**3GPP TSG-RAN WG4 Meeting # 112 R4-2411820**

**Maastricht, Netherlands, Aug 19 – Aug 23, 2024**

**Agenda item:** 8.24.3

**Source:** Moderator (Nokia)

**Title:** Topic summary for [112][225] NR\_XR\_Ph3

**Document for:** Information

# Introduction

This summary includes the proposals and issues for discussion related to Rel-19 enhancements for extended reality for NR Phase 3, under thread [112][225] NR\_XR\_Ph3.

This summary is based on the contributions submitted to the agenda items:

* 8.24 XR for NR Phase 3
  + 8.24.1 General aspects and work plan
  + 8.24.2 RRM core requirements
  + 8.24.3 Moderator summary and conclusions

The topics for discussion are organized as follows:

* Topic #1: Workplan
* Topic #2: Scenarios for XR enhancements
  + Sub-topic 2-1 Scope and scenarios for XR enhancements
  + Sub-topic 2-2 Need/feasibility of UE assistance information
  + Sub-topic 2-3 Timeline for measurement skipping processing
  + Sub-topic 2-4 Impact of measurement skipping

This is the first meeting for that work item, therefore some prioritization of the items for discussion is suggested:

* Issue 1-1: Workplan
* Issue 2-1-1: Workscope
* Issue 2-1-2: Deployment scenarios
* Issue 2-2-1: General on UAI
* Issue 2-2-2: Expected gNB behaviour
* Issue 2-2-3: Information related to measurement occasions

The latest WID can be found at:

* RP-240791, Revised WID on XR (eXtended Reality) for NR Phase 3, Nokia

And the latest time unit allocation agreed in the plenary RAN#104 for RAN4 is

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | 1 TU = ~2h; RD: RRM/demodulation |  |  |  | R4RD | R4 RD | R4RD | R4RD | R4 RD | R4RD | R4RD |
| **leading WG** | **RAT** | **WI code** | **Title** | **latest WID/SID** | **rapporteur** | **target** | 112 | 112bis | 113 | 114 | 114bis | 115 | 116 |
| R2 | NR | NR\_XR\_Ph3-Core | Core part: XR for NR Phase 3 | RP‑240791 | Nokia, Qualcomm | Sep.25 | 0,5 | 0,5 | 0,5 | 0,5 | 0,5 | 0,5 | 0,25 |
| R4 | NR | NR\_XR\_Ph3-Perf | Perf. part:XR for NR Phase 3 | RP‑240791 | Nokia, Qualcomm | Mar.26 |  |  |  |  |  |  | 0,25 |

# Topic #1: Workplan

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2413021 | Nokia | Workplan for discussion and approval |

## Open issues summary

### Sub-topic 1-1 Workplan

#### Issue 1-1: Workplan

* Proposals
  + Please consider the following workplan proposal

|  |  |
| --- | --- |
| **RAN4 meeting** | **Tasks** |
| RAN4 #112 - August 2024 | * Approval of workplan * Initial discussion on scenarios for measurement skipping based on RAN1 conclusions. |
| RAN4 #112bis - October2024 | * Conclusions on scenarios for measurement skipping based on RAN1 conclusions. |
| RAN4 #113 - November 2024 | * Discussion on measurement delay calculation with measurement skipping. * Discussion on the need for UE assistance information regarding measurements occasions needed. |
| RAN4 #114 - February 2025 | * Discussion on measurement delay calculation with measurement skipping. * Discussion on the need for UE assistance information regarding measurement skipping. * Agreement of CR work split. |
| RAN4 #114bis - April 2025 | * Conclusion on measurement delay calculation with measurement skipping. * Conclusion on the need for UE assistance information regarding measurement skipping. * First Draft CRs for RRM core requirements.   + Draft CRs for 38.133 expected. * First big Draft CR. |
| RAN4 #115 - May 2025 | * Discussion on remaining open issues for RRM core |
| RAN4 #116 - August 2025 | * Discussion on remaining open issues for RRM core . * Revision of CRs for RRM core requirements.      * Planning of RRM performance.   + Initial discussion on RRM test cases. |

* Recommended WF
  + Discuss if revisions of the workplan are necessary and approve the workplan.

# Topic #2: Scenarios for XR enhancements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2411440**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411440.zip) | Apple | Discussion of RRM impact of XR for NR Phase 3  Observation 1: it is challenging for UE to provide the following assistance information in a static manner. Besides, they are not enough for NW to determine which measurement occasion(s) can be skipped for data Rx/Tx.   * The number of needed measurement gaps/SMTC with restrictions within a time period; * The maximum number or ratio of MGs/SMTC with restrictions that can be skipped within a time period; * The number of required SSBs within a time period;   **Proposal 1:** **Reply RAN1 that RAN4 hasn’t identified an efficient way to let UE provide assistance information in a static manner.**  Observation 2: solutions being discussed in RAN1 to enable Tx/Rx in particular gap(s)/restriction(s) only focus on RRM measurement. However, according to RAN4 design not only RRM measurement could cause scheduling restriction, but also L1 operation, including RLM, BFD, CBD and L1 measurement.  Observation 3: enabling Tx/Rx in gap/restriction may have negative impact on measurement performance. Some study is expected in RAN4 to address this issue.  Observation 4: some of the solutions being discussed in RAN1 is also highly related to RAN4.  **Proposal 2: RAN4 shall proactively participate in solution design to enable Tx/Rx in gap/restriction. At least the following aspects could be led by RAN4:**   * **Tx/Rx in occasions of L1 operation including RLM, BFD, CBD and L1 measurement.** * **Impact on measurement performance due to measurement cancellation and corresponding solution to address the impact.** * **Possible UE assistance information.** * **Possible pattern for measurement cancellation.** |
| R4-2411296 | InterDigital Finland Oy | On UE assistance information for gap skipping occasions - NR XR  Observation 1: Careful determination/selection of specific supported cases (gap pattern id, deployment case) would be required as a preliminary step.  **Proposal 1: RAN4 to perform a clear selection of the applicable deployment cases when considering skipping of measurement occasions.**  Observation 2: Under poor cell conditions the XR QoS may degrade anyway through HARQ retransmissions or lower MCS grants. Also, the UE has no knowledge of the network load balancing or offloading intensions/strategy.  **Proposal 2: Any further RAN4 impact analysis shall account for XR QoS under measurement gap skipping occasions versus measurement accuracy degradation.**  Observation 3: UE assistance information signaling to the network may add delays to event triggering conditions, thus impacting mobility. Also, UE assistance information on skipping gaps/measurements may not translate to XR QoS improvement, given other impacting info/factors known only to network  **Proposal 3: Any further RAN4 impact analysis shall account for UE assistance information signaling latency impacts to mobility/triggered events.** |
| R4-2411684 | NTT DOCOMO, INC. | Discussions on enabling transmission/reception in gaps/restrictions  **Proposal 1: It is better to consider whether existing mechanisms, such as measurement without gaps, NCSG can be reused or not for transmission/reception in gaps as a starting point.**  **Proposal 2:** **The existing scheduling restrictions should be listed and classified whether it should be avoided or not for XR.**  **Proposal 3: Since there are still many FFS points in RAN1 discussions about how to enable Tx/Rx in gaps/restrictions, RAN4 should wait for RAN1 conclusions before going into details.**  Observation 1: The candidates of measurement related information derived in LS are generally specified like minimum measurement samples or maximum duration between previous measurement as a minimum requirement in RAN4 RRM spec.  **Proposal 4: No UE assistance information related to measurement occasion is needed.** |
| R4-2412248 | vivo | Discussion on RRM impacts for XR  **Proposal 1: RAN4 to study whether and how to define new core requirements when some of gaps that need to be used for measurements are enabled for data transmission/reception.**  **Proposal 2: RAN4 to decide what measurement gaps are considered in this WI, e.g., per-UE gap and per-FR gap, pre-configured measurement gap, concurrent measurement gaps, NCSG and MUSIM gaps etc.**  **Proposal 3: RAN4 to study whether and how to define new core requirements when some of SMTC occasions that need to be used for measurements outside gaps are enabled for data transmission/reception when scheduling restrictions exists.**  **Proposal 4: RAN4 does not consider enabling data transmission/reception on L1-RS symbols that need to be used for L1 measurements if there is scheduling restriction.**  **Proposal 5: RAN4 concludes semi-static solution for indication of gaps/SMTC occasions not used for measurement is better from RAN4 perspective and LS to RAN1 if necessary.** |
| R4-2412261 | Meta | Discussion on UE Assistance Information for RRM Performance  Observation 1: Incorporating UE assistance information related to skipping measurement occasions can be valuable in reducing RRM performance degradation.  **Proposal 1: It is up to RAN2 to discuss and decide what UE assistance information related to measurement occasions should be supported.** |
| R4-2413082 | ZTE Corporation, Sanechips | Discussion on RRM aspects of R19 XR  Observation 1: MG is usually used in the traditional RRM measurement. According to the frequency layer of the MO, the relation between the measurement resource and the active BWP, and the relevant UE capability, some RRM measurements are performed within gap, while others are performed without gap. One special case is that the gap based L1 measurement was also introduced in L1/L2 triggered mobility measurement.  **Proposal 1: It is necessary to clarify which types of measurement are in the scope mentioned by “RRM measurements”.**   * **The traditional L1 measurements(relatively short-term measurements without filtering specification) are not in the scope** * **The traditional RRM measurements(long-term measurement with filtering operation) are in the scope** * **FFS the L1/L2 triggered mobility measurement**   **Proposal 2: It is necessary to clarify which types of MG are in the scope, the candidates include Type1 MG, Type 2 MG, pre-configured MG, NCSG, MG used for positioning, MG used for MUSIM etc, including single MG and concurrent multiple MGs cases.**  **O**bservation 2: From time domain, only when the traffic Tx/Rx overlaps with the dynamic indicated/semi-static configured MG/restriction, the corresponding MG occasions/restrictions could be skipped. From frequency domain, whether the MG occasions/restrictions only restrict within the carrier/band/band combination/FR in which the traffic Tx/Rx happens, it should be identified.  Observation 3: When the targeted MG is skipped, how to handle the MO(s) not associated with the MG or the MO(s) without gap, which should be identified.  Observation 4: With the MG occasion(s)/restriction(s) skipped, some measurement opportunities would miss, to guarantee the legacy performance requirements, one direct solution is to applying additional scaling factor to make sure enough measurement samples.  **Proposal 3: The UAI mechanism is tradeoff between the overhead and the system efficiency, RAN4 could discuss the necessary of each candidate UAI one by one.** |
| R4-2411974 | CMCC | Discussion on XR (eXtended Reality) for NR Phase 3  Observation 1: the delay related requirments, e.g. delay for PSS/SSS detection, acquisition the index of the SSB, and measurement, are minimum requirements. Not all the measurment occasions, e.g. measurement gap occasion or SMTC occasion, are used for measurement for better UE implementation.  Observation 2: Since how UE perform measurement is up to UE implementation, network has no information about whether measurement is performed in a cetain measurement occasion, e.g. measurement gap occasion or SMTC occasion. Normally, it is assumed that UE is not required to conduct reception/transmission from/to the serving cells in all the measurement occasions.  Observation 3: UE assistance information related to measurement occasions, e.g. The number of needed measurement gaps/SMTC with restrictions within a time period, could help network to configure indication to skip a measurement gap(s) /restriction(s) in order to enable Tx/Rx.    **Proposal 1: it is proposed to introduce UE assistance information related to measurement occasions, e.g. the number of needed measurement gaps/SMTC with restrictions within a time period, which is benificial in network indication to skip a measurement gap(s) /restriction(s) in order to enable Tx/Rx.** |
| R4-2413210 | MediaTek inc. | Discussion on XR (eXtended Reality) for NR Phase 3  **Proposal 1: RAN4 should study all possible UAI options regardless of RAN1 deprioritisation decision.**  **Proposal 2: RAN4 RRM shall study all possible options that allow gap cancellations.** |
| R4-2413314 | Nokia | Discussion on RRM requirements for XR phase 3  Observation 1: RAN1 is discussing XR measurement enhancements considering a packet delay budget between 10 and 15 ms.  Observation 2: Measurement gaps and scheduling restrictions are large in comparison to the total packet delay budget of typical XR applications.  Observation 3: RAN1 left it up to RAN4 the discussion on which types of gaps/restrictions can be skipped.  Observation 4: RAN1 is discussing measurement occasion skipping based on dynamic DCI-based indication or semi-static indication based on RRC signalling.  Observation 5: FR2-2 measurement delay requirements are 1.5x, 3x and 4.5x longer than FR2-1 measurements for 120 kHz, 480 kHz and 960 kHz SCS.  **Proposal 1: Measurement skipping apply for FR1 and FR2-1 measurements**  Observation 6: RAN1 is defining enhancements for skipping measurements that cause scheduling restrictions which are agnostic to the types of measurement gaps or scheduling restrictions.  Observation 7: Intra-frequency measurements always cause scheduling restrictions in FR2, around SSB symbols to measure.  Observation 8: Interruptions will cause scheduling problems for latency sensitive traffic.  Observation 9: Requirements for measurements without gaps with interruptions using NeedForInterruptions-r18 do not limit interruption location.  Observation 10: Measurements without gaps based on NeedForGaps-r16 do not have interruption requirements.  **Proposal 2: Prioritize measurement skipping for following scenarios:**   * **Measurements with gaps**   + **Intra-frequency**   + **Inter-frequency** * **Measurements without gaps without interruptions**   + **Intra-frequency for FR2**   **Proposal 3:** **For UEs configured with search threshold (s-MeasureConfig), the UE shall inform the network when the condition is met (i.e. defined RSRP threshold is exceeded).**  **Proposal 4: For UEs configured with search threshold (s-MeasureConfig), the UE shall inform the network that it is stopping doing RRM measurements because the s-MeasureConfig condition is no longer fulfilled.**  Observation 11: UAI only makes sense if UAI information is used to provide skipping implies on no extension of measurement delay and no impact on measurement accuracy.  Observation 12: Discuss the feasibility and accuracy of UE reporting UAI in relation to XR capacity;  Observation 13: Discuss the feasibility and accuracy of UE reporting UAI in relation to measurement performance.  Observation 14: Discuss the benefits of UE reporting UAI in relation to XR capacity;  Observation 15: Discuss the benefits of UE reporting UAI in relation to measurement performance.  **Proposal 5: When considering the feasibility of UAI related to measurement occasions, it should be ensured that measurement delay and measurement accuracy is not impacted by measurement skipping**  **Proposal 6: Any proposals for UAI related to measurement occasions should be justified by clear performance benefit.**  **Proposal 7: The UE processing time for decoding a DCI with RRM measurement skipping indication should be the same as the currently defined processing requirements in 3GPP TS 38.214 for decoding of DCI and PDSCH decoding, or PUSCH preparation.**  **Proposal 8: RAN4 shall define processing requirements for a UE to act on a DCI with RRM measurement skipping indication. Inspired by UE requirements for e.g. acting on power control commands and uplink cancellation indication in DCI, the processing could be fraction of a slot.** |
| R4-2413392 | Ericsson | On RRM core requirements for XR  **Proposal 1: To avoid limiting the XR operation to good network radio conditions only and hereby limiting the XR service coverage, RRM measurement requirements are enhanced for UEs under XR operation.**    **Proposal 2: RAN4 to discuss possible enhancements to the legacy RRM requirements to account for the UE XR operation, e.g., whether pre-defined or dynamically extended RRM measurement period is to be specified for UE under XR operation to dynamically account for the availability of the RRM measurement occasions for RRM measurements.**    **Proposal 3: RAN4 to discuss which conditions the measurement gap configurations need to meet to be relevant for the UE XR operation, e.g., minimum MGL and/or maximum MGL, maximum MGRP, maximum acceptable time separation between the XR occasions, etc.**    **Proposal 4: RAN4 to discuss the impact on RRM samples and how they are combined during the UE XR operation, e.g., maximum acceptable time separation between two measurement occasions available for RRM measurements.**    **Proposal 5: RAN4 will not specify any explicit or implicit requirement on gNB behaviour in relation to the UE assistance data.**    **Proposal 6: RAN4 to discuss whether the information related to the maximum number of measurement occasions allowed for reallocated to XR over a time can be defined in RAN4 specification.**    **Proposal 7: UE assistance containing patterns still cannot guarantee that gNB configuration will follow the UE pattern, since the configuration is ultimately the network decision.** |
| R4-2413453 | Qualcomm Incorporated | RRM requirements for XR enhancements  Observation 1: RAN1/RAN2 are discussing schemes to enable transmission/reception in gaps/restrictions that are caused by RRM measurements.  Observation 2: Irrespective of the MG deactivation scheme adopted by RAN1/RAN2, RRM measurement requirements related to cell identification and measurements with MGs are going to be impacted.  **Proposal 1: RAN4 to consider extending the L3 requirements with MGs such as cell identification and measurements delays when one or more MGs are deactivated by the network.**  **•  The exact extension may depend on further RAN1/RAN2 discussion and agreements.**    Observation 3: RAN4 requirements are specified for different type of measurement gaps such as pre-MG, NCSG, MUSIM gaps etc., along with their concurrent operation.  **Proposal 2: RAN4 to discuss the applicability of MG deactivation to different type of measurement gaps such as pre-MG, NCSG, MUSIM** **gaps etc., along with their concurrent operation.**  Observation 4: Deactivation of excessive number of (consecutive or non-consecutive) measurement gaps by the network may have negative impact on RRM performance.  **Proposal 3: RAN4 to consider introducing UAI to indicate one or more of the following aspects for MG deactivation**  **•        Maximum number of consecutive MGs that can be skipped**  **•        maximum number of MGs that can be skipped**  **•        MG type that can be skipped** |
| R4-2412206 | Huawei, HiSilicon | Discussion on RRM impacts for R19 XR  Observation 1: In some scenarios, the RRM measurement performance (e.g. latency, accuracy) may have higher priority than XR service to guarantee the mobility performance.  **Proposal 1: NW shall have clear expectation on UE RRM behavior/performance, when the measurement occasion is skipped/canceled for data transmission/reception.**  **Proposal 2: RAN4 shall define corresponding RRM behavior/performance when the measurement occasion is skipped/canceled for data transmission/reception.**  Observation 2: Regarding the RRM behavior/performance when the measurement occasion is skipped/canceled, following options can be taken as starting point:  •        Alt1: Same requirement still applies  •        Alt2: The measurement delay to be extended  Observation 3: From NW point views, it is safe to support this feature when it can provide additional scheduling opportunity but will not decreasing the mobility performance.  Observation 4: UAI for measurement occasion may be helpful for enabling transmission/reception in MGs/SMTC with restriction. And the flexibility of scheduling shall be guaranteed as NW can properly scheduling the data transmission/reception.  Observation 5: To simply the discussion and UE implementation, it is suggested to treat MG and SMTC with restriction separately. Otherwise, the situation is much more complicated with multiple layers.  **Proposal 3: RAN4 reply LS to RAN1 that the UAI related to measurement occasions may be beneficial for enabling transmission/reception within MG/SMTC with restriction. RAN4 will further discuss the corresponding RRM behavior/performance related to UAI.**  **Proposal 4: The UAI shall not restrict NW behavior for scheduling which is up to NW implementation.** |
| [**R4-2411441**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411441.zip) | Apple | Reply LS to RAN1 on UE assistance information |
| [**R4-2413393**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413393.zip) | Ericsson | Draft LS response on UE assistance information |
| R4-2412247 | vivo | Reply LS on UE assistance information for XR  Observation 1: Depending on measurement configuration, e.g., gap, SMTC, MO etc., some of the gaps may not be used for measurements while measurement requirements being satisfied.  Observation 2: It is up to UE implementation which gaps are not used for measurements under current measurement configuration.  Observation 3: Significant gain on throughput is observed if UE can provide information about unused gaps for measurement without impact on mobility performance.  Observation 4: Depending on measurement configuration, e.g., SMTC, MO etc., some of the SMTC occasions may not be used for measurements while measurement requirements being satisfied.  Observation 5: It is up to UE implementation which SMTC occasions are not used for measurements under current measurement configuration.  Observation 6: Channel condition, e.g., RSRP, does not provide information about which gaps/SMTC occasions are not used for measurements.  Observation 7: UE mobility information does not help how gaps/SMTC occasions are used for measurement unless relaxed L3 measurement requirements are specified.    **Proposal 1: UE should provide assistance information about gaps not used for measurement for enabling transmission/reception in these gaps.**  **Proposal 2: NW may indicate the percentage of measurement gaps not used for measurement for UE to provide assistance information about gaps.**  **Proposal 3: UE should provide assistance information about SMTC occasions not used for measurement for enabling transmission/reception on the SMTC occasions.**  **Proposal 4: NW may indicate the percentage about SMTC occasions not used for measurement for UE to provide assistance information about SMTC occasions.**  **Proposal 5: The UE assistance information about SMTC occasions not used for measurement should be provided on each CC/MO.**  **Proposal 6: No UE assistance information about L1 measurements is provided.**  **Proposal 7: The patterns of gaps/SMTC occasions not used for measurement within a time period should be provided as UE assistance information.**  **Proposal 8: UE assistance information is reported in response to RRCReconfiguration.**  **Proposal 9: RAN4 to further decide what measurement gaps are considered in this WI, e.g., per-UE gap and per-FR gap, pre-configured measurement gap, concurrent measurement gaps, NCSG and MUSIM gaps etc.**  **Proposal 10: RAN4 to further study how UE assistance information is reported when DRX is configured.** |

## Open issues summary

### Sub-topic 2-1 Scope and scenarios for XR enhancements

#### Issue 2-1-1: Workscope

* Proposals
  + Proposal 1: RAN4 shall proactively participate in solution design to enable Tx/Rx in gap/restriction. At least the following aspects could be led by RAN4:
    - Proposal 1a: Tx/Rx in occasions of L1 operation including RLM, BFD, CBD and L1 measurement.
    - Proposal 1b: Impact on measurement performance due to measurement cancellation and corresponding solution to address the impact.
    - Proposal 1c: Possible UE assistance information.
    - Proposal 1d: Possible pattern for measurement cancellation.
  + Proposal 2: Since there are still many FFS points in RAN1 discussions about how to enable Tx/Rx in gaps/restrictions, RAN4 should wait for RAN1 conclusions before going into details.
  + Proposal 3: RAN4 to study whether and how to define new core requirements when some of gaps that need to be used for measurements are enabled for data transmission/reception.
  + Proposal 4: It is necessary to clarify which types of measurement are in the scope mentioned by “RRM measurements”.
  + Proposal 5: It is better to consider whether existing mechanisms, such as measurement without gaps, NCSG can be reused or not for transmission/reception in gaps as a starting point.
  + Proposal 6: RAN4 shall define corresponding RRM behavior/performance when the measurement occasion is skipped/canceled for data transmission/reception.
* Recommended WF
  + Please discuss the proposals above. For the proponents of Proposal 3 and 4, please check if we can discuss based on Proposal 1 to simplify the discussion.

#### Issue 2-1-2: Deployment scenarios

* Proposals
  + Proposal 1: RAN4 to perform a clear selection of the applicable deployment cases when considering skipping of measurement occasions.
  + Proposal 2: Measurement skipping apply for FR1 and FR2-1 measurements
  + Proposal 3: To avoid limiting the XR operation to good network radio conditions only and hereby limiting the XR service coverage, RRM measurement requirements are enhanced for UEs under XR operation.
* Recommended WF
  + Please discuss which options are agreeable.

#### Issue 2-1-3: Types of measurement gaps to consider

In this issue we discuss the types of measurement gaps to be considered in this WID. In order to help the discussion, we reuse the definition of Type-1 and Type-2 measurement gaps as agreed in Rel-18 NR\_MG-enh2:

|  |
| --- |
| * Type-1 MG: Gap(s) configured via GapConfig without suffix * Type-2 MG: Gap(s) configured via GapConfig-r17 without preConfigInd-r17 or ncsgInd-r17 |

* Proposals
  + Proposal 1: Type 1 MG
    - Option 1: First priority
    - Option 2: Second priority
  + Proposal 2: Per-UE and per-FR gaps
    - Option 1: First priority
    - Option 2: Second priority
  + Proposal 3: Type 2 MG
    - Option 1: First priority
    - Option 2: Second priority
  + Proposal 4: NCSG
    - Option 1: First priority
    - Option 2: Second priority
  + Proposal 5: MUSIM gaps
    - Option 1: First priority
    - Option 2: Second priority
  + Proposal 6: MG for positioning
    - Option 1: First priority
    - Option 2: Second priority
* Recommended WF
  + For this issue several companies brough similar proposals on discussing which types of MGs to consider. Therefore, RAN4 should discus which gap types to consider, having in mind the limited among of TUs allocated to this WID

#### Issue 2-1-4: Types of measurements without gaps to consider

* Proposals
  + Proposal 1: RAN4 to study whether and how to define new core requirements when some of SMTC occasions that need to be used for measurements outside gaps are enabled for data transmission/reception when scheduling restrictions exists.
  + Proposal 2: Prioritize measurement skipping for measurements without gaps without interruptions, in intra-frequency for FR2
* Recommended WF
  + Discussion is needed.

#### Issue 2-1-5: Whether L1 measurements are considered for XR measurement skipping

* Proposals
  + Option 1: XR measurement skipping do not include L1 measurements.
* Recommended WF
  + Please discuss whether RAN4 should consider L1 measurements for XR measurement shipping.

#### Issue 2-1-6: Whether L1/L2 triggered mobility measurements are considered for XR measurement skipping

* Proposals
  + Proposal 1: FFS the L1/L2 triggered mobility measurement.
* Recommended WF
  + Please discuss whether RAN4 should consider measurements for L1&L2 triggered mobility.

### Sub-topic 2-2 Need/feasibility of UE assistance information

*Sub-topic description*

RAN1 has sent an LS (R1-2405736) to RAN4, requesting RAN4 to decide whether to introduce any UE assistance information related to measurement occasions. This sub-topic includes issues relating to the need and feasibility of such UE assistance information.

*Open issues and candidate options before meeting:*

#### Issue 2-2-1: General on UAI

* Proposals
  + Option 1: No efficient way is identified to let UE provide assistance information in a static manner.
  + Option 2: discuss the necessary of each candidate UAI one by one
    - Option 2a: The UAI mechanism is tradeoff between the overhead and the system efficiency, RAN4 could discuss the necessary of each candidate UAI one by one.
    - Option 2b: Any further RAN4 impact analysis shall account for UE assistance information signaling latency impacts to mobility/triggered events.
* Recommended WF
  + Please discuss which option can be agreed.

#### Issue 2-2-2: Expected gNB behaviour

* Proposals
  + Proposal 1:
    - RAN4 will not specify any explicit or implicit requirement on gNB behaviour in relation to the UE assistance data.
    - UE assistance containing patterns still cannot guarantee that gNB configuration will follow the UE pattern, since the configuration is ultimately the network decision.
  + Proposal 2: The UAI shall not restrict NW behavior for scheduling which is up to NW implementation.
* Recommended WF
  + Please discuss if the proposal is agreed. Please have in mind that the LS from RAN1 already includes an agreement stating that there is no mandated gNB behaviour expected in response to any UE assistance information that might be specified in this WID.

#### Issue 2-2-3: Information related to measurement occasions

* Proposals
  + Option 1: No UE assistance information related to measurement occasion is needed.
  + Option 2: Introduce UE assistance information related to measurement occasions:
  + Option 3: Discuss feasibility of UAI.
    - Option 3a: When considering the feasibility of UAI related to measurement occasions, it should be ensured that measurement delay and measurement accuracy is not impacted by measurement skipping
    - Option 3b: Any proposals for UAI related to measurement occasions should be justified by clear performance benefit.
  + Option 4: It is up to RAN2 to discuss and decide what UE assistance information related to measurement occasions should be supported.
* Recommended WF
  + Please discuss the options above

#### Issue 2-2-4: If Information related to measurement occasions is introduced, which aspects should be considered

In the following, the proposals regarding what should be considered for UAI related to measurement occasions are listed. Please consider that this issue depends on Issue 2-2-3.

* Proposals
  + Option 1: the number of needed measurement gaps/SMTC with restrictions within a time period, which is beneficial in network indication to skip a measurement gap(s) /restriction(s) in order to enable Tx/Rx.
  + Option 2: The information related to the maximum number of measurement occasions allowed for reallocated to XR over a time.
  + Option 3: Maximum number of consecutive MGs that can be skipped
  + Option 4: maximum number of MGs that can be skipped
  + Option 5: MG type that can be skipped
  + Option 6: UE should provide assistance information about gaps not used for measurement for enabling transmission/reception in these gaps.
  + Option 7: UE should provide assistance information about SMTC occasions not used for measurement for enabling transmission/reception on the SMTC occasions.
  + Option 8: The UE assistance information about SMTC occasions not used for measurement should be provided on each CC/MO.
  + Option 9: The patterns of gaps/SMTC occasions not used for measurement within a time period should be provided as UE assistance information.
* Recommended WF
  + Please discuss the options above. Consider if options 1, 2 and 4 are not equivalent.

#### Issue 2-2-5: Information related to channel conditions

* Proposals
  + Proposal 1: For UEs configured with search threshold (s-MeasureConfig),
    - the UE shall inform the network when the condition is met (i.e. defined RSRP threshold is exceeded).
    - the UE shall inform the network that it is stopping doing RRM measurements because the s-MeasureConfig condition is no longer fulfilled.
* Recommended WF
  + Discus the proposal.

#### Issue 2-2-6: Reply LS

* Proposals
  + Option 1: Reply RAN1 that RAN4 hasn’t identified an efficient way to let UE provide assistance information in a static manner
  + Option 2: RAN4 concludes semi-static solution for indication of gaps/SMTC occasions not used for measurement is better from RAN4 perspective and LS to RAN1 if necessary.
  + Option 3: RAN4 reply LS to RAN1 that the UAI related to measurement occasions may be beneficial for enabling transmission/reception within MG/SMTC with restriction. RAN4 will further discuss the corresponding RRM behavior/performance related to UAI.
* Recommended WF
  + Discussion on the feasibility/use of UAI is needed before deciding to send reply to RAN1.

#### Issue 2-2-7: Other proposals on UAI

* Proposals
  + Proposal 1: NW may indicate the percentage of measurement gaps not used for measurement for UE to provide assistance information about gaps.
  + Proposal 2: NW may indicate the percentage about SMTC occasions not used for measurement for UE to provide assistance information about SMTC occasions.
  + Proposal 3: No UE assistance information about L1 measurements is provided.
  + Proposal 4: UE assistance information is reported in response to RRCReconfiguration.
  + Proposal 5: RAN4 to further decide what measurement gaps are considered in this WI, e.g., per-UE gap and per-FR gap, pre-configured measurement gap, concurrent measurement gaps, NCSG and MUSIM gaps etc.
  + Proposal 6: RAN4 to further study how UE assistance information is reported when DRX is configured.
* Recommended WF
  + Discussion on needed.

### Sub-topic 2-3 Timeline for measurement skipping processing

#### Issue 2-3-1: Timeline requirement for measurement skipping

* Proposals
  + Proposal 1: The UE processing time for decoding a DCI with RRM measurement skipping indication should be the same as the currently defined processing requirements in 3GPP TS 38.214 for decoding of DCI and PDSCH decoding, or PUSCH preparation.
  + Proposal 2: RAN4 shall define processing requirements for a UE to act on a DCI with RRM measurement skipping indication. Inspired by UE requirements for e.g. acting on power control commands and uplink cancellation indication in DCI, the processing could be fraction of a slot.
* Recommended WF
  + Discussion needed

### Sub-topic 2-4 Impact of measurement skipping

#### Issue 2-4-1: How measurement skipping impact is considered in RRM measurements

* Proposals
  + Proposal 1: RAN4 to consider extending the L3 requirements with MGs such as cell identification and measurements delays when one or more MGs are deactivated by the network.
    - The exact extension may depend on further RAN1/RAN2 discussion and agreements.
  + Proposal 2: Any further RAN4 impact analysis shall account for XR QoS under measurement gap skipping occasions versus measurement accuracy degradation.
  + Proposal 3: RAN4 to discuss possible enhancements to the legacy RRM requirements to account for the UE XR operation, e.g., whether pre-defined or dynamically extended RRM measurement period is to be specified for UE under XR operation to dynamically account for the availability of the RRM measurement occasions for RRM measurements.
  + Proposal 4: NW shall have clear expectation on UE RRM behavior/performance, when the measurement occasion is skipped/canceled for data transmission/reception.
* Recommended WF
  + Discuss how avoiding measurements should impact RAN4 RRM requirements.

#### Issue 2-4-2: Conditions for measurement skipping

* Proposals
  + Proposal 1: RAN4 to discuss which conditions the measurement gap configurations need to meet to be relevant for the UE XR operation, e.g., minimum MGL and/or maximum MGL, maximum MGRP, maximum acceptable time separation between the XR occasions, etc.
  + Proposal 2: RAN4 to discuss the impact on RRM samples and how they are combined during the UE XR operation, e.g., maximum acceptable time separation between two measurement occasions available for RRM measurements.
  + Proposal 3: Discuss possible pattern for measurement cancellation
* Recommended WF
  + Discuss the proposals