**3GPP TSG-RAN WG4 Meeting # 111 R4-240xxxx**

**Fukuoka City, Fukuoka, Japan, May 20 – 24, 2024**

**Agenda item:** 7.5.5

**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.

The MGE related feature in agreed feature list R4-2406680 is captured below for information.

Table 1: Rel-18 NR UE features for NR\_MG\_enh2 WI.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **Consequence if the feature is not supported by the UE** | **Type** | **Need of FDD/TDD diff** | **Need of FR1/FR2 diff** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 32-1 | Concurrent gaps with Pre-MG in a FR | Support of multiple per-UE (or per-FR) measurement gap patterns with at least one per-UE (or per-FR) Pre-MG. Details in Clause [9.1.x.2] of TS 38.133. | 19-3-x and 19-2  x = 1 or 2 | Yes | No | UE behaviour is undefined if the network configures concurrent MGs where at least one of the gaps is a Pre-MG | Per UE | No | No | N.A |  | Optional with capability signalling |
| 32-2 | Support for dynamic collisions | Support RRM requirements for handling dynamic collisions between a Pre-MG and another measurement gap or Pre-MG. | 32-1 | Yes | No | UE is not expected to meet RRM requirements for dynamic collisions | Per UE | No | No | N.A |  | Optional with capability signalling |
| 32-3 | Concurrent gaps with NCSG in a FR | Support of multiple per-UE (or per-FR) measurement gap patterns with at least one per-UE (or per-FR) NCSG. Details in clause [9.1.y.2] of TS 38.133. | 19-1 and 19-2 | Yes | No | UE behaviour is undefined if the network configures concurrent MGs where at least one of the gaps is a NCSG | Per UE | No | No | N.A |  | Optional with capability signalling |
| 32-4 | Inter-RAT EUTRAN measurements without gap and outside active DL BWP | Support inter-RAT EUTRAN measurements outside active DL BWP for nogap-noncsg | 19-1b | Yes | NA | UE does not meet the requirements of inter-RAT EUTRAN measurements without gap in TS 38.133 and the UE behavior is unknown to network | Per UE | No | No | N.A |  | Optional with capability signalling |
| 32-5 | Inter-RAT EUTRAN measurement without gap and within active DL BWP | Support of inter-RAT EUTRAN measurements without gap when CRS is contained within UE’s active DL BWP |  | Yes | No | Measurement gap will be needed for inter-RAT EUTRAN measurements | Per UE | No | FR1 only | N.A |  | Optional with capability signalling |
| 32-6 | Effective measurement window for inter-RAT EUTRAN measurements | Support configuration of effective measurement window for inter-RAT EUTRAN measurements, including offset, duration and periodicity. | 32-4 or 32-5 | Yes | No | UE is not allowed to cause scheduling restriction defined in TS 38.133 for 32-6 or 32-7 | Per UE | No | No | N.A | * A bitmap for 6 effective measurement window (EMW) patterns defined in TS 38.133. * #0 and #1 are mandatory, if UE supports EMW feature.   Other patterns are optional  Note: If UE supports 32-6 or 32-7 and UE requires scheduling restriction, UE should support this FG | Optional with capability signalling |
| 32-7 | Simultaneous reception of NR data and EUTRAN CRS with different numerology | Support concurrent inter-RAT measurement on EUTRAN cell in non-DSS with CRS and PDCCH or PDSCH reception from the serving cell with a different numerology | 32-4 or 32-5 | Yes | No | scheduling restriction is applicable | Per UE | No | FR1 only | N.A |  | Optional with capability signalling |

Table 2: Rel-18 LTE UE features for NR\_MG\_enh2 WI.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **Consequence if the feature is not supported by the UE** | **Type** | **Need of FDD/TDD diff** | **Need of FR1/FR2 diff** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| x-y | interRAT-NeedForInterruptionNR-r18 | Support of inter-RAT NR measurements without gap with or without interruption when the interRAT-NeedForGapsNR-r16 is false.  Note: This feature already has a defined UE capability: ‘interRAT-NeedForInterruptionNR-r18’. The intention of adding this FG is only keep consistency between 38.822 and 36.306. | interRAT-NeedForGapsNR-r16 | Yes | NA | The UE does not support inter-RAT NR measurements without gap with or without interruption for performing inter-RAT NR measurement without gap | [Per target band per BC]  Note: the same granularity as interRAT-NeedForGapsNR-r16 | No | No | NA | Candidate value: “{no-gap-with-interruption, no-gap-no-interruption}” | Optional with capability signalling |

# [111][207] NR\_MG\_enh2\_part1

## Sub-topic 3-2: Rel-18 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.*

*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 |

**Add Rel-17 Ad-hoc agreement.**

|  |
| --- |
| Sub-topic 4-1: Measurement of deactivated SCell in NCSG  * Proposals   + Option 1 (OPPO, Ericsson, vivo, Nokia):     - The Rel-17 UE behaviour 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. Otherwise, the UE performs the deactivated SCell measurements outside of NCSG.     - RAN4 not to consider a new UE capability for NCSG based deactivated SCell measurements in Rel-17   + Option 1a (OPPO):     - Clarify in spec that intraFreq-needForNCSG is limited to the activated SCell and UE is capable to measure the deactivated SCell within NCSG by default * Recommended WF   + Agree on option 1   + Discuss whether any spec change such as option 1a is needed.   Agreement   * The Rel-17 UE behaviour 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. Otherwise, the UE performs the deactivated SCell measurements outside of NCSG. * RAN4 not to consider a new UE capability for NCSG based deactivated SCell measurements in Rel-17 * FFS whether any spec change is needed or not. |

**Issue 3-2-1: [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, vivo,
    - 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, E///, CMCC, vivo, China Telecom
    - 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 2a: E///, HW
      * When the SCell is deactivated, the deactivated SCell’s MO will be measured within the associated NCSG if NCSG+NCSG is configured.
  + Option 3: Apple,
    - RAN4 should discuss the following scenarios:
      * Scenario 1: UE is configured with two NCSGs. Association between SCell MO and one NCSG is provided.
        + The measurement should be done with the associated NCSG.
      * Scenario 2: UE is configured with two NCSGs. Association between SCell MO and NCSG is not provided.
        + Discuss whether to define requirement for this scenario. If so, which NCSG shall be used for measurement?
      * Scenario 3: UE is configured with one NCSG and one type-2 legacy gap. Association between SCell MO and NCSG or MG is not provided.
        + The measurement should be done with the associated NCSG.
      * Scenario 4: UE is configured with one NCSG and one type-2 legacy gap. MO is associated to NCSG.
        + The measurement should be done with the associated NCSG.
      * Scenario 5: UE is configured with one NCSG and one type-2 legacy gap. MO is associated to MG.
        + Discuss whether to define requirement for this scenario. If so, whether the MO shall be moved from MG to NCSG when the Scell becomes deactivated.
  + Option 4: Nokia,
    - The collision case between measured deactivated SCell MO’s outside NCSG, if allowed in Rel-17 for scenarios with non-overlapping of deactivated SCell MO’s with NCSG, and concurrent MG occasions needs to be considered for Case 2 requirements in Rel-18.
  + Option 5: Nokia,
    - In case of non-overlapping of deactivated SCell measurement with NSCG and collision between deactivated SCell measurement with concurrent MG occasion, the deactivated SCell measurement shall be dropped, regardless of the concurrent MG priority.
  + Option 6: Nokia,
    - No capability for the support of deactivated SCell measurements with NCSG is introduced in Rel-18.
* Recommended WF
  + Discuss the options.

Discussion:

Ad-hoc chair: If we follow the tentative agreement in Rel-17:

* For UE configured with one NCSG and one Type 1/2 MG: All deactivated SCells are measured within NCSG, regardless of the reported UE capabilities [and gap association].
* For UE configured with 2 NCSG, deactivated SCells are measured with NCSG according to gap association, regardless of the reported UE capabilities.

Ad-hoc chair: come back this issue when treating the ad-hoc meeting munites.

Tentative agreement:

## Sub-topic 4-2: 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 4-2-3: [Case 1] Test cases list for Case 1: whether to do further setting changes to the agreed TCs**

* Background: <agreement from the last meeting>
* Modify TC1 and TC2 for dynamic collision to additionally verify gap collision behavior and pre-MG activation delay.
  + FFS whether to apply to TC3 and TC4
* TC5 and TC6 are not needed.

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Test case category** | **Test purpose** | **Volunteering company** |
| Con-Pre-MG TC1 | Event triggered reporting test on intra-frequency and inter-frequency in **FR1** with concurrent gap and **autonomous** activation/deactivation of Pre-MG + Type-2 | * 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 * Verify the gap collision rule | MediaTek |
| Con-Pre-MG TC2 | Event triggered reporting test on intra-frequency and inter-frequency in **FR2** with concurrent gap and **network-controlled** activation/deactivation of Pre-MG + Type-2 | * 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 * Verify the gap collision rule | Huawei |
| Con-Pre-MG TC3 | Event triggered reporting test on **intra**-frequency in **FR2** with concurrent gap with Pre-MG and **autonomous** activation/deactivation of **two Pre-MG** for FR2 | * Verify that the UE correctly activates and deactivates the pre-MG and makes correct measurement and reporting of an event with activated and deactivated pre-MG * Multiple Pre-MG activation/deactivation delay * Verify that the UE makes correct reporting of an event: * After pre-MG being activated by UE autonomously, UE can report the results of Cell2 and Cell3 within the required period. | Xiaomi |
| Con-Pre-MG TC4 | Event triggered reporting test on **intra**-frequency in FR1 with concurrent gap with Pre-MG and **network-controlled** activation/deactivation of **two Pre-MG** for **FR1** | * Verify that the UE correctly activates and deactivates the pre-MG and makes correct measurement and reporting of an event with activated and deactivated pre-MG * Multiple Pre-MG activation/deactivation delay * Verify that the UE makes correct reporting of an event: * After pre-MG being activated by UE network-controlled, UE can report the results of Cell2 and Cell3 within the required period. | CMCC |
| No | Test case category | Test purpose | Volunteering company |
| ~~Con-Pre-MG TC5~~ | ~~Inter-frequency measurement with autonomous activation/deactivation of Pre-MG in FR1 with dynamic collision~~ | * ~~Verify the gap association;~~ * ~~Verify the dynamic gap collision when Pre-MG activation~~ * ~~the UE shall NOT report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Type2 MG occasions.~~ * ~~the UE shall be able to receive PDSCH and report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasion overlapped in dynamic collision~~ |  |
| ~~Con-Pre-MG TC6~~ | ~~Inter-frequency measurement with network-controlled activation/deactivation of Pre-MG in FR2 with dynamic collision~~ | * ~~Verify the gap association;~~ * ~~Verify the dynamic gap collision when Pre-MG activation~~ * ~~the UE shall NOT report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Type2 MG occasions.~~ * ~~the UE shall be able to receive PDSCH and report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasion overlapped in dynamic collision~~ |  |

* Proposals
  + Option 1: Huawei
    - For TC1 and TC2, define separate test requirements for UE capable and incapable of FG 32-2.
  + Option 2: Huawei
    - For TC3 and TC4, do not verify dynamic collision handling behaviour.
* Recommended WF
  + Discuss the options.

Discussion:

Ad-hoc chair: Currently, TC#1 and TC#2 are written with dynamic collision. For UE not supporting dynamic collision, it is not testable. Can we do the following

* For UE supporting dynamic collision, Pre-MG is configured with a higher priority than the other MG
* For UE not supporting dynamic collision, Pre-MG is configured with a low priority than the other MG

Tentative agreement:

~~For UE not supporting dynamic collision, the MG will be drop if overlapped with Pre-MG, regardless whether Pre-MG (with higher priority) is activated or deactivated, including the case when the MG overlaps with the Pre-MG activation/deactivation procedure,~~

## Sub-topic 4-3: Test cases for Case 2

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

**Issue 4-3-1: [Case 2] Test cases list for Case 2: Whether to support ‘Con-NCSG TC4’?**

* Background:
  + Agreement:
    - FFS Con-NCSG TC4, pending on the core part maintenance conclusions.
* Proposals

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Test case category** | **Test purpose** | **Volunteering companies** |
| Con-NCSG TC4 | Event triggered reporting test on deactivated SCell in **FR1** with concurrent gap and NCSG | ·       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. |  |

* + Option 1: Whether to support ‘**Con-NCSG TC4**’
    - Yes: CMCC, E///, HW, China Telecom, Nokia
    - No:
  + Option 2: Whether to introduce inter-freq neighbouring cell (Cell 3) for ‘**Con-NCSG TC4**’?
    - Yes:
    - No: HW
* Recommended WF
  + Provide comments for the above options.

Discussion:

QC: We do not have the draft CR for the corresponding test case in this meeting.

Nokia: the core requirements need to be concluded first.

Tentative agreement:

Whether to introduced the test cases will be decided after the core part requirements are concluded.

# [111][208] NR\_MG\_enh2\_part2

## Open issues summary for topic #1

### Sub-topic 1-4 UE capabilities

**Issue 1-4-1: Relations between nr-NeedForGap-Reporting-r16 and nr-NeedForInterruptionReport-r18 and UE behaviours**

* Previous agreements

|  |
| --- |
| **Issue 1-1-2: Scenario 2, NR measurements without gaps**  **Tentative agreements**   1. “no-gap” as part of NeedForGapsInfoNR-r16=FALSE means that the UE support measurement without gaps    1. The UE may or may not cause interruption. 2. if UE causes interruptions when performing measurements without gaps:    1. Support early implementation of Rel-18 NeedForInterruption:       1. Optional since R17    2. FFS the UE behavior if the Rel-18 UE does not support NeedForInterruptionNR-r18 |

* Proposals
  + Option 1: A Rel-18 UE indicating support of nr-NeedForGap-Reporting-r16 shall also indicate support of nr-NeedForInterruptionReport-r18.
  + Option 2: When a Rel-18 UE only supports Rel-16 NFG capability but not supports Rel-18 NFI capability, the UE’s behaviour is the same as Rel-16 UE.
    - Option 2a: When a Rel-18 UE supports both Rel-16 NFG and Rel-18 NFI capabilities, but NW doesn’t configure Rel-18 needForInterruptionConfigNR, the UE’s behaviour is the same as Rel-16 UE.
  + Option 3: A Rel-18 UE indicating support of interRAT-NeedForGapsNR-r16 shall also indicate if interruptions are needed.
    - No new RRM test cases are defined for a Rel-18 UE supporting signalling above.
* Recommended WF

Discussions:

Nokia:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **UE capability** | **Rel 16 UE** | **Rel 17 UE** | **Rel 18 UE** |
| A | needForGaps-r16´no-gap  or  interRAT-NeedForGaps-r16=FALSE | UE may cause interruptions | UE may support B or C  Interruption depends on B or C | UE shall support B or C |
| B | nr-NeedForInterruptionReport-r18  or  interRAT-NeedForIntrNR-r18 | N/A | Optional early implementation  UE complies with R18 req | Optional/mandatory? |
| C | New capability  -clarification of interruption behavior,  -Independent of B | N/A | Optional early implementation | Conditional mandatory? |

New capability on C

* Option 1 – Indication no interruption
  + Per band, per BC?
* Option 2 – Indication of interruption
  + Per Band, per BC

E///: it is misleading. We do not agree supporting Rel-16 feature would lead to worse performance than Rel-15. We do not agree to add new capabilities. Question to everyone: Whether UE will have performance loss compared to Rel-15, if UE supports only Rel-16 feature?

Nokia: the intention is to provide more info to network. We want to differentiate UE with and without interruption. UE does not need to meet the requirement. This can reduce UE burden.

Vivo: We do not want to combine this 2 Rel-16 and Rel-18 features.

ZTE: it is up to network to request what to be reported by UE. We prefer not to couple these 2 features.

CMCC: We support to Option 1. We need to resolve this issue.

Nokia: on capability C, it does not need to be conditional mandatory with Rel-16.

Apple: If C is not cond mandatory, what is the benefit for C? UE without interruption will simply go with B. C is only needed for UE who needs interruption.

QC: C means with interruption but no requirement.

Charter: We can’t change Rel-16 UE. Why Rel-18 cannot support this feature as mandatory? We understand some overhead, but it can make the network better.

E///: it will lead to perf issue in network side. If mandatory it, UE may choose not to support Rel-16. Then Rel-16 network has worse perf than Rel-15 network. Rel-18 UE, if not able to support Rel-18 feature, will choose the disable Rel-16 feature. We believe Rel-16 UE supports this feature only if it sees the gain.

Nokia: our original preference is Option 1. Option 3 is already our compromise. We are open to further suggestions. We also want to know which options between Option 1 and 2 can help to resolve the issue.

E///: We do not see there is an issue to be resolved.

Charter: We want to avoid network performance issue. Is this a common understanding that there is no issue?

Nokia: All capabilities are optional. There could be some UE still causing interruptions (e.g., degrade network perf).

Tentative agreements:

## Open issues summary for topic #2

**Issue 2-3-1a: Relations between interRAT-NeedForGaps-r16 and interRAT-NeedForIntrNR-r18 and UE behaviours**

* Previous agreements

|  |
| --- |
| **Issue 1-1-1: Scenario 1, LTE – NR inter-RAT measurement**  **Tentative agreements**   1. interRAT-NeedForGaps-r16=FALSE means that the UE support measurement without gaps    1. The UE may or may not cause interruption. 2. if UE causes interruptions when performing measurements without gaps:    1. Support early implementation of Rel-18 NeedForInterruption:       1. Optional since R17    2. FFS mandatory report of the UE capability R18 interRAT-NeedForIntrNR-r18 from Rel-18 UE if the UE reports interRAT-NeedForGaps-r16=FALSE    3. FFS the UE behavior if the Rel-18 UE does not support interRAT-NeedForIntrNR-r18 |

* Proposals
  + Option 1: A Rel-18 UE indicating support of interRAT-NeedForGapsNR-r16 shall also indicate support of interRAT-NeedForInterruptionNR-r18.
  + Option 2: When a Rel-18 UE only supports Rel-16 NFG capability but not supports Rel-18 NFI capability, the UE’s behaviour is the same as Rel-16 UE.
    - Option 2a: When a Rel-18 UE supports both Rel-16 NFG and Rel-18 NFI capabilities, but NW doesn’t configure Rel-18 needForInterruptionConfigNR, the UE’s behaviour is the same as Rel-16 UE.
  + Option 3: A Rel-18 UE indicating support of interRAT-NeedForGapsNR-r16 shall also indicate if interruptions are needed.
    - No new RRM test cases are defined for a Rel-18 UE supporting signalling above.
* Recommended WF

Newly agreed UE feature x-z

Table 2: Rel-18 LTE UE features for NR\_MG\_enh2 WI.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **Consequence if the feature is not supported by the UE** | **Type** | **Need of FDD/TDD diff** | **Need of FR1/FR2 diff** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| x-y | interRAT-NeedForInterruptionNR-r18 | Support of inter-RAT NR measurements without gap with or without interruption when the interRAT-NeedForGapsNR-r16 is false.  Note: This feature already has a defined UE capability: ‘interRAT-NeedForInterruptionNR-r18’. The intention of adding this FG is only keep consistency between 38.822 and 36.306. | interRAT-NeedForGapsNR-r16 | Yes | NA | The UE does not support inter-RAT NR measurements without gap with or without interruption for performing inter-RAT NR measurement without gap | [Per target band per BC]  Note: the same granularity as interRAT-NeedForGapsNR-r16 | No | No | NA | Candidate value: “{no-gap-with-interruption, no-gap-no-interruption}” | Optional with capability signalling |
| x-z | Simultaneous reception of EUTRAN data and NR SSB with different numerology | Support concurrent inter-RAT measurement on NR cell in non-DSS with SSB and PDCCH or PDSCH reception from the serving cell with a different numerology | x-y | Yes | NA | scheduling restriction is applicable | Per UE | No | FR1 only | NA |  | Optional with capability signalling |

Discussion:

Ad-hoc chair: Moderator to trigger the Email for updated feature list. Delegate to check offline.

Tentative agreement:

## Test cases for NFG

### Configurations for NFG test cases

**Issue 2-1-1: Configuration for Intra-frequency measurements test cases:**

* Proposals
  + Option 1: Follow legacy approach for configuring RLM/RS for intra-frequency measurements without gaps with interruptions.
  + Option 2: Use CSI-RS for RLM measurements in the test cases for NeedForGap of intra-frequency measurements with SSB outside the active BWP but no need to support Option A and no requirements for CSI-RS measurements.
* Recommended WF
  + Discussion needed

Discussion:

Moderator: in our test case, we configure both NCD-SSB and CSI-RS

QC: RAN5 has the applicability condition for legacy TCs. We can additional consider Rel-18 BWP wor capabilities

MTK: Fine with QC’s first part. (FG 6-1a).

Intel: We are ok to follow RAN5 legacy applicability rule

Tentative agreement:

Define the test case where the serving cell SSB is outside of UE’s active BWP by

* Configuring CSI-RS for RLM
* Note: In RAN4’s understanding, RAN5 can follow the legacy applicability of the Rel-15 intra-frequency with gap TC

**Issue 2-1-2: Test cases with DRX**

* Proposals
  + Option 1: Specify test cases with DRX and with non-DRX.
* Recommended WF
  + Discussion needed

Discussion:

Ad-hoc chair: can we compromise to define the test case which check only the interruption ratio, but not the location

* Updating core part: Tcycle = max (80ms, DRX cycle, SMTC period) x CSSFoutside\_gap,i
* In the test case,
  + UE is only scheduling during DRX Onduration
  + UE is allowed to cause L slots in each Tcycle period.

Nokia: We have the draft TC which checks only the ratio for now. FFS on the location.

QC: How do we check the ratio

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| off | off | on | on | off | off | off | off | off | off |

Tentative agreement:

* Do not introduce test cases with DRX configured for NFG and inter-RAT measurements

**Issue 2-1-3: How to define test procedure with DRX**

* Proposals
  + Option 1:
    - Interruptions during test cases with DRX can be verified by scheduling the UE during the entire DRX period.
    - When testing for interruptions, the entire DRX cycle is considered, not stopped when activity timer starts.
* Recommended WF
  + Discussion needed

Discussion:

Tentative agreement:

### Test cases list and responsibilities

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **FR of serving cell** | **SMTC** | **MG** | **DRX** | **Subclause** | **Responsibility** |
| NFG1 | Event triggered reporting and interruptions | **Intra**-frequency measurements without gap config but **with DRX**  Note: The testability needs to be checked before introducing the test case | FR1 | 20ms | No | No | A.6.6.1.X | Nokia |
| NFG2 |  | **Intra**-frequency measurements **with gap** configuration and non-DRX configuration  The test purpose: UE is not allowed to cause interruption outside MG when SMTC partially overlaps with gap | FR2 | 20ms | gap is configured  Note: UE can skip corresponding Rel-15 TC | No | A.7.6.1.X | Intel |
| NFG3 |  | **Inter**-frequency measurements without gap and without DRX | All in FR1 | 20ms | No | No | A.6.6.1.X | QC |
| NFG4 |  | **Inter**-frequency measurements without gap config but without DRX  Note: The testability needs to be checked before introducing the test case | All in FR1 | **160ms** | No | No | A.7.6.1.X | HW |
| NFG5 | Event triggered reporting [without interruption] | **Inter**-frequency measurements without gap with non-DRX | All in FR1 | 20ms | No | No | A.6.6.1.X | Ericsson |
| NFG6 |  | **Inter**-frequency measurements without gap with non-DRX | All in FR2 | 20ms | No | No | A.7.6.1.X | CATT |
| NFG7 |  | **Intra**-frequency measurements without gap with non-DRX | FR1 | 20ms | No | No | A.6.6.1.X | CMCC |
| NFG8 |  | **Intra**-frequency measurements without gap with non-DRX | FR2 | 20ms | No | No | A.7.6.1.X | MTK |

* Previous agreements
  + For all intra-freq without gap TC, companeis are encourage to check the testability, e.g., FFS L1 measurement configuration for active BWP not containing serving cell SSB.
  + FFS whether to change the test case list remove TC among NFG5 to NFG8 will be confirmed in RAN4#111 meeting

Discussion:

Ad-hoc chair: The most likely case is the merge NFG3 and NFG5 based on UE capability reports

Nokia: we have separate TCs for delay and interruption. Should we merge?

Ad-hoc chair: yes. Merge to the delay TC

Tentative agreement:

No TC among NFG5 to NFG8 will be merged.

|  |  |  |
| --- | --- | --- |
| R4-2409148 | Nokia | Draft CR TC for FR1 intra-freq measurments without gaps with interruptions (NFG1) |
| R4-2408487 | Intel | Test case for FR2 intra-frequency measurements for UE indicating NeedforInterruptionInfoNR under non-DRX and no interruption outside configured measurement gaps (NFG2) |
| R4-2408434 | Qualcomm | DraftCR TC FR1 inter-frequency measurement without gap with interruption (NFG3) |
| R4-2409255 | Huawei | draftCR on NFG TC4 (NFG4) |
| R4-2408325 | Ericsson | Draft CR to 38.133 Test Case of NFG TC5 (NFG5) |
| R4-2407515 | CATT | (NFG6) DraftCR on FR2 inter-frequency measurements without gap without interruption for needforgap reporting |
| R4-2408167 | CMCC | DraftCR on test case for intra-frequency measurement without gap without interruption and inter-RAT EUTRAN measurement case b-2 (NFG7) |
| R4-2409747 | MTK | Draft CR for test case of event triggered reporting without interruption Intra-frequency measurements without gap or DRX configuration (NFG8) |

This section is the place holder for comments on the test cases list NFG5 to NFG8. The companies are expected to provide comments only on the systematic test coverage and reduction of cases.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Moderator | This section is the place holder for comments on the test cases list NFG5 to NFG8. Balance between test coverage and test cases number is considered by staggered configurations among SMTC, measurement gap, DRX, Frequency Range, and test scenarios (intra or inter frequency). |
|  |  |
|  |  |
|  |  |
|  |  |

### Test cases details

**NFG1: R4-2409148**

* Test cases proposals:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **Frequency range of serving cell** | **SMTC configuration** | **MG configuration** | **DRX configuration** | **Subclause** | **Responsibility** |
| **NFG1** | **Event triggered reporting and interruptions** | **Intra-frequency measurements without gap config but with DRX**  **Note: The testability needs to be checked before introducing the test case** | **FR1** | **20ms** | **No gap config** | **Test 1: 320ms**  **Test 2: 20ms** | **A.6.5.2.X**  **A.6.6.1.X** | **Nokia** |

* Other proposals
  + This test case requirements consist two test cases: one is in interruption clauses and the other is in measurement delay clauses.
* Recommended WF
  + Discuss upon the draftCR for test configurations related only to this case.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

**NFG2: R4-2408487**

* Test cases proposals:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **Frequency range of serving cell** | **SMTC configuration** | **MG configuration** | **DRX configuration** | **Subclause** | **Responsibility** |
| **NFG2** | **Event triggered reporting and interruptions** | **Intra-frequency measurements with gap configuration and non-DRX configuration**  **The test purpose is: UE is not allowed to cause interruption outside measurement gap when SMTC partially overlaps with gap** | **FR2** | **20ms periodicity** | **40ms MGRP** | **No DRX** | **A.7.6.1.X** | **Intel** |

* Recommended WF
  + Discuss upon the draftCR for test configurations related only to this case.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

**NFG3: R4-2408434**

* Test cases proposals:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **Frequency range of serving cell** | **SMTC configuration** | **MG configuration** | **DRX configuration** | **Subclause** | **Responsibility** |
| **NFG3** | **Event triggered reporting and interruptions** | **Inter-frequency measurements without gap and without DRX** | **All in FR1** | **20ms** | **No gap config** | **No DRX config** | **A.6.6.2.X** | **QC** |

* Other Proposals
  + SSB time index detection is tested.
* Recommended WF
  + Discuss upon the draftCR for test configurations related only to this case.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

**NFG4: R4-2409255**

* Test cases proposals:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **Frequency range of serving cell** | **SMTC configuration** | **MG configuration** | **DRX configuration** | **Subclause** | **Responsibility** |
| **NFG4** | **Event triggered reporting and interruptions** | **Inter-frequency measurements without gap config but without DRX**  **Note: The testability needs to be checked before introducing the test case** | **All in FR1** | **160ms** | **No gap config** | **No DRX config** | **A.6.6.2.X** | **HW** |

* Other Proposals
  + The TE schedules continuous DL data on PCell during the DRX ON duration. The parameter drx-LongCycleStartOffset is configured as {ms320, 10} such that measurement gap do not occur in DRX ON duration.
* Recommended WF
  + Discuss upon the draftCR for test configurations related only to this case.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

**NFG5: R4-2408325**

* Test cases proposals:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **Frequency range of serving cell** | **SMTC configuration** | **MG configuration** | **DRX configuration** | **Subclause** | **Responsibility** |
| **NFG5** | **Event triggered reporting without interruption** | **Inter-frequency measurements without gap with non-DRX** | **All in FR1** | **20ms** | **No gap config** | **No DRX config** | **A.6.6.X.Y** | **Ericsson** |

* Recommended WF
  + Discuss upon the draftCR for test configurations related only to this case.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

**NFG6: R4-2407515**

* Test cases proposals:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **Frequency range of serving cell** | **SMTC configuration** | **MG configuration** | **DRX configuration** | **Subclause** | **Responsibility** |
| **NFG6** | **Event triggered reporting [without interruption?]** | **Inter-frequency measurements without gap with non-DRX** | **All in FR2** | **20ms** | **No gap config** | **No DRX config** | **A.7.6.1.X** | **CATT** |

* Other Proposals
  + During the T1 and T2, UE shall be able to report ACK/NACK for all slots with PDCCH/PDSCH on PCell excluding those symbles as defined in 9.3.9.4.
* Recommended WF
  + Discuss upon the draftCR for test configurations related only to this case.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

**NFG7: R4-2408167**

* Test cases proposals:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **Frequency range of serving cell** | **SMTC configuration** | **MG configuration** | **DRX configuration** | **Subclause** | **Responsibility** |
| **NFG7** | **Event triggered reporting without interruption** | **Intra-frequency measurements without gap or DRX configuration** | **FR1** | **20ms** | **No gap config** | **No DRX config** | **A.6.6.1.X** | **CMCC** |

* Recommended WF
  + Discuss upon the draftCR for test configurations related only to this case.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

**NFG8: R4-2409747**

* Test cases proposals:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **Frequency range of serving cell** | **SMTC configuration** | **MG configuration** | **DRX configuration** | **Subclause** | **Responsibility** |
| **NFG8** | **Event triggered reporting [without interruption?]** | **Intra-frequency measurements without gap or DRX configuration** | **FR2** | **20ms** | **No gap config** | **No DRX config** | **A.7.6.1.X** | **MTK** |

* Other Proposals
  + CSI-RS.3.2 TDD resource #0 is configured for RLM.
  + Interruption is not tested.
* Recommended WF
  + Discuss upon the draftCR for test configurations related only to this case.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

## Test cases for inter-RAT

For information

Up to this meeting, all agreed using scenarios for inter-RAT NR/LTE measurements without gap can summarized as:

1. the inter-RAT NR measurements without gap in Rel18 includes the two scenarios below.
   * **Case a-1**: UE performing the measurements without gap in NR carriers as there is vacant RF chains for UE measurements
2. the inter-RAT LTE measurements without gap in Rel18 includes the two scenarios below.
   * **Case b-1**: UE performing the measurements without gap in LTE carriers as there is vacant RF chains for UE measurements
   * **Case b-2**: LTE CRS are fully contained within UE’s active BWP

### Test cases list and responsibilities

Tentative agreement:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No.** | **Item of core requirements** | **Type of test cases** | **FR of serving cell** | **EMW** | **MG** | **DRX** | **Subclause** | **Responsibility** |
| IR1 | Event triggered reporting and nogp-noncsg | Inter-RAT **EUTRAN** measurements case **b-1** without MG without interruption and no DRX configuration  Note: UE follows EMW | NR FR1 | [Yes] | No | No | A.6.6.3.X | CATT |
| [IR2] | Event triggered reporting and nogp-noncsg | Inter-RAT **EUTRAN** measurements case **b-1** with MG but no DRX configuration  Note: UE is configured with MG and has no scheduling restrictions outside MG | NR FR1 | TBD | [Pattern TBD] | No | A.6.6.3.X | xiaomi |
| IR3 | Event triggered reporting [without interruption] | Inter-RAT **EUTRAN** measurements case **b-2** without MG or DRX configuration | NR FR1 | [Yes] | No | No | A.6.6.3.X | CMCC |
| IR4 | Event triggered reporting | Inter-RAT **NR** measurements case **a-1** with MG | NR FR1 | No EMW config | [Pattern TBD] | No | A.8.4.2.X | HW |
| IR5 | Event triggered reporting and interruptions | Inter-RAT **NR** measurements case **a-1** with MG | NR FR1 | No EMW config | [Pattern TBD] | No | A.8.4.2.X | Nokia |

|  |  |  |
| --- | --- | --- |
| R4-2407516 | CATT | (IR1) DraftCR on inter-RAT EUTRAN measurements wihtout gap case b-1 |
| R4-2407832 | Xiaomi | [draftCR IR2] CR for inter-RAT EUTRAN measurements case b-2 without gap |
| R4-2408167 | CMCC | DraftCR on test case for intra-frequency measurement without gap without interruption and inter-RAT EUTRAN measurement case b-2 (IR3) |
| R4-2409256 | Huawei | draftCR on IR TC4 (IR4) |
| R4-2409149 | Nokia | Draf CR TC for inter-RAT NR measurements without gaps with interruption (IR5) |

This section is the place holder for comments on the test cases list. The companies are expected to provide comments only on the systematic test coverage and reduction of cases. A trade-off in test coverage and test time (number of tests and sub tests) is expected to be implemented according to the consensus of the group.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Moderator | Balance between test coverage and test cases number is considered by staggered configurations among SMTC, measurement gap, DRX, Frequency Range, and test scenarios (intra or inter frequency). |
|  |  |
|  |  |
|  |  |
|  |  |

### Test cases details

**IR1: R4-2407516**

* Test cases proposals:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **Frequency range of serving cell** | **EMW configuration** | **MG configuration** | **DRX configuration** | **Subclause** | **Responsibility** |
| **IR1** | **Event triggered reporting and interruptions** | **Inter-RAT EUTRAN measurements case b-1 with MG and DRX configuration** | **NR FR1** | **Pattern 0** | **No gap for subtest 1**  **GAP 0 for subtest 2** | **No DRX** | **A.6.6.3.X** | **CATT** |

* Other proposals
  + EMW is configured as pattern 0.
* Recommended WF
  + Discuss upon the draftCR for test configurations related only to this case.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

**IR2: R4-2407832**

* Test cases proposals:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **Frequency range of serving cell** | **EMW configuration** | **MG configuration** | **DRX configuration** | **Subclause** | **Responsibility** |
| **IR2** | **Event triggered reporting and interruptions** | **Inter-RAT EUTRAN measurements case b-1 with MG but no DRX configuration** | **NR FR1** | **Pattern 0** | **No GAP configuration** | **No DRX config** | **A.6.6.3.X** | **xiaomi** |

* Other proposals
  + The serving frequency and the target frequency should be selected such that UE reports [nogap-noncsg] for the target frequency given the serving frequency.
  + EMW 0 is configured and no overlap is between EMW and SMTC.
  + During T2, UE shall send HARQ-ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern.
* Recommended WF
  + Discuss upon the draftCR for test configurations related only to this case.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

**IR3: R4-2408167**

* Test cases proposals:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **Frequency range of serving cell** | **EMW configuration** | **MG configuration** | **DRX configuration** | **Subclause** | **Responsibility** |
| **IR3** | **Event triggered reporting**  **Interruption is tested** | **Inter-RAT EUTRAN measurements case b-2 without MG or DRX configuration** | **NR FR1** | **Pattern 0** | **No gap configuration** | **No DRX configuration** | **A.6.6.3.X** | **CMCC** |

* Other proposals
  + EMW is configured as pattern 0.
  + During T2, For configuration 3 and 6, for UE capable of [Simultaneous reception of NR data and EUTRAN CRS within BWP with different numerology], UE shall send HARQ ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots. For UE not capable of [Simultaneous reception of NR data and EUTRAN CRS within BWP with different numerology], UE shall send HARQ ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots except for the case where PDSCH or PUCCH is overlapped with the EMW.
* Recommended WF
  + Discuss upon the draftCR for test configurations related only to this case.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

**IR4: R4-2409256**

* Test cases proposals:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **Frequency range of serving cell** | **EMW configuration** | **MG configuration** | **DRX configuration** | **Subclause** | **Responsibility** |
| **IR4** | **Event triggered reporting** | **Inter-RAT NR measurements case a-1with MG** | **NR FR2** | **No EMW configuration** | **No gap configuration** | **No DRX config** | **A.8.4.2.X** | **HW** |

* Other proposals
  + No EMW is configured.
  + SMTC periodicity is configured as 160ms.
  + During the test, the interruption ratio (number of interrupted subframes over the number of total subframes) in LTE PCell shall be less than 1.25%, and each interruption shall not exceed 1 subframe.
* Recommended WF
  + Discuss upon the draftCR for test configurations related only to this case.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

**IR5: R4-2409149**

* Test cases proposals:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. #** | **Item of core requirements** | **Type of test cases** | **Frequency range of serving cell** | **EMW configuration** | **MG configuration** | **DRX configuration** | **Subclause** | **Responsibility** |
| **IR5** | **Event triggered reporting and interruptions** | **Inter-RAT NR measurements case a-1 with MG** | **NR FR1** | **No EMW config** | **No MG configuration** | **No DRX config** | **A.8.x.1 for Test 1**  **A.8.4.2.X for Test 2** | **Nokia** |

* Other proposals
  + Two test cases are introduced: one for Interruption clauses and the other for measurement delay clauses.
* Recommended WF
  + discuss upon the draftCR for test configurations related only to this case.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |