Legacy FR2 gap + NCSG FR1 gap
* RAN4 confirms that the following combinations are not supported from RAN4 requirement perspective:
	1. One legacy perUE gap + one NCSG perUE gap
	2. One legacy perUE gap + NCSG FR1 gap
	3. One legacy perUE gap + NCSG FR2 gap
 |

Please also note that in RAN4 LS [R2-2202160](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2202_R2_117-e/Docs/R2-2202160.zip), the same limitation applies to pre-configured MG (We can actually replace the “NCSG xxx gap” with “pre-configured xxx gap” in above 6 cases).

It should be possible the use the new field in [R2-2205229](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CRAN2%5C2205_R2_118-e%5CDocs%5CR2-2205229.zip) to configure the supported cases (case 1), 2), 3)). And we can have some clarification on field description to say that case 4), 5), 6) are not supported. One example to clarify the configuration limitation is shown below. So, rapporteur understands that the LS from RAN4 does not prevent us from using E033/E034 approach.

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| --- |
| ***gapToAddModList***A list of of measurement gap configuration to be added or modified. The network does not setup a measurement gap using this field together with *gapFR1*, *gapFR2*, or *gapUE*. The network configures at most one NCSG or pre-configured gap for one gap type and in this case the network does not configure any other gaps with same *gapType*. In this version of the specification, the network configures this field only in NR standalone. |

**Question 4: Do companies agree that the new field in** [**R2-2205229**](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CRAN2%5C2205_R2_118-e%5CDocs%5CR2-2205229.zip) **could configure the supported cases in** [**R2-2204474**](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2205_R2_118-e/Docs/R2-2204474.zip) **and it is possible to add configuration limitation in field description for the non-supported cases? Please also comment whether you think the configuration limitation in field description is needed and any wording suggestion.**

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| **Company** | **Agree or not** | **Comments** |
| Intel | Not agree | Similar to previous question, we slightly prefer to separate legacy gap configuration and r17 gaps. We think this is a less confusion configuration. Of course, if majority of the companies prefer allowing legacy gap to be configured in the new list for technical reason, we will be ok. |
| Apple | Agree | I guess this question is independent from Question 1? If I did not mistake the question, the restriction seems reasonable. |
| LGE |  | We are OK to specify the limitation in the field description. |
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**Summary: TBD**

## 3.3 Maximum number of gap ID

In current 38.331 v17.0.0, the definition for maximum number of gap ID is still FFS.

– *MeasGapId*

The IE *MeasGapId* used to identify a per UE or per FR measurement gap configuration.

***MeasGapId* information element**

-- ASN1START

-- TAG-MEASGAPID-START

MeasGapId-r17 ::= INTEGER (1..maxNrofGapId-r17)

-- TAG-MEASGAPID-STOP

-- ASN1STOP

maxNrofGapId-r17 INTEGER ::= ffsUpperLimit -- Maximum number of measurement gap ID is FFS

According to the proposals so far, most companies suggest to define the maximum value as 8 or 16. Rapporteur would like to check more companies’ view on this.

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| **Companies** | **Proposals** |
| Ericsson[R2-2206015](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2205_R2_118-e/Docs/R2-2206015.zip) | Proposal 4 Set the number of maximum gap IDs to 16. |
| MediaTek[R2-2205229](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CRAN2%5C2205_R2_118-e%5CDocs%5CR2-2205229.zip) | M605 – Define the maximum number of gap ID to 16 |
| CATT[R2-2204976](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2205_R2_118-e/Docs/R2-2204976.zip) | Proposal 1: The maximum number of both gap priority and gap ID is 8. |
| Vivo[R2-2204823](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2205_R2_118-e/Docs/R2-2204823.zip) | Proposal 2: The maximum number of measurement gap ID is up to the maximum number on total gaps for all activated features. It is decided based on RAN4 input. |
| Xiaomi[R2-2205227](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2205_R2_118-e/Docs/R2-2205227.zip) | Proposal 1: The maximum number of gap ID can be 8. |

**Question 5: Companies are invited to provide their views on maximum number of gap ID.**

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| **Company** | **Preferred max value** | **Comments** |
| Intel | 16 |  |
| Apple | 16 | With ePositioning gap agreement (ePostioning gap max number is 16), seems 16 should be supported. |
| LGE |  | No strong view, but we are also ok with 16. |
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**Summary: TBD**

## 3.4 Others

In R2-2206015, it is proposed to allow delta configuration for the gap configured by the new list.

[R2-2206015](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2205_R2_118-e/Docs/R2-2206015.zip) On [E030] and further concurrent MG aspects Ericsson discussion Rel-17 NR\_MG\_enh-Core

**Proposal 1 Let a UE modify/reconfigure a R17 gap (instead of directly releasing it) when the *measGapId* in *GapConfig(-r17)* matches one that has already been setup.**

Rapporteur understands the intention is to delete the yellow highlight clause below. Note that we have this kind of release first behavior for legacy field because *SetupRelease* structure is used for that. It is not possible to release and setup and the same time while using *SetupRelease*. Since a listed is used for new field, it maybe fine to have delta configuration for this.

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| --- |
| 1> for each *GapConfig* received in *gapFR1ToAddModList*:~~2> if an FR1 measurement gap configuration associated with the~~ *~~measGapId~~* ~~indicated by the~~ *~~GapConfig~~* ~~is already setup, release the FR1 measurement gap configuration;~~2> setup an FR1 measurement gap configuration indicated by the *GapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:…. |

**Question 6: Do companies agree P1 from** [**R2-2206015**](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2205_R2_118-e/Docs/R2-2206015.zip) **?**

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| --- | --- | --- |
| **Company** | **Agree or not** | **Comments** |
| Intel |  | No strong view. Either delta configuration or release is fine with us. |
| Apple | See comments | Don’t see big difference. This procedure follows legacy gap handling. If there is no strong motivation, should we better just follow legacy gap handling? |
| LGE | Agree | The ToAddMod structure enables the UE to modify the configuration without release, so it is better to use ‘modify’ instead of ‘release & setup’ in this case. |
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**Summary: TBD**

In R2-2206113, it is proposed to add conditional code for *associatedMeasGapSSB* and *associatedMeasGapCSIRS*. The main intention is to clarify this field shall be presented if concurrent gap (i.e. more than one gap) is configured.

[R2-2206113](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CRAN2%5C2205_R2_118-e%5CDocs%5CR2-2206113.zip) [H653] Corrections on associatedMeasGapSSB and associatedMeasGapCSIRS Huawei, HiSilicon CR Rel-17 38.331 17.0.0 3173 F NR\_MG\_enh-Core

**Clarify that *associatedMeasGapSSB* and *associatedMeasGapCSIRS* are mandatorily present for concurrent gaps.**

Rapporteur would like to collect company’s view on this CR.

**Question 7: Do companies the intention of CR R2-2206113 ? Any comment on the TP?**

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| **Company** | **Agree or not** | **Comments** |
| Intel | agree |  |
| Apple | See comments | Without considering NTN gaps, the proposal is correct. But last RAN2 meeting agreed the following on NTN. If RAN4 confirms the feasibility that two measurement gaps could be associated with the same frequency layer, the condition would require update.1. could be configured simultaneously for each gap type (per-UE /per-FR1/per-FR2) confirmed in MGE WI, i.e., more than 2 simultaneous measurement gaps for each gap type are NOT considered in R17 NR NTN.
2. Send LS to RAN4 asking if it's feasible/possible, for NTN, that two measurement gaps could be associated with the same frequency layer
 |
| LGE | Agree |  |
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**Summary: TBD**

# 4 Conclusions

Base on the discussion in section 2, we propose the following:

**Proposal 1:**

# 5 References

[1]