**3GPP TSG-RAN WG4 Meeting #109 R4-2318166**

**Chicago, US, November 13th – 17th, 2023**

**Agenda item:** 8.9.6

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

**Title:** Topic summary for [109][210] NR\_MG\_enh2\_part1

**Document for:** Information

# Introduction

This document is the topic summary for [109][210] NR\_MG\_enh2\_part1 with the following topics covered

* Topic 1: General, feature list and CR handling (AI 8.9.1)
* Topic 2: Case 1 requirements (Pre-configured MG and concurrent MG) (AI 8.9.2.2)
* Topic 3: Case 2 requirements (NCSG and concurrent MG) (AI 8.9.2.3)
* Topic 4: Rel-17 MGE maintenance core part (AI 5.2.3) + related issues on Con-MG with NCSG (AI 8.9.2.3)
* Topic 5: Performance discussion for NR\_MG\_enh2 Part 1 (AI 8.9.4)
* Note: suggested issues for discussion during online session: 4-1-1, 4-1-2, 4-2-1, 4-2-2, 3-3-1, 2-2-1.

# Topic #1: General, work plan and CR handling (AI 8.9.1)

## Companies’ contributions summary

Moderator’s note: Tdoc [[R4-2318330](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318330.zip)] submitted by CATT, proposal 1 should be treated in thread [211], while propsal 2 is handled in Topic #4 issue 4-1-2 of this thread.

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| **T-doc number** | **Company** | **Proposals / Observations / Draft CR Title** |
| [**R4-2318330**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318330.zip) | CATT | **Proposal 2: Clarify the case when he SMTC is partially overlapping with the associated gap, but fully overlapping with the union of the gaps in the definition of CSSF for intra-frequency and inter-frequency measurement without gap.**  |
| [**R4-2319112**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319112.zip) | Xiaomi |

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| **Index** | **Feature group** | **Components** |
| 32-1 | Simultaneous activation/deactivation of two Pre-MGs in a FR | Capability to support the simultaneous activation/deactivation of two Pre-MGs in the same FR |
| 32-2-1 | Concurrent NCSGs in a FR | Capability to support concurrent gaps with NCSG in an FR  |
| 32-2-2 | Concurrent NCSGs in a FR | FFS: Whether to consider an additional capability for NCSG + NCSG in an FR |
| 32-3 | needForGap in Rel18 | UE capability to differentiate UE supporting “no gap with interruption” and “no gap without interruption” |
| 32-4-1 | inter-RAT NR measurements without gap (Case a-1) | UE capability to support the inter-RAT NR measurements without gap but interruption needed as there is vacant RF chains for UE measurements (Case a-1)(Note 1) This feature shall be discussed in LTE spec |
| 32-4-2 | inter-RAT LTE measurement requirements (Case b-1) | Support of inter-RAT LTE measurement without MG when UE has vacant RF chain available |
| 32-4-3 | inter-RAT LTE measurement requirements (Case b-2) | UE capability to support the inter-RAT LTE measurements without gap but interruption needed when LTE CRS to be measured is contained in UE’s active BWP |

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| [**R4-2319940**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319940.zip) | Intel Corporation | Rel-18 NR UE features for NR\_MG\_enh2 WI.

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| **Index** | **Feature group** | **Components** |
| 32-1 | Inter-RAT EUTRAN measurements without measurement gap using vacant RF chain (case b-1) | 1. Support of inter-RAT EUTRAN measurements without gap with or without interruption |
| 32-2 | Inter-RAT EUTRAN measurements without measurement gap when target CRS is within UE active bandwidth part (case b-2) | 1. Support of inter-RAT EUTRAN measurements without gap when CRS is fully contained within UE active BWP |
| 32-3 | Support of effective measurement window (EMW) for Inter-RAT EUTRAN measurements without measurement gap | 1. Supported EMW patterns for Inter-RAT EUTRAN measurements without measurement gap |
| 32-4 | Intra and Inter-frequency measurement without gap using vacant RF chain | 1. Support of intra- and inter- frequency measurements without gap with or without interruption |
| 32-5 | Concurrent measurement gap with Pre-MG | 1. Support of RRM requirements in TS 38.133 for multiple per-UE (or per-FR) measurement gap patterns with at least one per-UE (or per-FR) Pre-MG.  |
| 32-6 | Concurrent measurement gap with NCSG | 1. Support of RRM requirements in TS 38.133 for multiple per-UE (or per-FR) measurement gap patterns with at least one per-UE (or per-FR) NCSG.  |

**Rel-18 LTE UE features for NR\_MG\_enh2 WI.**

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| **Index** | **Feature group** | **Components** |
| x-x | Inter-RAT NR measurement without gap using vacant RF chain | 1. Support of inter-RAT NR measurements without gap with or without interruption |

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| [**R4-2320918**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320918.zip) | MediaTek inc. |

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| **Index** | **Feature group** | **Components** |
| 32-1 | Concurrent gap with Pre-MG | Support of multiple per-UE (or per-FR) measurement gap patterns with at least one per-UE (or per-FR) Pre-MG. Detail in Table 9.1.x-1 of TS 38.133.  |
| 32-2 | 2 Pre-MG configuration with simultaneous activation/deactivation | Support configurations of 2 Pre-MG with simultaneous activation/deactivation in the same FR.  |
| [32-3] | Dynamic collision | Support the RRM requirements when the activation/deactivation delay of Pre-MG overlaps the other measurement gap or Pre-MG |
| 32-4 | Concurrent gap with NCSG | Support of multiple per-UE (or per-FR) measurement gap patterns with at least one per-UE (or per-FR) NCSG. Detail in Table 9.1.y-1 of TS 38.133.  |
| [32-5] | 2 NCSG configuration | Support configurations of 2 NCSG in the same FR |
| 32-6 | Inter-RAT EUTRAN measurement with RS on UE active BWP | Support inter-RAT EUTRAN measurements with CRS contained within UE’s active DL BWP |
| [32-7] | Effective measurement window for inter-RAT EUTRAN measurements | Support configuration of effective measurement window for inter-RAT EUTRAN measurements, including offset, duration and periodicity.  |
| [32-8] | simultaneousRxDataCRS-DiffNumerology | Support concurrent inter-RAT measurement on EUTRAN cell with CRS contained within UE’s active DL BWP and PDCCH or PDSCH reception from the serving cell with a different numerology |

Some of the feature’s numbers are in **[brackets]** to indicate that this capability is still under discussion |
| [**R4-2320919**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320919.zip) | MediaTek inc., Intel Corporation | Big CR to TS 38.133 on Further enhancements on NR and MR-DC measurement gaps and measurements without gaps |
| [**R4-2320920**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320920.zip) | MediaTek inc., Intel Corporation | Big CR to TS 36.133 on inter-RAT NR measurement without gap |
| [**R4-2320921**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320921.zip) | MediaTek inc. | Draft CR for new abbreviation in 38.133 |
| [**R4-2319474**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319474.zip) | OPPO | [NR\_MG\_enh2-Core] CR on CSSF for R18 MGE |
| [**R4-2319146**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319146.zip) | Ericsson | Draft CR on PreMG and ConMGs general |
| [**R4-2320924**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320924.zip) | MediaTek inc. | Draft CR for NCSG with concurrent gaps |

## Open issues summary

### Sub-topic 1-1: feature list for NR\_MG\_enh2 WI

**Issue 1-1-1: Rel-18 NR UE features for NR\_MG\_enh2 WI for Objective 1:**

* Proposals
	+ Option 1: Xiaomi

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| **Index** | **Feature group** | **Components** |
| 32-1 | Simultaneous activation/deactivation of two Pre-MGs in a FR | Capability to support the simultaneous activation/deactivation of two Pre-MGs in the same FR |
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| 32-2-2 | Concurrent NCSGs in a FR | FFS: Whether to consider an additional capability for NCSG + NCSG in an FR |

* + Option 2: Intel

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| **Index** | **Feature group** | **Components** |
| 32-5 | Concurrent measurement gap with Pre-MG | 1. Support of RRM requirements in TS 38.133 for multiple per-UE (or per-FR) measurement gap patterns with at least one per-UE (or per-FR) Pre-MG.  |
| 32-6 | Concurrent measurement gap with NCSG | 1. Support of RRM requirements in TS 38.133 for multiple per-UE (or per-FR) measurement gap patterns with at least one per-UE (or per-FR) NCSG.  |

* + Option 3: MTK

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| **Index** | **Feature group** | **Components** |
| 32-1 | Concurrent gap with Pre-MG | Support of multiple per-UE (or per-FR) measurement gap patterns with at least one per-UE (or per-FR) Pre-MG. Detail in Table 9.1.x-1 of TS 38.133.  |
| 32-2 | 2 Pre-MG configuration with simultaneous activation/deactivation | Support configurations of 2 Pre-MG with simultaneous activation/deactivation in the same FR.  |
| [32-3] | Dynamic collision | Support the RRM requirements when the activation/deactivation delay of Pre-MG overlaps the other measurement gap or Pre-MG |
| 32-4 | Concurrent gap with NCSG | Support of multiple per-UE (or per-FR) measurement gap patterns with at least one per-UE (or per-FR) NCSG. Detail in Table 9.1.y-1 of TS 38.133.  |
| [32-5] | 2 NCSG configuration | Support configurations of 2 NCSG in the same FR |

* Recommended WF
	+ Discuss the options

**Issue 1-1-2: Rel-18 NR UE features for NR\_MG\_enh2 WI for Objective 2:**

* Proposals
	+ Option 1: Xiaomi

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| **Index** | **Feature group** | **Components** |
| 32-3 | needForGap in Rel18 | UE capability to differentiate UE supporting “no gap with interruption” and “no gap without interruption” |
| 32-4-1 | inter-RAT NR measurements without gap (Case a-1) | UE capability to support the inter-RAT NR measurements without gap but interruption needed as there is vacant RF chains for UE measurements (Case a-1)(Note 1): This feature shall be discussed in LTE spec |
| 32-4-2 | inter-RAT LTE measurement requirements (Case b-1) | Support of inter-RAT LTE measurement without MG when UE has vacant RF chain available |
| 32-4-3 | inter-RAT LTE measurement requirements (Case b-2) | UE capability to support the inter-RAT LTE measurements without gap but interruption needed when LTE CRS to be measured is contained in UE’s active BWP |

* + Option 2: Intel

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| **Index** | **Feature group** | **Components** |
| 32-1 | Inter-RAT EUTRAN measurements without measurement gap using vacant RF chain (case b-1) | 1. Support of inter-RAT EUTRAN measurements without gap with or without interruption |
| 32-2 | Inter-RAT EUTRAN measurements without measurement gap when target CRS is within UE active bandwidth part (case b-2) | 1. Support of inter-RAT EUTRAN measurements without gap when CRS is fully contained within UE active BWP |
| 32-3 | Support of effective measurement window (EMW) for Inter-RAT EUTRAN measurements without measurement gap | 1. Supported EMW patterns for Inter-RAT EUTRAN measurements without measurement gap |
| 32-4 | Intra and Inter-frequency measurement without gap using vacant RF chain | 1. Support of intra- and inter- frequency measurements without gap with or without interruption |

* + Option 3

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| **Index** | **Feature group** | **Components** |
| 32-6 | Inter-RAT EUTRAN measurement with RS on UE active BWP | Support inter-RAT EUTRAN measurements with CRS contained within UE’s active DL BWP |
| [32-7] | Effective measurement window for inter-RAT EUTRAN measurements | Support configuration of effective measurement window for inter-RAT EUTRAN measurements, including offset, duration and periodicity.  |
| [32-8] | simultaneousRxDataCRS-DiffNumerology | Support concurrent inter-RAT measurement on EUTRAN cell with CRS contained within UE’s active DL BWP and PDCCH or PDSCH reception from the serving cell with a different numerology |

* Recommended WF
	+ Discuss the options

**Issue 1-1-3: Rel-18 LTE UE features for NR\_MG\_enh2 WI:**

* Proposals
	+ Option 1: Intel

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| **Index** | **Feature group** | **Components** |
| x-x | Inter-RAT NR measurement without gap using vacant RF chain | 1. Support of inter-RAT NR measurements without gap with or without interruption |

* + Option 2: Xiaomi

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| **Index** | **Feature group** | **Components** |
| 32-4-1 | inter-RAT NR measurements without gap (Case a-1) | UE capability to support the inter-RAT NR measurements without gap but interruption needed as there is vacant RF chains for UE measurements (Case a-1)**(Note 1): This feature shall be discussed in LTE spec** |

* Recommended WF
	+ Discuss the options

### Sub-topic 1-2: CR handling

**Issue 1-2-1: R4-2320919**

* Recommended WF
	+ Revise it to capture agreements/comments in this meeting.

**Issue 1-2-2: R4-2320920**

* Recommended WF
	+ Revise it to capture agreements/comments in this meeting.

**Issue 1-2-3: R4-2320921**

* Recommended WF
	+ Revise it to capture agreements/comments in this meeting.

**Issue 1-2-4: R4-2319474**

* Recommended WF
	+ Revise it to capture agreements/comments in this meeting.

**Issue 1-2-5: R4-2319146**

* Recommended WF
	+ Revise it to capture agreements/comments in this meeting.

**Issue 1-2-6: R4-2320924**

* Recommended WF
	+ Revise it to capture agreements/comments in this meeting.

# Topic #2: Case 1 requirements (Pre-configured MG and concurrent MG) (AI 8.9.2.2)

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

## Companies’ contributions summary

Moderator’s note: Draft CR are mentioned in Topic #1.

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2318331**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318331.zip) | CATT | **Proposal 1: For scenario 4,** **no gap dropping rule need to be applied and UE shall perform measurement within each activated Pre-MG.** **Proposal 2: No need to define additional UE capability for dynamic collisions.**  |
| [**R4-2318591**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318591.zip) | Apple | **Observation 1: RAN4 only needs to discuss fully overlapped simultaneous Pre-MGs activation/deactivation, since RAN4 already agreed in RAN4#108 not to define requirements for Partially overlapped simultaneous Pre-MGs activation/deactivation for Pre-MG + Pre-MG.****Observation 2: in fully overlapped simultaneous Pre-MGs activation/deactivation, statuses of the two Pre-MGs are assumed to be changed by the end of activation/deactivation, e.g. BWP switch delay + 5ms + T1.****Observation 3: whether gap is needed would change immediately after BWP switch. However, there is additional delay in activation/deactivation of Pre-MG, which is problematic sometimes.****Proposal 1: it is up to UE implementation whether to conduct measurement within Pre-MG occasions (both active and deactivated) during simultaneous Pre-MGs activation/deactivation.****Proposal 2: When NW configures a Pre-MG1 and a Pre-MG2/Type-2 MG in ConMGs, the MO associated with Pre-MG1 will be measured within activated Pre-MG2/Type-2 MG if Pre-MG1 is deactivated and the MO is fully overlapping with activated Pre-MG2/Type-2 MG.** |
| [**R4-2318854**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318854.zip) | Xiaomi | **Observation 1: After UE finish the (de)activation procedure (e.g. time point A in Figure 1) and before the next available Pre-MG occasion (e.g time point B in Figure 1), UE may be ambiguous on whether the concurrent MGs which is collided with the next Pre-MG which is to change its status (ON/OFF) shall be dropped or not.*****Proposal 1: The more detailed statements on UE behavior when there is overlapping between Pre-MG and other concurrent MGs when UE is pending on Pre-MG status change needs to be clarified.*****Observation 2: The overall (de)activation procedure in all dynamic collision scenarios can be consisted with the processing time for the trigger event and other extension for RF processing.*****Proposal 2: The (de)activation delay requirements itself can be reused. For an instance, the total time delay allowed for the whole (de)activation procedure completion can be same as these of Rel17.*****Observation 3: Since UE will postpone the status change of Pre-MG in Scenario 1, the Pre-MG status change taking effective time point needs to be updated.*****Proposal 3:*** ***The time point when Pre-MG activation/deactivation take effects shall be updated as:***

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| 8.19.2 Pre-configured measurement gap activation/deactivation upon DCI/timer-based BWP switch8.19.2.1 Activation/deactivation upon DCI/timer-based BWP switch delay on a single CC……Activation of Pre-MG takes effect from the first complete MG occasion after the activation and deactivation delay if the time difference between the last overlapping MG and first Pre-MG occasion to be changed is larger than 5ms. Otherwise, the first Pre-MG occasion shall be kept as deactivated also.  |

**Observation 4: According to current spec on UE handling the collision in case of concurrent MGs (e.g. 9.1.8.3 in TS38.133 CR[4]), UE is not clear which types of measurement shall be performed (e.g. the measurement within or outside of gap ) when Pre-MG was deactivated if these concurrent MG instances (Pre-MG #1 and Tyep2 MG #2 in Figure 2) was overlapping.****Observation 5: According to Rel17 concurrent MG colliding rules above, Type2 MG and Pre-MG in Figure 2b are collided. UE measurement behavior according to current dropping rules in TS38.133, one of them shall be dropped. As a result, the benefits of concurrent MGs will be vanished.****Observation 6: SSBs to be measured within the different concurrent gaps which are overlapped can be separated enough.*****Proposal 4: The measurement dropping rules when the concurrent measurement gaps are collided can be optimized, e.g.*****Option 1). Only there is overlapping among the [SSBs+Xms] to be measured by these collided concurrent gaps, UE needs to drop the measurement with the lower priority gap. Otherwise, UE can perform these measurements sequentially because UE can return to each of carriers one by one.** |
| [**R4-2319088**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319088.zip) | CMCC | ***Proposal 1: No additional capability is needed to handle the dynamic collision.***  |
| [**R4-2319142**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319142.zip) | Ericsson | **Proposal 1: When one pre-configured MG(Pre-MG #1) deactivation procedure fully overlaps with another pre-configured MG(Pre-MG #2) activation procedure, no gap dropping rule shall be applied and UE shall perform measurement within each activated Pre-MG. Data scheduling is not expected within the deactivated Pre-MG occasions before and after the Pre-MG activation/deactivation procedure.****Proposal 2: No additional capability is needed to handle the dynamic collision.****Proposal 3: When NW configures a Pre-MG1 and a Pre-MG2/Type-2 MG in ConMGs, the MO associated with Pre-MG1 will be measured within activated Pre-MG2/Type-2 MG if Pre-MG1 is deactivated and the MO is fully overlapping with activated Pre-MG2/Type-2 MG.** |
| [**R4-2319248**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319248.zip) | vivo | **Proposal 1: For the scenario 4, resolve the dynamic collision issue firstly.** **Proposal 2: When the activated Pre-MG has higher priority, the Pre-MG status and dropping rule shall be applied 5ms after the overlapping (deactivated)Pre-MG. Measurement will be performed on the Pre-MG in deactivation procedure.** **Proposal 3: When the deactivated Pre-MG has higher priority, conclusion of scenario 2 of case 1 can be reused directly, i.e., UE should drop the colliding Pre-MG occasion in activation procedure.** **Proposal 4: For issue 2-1-5, support option 1 to add a new UE capability.** **Proposal 5: For the issue 2-2-1, support option 1.**  |
| [**R4-2319475**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319475.zip) | OPPO | **Proposal 1: For scenario 4,** * **For case a and case b when Pre-MG2 (activate 🡪 deactivate) is overlapped with (de)activation procedure, the same agreement as scenario 1;**
* **For case c and case d when Pre-MG1 (deactivate 🡪 activate) is overlapped with (de)activation procedure, support option 5 since no gap collision will happen.**

**Proposal 2: Not consider the scenario 4 when two Pre-MGs (de)activation procedures are overlapped during dynamic collision.****Proposal 3: No** **additional capability is needed to handle the dynamic collision.****Proposal 4: The MO associated with Pre-MG1 is not allowed to be measured with activated Pre-MG2/Type-2 MG without explicated signalling.**  |
| [**R4-2319520**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319520.zip) | China Telecom | **Proposal 1: For Scenario 4, it’s preferred to follow the agreements from Scenario 1/2/3, and the Type-2 MG can be replaced by an activated Pre-MG.****Proposal 2: Additional UE capability for dynamic collisions is not needed.** |
| [**R4-2319977**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319977.zip) | Huawei, HiSilicon | **Proposal 1: For scenario 1,*** **Reuse the same pre-MG activation delay as in Rel-17**
* **Add one more condition that the activation procedure of pre-MG ends earlier than the start of pre-MG occasion.**

**Proposal 2: For scenario 2,** * **Reuse the same wording as in scenario 1 to define collision between pre-MG deactivation procedure and Type-2 MG occasion,**
* **Add one more condition that the deactivation procedure of pre-MG ends earlier than the start of pre-MG occasion.**

**Proposal 3: For scenario 4, RAN4 not to define UE behaviour or requirements.****Proposal 4: Introduce a UE capability for UE to indicate whether UE supports dynamic collision.****Proposal 5: Agree on option 1 for Issue 2-2-1, FFS whether it needs to be captured in spec.**  |
| [**R4-2320420**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320420.zip) | ZTE Corporation | **Observation 1: The partially overlapping between multiple Pre-MG activation/deactivation procedures has been decided to not consider any more.****Proposal 1: For Scenario 4, directly apply the agreements decided for the fully simultaneous multiple Pre-MG activation/deactivation is fine, no need to touch the agreements for dynamic collision of Scenario 1/2/3, i.e.** **- The new status of two Pre-MG are applied after the extended T1;****- The dropping rule is only applicable for the activated status of Pre-MG.****Proposal 2: Not need any additional UE capability for dynamic collision.****Proposal 3: The case that Pre-MG1 is deactivated whereas the associated MO still has to be performed with MG is corner case.** |
| [**R4-2320805**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320805.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: For scenario 4, in case of collision of Pre-MG activation and Pre-MG deactivation, the gap is activated or deactivated which is assigned the higher priority and the activation/deactivation of the other Pre-MG is postponed by 5ms.Proposal 2: No new UE capability for dynamic collisions is needed for UEs supporting Case 1 requirements, as Rel-17 collision rules based on configured priorities are valid in case of Pre-MG instances after Pre-MG activation.Proposal 3: For Pre-MG association with deactivated Pre-MG1 and activated Pre-MG2, RAN4 to distinguish the cases:  no overlap or partial overlap of Pre-MG1 and Pre-MG2: UE is required to perform all measurements assigned to Pre-MG1 outside the activated Pre-MG2 (e.g. search for SMTCs outside the MG). full overlap of Pre-MG1 and Pre-MG2: UE is required to perform all measurements assigned to Pre-MG1 in Pre-MG2 and drop all measurements assigned to Pre-MG2, if Pre-MG1 is configured with higher priority than Pre-MG2, or UE is required to perform all measurements assigned to Pre-MG2 in Pre-MG2 and drop all measurements assigned to Pre-MG1, if Pre-MG1 is configured with lower priority than Pre-MG2. |
| [**R4-2320904**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320904.zip) | Qualcomm Incorporated | **Proposal 1: Define a UE capability to indicate whether the UE supports Case 1 gap configurations that cause dynamic collisions.** |
| [**R4-2320922**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320922.zip) | MediaTek inc. | 1. Proposal 1: For scenario 4: When one pre-configured MG deactivation procedure is fully overlapped with another pre-configured MG activation procedure triggered by single BWP switching during the dynamic collision, no requirements shall be defined.
2. Proposal 2: RAN4 shall support a UE capability for the scenarios of dynamic collision.

Proposal 3: No need to introduce implicit association for concurrent gaps with Pre-MG. |

## Open issues summary

### Sub-topic 2-1: Collision handling for dynamic collisions

*Sub-topic description: This sub-topic covers issues related to the collision cases for concurrent gaps with Pre-MG. The summary of the issues on this topic are provided below:*

***Scenario 1: the pre-configured MG activation procedure is overlapped with one of concurrent gap occasion during the dynamic collision (i.e. Pre-MG has higher priority than the MG)***

 *• RAN4 has an agreement.*

 *• Open issue: further clarification to the definition of this scenario might be needed.*

***Scenario 2: pre-configured MG deactivation procedure is overlapped with one of concurrent gap occasion during the dynamic collision (i.e. Pre-MG has higher priority than the MG)***

 *• Open issue: whether to follow the same agreement from Scenario 1.*

***Scenario 3: pre-configured MG activation procedure is overlapped with one of concurrent gap occasion where the MG has higher priority than the Pre-MG.***

 *• Open issue: whether to follow*

* *the same agreement from Scenario 1, or*
* *the dropping role based on priority rule, or*
* *other options.*

***Scenario 4: One pre-configured MG deactivation procedure is overlapped with another pre-configured MG activation procedure during the dynamic collision (This scenario is for Pre-MG + Pre-MG).***

 *• Open issue: whether to follow*

* *the same agreement from Scenario 1, and/or scenario 3, or*
* *extend the delay to align with (5ms + T1), or*
* *Other options*



**Figure: the collision scenarios for concurrent gaps with Pre-MG during dynamic collision.**

*Open issues and candidate options before meeting:*

**Issue 2-1-1: [Case 1] - [Scenario 1] Further clarification on the agreement from scenario 1?**

* Background:
	+ Agreements from dynamic collision:
		- A collision between a change in the status of a pre-configured MG (MG#1) and a gap instance happens when the change occurs ≤ 4 ms before the start or ≤ 4 ms after the end of a gap instance of an activated concurrent MG (MG#2) the Pre-MG status and dropping rule shall be applied 5ms after the overlapping MG and UE should continue the measurement within the MG#2
			* TBD whether same Pre-MG activation delay requirements as Rel-17 can still be re-used
			* The collision scenario in this issue is depicted in the figure below:



* Proposals
	+ Option 1: HW
		- Reuse the same pre-MG activation delay as in Rel-17
		- Add one more condition that the activation procedure of pre-MG ends earlier than the start of pre-MG occasion.
	+ Option 2: Xiaomi
		- The (de)activation delay requirements itself can be reused. For an instance, the total time delay allowed for the whole (de)activation procedure completion can be same as these of Rel17.
		- The time point when Pre-MG activation/deactivation take effects shall be updated as: ‘Activation of Pre-MG takes effect from the first complete MG occasion after the activation and deactivation delay if the time difference between the last overlapping MG and first Pre-MG occasion to be changed is larger than 5ms. Otherwise, the first Pre-MG occasion shall be kept as deactivated also’
* Recommended WF
	+ Discuss the options.

**Issue 2-1-2: [Case 1] - [Scenario 2] When the pre-configured MG deactivation procedure is overlapped with one of concurrent gap occasion during the dynamic collision (i.e. Pre-MG has higher priority than the MG)**

* Background:
	+ Agreement from the previous meeting:
		- [Case 1] - [Scenario 2] When the pre-configured MG deactivation procedure is overlapped with one of concurrent gap occasion during the dynamic collision (i.e. Pre-MG has higher priority than the MG)
			* When a pre-MG deactivation and a Type-2 MG collide, and the pre-MG has higher priority, UE should drop the colliding Type-2 MG occasion
				+ The detailed condition to be checked when drafting the CR.
	+ The collision scenario in this issue is depicted in the figure below:



* Proposals
	+ Option 1: Huawei
		- Reuse the same wording as in scenario 1 to define collision between pre-MG deactivation procedure and Type-2 MG occasion,
		- Add one more condition that the deactivation procedure of pre-MG ends earlier than the start of pre-MG occasion.
	+ Option 2: Xiaomi
		- The more detailed statements on UE behaviour when there is overlapping between Pre-MG and other concurrent MGs when UE is pending on Pre-MG status change needs to be clarified
* Recommended WF
	+ Discuss the options.

**Issue 2-1-3: [Case 1] - [Scenario 4] When one pre-configured MG deactivation procedure is overlapped with another pre-configured MG activation procedure during the dynamic collision**

Moderator’s note: this issue is a mix between an existing issue of fully overlapping activation/deactivation Pre-MG with collision a Pre-MG gap in the concurrent gap with Pre-MG.

* Background:
	+ Agreements from fully overlap with activation/deactivation [R4-2310175]:
		- * For Case 1 (Pre-configured MG and multiple concurrent MGs), under the assumption that the baseline requirement considers collisions on Pre-MG is only considered when Pre-MG is activated, extend the delay by T1 ms for fully overlapped simultaneous activation/deactivation for Pre-MG + Pre-MG
			* T1 = 2ms.
			* FFS if this activation delay collide with existing gaps
			* An illustration example is captured below [R4-2306330]:



* + Agreements from dynamic collision:
		- A collision between a change in the status of a pre-configured MG (MG#1) and a gap instance happens when the change occurs ≤ 4 ms before the start or ≤ 4 ms after the end of a gap instance of an activated concurrent MG (MG#2) the Pre-MG status and dropping rule shall be applied 5ms after the overlapping MG [and UE should continue the measurement within the MG#2]
			* TBD whether same Pre-MG activation delay requirements as Rel-17 can still be re-used
			* The collision scenario in this issue is depicted in the figure below:



* Proposals
	+ if fully overlapped simultaneous activation/deactivation for Pre-MG + Pre-MG collides with activated Pre-MG:
		- Option 1: OPPO, vivo, China Telecom, ZTE
			* it’s preferred to follow the agreements from Scenario 1/2/3, and the Type-2 MG can be replaced by an activated Pre-MG.
		- Option 2: HW, Apple, MTK
			* It is up to UE implementation whether to conduct measurement within Pre-MG occasions (both active and deactivated) during simultaneous Pre-MGs activation/deactivation, i.e., RAN4 not to define UE behaviour and requirements for scenario 4.
		- Option 3: E///, CATT
			* When one pre-configured MG (Pre-MG #1) deactivation procedure fully overlaps with another pre-configured MG (Pre-MG #2) activation procedure, no gap dropping rule shall be applied and UE shall perform measurement within each activated Pre-MG. Data scheduling is not expected within the deactivated Pre-MG occasions before and after the Pre-MG activation/deactivation procedure.
		- Option 4: Nokia
			* For scenario 4, in case of collision of Pre-MG activation and Pre-MG deactivation, the gap is activated or deactivated which is assigned the higher priority and the activation/deactivation of the other Pre-MG is postponed by 5ms.
* Recommended WF
	+ Collect views.

**Issue 2-1-4: [Case 1] Whether to define a new UE capability for dynamic collisions?**

* Proposals
	+ Option 1: Huawei, MTK, QC, vivo
		- Add a UE capability to indicate whether the UE supports Case 1 gap combinations that cause dynamic collisions.
	+ Option 2: CATT, Nokia, ZTE, CMCC, E///, OPPO, China Telecom
		- No additional capability is needed to handle the dynamic collision.
* Recommended WF
	+ Discuss the options.

### Sub-topic 2-2: Others

*Sub-topic description: This sub-topic covers other issues related to concurrent gap with Pre-MG scenarios.*

*Open issues and candidate options before meeting:*

**Issue 2-2-1: [Case 1] Pre-MG association clarification**

* Proposals
	+ Option 1: E///, HW, MTK, vivo, Apple
		- When NW configures a Pre-MG1 and a Pre-MG2/Type-2 MG in ConMGs, the MO associated with Pre-MG1 will be measured within activated Pre-MG2/Type-2 MG if Pre-MG1 is deactivated and the MO is fully overlapping with activated Pre-MG2/Type-2 MG.
			* Option 1a: HW
				+ FFS: whether it need to be captured in spec
	+ Option 2: Nokia
		- For Pre-MG association with deactivated Pre-MG1 and activated Pre-MG2, RAN4 to distinguish the cases:
			* no overlap or partial overlap of Pre-MG1 and Pre-MG2: UE is required to perform all measurements assigned to Pre-MG1 outside the activated Pre-MG2 (e.g. search for SMTCs outside the MG).
			* full overlap of Pre-MG1 and Pre-MG2: UE is required to perform all measurements assigned to Pre-MG1 in Pre-MG2 and drop all measurements assigned to Pre-MG2, if Pre-MG1 is configured with higher priority than Pre-MG2, or UE is required to perform all measurements assigned to Pre-MG2 in Pre-MG2 and drop all measurements assigned to Pre-MG1, if Pre-MG1 is configured with lower priority than Pre-MG2.
	+ Option 3: MTK
		- No need to introduce implicit association for concurrent gaps with Pre-MG.
* Recommended WF
	+ When NW configures a Pre-MG1 and a Pre-MG2/Type-2 MG in ConMGs, the MO associated with Pre-MG1 will be measured within activated Pre-MG2/Type-2 MG if Pre-MG1 is deactivated and the MO is fully overlapping with activated Pre-MG2/Type-2 MG.
		- Provided that the SSB is within the active BWP of the MO associated with Pre-MG1.
		- FFS: whether it need to be captured in spec

**Issue 2-2-2: [Case 1] Pre-MG association collisions related issue**

* Proposals
	+ Option 1: Xiaomi
		- The measurement dropping rules when the concurrent measurement gaps are collided can be optimized, e.g.
			* Option 1). Only there is overlapping among the [SSBs+Xms] to be measured by these collided concurrent gaps, UE needs to drop the measurement with the lower priority gap. Otherwise, UE can perform these measurements sequentially because UE can return to each of carriers one by one
* Recommended WF
	+ Moderator’s understanding: This is the last meeting of core part, hence, unless there is a critical issue with the existing agreement then there is no need to further enhance the collision rules.
	+ Collect views.

# Topic #3: Case 2 requirements (NCSG and concurrent MG) (AI 8.9.2.3)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2318332**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318332.zip) | CATT | **Proposal 1: No additional UE capability is needed for support of NCSG + NCSG case.** **Proposal 3: The Rel-18 UE behavior (assume SMTC partially overlapped with NCSG) can follow the gap association, i.e., deactivated SCell MO associated with NCSG is measured within NCSG and the MO not associated with NCSG is measured outside NCSG.**  |
| [**R4-2318592**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318592.zip) | Apple | **Proposal 1: consider an additional capability for NCSG + NCSG in an FR.** |
| [**R4-2319089**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319089.zip) | CMCC | ***Proposal 1: No need to have additional capability for NCSG + NCSG in an FR.*** |
| [**R4-2319143**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319143.zip) | Ericsson | **Proposal 1: No additional UE capability is needed for NCSG+NCSG in an FR.** |
| [**R4-2319249**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319249.zip) | vivo | **Proposal 2: For the Rel-18 NCSG + Type-2 MG case, for the deactivated SCell measurement, prefer to follow the gap association, i.e.,** * + - * + **Deactivated Scell MO associated with NCSG is measured within NCSG**
				+ **Deactivated Scell MO not associated with NCSG is measured outside NCSG**
 |
| [**R4-2319476**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319476.zip) | OPPO | **Proposal 1: Support NCSG + NCSG in an FR with additional UE capability.****Proposal 3: When UE is configured with concurrent gaps with NCSG, the deactivated SCell MO measurement should follow the gap association.** |
| [**R4-2319521**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319521.zip) | China Telecom | **Proposal 1: Not to consider an additional capability for NCSG + NCSG in an FR.** |
| [**R4-2319978**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319978.zip) | Huawei, HiSilicon | **Proposal 1: No additional UE capability is defined for NCSG +NCSG.** |
| [**R4-2320421**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320421.zip) | ZTE Corporation | **Observation 1: Parallel measurements upon NCSGs collision is not allowed in Rel-18 WID, even NCSG +NCSG in an FR is configured, the measurements associated to the two NCSGs can only be performed in sequence rather than in parallel.****Proposal 1: No need to introduce additional UE capability for NCSG +NCSG in an FR.****Observation 3: If skipping the gap association, all deactivated SCells are measured within NCSG, it is hard to decide which NCSG to apply for one deactivated SCell MO under the gap combination of NCSG + NCSG.****Proposal 2: Prefer to reuse the gap association rule to determine in which MG the deactivated SCell MO would be performed, this is the most straightforward and uniform for any gap combination.****Proposal 3: Based on the principle of reusing the gap association rule to determine in which MG the deactivated SCell MO would be performed, when the deactivated SCell switches to be activated, still reuse the R17 conditions to decide whether this SCell can be measured with the NCSG. That is, keep alignment with the understanding of R17 UE behaviors.** |
| [**R4-2320806**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320806.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1: In case of NCSG+NCSG combination in an FR, Rel-17 collision rule based on configured priorities and proximity condition is applied.** **Proposal 2: No new capability for the support of NCSG+NCSG combination in an FR is needed.** **Proposal 5: RAN4 to apply the Rel-17 collision rule for the case of partial or full overlapping of Type-2 MG or other NCSG with NCSG used for deactivated SCell measurements.****Proposal 6: RAN4 not to consider a new UE capability for NCSG based deactivated SCell measurements, as same UE behavior will be specified already in Rel-17.**  |
| [**R4-2320905**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320905.zip) | Qualcomm Incorporated | **Proposal 1: Two NCSGs in the same FR can be supported with UE capability.****Proposal 3: When the network configures one Type-2 MG and one NCSG in the same FR or per-UE,*** **Measurements on an SCell (MO) that is associated with the NCSG are performed either within the NCSG or outside of both gaps, according to the Rel-17 rules.**
* **Measurements on an SCell (MO) that is associated with the Type-2 MG are performed either within the Type-2 MG or outside of both gaps, according to the Rel-17 rules.**
 |
| [**R4-2320923**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320923.zip) | MediaTek inc. | 1. Proposal 1: RAN4 shall support two separate UE capabilities for the scenarios of (i) NCSG + NCSG in an FR, and (ii) Type-2 MG + NCSG in an FR.
 |

## Open issues summary

*Before Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 3-2: UE capabilities for Concurrent gaps with NCSG and NCSG + NCSG

*Sub-topic description: This sub-topic covers UE capabilities issues related to concurrent gap with NCSG scenarios.*

*Open issues and candidate options before meeting:*

**Issue 3-2-1: [Case 2] Whether to consider an additional capability for NCSG + NCSG in an FR**

Moderator: Agreement from previous meeting that a new capability for Concurrent gaps with NCSG in an FR will be defined as a new UE capability in Rel-18. This issue is whether to consider an additional UE capability for NCSG + NCSG.

* Proposals
	+ Option 1: CATT, Nokia, CMCC, E///, HW, China Telecom, ZTE
		- No, **without** **additional** UE capability.
	+ Option 2: OPPO, QC, MTK, Apple
		- Yes, **with additional** UE capability
* Recommended WF
	+ Can companies compromise to agree on option 1?

### Sub-topic 3-3: Other Rel-17 rules to be revisited

*Sub-topic description: This sub-topic covers NCSG upon SCell activation issue in concurrent gap with NCSG.*

*Open issues and candidate options before meeting:*

* Agreement from previous meetings:

|  |
| --- |
| **< Agreement >**: * **New in Rel-18**
	+ When Type-2 MG and NCSG are both configured, some serving cell MOs may associated to the NCSG and some are not.
		- Question 1: What is the expected UE behaviour (assume SMTC partially overlapped with NCSG)
			* Option 1: skip gap association, all deactivated Scells are measured within NCSG. (This implies some new rule to override the existing gap association rule)
			* Option 2: Still follow the gap association, i.e., (This implies we follow Rel-17 gap association rule)
				+ Deactivated Scell MO associated with NCSG is measured within NCSG
				+ Deactivated Scell MO not associated with NCSG is measured outside NCSG
		- Question 2: Whether additional UE capability indication is needed
 |

**Issue 3-3-1: [Case 2] When the UE is configured with Concurrent gaps with NCSG, what is the potential changes to UE behaviour for NCSG upon SCell activation (in Rel-18)**

* Proposals
	+ Option 1: MTK, ZTE, QC, vivo, OPPO, [Nokia?]
		- Still follow the gap association, i.e., (This implies we follow Rel-17 gap association rule)
			* Deactivated Scell MO associated with NCSG is measured within NCSG
			* Deactivated Scell MO not associated with NCSG is measured outside NCSG
	+ Option 1a: ZTE
		- Based on the principle of reusing the gap association rule to determine in which MG the deactivated SCell MO would be performed, when the deactivated SCell switches to be activated, still reuse the R17 conditions to decide whether this SCell can be measured with the NCSG. That is, keep alignment with the understanding of R17 UE behaviours
	+ Option 2: Huawei, China Telecom, CMCC, E///
		- When the SCell is deactivated, the deactivated SCell’s MO will be measured within NCSG if the SMTC is partially or fully overlapped with NCSG **regardless of gap association**.
	+ Option 3: CATT,
		- The Rel-18 UE behavior (assume SMTC partially overlapped with NCSG) can follow the gap association, i.e., deactivated SCell MO associated with NCSG is measured within NCSG and the MO not associated with NCSG is measured outside NCSG.
* Recommended WF
	+ Moderator suggests to wait until Rel-17 understanding is clarified of issue 4-2-1 in this thread.

# Topic #4: Rel-17 MGE maintenance core part (AI 5.2.3) + related issues on concurrent gaps with NCSG (AI 8.9.2.3)

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

## Companies’ contributions summary submitted under AI (5.2.3)

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2318494**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318494.zip) | MediaTek inc, Qualcomm Incorporated | [NR\_MG\_enh-Core] Update on scheduling availability requirements for NCSG R17 |
| [**R4-2318496**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318496.zip) | MediaTek inc., Anritsu | [NR\_MG\_enh-Perf] Maintenance CR for MGE perf part R17 |
| [**R4-2319154**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319154.zip) | Ericsson, ZTE | CR on ConMGs |
| [**R4-2319155**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319155.zip) | Ericsson | CR on ConMGs |
| [**R4-2319156**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319156.zip) | Ericsson | Draft CR on ConMGs capability |
| [**R4-2319971**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319971.zip) | Huawei, HiSilicon | [NR\_MG\_enh-Core] CR on Rel-17 MGE requirements |
| [**R4-2320439**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320439.zip) | ZTE | [NR\_MG\_enh-Core] CR on the scheduling restriction of NCSG |

## Companies’ contributions summary submitted under AI (8.9.2.3)

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2318332**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318332.zip) | CATT | **Proposal 2: The Rel-17 UE behavior is that when the SMTC of deactivated SCell is fully or partially overlapped with NCSG, the deactivated SCell is measured via NCSG regardless the UE capability report of intraFreq-needForNCSG.** **Proposal 4: No additional UE capability on the support of NCSG for deactivated SCell is needed in Rel-18.**  |
| [**R4-2318592**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318592.zip) | Apple | **Observation 1: NCSG is supposed to be a band dependent feature. However, nr-NeedForGapNCSG-Reporting-r17 is reported per UE.****Observation 2: NCSG can still be supported per band by indicating ‘ncsg’ in NeedForGapNCSG-InfoNR-r17 only for bands on which UE is willing to support NCSG.****Observation 3: “all deactivated Scell be measured via NCSG regardless the UE capability report of intraFreq-needForNCSG” would make NCSG a per-UE feature.****Proposal 2: RAN4 shall NOT assume “all deactivated Scell be measured via NCSG regardless the UE capability report of intraFreq-needForNCSG”.****Observation 4: according to R17 NCSG reporting design, UE shall NOT indicate support of NCSG for the band unless UE can always perform measurement within NCSG regardless of which BWP is the active BWP. In other word, once UE indicates support of NCSG for the band, the MO within this band can always be measured within NCSG. This jeopardizes the benefit of using NCSG for measurement on SCC.****Proposal 3: a new indication shall be introduced enable support of NCSG for deactivated SCell only.** |
| [**R4-2319089**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319089.zip) | CMCC | ***Proposal 2: when the SCell is deactivated, the deactivated SCell’ s MO will be measured within NCSG if the SMTC is partially or fully overlapped with NCSG*** |
| [**R4-2319143**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319143.zip) | Ericsson | **Observation 1: In Rel-17, when UE supports NCSG, deactivated SCell measurement will be performed within NCSG.****Proposal 2: When the SCell is deactivated, the deactivated SCell’s MO will be measured within NCSG if the SMTC is partially or fully overlapped regardless of gap association.** |
| [**R4-2319249**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319249.zip) | vivo | **Proposal 1: For the question “Will all deactivated Scell be measured via NCSG regardless the UE capability report of intraFreq-needForNCSG”, support option 2.** **Proposal 3: It is not necessary to have any additional UE capability indication.** |
| [**R4-2319476**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319476.zip) | OPPO | **Proposal 2: Support option 1:*** **The deactivated SCell MO(s) are measured within NCSG if the UE reports ‘intraFreq-needForNCSG’ on the band(s) where the deactivated SCell MO(s) located in.**
* **Otherwise, the deactivated SCell MO(s) are measured outside of MG with interruption**
 |
| [**R4-2319521**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319521.zip) | China Telecom | **Proposal 2: The deactivated SCell’s MO is measured within NCSG if the SMTC is partially or fully overlapped with the NCSG, and the deactivated SCell’s MO and NCSG can be implicitly associated.** |
| [**R4-2319978**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319978.zip) | Huawei, HiSilicon | **Proposal 2: When SCell is deactivated, the corresponding MO is implicitly associated to NCSG with which the SMTC is partially or fully overlapped, regardless of configured MG association.** **Proposal 3: Discuss Issue 3-3-3 in Rel-17 instead of Rel-18.** |
| [**R4-2320421**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320421.zip) | ZTE Corporation | **Observation 2: Regarding the R17 UE behavior alignment, based on current R17 spec, it can be clarified that: All deactivated Scell should be measured via NCSG regardless the UE capability report of intraFreq-needForNCSG given that all or part of the SMTC occasions of the deactivated SCell are overlapped with the NCSG.****Proposal 4: No need to distinguish the UE indication for activated status and deactivated status separately for a single serving cell.** |
| [**R4-2320806**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320806.zip) | Nokia, Nokia Shanghai Bell | **Proposal 3: RAN4 to consider NCSG based measurement support for deactivated SCells regardless the intraFreq-needForNCSG report from Rel-17.** **Proposal 4: RAN4 to agree on the following UE behavior in Rel-17 for use of NCSG for deactivated SCell measurements. When the SCell is deactivated,** **- the deactivated SCell’s MO will be measured within NCSG if the SMTC is partially or fully overlapped with NCSG regardless of gap association,** **- else the deactivated SCell’s MO is measured outside NCSG.** |
| [**R4-2320905**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320905.zip) | Qualcomm Incorporated | **Observation 1: If the UE does not signal that it can measure an SCell with NCSG via *needForGapNCSG-InfoNR*, then the UE cannot be expected to measure the SCell’s SSB outside of active BWP with NCSG.****Proposal 2: In Rel-17, if the UE supports NCSG (*ncsg-MeasGapNR-Patterns-r17* or *ncsg-MeasGapPatterns-r17*) and the network configures an NCSG supported by the UE:*** **A deactivated SCell is measured within NCSG if at least some of the SCell’s SMTC overlaps with NCSG occasions; otherwise, the deactivated SCell is measured outside of NCSG.**
* **An activated SCell is measured within NCSG only if either the SCell’s SSB is outside the active DL BWP or the SCell’s SMTC fully overlaps with NCSG, and the UE signaled that the SCell can be measured with NCSG via *needForGapNCSG-InfoNR*; otherwise, the activated SCell is measured outside of NCSG, if possible.**
 |
| [**R4-2320923**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320923.zip) | MediaTek inc. | Proposal 2: RAN4 shall wait for the outcome of the issue on whether all deactivated Scell will be measured via NCSG regardless the UE capability report of intraFreq-needForNCSG from Rel-17 maintenance on Rel-17 MGE. |

## Open issues summary

*Sub-topic description (guidance from Chairman):* For R17 measurement gap, the issues impacting R18 WI completion are covered by thread [210], including: a) scheduling availability requirement for Rel-17 nogap-noncsg, b) NCSG upon SCell activation.

* **Moderator’s note:** these issues belong to Rel-17 MGE maintenance, and the outcome of this issue has potential impact to Rel-17 MGE requirements.

### Sub-topic 4-1: Scheduling availability requirement and new structure to define intra-freq measurements without MG for Rel-17

*Sub-topic description: This sub-topic covers NCSG upon SCell activation issue in concurrent gap with NCSG.*

**Issue 4-1-1: [Rel-17] Whether to add a new section for the schedule availability requirements when UE supports nogap-noncsg and when SSB is not completely contained in the active BWP of the UE?**

* Proposals
	+ Option 1: from CR [R4-2318494]
		- Yes, and discuss details in the CR directly.
* Recommended WF
	+ Option 1 is agreeable.

**Issue 4-1-2: [Rel-17] Whether to introduce a new structure to define the intra-frequency measurements without measurement gaps?**

* Proposals
	+ Option 1: from CR [R4-2319154]
		- Yes, and discuss details in the CR directly.
	+ Option 2: CATT [R4-2318330]
		- Clarify the case when he SMTC is partially overlapping with the associated gap, but fully overlapping with the union of the gaps in the definition of CSSF for intra-frequency and inter-frequency measurement without gap.
* Recommended WF
	+ Option 1 is agreeable.

### Sub-topic 4-2: UE behavior for deactivated SCell measurements with NCSG

*Sub-topic description: This sub-topic covers NCSG upon SCell activation issue in concurrent gap with NCSG.*

* Agreement from previous meetings:

|  |
| --- |
| **< Agreements from meeting RAN4#106-bis-e >**: * UE behavior for deactivated SCell measurements with NCSG in Case 2 is FFS
	+ Option 1: Legacy UE behavior (i.e. UE measures the deactivated SCell outside of MG)
	+ Option 2: When the SCell is deactivated, the deactivated SCell’s MO will be measured within NCSG if the SMTC is partially or fully overlapped.

**< Agreements from online session >**: * + Option 1:
		- UE measures the deactivated SCell outside of MG
	+ Option 2:
		- When the SCell is deactivated, the deactivated SCell’s MO will be measured within NCSG if the SMTC is partially or fully overlapped with NCSG.
		- FFS whether a new indication shall be introduced enable support of NCSG for deactivated SCell only.

**< Agreement >**: * **Align the understanding of Rel-17 UE behaviours**
	+ Only up to 1 NCSG can be configured. All activated Scell MOs are implicitly associated to the NCSG
	+ In the dynamic UE capability signalling, there is no separate indication for activated/deactivated serving cells. This implies UE only indicate the capability if it supports all scenarios, including
		- deactivated Scell
		- activated Scell but SSB not in active BWP
	+ Understanding to be clarified:
		- Will all deactivated Scell be measured via NCSG regardless the UE capability report of intraFreq-needForNCSG?
 |

**Issue 4-2-1: [Rel-17] Will all deactivated Scell be measured via NCSG regardless the UE capability report of intraFreq-needForNCSG? (Clarify Rel-17 understanding)**

* Proposals
	+ Option 1: Apple, MTK, OPPO,
		- No,
			* The deactivated SCell MO(s) are measured within NCSG if the UE reports ‘intraFreq-needForNCSG’ on the band(s) where the deactivated SCell MO(s) located in.
			* Otherwise, the deactivated SCell MO(s) are measured outside of MG with interruption.
	+ Option 2: CATT, E///, ZTE, CMCC, HW, China Telecom, Nokia, vivo, [QC?]
		- The Rel-17 UE behavior is that when the SMTC of deactivated SCell is fully or partially overlapped with NCSG, the deactivated SCell is measured via NCSG regardless the UE capability report of intraFreq-needForNCSG.
	+ Option 3: QC
		- In Rel-17, if the UE supports NCSG (ncsg-MeasGapNR-Patterns-r17 or ncsg-MeasGapPatterns-r17) and the network configures an NCSG supported by the UE:
			* A deactivated SCell is measured within NCSG if at least some of the SCell’s SMTC overlaps with NCSG occasions; otherwise, the deactivated SCell is measured outside of NCSG.
			* An activated SCell is measured within NCSG only if either the SCell’s SSB is outside the active DL BWP or the SCell’s SMTC fully overlaps with NCSG, and the UE signaled that the SCell can be measured with NCSG via needForGapNCSG-InfoNR; otherwise, the activated SCell is measured outside of NCSG, if possible.
* Recommended WF
	+ Discuss the issue.

**Issue 4-2-2: [Rel-17] Whether a new UE capability is needed for the support of NCSG for deactivated SCell?**

* Proposals
	+ Option 1: CATT, vivo, Nokia, ZTE
		- No
	+ Option 2: Apple,
		- A new indication shall be introduced enable support of NCSG for deactivated SCell only.
* Recommended WF
	+ Wait for the outcome of issue 4-2-1.

# Topic #5: Performance Part 1 (Pre-MG/NCSG and concurrent MG) (AI 8.9.4)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2318596**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318596.zip) | Apple | **Proposal 1: general configuration for test cases for case 1 and 2:*** **Only inter-frequency measurement**
* **Only non-DRX**
* **without SSB time index detection**
* **Only define test case in NR SA in both FR1 and FR2**
* **Do not introduce the test for L1 impact**
* **Do not introduce test cases for intra-freq measurement without gap**
* **Define a minimum set of test cases for SSB-based measurement**
* **On SSB-only test cases, RAN4 does not consider simultaneous per-UE gap and per-FR gap configurations**
* **Do not define test cases with simultaneously FR1 and FR2 gaps configured.**
* **Test cases are limited to single serving carrier**
* **Only use mandatory gap patterns to define test cases**
* **Focus on only partially partial overlap in the test case design**
 |
| [**R4-2318855**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318855.zip) | Xiaomi | ***Proposal 1: It is necessary to define the test cases for NR standalone scenario only.******Proposal 2: Test cases for SSB measurement with Pre-MG shall be defined at least.*** ***Proposal 3: Test cases for the intra-frequency with Pre-MG gap can be defined with high priority.*** ***Proposal 4: In Rel18, the test cases under single carrier when the pre-MG activation is based on UE*** ***autonomous pre-MG activation shall be defined.******Proposal 5: BWP switching trigger event can be tested ONLY.******Proposal 6: Non-DRX cases will be tested only in Rel18.******Proposal 7: Only the test case when the colliding happened needs to be defined. And in the test case for colliding, the separated sub test cases with different Pre-MG priority can be considered.*****Observation 1: the testing procedure can involve the multiple purposes.**1. **The requirements of measurement reporting delay for the measurement by legacy MG within the concurrent MGs which is not collided with Pre-MG**
2. **The requirements of measurement reporting delay for the measurement by Pre-MG within the concurrent MGs which is not collided with Pre-MG**
3. **The requirements on activation delay of Pre-MG within concurrent MGs**
4. **The new functionalities of dynamical collision rules for Pre-MG within concurrent MGs**
5. **The requirements of measurement reporting delay for the measurement with Pre-MG within the other concurrent MGs which is collided with Pre-MG**

***Proposal 8: RAN4 can use the testing procedure below to reduce the overall testing efforts for PreMG and Concurrent MGs testing.***

|  |
| --- |
| The testing procedure for measurements by Pre-MG which is transited from **deactivation to activation** can consist of three successive time periods, with time durations of T1, T2 and T3 respectively. * During the duration of T1, UE can be configured with Pre-MG but being deactivated and the other Type2 MG within concurrent MGs. The configuration of them can be:
	+ The periodicity of Pre-MG and Type2 MG can be Ttype2MG =2\* TpreMG
	+ The occasion of Type2 MG can be fully overlapped with these of Pre-MG
	+ Pre-MG activated has higher priority than that of Type2 MG
* At the start of time duration T1, Pre-MG was configured but not activated. The measurements with Type2 MG will be prioritized while colliding with Pre-MG deactivated and the reporting delay will be tested. The measurement results by Pre-MG deactivated will be reported based on the occasions which is not collided with other Pre-MG/MGs.
* At the start of time duration T2, the serving gNB can trigger Pre-MG activation. And UE is expected to complete the Pre-MG activation within T2.
* The dynamic collision rule shall be verified within T2. For an example, the measurement by Type2 MG will be kept during T2.
* At the start of time duration T3, Pre-MG shall be activated.
* During T3, Type2 MG will be dropped because it was collided with the activated Pre-MGs. The measurement by Pre-MG activated will be tested only.

The testing procedure for measurements by Pre-MG which is transited from **activation to deactivation** can also consist of three successive time periods, with time durations of T1, T2 and T3 respectively. * During the duration of T1, UE can be configured with Pre-MG but being activated and the other Type2 MG within concurrent MGs. The configuration of them can be:
	+ The periodicity of Pre-MG and Type2 MG can be Ttype2MG =2\* TpreMG
	+ The occasions of Type2 MG can be fully overlapped with these of Pre-MG
	+ Pre-MG activated has higher priority than that of Type2 MG
* At the start of time duration T1, Pre-MG was configured and activated. The measurements with Pre-MG will be prioritized when colliding with other MGs and the reporting delay will be tested. The measurements with Pre-MG deactivated will be reported based on the occasion which is not collided with other MGs.
* At the start of time duration T2, the serving gNB can trigger Pre-MG activation. And UE is expected to complete the Pre-MG activation within T2.
* The dynamic collision rule defined in Rel18 can be verified within T2
* During T2, Pre-MG can be deactivated.
* During T3, the deactivated Pre-MGs collide Type2 MGs will be dropped.
	+ The gapless measurement on MO which is associated with Pre-MG will be tested ONLY.
 |

***Proposal 9: The following test cases for core requirement of Pre-MG within concurrent MGs in Rel18 are listed in Table 1 below.*** **Table 1 Test cases for Pre-MG within concurrent MGs core requirements**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Type of Test** | **Description** | **Test purpose**  | **Notes** |
| 1 | Pre-configured measurement gap activation delay and measurement reports | FDD/ TDDPre-configured gap configuration, activation upon DCI/timer-based BWP switching No network signaling to indicate pre-MG activation/deactivation statusGap#0BWP switching trigger No DRX cycle AWGN | Core requirements in section xxxx and yyyy which is also rely on UE’s capability to be verified. * UE completes the pre-configured MG activation/deactivation within the requirements
* Collison handling behavior
* UE reports intra/inter frequency measurement by PreMG.
 |  |

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| [**R4-2319092**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319092.zip) | CMCC | ***Proposal 1: for case 1, it is proposed to define test for Pre-MG + Pre-MG, Pre-MG + Type-2 MG and Pre-MG + Type-1 MG.*** ***Proposal 2: it is proposed to define test for NCSG + NCSG, NCSG + Type-2 MG, and NCSG + Type-1 MG.******Proposal 3: for gap combination, it is propsed to define test for the combination with 2 gaps for UE which does not support per-FR gap, and define test for the combination with 3 gaps cross all FRs for UE which supports per-FR gap.*** ***Proposal 4: it is proposed to define test to verify the gap collision handling for concurrent gap with Pre-MG and concurrent gap with NCSG.******Proposal 5: it is proposed to define test for dynamic collision with Pre-MG.*** |
| [**R4-2319148**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319148.zip) | Ericsson | **Pre-MG+Con-MGs*****Proposal 11: To simplify the test case setting, we confirm the following test configuration:**** + ***Only define test case in NR SA in both FR1 and FR2: support***
	+ ***Do not introduce the test for L1 impact: support***
	+ ***Do not introduce test cases for intra-freq measurement without gap: Not support, both intra-frequency inter-frequency, and deactivated SCell measurement shall be introduced***
	+ ***Define a minimum set of test cases for SSB-based measurement: support***
	+ ***Only define test case under non-DRX: support***
	+ ***Define test case without SBI reporting: support***
	+ ***On SSB-only test cases, RAN4 does not consider simultaneous per-UE gap and per-FR gap configurations: support***
	+ ***Do not define test cases with simultaneously FR1 and FR2 gaps configured: support***
	+ ***Test cases are limited to single serving carrier: support***
	+ ***Only use mandatory gap patterns to define test cases: support***
	+ ***Focus on only fully non-overlp and partially partial overlap in the test case design: support***
	+ ***Verify gap dropping behaviour without introducing additional test cases: support***

***Proposal 2: RAN4 to define Pre-MG and Con-MGs test cases to cover both Pre-MG+MG and Pre-MG+Pre-MG.******Proposal 3: RAN4 to define Pre-MG and Con-MGs test cases with the following combinations:**** ***Pre-MG Combination 1: Pre-MG+MG without gap collision***
* ***Pre-MG Combination 2: Pre-MG+MG with gap collision***
* ***Pre-MG Combination 3: (Pre-MG1, Pre-MG2): (Deactivation, Deactivation) <-> (Activation, Activation) without gap collision***
* ***Pre-MG Combination 4: (Pre-MG1, Pre-MG2): (Deactivation, Deactivation) <-> (Activation, Activation) with gap collision***
* ***Pre-MG Combination 5: (Pre-MG1, Pre-MG2): (Activation, Deactivation) <-> (Deactivation, Activation) without gap collision***

***Proposal 4: RAN4 to define the Pre-MG+Con-MGs test case based on the following rules.**** ***Different test cases for UE autonomous and network-controlled Pre-MG (de)activation mechanisms separately.***
* ***Combine the test cases for the measurement reporting with multiple Pre-MG activation/deactivation delay.***
* ***The trigger events of Pre-MG activation will be only DCI-based BWP switching***

***Proposal 5: RAN4 not to define the test cases to verify the collision during the transition period between Pre-MG activation/deactivation and MG occasion.******Proposal 6: The test case list for Pre-MG+Con-MGs is as follow.***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Test category** | **gap combination** | **Test Configuration** | **Test Purpose** |
| 1 | Intra-frequency measurement with autonomous activation/deactivation of Pre-MG in FR1 | Pre-MG+MG without gap collision | FR1PCell FR1 – target cell 1 NR FR1, target cell 2 NR FR1DRX: Non-DRXPer-UE or per-FR gapSSB index reading: noDCI-based BWP switching trigger event | Verify the gap associationVerify the Pre-MG activation delayThe UE performs measurement with Pre-MG activation and deactivation  |
| 2 | Intra-frequency measurement with network-controlled activation/deactivation of Pre-MG in FR1 | Pre-MG+MG with gap collision | FR1PCell FR1 – target cell 1 NR FR1, target cell 2 NR FR1DRX: Non-DRXPer-UE or per-FR gapSSB index reading: noDCI-based BWP switching trigger event | Verify the gap associationVerify the Pre-MG activation delayVerify the gap collision when Pre-MG activationThe UE performs measurement with Pre-MG activation and deactivation  |
| 3 | Inter-frequency measurement with network-controlled activation/deactivation of Pre-MG in FR1 | (Pre-MG1, Pre-MG2): (Deactivation, Deactivation) <-> (Activation, Activation) without gap collision | FR1PCell FR1 – target cell 1 NR FR1, target cell 2 LTEDRX: Non-DRXPer-UE or per-FR gapSSB index reading: noDCI-based BWP switching trigger event | Verify the gap association;Verify the multiple Pre-MGs activation delay;Verify the gap collision when Pre-MG activationThe UE performs measurement with Pre-MG activation and deactivation  |
| 4 | Inter-frequency measurement with network-controlled activation/deactivation of Pre-MG in FR1 | (Pre-MG1, Pre-MG2): (Deactivation, Deactivation) <-> (Activation, Activation) with gap collision | FR1PCell FR1 – target cell 1 NR FR1, target cell 2 LTEDRX: Non-DRXPer-UE or per-FR gapSSB index reading: noDCI-based BWP switching trigger event | Verify the gap association;Verify the multiple Pre-MGs activation delayVerify the gap collision when Pre-MG activationThe UE performs measurement with Pre-MG activation and deactivation  |
| 5 | Inter-frequency measurement with network-controlled activation/deactivation of Pre-MG in FR1 | (Pre-MG1, Pre-MG2): (Activation, Deactivation) <-> (Deactivation, Activation) without gap collision | FR1PCell FR1 – target cell 1 NR FR1, target cell 2 NR FR1DRX: Non-DRXPer-UE or per-FR gapSSB index reading: noDCI-based BWP switching trigger event | Verify the gap association;Verify the multiple Pre-MG activation delayThe UE performs measurement with Pre-MG activation and deactivation  |
| 6 | Intra-frequency measurement with autonomous activation/deactivation of Pre-MG in FR2 | Pre-MG+MG without gap collision | FR2PCell FR2 – target cell 1 NR FR2, target cell 2 NR FR2DRX: Non-DRXPer-UE or per-FR gapSSB index reading: noDCI-based BWP switching trigger event | Verify the gap associationVerify the Pre-MG activation delayThe UE performs measurement with Pre-MG activation and deactivation  |
| 7 | Inter-frequency measurement with network-controlled activation/deactivation of Pre-MG in FR2 | (Pre-MG1, Pre-MG2): (Deactivation, Deactivation) <-> (Activation, Activation) with gap collision | FR2PCell FR2 – target cell 1 NR FR2, target cell 2 NR FR2DRX: Non-DRXPer-UE or per-FR gapSSB index reading: noDCI-based BWP switching trigger event | Verify the gap associationVerify the Pre-MG activation delayVerify the gap collision when Pre-MG activationThe UE performs measurement with Pre-MG activation and deactivation  |

**NCSG+Con-MGs*****Proposal 7: RAN4 to define NCSG and Con-MGs test cases to cover both NCSG+MG and NCSG+NCSG.******Proposal 8: RAN4 to follow the Rel-17 NCSG test configurations to define NCSG+Con-MGs test.**** ***If a UE supports per-FR NCSG, it only needs to pass test case with per-FR NCSG, otherwise, UE only needs to pass test case with per-UE NCSG.***
* ***For FR1 NCSG #0 per-UE gap and NCSG #2 per-FR gap are both tested in inter-frequency sub test cases. For FR2 we test with per-FR NCSG pattern #13.***
* ***In NCSG tests for intra-frequency, inter-frequency and inter-RAT, the serving frequency and the target frequency should be selected such that UE reports ‘ncsg’ for the target frequency given the serving frequency.***

***Proposal 9: RAN4 to define NCSG and Con-MGs test cases scenarios as follow.**** ***TC1: Measurement with NCSG on deactivated SCC without collision(NCSG+MG)***
* ***TC2: Measurement with NCSG on deactivated SCC with collision(NCSG+MG)***
* ***TC3: Inter-frequency measurement with NCSG without collision (NCSG+NCSG)***
* ***TC4: Inter-frequency measurement with NCSG with collision (NCSG+NCSG)***
* ***TC5: Intra-frequency measurement with NCSG without collision(NCSG+NCSG)***
* ***TC6: Intra-frequency measurement with NCSG with collision(NCSG+NCSG)***

***Proposal 10: The test case list for NCSG+Con-MGs is as follow.***

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Test case** | **Test setup and scenario** | **Purpose of test**  |
| 1 | Event triggered reporting test on SCC with deactivated Scell in FR1 | * CA with Pcell (Cell1) on F1 and deactivated Scell (Cell2) on F2 and unknown neighbor cell (Cell3) on F3
* Both F1, F2 and F3 in FR1
* per-UE or per-FR NCSG
* non-DRX, AWGN
* NCSG pattern: #0 per-UE gap and #2 per-FR gap
* F2 associated with NCSG
* F3 associated with MG
* RS to measure: SSB w/o SBI reporting
* Data scheduled during the whole test
 | * Intra-frequency cell search/measurement delay for deactivated SCC is met for Cell2 in NCSG, and Inter-frequency cell search/measurement delay for Cell3 in MG
* UE receives data in Cell1 meeting scheduling restriction requirements, and
* UE will not cause any interruption on Cell1 outside VIL windows.
 |
| 2 | Event triggered reporting test on SCC with deactivated Scell in FR2 | * Same as in test case 1 except that F1 and F2 are in FR2
* NCSG pattern: #0 per-UE gap and #13 per-FR gap
 | * Same as in test case 1
* Verify the gap collision rule
 |
| 3 | Event triggered reporting test on inter-frequency in FR1 | * Pcell (Cell1) on F1 and unknown inter-frequency neighbor cell (Cell2) on F2 and unknown inter-frequency neighbor cell (Cell3) on F3
* Both F1, F2 and F3 in FR1
* per-UE NCSG and per-FR NCSG
* non-DRX, AWGN
* NCSG pattern: #0 per-UE gap and #2 per-FR gap
* F2 associated with NCSG1
* F3 associated with NCSG2
* RS to measure: SSB w/o SBI reporting
* Data scheduled during the whole test
 | * Inter-frequency cell search delay is met for Cell2 in NCSG1 and Inter-frequency cell search/measurement delay for Cell3 in NCSG2, and
* UE receives data in Cell1 meeting scheduling restriction requirements, and
* Verify the gap collision rule
 |
| 4 | Event triggered reporting test on inter-frequency in FR2 | * Same as in test case 3 except that F1, F2 and F3 are in FR2
* NCSG pattern: #0 per-UE gap and #13 per-FR gap
 | * Same as in test case 3 except no gap collision
 |
| 5 | Event triggered reporting test on intra-frequency in FR1 | * Pcell (Cell1) on F1 and unknown neighbor cell (Cell2) on F2 and unknown inter-frequency neighbor cell (Cell3) on F3
* Both F1, F2 and F3 in FR1
* per-UE or per-FR NCSG,
* non-DRX, AWGN
* NCSG pattern: #0 per-UE gap and #2 per-FR gap
* F2 associated with NCSG1
* F3 associated with NCSG2
* RS to measure: SSB w/o SBI reporting
* Data scheduled during the whole test
 | * Intra-frequency cell search/measurement delay is met for Cell2 in NCSG and Inter-frequency cell search/measurement delay for Cell3 in NCSG, and
* UE receives data in Cell1 meeting scheduling restriction requirements, and
* Verify the gap collision rule
 |
| 6 | Event triggered reporting test on intra-frequency in FR2 | * Same as in test case 5 except that F1 and F2 are in FR2
* NCSG pattern: #0 per-UE gap and #13 per-FR gap
 | * Same as in test case 5 except no gap collision
 |

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| [**R4-2319522**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319522.zip) | China Telecom | **Proposal 1: Test cases for Pre-MG + Pre-MG, and Pre-MG + Type-2 MG shall be defined primarily.****Proposal 2: For Pre-MG + Pre-MG, it’s proposed to design test cases with consideration of simultaneous and non-simultaneous multiple Pre-MGs activation/deactivation, autonomous activation/deactivation and network-controlled activation/deactivation, FR1 and FR2.****Proposal 3: For** **Pre-MG + Type-2 MG, test cases of collision handling for dynamic collisions in scenario 1 can be designed primarily, with consideration of autonomous activation/deactivation and network-controlled activation/deactivation, FR1 and FR2.****Proposal 4: Test cases for NCSG + NCSG, and NCSG + Type-2 MG shall be defined primarily.****Proposal 5: For NCSG + NCSG, test cases for collision between two NCSGs need to be designed in FR1 and FR2.****Proposal 6: For NCSG + Type-2 MG, test cases for collision between NCSG and Type-2 MG need to be designed in FR1 and FR2. Besides, test cases for deactivated SCell measurement via NCSG need to be designed in FR1 and FR2.** |
| [**R4-2319982**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319982.zip) | Huawei, HiSilicon | **Proposal 1: Adopt option 2 as the general principle for defining test cases for Case 1 and Case 2, except the following ones.*** **Do not introduce test cases for intra-freq measurement without gap**
* **Test cases are limited to single serving carrier**
* **Verify gap dropping behaviour without introducing additional test cases**

**Proposal 2: RAN4 to define test cases to verify the following core requirements** **for Case 1.*** **Pre-MG (de)activation**
	+ **Pre-MG (de)activation is based on the associated MO or the associated pre-configured status**
	+ **In non-simultaneous case, the (de)activation delay is same as in Rel-17**
	+ **In simultaneous case, the (de)activation delay is extended by 2ms**
* **Collision handling**
	+ **Deactivated pre-MG is not considered in collision**
	+ **Dynamic collision including at least scenario 1 and 2**

**Proposal 3: RAN4 to define following sets of test case for Case 1.** * **TC set 1: pre-MG + pre-MG, no collision, non-simultaneous (de)activation**
* **TC set 2: pre-MG + pre-MG, no collision, simultaneous (de)activation**
* **TC set 3: pre-MG + type-2 MG, dynamic collision scenario 1**
* **TC set 4: pre-MG + type-2 MG, dynamic collision scenario 2**

**Proposal 4: RAN4 to define test cases to verify the following core requirements for Case 2.*** **Collision definition**
	+ **Total NCSG duration, including both the VILs and the ML are considered in the proximity**
* **[Deactivated SCell measurement**
	+ **Deactivated SCell is measured in NCSG regardless of the gap association]**

**Proposal 5: RAN4 to define following test cases for Case 2.*** **TC1: NCSG + type-2 MG, with collision, FR1**
* **TC2: NCSG + NCSG, with collision, FR1**
* **TC3: NCSG + type-2 MG, with collision, FR2**
* **TC4: NCSG + NCSG, with collision, FR2**
* **[TC5: NCSG + type-2 MG, for deactivated SCC measurement, FR1]**
* **[TC6: NCSG + type-2 MG, for deactivated SCC measurement, FR2]**
 |
| [**R4-2320431**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320431.zip) | ZTE Corporation | **Proposal 1: Regarding the test configurations, the following is preferred:*** **Only define test case for SA mode;**
* **No need to introduce test case for intra-frequency without gap;**
* **Only define test case of non-DRX;**
* **Only consider per-UE + per-UE MGs or per-FR + per-FR MGs configuration**

**Proposal 2: It is preferred to define test cases to verify at least all the following enhancements for Case 1:*** **Collision handling between multiple overlapping MGs**
* **Dynamic collision handling with pre-MG involved in**
* **Priority rule handling without dynamic collision**
* **Multiple activation/deactivation transition procedures**
* **Simultaneous multiple activation/deactivation transition procedures**
* **Non-simultaneous multiple activation/deactivation transition procedures**

**Proposal 3: It is preferred to define test cases to verify at least all the following enhancements for Case 2:*** **No need to consider the parallel measurements**
* **Need to test the priority rule with NCSG configured**
* **The combinations of NCSG+NCSG and NCSG+Type 1/2 MG should be covered in the test cases**
* **No need to test the combination of per-UE+per-FR case.**
 |
| [**R4-2320807**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320807.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1: RAN4 to proceed with option 2 of issue 4-1-1 as baseline for the general configuration.****Proposal 2: RAN4 to proceed with option 4 of issue 4-2-1 as baseline for the topics related to Case 1 test cases and specify tests for collision handling for scenarios 1 to 4.****Proposal 3: RAN4 to proceed with options 2 and 4 of issue 4-2-2 as baseline for Case 1 test cases.****Proposal 4: RAN4 to proceed with option 1 of issue 4-2-3 as baseline for rules for Pre-MG + Pre-MG test cases.****Proposal 5: RAN4 to proceed with option 3 of issue 4-3-1 as baseline for the topics related to Case 2 test cases.****Proposal 6: RAN4 to proceed with options 1 and 3 of issue 4-3-2 as baseline for Case 2 test cases.****Proposal 7: RAN4 to proceed with option 1 of issue 4-3-3 as baseline for rules for NCSG + NCSG test cases.** |
| [**R4-2320906**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320906.zip) | Qualcomm Incorporated | **Observation 1: Test cases for Rel-17 concurrent MG and Rel-17 pre-configured MG may be used as a baseline for Case 1 test cases.****Proposal 1: Prioritize testing Type-2 + Pre-MG.****Proposal 2: If Pre-MG + Pre-MG is tested, prioritize test scenarios without dynamic collisions.****Proposal 3: Deprioritize test scenarios with dynamic collisions.****Proposal 4: If dynamic collisions are tested, test them with Type-2 + Pre-MG.** **Proposal 5: Configure only two MGs in each test case.****Proposal 6: Introduce applicability conditions for Rel-17 concurrent MG and Rel-17 pre-configured MG test cases for a UE that passes the Rel-18 Case 1 test cases.****Observation 2: Test cases for Rel-17 concurrent MG and Rel-17 NCSG may be used as a baseline for Case 2 test cases.****Proposal 7: Prioritize testing NCSG + Pre-MG.****Proposal 8: Configure only two MGs in each test case.****Proposal 9: Introduce applicability conditions for Rel-17 concurrent MG and Rel-17 NCSG test cases for a UE that passes the Rel-18 Case 2 test cases.** |
| [**R4-2320927**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320927.zip) | MediaTek inc. | **Proposal 1: RAN4 shall take the following Rel-17 principles from Concurrent MG as starting point to define test cases for Rel-18 Concurrent MG with Pre-MG/NCSG.*** **Only define test case in NR SA in both FR1 and FR2**
* **Do not introduce the test for L1 impact**
* **Do not introduce test cases for intra-freq measurement without gap**
* **Define a minimum set of test cases for SSB-based measurement**
* **Only define test case under non-DRX**
* **Define test case without SBI reporting.**
* **On SSB-only test cases, RAN4 does not consider simultaneous per-UE gap and per-FR gap configurations**
* **Do not define test cases with simultaneously FR1 and FR2 gaps configured.**
* **Test cases are limited to single serving carrier**
* **Only use mandatory gap patterns to define test cases**
* **Focus on only fully non-overlp and partially partial overlap in the test case design**
* **Verify gap dropping behaviour without introducing additional test cases**

**Proposal 2: RAN4 should consider defining test cases listed in Table 1 and 2 of this contribution.****Table 1: tentative test cases for Case 1**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Test case | Test setup and scenario | Purpose of test |
| 1-1-1 | Event triggered reporting test on intra-frequency in FR1 with concurrent gap and autonomous activation/deactivation of Pre-MG for  | * Pcell (Cell1) on F1
* Unknown neighbor cell (Cell2) on F2
* Unknown neighbor cell (Cell3) on F3
* F1, F2 and F3 in FR1
* non-DRX, AWGN
* RS to measure: SSB w/o SBI reporting
* Data scheduled on Cell1 during the whole test
* MG (#1) with lower priority covers Cell2
* Pre-MG (#2) with higher priority covers Cell3
* MG Overlapping: Partially-fully overlapping
 | * When pre-MG being deactivated at the beginning of testing, UE can report the results of Cell2 within the required period
* Pre-MG activation/deactivation delay
* After pre-MG being activated by UE autonomously, UE can report the results of Cell2 and Cell3 within the required period
 |
| 1-1-2 | Event triggered reporting test on intra-frequency in FR1 with concurrent gap and network-controlled activation/deactivation of Pre-MG for  | * Pcell (Cell1) on F1
* Unknown neighbor cell (Cell2) on F2
* Unknown neighbor cell (Cell3) on F3
* F1, F2 and F3 in FR1
* non-DRX, AWGN
* RS to measure: SSB w/o SBI reporting
* Data scheduled on Cell1 during the whole test
* MG (#1) with lower priority covers Cell2
* Pre-MG (#2) with higher priority covers Cell3
* MG Overlapping: Partially-fully overlapping
 | * When pre-MG being deactivated at the beginning of testing, UE can report the results of Cell2 within the required period
* Pre-MG activation/deactivation delay
* After pre-MG being activated by network-control, UE can report the results of Cell2 and Cell3 within the required period
 |
| 1-1-3 | Event triggered reporting test on intra-frequency in FR2 with concurrent gap and autonomous activation/deactivation of Pre-MG | * Pcell (Cell1) on F1
* Unknown neighbor cell (Cell2) on F2
* Unknown neighbor cell (Cell3) on F3
* F1, F2 and F3 in FR2
* non-DRX, AWGN
* RS to measure: SSB w/o SBI reporting
* Data scheduled on Cell1 during the whole test
* MG (#1) with lower priority covers Cell2
* Pre-MG (#2) with higher priority covers Cell3
* MG Overlapping: Partially-fully overlapping
 | * When pre-MG being deactivated at the beginning of testing, UE can report the results of Cell2 within the required period
* Pre-MG activation/deactivation delay
* After pre-MG being activated by UE autonomously, UE can report the results of Cell2 and Cell3 within the required period
 |
| 1-1-3 | Event triggered reporting test on intra-frequency in FR2 with concurrent gap and network-controlled activation/deactivation of Pre-MG | * Pcell (Cell1) on F1
* Unknown neighbor cell (Cell2) on F2
* Unknown neighbor cell (Cell3) on F3
* F1, F2 and F3 in FR2
* non-DRX, AWGN
* RS to measure: SSB w/o SBI reporting
* Data scheduled on Cell1 during the whole test
* MG (#1) with lower priority covers Cell2
* Pre-MG (#2) with higher priority covers Cell3
* MG Overlapping: Partially-fully overlapping
 | * When pre-MG being deactivated at the beginning of testing, UE can report the results of Cell2 within the required period
* Pre-MG activation/deactivation delay
* After pre-MG being activated by network-control, UE can report the results of Cell2 and Cell3 within the required period
 |

Regarding the test case list for Case 2, we provide out tentative list as below:**Table 2: tentative test cases for Case 2**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Test case | Test setup and scenario | Purpose of test |
| 1-1-1 | Event triggered reporting test on intra-frequency in FR1 with concurrent gap and NCSG | * Pcell (Cell1) on F1
* Unknown neighbor cell (Cell2) on F2
* Unknown neighbor cell (Cell3) on F3
* F1, F2 and F3 in FR1
* non-DRX, AWGN
* RS to measure: SSB w/o SBI reporting
* Data scheduled on Cell1 during the whole test
* MG (#1) with lower priority covers Cell2
* NCSG (#2) with higher priority covers Cell3
* MG Overlapping: Partially-fully overlapping
 | * UE can report the results of Cell2 and Cell3 within the required period
 |
| 1-1-2 | Event triggered reporting test on intra-frequency in FR2 with concurrent gap and NCSG | * Pcell (Cell1) on F1
* Unknown neighbor cell (Cell2) on F2
* Unknown neighbor cell (Cell3) on F3
* F1, F2 and F3 in FR2
* non-DRX, AWGN
* RS to measure: SSB w/o SBI reporting
* Data scheduled on Cell1 during the whole test
* MG (#1) with lower priority covers Cell2
* NCSG (#2) with higher priority covers Cell3
* MG Overlapping: Partially-fully overlapping
 | * UE can report the results of Cell2 and Cell3 within the required period
 |

 |

## Open issues summary

*Before Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 5-1: Performance principles for Case 1 and Case 2

*Sub-topic description: This sub-topic provides general principles for performance part.*

*Moderator’s note: In this meeting, the focus to resolve remaining Rel-17 MGE maintenance, which could impact Rel-18 discussion. Then, the discussion will continue to complete remaining issues from core part MGE-2. If time allows, we can discuss the principles for performance part. Yet, it is more important to ensure high quality CR rather than pushing to complete the performance part. Therefore, some proposals from multiple companies are not addressed in the following issues because they are very detailed.*

**Issue 5-1-1: Which general configuration shall be defined for the test cases?**

* Proposals
	+ Option 1: E///, MTK, [partially Huawei excluding the highlighted ones], Nokia
		- Only define test case in NR SA in both FR1 and FR2: support
		- Do not introduce the test for L1 impact: support
		- Do not introduce test cases for intra-freq measurement without gap: [Not support, both intra-frequency inter-frequency, and deactivated SCell measurement shall be introduced]
		- Define a minimum set of test cases for SSB-based measurement: support
		- Only define test case under non-DRX: support
		- Define test case without SBI reporting: support
		- On SSB-only test cases, RAN4 does not consider simultaneous per-UE gap and per-FR gap configurations: support
		- Do not define test cases with simultaneously FR1 and FR2 gaps configured: support
		- Test cases are limited to single serving carrier: support
		- Only use mandatory gap patterns to define test cases: support
		- Focus on only fully non-overlp and partially partial overlap in the test case design: support
		- Verify gap dropping behaviour without introducing additional test cases: support
	+ Option 2: Apple
		- Only inter-frequency measurement
		- Only non-DRX
		- without SSB time index detection
		- Only define test case in NR SA in both FR1 and FR2
		- Do not introduce the test for L1 impact
		- Do not introduce test cases for intra-freq measurement without gap
		- Define a minimum set of test cases for SSB-based measurement
		- On SSB-only test cases, RAN4 does not consider simultaneous per-UE gap and per-FR gap configurations
		- Do not define test cases with simultaneously FR1 and FR2 gaps configured.
		- Test cases are limited to single serving carrier
		- Only use mandatory gap patterns to define test cases
		- Focus on only partially partial overlap in the test case design
	+ Option 3: ZTE
		- Only define test case for SA mode;
		- No need to introduce test case for intra-frequency without gap;
		- Only define test case of non-DRX;
		- Only consider per-UE + per-UE MGs or per-FR + per-FR MGs configuration
	+ Option 4: Xiaomi
		- It is necessary to define the test cases for NR standalone scenario only;
		- Test cases for SSB measurement with Pre-MG shall be defined at least
		- Test cases for the intra-frequency with Pre-MG gap can be defined with high priority
		- In Rel18, the test cases under single carrier when the pre-MG activation is based on UE autonomous pre-MG activation shall be defined
		- BWP switching trigger event can be tested ONLY
		- Non-DRX cases will be tested only in Rel18
		- Only the test case when the colliding happened needs to be defined. And in the test case for colliding, the separated sub test cases with different Pre-MG priority can be considered
* Recommended WF
	+ Discuss the issue.

**Issue 5-1-2: Testing procedure**

* Proposals
	+ Option 1: Xiaomi
		- RAN4 can use the testing procedure below to reduce the overall testing efforts for Pre-MG and Concurrent MGs testing.

|  |
| --- |
| The testing procedure for measurements by Pre-MG which is transited from **deactivation to activation** can consist of three successive time periods, with time durations of T1, T2 and T3 respectively. * During the duration of T1, UE can be configured with Pre-MG but being deactivated and the other Type2 MG within concurrent MGs. The configuration of them can be:
	+ The periodicity of Pre-MG and Type2 MG can be Ttype2MG =2\* TpreMG
	+ The occasion of Type2 MG can be fully overlapped with these of Pre-MG
	+ Pre-MG activated has higher priority than that of Type2 MG
* At the start of time duration T1, Pre-MG was configured but not activated. The measurements with Type2 MG will be prioritized while colliding with Pre-MG deactivated and the reporting delay will be tested. The measurement results by Pre-MG deactivated will be reported based on the occasions which is not collided with other Pre-MG/MGs.
* At the start of time duration T2, the serving gNB can trigger Pre-MG activation. And UE is expected to complete the Pre-MG activation within T2.
* The dynamic collision rule shall be verified within T2. For an example, the measurement by Type2 MG will be kept during T2.
* At the start of time duration T3, Pre-MG shall be activated.
* During T3, Type2 MG will be dropped because it was collided with the activated Pre-MGs. The measurement by Pre-MG activated will be tested only.

The testing procedure for measurements by Pre-MG which is transited from **activation to deactivation** can also consist of three successive time periods, with time durations of T1, T2 and T3 respectively. * During the duration of T1, UE can be configured with Pre-MG but being activated and the other Type2 MG within concurrent MGs. The configuration of them can be:
	+ The periodicity of Pre-MG and Type2 MG can be Ttype2MG =2\* TpreMG
	+ The occasions of Type2 MG can be fully overlapped with these of Pre-MG
	+ Pre-MG activated has higher priority than that of Type2 MG
* At the start of time duration T1, Pre-MG was configured and activated. The measurements with Pre-MG will be prioritized when colliding with other MGs and the reporting delay will be tested. The measurements with Pre-MG deactivated will be reported based on the occasion which is not collided with other MGs.
* At the start of time duration T2, the serving gNB can trigger Pre-MG activation. And UE is expected to complete the Pre-MG activation within T2.
* The dynamic collision rule defined in Rel18 can be verified within T2
* During T2, Pre-MG can be deactivated.
* During T3, the deactivated Pre-MGs collide Type2 MGs will be dropped.
	+ The gapless measurement on MO which is associated with Pre-MG will be tested ONLY.
 |

### Sub-topic 5-2: Test cases for Case 1

*Sub-topic description: This sub-topic covers test cases for Case 1.*

*Open issues and candidate options before meeting:*

**Issue 5-2-1: [Case 1] Which topics shall RAN4 RRM define test cases for Pre-MG and concurrent MG (Case 1)**

* Proposals
	+ Option 1: CMCC,
		- Pre-MG + Pre-MG, Pre-MG + Type-2 MG and Pre-MG + Type-1 MG.
	+ Option 2: E///, China Telecom
		- Pre-MG + Pre-MG, Pre-MG + Type-2 MG.
	+ Option 3: Nokia
		- Concurrent MG and 1 Pre-MG activation / deactivation in same FR
		- Pre-MGs with activation / deactivation in the same FR.
	+ Option 4: QC
		- Prioritize testing Type-2 + Pre-MG
		- If Pre-MG + Pre-MG is tested, prioritize test scenarios without dynamic collisions
		- Deprioritize test scenarios with dynamic collisions
		- If dynamic collisions are tested, test them with Type-2 + Pre-MG
		- Configure only two MGs in each test case
	+ Option 5: HW
		- Pre-MG (de)activation
			* Pre-MG (de)activation is based on the associated MO or the associated pre-configured status
			* In non-simultaneous case, the (de)activation delay is same as in Rel-17
			* In simultaneous case, the (de)activation delay is extended by 2ms
		- Collision handling
			* Deactivated pre-MG is not considered in collision
			* Dynamic collision including at least scenario 1 and 2
* Recommended WF
	+ Discuss the options.

### Sub-topic 5-3: Test cases for Case 2

*Sub-topic description: This sub-topic covers test cases for Case 2.*

*Open issues and candidate options before meeting:*

**Issue 5-3-1: [Case 2] Which topics shall RAN4 RRM define test cases for NCSG and concurrent MG (Case 2)**

* Proposals
	+ Option 1: CMCC,
		- NCSG + NCSG, NCSG + Type-2 MG and NCSG + Type-1 MG.
	+ Option 2: E///, China Telecom
		- NCSG + NCSG, NCSG + Type-2 MG.
	+ Option 3: Nokia
		- 1 Concurrent MG and 1 NCSG in the same FR
		- 2 NCSGs (non-overlapping) in the same FR
		- Measurement for deactivated SCells with 1 Concurrent MG (w/o gap or with NCSG, as being discussed for Rel-17 maintenance).
	+ Option 4: HW
		- Collision definition
			* Total NCSG duration, including both the VILs and the ML are considered in the proximity
		- [Deactivated SCell measurement
			* Deactivated SCell is measured in NCSG regardless of the gap association]
	+ Option 5: QC
		- Prioritize testing NCSG + Pre-MG
* Recommended WF
	+ Discuss the options.

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