**3GPP TSG-RAN WG4 Meeting #116bis R4-2514518**

**Prague, Czech Republic, Oct 13th ‒ 17th, 2025**

**Agenda item:** 8.1

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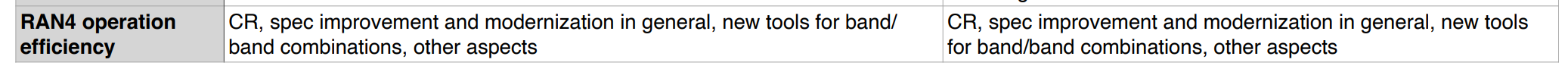
**Title:** Topic summary for [116bis][111] 6G operation efficiency

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion (e.g. list of treated agenda items) and provide some guidelines for email discussion if necessary.*

As instructed by RAN4 leadership, this thread is about RAN4 operation efficiency, which include CR, spec improvement and modernization in general, and new tools for band and band combinations and other related aspects.



*Under Agenda Item 8.13, the following 15 tdocs are submitted, of which 1 tdoc moves to UE RF Agenda (R4-2513289):*

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2513023 | Qualcomm Incorporated | Section 2.1 – Impact of Increasing Channel BWs to RAN4 Work   * Observation 2.1-1: *The volume of specification work is expected to increase with 6G.* * Proposal 2.1-1: *RAN4 should study how to manage the growing number of channel bandwidths by simplifying the specifications and making them easily scalable.*   Section 2.2.1 – Views on FFT Increase and Its Impact on RAN4 Requirements   * Observation 2.2-1: *Similarly to adding more channel BWs in RAN4, increasing the FFT size will mean more volume of work in RAN4.*   Section 2.3 – CR Handling Practices and Technical Specifications   * Observation 2.3-1: *Only normative requirements in Technical Specifications have impact on how features are implemented.* * Observation 2.3-2: *Proper time should be allowed for companies to check the CR and their implementation status before rushing to agree Change Request.* * Observation 2.3-3: *Well-written requirements do not leave room for interpretations of the underlying functional requirement.*   Section 2.4 – Modernization of Specification Drafting Tools in RAN4   * Proposal 2.4-1: *RAN4 should consider Markdown-based spec authoring with Git integration, aligning with TR 21.802 to evaluate editorial and operational benefits.*   Section 2.5 – Structure and Drafting Principles for TS 38.101-4   * Observation 2.5-1: *The current structure of applicability rules in TS 38.101-4 is fragmented and sometimes inconsistent across device types, making it difficult for stakeholders to interpret test requirements reliably.* * Proposal 2.5-1: *RAN4 should discuss improving Demodulation spec in 6GR by replacing broad applicability statements with clear, centralized mappings of test coverage.* * Observation 2.5-2: *RAN4 is defining performance requirements for emerging device types, recognizing that some devices may support TN functionality while others may operate independently without supporting it.* * Proposal 2.5-2: *RAN4 should implement a capability-aware test applicability framework that considers device functionality. For devices lacking legacy TN support, test applicability should be designed to avoid dependency on TN-related procedures and corresponding test cases.*   Section 2.6 – Structure and Drafting Principles for TS 38.133   * Proposal 2.6-1: *The 6G RRM spec should follow the agreements for RRM specification improvement made in R4-2420107.* * Proposal 2.6-2: *The 6G RRM specification should adopt RAN2 pseudo-code approach in all sections.* * Proposal 2.6-3: *The following drafting principles agreed in Rel-19 should be applied for the 6G RRM specification:*   + *Put conditions before requirements.*   + *Start paragraphs with UE capability when applicable.*   + *Separate new and legacy requirements using “If” and “Else if” structure.* * Proposal 2.6-4: *RAN4 should study whether further drafting principles should be defined to enhance readability and document them clearly.* * Proposal 2.6-5: *RAN4 should study in the 6G study item whether the amount of RRM procedures can be reduced. Requirements should only be defined for key RRM procedures.*   Proposal 2.6-6: *CRs for the 6GR RRM spec should only be accepted if they clearly follow the drafting principles.* |
| R4-2513036 | Apple | *Proposal 1: It is proposed to limit the number of parallel sessions to four, Main/RRM/BDaT + one ad hoc session.*  *Proposal 2: It is proposed to establish a dedicated email thread for ad hoc/offline session topics and timing. During a meeting, once an ad hoc session is approved by RAN4 chair/session chair, the delegate who is going to chair the ad hoc session will announce it on the email thread.*  *Proposal 3: It is proposed to explore the means to put the meeting schedule on a common calendar that every delegate can access.*  *Proposal 4: It is proposed to discuss how to make sure TU budget more accurately represent the actual meeting time spent, and how to limit the work/open issues left to maintenance stage.*  *Proposal 5: It is proposed to make WI code mandatory when allocating tdoc numbers for discussion papers and WFs.*  *Proposal 6: For specification modernization, follow the conclusion from the SI of Modernization of Specification Format and Procedures (SP-250802).*  *Proposal 7: It is proposed to start discussion on how to address the above identified issues for UE RF specification improvements.*  *Proposal 8: Define baseline RRM requirements for the most typical or practical use cases (some exceptions are allowed if there is strong demand from operators).*  *Proposal 9: For Spec structure and readability, similar principle can be adopted as agreed in R4-2420107, i.e., adopt RAN2 pseudo-code approach for 6G RRM requirements.*  *Proposal 10: For spec and CR drafting rules, use similar principle as in 5G RAN4 Meeting Efficiency Improvements (R4-2114691), i.e., big CR approach.*  *Proposal 11: Streamline FRC table contents to include necessary configuration data and avoid any derived information.*  *Proposal 12: Study a methodology to efficiently introduce new FRCs in the specification.*  *Proposal 13: Study a methodology to align specifications created in parallel.* |
| R4-2513053 | Samsung | Observation 1: With AI/ML-enabled features contained in the 6G specification, how to capture the standardized AI/ML model and the standardized dataset in the 3GPP specification are the issues to be studied.  Proposal 1: For specification quality improvement, the following procedures led by specification editors can be considered:  Proposal 2: For specification modernization for capturing the standardized AI/ML model and the standardized dataset, the following issues can be studied in RAN4:  Proposal 3: The JSON schema continue to be used for the development of band combination database, with careful consideration of the outcomes and advancements in 6G related to band combinations. |
| R4-2513071 | Nokia | Observation 1: Capturing agreements late in the meeting week often leads to errors or poor text.  Observation 2: RAN4 intends to transition to fully use the database and remove the current DOCX table-based representation of supported band combinations in Rel-20.  Observation 3: RAN4 is considering to also address band combination specific requirements as delta values and MSD.  Proposal 1: RAN4 experts are encouraged to engage in the 6G specification modernization discussion under FS\_6GSpecs, and RAN4 shall adopt the conclusions in the first version of the RAN4 6G specification.  Proposal 2: Adopt RAN2 pseudo-code approach when drafting the 6G UE RRM requirements.  Proposal 3: RAN4 to discuss potential specification skeleton for the new RRM specification in 6G including at least:  Proposal 4: Study the root causes of specification quality challenges in RAN4 and aim to address them before 6G normative phase.  Proposal 5: Define clear rules about bringing new features in CRs late during the meeting week.  Proposal 6: Suggestion for CR handling is to start discussion on CR revisions early during the meeting week, e.g. end of Monday to allow companies to have more time to merge and review CRs. This is expected to improve CR quality.  Proposal 7: RAN4 shall utilize the band combination database from the beginning of 6GR  Proposal 8: RAN4 shall consider automated tools for generating supported band combinations and their related specific requirements as e.g. delta values and MSD in 6GR. |
| R4-2513077 | MediaTek inc. | Observation 1: One single feature may have requirements at multiple clauses and across multiple specs.  Observation 2: For the same feature, RAN4 may agree to introduce new clause for one requirement and re-use legacy clause for another requirement.  Observation 3: The duplicated requirement leads to confusion and unnecessary extra effort for spec maintenance.  Proposal 1: RAN4 to study how to document whether a feature has RAN4 requirement and test cases as well as where to find them.  Proposal 2: RAN4 to consider new in-meeting and post-meeting arrangement to provide sufficient time for CR drafting and review.  Proposal 3: RAN4 can define UE RF requirements for single carrier as baseline for minimum requirements and specifies the 2Tx/CA/DC/DL-UL decoupling/1Tx RF requirements with Suffix.  Proposal 4: For vertical device requirements (i.e., Vehicle Device, RedCap, NTN, ATG, UAV, …), RAN4 can consider whether to specify the corresponding requirements in different specs.  Proposal 5: When discussing RF spec improvement, RAN4 needs to consider the progress in band combo simplification.  Proposal 6: The agreements in R4-2420107 should be treated as a starting point for 6G RRM spec.  Proposal 7: RAN4 to study methods to differentiate whether the difference between 2 requirements are due to editorial issue or technical issue. |
| R4-2513128 | CMCC | Proposal 1: Taking Rel-19 agreements on spec improvements into account, it is proposed that following aspects need to be avoided for RAN4 6GR specification  Proposal 2: it is proposed to adopt pseudo-code approach instead of hierarchy of indent when drafting requirements with complex logic.  Proposal 3: to avoid the duplication issue in the specification, it is proposed to consider following options:  Proposal 4: for CR handling, it is proposed to consider following options |
| R4-2513137 | ZTE Corporation, Sanechips | Observation 1: In RAN4, it intends to transition 5G CA/EN-DC/NE-DC band combinations from Docx table in the specifications to database in Rel-20.  Observation 2: In 5G UE RF specification, different approaches are adopted for different features in the structure. Meanwhile, there are too many (sub-)clause suffixes not defined for RF requirements.  Observation 3: There exist different interpretations for the missing (sub-)clause suffixes requirements which causes misunderstanding.  Observation 4: In 5G UE RF spec, the structure is organized by the requirements with different features packing into the second level sub-clauses. However, there are also some second level features further recursively categorized into 3rd level features. This causes the spec poor readability.  Observation 5: In RAN4, Word is currently used for writing specifications and for working on CRs/pCRs in the meetings. Additional tools such as Visio for figures and Excel spreadsheets are used in some cases.  Observation 6: Recently some voices appeared in 3GPP to check if using  Proposal 1: It is suggested that the band combinations in 6GR follow Rel-20 5G not to store the band combinations in the specifications but store in the database.  Proposal 2: It is proposed in 6GR to discuss uniform drafting guidance/rules for the RF requirements definition when introduction of a new feature in the specification.  Proposal 3: In 6GR, it is proposed to study the UE RF spec structure by the requirements with different features.  Proposal 4: In 6GR, it is proposed to reduce the usage of RAN2 language in RAN4 specification as much as possible.  Proposal 5: It is proposed to leverage the Rel-19 RAN task for the simplification for co-existence and co-location requirements for 6GR BS specification.  Proposal 6: It is proposed to discuss how to capture the same requirements (e.g. TRP measurement, EVM measurement, test mode/configuration, OTA test chamber) or test procedures across different network nodes specifications if there are many similarities just with some items/notation difference.  Proposal 7: Compared with the existing 5G framework in TS 38.133, construct the overall blueprint of RRM for 6GR with more clear structure from the perspective of RRM procedure. The following framework is preferred:  Proposal 8: Editorial modifications in NR can be used as the baseline for future optimization toward 6G.  Proposal 9: Improve readability through structured indentation, such as using RAN2 pseudo-code to indicate indentation levels through 1>, 2>, 3>, etc.  Proposal 10: For the same parts of the requirements, reduce redundancy by referencing common descriptions instead of repeating descriptions in multiple places.  Proposal 11: Include references or mapping tables in the core part requirements that point to the relevant test cases in 6G.  Proposal 12: To ensure consistency in terminology and structure within the same topic, a partial initial draft template can be provided before the overall drafting.  Proposal 13: To complete the specification update as comprehensively as possible while controlling the number of maintenance CRs, one maintenance CR can be made for one source within a single specification under the same work WI code.  Proposal 14: In 6GR, it is proposed to develop an automatic checking tool for fallback band combinations in RAN4.  Proposal 15: Although final decision on whether using Markdown or LaTeX in 6GR will be decided by SA/RAN plenary, it is suggested RAN4 to study the possible influence to RAN4. |
| R4-2513241 | CATT | Proposal 1: RAN4 to consider adopting a big CR approach for maintenance, where Cat-F draftCRs are submitted, endorsed and consolidated quarterly into a big draftCR, and the big draftCR is submitted to the last WG meeting of the subsequent quarter, and if endorsed, converted into a formal big CR with associated Cat-A CRs in the same meeting.  Proposal 2: RAN4 to revisit the orchestrations of RAN4 specifications for 6G, with the goal of reducing redundancy, improving clarity and easing long-term maintenance.  Proposal 3: 3GPP to consider and adopt equivalent multi-formatted specifications with each format tailored to a specific purpose, e.g., facilitating script-based tools for CR drafting and consolidation.  Proposal 4: 3GPP to consider one format as the root specification under version control, and other formats can automatically be generated from the root format for different purposes, if multi-formatted specifications are to be introduced.  Proposal 5: With the introduction of assistant new tools for band/band combinations, RAN4 6G specifications should still remain tangible, self-contained and not dependent on any new tool. |
| R4-2513262 | LG Electronics Inc. | Proposal 1: Based on discussion on RRM specification improvement and spec.  modernization in RAN, RAN4 to discuss  – 6GR specification drafting rules  » e.g., overall spec structure, hierarchy of indent, suffix rule, etc.  – Handling of Big CR approach  Proposal 2: In 6GR, target to exploit the rules and principles made on the band/band  combinations in 5G-NR via data-based approach and spec. modernization as  much as possible |
| R4-2513281 | Xiaomi | Observation 1: The current way in 5G to organize RRM specification is not friendly to improve the readability.  Observation 2: the measurement requirement categorized by the intra/inter-frequency is not efficient way in NR by which the duplicated requirements will be introduced.  Observation 3: The new UE state in 6GR like RRC\_Inactive in 5G needs to be considered.  Observation 4: As one of ways to re-consider 6GR RAN4 spec framework, the unified RRM could impact the detailed specification skeleton also.  Observation 5: There’s many challenges using these modernization tools in 3GPP, including the public data sharing and friendly efficient usage for all delegates.  Proposal 1: RAN4 discuss if it’s beneficial to organize and package the xx.101-1 spec using the following method,  Proposal 2: RAN4 discuss if it’s beneficial to only maintain one release RF spec which includes the RF requirements for all of the previous releases.  Proposal 3: RAN4 discuss the following two candidates to handle the release independent information  Proposal 4: Discuss the possibility of including the CA MSD requirements or relevant notation notes in the CA database if MSD continues to be defined in 6G.  Proposal 5: The following alternatives can be considered in 6G to improve the specification readability in high level:  Proposal 6: RAN4 can identify the basic functionalities and prioritize the 6G day1 typical cases’ requirements.  Proposal 7: In 6GR spec, RAN shall avoid duplication and repetition of UE requirements for different scenarios and use cases.  Proposal 8: Consistent and identical terminologies shall be used in RAN4 specifications.  Proposal 9: RAN4 should firstly discusses the specification style, and considers a template for requirements.  Proposal 10: RAN4 RRM spec in 6GR can include the following parts as the start point:  Proposal 11: The more detailed specification skeleton under 2nd level can be FFS upon the other WGs agreements. e.g.  Proposal 12: The general specification modernization works can be discussed and decided in RANP to identify the needs and feasibility first, before starting any trial/study in RAN WGs level. |
| R4-2513289 | Murata Manufacturing Co Ltd. | Move to UE RF thread |
| R4-2513294 | NTT DOCOMO, INC. | Observation 1: There are many instances of redundancy in TS 38.133 for NR, with repeated definitions and tables appearing throughout the specification.  Observation 2: In the 5G BS demodulation performance specifications, the applicability of certain requirements is not explicitly linked to the support of the corresponding features. This can lead to the unintentional omission of requirements and inconsistent network performance.  Proposal 1: Addressing these issues during the Release 20 study phase will allow RAN4 to define a more scalable and maintainable structure for 6G RRM specifications before formalization in Release 21.  Proposal 2: For 6G, the specification needs to be explicitly stated so that it is always clear which requirements apply to a given BS. |
| R4-2513302 | vivo | Observation 1: The NR UE RF spec is split based on frequency range (FR1/FR2) but the rationale behind should be the difference between conductive requirement and radiate requirement.  Observation 2: NR spec mixed the requirement for both mandatory and optional feature into a single spec, which make the readability is not good enough for the RF engineer who only want to implement mandatory feature, and make the maintenance is quite difficult.  Proposal 1: For the 6G RRM spec, top level of sections 4, 5, 6, 7, 9, 10 in TS 38.1133 can be reused.  Proposal 2: Section 8 is used to capture procedure delay related requirements.  Proposal 3: Scheduling restriction related requirements and interruption requirements are capture in one high-level section.  Proposal 4: L1 measurement requirements including radio link monitoring and link recovery and L3 measurements requirements are captured in one high-level section.  Proposal 5: Some distinct features can be captured in a separated section, e.g., sidelink requirements. RAN4 to study how new features to be introduced in 6G are captured in RRM requirements specification.  Proposal 6: New features introduced in later releases are captured either by incorporating in existing section(s) or by creating new sub-sections. Same suffix should be used for the same feature in different sub-sections.  Proposal 7: RAN4 to consider split RRM spec into two files for core part and performance part, respectively.  Proposal 8: Uses block-based approach to define core requirements as much as possible.  Proposal 9: Uses block-based approach to define test cases, especially for test setup.  Proposal 10: A new tool, if possible, is used to capture tabulated test setup in test cases.  Proposal 11: RAN4 to discuss how to capture the UE RF requirement for new spectrum (e.g., FR3):  Proposal 12: It is suggested to discuss whether it is feasible to decouple the mandatory feature and optional feature into different spec.  Proposal 13: Running CR approach is used in RAN4 for 6G CR handling, which is used to capture requirements for the agreements in the previous meeting unless it is the last meeting and is updated per meeting cycle.  Proposal 14: Work split should be done as early as possible to assign responsible editors for the running CRs.  Proposal 15: RAN4 to study procedures how to relieve the workload on Friday, e.g., making decision early during the meeting etc. |
| R4-2513321 | OPPO | Observation 1:In other working group, there are some preliminary discussions on the problems identified of using word-based specification, and also potential alternative tools.  Observation 2:Band combination database is useful in simplifying RAN4 specifications and facilitate the band combination handling.  Observation 3:Current offline discussion usually is handled in an informal and sometimes non-transparent way. This may give wrong impression of the discussion status and also confront with “surprise” comments even complaints.  Proposal 1:Avoid defining too huge spec like 38.133, and consider splitting the 6G RRM spec into several specs covering core requirements, performance requirements, and test cases respectively.  Proposal 2:RAN4 needs to keep an eye on the progress of alternative tools to replace current word-based specification, and prepare for the potential impacts.  Proposal 3:RAN4 to make some trial of using this band combination database and study how to incorporate this database into RAN4 specification and meeting handling like CR process, etc.  Proposal 4:Continue to use NWM flag process to trigger early offline discussion and revision in 6G.  Proposal 5:Study the possibility of introducing some new tools to automatically generate the CR cover page and avoid unnecessary efforts on the cover page format issues.  Proposal 6:For the similar change among different releases, treat these CRs under same agenda even the changes are not exactly the same, i.e., both CAT-A and CAT-F in later release.  Proposal 7:For the CAT-F CRs in later release, the difference comparing to earlier release CRs should be highlighted to facilitate the CR reviewing.  Proposal 8:Formal offline discussions need to be triggered on the reflector to let companies aware of such discussion. And it should be handled in a transparent way. |
| R4-2513346 | Ericsson | Observation 1: Release independent from Rel-N in RAN2 is defined as "Implementation of this CR from Rel-N” and RAN2 also has a rule of “not cause interoperability issues”.  Observation 2: Some “release independent” aspects in TS 38.307 overlap with early implementation of CR in RAN2 TS 38.331.  Observation 3: the Coexisting work for each feature in 5G is agreed within the feature study/working item phase and no generic guideline followed.  Observation 4: the wording in RF specification is not consistent in different requirement in 5G specification  Proposal 1: Use RAN2 release independent from Rel-N with early implementation concept for “release independent” feature instead of the 3x.307 if such feature has other working group impact, e.g signaling in RAN2.Following the MCC guidance on release independent handling in RAN4, only allow the band related feature in 3x.307.  Proposal 2: Start 6G coexisting framework for all features with common assumptions to save future work load in feature development.  Proposal 3: companies follow the SI [1] for specification modernization.  Proposal 4: the clause numbering in RAN4 specification of 6GR for different FR range should be aligned.  Proposal 5: discuss which specification is used to specify the 7GHz, 8GHz and 15GHz.  Proposal 6: In case to specify the feature requirements at both general clause and suffix clause, and the requirement in general clause and suffix clause relating to each other, it is preferable to state which requirement should be met in what condition.  Proposal 7: the wording consistency can be improved with drafting rules and clearly defined terminology.  Proposal 8: Include a reference to the corresponding test cases in the corresponding requirement clause, e.g., in the text or as a new subclause.  Proposal 9: Specification structure for 6G test cases is similar to the requirements structure in the main part of the specification, at least at the top level (or maybe even at the second level), e.g.:  - RRC\_IDLE state mobility  - RRC\_INACTIVE state mobility  - RRC\_CONNECTED state mobility  - Timing  - Signalling characteristics  - Measurement procedure  - Measurement performance requirements.  Proposal 10: Test cases for specific applications or use cases can be in a separate section, but without breaking the main structure of test cases and the mapping between the core requirements sections and sections with test cases, e.g.:   * Option 1: uses cases are added as separate sections after the main test cases hierarchy; * Option 2: uses cases are grouped at a second level of the test cases hierarchy   Proposal 11: If common configurations can be identified for different test cases, they can be collected in a common section, e.g., under A.3 (RRM test configurations) or similar.  Proposal 12: Adapt an overall principle for 3GPP RAN4 specifications - creating lean and streamlined standards for 6G, e.g., by dimensioning an appropriate set of functionalities, minimizing the adoption of multiple options for the same functionality, avoiding excessive configurations, etc. Any exception to the above shall be well justified. |

*In addition, there are also some inputs from several tdocs which are not submitted to this agenda item but with some proposals related to the discussions here:*

* *Skyworks (****R4-2513062*** *under AI8.2):*

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| ***Proposal on UERF RAN4 specification and structure:***   * ***RAN4 specification should consider features to be self-contained in a clause and introduce UE types to avoid ambiguity for the implementation.***   + ***No separate file for one feature.***   + ***In its simplest implementation, all single band requirements should be in one place in the specification, then followed by intra-band and inter-band combinations***   + ***Requirement could then be across UE types and applications*** * ***TN and NTN application should not be separated, as it can be identified by different bands and UE types*** * ***Simplify spectrum requirements by creating band-group level requirements (at least as a default)*** * ***Rather than using frequency ranges, requirements should be separated between individual antennas/connectors/conducted measurements versus antenna arrays/beamforming/OTA measurements*** * ***In that case, the associated frequency ranges could overlap within the 7-20GHz region: For 0.4 to 52GHz, two overlapping frequency ranges may prove sufficient.*** * ***Simplify band and band-combination requirements (Emissions, REFSENS, MSD, blocking) with a default set of requirements per band groups and band group combinations.*** * ***Favor equation-based requirements and parameters.***     ***Proposal on improved CBW and BW parts support:***   * ***Support of 2x 5G maximum CBW in the same band thanks to 8K FFT and single SCS per band/band-group.*** * ***Enable variable BW support by design such that any CBW (1MHz granularity?) can be supported but only a limited set is measured.*** |

* *Issue #2 and #13 in Thread [105] on 6G RRM*

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| ***Issue 2: RRM requirement design principle***   * *Proposal 1 (QC):*    + *RAN4 should focus on enhancing the testing of RRM procedures to ensure that functionality and performance is tested under conditions that reflect field-relevant scenarios.*   + *RAN4 should study how to ensure that real UE implementations are tested as much as possible.*   + *RAN4 should re-evaluate existing RRM core and performance requirements whether they still reflect state-of-the art UE implementations.*   + *RAN4 should study in the 6G study item whether the amount of RRM procedures can be reduced. Requirements should only be defined for key RRM procedures.*   + *RAN4 should investigate how the network can be enabled to follow true UE performance in its RRM procedures instead of assuming that all UEs just support minimal requirements.*   + *We propose to discuss between RAN4 and RAN5 whether in 6GR RAN4 could focus on the scope and framework for defining RRM performance tests and RAN5 could specify the detailed parameter configurations of the RRM performance tests.* * *Proposal 2 (Samsung):*    + *For 6G Day-1 RRM requirements, we propose to align with high-level principles for:*     - *RAN4 to define necessary RRM requirements for key features and procedures. It is not mandatory to define RRM requirements for all features and procedures. To consider by two criteria:*       * *Must to have actual impacts and guidance on implementation design. As mentioned above, many of the RRM requirements haven’t never actually been utilized in real-world deployments. Take an example, several MGs have never been utilized in practice.*       * *Must to be tested and testable in conformance testing: we can use existing GCF (Global Certification Forum) test scope as start point and further consider the mandatory from 2.2~2.12. If RRM requirements cannot be tested with testability issue, there is really no need to waste time discussing corner cases and cases in paper work.*     - *Even the named of procedures are the same as in 5GNR, it doesn’t mean RAN4 will reuse the exactly same RRM requirements in 5GNR. Take an example, RRM with timeline procedures can be changed in 6GR.*     - *RAN4 to discuss and achieve the common assumption of each component for different UE capabilities, including assumption of RF and BB processing, like: RF retuning time, AGC time, time for change bandwidth, time for BB processing, T/F tracking, number of searchers, etc. It can be shared and utilized in different RRM requirements to avoid different and excursive assumption for timeline RRM requirements.* * *Proposal 3 (OPPO):*    + *From RRM requirements’ perspective, more efficiency and less energy consumption, higher throughput and less interruption, should be considered as target for next generation technique innovation.* * *Proposal 4 (CMCC):*    + *it is proposed that* *the feature with market demand are supported from 6G day-one.* * *Proposal 5 (LGE):*    + *RAN4 to first discuss clear scope and goal / direction to be discussed /derived during 6G SI phase.* * *Proposal 6 (ZTE):*    + *Comprehensively consider the RRM design in 6G with some high-level principles:*     - *Measurement bandwidth/Rx number vs implementation complexity*     - *Power saving vs always-on RF chain*     - *Gap-less design vs the number of searcher/idle RF chain*     - *Measurement period vs measurement accuracy*     - *TN&NTN integration vs implementation complexity* * *Proposal 6 (NTT DCM):*    + *Even without AI/ML-based operation, the 6G RRM specifications must provide improvements over NR.*   + *RAN4 should initiate discussions on defining standardized and meaningful measurement metrics for 6G from day one, ensuring that these metrics are clearly specified and consistently implemented across vendors.* * *Proposal 7 (Ericsson):*    + *When RAN4 defines the RRM requirement,*      - *RAN4 should consider both the baseline requirement and the strict performance requirement based on real field conditions without UE capability.*     - *RAN4 should define reasonable baseline requirements based on the typical scenarios other than focus on minimum requirement for corner cases.*     - *RAN4 should strive to establish quantifiable requirements to avoid the vague specification.*   + *RAN4 should define 6G feature requirements based on realistic UE architecture assumptions, rather than relying solely on basic UE profiles that may not support the intended feature.* * *Proposal 8 (Nokia):*    + *Study how to define RRM requirements that allow UE implementation based on minimum requirements but also allow UEs that can outperform the minimum requirements the benefits from such better performance.*   + *RAN4 to study any changes to the synchronization signal design and other related reference signals and the impact on cell detection and measurement requirements.*   ***Issue 13: RAN4 RRM spec simplification/improvement***   * *Proposal 1 (Samsung):*    + *For 6GR RRM spec structure and drafting rules, the overall spec structure in 5GNR can be inherited such as: RRC\_IDLE/INACTIVE/ CONNECTED state mobility, Timing, Signaling, Measurement. etc.*     - *RAN4 to discuss and decide the high-level principle to decide whether a new feature is introduced, new sub-clauses can be allowed or not. We prefer to category the clauses from procedures and different assumptions rather than UE types.*   + *RAN4 can use the following aspects as start point:*     - *Reuse the Big CR procedure and RAN4 Chair and MCC’s rules of Big CR: no [], TBD, FFS clean up in the Big CR and specs.*     - *Reuse the rules of “Forward section” to ensure consistent usage of frequently used terms, notation, abbreviations, CA configuration vocabulary, etc.*     - *For new features, determine the common rule of whether to add a new sub-clause. If new sub-clauses are introduced:*       * *It is recommended to clearly declare the numbering corresponding to a feature in an appendix or designated location.*       * *For situations where similar text needs to be repeated across multiple sections (or specifications), the general text should first be agreed upon as a reference and then used across different sections/CRs/specifications to improve consistency.* * *Proposal 2 (HW):*    + *RAN4 to study at least following aspects or RRM spec improvement in 6GR*     - *Better classification of L3 RRM measurement requirements*     - *Consistent principles to address different collisions* * *Proposal 3 (CATT):*    + *It is necessary for RAN4 to introduce a more intuitive and simpler way to define RRM requirements, and new forms of representation can be introduced if necessary to make spec more concise, such as: multi-dimensional condition configuration tables, diagrams of timeline, etc.*   + *RAN4 to adopt a more unified form to manage similar parameters and simplify as much as possible, avoiding the introduction of too many parameters with similar meanings and functions.* |

# Topic #1: Observations/Issues/Lessons from 5G standardization

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

This topic aims to reach a common consensus on lessons learning from previous 5G standardization practice so that providing a substantiate foundation to improve 6GR standardization.

## Companies’ contributions summary

See the Tdocs list in Section 0.

## Open issues summary

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

### Sub-topic 1-1 on RAN4 5G specs

*Sub-topic description: This sub-topic collects views on observations/issues/lessons on RAN4 5G specifications*

*Open issues and candidate options before meeting:*

**Issue 1-1-1: General and common Issues for all RAN4 specifications**

* Observed issues
  + Issue 1: Requirements for one feature
    - One single feature may have requirements at multiple clauses and across multiple specs.
    - For the same feature, either new clause for one requirement or re-use legacy clause for another requirement.
    - Different approaches are adopted for different features in the structure.
  + Issue 2: Redundancy
    - Many duplications and repetition of requirements for different scenarios and use cases.
    - Duplicated requirements scattered throughout different sections.
  + Issue 3: Consistency
    - Terminologies are not aligned or consistent
  + Issue 4: Structuring
    - Combine core and performance requirements into the same spec.
    - Some of the 3GPP specs are too large and become very difficult even to open.

Agreement:

* By taking the identified issues in the feature lead’s summary into consideration, in RAN4#117, a dedicated singe sub-agenda item will be introduced for the spec improvement. Interested companies are encouraged to structure their contributions such that the spec specific proposals and the general proposals for all RAN4 spec can be separately presented.
* Interested companies are encouraged to continue populating the list of identified issues to be addressed in 6G as necessary.

OPPO: more discussion is need to combine the core and performance.

ZTE: other issues may be missing and can be included in coming meetings.   
Huawei:softening the wording in WF is preferred. Further discussion is needed.

Ericsson: some issues may be specification dependent. Some of the duplications were purposely introduced. It needs to be discussed case by case.

Nokia: further discussion on the details is needed and can be specification specific.

CHTTL: While focusing on the lessons learned in 5G, we should be proud of what we have achieved in 5G. More positive tone is preferred.

MTK: some spec specific discussion may be needed. This summary can be used as a general observation. No rush agreement is needed.

Samsung:issue 1/4 need to be further discussed.

Xiaomi:good summary but no rush decision is needed.

LGE:OK with the high level analysis. The detailed sub-bullets are subject to further discussion.

Qualcomm:issue 3 is important to be addressed. On issue 4, the requirements with concurrent features are normally challenging to be addressed.

Apple: both issue 2 and 3 need to be addressed. In issue 4, it is questionable how the two sub-bullets can work together.

* Recommended WF
  + Confirm the above issues and consider measures to avoid such issues in 6GR.

**Issue 1-1-2: Issues for UE RF specifications**

* Observed issues
  + Issue 1: framework
    - Inefficiency caused by RF requirements framework (time-consuming for MSD, too many segmentations for BCS, unuseful complex requirements such as Power class, inter-band UL combo, duty cycle for SAR mitigation, complex Pcmax section).
    - The NR UE RF spec is split based on frequency range (FR1/FR2).
    - The latest release requirements are the superset of all previous releases.
    - NR spec mixes mandatory and optional feature requirements in one spec
  + Issue 2: band combinations
    - Huge band combination tables in MS Word format.
    - Tens of thousands of band combinations have been specified in UE specifications.
  + Issue 3: Suffix approach
    - For TS 38.101-1, suffix-ed requirements for different features make specs complex.
    - Rules on applicability of suffix requirements and general requirements are not clear or not strictly followed.
    - Different approaches are adopted for different features in the structure; too many undefined (sub-)clause suffixes.
    - Too many (sub-)clause suffixes not defined for RF requirements.
  + Issue 4: Readability
    - Poor readability caused by recursively 3rd-level heading in UE RF specs.
    - Some RF requirements are quite complicated and difficult to understand.
    - Readability not good enough for engineers who only want to implement mandatory features and making maintenance difficult.
* Recommended WF
  + Confirm the above issues and consider measures to avoid such issues in 6GR.

**Issue 1-1-3: Issues on RRM Specifications**

* Observed issues
  + Issue 1: Redundancy
    - The duplicated requirement in TS 38.133 leads to confusion and unnecessary extra effort for spec maintenance.
    - Many instances of redundancy in TS 38.133 for NR, with repeated definitions and tables appearing throughout the specification.
    - Duplicated clauses exist in TS 38.133.
    - Duplicated requirements scattered throughout different sections.
    - Many configuration parameters in test cases are repeated in RRM specs
  + Issue 2: Cases and scenarios
    - When defining RRM requirements there are multiple cases and scenarios involved even when they are rarely deployed.
  + Issue 3: Readability
    - Measurement requirements categorized by intra/inter-frequency are not efficient in TS 38.133.
    - Readability and friendliness issues in TS 38.133.
    - Unclear or non-straightforward relation between requirements and test cases in RRM specs.
  + Issue 4: Test cases
    - Test cases exist in the top-level heading in RRM specs
* Recommended WF
  + Confirm the above issues and consider measures to avoid such issues in 6GR

**Issue 1-1-4: Issues on BS specification**

* Observed issues
  + Issue 1: Observed mismatch between requirements and conformance specs in TS 38.104.
  + Issue 2: In the 5G BS demodulation performance specifications, the applicability of certain requirements is not explicitly linked to the support of the corresponding features, leading to unintentional omission of requirements and inconsistent network performance.
* Recommended WF
  + Confirm the above issues and consider measures to avoid such issues in 6GR

**Issue 1-1-5: Issues on Performance or Demodulation Specifications**

* Observed issues
  + Issue 1: In the 5G BS demodulation performance specifications, applicability of certain requirements is not explicitly linked to the support of the corresponding features.
  + Issue 2: The current structure of applicability rules in TS 38.101-4 is fragmented and inconsistent across device types
* Recommended WF
  + Confirm the above issues and consider measures to avoid such issues in 6GR

### Sub-topic 1-2 on standardization practice/procedure

*Sub-topic description: This sub-topic collects views on observations/issues/lessons on RAN4 5G standardization practice and procedures.*

*Open issues and candidate options before meeting:*

**Issue 1-2-1: Discussion arrangement and WI management**

* Issues observed
  + Issue 1: Discussion arrangement
    - Number of parallel sessions: Main/RRM/BDaT + 1/2 ad hoc sessions: scheduling conflicts.
    - Current offline discussion usually is handled in an informal and sometimes non-transparent way.
  + Issue 2: WI management
    - Mismatch between TU budget and actual meeting time spent in some WI/SIs.
    - Open issues still left to maintenance when declaring 100% completion.
    - Not every tdoc has a WI code.
* Recommended WF
  + Confirm the issues and check with RAN4 leadership for further guidelines.

**Issue 1-2-2: CR Drafting, Review, and Approval Process**

* Issues observed
  + Issue 1: Not sufficient time to review CRs
    - Not sufficient review time for maintenance CRs.
    - Limited time for drafting CRs for incumbent WIDs
    - TPs for block approval cannot ensure quality due to lack of sufficient time
    - Last minutes CRs
      * Lots of CRs on Friday based on late agreements are not sufficiently reviewed.
      * Capturing agreements late in the meeting week often leads to errors or poor text.
      * Controversial open issues are settled on Friday or even in the afternoon, leading to insufficient time for CR drafting and review.
  + Issue 2: Fall-back rules for requesting band combos are not strictly followed due to limited time.
  + Issue 3: Similar but not identical changes are not treated under the same agenda item.
  + Issue 4: Different interpretations (Editorial or requirement changes).

OPPO: we agree with the identified issues.

Qualcomm: some of RAN4 CR are the results of the change of the spec from other WG. Also, we have many CR based on the RAN5’s request in terms of the test procedures previously specified in RAN4.

Samsung: sometimes, double efforts have been paid on the same CR in bis and the following meetings. It may rely on some extra effort to timely update the spec. Fall-back rule is not always followed.

Agreement:

A dedicated sub-agenda will be introduced on CR handling improvement from RAN4#117.

* Recommended WF
  + Confirm the issues and check with RAN4 leadership for further guidelines.

**Issue 1-2-3: Release independent handling**

* Issues observed
  + Issue 1: The current release independent handling is inherited from LTE which was mainly for band and band combinations, but extended to other features.
  + Issue 2: Different from the way in RAN2 which is early implementation without interoperability issue
  + Issue 3: TS 38.307 is messy and difficult to maintain.
* Recommended WF
  + Confirm the issues and check with RAN4 leadership for further guidelines.

**Issue 1-2-4: Coexistence studies**

* Issues observed
  + Issue 1: Coexistence studies carried out in 5G are captured in several TRs and
  + Issue 2: No common generic guideline is followed.
* Recommended WF
  + Confirm the issues and check with RAN4 leadership for further guidelines.

# Topic #2: General aspects on RAN4 6G standardization

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

## Companies’ contributions summary

See the Tdocs list in Section 0.

## Open issues summary

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

### Sub-topic 2-1 General potential challenges on RAN4 6GR standardization

*Sub-topic description: This sub-topic collects views on general potential challenges on RAN4 6GR standardization compared with that in 5G.*

*Open issues and candidate options before meeting:*

**Issue 2-1: General potential challenges on RAN4 6GR standardization**

* Proposals
  + Option 1: Volume to increase (a larger FFT size leads to more CBWs, thus more RB allocations (>20milj)).
  + Option 2: Emergence of new application scenarios and novel device types.
  + Option 3: For AI/ML-enabled features, how to capture the standardized AI/ML model and dataset in the 3GPP specification.
* Recommended WF
  + Confirm the above challenges and consider them in 6GR standardization.

### Sub-topic 2-2 General potential improvements

*Sub-topic description: This sub-topic collects views or proposals on general potential improvement in 6GR standardization.*

*Open issues and candidate options before meeting:*

**Issue 2-2-1: General principles for RAN4 6GR specifications**

* Proposals
  + Proposal 1: Adapt an overall principle for 3GPP RAN4 specifications – creating lean and streamlined standards for 6G, e.g., by dimensioning an appropriate set of functionalities, minimizing the adoption of multiple options for the same functionality, avoiding excessive configurations, etc. Any exception to the above shall be well justified.
  + Proposal 2: Scalable specs consideration
    - Proposal 2a: Study how to manage growing number of CBWs, e.g., requirements scalable to CBW, etc.
    - Proposal 2b: Study in Rel-20 on how to define a more scalable and maintainable structure for 6G RRM specifications before formalization in Release 21.
  + Proposal 3: Specs restructuring
    - Proposal 3a: Revisit the orchestrations of RAN4 specifications for 6G, with the goal of reducing redundancy, improving clarity and easing long-term maintenance
    - Proposal 3b: For AI/ML-enabled features, how to capture the standardized AI/ML model and dataset in the 3GPP specification, considering AI/ML model and dataset naming rules, and unified AI/ML model and dataset format for sharing.
    - Proposal 3c: Consider common coexisting framework for all features.
    - Proposal 3d: Use RAN2 release independent from Rel-N with early implementation concept for “release independent” feature instead of the 3x.307.
    - Proposal 3e: Remove release-independent spec and capture all of the information in a separate file in the latest-release core spec package.
* Recommended WF
  + To be further discussed

**Issue 2-2-2: Modernization and new tools**

* Proposals
  + Proposal 1: Follow conclusions in 6GSM SID (SP-250802).
    - Modernization of drafting tool: markdown, version control (TR 21.802).
    - Study RAN4 impacts on new formats such as Markdown or LaTeX.
    - RAN4 needs to keep an eye on the progress of alternative tools to replace current Word-based specification, and prepare for the potential impacts.
  + Proposal 2: The general specification modernization works (6GSM SID) can be discussed and decided in RANP to identify the needs and feasibility first, before starting any trial/study in RAN WGs level.
  + Proposal 3: Adopt equivalent multi-formatted specifications with each format tailored to a specific purpose, e.g., facilitating script-based tools for CR drafting and consolidation: one format as the root specification under version control, and other formats can automatically be generated from the root format for different purposes.
  + Proposal 4: New tools to avoid cover sheet issues.
  + Proposal 5: For band combos, continue to use JSON schema with CA config tables as first priority.
* Recommended WF
  + To be further discussed

**Issue 2-2-3: Meeting arrangement and WI management**

* Proposals
  + Proposal 1: Limit parallel sessions to Main/RRM/BdaT + 1 Ad Hoc session.
  + Proposal 2: Enhanced transparency
    - * Proposal 2a: Dedicated email thread for the Ad Hoc session.
      * Proposal 2b: Put the meeting schedule to a common calendar.
      * Proposal 2c: Formal offline discussions need to be triggered on the reflector to let companies aware of such discussion
  + Proposal 3: RAN4 to study procedures how to relieve the workload on Friday, e.g. making decision early during the meeting, etc.
  + Proposal 4: WI management
    - * Proposal 4a: Actual meeting time spent should reflect TU budget.
      * Proposal 4b: Restrict work/open issues left to maintenance stage.
      * Proposal 4c: Mandate WI code for each tdoc to facilitate searching.
* Recommended WF
  + To be further discussed

**Issue 2-2-4: CR review and approval process to ensure sufficient time and reviews on CRs**

* Proposals
  + Proposal 1: for both ongoing WIDs’ and maintenance CRs
    - Proposal 1a: No approval of CR without specs editors’ review.
    - Proposal 1b: Online off-track drafting session led by specs editor.
    - Proposal 1c: Appoint big CR editor/section editor.
    - Proposal 1d: Start discussion on CR revisions early during the meeting week to allow more time on reviewing CRs.
  + Proposal 2: for ongoing WIDs’ CRs
    - Proposal 2a: Running CR approach as in RAN1/2 is used in RAN4 6G CR handling to allow more time to review – led by specs editors.
    - Proposal 2b: Work split should be done as early as possible to assign responsible editors for the running CRs
    - Proposal 2c: Define clear rules about bringing new features in CRs late during the meeting week.
  + Proposal 3:
    - Proposal 3a: For maintenance CRs, adopting a big CR approach for maintenance allowing one more quarter to review
    - Proposal 3b: One maintenance CR can be made for one source within a single specification under the same WI code.

OPPO: need to balance the quality and how timely the spec can be updated.

Xiaomi: 6G CR is not expected until 2027.

MTK:the related conclusion can be useful for both 6G and ongoing 5G work.

Ericssion: need to be careful about the potential extra work or resources behind the new approaches.

Apple: CR for maintenance and ongoing WI should be discussed separately.

Recommended WF

* + To be further discussed

**Issue 2-2-5: Drafting rules and principles for specification quality assurance**

* Proposals
  + Proposal 1: Study the root causes of specification quality challenges in RAN4.
  + Proposal 2: Uniform drafting guidance/rules for requirements definition when introduction of a new feature in the specification.
  + Proposal 3: For 6G, the specification needs to be explicitly stated so that it is always clear which requirements apply to a given BS.
  + Proposal 4: Consistency and editorial improvements:
    - To ensure consistency in terminology and structure within the same topic, a partial initial draft template can be provided before the overall drafting.
    - Consistent and identical terminologies shall be used.
    - Avoid the following issues:
      * Terminology/style inconsistency, incorrect notation/symbols/abbreviation, undefined abbreviations, redundant information/notes.
      * “TBD”, “FFS”, empty test cases.
  + Proposal 5: Reduce redundancy
    - Proposal 5a: Add paragraph numbering to some paragraphs, and using these numbers to refer to identical paragraphs without any text changes.
    - Proposal 5b: Block-based method, i.e., capture similar requirements just in one place and refer this part if needed.
    - Proposal 5c: Introduce an applicability description in relevant sections and define different parameter values for each relevant parameter for the different scenarios, use cases etc.
  + Proposal 6: Reduce the usage of RAN2 language in RAN4 specification as much as possible.
* Recommended WF
  + To be further discussed

# Topic #3: RAN4 6GR specification improvements

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

## Companies’ contributions summary

See the Tdocs list in Section 0.

## Open issues summary

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

### Sub-topic 3-1 UE RF specs improvement

*Sub-topic description: This sub-topic collects views or proposals on UE RF specs improvement*

*Open issues and candidate options before meeting:*

**Issue 3-1-1: General and Structural Improvements**

* Proposals
  + Proposal 1: Further study on UE RF specs improvements by taking into account identified issues.
  + Proposal 2: Study UE RF spec structure by the requirements with different features.
  + Proposal 3: Restructuring: requirements without suffixes + requirements per features + release-independent information.
  + Proposal 4: Only maintain one release RF spec.
  + Proposal 5: Only maintain the latest-release 307 spec.
  + Proposal 6: Clause numbering alignment should be kept.
  + Proposal 7: RAN4 specification should consider features to be self-contained in a clause and introduce UE types to avoid ambiguity for the implementation.
    - No separate file for one feature.
    - In its simplest implementation, all single band requirements should be in one place in the specification, then followed by intra-band and inter-band combinations
    - Requirement could then be across UE types and applications
  + Proposal 8: TN and NTN application should not be separated, as it can be identified by different bands and UE types.
* Recommended WF
  + To be further discussed

**Issue 3-1-2: Band-Combination Handling and Tool Support**

* Proposals
  + Proposal 1:
    - Proposal 1a: Utilize the band-combination database from the beginning of 6GR.
    - Proposal 1b: Band combos stored in database instead of in specs.
    - Proposal 1c: Exploit the rules and principles made on the band/band combinations in 5G-NR via data-based approach and spec. modernization as much as possible.
    - Proposal 1d: RAN4 to make some trial of using this band-combination database and study how to incorporate this database into RAN4 specification and meeting handling like CR process, etc.
    - Proposal 1e: Consider the CA MSD requirements or relevant notation notes in the CA database.
  + Proposal 2: Automated tools for generating supported band combinations and their related specific requirements, e.g. delta values and MSD in 6GR.
  + Proposal 3: Develop an automatic checking tool for fallback band combinations in RAN4.
  + Proposal 4: With the introduction of assistant new tools for band/band combinations, RAN4 6G specifications should still remain tangible, self-contained and not dependent on any new tool.
  + Proposal 5: Consider the progress in band-combo simplification.
  + Proposal 6: Simplify band and band-combination requirements (Emissions, REFSENS, MSD, blocking) with a default set of requirements per band groups and band group combinations (See also in Issue 3-1-3).
* Recommended WF
  + To be further discussed

**Issue 3-1-3: Requirement Definition and Feature Separation**

* Proposals
  + Proposal 1: Define UE RF requirements for single carrier as baseline for minimum requirements and specifies the 2Tx / CA / DC / DL-UL decoupling / 1Tx RF requirements with Suffix.
  + Proposal 2: Separate specs for vertical device requirements (i.e. Vehicle Device, RedCap, NTN, ATG, UAV, …).
  + Proposal 3: Decouple the mandatory feature and optional feature into different spec.
  + Proposal 4: Simplify spectrum requirements by creating band-group level requirements (at least as a default)
  + Proposal 5: Rather than using frequency ranges, requirements should be separated between individual antennas/connectors/conducted measurements versus antenna arrays/beamforming/OTA measurements
    - In that case, the associated frequency ranges could overlap within the 7-20GHz region: For 0.4 to 52GHz, two overlapping frequency ranges may prove sufficient.
    - Simplify band and band-combination requirements (Emissions, REFSENS, MSD, blocking) with a default set of requirements per band groups and band group combinations.
    - Favor equation-based requirements and parameters.
* Recommended WF
  + To be further discussed

**Issue 3-1-4: Frequency-Range and New-Spectrum Handling**

* Proposals
  + Proposal 1: RAN4 to discuss how to capture the UE RF requirement for new spectrum (e.g. FR3):
    - * Option 1: Allocate a dedicated spec for the new 6G spectrum.
      * Option 2: Two specs are created for conductive requirement and radiated requirement respectively, and capture the RF requirement of FR3 based on the decision of requirement applicability.
  + Proposal 2: Discuss which specification is used to specify the 7 GHz, 8 GHz and 15 GHz bands.
* Recommended WF
  + To be further discussed

**Issue 3-1-5: Improved CBW and BWP support**

* Proposals
  + Proposal 1: Support of 2x 5G maximum CBW in the same band thanks to 8K FFT and single SCS per band/band-group.
  + Proposal 2: Enable variable BW support by design such that any CBW (1MHz granularity?) can be supported but only a limited set is measured.
* Recommended WF
  + To be further discussed

### Sub-topic 3-2 RRM specs improvement

*Sub-topic description: This sub-topic collects views or proposals on RRM specs improvement*

*Open issues and candidate options before meeting:*

**Issue 3-2-1: General principles and targets**

* Proposals
  + Proposal 1:
    - Proposal 1a: Follow agreements in R4-2420107 for better readability.
    - Proposal 1b: The agreements in R4-2420107 should be treated as a starting point for 6G RRM spec.
  + Proposal 2: Consider 6GR specification drafting rules (e.g. overall spec structure, hierarchy of indent, suffix rule, etc.).
  + Proposal 3: Enforcement of drafting rules: only CRs following drafting rules can be agreed.
  + Proposal 4: Differentiate whether the difference between two requirements is due to editorial issue or technical issue.
  + Proposal 5: For spec and CR drafting rules, follow agreed principles as in 5G RAN4 Meeting Efficiency Improvements (R4-2114691), i.e., big CR approach.
  + Proposal 6: Study further drafting rules to improve readability.
  + Proposal 7:
    - Proposal 7a: Avoid corner cases and focus on most typical and practical use cases.
    - Proposal 7b: Focus on enhancing the testing of RRM procedures to ensure that functionality and performance is tested under conditions that reflect field-relevant scenarios.
    - Proposal 7c: Study how to ensure that real UE implementations are tested as much as possible.
    - Proposal 7d: Discuss whether to define two threads requirements, one focus on the baseline and another focus on the strict performance with real field request.
    - Proposal 7e: Study how to define RRM requirements that allow UE implementation based on minimum requirements but also allow UEs that can outperform the minimum requirements the benefits from such better performance

* + Proposal 8: Consider a template for requirements.
  + Proposal 9: Use the following aspects as start point:
    - Reuse the Big CR procedure and RAN4 Chair and MCC’s rules of Big CR: no [], TBD, FFS clean up in the Big CR and specs.
    - Reuse the rules of “Forward section” to ensure consistent usage of frequently used terms, notation, abbreviations, CA configuration vocabulary, etc.
    - For new features, determine the common rule of whether to add a new sub-clause. If new sub-clauses are introduced:
    - Clearly declare the numbering corresponding to a feature in an appendix or designated location.
    - For situations where similar text needs to be repeated across multiple sections (or specifications), the general text should first be agreed upon as a reference and then used across different sections/CRs/specifications to improve consistency.
  + Proposal 10: Study at least following aspects or RRM spec improvement in 6GR
    - Better classification of L3 RRM measurement requirements
    - Consistent principles to address different collisions
  + Proposal 11:
    - Introduce a more intuitive and simpler way to define RRM requirements, and new forms of representation if necessary.
    - Adopt a more unified form to manage similar parameters and simplify as much as possible, avoiding the introduction of too many parameters with similar meanings and functions.
  + Proposal 12: Target for next generation technique innovation on RRM should be more efficiency and less energy consumption, higher throughput and less interruption.
  + Proposal 13: clear scope and goal / direction to be discussed /derived during 6G SI phase.
  + Proposal 14: Comprehensively consider the RRM design in 6G with some high-level principles:
    - Measurement bandwidth/Rx number vs implementation complexity
    - Power saving vs always-on RF chain
    - Gap-less design vs the number of searcher/idle RF chain
    - Measurement period vs measurement accuracy
    - TN&NTN integration vs implementation complexity
  + Proposal 15: Even without AI/ML-based operation, the 6G RRM specifications must provide improvements over NR
  + Proposal 16: Strive to establish quantifiable requirements to avoid the vague specification.
* Recommended WF
  + To be further discussed

**Issue 3-2-2: Structural Options and Specification Organization**

* Proposals
  + Proposal 1: High-level structure for new 6G RRM specs
    - Proposal 1a: RAN4 to discuss the following for new 6G RRM specs:
      * a. High level structure (highest level sections: Idle, Inactive etc.)
      * b. UE requirements for a scalable 6G design
      * c. Any gain in further splitting the specification
      * d. Test case mapping (e.g. TC reference in core part)
    - Proposal 1b: Consider the following framework (preferred):
      * RRC\_IDLE/INACTIVE state mobility
      * RRC\_CONNECTED state mobility
      * Timing
      * Measurement procedure for RRC\_CONNECTED state
      * RLM/BFD/CBD
      * PSCell/SCell management (if applicable by PHY/high layer design in 6GR)
      * Other UE-specific characteristic switching (if applicable by PHY design in 6GR)
      * Measurement performance
    - Proposal 1c:
      * For the 6G RRM spec, top level of sections 4, 5, 6, 7, 9, 10 in TS 38.133 can be reused.
      * Section 8 is used to capture procedure delay related requirements.
      * Scheduling restriction related requirements and interruption requirements are captured in one high-level section.
      * L1 measurement requirements (incl. RLM and link recovery) and L3 measurement requirements are captured in one high-level section.
      * Some distinct features (e.g. sidelink requirements) can be captured in a separate section.
    - Proposal 1d: The following skeleton as a starting point:
      * Requirements for RRC\_Idle/Inactive
      * Requirements for RRC\_Connected
      * Requirements for timing signal
      * Requirements for the measurement procedure
      * Reconsider if there should be RRC\_INACTIVE.
      * Second-level heading to be discussed further:
        + More UE states
        + Intra/inter-frequency requirements separation
        + RRM unified requirement framework.
    - Proposal 1e: Specification structure for 6G test cases is similar to the requirements structure in the main part of the specification (at least top level, maybe second level).
    - Proposal 1f: the overall spec structure in 5GNR can be inherited such as: RRC\_IDLE/INACTIVE/ CONNECTED state mobility, Timing, Signaling, Measurement. etc.
      * Decide the high-level principle to decide whether a new feature is introduced, new sub-clauses can be allowed or not. Preferable to category the clauses from procedures and different assumptions rather than UE types.
      * Even the named of procedures are the same as in 5GNR, it doesn’t mean the exactly same RRM requirements in 5GNR will be reused.
      * Achieve the common assumption of each component for different UE capabilities, including assumption of RF and BB processing, like: RF retuning time, AGC time, time for change bandwidth, time for BB processing, T/F tracking, number of searchers, etc
  + Proposal 2: The following alternatives can be considered in 6G to improve spec readability:
    - Option 1: a single spec for all UE features
    - Option 2: different sub-specs for common features and other vertical UE features (e.g. sidelink, NTN)
    - Option 3: different sub-specs for core, performance, TC separately.
  + Proposal 3: The basic functionalities and prioritize 6G day-1 typical cases’ requirements.
  + Proposal 4: Avoid duplication and repetition of UE requirements for different scenarios and use cases.
  + Proposal 5:
    - Proposal 5a: RAN4 to study how new features introduced in 6G are captured in RRM requirements specification.
    - Proposal 5b: New features introduced in later releases are captured either by incorporating in existing sections or by creating new sub-sections. Same suffix should be used for the same feature in different sub-sections.
  + Proposal 6:
    - Proposal 6a: Consider split RRM spec into two files for core part and performance part, respectively.
    - Proposal 6b: Avoid defining too huge spec like 38.133; consider splitting the 6G RRM spec into several specs covering core requirements, performance requirements, and test cases respectively.
* Recommended WF
  + To be further discussed

**Issue 3-2-3: Drafting approach**

* Proposals
  + Proposal 1: Adopt RAN2 pseudo-code approach in all sections.
  + Proposal 2: Uses block-based approach to define core requirements and test cases.
  + Proposal 3: A new tool, if possible, is used to capture tabulated test setup in test cases.
* Recommended WF
  + To be further discussed

**Issue 3-2-4: Readability and simplification**

* Proposals
  + Proposal 1: simplification on core requirements and tests by considering real demands, typical scenarios and realistic UE implementation
    - Proposal 1a: Study how to reduce the amount of RRM procedure and requirements are defined only for key RRM procedures.
    - Proposal 1b: Re-evaluate existing RRM core and performance requirements whether they still reflect state-of-the art UE implementations.
    - Proposal 1c: Study in the 6G study item whether the amount of RRM procedures can be reduced. Requirements should only be defined for key RRM procedures.
    - Proposal 1d: Investigate how the network can be enabled to follow true UE performance in its RRM procedures instead of assuming that all UEs just support minimal requirements.
    - Proposal 1e: Define necessary RRM requirements for key features and procedures. It is not mandatory to define RRM requirements for all features and procedures. To consider by two criteria:
      * Must to have actual impacts and guidance on implementation design.
      * Must to be tested and testable in conformance testing.
    - Proposal 1f: the feature with market demand are supported from 6G day-one.
    - Proposal 1g: Defining standardized and meaningful measurement metrics for 6G from day one, ensuring that these metrics are clearly specified and consistently implemented across vendors.
    - ~~Proposal 1h: RRM requirement should be based on real field conditions without UE capability and typical scenarios (not for corner cases) for both the baseline requirements and the strict performance requirements, and quantifiable requirements should be established to avoid vague specification.~~
    - Proposal 1h~~i~~: Define 6G feature requirements based on realistic UE architecture assumptions, rather than relying solely on basic UE profiles that may not support the intended feature.
  + Proposal 2:
    - Proposal 2a: Include references or mapping tables in the core part requirements that point to the relevant test cases in 6G.
    - Proposal 2b: Include a reference to the corresponding test cases in the corresponding requirement clause (e.g., in the text or as a new sub-clause).
    - Proposal 2c: Test cases for specific applications or use cases can be in a separate section, but without breaking the main structure and mapping between core requirements and test cases:
      * Option 1: use cases added as separate sections after the main test case hierarchy.
      * Option 2: use cases grouped at a second level of the test case hierarchy.
    - Proposal 2d: If common configurations can be identified for different test cases, they can be collected in a common section (e.g. under A.3 RRM test configurations or similar).
  + Proposal 3: Reduce redundancy by referencing common descriptions instead of repeating descriptions in multiple places.
  + Proposal 4: Editorial modifications in NR can be used as the baseline for future optimization toward 6G.
  + Proposal 5: Study any changes to the synchronization signal design and other related reference signals and the impact on cell detection and measurement requirements.
* Recommended WF
  + To be further discussed

### Sub-topic 3-3 BS specs improvement

*Sub-topic description: This sub-topic collects views or proposals on BS specs improvement*

*Open issues and candidate options before meeting:*

**Issue 3-3: BS specs improvements**

* Proposals
  + Proposal 1: Study a methodology to align specifications created in parallel
  + Proposal 2: Leverage the Rel-19 RAN task for the simplification for co-existence and co-location requirements for 6GR BS specification
  + Proposal 3: Discuss how to capture the same requirements (e.g. TRP measurement, EVM measurement, test mode/configuration, OTA test chamber) or test procedures across different network nodes specifications if there are many similarities just with some items/notation difference."
* Recommended WF
  + To be further discussed

### Sub-topic 3-4 Performance/demodulation specs improvement

*Sub-topic description: This sub-topic collects views or proposals on performance or demodulation specs improvement*

*Open issues and candidate options before meeting:*

**Issue 3-4: Perf/Demod specs improvements**

* Proposals
  + Proposal 1: Replacing broad applicability statements with clear, centralized mappings of test coverage. This would enhance consistency and reduce ambiguity across device types and configurations.
  + Proposal 2: A capability-aware test applicability framework should be intended, e.g., For devices lacking legacy TN support, test applicability should be designed to avoid dependency on TN-related procedures and corresponding test cases."
  + Proposal 3: FRC table improvements considering
    - necessary configuration and avoid derived information
    - methodology to generate FRC table efficiently
* Recommended WF
  + To be further discussed.