**3GPP TSG-RAN Meeting #92-e RP-21xxxx**

**Electronic Meeting, September 14th – 18th 2020**

**Agenda item:** TBA

**Source:** Moderator (RAN4 VC, Intel Corporation)

**Title:** Moderator's summary for email discussion [92-e-23-RRM-Enh]

**Document for:** Discussion

# Introduction

This document is the summary of the email discussion [92-e-23-RRM-Enh] on potential additional RRM objectives to be included in the Rel-17 work scope. Based on the discussions the recommendations will be provided. The following documents are covered in this email thread.

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| **Tdoc** | **Title** | **Source** |
| RP-211149 | New WID on legacy RRM requirements improvements | vivo |
| RP-211150 | Views on RRM requirements improvements | vivo |
| RP-211392 | Discussion on handling of RRM requirements related to R16 features | Huawei, HiSilicon |
| RP-211416 | Views on RAN4 RRM TEI Topics | Intel Corporation |
| RP-211417 | New WID: RRM TEI requirements | Intel Corporation |
| RP-211348 | Motivation: Measurement Requirements for “NeedForGap” | Ericsson, Huawei, HiSilicon |
| RP-211461 | Views on postponed RAN4 RRM issues | MediaTek Inc. |
| RP-211161 | Views on scope of further RRM enhancements | vivo |
| RP-211427 | Proposal to expand R17 FeRRM WI scope | Apple |

## Summary of proposals

The summary of companies’ proposals is provided below:

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| **Tdoc** | **Source** | **Observations and proposals** |
| RP-211161 | vivo | Proposal 1: Add the three new scenarios into the scope of the HO with PSCell in FeRRM WI.   * from NR SA to NE-DC * from NR SA to NR-DC * from LTE SA to EN-DC   Proposal 2: No TU change is needed by adding the new scenarios.  Proposal 3: Whether NR-U is in the scope of HO with PSCell in FeRRM WI needs to be clarified. |
| RP-211150 RP-211149 | vivo | Proposal 1: RRM requirements for FR1+FR1 NR-DC in Rel-16 are to be improved by creating a new WI in Rel-17.  Proposal 2: The improved RRM requirements for FR1+FR1 NR-DC are specified in release independent from Rel-16.  Proposal 3: RRM requirements for FR1+FR1 NR-DC are specified for   * PSCell addition delay requirements * NR-DC mode: carrier-specific scaling factor for SSB-based and CSI-RS based L3 measurements performed outside gaps * NR-DC: carrier-specific scaling factor for SSB-based and CSI-RS-based L3 measurements performed within gaps   Proposal 4: RRM requirements for UE capability ‘NeedForGap’ are to be specified in a new WI in Rel-17.  Proposal 5: Whether RRM requirements for UE capability ‘NeedForGap’ are specified in release independent from Rel-16 are decided in WI phase.  Proposal 6: Objectives for RRM requirements for UE capability ‘NeedForGap’ are   * RRM requirements for UE capability ‘NeedForGap’ are applied to NR SA only. * The measurements related to ‘NeedForGap’ are limited to SSB based measurements only. * Study whether the additional interruption is allowed when UE reporting ‘no gap’.   + Specify interruption requirements, if interruption is allowed. * Study CSSF for measurements with ‘no gap’ in ‘NeedForGap’ reporting, and specify requirements if needed. * Study scheduling restriction for measurements with ‘no gap’ in ‘NeedForGap’ reporting, and specify requirements if needed. * Study measurement period for measurements with ‘no gap’ in ‘NeedForGap’ reporting, and specify requirements if needed. * Decide if requirements are specified in release independent from Rel-16. |
| RP-211392 | Huawei, HiSilicon | Proposal 1: RAN4 RRM to develop requirements for the following features in R17 TEI and release independent from R16:   * per-BC indication of per-FR measurement, * needforgap, * non-co-located deployment for FR1 intra-band NR-CA/EN-DC |
| RP-211416 RP-211417 | Intel Corporation | Observation: In the previous RAN4 meetings, several RRM-relevant ‘TEI16’ topics were raised by companies, which received echo in the group that they should be addressed in the future   * NeedForGap RRM requirements [1] * Intra-band non-contiguous CA/EN-DC MRTD requirements [2] * FR1+FR1 NR-DC RRM requirements [3] * Per-FR gap UE capability enhancement [4]   Proposal: Further discuss and decide on how to handle each of the candidate RRM ‘TEI’ topics   * Option 1: Allow a limited NR Rel-17 scope extension to fit additional RRM objectives   + Option 1A: Schedule work to start in Q4’2021 and aim to complete by March’2022.   + Further discuss whether to extend the scope of the existing Rel-17 FeRRM WI, Rel-17 MG Enh WI or create a separate WI * Option 2: Consider the objectives as candidate objectives for Rel-18 |
| RP-211348 | Ericsson, Huawei, HiSilicon | Work scope:   * Limited to SSB based measurements configured via measurement objects in NR-SA only * Study whether the additional interruption is allowed when UE reporting ‘no gap’   + Further define the interruption length, occasion and ratio, if the interruption is allowed * Study the related requirements, such as CSSF, measurement period, scheduling restriction etc. * No impact to other WG is expected.   Release:   * Specify UE requirements in R16 under TEI16.   Timeline/TU:   * 1 TU in total:   + 0.5 TU per RAN4 meeting over 2 RAN4 meetings (see next slide). |
| RP-211461 | MediaTek | Proposal 1: Whether to start the RAN4 discussions for additional topics should also take into account the current RAN4 workload assessment from RAN4 chairman.  Proposal 2: Subject to RAN4 workload, merge NeedForGap requirements into NCSG in Rel-17 NR\_MG\_enh and increase the TU allocation by to 1.5 per meeting.  Proposal 3: Subject to RAN4 workload, the requirements for FR1 intra-band non-contiguous NR-CA/NR-DC are to be included in a new (or existing) RF WI with RRM and Demod objectives.  Proposal 4: Subject to RAN4 workload, create a new RAN4 TEI for introducing per-BC indication of per-FR gap. |
| RP-211427 | Apple | Proposal: Select up to 3 candidate scopes from following list to expand the R17 FeRRM WI, and no need to have  any new RAN4 led WI:  - Candidate scope 1: CMTC for CSI-RS L3 measurement  - Candidate scope 2: TCI switching enhancement  - Candidate scope 3: Collision between SSB/CSI-RS based L1 and CSI-RS L3  - Candidate scope 4: CGI reading requirement for NR-U cell  - Candidate scope 5: FR1+FR1 NR-DC RRM  - Candidate scope 6: Study and, if necessary, to specify New MR-DC Scenario for HO with PSCell in R17 FeRRM  - Candidate scope 7: RRM requirement with NeedForGap  - Candidate scope 8: Study and, if necessary, to specify Per-BC indication of per-FR MG UE capabilities in R17 FeRRM |

## Topics for discussion

* Topic 1: New RRM-related objectives
* Topic 2: Clarification of FeRRM WI objectives (NR-U for HO with PSCell)

# Topic #1: New RRM-related objectives

Several new RRM-related objectives were proposed to be handled in RAN4 and further decision on how to handle those shall be made:

* Objective #1: RRM requirements for FR1+FR1 NR-DC
* Objective #2: RRM requirements for UE capability ‘NeedForGap’
* Objective #3: Enhanced indication of UE per-FR gap capabilities
* Objective #4: Support of non-co-located deployment for FR1 intra-band NR-CA/EN-DC
* Objective #5: HO with PSCell requirements for additional scenarios
  + from NR SA to NE-DC
  + from NR SA to NR-DC
  + from LTE SA to EN-DC
* Objective #6: CMTC for CSI-RS L3 measurement
* Objective #7: TCI switching enhancement
* Objective #8: Collision between SSB/CSI-RS based L1 and CSI-RS L3
* Objective #9: CGI reading requirement for NR-U cell

For Topic #1 moderator recommends the following plan of the discussion:

1. GTW discussion (Mon)
   1. Identify whether and how many new RRM-related objectives can be added into the scope taking into account RAN4 Chair TU assessment
   2. If any new objectives can be handled, then further clarify
      1. Whether the proposals can be handled as TEI17 or shall be included into a certain Rel-17 WI
      2. Whether TEI16 approach can be used for specific objectives
      3. Note: Possibility of using TEI16/17 approach should be further confirmed in GTW session based on feedback from RAN4 Chair, RAN Chair and MCC.
2. Initial round
   1. Collect views on prioritization of candidate objectives
   2. Collect views on how to organize the work in case any objectives are approved.
   3. Collect views on detailed objectives.
3. Intermediate round
   1. Stabilize the set of new RRM-related objects (if any)
   2. Decide whether objectives shall be handled in a specific WI or in the TEI scope
   3. Discuss detailed objectives
4. Final round
   1. Conclude on detailed objectives
   2. Update WIDs if needed

## Initial Round

For the initial round moderator recommends to:

1. Collect companies views on prioritization of candidate objectives
2. Collect companies views on how to organize the work in case any objectives are approved.
3. Collect companies views on detailed objectives.

Moderator’s view is that exact set of objectives can be decided taking into account companies support of individual objectives as well GTW discussion on available RAN4 capacity.

### Open issues and companies views’ collection

**Sub-topic 1-1. Prioritization of candidate RRM-related objectives**

*Moderator: Companies are encouraged to share 1) proposals on the prioritization of proposed candidate RRM objectives general views on the objectives (please indicate your support on the specific objectives); 2) general views on the prioritization process (e.g. how many new objectives can be approved, whether any down-scoping is required, timelines of work).*

* Objective #1: RRM requirements for FR1+FR1 NR-DC
* Objective #2: RRM requirements for UE capability ‘NeedForGap’
* Objective #3: Enhanced indication of UE per-FR gap capabilities
* Objective #4: Support of non-co-located deployment for FR1 intra-band NR-CA/EN-DC
* Objective #5: HO with PSCell requirements for additional scenarios
  + from NR SA to NE-DC
  + from NR SA to NR-DC
  + from LTE SA to EN-DC
* Objective #6: CMTC for CSI-RS L3 measurement
* Objective #7: TCI switching enhancement
* Objective #8: Collision between SSB/CSI-RS based L1 and CSI-RS L3
* Objective #9: CGI reading requirement for NR-U cell

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| **Company** | **Comments collection** |
| Ericsson | 1. First priority: objective # 2, second priority: objective #4 and third priority: objective #1. We prefer objective #2 as release independent from Rel-16. 2. In our view not more than 2 new objectives can be accommodated in Rel-17 while considering significant Rel-16 RRM performance maintenance work in Q3/Q4. |
| **Apple** | * We see the motivations for all of them. However, due to TU limitation, our top 3 preferences are objectives #6, #9 and #1 * No more than 3 new objectives should be considered. * Based on the discussion in GTW as well as the guidance from RAN and RAN4 chairs, shall we allow the study phase for the new objectives? |
| SoftBank | We prefer that objective#4 is the first priority and objective#1 is the second priority. |
| China Telecom | Support objective #2. Work can be done in Rel-17 and the requirements will be release independent from Rel-16. |
| Intel | One general comment for all the proposals is that we have to take the ones which had already reached consensus in RAN4. Those are #1 2 3 4. |

**Sub-topic 1-2. Whether the requirements for objectives in issue 1-1 shall be defined in Rel-16/Rel-17 and how to organize the work for each of supported individual objectives**

*Moderator: Multiple proposal on how to handle the new objectives were provided. It is recommended to collect companies views on the preferred approaches. Companies are encouraged to provide views on how to handle each additional objective. Feasibility of using TEI16/17 approach should be further confirmed in GTW session based on feedback from RAN4 Chair, RAN Chair and MCC.*

* Option 1: Include the work in Rel-17
  + Option 1A: Extend existing WI (e.g. FeRRM WI, MG Enhancements WI, other?)
  + Option 1B: Create new Rel-17 WI
  + Option 1C: Handle in TEI17
* Option 2: Rel-16
  + Option 2A: Handle in TEI16
* Other

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| **Company** | **Comments collection** |
| Ericsson | Option 1A. However, if needed some requirements can be release independent from Rel-16 (see our response on issue 1-1). |
| **Apple** | Option 1A. TEI16 does not seems appropriate for any of them due to the scope and cross-WG impacts. It is suggested to only consider the option to expand the existing WI scope. |
| China Telecom | Option 1A with a clear scope. |
| Intel | We can compromise with Option 1A. we think it is a better approach than anything else on the table, considering the current RAN4 workload. Possibly #1 and #3 can be fit into FeRRM, #2 in MG\_enh, #4 in FR1 RF. But we don’t think there is enough room for all four at the same time. Let’s choose 2 or 3. |

**Sub-topic 1-3: Whether requirements can be introduced in a release independent manner**

*Moderator: Several companies proposed to define requirements in release independent manner (FR1+FR1 NR-DC, ‘NeedForGap’). Companies are encouraged to provide views on how to handle each additional objective and whether it is feasible to define objectives in a release-independent manner.*

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| **Company** | **Comments collection** |
| **Apple** | It should be discussed and decided after the corresponding features and requirements becomes available. This is also the typical procedure how release independent is treated.  Combining sub-topic 1-1 and 1-3 makes the overall discussion even more complicated. |
| China Telecom | Yes |
| Intel | YES with case by case discussion.  Anyway RRM has to discuss this aspect as several releases have passed since Rel-15. NR has not seen any release independent RRM requirements. We suggest that we discuss this aspect in general so that the outcome provides guidance in future works. |
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**Sub-topic 1-4: Detailed objectives**

*Moderator: Companies are encouraged to share general views on each objective and proposals on the detailed scope for each identified objective.*

**Issue 1-4-1: RRM requirements for FR1+FR1 NR-DC**

* Option 1 (vivo):
  + PSCell addition delay requirements
  + NR-DC mode: carrier-specific scaling factor for SSB-based and CSI-RS based L3 measurements performed outside gaps
  + NR-DC: carrier-specific scaling factor for SSB-based and CSI-RS-based L3 measurements performed within gaps
* Option 2 (Intel):
  + Specify missing FR1+FR1 NR-DC RRM requirements
    - Specify general RRM requirement applicability: number of serving carriers configured under NR-DC
    - Specify delay requirements for PSCell procedures
      * PSCell addition and release
      * PSCell change and conditional PSCell change
    - Specify scheduling availability of UE during RLM and BFD
    - Specify or update CSSF for NR-DC
    - Specify if needed, release independency of this objective from Rel-16

Note: this objective applies only to NR SA and only to SSB-based measurements.

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| **Company** | **Comments collection** |
| Ericsson | This will be significant amount of work. If this objective is included then it should be limited to SSB based L3 measurements. |
| **Apple** | The same as other objectives, if this one is agreed to be included in R17, the exact scope can be discussed and decided in WG level. We probably do not need to go to details in the plenary. |
| Intel | Option 2 is more comprehensive.  In practice many of the subobjectives here don’t impose much of workload as it seems, since most of the RRM requirements have corresponding references from existing ones. Note that this objective applies only to NR SA and only to SSB-based measurements. |

**Issue 1-4-2: RRM requirements for UE capability ‘NeedForGap’**

* Option 1 (vivo):
  + RRM requirements for UE capability ‘NeedForGap’ are applied to NR SA only.
  + The measurements related to ‘NeedForGap’ are limited to SSB based measurements only.
  + Study whether the additional interruption is allowed when UE reporting ‘no gap’.
    - Specify interruption requirements, if interruption is allowed.
  + Study CSSF for measurements with ‘no gap’ in ‘NeedForGap’ reporting, and specify requirements if needed.
  + Study scheduling restriction for measurements with ‘no gap’ in ‘NeedForGap’ reporting, and specify requirements if needed.
  + Study measurement period for measurements with ‘no gap’ in ‘NeedForGap’ reporting, and specify requirements if needed.
  + Decide if requirements are specified in release independent from Rel-16.
* Option 2 (Intel)
  + Specify RRM requirements for UE supporting gap-less RRM measurements
  + Discuss and specify if needed, possible interruptions or scheduling restrictions due to UE retuning the vacant chain for gap-less measurements
  + Specify or update RRM measurement requirements related to gap-less measurements
    - CSSF
    - Measurement period
    - Scheduling or measurement restrictions/availabilities
  + Specify if needed, release independency of this objective from Rel-16
* Option 3 (E///, Huawei, HiSilicon)
  + Limited to SSB based measurements configured via measurement objects in NR-SA only
  + Study whether the additional interruption is allowed when UE reporting ‘no gap’
    - Further define the interruption length, occasion and ratio, if the interruption is allowed
  + Study the related requirements, such as CSSF, measurement period, scheduling restriction etc.

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| **Company** | **Comments collection** |
| Ericsson | Fundamentally all options are similar. We prefer scope as agreed in RAN4 WF (R4-2108039):   * Potential new objective - NeedForGap for NR-SA only   1. Limited to SSB based measurements configured via measurement objects   2. Study whether the additional interruption is allowed when UE reporting ‘no gap’      1. Further define the interruption length, occasion and ratio, if the interruption is allowed   3. Study the related requirements, such as CSSF, measurement period, scheduling restriction etc.   4. RAN4 to further consider the relation with other UE capabilities, such as NCSG etc.   5. Analyse other WG impact although impact is not expected. |
| **Apple** | Agree to take agreed WF in RAN4#99e as the baseline. Once this topic is agreed, details can be further discussed and finalized. |
| Intel | OK to go with the agreeable WF. But release independency has to be discussed. |

**Issue 1-4-3: Enhanced indication of UE per-FR gap capabilities**

* Option 1 (Intel)
  + Enhance indication of UE per-FR gap capabilities
    - Study and update if needed, RRM requirements for Per-BC indication of per-FR gap capabilities
    - Other indication is not precluded

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| **Company** | **Comments collection** |
| Ericsson | Looks fine to us. |
| Intel | The problem for this objective is where to put it. FeRRM is one candidate place. No release independency is assumed for now but still subject to group discussion. |
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**Issue 1-4-4: Support of non-co-located deployment for FR1 intra-band NR-CA/EN-DC**

* Option 1 (Intel)
  + Study the following aspects to enable UE support of non-collocated intra-band non-contiguous CA and EN-DC
    - Baseline UE RF architecture
    - Baseline BS RF architecture
    - Power imbalance between 2 CCs in the same band
    - MRTD and MTTD requirements
    - Others
  + Specify if needed, any RAN4 requirement according to the above study

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| **Company** | **Comments collection** |
| Ericsson | The scope looks fine. However, only MRTD/MTTD is part of RRM work. |
| Intel | We can remove ‘others’ bullet. Maybe to put this objective in FR1 RF WI is a proper approach. Release independency is not considered for this objective. |
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**Issue 1-4-5: HO with PSCell requirements for additional scenarios**

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| **Company** | **Comments collection** |
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**Issue 1-4-6: Objective #6: CMTC for CSI-RS L3 measurement**

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**Issue 1-4-7: TCI switching enhancement**

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| **Company** | **Comments collection** |
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**Issue 1-4-8: Collision between SSB/CSI-RS based L1 and CSI-RS L3**

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| **Company** | **Comments collection** |
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**Issue 1-4-9: CGI reading requirement for NR-U cell**

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| **Company** | **Comments collection** |
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### Summary

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## Intermediate Round

### Open issues and companies views’ collection

### Summary

## Final Round

### Open issues and companies views’ collection

### Summary

# Topic #2: Clarification of FeRRM WI objectives

In RAN4 #99e there was no common understanding whether NR-U scenario is in the scope of in the scope of HO with PSCell objective in FeRRM WI.

For Topic #2 moderator recommends the following plan of the discussion:

1. Initial round
   1. Collect views on whether further clarification on NR-U scope are needed
   2. Collect views whether NR-U shall be treated as a separate objective.
2. Intermediate round
   1. Decide on updated WID (if agreeable) or move discussion to Topic #1 if companies prefer to handle it as a separate objective

## Initial Round

### Open issues and companies views’ collection

*Moderator: In RAN4 #99e there was no common understanding whether NR-U scenario is in the scope of in the scope of HO with PSCell objective in FeRRM WI. Moderator recommend to further collect companies views on this issue.*

**Issue 2-1. Whether NR-U is in the scope of HO with PSCell objective in FeRRM WI**

* Option 1: Yes (NR-U is in the scope of HO with PSCell in FeRRM WI)
* Option 2: No (NR-U is NOT in the scope of HO with PSCell in FeRRM WI)

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| **Company** | **Comments collection** |
| Ericsson | Option 1. RAN2 procedures/signaling on HO with PSCell covers NR as well as NR-U. The RAN2 procedures are the same for two cases. FeRRM WID does not explicitly excludes HO with PSCell for NR-U. So we see no reason to exclude NR-U. Also EN-DC with NR-U is an important deployment scenario. |
| Apple | Option 2. Unless NR-U is explicitly specified, we otherwise should assume only licensed based operation. Otherwise, NR-U can be interpreted as being included in all other ongoing WI, e.g. HST, RedCap, etc. |
| Intel | Option 2. From RRM perspective, requirements are defined separately between NR and NR-U. in our understanding if not explicitly displayed, NR-U is not considered as a target scenario in terms of RRM requirements applicability. |

**Issue 2-2. Whether NR-U scope for HO with PSCell shall be added as a separate objective and handled in Topic #1**

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| **Company** | **Comments collection** |
| Ericsson | Related to issue 2-1. We do not see any need to add it as separate objective. |
| Apple | It is not suggested to include NR-U at this stage. If needed, it can be considered in the future release. |
| Intel | We prefer not to, at least before Rel-18. Let’s further discuss it in Rel-18. |

### Summary

TBA

## Intermediate Round

### Open issues and companies views’ collection

### Summary

## Final Round

### Open issues and companies views’ collection

### Summary

## Annex: Contacts

Please provide a company contact that the email discussion moderator can contact if required.

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| **Company** | **Contact name and email** |
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