**3GPP TSG-RAN WG4 Meeting # 101bis-e R4-220XXXX**

**Electronic Meeting, 17 – 25 Jan, 2022**

**Agenda item:** 6.11.1 and 6.11.2.2

**Source:** Moderator (MediaTek inc.)

**Title:** Email discussion summary for [101bis-e][209] NR\_MG\_enh\_1

**Document for:** Information

# Introduction

This document is the email discussion summary for [101bis-e][209] NR\_MG\_enh\_1 with the following topics covered

* Topic 1: General (AI 6.11.1)
* Topic 2: Multiple concurrent and independent MG patterns (AI 6.11.2.2)
	+ **UE feature list will be discussed in Sub-topic 2-2.**

List of candidate target of email discussion for 1st round and 2nd round

* 1st round: Collect views from companies. Make early decision on issues with clear consensus. Decide on the scope, priority, options and tentative agreement to be discussed in the 2nd round.
* 2nd round:
	+ Conclude the issues identified in the 1st round.
	+ Revise and endorse draft CRs

# Topic #1: General (AI 6.11.1)

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2200486 | MediaTek Inc | **Proposal 1: Introduce separate UE capabilities of network-controlled and UE autonomous mechanism for preconfigured measurement gap activation and deactivation.** **Proposal 2: Introduce a UE baseline capability of concurrent gap and conclude the following issues with potential UE capability impact: max number of gaps for per-FR capable UE, E-UTRAN only measurement, overhead cap and gap sharing ratios.****Proposal 3: Introduce a UE baseline capability of NCSG and the UE capability to indicate the supported NCSG patterns.**Moderator: According to session chair’s guidance, the proposals will be handled by individual Email threads. Proposal 2 will be discussed under **Issue2 -2-3** for UE capability |
| R4-2200599 | ZTE | Moderator: This document is for pre-MG and will be handled in thread [101bis-e][210] NR\_MG\_enh\_2 |

## Open issues summary

### Sub-topic 1-1: General isues

Moderator: all issues are moved to other Email threads or other section.

## Companies views’ collection for 1st round

### Open issues

Moderator: Companies’ views are collected in previous section together with the list of issues

### CRs/TPs comments collection

No CR/TP submitted in this agenda

## Summary for 1st round

### Open issues

### CRs/TPs

No CR/TP submitted in this agenda

## Discussion on 2nd round (if applicable)

# Topic #2: Multiple concurrent and independent MG patterns (AI 6.11.2.2)

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc #** | **Company** | **Proposals / Observations** |
| R4-2200113 | CATT | Proposal 1: Concurrent gaps are allowed in the case when only non-NR RAT measurement objectives are configured. Proposal 2: When UE supports per-FR gap, allow simultaneous configuring per-UE gap and per-FR gap. Proposal 3: The max number of supported concurrent gaps across all FRs for per-FR gap capable UE is 4. Proposal 4: The following combinations of gap configuration for per-FR gap capable UE should be supported:

|  |  |  |
| --- | --- | --- |
| Index | # of simultaneous MG | RAN4 conclusion |
| Per-FR1 | Per-FR2 | Per-UE |
| 3 | 1 | 0 | 1 | Supported |
| 4 | 0 | 1 | 1 | Supported |
| 5 | 1 | 1 | 1 | Supported |
| 6 | 2 | 2 | 0 | Supported |

Proposal 5: For colliding (overlapping) condition#2 for concurrent gap, X=1ms for both FR1 and FR2. Proposal 6: For UE behavior during colliding gap occasion, support option 5 (i.e. introduce gap sharing rule and only sharing factor 0% and 100% are considered in R17). Proposal 7: The data can be scheduled on the non-overlapped part in the dropped gap occasion. Proposal 8: Support to introduce FO, FPO, PFO, PPO scenarios. Proposal 9: Not to define overhead cap for concurrent gap. Proposal 10: For the measurement without gap, the following principles apply: * Case 1: All SMTC occasions are non-overlapped with any of the 2 MGs,
	+ The current measurement requirements without gap with CSSFoutside\_gap,i apply.
* Case 2: All SMTC occasions are fully-overlapped with one of the 2 MGs (including both MGs),
	+ For non-overlapping case of concurrent gap, the current measurement requirements without gap with CSSFwithin\_gap,i apply, the CSSFwithin\_gap,i is based on the gap that fully-overlapped with SMTC.
	+ For overlapping case of concurrent gap, the current measurement requirements without gap with CSSFoutside\_gap,i apply if SMTC is fully overlapped with the dropped gap, and the current measurement requirements without gap with CSSFwithin\_gap,i apply if it is overlapped with the prioritized gap in which the CSSFwithin\_gap,i is based on the prioritized gap.
* Case 3: Some SMTC occasions are non-overlapped with MGs and some are not
	+ The measurement requirements are based on the number of SMTC occasions that non-overlapped with MG and the number of SMTC occasions that overlapped with MG.

Proposal 11: For the measurement within gap, the current measurement requirements within gap apply in which the CSSFwithin\_gap,i is based on the associated MG. |
| R4-2200114 | CATT | Proposal 1: Confirm to RAN2 that the understanding in the LS is correct. Proposal 2: Rel-17 concurrent gaps cannot be configured together with legacy gap. Proposal 3: If UE doesn’t support per-FR gap, at most 2 per-UE gaps can be configured. If UE support per-FR gap, at most 2 gaps can be configured in each FR. Proposal 4: Concurrent gaps can be configured with different types and at most 4 gaps can be configured across all FRs. Proposal 5: The legacy gap sharing configuration is still applicable for each gap of the concurrent gaps. Proposal 6: From RAN4 perspective, the measurement requirements on NR and EUTRAN will be prioritized. Whether to support gap association to 2G/3G from signalling perspective is up to RAN2. |
| R4-2200115 | CATT | Draft CR on measurement delay requirements for concurrent MG patterns |
| R4-2200242 | Apple | Proposal 1: not allow concurrent gap in the case when only non-NR RAT measurement objectives are configured. This can be handled by simply adding clarification in CSSF session in RAN4 spec.Proposal 2: Simultaneous configuring per-UE gap and per-FR gap is only allowed when the per-UE gap is associated to PRS measurement. Proposal 3: Max number of concurrent gap across all FRs for per-FR gap capable Ues (without considering MU-SIM and NTN):* Option 1: 3
* Option 2: Up to UE capability

Proposal 4: gap in proximity condition for overlapping is 4ms for both FR1 and FR2.Proposal 5: Introduce gap sharing rule: * Request RAN2 to reserve some RRC signaling for different sharing factors.
	+ The signalling design may consider the possibility of resuming data scheduling on dropped gaps
* Rel-17 requirements will only consider sharing ratios 0% and 100%.

Proposal 6: it is necessary to introduce an overhead cap for concurrent gaps. RAN4 can introduce a UE capability indicating the supported maximum overhead.Proposal 7: to define overhead cap, the following option 1 is preferred and option 3 is also acceptable:* Option 1: The max overhead that UE can support in Rel-15/16.
* Option 2: $\frac{\sum\_{m=1}^{N}\left(\frac{MGL\_{m}}{MGRP\_{m}}\right)}{\frac{MGL\_{r}}{MGRP\_{r}}}\leq 1+ threshold(K)$
	+ N : number of multiple MG patterns
	+ MGLr : MGL of referenced MG
	+ MGRPr : MGRP
* Option 3: When concurrent MGs are configured, the MGRP for each MG cannot be smaller than 40ms

Proposal 8: for the open issue Issue 2-7-2: UE measurement behavior after transition in the last meeting, option 1 is not supported.* Option 1:
	+ The UE will continue and complete the ongoing measurement on MO1 using MGP1 and meet the corresponding measurement requirement based on MGP1 during this measurement period even if the MO1 is reconfigured to be measured using MGP2.
	+ UE will perform the measurement on MO2 using MGP2 immediately after the concurrent gaps reconfiguration, if MO2 can’t be measured by MGP1 due to gap offset or if gap length is not enough.
	+ After one of concurrent gaps deconfiguration, data scheduling is expected on this disabled MG’s time occasions.
* Option 2:
	+ FFS whether/how to define UE measurement behaviour after transition.

Proposal 9: RAN4 response to RAN2 LS:

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| (Moderator: Skip some text from RAN2 LS)[RAN4]: RAN4 confirms all above understanding is correct. Note that RAN4 may not define RRM requirements for yellow (since R16), even though it can be supported from RRC configuration point of view.  Yellow: It is possible to have Multiple MOs including CSI-RS resources with same center frequency[RAN4 answer to Q1]: Yes. However, from RAN4 perspective, it is important for NW and UE to have same understanding on which MG pattern to use for each MO. Therefore, for the MOs for which NW doesn’t provide the association, UE shall conduct measurement using the legacy MG.[RAN4 answer to Q2]:

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| --- | --- | --- |
| Index | # of simultaneous MG | RAN4 conclusion |
| Per-FR1 | Per-FR2 | Per-UE |
| 0 | 2 | 1 | 0 | Supported |
| 1 | 1 | 2 | 0 | Supported |
| 2 | 0 | 0 | 2 | Supported |
| 3 | 1 | 0 | 1 | FFS |
| 4 | 0 | 1 | 1 | FFS |
| 5 | 1 | 1 | 1 | FFS |
| 6 | 2 | 2 | 0 | FFS |
| 7 | 0 | 0 | 1 | Supported |
| 8 | 1 | 1 | 0 | Supported |
| 9 | 1 | 0 | 0 | Supported |
| 10 | 0 | 1 | 0 | Supported |
| 11 | 2 | 0 | 0 | Supported |
| 12 | 0 | 2 | 0 | Supported |

[RAN4 answer to Q3]: same as above.[RAN4 answer to Q4]: from flexibility perspective, it is beneficial to allow separate *MeasGapSharingConfig* for each MG pattern. This is feasible from RAN4 point of view, since both NW and UE know the category and which MG pattern to use for each MO.[RAN4 answer to Q5]: RAN4 agreed to leave it up to RAN2:* Agreement in RAN4:
	+ RAN4 to focus on NR and EUTRAN measurement requirements with concurrent gaps before considering 2G/3G.
		- It is up to RAN2 to decide whether to support gap association to 2G/3G from signalling perspective
		- Note: The understanding of “2G/3G is not supported with concurrent gap” is that UE expects network to configure only one MG if any 2G/3G measurements are configured, regardless whether NR or EUTRAN measurements are configured.
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| R4-2200243 | Apple | CR on CSSF for concurrent gaps |
| R4-2200388 | vivo | Proposal 1: Whether concurrent gaps are allowed in the case when only E-UTRAN measurement objectives are configured depends on UE capability, i.e., option 4. Proposal 2: Use option 2a for whether allow simultaneous configuring per-UE gap and per-FR gap for per-FR gap capable UEs issue. If option 2a is not agreeable we prefer option 1.Proposal 3: For the scenario where only per-FR is configured, the max number of gaps across all FRs could be 4.Proposal 4: Consider both option 1 and option 5 for UE behavior during colliding gap occasion.Proposal 5: For the FO case, support option 1, i.e., defining requirements, at least for the right hand side scenario in the figure. FPO, PFO, PPO should be introduced.Proposal 6: Suggest to define the overhead cap, i.e., option 1. Ok with option 3. For the method on how to define the overhead cap, in principle Rel-15/16 max overhead can be used, i.e., option 1.Proposal 7: for the delay requirement outside gap, principle for L1 measurement could be reused.Proposal 8: Suggest to define multiple CSSFinter,i, i.e., from CSSFinter,1 to CSSFinter, N where *N* is the total number of concurrent gaps allocated per UE or per FR. Proposal 9: The measurement delay requirements of a particular MO could be based on the new introduced CSSFinter,i and the legacy framework where MGRP, SMTC period, DRX cycle are jointly considered. Whether the MGRP here is impacted by the overlapping issue could be FFS.Proposal 10: Investigate how to define a suitable MGRP when multiple measurement gaps are configured for related measurement performance requirements such as RLM.Proposal 11: suggest to consider the following answers for the LS from RAN2: Answers for Q1: RAN4 does not identify the necessity where concurrent gaps are configured together with a legacy gap.Answers for Q2: For the max number of concurrent gap across all FRs for per-FR gap capable UEs, the total number of concurrent gaps are [4].Answers for Q3: The only case identified by RAN4 where concurrent gaps are configured with different gap types is when simultaneous configuring per-UE gap and per-FR gap is only allowed when the per-UE gap is associated to PRS measurement.Answers for Q4: The legacy gap sharing configuration (configured in *MeasGapSharingConfig*) is applicable to each individual gap among Rel-17 concurrent gaps. For each individual gap among concurrent gaps, the principles on how gap sharing configuration works should follow the legacy principles defined in Rel-15/16. Answers for Q5: RAN4 clarifies that UTRAN-FDD measurement (configured in *MeasObjectUTRA-FDD*) is not applicable in concurrent gap operation. |
| R4-2200404 | vivo | Draft CR on inter-RAT measurement requirements with concurrent gaps |
| R4-2200489 | MediaTek inc. | Proposal 1: No limitation to concurrent gap in the case when only E-UTRAN measurement objectives are configured.Proposal 2: For per-FR gap capable UE, simultaneous configuring per-UE gap and per-FR gap is only allowed when the per-UE gap is associated to PRS measurement.Proposal 3: Without considering other WIs, the max # of gap to be supported across all FRs for per-FR gap capable UEs is up to UE’s capability. The value is either 3 or 4.Proposal 4: Two measurement gap occasions are defined as colliding, if the minimal distance between the two gap instances is equal or less to X, where X = 4ms in FR1 and 1ms in FR2.Proposal 5: On UE behavior during colliding gap occasion, adopt Option 5 to move forward. FFS whether to introduce a UE capability to indicate whether UE supports only 0% and 100% gap sharing ratios or UE supports arbitrary configured sharing ratios.Proposal 6: For per-UE gap case, one gap sharing ratio can be defined between the 2 per-UE gaps. For per-FR gap case, 2 gap sharing ratios can be configured for FR1 and FR2, respectively.Proposal 7: Resume data scheduling on the dropped gap occasions. FFS the impact to the delay requirements of intra-frequency measurements and L1 measurements.Proposal 8: Send an LS to RAN2 with the suggested gap sharing ratios 0%, 25%, 50%, 75% and 100%.Proposal 9: The baseline UE supports the overhead cap no larger than the max overhead that it can support in Rel-15/16. An advanced UE capability can be added for the UE which does not need this overhead cap.Proposal 10: The definitions for the applicable measurement types specified in Section 9.1.5.1 for CSSF outside gap can be re-used as a starting point with the modification to consider more than 1 measurement gaps.Proposal 11: The Kp value for the frequency layers to be measured outside gap is defined as Kp = Noriginal / Nremaining, where* Noriginal is the number of original SMTC occasions without considering gap within a [160ms] window.
* Nremaining is the number of remaining SMTC occasions not collided with measurement gap within a [160ms] window
* The [160ms] window starts from the beginning of a SMTC occasion of the target frequency

Proposal 12: The definitions for the applicable measurement types specified in Section 9.1.5.2 for CSSF within gap can be re-used as a starting point with the modification to indicate which measurement gap to be considered when calculating the CSSF value of a particular frequency layer.Proposal 13: In the delay requirements of measurements within gap, indicate which MGRP to be selected between 2 configured measurement gaps.Proposal 14: Introduce the Kp value to address the issue of dropped gap occasions due to gap collision. The Kp value for the frequency layers to be measured within gap is defined as Kp = Noriginal / Nremaining, where* Noriginal is the number of original associated gap occasions covering the target SMTC without considering the other measurement gaps within a [160ms] window
* Nremaining is the number of remaining associated gap occasions covering the target SMTC by removing the dropped gap occasions within a [160ms] window
* The [160ms] window starts from the beginning of an associated gap occasion covering the SMTC occasion of the target frequency

Proposal 15: When there are still some L1 RS occasions not overlapped by measurement gaps and intra-frequency SMTC in FR2, the P factor for L1 measurements equals Noriginal / Nremaining, where* Noriginal is the number of original RS occasions without considering measurement gaps nor intra-frequency SMTC occasions within a [160ms] window.
* Nremaining is the number of remaining RS occasions not fully nor partially collided with measurement gap or intra-frequency SMTC occasions within a [160ms] window
* The [160ms] window starts from the beginning of a slot with the target RS occasion

Proposal 16: In FR1 or when there are no L1 RS occasions not overlapped by measurement gaps and intra-frequency SMTC in FR2, the P factor for L1 measurements equals Psharing factor x Noriginal / Nremaining, where* Noriginal is the number of original RS occasions without considering measurement gaps nor intra-frequency SMTC occasions within a [160ms] window.
* Nremaining is the number of remaining RS occasions not fully nor partially collided with measurement gap within a [160ms] window
* The [160ms] window starts from the beginning of a slot with the target RS occasion

Proposal 17: Reply to RAN2 that RAN2’s agreement about the concurrent gap operation and the clarification on frequency layer (and its limitations) aligns with RAN4 understandingProposal 18: Reply to RAN2 with the answer to Q1 that it is up to RAN2 decision if associations are provided to all gaps.Proposal 19: Reply to RAN2 with the answer to Q2 that Up to 2 gaps can be configured to UE which does not support per-FR gap. Regarding per-FR gap capable UE, RAN4 can reply to RAN2 once the consensus is reached.Proposal 20: Reply to RAN2 with the answer to Q3 that it is still under discussion in RAN4. RAN4 can reply to RAN2 once the consensus is reachedProposal 21: Reply to RAN2 with the answer to Q4 that t MeasGapSharingConfig is applicable to Rel-17 concurrent gaps. Same configuration can be shared by all concurrent gaps.Proposal 22: Reply to RAN2 with the answer to Q5 that it is already addressed in RAN4’s previous LS R4-2120304. |
| R4-2200490 | MediaTek inc. | Draft CR on 38.133 for L1 measurement impact of concurrent gaps |
| R4-2200538 | Intel Corporation | Proposal 1: Simultaneous configuration of per-UE gap and per-FR gap to FR gap capable UEs shall be allowed if UE support the concurrent gaps. Proposal 2: The maximum number of supported concurrent gaps across all FRs can be 3. Proposal 3: No need to define the gap overhead cap.Proposal 4: The minimal distance between two gap instances is equal or less to 4ms for both FR1 and FR2.Proposal 5: Introduce gap sharing rule to handle the overlapping issues in case of concurrent gaps. Proposal 6: RAN4 can define the requirements for PPO only with the different gap sharing factorProposal 7: No need to define the new UE measurement behavior after transition when UE’s new MG instance configured. Proposal 8: The measurement delay requirement in case of multiple gaps shall be revisited. The non-overlapping scenarios can be studied as a start point. |
| R4-2200560 | LG Electronics | Proposal 1: Do not define simultaneous configurations of per-UE gap and per-FR gap for UE supporting per-FR gap in Rel-17.Proposal 2: For minimum distance between two GPs of proximity condition #2, X = 1 or 4ms for both FR1 and FR2.Proposal 3: Decide one option between the updated 2 options.* Option 1
	+ UE will only do the measurement w.r.t. the gap with higher priority on all colliding occasions
	+ The priority can be configurable or fixed
	+ Data scheduling is resumed during dropped gap occasions
* Option 5: Compromised proposal
	+ Introduce gap sharing rule.
		- Request RAN2 to reserve some RRC signaling for different sharing factors.
			* The signaling design may consider the possibility of resuming data scheduling on dropped gaps
		- Rel-17 requirements will only consider sharing ratios 0% and 100%.
			* The sharing ratios can be configurable or fixed.
		- The requirements for other sharing factors are FFS in later releases.
		- Data scheduling is assumed on those dropped gaps
		- FFS the impact to other intra-frequency measurements

Proposal 4: Define overhead cap.Proposal 4-1 : Consider overhead cap with $\frac{\sum\_{m=1}^{N}\left(\frac{MGL\_{m}}{MGRP\_{m}}\right)}{\frac{MGL\_{r}}{MGRP\_{r}}}$ when configuring multiple MG patterns.* $\frac{\sum\_{m=1}^{N}\left(\frac{MGL\_{m}}{MGRP\_{m}}\right)}{\frac{MGL\_{r}}{MGRP\_{r}}}\leq 1+ threshold(K)$
	+ N : number of multiple MG patterns
	+ MGLr : MGL of referenced MG
	+ MGRPr : MGRP of referenced MG
	+ K is FFS
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| R4-2200587 | ZTE Corporation | Proposal 1: Since the demand of PRS measurement, UE should support simultaneous configuring per-UE gap and per-FR gap for the UE being capable of per-FR gap and concurrent gaps. Proposal 2: Once the simultaneous configuring supported, no need to introduce additional limitation, NW can decide whether executing such simultaneous configuring depend on the RRM measurement demand. Proposal 3: Based on the starting point of max 2 MGs in an FR, we support 4 MGs for the two FRs.Proposal 4: If without specific technical consideration for X=2, we suggest using unified candidate values for both FR1 and FR2.Proposal 5: Option 3, 4 and 5 can be removed firstly, Option 1 and 2 can be kept.Proposal 6: Between Option 1 and Option 2, we believe Option 2 is more flexible and preferred by us.Proposal 7: It is no need to define an overhead cap for concurrent gaps. NW can fully control the concurrent gaps overhead when configuring.Proposal 8: Some further clarification should be added into the limitation of “Measurements for different frequency layers but with the same reference signal can be associated to different concurrent MGs” for the case of CSI-RS frequency layer. The meaning of “same reference signal” is ambiguous. Proposal 9: In order to identify the Kp and CSSF according to the exact overlapping case, we suggest NW should configure the associated gap between concurrent gaps even for a MO/frequency layer without gap. Proposal 10: For the measurement delay within gap case, not need any new solution. Just re-using the mechanism of CSSFwithin\_gap,i in legacy Rel-16 for each gap is enough. All MOs/frequency layers with gap associated with a same gap would participate in the sharing of this gap. |
| R4-2200631 | CMCC | Proposal 1: it is proposed to consider partially and fully-overlapped concurrent gaps (FO, FPO, PFO, PPO scenarios).Proposal 2: whether to have different X for FR1 and FR2 depends on the reason why we consider it as overlapped cases even if two gaps are not physically overlapping in time domain. * If only measurement scheduling is considered, it is better to have same value of X for FR1 and FR2.
* If UE processing is considered, it is suggested to have different X for FR1 and FR2.

Proposal 3: if the reason to consider it as overlapped cases even if two gaps are not physically overlapping in time domain is mainly about UE processing, it is proposed to introduce UE capability, which means for some UEs with high capability, X is not needed or the value of X is zero. Proposal 4: for UE behavior during colliding gap occasion, it is proposed to take option 5.Proposal 5: for the dropped gaps during the overlapping scenarios, the scheduling can be resumed.Proposal 6: concurrent gaps are allowed in the case when only E-UTRAN measurement objectives are configured.Proposal 7: For the per-FR gap capable UE, it is proposed to allow the simultaneous configuring per-UE gap and per-FR gap at least for PRS measurement.Proposal 8: the max number of concurrent gaps across all FRs for per-FR gap capable UEs is proposed to be 4.Proposal 9: it is not necessary to define an overhead cap for concurrent gaps, which can be left to network implementation. |
| R4-2200677 | Xiaomi | Proposal 1: It is allowed to be configured with concurrent MG to perform only non-NR RAT measurements provided that the UE is capable to support inter-RAT E-UTRAN measurement with concurrent gaps.Proposal 2: For an UE supporting per-FR gap, the use case of simultaneous configuring per-UE gap and per-FR gap is only allowed when per-UE gap is associated to PRS measurement.Proposal 3: For per-FR capable UE, the maximum number of the concurrent measurement gap across all FRs is 3.Proposal 4: The minimum distance between two gap instances is equal or less than 4ms for both FR1 and FR2.Proposal 5: Either the priority rule or gap sharing rule is adopted for the colliding gap occasions.Proposal 6: RAN4 is deprioritized to define requirements for fully-overlapped (FO) and fully-partial overlapped (FPO) concurrent gaps in Rel-17.Proposal 7: RAN4 is to define the RRM requirements for partial fully-overlapped (PFO) or partial partial-overlapped (PPO) concurrent gaps in Rel-17.Proposal 8: For measurement delay without gap, when SMTC occasion is partially overlapping with both concurrent gaps, the scaling factor Kp = $\frac{1}{1-\frac{SMTC}{MGRP1}-\frac{SMTC}{MGRP2}}$, where MGRP1 and MGRP2 is the MGRP of concurrent gaps.Proposal 9: For the measurement within the concurrent gap with priority or 100% gap sharing, the existing measurement delay requirement within gap is applied.Proposal 10: For the measurement within the concurrent gap with low priority or 0% gap sharing, the measurement delay would be extended by a scaling factor of $\frac{1}{1-\frac{MGRP1}{MGRP2}}$, where MGRP1 is the MGRP of prioritized concurrent gap or the MGRP of concurrent gap with 100% gap sharing, and the MGRP2 is the MGRP of deprioritized concurrent gap or the MGRP of concurrent gap with 0% gap sharing. |
| R4-2200678 | Xiaomi | DraftCR on inter-frequency measurement delay requirements with concurrent gaps |
| R4-2200694 | Intel Corporation | DraftCR on positioning measurement requirements due to concurrent gap in NR |
| R4-2200762 | Qualcomm Incorporated | Proposal 1: For UEs capable of per-FR gaps and multiple concurrent gaps, support simultaneous configuration of per-UE gap and per-FR gap when the per-UE gap is used for positioning measurements.Proposal 2: Support a maximum of 3 concurrent MG across FRs. Specifically, support concurrent MG combinations in rows 0-4 in the table below.

|  |  |  |
| --- | --- | --- |
| Index | # of simultaneous MG | RAN4 conclusion |
| Per-FR1 | Per-FR2 | Per-UE |
| 0 | 2 | 1 | 0 | Supported |
| 1 | 1 | 2 | 0 | Supported |
| 2 | 0 | 0 | 2 | Supported |
| 3 | 1 | 0 | 1 | FFS |
| 4 | 0 | 1 | 1 | FFS |
| 5 | 1 | 1 | 1 | FFS |
| 6 | 2 | 2 | 0 | FFS |
| 7 | 0 | 0 | 1 | Supported |
| 8 | 1 | 1 | 0 | Supported |
| 9 | 1 | 0 | 0 | Supported |
| 10 | 0 | 1 | 0 | Supported |
| 11 | 2 | 0 | 0 | Supported |
| 12 | 0 | 2 | 0 | Supported |

Proposal 3: The UE should be able to signal which concurrent MG configurations it supports from the table above as part of the UE capability.Proposal 4a: Two measurement gap occasions are declared to be “colliding occasions” if the minimum distance between them, from the end of the first occasion to the start of the second occasion, is equal or less than 4 ms, regardless of which FR is measured on each occasion.Proposal 4b: Support of colliding MG would be subject to additional UE capability.Proposal 5: The definition of colliding measurement gap occasions applies only between1. two per-FR1 gaps, or
2. two per-FR2 gaps, or
3. one per-UE gap and one per-FR (FR1 or FR2) gap.

Proposal 6: Support priority rule (option 1) to resolve collisions between concurrent MG instances. Each concurrent MG should be assigned a unique priority so that collisions can be resolved without ambiguity and data transfers can be scheduled during the dropped gap instances.Proposal 7: Do not introduce support FO or FPO concurrent MG in Rel 17.Proposal 8: Do not introduce a hard limit on MG overhead. It would be up to the network to control MG overhead by choosing efficient MG configurations.Proposal 9: Modify the definition of Ri for CSSFwithin\_gap,i as follows: Ri is the maximal ratio of the number of measurement gap where measurement object *i* is a candidate to be measured over the number of measurement gap where measurement object *i* is a candidate and not used for a long-periodicity measurement defined above and not dropped due to measurement gap collisions.Proposal 10: Modify the definition of Kp for NR intra-frequency measurements without gaps as follows: Kp is the reciprocal of the fraction of SMTC occasions that do not overlap with measurement gaps.Proposal 11: Modify the definition of the P scaling factor for L1-RSRP measurements: P is the reciprocal of the fraction of SSB (or CSI-RS) occasions that do not overlap with measurement gaps.Proposal 12: No need to specify transient UE behavior when concurrent MGs are re-configured.[RAN4 response to Q1]:It may be possible to configure a legacy gap together with a Rel-17 concurrent gap, however RAN4 does not anticipate any benefit of configuring a legacy gap vs. an equivalent Rel-17 concurrent gap.From a configuration perspective, the main differences RAN4 can identify between the two types of gaps are1. that measurement objects cannot be explicitly associated with a legacy MG, and
2. there is no explicit priority assigned to a legacy MG to resolve collisions.

RAN4 would need to define rules to determine implicit association and priority for legacy MG. Once those rules are in place, the UE behavior would be well defined and there would be no difference in UE behavior w.r.t. to the case where the UE is configured with an equivalent Rel-17 concurrent MG.[RAN4 response to Q2]:RAN4 has sent additional information regarding this question in a follow-up LS to RAN2. RAN4 kindly requests that RAN2 refer to LS R4-2120304.[RAN4 response to Q3]:RAN4 has sent additional information regarding this question in a follow-up LS to RAN2. RAN4 kindly requests that RAN2 refer to LS R4-2120304.[RAN4 response to Q4]:RAN4 understands that the network would benefit from having the flexibility to specify and select a gap sharing scheme for Rel-17 concurrent gaps, as with legacy gaps. Ideally, the network would have the flexibility to configure different gap sharing schemes for each MG. To enable configuring separate gap sharing schemes for each concurrent gap, RAN4 kindly requests RAN2 to consider upgrading the signalling structure.Regarding the question of how it would work, RAN4 has agreed that CSSF will be calculated separately for each concurrent MG, counting only the measurement objects assigned/associated with each gap. The gap sharing scheme signalled for each gap would be applied to the corresponding CSSF calculation. Additionally, if there are collisions any between gaps, they should be accounted for when calculating CSSF. This issue is still under discussion in RAN4.[RAN4 response to Q5]:RAN4 has sent additional information regarding this question in a follow-up LS to RAN2. RAN4 kindly requests that RAN2 refer to LS R4-2120304 |
| R4-2201139 | OPPO | Proposal 1: E-UTRAN measurement is applicable in concurrent gap operation under the condition that only one per-UE MG is configured for UE.Proposal 2: For Per-FR gap capable UE, it is allowed to be configured with only per-FR or per-UE concurrent gaps, but not allowed for per-UE gap and per-FR gap to be configured simultaneously.Proposal 3: Define max number of concurrent gaps across all FRs for per-FR gap capable UEs as 4.

|  |  |  |
| --- | --- | --- |
| Index | # of simultaneous MG | RAN4 conclusion |
| Per-FR1 | Per-FR2 | Per-UE |
| 3 | 1 | 0 | 1 | Not Supported |
| 4 | 0 | 1 | 1 | Not Supported |
| 5 | 1 | 1 | 1 | Not Supported |
| 6 | 2 | 2 | 0 | Supported |

Proposal 4: Either priority rule or gap sharing rule with sharing ratios 0% and 100% for colliding occasions is feasible.Proposal 5: if RAN4 agreed to adopt gap sharing rule for overlapping between gaps, new signaling design should be considered to cover all the cases of sharing factors in concurrent gap.Proposal 6: Open to discuss overhead issues after conclusion of overlapping issues.Proposal 7: UTRAN-FDD measurement (configured in MeasObjectUTRA-FDD) is also applicable in concurrent gap operation if only one per-UE MG is configured for UE. |
| R4-2201140 | OPPO | Draft CR to 38133 on CSI-RS based L3 measurement requirements with concurrent gap |
| R4-2201213 | Ericsson | Proposal 1: It’s up to NW to decide whether to configure only E-UTRAN RAT measurement objectives.Proposal 2: UE can be configured with per-UE gap and per-FR gap when UE is capable of per-FR gap and concurrent gaps.Proposal 3: When UE supports both per-FR gap and concurrent gaps, except the legacy gap combination, the combination of the per-UE gap and/or per-FR gap to be configured can be as follow.

|  |  |  |
| --- | --- | --- |
| Index | # of simultaneous MG | RAN4 conclusion |
| Per-FR1 | Per-FR2 | Per-UE |
| 0 | 2 | 1 | 0 | Supported |
| 1 | 1 | 2 | 0 | Supported |
| 2 | 0 | 0 | 2 | Supported |
| 3 | 1 | 0 | 1 | Supported |
| 4 | 0 | 1 | 1 | Supported |
| 5 | 1 | 1 | 1 | Supported |
| 6 | 2 | 2 | 0 | Supported |
| 7 | 0 | 0 | 1 | Supported |
| 8 | 1 | 1 | 0 | Supported |
| 9 | 1 | 0 | 0 | Supported |
| 10 | 0 | 1 | 0 | Supported |

Proposal 4: The max number of supported concurrent gap can be 4 when UE supports both per-FR gap and concurrent gaps without considering MUSIM and NTN gaps.Proposal 5: The proximity condition X = 4ms for FR1 and 1ms for FR2 once data scheduling is assumed during dropped gap occasions.Proposal 6: Data scheduling is assumed on the dropping gap occasions.Proposal 7: As a compromised solution, RAN4 to only define requirement for UE to perform measurement in the gap with higher priority on all colliding occasions in Rel-17.Proposal 8: The concurrent gaps can support new type of gaps by indicating the gaps based on the usage, such as MU-SIM gaps.Proposal 9: NW needs to configure each measurement gap together with the priority indication.Proposal 10: RAN4 not to define an overhead cap for concurrent gaps.Proposal 11: The following UE behaviours after transition should be defined.* UE will continue the measurement by MGP2 and meet the corresponding measurement requirement based on MGP2 during this measurement period once the MO1 is reconfigured to be measured using MGP2.
* UE will perform the measurement on MO2 using MGP2 immediately after the concurrent gaps’ reconfiguration, if MO2 can’t be measured by MGP1 due to gap offset or if gap length is not enough.
* After one of concurrent gaps deconfiguration, data scheduling is expected on this disabled MG’s time occasions.

Proposal 12: Additional scaling factor Kgap shall be introduced on top of CSSF within gap, where:* When none of the MG occasions of the MGP with lower priority are overlapped by other MGP(s), Kgap = 1.
* When all of the MG occasions of the MGP with lower priority are overlapped by other MGP(s), the MGP with lower priority will be disabled.
* Otherwise, Kgap will be applied to the MG with lower priority and equals$\frac{1}{1-\frac{MGRP\_{high priority}}{MGRP\_{low priority}}}$.

Proposal 13: The scaling factor $K\_{p}$ for measurement outside gap shall be updated as follow.* + When all the MG occasions of the MGP with lower priority are overlapped by other MGP(s), the MGP with lower priority will be disabled.
	+ When none of the MG occasions of the MGP with lower priority are overlapped by other MGP(s), $K\_{p}= \frac{1}{1- \sum\_{i=1}^{N}\frac{SMTC}{MGRP\_{i}}}$ .
	+ Otherwise,
		- When both MGs are overlapping with the SMTC, $K\_{p}= \frac{1}{1- \frac{SMTC}{MGRP\_{lower priority}}}$
		- When MG with lower priority is overlapping with the SMTC, but MG with higher priority isn’t overlapping with the SMTC, $K\_{p}= \frac{1}{1- \frac{SMTC}{MGRP\_{lower priority}×K\_{gap}}}$
		- When MG with lower priority isn’t overlapping with the SMTC, but MG with higher priority is overlapping with the SMTC, $K\_{p}= \frac{1}{1- \frac{SMTC}{MGRP\_{higher priority}}}$

Proposal 14: Reply RAN2’s LS as follow.Q1 – Can Rel-17 concurrent gaps be configured together with legacy gap?In Rel-17, concurrent gaps can be believed as multiple legacy gaps. NW can configure one legacy gap firstly. After that how to configure additional gaps for concurrent gaps is up to RAN2’s design. NW can also configure multiple gaps simultaneously, where at least one of the gaps shall be legacy gap.Q2 – How many concurrent gaps could be configured simultaneously?When UE only supports per-UE gap and concurrent gaps, up to 2 gaps can be configured to UE. When UE supports per-FR gap and concurrent gaps, up to 2 gaps in each FR can be configured to UE. Q3 – Could concurrent gaps be configured with different gap types?RAN4 agrees to support per-UE gap and per-FR gap configuration in Rel-17.Q4 – Is the legacy gap sharing configuration (configured in MeasGapSharingConfig) applicable to Rel-17 concurrent gaps?RAN4 confirms that the legacy gap sharing configuration for intra-frequency and inter-frequency is applicable in each measurement gap. The network can configure MeasGapSharingConfig for each legacy gap within concurrent gaps separately.Q5 – Could RAN4 help to clarify whether UTRAN-FDD measurement (configured in MeasObjectUTRA-FDD) is also applicable in concurrent gap operation?It has already captured in previous RAN4 LS. |
| R4-2201214 | Ericsson | draftCR on concurrent gaps (9.1.2B) |
| R4-2201623 | Huawei, Hisilicon | Proposal 1: RAN4 not to define E-UTRA measurement requirements with concurrent MGs.* When UE is configured with only E-UTRA MOs, it is not expected to be configured with concurrent MGs;
* When UE is configured with both E-UTRA and NR MOs, UE can be configured with concurrent MGs, but all E-UTRA MOs are expected to be associated with one single MG.

Proposal 2: RAN4 to ask RAN2 to decide whether concurrent MGs is supported in MR-DC scenario.Proposal 3: Simultaneous configuration of per-UE MG and per-FR MG is only allowed when the per-UE MG is associated to PRS measurement.Proposal 4: Max number of concurrent MGs across all FRs for per-FR MG capable UE is 3.Proposal 5: Define X value in proximity condition as 4ms for both FR1 and FR2.Proposal 6: Adopt priority rule for collision handling for concurrent MGs:* + UE will only do the measurement w.r.t. the MG with higher priority
	+ The MG priority is configured by NW
	+ Data scheduling is expected during dropped MG occasions

Proposal 7: Define overhead for concurrent MGs: when concurrent MGs are configured, the MGRP for each MG cannot be smaller than 40ms.Proposal 8: For measurement with MG, existing measurement period requirements can be re-used, where the MGRP and CSSF are based on the MG to which the measurement is associated. Impact of the MG colliding can be discussed after collision handling is settled.Proposal 9: For measurement outside MG,* + If the SMTC windows or CSI-RS resources are fully non-overlapped with any of the concurrent MGs, the existing measurement period requirements can be re-used.
	+ If the SMTC windows or CSI-RS resources are partially overlapped with one or both of the concurrent MGs, the measurement will be performed outside MG.
		- Kp = Ntotal / Navailable, where Ntotal is the total number of SMTC windows or CSI-RS resource occasions during T, and Navailable is the number of SMTC windows or CSI-RS resource occasions that are not overlapped with any MG occasion during T, and T = max(TSMTC, MGRP1, MGPR2).
	+ If the SMTC windows are fully overlapped with one or both of the concurrent MGs, the measurement will be performed with MG.

Proposal 10: Re-use the existing requirements for L1 measurement with the updated calculation for P factor as follows:* + For L1 measurement in FR1, P = Ntotal / Navailable
	+ For L1 measurement in FR2,
		- P = Psharing \* Ntotal / Noutside\_MG, if Navailable = 0
		- P = Ntotal / Navailable, if Navailable > 0
	+ where, Ntotal is the total number of L1 resource occasions during T, Noutside\_MG is the number of L1 resource occasions not overlapped with any MG occasion during T, Navailable is the number of L1 resource occasions not overlapped with any MG occasion or any SMTC window during T, and T = max(TL1, MGRP1, MGPR2).

Proposal 11: RAN4 not to define UE measurement behaviour after transition.Proposal 12: In the reply LS to R2-2111472, inform RAN2 that different MOs with CSI-RS resources are considered as different frequency layers, no matter if the CSI-RS resources are with same or different centre frequencies. Proposal 13: In the reply LS to R2-2111472, inform RAN2 the following* + Concurrent MGs cannot be configured with legacy MG
	+ The UE capabilities in number of concurrent MGs based on RAN4 agreements
	+ The applicability of legacy MG sharing configuration and new signaling for collision handling of concurrent MGs

[RAN4 response to Q1] No. RAN4 has agreed that “Concurrent gaps are multiple measurement gaps configured by RRC message(s)”, so when more than one gaps are configured, UE is considered to be configured with concurrent gaps, and there is no such scenario where concurrent gaps are configured together with legacy gaps.[RAN4 response to Q2] For UE not capable of per-FR MG, at maximum 2 per-UE MGs can be configured.For UE capable of per-FR MG, the following configurations are supported:

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| --- | --- | --- |
| Index | # of simultaneous MG | RAN4 conclusion |
| Per-FR1 | Per-FR2 | Per-UE |
| 0 | 2 | 1 | 0 | Supported |
| 1 | 1 | 2 | 0 | Supported |
| 2 | 0 | 0 | 2 | Supported |
| 3 | 1 | 0 | 1 | Supported Note 1 |
| 4 | 0 | 1 | 1 | Supported Note 1 |
| 5 | 1 | 1 | 1 | FFS |
| 6 | 2 | 2 | 0 | FFS |
| 7 | 0 | 0 | 1 | Supported |
| 8 | 1 | 1 | 0 | Supported |
| 9 | 1 | 0 | 0 | Supported |
| 10 | 0 | 1 | 0 | Supported |
| 11 | 2 | 0 | 0 | Supported |
| 12 | 0 | 2 | 0 | Supported |
| Note 1: Supported only when the per-UE gap is associated to PRS measurement.  |

[RAN4 response to Q3] Please refer to the answer to Q2.[RAN4 response to Q4] Yes. RAN4 would like to clarify that the legacy gap sharing configuration (configured in MeasGapSharingConfig) is applicable for different measurements (e.g. intra- and inter-frequency) that are associated to the same gap, while for handling of collision between different gaps, new signalling is needed as mentioned below.[RAN4 response to Q5] RAN4 has agreed that it is up to RAN2 to decide whether to support gap association to 2G/3G from signalling perspective. |
| R4-2201624 | Huawei, Hisilicon | CR on collision handling and MG related requirements for concurrent MGs |
| R4-2201694 | Nokia, Nokia Shanghai Bell | Proposal 1: Allow concurrent gap when only non-NR RAT measurement objectives are configured.Proposal 2: UE can be configured with one legacy gap pattern and additional concurrent measurement gaps patterns reaching the maximum gap configuration limitationProposal 3: UE can be configured with one or more concurrent measurement gap patterns reaching the maximum gap configuration limitationProposal 4: Capture LTE layers in a similar manner as RAN4 has captured it for NR SSB, CSI-RS and PRS layersProposal 5: RAN4 to discuss and agree the scenario where, for concurrent measurement gaps, UE is configured with more than one MO including CSI-RS resources with the same center frequency.Proposal 6: Support simultaneous configuring of per-UE gap and per-FR gap (for per-FR gap capable UE).Proposal 7: Simultaneous MG combinations Index 3 – 5 are supported.Proposal 8: Support Index 6, 2 MGs per FR when UE support per-FR and concurrent MGs and in total of 4 MGPs.Proposal 9: X = 1 for FR1Proposal 10: X = 1 for FR2Proposal 11: It is not necessary to split X between FR1/FR2.Proposal 12: Support Option 5 regarding UE behavior during colliding gap occasionProposal 13: UE will resume normal operation during the dropped gapsProposal 14: Define requirements for fully overlapped (FO)Proposal 15: Define requirements for fully partial overlapped (FPO)Proposal 16: Option 2. There is no need for RAN4 to define a measurement gap overhead.Proposal 17: Any measurement gap overhead limitations need to be justified.Proposal 18: For measurement delay outside gaps the existing sharing rule applies as general principle.Proposal 19: When the C-MG collide with and have to share the gap opportunities with legacy gaps RAN4 can apply same principles as for legacy for each GPProposal 20: The MGRP to be applied in the requirements would need to capture both or either of legacy and C-MG MRGP.Proposal 21: RAN4 follow legacy principle: UE measure an MO according to the MGP while MO/MGP is configured. |
| R4-2201695 | Nokia, Nokia Shanghai Bell | Regarding:* RAN2 confirms the following understanding for concurrent gap operation:

1. Concurrent gaps are multiple measurement gaps and each gap pattern could be associated with one or multiple frequency layers.2. Each frequency layer can be associated with only one of the concurrent gaps.3. Without considering pre-configured MG, concurrent gaps are always activated if it is setup by the network.4. No new gap pattern is introduced for concurrent gap, the existing R15/R16 gap pattern could be configured for the concurrent gaps.Proposal 1: Reply and confirm to RAN2 according to above discussion TP. Additionally, clarify to RAN2 on the Issues not yet explicitly agreed in RAN4 yet.Concerning:* RAN2 to clarify “frequency layer” and limitations as below:

PRS measurement can be associated with one gap pattern, no matter how many frequencies are measured for PRS.Each measured SSB or LTE frequency is considered as one frequency layer.Measured CSI-RS resources with the same center frequency is considered as one frequency layer. It is possible to have Multiple MOs including CSI-RS resources with same center frequency.SSB and CSI-RS measurement in one MO are considered as different frequency layers.Proposal 2: Reply to RAN2 according to above discussion TP. Additionally, clarify to RAN2 on the Issues not yet explicitly agreed in RAN4 yet. |

## Open issues summary

### Sub-topic 2-1 Applicability and configurations

Moderator’s note:

* OPPO has a proposal (P7) regarding UTRAN-FDD. According to the agreement in the WF in last meeting, RAN4 to focus on NR and EUTRAN measurement requirements with concurrent gaps before considering 2G/3G. Therefore, this proposal is skipped here.
* Nokia has a proposal (P4) to capture LTE layers in a similar manner as RAN4 has captured it for NR SSB, CSI-RS and PRS layers. However, it should already be address in previous RAN4 agreements, e.g., in R4-2115343 as below. Please Nokiacomment if Moderator mis-understood your proposal.

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| * The measurement gap can be associated to one or multiple use cases in the following, while the detail on how to implement the association is left to RAN2
	+ One or more MO(s) for same or different RATs
	+ SSB and/or CSI-RS in each associated NR MO
	+ PRS
 |

* Ericsson has a proposal (P8) to support concurrent gaps for MU-SIM gaps. As RAN4 will not work on the corresponding requirements for MU-SIM in Rel-17, the proposal probably only makes sense from RAN2 perspective. To moderator’s understanding, RAN2 already has some planned discussions regarding this issue. Therefore, the proposal is skipped here.

#### **Issue 2-1-1: Whether concurrent gaps are allowed in the case when only E-UTRAN measurement objectives are configured**

* Proposals
	+ Option 1: CATT, MTK, CMCC, Intel, Ericsson, Nokia
		- Yes
	+ Option 1a: vivo, Xiaomi,
		- Yes, provided that UE supports LTE measurement with concurrent MGs, which is up to UE capability
	+ Option 1b: OPPO
		- Yes, under the condition that only one per-UE MG is configured for UE
	+ Option 2: Apple, Huawei
		- No
* Recommended WF
	+ Collect view from companies in 1st round

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| **Company** | **Comments** |
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#### **Issue 2-1-2: Additional limitation when UE is configured with both E-UTRA and NR MOs**

* Proposals
	+ Option 1: Huawei
		- When UE is configured with both E-UTRA and NR MOs, UE can be configured with concurrent MGs, but all E-UTRA MOs are expected to be associated with one single MG.
* Recommended WF
	+ Collect views from companies in 1st round

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#### **Issue 2-1-3: Supporting concurrent gap in MR-DC scenario**

* Proposals
	+ Option 1: Huawei
		- RAN4 to ask RAN2 to decide whether concurrent MGs is supported in MR-DC scenario
* Recommended WF
	+ Collect view from companies in 1st round

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### Sub-topic 2-2: UE capability related issues

#### **Issue 2-2-1: Whether to allow simultaneous configuration of per-UE gap and per-FR gap to FR gap capable UEs**

* Proposals
	+ Option 1: LGE, OPPO
		- No
	+ Option 2: CATT, [CMCC], Ericsson, Nokia, ZTE
		- Yes
	+ Option 2a: Apple, QC, MTK, vivo, Xiaomi, Huawei
		- Yes, but only when the per-UE gap is associated to PRS measurements
* Recommended WF
	+ Collect views from companies. Expected to be concluded in this meeting for not delaying RAN2 work.

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#### **Issue 2-2-2: Max number of concurrent gap across all FRs for per-FR gap capable UEs (without considering other WIs)**

* Proposals
	+ Option 1: Apple, QC, Xiaomi, Intel, Huawei
		- 3
	+ Option 2: CATT, CMCC, vivo, OPPO, Ericsson, Nokia, ZTE
		- 4
	+ Option 3: Apple, MTK
		- Up to UE capability
* Recommended WF
	+ Collect views from companies. Expected to be concluded in this meeting for not delaying RAN2 work.

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#### **Issue 2-2-3: UE feature list**

* Moderator: Let’s focus on the wording of baseline concurrent gap feature. For other features related to ongoing discussions, we can wait for the technical discussions to conclude first.
* Proposals
	+ Some entries with the same proposals are skipped in below table

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|  | **Feature group** | **Components** | **Consequence if the feature is not supported by the UE** | **Note** | **Mandatory/Optional** |
| Option 1 Apple0286 | Multiple independent and concurrent gaps | Support of multiple independent and concurrent gaps | UE cannot support multiple independent and concurrent gaps | The capability is to indicate UE support multiple independent and concurrent gaps. | Optional with capability signalling |
| Option 2MTK0485 | Concurrent measurement gaps | Capability of configuration of more than 1 per-UE measurement gap configurations or more than 1 per-FR gap measurement gap configurations in an FR | UE cannot be configured with concurrent gaps |  | Optional with capability signalling |
| Option 3Intel0544 | Concurrent measurement gaps | 1) Support of configuration of more than 1 per-UE/per-FR measurement gap configurations | UE cannot be configured with concurrent gaps | The maximum supported number of concurrent gaps is FFS and pending RAN4 discussion | Optional with capability signalling |

* Recommended WF
	+ Moderator: 3 proposals have no technical difference. Please check if the below **merged version** is agreeable.

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|  | **Feature group** | **Components** | **Consequence if the feature is not supported by the UE** | **Note** | **Mandatory/Optional** |
| **Merged version** | Multiple independent and concurrent gaps | Support of more than 1 per-UE measurement gap configurations or more than 1 per-FR gap measurement gap configurations in an FR | UE cannot be configured with multiple independent and concurrent gaps | This is the baseline capability is to indicate UE support multiple independent and concurrent gaps. | Optional with capability signalling |

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#### **Issue 2-2-4: UE indication of supported gap combination index**

* Proposals
	+ Option 1: QC
		- The UE should be able to signal which concurrent MG configurations it supports from the table below as part of the UE capability

|  |  |  |
| --- | --- | --- |
| **Index** | **# of simultaneous MG** | **RAN4 conclusion** |
| **Per-FR1** | **Per-FR2** | **Per-UE** |
| **0** | **2** | **1** | **0** | Supported |
| **1** | **1** | **2** | **0** | Supported |
| **2** | **0** | **0** | **2** | Supported |
| **3** | **1** | **0** | **1** | FFS |
| **4** | **0** | **1** | **1** | FFS |
| **5** | **1** | **1** | **1** | FFS |
| **6** | **2** | **2** | **0** | FFS |
| **7** | **0** | **0** | **1** | Supported |
| **8** | **1** | **1** | **0** | Supported |
| **9** | **1** | **0** | **0** | Supported |
| **10** | **0** | **1** | **0** | Supported |
| **11** | **2** | **0** | **0** | Supported |
| **12** | **0** | **2** | **0** | Supported |

* Recommended WF
	+ Collect views from companies.

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### Sub-topic 2-3: Overlapping

#### **Issue 2-3-1: X value in proximity condition for overlapping in FR1.**

* Proposals
	+ Option 1: CATT, Nokia
		- 1 ms
	+ Option 2: ZTE
		- 2 ms
	+ Option 3: Apple, QC, MTK, Xiaomi, Intel, Ericsson, Huawei
		- 4 ms
	+ Option 4: CMCC
		- Up to UE capability
* Recommended WF
	+ Collect views from companies.

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#### **Issue 2-3-2: X value in proximity condition for overlapping in FR2**

* Proposals
	+ Option 1: CATT, Nokia, MTK, Ericsson
		- 1 ms
	+ Option 2: ZTE
		- 2 ms
	+ Option 3: Apple, QC, Xiaomi, Intel, Huawei
		- 4 ms
	+ Option 4: CMCC
		- Up to UE capability
* Recommended WF
	+ Collect views from companies.

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#### **Issue 2-3-3: UE behavior during colliding gap occasion**

* Background: Status after last meeting
	+ Option 1: Priority rule
		- UE will only do the measurement w.r.t. the gap with higher priority on all colliding occasions
		- The priority can be configurable or fixed
		- FFS whether to resume data scheduling during dropped gap occasions
	+ Option 5: Compromised proposal from moderator
		- Introduce gap sharing rule.
			* Request RAN2 to reserve some RRC signaling for different sharing factors.
				+ The signalling design may consider the possibility of resuming data scheduling on dropped gaps
			* Rel-17 requirements will only consider sharing ratios 0% and 100%.
			* The requirements for other sharing factors are FFS in later releases.
			* FFS whether the resume scheduling on those dropped gaps as well as the impact to other intra-frequency measurements
* Moderator:
	+ As RAN4 already spent a great effort to converge to the 2 options above, I suggest not to go back to re-open other options.
	+ Whether to resume data scheduling will be discussed in a separate issue.
* Proposals
	+ Option 1: QC, vivo, Xiaomi, LGE, OPPO, Huawei
		- Option 1 in last meeting. Each concurrent MG should be configured with a unique priority
	+ Option 5: CATT, Apple, MTK, CMCC, vivo, Xiaomi, LGE, OPPO, Ericsson, Nokia
		- Option 5 in last meeting.
* Recommended WF
	+ Collect views from companies.

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#### **Issue 2-3-4: Whether to resume data scheduling on the dropped gap ocassions**

* Proposals
	+ Option 1: CATT, QC, MTK, CMCC, LGE, Ericsson, Nokia, Huawei
		- Yes
* Recommended WF
	+ Agree on Option 1

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#### **Issue 2-3-5: Whether to introduce a UE capability to indicate whether UE supports only 0% and 100% gap sharing ratios or UE supports arbitrary configured sharing ratios. (If Option 5 in Issue 2-3-5 is agreed)**

* Proposals
	+ Option 1: MTK
		- Yes
* Recommended WF
	+ Collect views from companies

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| **Company** | **Comments** |
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#### **Issue 2-3-6: Detail gap sharing ratios (If Option 5 in Issue 2-3-5 is agreed)**

* Proposals
	+ Option 1: MTK
		- Send an LS to RAN2 with the suggested gap sharing ratios 0%, 25%, 50%, 75% and 100%.
		- For per-UE gap case, one gap sharing ratio can be defined between the 2 per-UE gaps.
		- For per-FR gap case, 2 gap sharing ratios can be configured for FR1 and FR2, respectively.
* Recommended WF
	+ Collect views from companies

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| **Company** | **Comments** |
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#### **Issue 2-3-7: Whether to introduce FO, FPO, PFO, PPO scenarios.**

* Proposals
	+ Option 1: CATT, CMCC, vivo, [Nokia]
		- Introduce all scenarios
	+ Option 2: QC, Xiaomi, [Intel]
		- Only introduce PFO, PPO scenarios
* Recommended WF
	+ Collect views from companies

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| **Company** | **Comments** |
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#### **Issue 2-3-8: Whether to introduce UE capability for different overlapping scenarios (FO, FPO, PFO, PPO).**

* Proposals
	+ Option 1: QC
		- Support of colliding MG would be subject to additional UE capability
* Recommended WF
	+ Collect views from companies

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| **Company** | **Comments** |
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### Sub-topic 2-4: Overhead

#### **Issue 2-4-1: Whether to define the overhead cap**

* Proposals
	+ Option 1: Apple, vivo, LGE, Huawei
		- Yes
	+ Option 2: CATT, QC, CMCC, Intel, Ericsson, Nokia, ZTE
		- No
	+ Option 3: Apple, MTK, vivo
		- Up to UE capability
* Recommended WF
	+ Collect views from companies

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| **Company** | **Comments** |
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#### **Issue 2-4-2: Definition of overhead cap (if agreed in Issue 2-4-1)**

* Proposals
	+ Option 1: Apple, vivo, MTK
		- The max overhead that UE can support in Rel-15/16
	+ Option 2: LGE
		- Consider overhead cap with $\frac{\sum\_{m=1}^{N}\left(\frac{MGL\_{m}}{MGRP\_{m}}\right)}{\frac{MGL\_{r}}{MGRP\_{r}}}$ when configuring multiple MG patterns.
			* $\frac{\sum\_{m=1}^{N}\left(\frac{MGL\_{m}}{MGRP\_{m}}\right)}{\frac{MGL\_{r}}{MGRP\_{r}}}\leq 1+ threshold(K)$
				+ N : number of multiple MG patterns
				+ MGLr : MGL of referenced MG
				+ MGRPr : MGRP of referenced MG
				+ K is FFS
	+ Option 3: Apple, Huawei
		- When concurrent MGs are configured, the MGRP for each MG cannot be smaller than 40ms
* Recommended WF
	+ Collect views from companies

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| **Company** | **Comments** |
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### Sub-topic 2-5: Measurement requirements

Moderator: There are many different proposals on how to specify the requirement. It is difficult to put all proposals within the same issues for discussion. Therefore, Moderator will separate the discussions in to 2 parts: measurement outside gap and within gap. In each part, we further discuss how the CSSF, Kp should be revised and other issues.

#### **Issue 2-5-1: [Outside gap] CSSF**

* Proposals
	+ Option 1: MTK
		- The definitions for the applicable measurement types specified in Section 9.1.5.1 for CSSF outside gap can be re-used as a starting point with the modification to consider more than 1 measurement gaps
* Recommended WF
	+ Collect views from companies

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| **Company** | **Comments** |
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#### **Issue 2-5-2: [Outside gap] Kp**

* Proposals
	+ Option 1: QC
		- Kp is the reciprocal of the fraction of SMTC occasions that do not overlap with measurement gaps
	+ Option 2: MTK
		- The Kp value for the frequency layers to be measured outside gap is defined as Kp = Noriginal / Nremaining, where
			* Noriginal is the number of original SMTC occasions without considering gap within a [160ms] window.
			* Nremaining is the number of remaining SMTC occasions not collided with measurement gap within a [160ms] window
			* The [160ms] window starts from the beginning of a SMTC occasion of the target frequency
	+ Option 3: vivo
		- Principle for L1 measurement could be reused
	+ Option 4: Xiaomi
		- When SMTC occasion is partially overlapping with both concurrent gaps, the scaling factor Kp = $\frac{1}{1-\frac{SMTC}{MGRP1}-\frac{SMTC}{MGRP2}}$, where MGRP1 and MGRP2 is the MGRP of concurrent gaps.
	+ Option 5: Ericsson
		- When all the MG occasions of the MGP with lower priority are overlapped by other MGP(s), the MGP with lower priority will be disabled.
		- When none of the MG occasions of the MGP with lower priority are overlapped by other MGP(s), $K\_{p}= \frac{1}{1- \sum\_{i=1}^{N}\frac{SMTC}{MGRP\_{i}}}$ .
		- Otherwise,
			* When both MGs are overlapping with the SMTC, $K\_{p}= \frac{1}{1- \frac{SMTC}{MGRP\_{lower priority}}}$
			* When MG with lower priority is overlapping with the SMTC, but MG with higher priority isn’t overlapping with the SMTC, $K\_{p}= \frac{1}{1- \frac{SMTC}{MGRP\_{lower priority}×K\_{gap}}}$
			* When MG with lower priority isn’t overlapping with the SMTC, but MG with higher priority is overlapping with the SMTC, $K\_{p}= \frac{1}{1- \frac{SMTC}{MGRP\_{higher priority}}}$
	+ Option 6: Nokia
		- The existing sharing rule applies as general principle.
	+ Option 7: Huawei
		- If the SMTC windows or CSI-RS resources are fully non-overlapped with any of the concurrent MGs, the existing measurement period requirements can be re-used.
		- If the SMTC windows or CSI-RS resources are partially overlapped with one or both of the concurrent MGs, the measurement will be performed outside MG.
		- Kp = Ntotal / Navailable, where Ntotal is the total number of SMTC windows or CSI-RS resource occasions during T, and Navailable is the number of SMTC windows or CSI-RS resource occasions that are not overlapped with any MG occasion during T, and T = max(TSMTC, MGRP1, MGPR2).
		- If the SMTC windows are fully overlapped with one or both of the concurrent MGs, the measurement will be performed with MG.
* Recommended WF
	+ Moderator: It seems that companies’ proposals follow a similar principle but have different level of detail and different way to present the solution. To speed up the discussion, moderator tried to provide a harmonized proposal, as below. Companies are encouraged to directly comment to the harmonized proposal:
		- The Kp value for the frequency layers to be measured outside gap is defined as Kp = Ntotal / Navailable
			* Ntotal is the total number of SMTC occasions or CSI-RS resource occasions without considering MG overlapping during a window T
			* Navailable is the number of SMTC occasions or CSI-RS resource occasions that are not overlapped with any MG occasion during a window T.
			* The window T has the duration max(TSMTC, MGRP1, MGPR2) and starts from the beginning of a SMTC occasion of the target frequency

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| **Company** | **Comments** |
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#### **Issue 2-5-3: [Within gap] CSSF**

* Proposals
	+ Option 1: Apple, Huawei, CATT, vivo
		- The CSSF is calculated separately for each gap pattern, [provided that the association between measurement objects and gap pattern is configured by network. Only the measurement objects associated to the same measurement gap pattern are counted when deriving CSSFwithin\_gap,i for a target measurement object with index *i*.]
	+ Option 2: QC
		- Modify the definition of Ri for CSSFwithin\_gap,i as follows: Ri is the maximal ratio of the number of measurement gap where measurement object i is a candidate to be measured over the number of measurement gap where measurement object i is a candidate and not used for a long-periodicity measurement defined above and not dropped due to measurement gap collisions.
* Recommended WF
	+ Collect views from companies

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| **Company** | **Comments** |
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#### **Issue 2-5-4: [Within gap] MGRP**

* Proposals
	+ Option 1: MTK
		- In the delay requirements of measurements within gap, indicate which MGRP to be selected between 2 configured measurement gaps.
* Recommended WF
	+ Collect views from companies

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| **Company** | **Comments** |
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#### **Issue 2-5-5: [Within gap] Kp**

* Proposals
	+ Option 1: MTK
		- Introduce the Kp value to address the issue of dropped gap occasions due to gap collision. The Kp value for the frequency layers to be measured within gap is defined as Kp = Noriginal / Nremaining, where
			* Noriginal is the number of original associated gap occasions covering the target SMTC without considering the other measurement gaps within a [160ms] window
			* Nremaining is the number of remaining associated gap occasions covering the target SMTC by removing the dropped gap occasions within a [160ms] window
			* The [160ms] window starts from the beginning of an associated gap occasion covering the SMTC occasion of the target frequency
	+ Option 2: Xiaomi
		- For the measurement within the concurrent gap with priority or 100% gap sharing, the existing measurement delay requirement within gap is applied.
		- For the measurement within the concurrent gap with low priority or 0% gap sharing, the measurement delay would be extended by a scaling factor of 1/(1-MGRP1/MGRP2), where MGRP1 is the MGRP of prioritized concurrent gap or the MGRP of concurrent gap with 100% gap sharing, and the MGRP2 is the MGRP of deprioritized concurrent gap or the MGRP of concurrent gap with 0% gap sharing.
	+ Option 3: Ericsson
		- When none of the MG occasions of the MGP with lower priority are overlapped by other MGP(s), Kgap = 1.
		- When all of the MG occasions of the MGP with lower priority are overlapped by other MGP(s), the MGP with lower priority will be disabled.
		- Otherwise, Kgap will be applied to the MG with lower priority and equals$\frac{1}{1-\frac{MGRP\_{high priority}}{MGRP\_{low priority}}}$.
	+ Option 4: Nokia
		- When the C-MG collide with and have to share the gap opportunities with legacy gaps RAN4 can apply same principles as for legacy for each GP
	+ Option 5: ZTE
		- Not need any new solution. Just re-using the mechanism of CSSFwithin\_gap,i in legacy Rel-16 for each gap is enough. All MOs/frequency layers with gap associated with a same gap would participate in the sharing of this gap.
	+ Option 6: Huawei
		- Impact of the MG colliding can be discussed after collision handling is settled.
* Recommended WF
	+ Moderator: The situation is similar to Issue 2-5-2. To speed up the discussion, moderator tried to provide a harmonized proposal, as below. Companies are encouraged to directly comment to the harmonized proposal:
		- Introduce a Kgap value to address the issue of dropped gap occasions due to gap collision. For the frequency layers to be measured outside gap is defined as Kgap = Ntotal / Navailable
			* Ntotal is the total number of gap occasions covering target SMTC occasions or CSI-RS resource occasions without considering MG overlapping during a window T
			* Navailable is the number of gap occasions covering target SMTC occasions or CSI-RS resource occasions, and these occasions are not overlapped with any MG occasion during a window T.
				+ When Navailable =0, the MGP is disabled.
			* The window T has the duration max(TSMTC, MGRP1, MGPR2) and starts from the beginning of a gap occasions covering target SMTC of the target frequency

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| **Company** | **Comments** |
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### Sub-topic 2-6: Impact to other L1 measurements

#### **Issue 2-6-1: P factor of L1 measurement**

* Proposals
	+ Option 1: QC
		- Modify the definition of the P scaling factor for L1-RSRP measurements: P is the reciprocal of the fraction of SSB (or CSI-RS) occasions that do not overlap with measurement gaps.
	+ Option 2: MTK
		- When there are still some L1 RS occasions not overlapped by measurement gaps and intra-frequency SMTC in FR2, the P factor for L1 measurements equals Noriginal / Nremaining, where
			* Noriginal is the number of original RS occasions without considering measurement gaps nor intra-frequency SMTC occasions within a [160ms] window.
			* Nremaining is the number of remaining RS occasions not fully nor partially collided with measurement gap or intra-frequency SMTC occasions within a [160ms] window
			* The [160ms] window starts from the beginning of a slot with the target RS occasion
		- In FR1 or when there are no L1 RS occasions not overlapped by measurement gaps and intra-frequency SMTC in FR2, the P factor for L1 measurements equals Psharing factor x Noriginal / Nremaining, where
			* Noriginal is the number of original RS occasions without considering measurement gaps nor intra-frequency SMTC occasions within a [160ms] window.
			* Nremaining is the number of remaining RS occasions not fully nor partially collided with measurement gap within a [160ms] window
			* The [160ms] window starts from the beginning of a slot with the target RS occasion
	+ Option 3: Huawei
		- Re-use the existing requirements for L1 measurement with the updated calculation for P factor as follows:
			* For L1 measurement in FR1, P = Ntotal / Navailable
			* For L1 measurement in FR2,
				+ P = Psharing \* Ntotal / Noutside\_MG, if Navailable = 0
				+ P = Ntotal / Navailable, if Navailable > 0
			* where, Ntotal is the total number of L1 resource occasions during T, Noutside\_MG is the number of L1 resource occasions not overlapped with any MG occasion during T, Navailable is the number of L1 resource occasions not overlapped with any MG occasion or any SMTC window during T, and T = max(TL1, MGRP1, MGPR2)
* Recommended WF
	+ The situation is similar to Issue 2-5-2. To speed up the discussion, moderator tried to provide a harmonized proposal, as below. Companies are encouraged to directly comment to the harmonized proposal:
		- The P factor for L1 measurements equals
			* Ntotal / Navailable in FR1
			* Psharing \* Ntotal / Noutside\_MG in FR2 with Navailable = 0
			* Ntotal / Navailable in FR2 with Navailable > 0
			* Where
				+ Ntotal is the total number of L1 resource occasions without considering measurement gaps nor intra-frequency SMTC occasions during a window T
				+ Noutside\_MG is the number of L1 resource occasions not overlapped with any MG occasions during a window T,
				+ Navailable is the number of L1 resource occasions not overlapped with any MG occasions nor any SMTC occasions during T,
				+ The window T has the duration max(TL1, MGRP1, MGPR2) and starts from the beginning of a L1 resource occasion

TL1 is periodicity of the target L1 RS.

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| **Company** | **Comments** |
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### Sub-topic 2-7: Others

#### **Issue 2-7-1: Whether to to specify transient UE behavior when concurrent MGs are re-configured**

* Proposals
	+ Option 1: Apple, QC, Intel, Huawei
		- No
	+ Option 2: Ericsson
		- UE will continue the measurement by MGP2 and meet the corresponding measurement requirement based on MGP2 during this measurement period once the MO1 is reconfigured to be measured using MGP2.
		- UE will perform the measurement on MO2 using MGP2 immediately after the concurrent gaps’ reconfiguration, if MO2 can’t be measured by MGP1 due to gap offset or if gap length is not enough.
		- After one of concurrent gaps deconfiguration, data scheduling is expected on this disabled MG’s time occasions.
* Recommended WF
	+ Collect views from companies

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| **Company** | **Comments** |
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### Sub-topic 2-8: RAN4 reply to RAN2 LS R2-2111472

#### **Issue 2-8-1: Confirmation to RAN2’s understanding**

* Background

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| … RAN2 has discussed the operation and limitation for concurrent gap and reached the following agreements. * RAN2 confirms the following understanding for concurrent gap operation:

1. Concurrent gaps are multiple measurement gaps and each gap pattern could be associated with one or multiple frequency layers.2. Each frequency layer can be associated with only one of the concurrent gaps.3. Without considering pre-configured MG, concurrent gaps are always activated if it is setup by the network.4. No new gap pattern is introduced for concurrent gap, the existing R15/R16 gap pattern could be configured for the concurrent gaps.* RAN2 to clarify “frequency layer” and limitations as below:

PRS measurement can be associated with one gap pattern, no matter how many frequencies are measured for PRS.Each measured SSB or LTE frequency is considered as one frequency layer.Measured CSI-RS resources with the same center frequency is considered as one frequency layer. It is possible to have Multiple MOs including CSI-RS resources with same center frequency.SSB and CSI-RS measurement in one MO are considered as different frequency layers.Firstly, RAN2 would like to confirm with RAN4 that the above understanding is correct.  |

* Proposals
	+ Option 1: CATT, MTK
		- Confirm to RAN2 that the understanding in the LS is correct
	+ Option 2: Apple, Huawei
		- RAN4 confirms all above understanding is correct, but different MOs with CSI-RS resources are considered as different frequency layers, no matter if the CSI-RS resources are with same or different centre frequencies.
	+ Option 3: Nokia
		- Reply and confirm to RAN2 according to above discussion TP. Additionally, clarify to RAN2 on the Issues not yet explicitly agreed in RAN4 yet.
		- For concurrent measurement gaps, UE is configured with more than one MO including CSI-RS resources with the same center frequency.
* Recommended WF
	+ Collect views from companies

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#### **Issue 2-8-2: RAN4 response to Q1**

* Background

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| **Q1 –** Can Rel-17 concurrent gaps be configured together with legacy gap? If ‘yes’, what would be the UE behavior? |

* Proposals
	+ Option 1: CATT, Huawei
		- Rel-17 concurrent gaps cannot be configured together with legacy gap
	+ Option 2: Apple, [Nokia]
		- Yes. For the MOs without the association, UE shall conduct measurement using the legacy MG.
	+ Option 3: QC, vivo
		- Possible, but no benefit. Gap priority and association may be missing for legacy gap. Extra RAN4 work is needed to define new UE behaviours.
	+ Option 4: MTK, Ericsson
		- Up to RAN2, as long as the associations are provided to all gaps
* Recommended WF
	+ Moderator: the controversial point seems on the lack of association to legacy gap. In moderator’s understanding, it is also possible to associate a MO to a legacy gap, if RAN2 wants to do so. Therefore, Moderator suggest proceeding with the following WF:
		- If RAN2 decides to introduce gap association and [sharing ratio or priority] to legacy gap, Rel-17 concurrent gaps can be configured together with legacy gap. Otherwise, they cannot.

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| **Company** | **Comments** |
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#### **Issue 2-8-3: RAN4 response to Q2 and Q3**

* Background

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| **Q2** – How many concurrent gaps could be configured simultaneously?**Q3** – Could concurrent gaps be configured with different gap types (i.e., some gaps are per-UE while some gaps are per-FR)? If so, what is the maximum number of gaps that could be configured simultaneously for each gap type (per-UE /per-FR1/per-FR2)? |

* Recommended WF
	+ - Moderator: This is already an ongoing discussion in Issue 2-2-2 and Issue 2-2-1. No need to duplicate the discussion here. RAN4 can reply to RAN2 after reaching conclusions.

#### **Issue 2-8-4: RAN4 response to Q4**

* Background

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| **Q4** – Is the legacy gap sharing configuration (configured in MeasGapSharingConfig) applicable to Rel-17 concurrent gaps? If ‘yes’, could RAN4 clarify how this would work? |

* Proposals
	+ Option 1: CATT, vivo, Huawei
		- Yes.
	+ Option 2: Apple, QC, Ericsson
		- Yes, with separate MeasGapSharingConfig for each MG pattern.
	+ Option 3: MTK
		- Yes, with same MeasGapSharingConfig for each MG pattern
* Recommended WF
	+ - Collect views from companies

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| **Company** | **Comments** |
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#### **Issue 2-8-5: RAN4 response to Q4**

* Background

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| **Q5** – Could RAN4 help to clarify whether UTRAN-FDD measurement (configured in MeasObjectUTRA-FDD) is also applicable in concurrent gap operation? |

* Recommended WF
	+ - Moderator: This issue has been included in the previous LS R4-2120304 to RAN2. Moderator does not see a need to reopen the discussion here.

## Companies views’ collection for 1st round

### Open issues

Moderator: Companies’ views are collected in previous section together with the list of issues

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
|  R4-2201214EricssonGeneral | Company A |
| Company B |
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| R4-2201624HuaweiCollision rule  | Company A |
| Company B |
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| R4-2200243AppleCSSF  | Company A |
| Company B |
|  |
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| R4-2200115CATTIntra-freq  | Company A |
| Company B |
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| R4-2200678XiaomiInter-freq | Company A |
| Company B |
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| R4-2200404VivoInter-RAT  | Company A |
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| R4-2200694IntelPositioning  | Company A |
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| R4-2201140OPPOL3 CSI-RS  | Company A |
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| R4-2200490MTKL1 impact | Company A |
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## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
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**Existing tdocs**

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| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

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| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents

# Annex

Contact information

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| --- | --- | --- |
| **Company** | **Name** | **Email address** |
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Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)