**3GPP TSG-RAN WG4 Meeting # 109 R4-2321324**

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

**Agenda item:** 8.9.6

**Source:** MediaTek inc.

**Title:** Ad-hoc minutes for NR and MR-DC measurement gaps and measurements without gaps WI

**Document for:** Information

# Introduction

This is the ad-hoc minutes for ad-hoc session for NR and MR-DC measurement gaps and measurements without gaps WI.

# [109][202] Maintenance\_R17\_R18 – MG part

*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.

Discussions

Ad-hoc chair: A summary of all sections with scheduling restriction requirements is as follows

|  |  |  |
| --- | --- | --- |
| Section | For requirements | Note |
| 9.2.5.3 | Intra-freq meas wo gap | Added in R15 |
| 9.2.7.3 | Intra-freq meas w/ NCSG (fully overlapped case) | Added in R17 |
| 9.3.9.3 | Inter-freq meas wo gap (SSB in BWP) | Added in R16 |
| 9.3.9.4 | Inter-freq meas wo gap | Added in R17  Extended to NFG in [R4-2320488](file:///D:\docs\RP-2320488.zip) (QC) |
| 9.3.10.3 | Inter-freq meas for nogap-noncsg | Added in [R4-2318494](file:///D:\docs\RP-2318494.zip) (MTK) |
| 9.4.3.5 | Inter-RAT meas w/ NCSG | Added in R17 |

Tentative agreements

**Issue 4-1-2: [Rel-17] Whether scheduling restriction due to mixed numerology applies for inter-RAT E-UTRA measurement that are performed within NCSG?**

* Proposals
  + Option 1: from Huawei CR [R4-2319971]
    - Yes, scheduling restriction applies, similar to scheduling restriction for inter-frequency measurement defined in clause 9.3.10.3.2
  + Option 2:
    - No, scheduling restriction does not apply.
* Recommended WF
  + Discuss the issue

**Discussions**

Ad-hoc chair: Does this CR have dependency to Rel-18 CRs?

**Tentative agreements**

**Issue 4-1-3: [Rel-17, Rel-18] Whether to introduce a new structure to define the intra/inter-frequency measurements without measurement gaps?**

* Proposals
  + Option 1: from CR [R4-2319154]
    - Yes, and discuss details in the CR directly.
    - Related CR for R18 NFG [QC, [R4-2320488](file:///D:\\docs\\RP-2320488.zip)] for R18 inter-f frequency measurement
  + 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.

**Discussions**

Ad-hoc chair: The CR targets to address the following scenario, which needs max{MGRP, SMTC} in the delay requirement. However, this max{} structure was not introduced in Section 9.2.5 and 9.3.9.



**Tentative agreements**

## 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.

**Discussions**

Ad-hoc chair’s understanding as below. Please check

* Option 1 (depends on intraFreq-needForNCSG report) means UE should only report NCSG, only if UE can do measurements via NCSG for both 1) deactivated SCell and 2) activated Scell with SSB outside BWP. Then, in in the related Rel-18 issues, UE always follow the network’s gap association to choose the GAP for measurement.
* Option 2 (agnostic to intraFreq-needForNCSG report) means UE can report NCSG only based on whether UE can do measurements via NCSG for 2) activated Scell with SSB outside BWP. Then, in the related Rel-18 issue, UE does not need to follow association when Scell is deactivated.

**Tentative agreements**

**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.

**Discussions**

**Tentative agreements**

# [109][211] NR\_MG\_enh2\_part2

## Sub-topic 1-1 General definitions

**Issue 1-1-1: Tcycle definition on a certain configured carrier i: lower bound 80ms.**

* ***Background***
  + ***Tcycle is used for interruption requirements specification implementation.***
  + ***The UE is allowed to cause a certain interruption length every Tcycle period.***
  + ***Interruption requirements are specified per serving cell/per UE not per MO or per frequency layer.***
  + Agreements
    - Tcycle per MO/frequency layer is the same as UE measurement cycle.
  + Previous agreement: When MG is configured and overlapped with some of the SMTC occasions on carrier i, interruption is not allowed and all the measurements with interruptions are carried out within the configured MG.
* Proposals
  + Option 1: Tcycle,i = scaling factors \* max (80ms, SMTC period).
  + Option 2: Tcycle,i = max (80ms, scaling factors \* SMTC period).
  + Option 3: Tcycle = max(80ms, SMTCmin), where SMTCmin is smallest SMTC among multiple MO/frequency layers.
* Recommended WF
  + Discuss on following options:
  + Option 1
    - Tcycle,i = (CSSFintra or CSSFinter) \* max (80ms, SMTC period).
      * This applies to the interruption cycle when MG is either not configured or not overlapped with any SMTC occasions on carrier i.
      * This applies when DRX is not configured.
    - Tcycle,i = (CSSFintra or CSSFinter) \* max (80ms, SMTC period, DRX cycle).
      * This applies to the interruption cycle when MG is either not configured or not overlapped with any SMTC occasions on carrier i.
      * This applies when DRX is configured and DRX cycle is applied when interruption is allowed according to RAN4 conclusions.
  + Option 2
    - Tcycle = max(80ms, SMTCmin), where SMTCmin is smallest SMTC among multiple MO/frequency layers
      * This applies when DRX is not configured.
    - Tcycle = max(80ms, SMTCmin, DRXcycle)
      * This applies when DRX is configured and DRX cycle is applied when interruption is allowed according to RAN4 conclusions.
  + Option 3
    - Tcycle,i = (CSSFintra or CSSFinter) \* max (80ms, max(SMTC period, MGRP)).
      * This applies to the interruption cycle when MG is configured and partially or fully overlapped with SMTC occasions on carrier i.
      * This applies when DRX is not configured.

**Discussions**

Ad-hoc chair: Please companies check the definition of Tcycle,i is (Note: this issue is also related to Issue 1-2-2)

* UE is only allowed to cause one pair (for RF re-tuning to and back) of interruptions during Tcycle,i due to measurement for MO I which needs interruption
* E.g., 4 inter-freq layers (A,B,C,D) with SMTC=20ms. Two (A,B) needs interruption and two (C,D) do not. Tcycle,i = 80ms x 4. While during 320ms, only 2 pairs of interruptions are allowed.

**Tentative agreements**

**Issue 1-1-2: Kp definition for interruption requirements**

* ***Background***
  + ***Kp is the scaling factor introduced in legacy releases, applied to the cases where the target SSB is within the UE active bandwidth part and measurement gap is not needed in nature, but since measurement gap is configured the measurements only happen outside gap occasions; Kp is calculated by dividing the total number of SMTCs by available SMTC number outside gap during window length max(SMTC, MGRP); Kp = 1 when SMTC occasion is always overlapped with gap.***
  + ***For interruption requirements, since either the measurements with interruptions are carried out within measurement gap or SMTC is not overlapped with any gap occasions, Kp is not needed.***
* Recommended WF
  + Continue discussion.

**Discussions**

Ad-hoc chair: Can we directly discuss Issue 1-1-3?

**Tentative agreements**

**Issue 1-1-3: Kp definition for measurement periods when measurement gap is configured**

* ***Background***
  + ***Kp is the scaling factor introduced in legacy releases, applied to the cases where the target SSB is within the UE active bandwidth part and measurement gap is not needed in nature, but since measurement gap is configured the measurements only happen outside gap occasions; Kp is calculated by dividing the total number of SMTCs by available SMTC number outside gap during window length max(SMTC, MGRP); Kp = 1 when SMTC occasion is always overlapped with gap.***
* Proposals
  + ***Option 1:*** 
    - **A measurement is only defined as measurement outside gap if the SMTC does not overlap with GAP, otherwise the requirements with measurement gap apply and no interruptions are allowed**.
    - **Do not consider measurement delay extension when GAP overlaps with SMTC.**
    - ***Do not apply Kp to Tcycle or measurement period.***
  + ***Option 2:*** 
    - Apply Kp in general to measurement period requirements.
    - Kp = 1 when any one/set of the below conditions is met
      * Measurement gap is not configured.
      * Measurement gap is configured, and measurement gaps are fully overlapped with the SMTC occasions.
      * Measurement gap is configured, and measurement gaps are not fully overlapped with SMTC occasions, and measurements are with interruption, and all measurements are carried out within measurement gaps.
    - Otherwise Kp = (total number of SMTC periods) / (number of available SMTC periods outside gap) within time period (max (SMTC period, MGRP)).
* Recommended WF
  + - More discussion needed.

**Discussions**

**Tentative agreements**

## Sub-topic 1-2 Interruption requirements

**Issue 1-2-1: Specify total interruption ratio requirements in equation format to replace the texts below in the spec:**

**‘** UE is allowed to cause interruption on a certain frequency layer i:

- up to [2.50%] probability of missed ACK/NACK when 80ms ≤ Tcycle,i < 160ms, or

- up to [1.25%] probability of missed ACK/NACK when 160ms ≤ Tcycle,i < 320ms, or

- up to [0.625%] probability of missed ACK/NACK when 320ms ≤ Tcycle,i. ’

* ***Background***
  + ***The texts were part of agreements reached in one of the early meetings of discussions. The idea was to replace the bullets with equation format requirements.***
    - ***‘Interruption ratio is defined as follows:*** 
      * ***80ms ≤ Tcycle < 160ms: up to [2.50%] probability of interruption***
      * ***160ms ≤ Tcycle < 320ms: up to [1.25%] probability of interruption***
      * ***320ms ≤ Tcycle: up to [0.625%] probability of interruption***
      * ***FFS if the interruption rate can be captured in equation format’.***
  + ***Equation format interruption ratio was agreed to be implemented in the spec if possible, but the interruption ratio function was not endorsed in the last meeting.***
* Proposals
  + Option 1: Remove the texts after accurate equation format total interruption ratio is specified.
    - Option 1a: interruption ratio of single frequency layer equals 2\*L/Tcycle,i
* Recommended WF
  + Agree on option 1.

**Discussions**

**Tentative agreements**

**Issue 1-2-2: Total interruption ratio considering maximum 2L interruption caused every time UE carries out measurements**

* ***Background***
  + Proposals in the last meetings
    - Option 1: Sum among all possible maximum interruptions caused on applicable carriers during a pre-defined window, and
      * Specify the window length and calculate the exact maximum interruption length.
      * Total interruption ratio is the total sum divided by window length.
    - Option 2: Do not sum up but to consider the smallest Tcycle,i among all applicable carriers, and
    - Total interruption ratio is 2L divided by smallest Tcycle,i among all applicable carriers.
  + Agreement:
    - Take option 1 as baseline for CR drafting and go with option 2 if option 1 is not feasible from CR draft perspective.
* Proposals
  + Option 1: Total interruption ratio = where N is number of layers and L is single interruption length
  + Option 2: Total interruption ratio = , where
    - N is number of carriers which are measured with interruption,
    - M is total number of carriers which are measured outside MG, including carriers that are measured with and without interruption,
  + Option 3: Total interruption ratio is the sum of interruption ratio of individual frequency layers with interruption.
* Recommended WF
  + Discuss the candidate options.

**Discussions**

**Tentative agreements**

**Issue 1-2-3: Definition of measurements without gaps and cases with interruptions:**

* Proposals
  + Proposal 1: Discuss the definition of measurements without gaps for the cases below:
    - Case 1: Intra frequency with SSB contained within active BWP
    - Case 2: Intra frequency with SSB not contained withing the active BWP
    - Case 3: Inter frequency with SSB contained within active BWP
    - Case 4: Inter frequency with SSB not contained within active BWP
  + Proposal 2: A measurement is only defined as measurement outside gap if the SMTC does not overlap with GAP, otherwise the requirements with measurement gap apply and no interruptions are allowed.
  + Proposal 3: For Case 1, measurements are always performed without gaps, and no interruptions are allowed, if the SMTC does not overlap with GAP.
  + Proposal 4: For Case 2, measurements are always performed without gaps if
    - the SMTC does not overlap with GAP, and
    - the UE indicates ‘no-gap’ via intraFreq-needForGap, or the UE indicates ‘nogap-noncsg’ via NeedForGapNCSG-InfoNR
  + Proposal 5: For case 3, measurements are always performed without gaps, and no interruptions are allowed, if
    - the SMTC does not overlap with GAP, and
    - the UE supports interFrequencyMeas-Nogap-r16, or the UE indicates ‘no-gap’ via interFreq-needForGap, or the UE indicates ‘nogap-noncsg’ via NeedForGapNCSG-InfoNR
  + Proposal 6: For case 4, measurements are always performed without gaps if
    - the SMTC does not overlap with GAP, and
    - the UE indicates ‘no-gap’ via interFreq-needForGap, or the UE indicates ‘nogap-noncsg’ via NeedForGapNCSG-InfoNR

**Discussions**

Ad-hoc chair: Figures for Cases 1, 2, 3 and 4



**Tentative agreements**

## Sub-topic 1-3 Measurement reporting delay requirements

* **Case 1:** without gap and no interruption
* **Case 2:** without gap but interruption allowed

**Issue 1-3-1: Measurement sample number for PSS/SSS detection without AGC**

* Proposals
  + Option 1: 5.
* Recommended WF
  + Agree on 5.

**Discussions**

**Tentative agreements**

**Issue 1-3-2: Measurement sample number for Measurements without AGC**

* Proposals
  + Option 1: 5.
* Recommended WF
  + Agree on 5.

**Discussions**

**Tentative agreements**

**Issue 1-3-3: Measurement sample number for SSB index detection without AGC**

* Proposals
  + Option 1: 3.
* Recommended WF
  + Agree on 3.

**Discussions**

**Tentative agreements**

**Issue 1-3-4: Measurement sample number when AGC is needed**

* Proposals
  + Option 1: 3 samples are added.
* Recommended WF
  + Agree on additional 3.

Discussions

Tentative agreements

**Issue 1-3-5: Lower bounds**

* Proposals
  + Option 1: reuse all existing values.
  + Option 2: other values.
* Recommended WF
  + Agree on option 1.

Discussions

Tentative agreements

**Issue 1-3-6: Conditions when ACG is needed.**

* Proposals
  + Option 1: Additional ACG samples are only needed for inter-frequency measurement requirements if the SSB is not completely contained in the active BWP of the UE.
* Recommended WF
  + Discussion needed.

Discussions

Tentative agreements

## Sub-topic 1-4 DRX specific issues

**Issue 1-4-1: Interruption caused when DRX is configured larger than 320ms**

* Proposals
  + Option 1: No interruption is expected when DRX is configured larger than 320ms on the serving cell.
  + Option 2: Interruption is allowed, and it is according to Tcycle,i.
  + Option 3: No interruption is expected during DRX activity time, including DRX ON duration extended by inactivity-timer after each PDCCH reception.
* Recommended WF
  + Discussion needed.

**Issue 1-4-2: Interruption caused when DRX is configured smaller than 320ms**

* Proposals
  + Option 1: No interruption is expected when SMTC is during DRX-off and UE uses such SMTC to measure NFG measurements with interruption on a certain MO; otherwise interruption is allowed.
  + Option 2: Interruption is always allowed, and it is according to Tcycle,i.
  + Option 3: No interruption is expected during DRX activity time, including DRX ON duration extended by inactivity-timer after each PDCCH reception.
* Recommended WF
  + Discussion needed.

**Issue 1-4-3: Scaling factor 1.5**

* ***Background***
  + ***1.5 is to address frequent measurements in legacy releases when DRX cycle length is smaller than 320ms.***
* Proposals
  + Option 1: Apply 1.5.
* Recommended WF
  + Discussion needed.

## Sub-topic 1-5 Others

**Issue 1-5-1: 1-to-1 mapping between NeedForGaps and NCSG capabilities**

* Proposals
  + Option 1: NeedForGaps and NCSG are not expected to be enabled for the same UE at the same time and there is No need to establish the mapping between UE’s indication for NeedForGaps and NCSG.
* Recommended WF
  + Agree on option 1.
  + Send an LS to RAN2 about RAN4 agreements.

**Issue 1-5-2: NFG with concurrent gaps**

* Proposals
  + Option 1: When UE supports NFG and Con-MGs, and NW configures the Con-MGs, NFG MO will be performed within the associated MG in the following scenarios:
    - when the MO belongs to a band in which UE reports ‘nogap-nointerruption’ and all of the SMTC occasions of this MO are overlapped by the associated measurement gap
    - when the MO belongs to a band in which UE reports ‘nogap-interruption’ and part or all of the SMTC occasions of this MO are overlapped by the associated measurement gap
* Recommended WF
  + Not to reflect the discussions in the spec.

**Issue 1-5-3: Difference between R16** **inter-frequency measurement without MG and NFG**

* ***Background***

Table 1 difference between Rel 16 inter-frequency measurement without MG and NFG

|  |  |  |
| --- | --- | --- |
|  | **Rel 16 inter-frequency measurement without MG** | **NFG** |
| **Scenario** | Inter-frequency measurement without gap is support when SSB is completely contained in the active BWP of the UE | Inter-frequency measurement without gap is support when there is spare RF chain |
| **UE capability** | Per-UE capability: *interFrequencyMeas-NoGap-r16*   * According TS 38.306, this capability indicates whether the UE can perform inter-frequency SSB based measurements without measurement gaps if the SSB is completely contained in the active BWP of the UE | Per-band capability: *NeedForGap*   * Indicates whether the UE supports reporting the measurement gap requirement information for NR target in the UE response to a network configuration RRC message. |
| **Interruption** | No interruption, since SSB is within active BWP | Based on UE capability:   * NFG without interruption * NFG with interruption |
| **Delay requirements** | Taking PSS/SSS detection as an example, the number of sample is 5, AGC is not needed | Taking PSS/SSS detection as an example, even the number of sample is FFS, but the number may be larger than 5, since AGC is needed when SSB is not in the active BWP |

* Proposals
  + Option 1: it is proposed to follow the similar approach as for Rel-15 intra-frequency measurement: when the target SSB is completely contained in active BWP of UE, apply the requirements on Rel-16 inter-frequency measurement without gap without interruption when UE supports interFrequencyMeas-NoGap-r16, regardless of the NeedForGaps’ status reporting.
* Recommended WF
  + Discuss if there is impact on the spec from this issue.
  + The moderator’s observation is that the differences are clear to the group in technical aspects.

**Issue 1-5-4: Specification structure**

* Proposals
  + Update clauses 9.2.1 and 9.3.1 to determine the cases where measurements without gaps apply, including:
    - Measurement is performed within gap, if SMTC partially or fully overlaps with GAP.
* Recommended WF
  + Discussion needed

# [109][210] NR\_MG\_enh2\_part1

**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.

Discussions

Tentative agreements

**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 2a: OPPO
    - The MO associated with Pre-MG1 is not allowed to be measured with activated Pre-MG2/Type-2 MG without explicated signalling.
  + 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

Discussions

Tentative agreements

## Sub-topic 1-4 DRX specific issues

**Issue 1-4-1: Interruption caused when DRX is configured larger than 320ms**

* Proposals
  + Option 1: No interruption is expected when DRX is configured larger than 320ms on the serving cell.
  + Option 2: Interruption is allowed, and it is according to Tcycle,i.
  + Option 3: No interruption is expected during DRX activity time, including DRX ON duration extended by inactivity-timer after each PDCCH reception.
* Recommended WF
  + Discussion needed.

Discussions

Tentative agreements

**Issue 1-4-2: Interruption caused when DRX is configured smaller than 320ms**

* Proposals
  + Option 1: No interruption is expected when SMTC is during DRX-off and UE uses such SMTC to measure NFG measurements with interruption on a certain MO; otherwise interruption is allowed.
  + Option 2: Interruption is always allowed, and it is according to Tcycle,i.
  + Option 3: No interruption is expected during DRX activity time, including DRX ON duration extended by inactivity-timer after each PDCCH reception.
* Recommended WF
  + Discussion needed.

Discussions

Tentative agreements

**Issue 1-4-3: Scaling factor 1.5**

* ***Background***
  + ***1.5 is to address frequent measurements in legacy releases when DRX cycle length is smaller than 320ms.***
* Proposals
  + Option 1: Apply 1.5.
* Recommended WF
  + Discussion needed.

Discussions

Tentative agreements

## Sub-topic 1-5 Others

**Issue 1-5-1: 1-to-1 mapping between NeedForGaps and NCSG capabilities**

* Proposals
  + Option 1: NeedForGaps and NCSG are not expected to be enabled for the same UE at the same time and there is No need to establish the mapping between UE’s indication for NeedForGaps and NCSG.
* Recommended WF
  + Agree on option 1.
  + Send an LS to RAN2 about RAN4 agreements.

Discussions

Tentative agreements

**Issue 1-5-2: NFG with concurrent gaps**

* Proposals
  + Option 1: When UE supports NFG and Con-MGs, and NW configures the Con-MGs, NFG MO will be performed within the associated MG in the following scenarios:
    - when the MO belongs to a band in which UE reports ‘nogap-nointerruption’ and all of the SMTC occasions of this MO are overlapped by the associated measurement gap
    - when the MO belongs to a band in which UE reports ‘nogap-interruption’ and part or all of the SMTC occasions of this MO are overlapped by the associated measurement gap
* Recommended WF
  + Not to reflect the discussions in the spec.

Discussions

Tentative agreements

**Issue 1-5-3: Difference between R16** **inter-frequency measurement without MG and NFG**

* ***Background***

Table 1 difference between Rel 16 inter-frequency measurement without MG and NFG

|  |  |  |
| --- | --- | --- |
|  | **Rel 16 inter-frequency measurement without MG** | **NFG** |
| **Scenario** | Inter-frequency measurement without gap is support when SSB is completely contained in the active BWP of the UE | Inter-frequency measurement without gap is support when there is spare RF chain |
| **UE capability** | Per-UE capability: *interFrequencyMeas-NoGap-r16*   * According TS 38.306, this capability indicates whether the UE can perform inter-frequency SSB based measurements without measurement gaps if the SSB is completely contained in the active BWP of the UE | Per-band capability: *NeedForGap*   * Indicates whether the UE supports reporting the measurement gap requirement information for NR target in the UE response to a network configuration RRC message. |
| **Interruption** | No interruption, since SSB is within active BWP | Based on UE capability:   * NFG without interruption * NFG with interruption |
| **Delay requirements** | Taking PSS/SSS detection as an example, the number of sample is 5, AGC is not needed | Taking PSS/SSS detection as an example, even the number of sample is FFS, but the number may be larger than 5, since AGC is needed when SSB is not in the active BWP |

* Proposals
  + Option 1: it is proposed to follow the similar approach as for Rel-15 intra-frequency measurement: when the target SSB is completely contained in active BWP of UE, apply the requirements on Rel-16 inter-frequency measurement without gap without interruption when UE supports interFrequencyMeas-NoGap-r16, regardless of the NeedForGaps’ status reporting.
* Recommended WF
  + Discuss if there is impact on the spec from this issue.
  + The moderator’s observation is that the differences are clear to the group in technical aspects.

Discussions

Tentative agreements

**Issue 1-5-4: Specification structure**

* Proposals
  + Update clauses 9.2.1 and 9.3.1 to determine the cases where measurements without gaps apply, including:
    - Measurement is performed within gap, if SMTC partially or fully overlaps with GAP.
* Recommended WF
  + Discussion needed

Discussions

Tentative agreements

# UE feature list

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

* Proposals
  + Option 1: Xiaomi

|  |  |  |
| --- | --- | --- |
| **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 |
|  |  |  |
| 32-2-2 | Concurrent NCSGs in a FR | FFS: Whether to consider an additional capability for NCSG + NCSG in an FR |

* + Option 2: Intel

|  |  |  |
| --- | --- | --- |
| **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

|  |  |  |
| --- | --- | --- |
| **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

|  |  |  |
| --- | --- | --- |
| **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

|  |  |  |
| --- | --- | --- |
| **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

|  |  |  |
| --- | --- | --- |
| **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

|  |  |  |
| --- | --- | --- |
| **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