3GPP TSG-RAN WG4 Meeting #116bis R4-2514515

Prague, Czech Republic, Oct. 13-17, 2025

**Agenda item:** 8.1

**Source:** Feature lead (CMCC)

**Title:** Feature lead summary for [116bis][108] 6G spectrum sharing

**Document for:** Information

# Introduction

This document provides feature lead summary for spectrum sharing (AI 8.10) for 6G study.

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| **SID on 6G radio (RP-251881)**1. Migration from 5G NR to 6GR as well as interworking and mobility between 5G NR and 6GR:
2. 5G-6G Multi-RAT Spectrum Sharing for migration [RAN1, RAN2, RAN4, RAN3]
3. Study if any additional migration mechanism is necessary. [RAN] [RAN2, RAN1, RAN3, RAN4]NOTE: the start of this study objective (b) should be triggered by RAN plenary in time to guarantee proper completion of the WG study.
4. Mobility between 5G NR and 6GR [RAN2, RAN3, RAN4]

Note: Inclusion of LTE/6G interworking/coexistence aspects may be further discussed based on the requirement from RAN plenary |

*List of candidate target of discussions for this topic.*

* Mainly discuss on
	+ Issue 1-1-1: Migration scheme
	+ Issue 1-1-2: Scenarios for MRSS between 6GR and NR
	+ Issue 1-1-3: Spectrum sharing with NTN
	+ Issue 1-2-0: General consideration
	+ Issue 1-3-2: Inter-RAT measurement

# Topic #1: spectrum sharing (8.10)

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2513032**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513032.zip) | Apple | ***Proposal 1: RAN4 should prioritize 6G-5G MRSS in FR1.******Proposal 2: Do not consider MRSS between 6G&5G for small channel bandwidths, e.g., 3MHz (or even 5MHz)******Proposal 3: Prefer not to support MRSS in FR2 or treat it with low priority.******Proposal 4: 7.5kHz shifting is not needed for 6G-5G MRSS.******Proposal 5: Timely coordination between RAN1/4 on MRSS signal design/raster design/measurement shall be ensured for efficient and robust MRSS operation.*** |
| [**R4-2513050**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513050.zip) | Samsung | **Observation 1: Dual stack and MRSS are not contradicted to each other. MRSS is network-centric migration scheme for 5G and 6G at same band enabling flexible spectrum allocation while there might be some overhead. Dual stack is an integrated migration scheme involving both UE and network applicable for more deployment scenarios and provides better user experience and spectrum utilization with less complexity compared with DC.****Proposal 1: RAN4 needs to study both dual stack and MRSS for RAN4 related impact.****Observation 2: The switching based dual stack is expected to have minimum RAN4 spec impact. Most RF requirements of standalone single carrier can be reused.****Observation 3: Both steering based dual stack and splitting based dual stack are expected to have simultaneous transmission and reception at UE side, so more RAN4 spec impacts are expected.****Proposal 2: RAN4 needs to study both switching based dual stack and steering/splitting based dual stack respectively for RAN4 related impact.****Proposal 3: RAN4 to focus on FR1 bands in MRSS discussion.****Proposal 4: NR signals/channels (e.g., SSB) should not be reused for 6GR in MRSS****Proposal 5: RAN4 to discuss the spec impacts for semi-static MRSS and dynamic MRSS respectively before down-selection is made if needed.** |
| [**R4-2513126**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513126.zip) | CMCC | ***Proposal 1: For Multi-RAT Spectrum Sharing, it is proposed that RAN4 focus on MRSS between 6GR and NR.******Proposal 2: for inter-RAT mobility, it is proposed that RAN4 focus on inter-RAT mobility between 6GR and NR .******Proposal 3: it is proposed to consider the spectrum sharing between 6GR and NB-IoT, spectrum sharing between 6GR and eMTC.******Proposal 4: For MRSS between 6GR and NR, it is proposed to focus on legacy bands where there is commercial NR deployment in FR1. FFS whether to consider MRSS for FR2-1.******Proposal 5: for the legacy bands where there is no commercial NR deployment e.g. U6G, and new 6G spectrum, no need to consider MRSS.******Proposal 6: it is proposed to support MRSS in both TDD and FDD.*** ***Proposal 7: it is proposed to firstly identify the aspects that RAN4 need to study for MRSS.*** ***Proposal 8: to facilitate MRSS, it is proposed to taking following aspects as starting point for RAN4 study**** ***Waveform***
* ***CBW***
* ***Numerology***
* ***Channel/Synchronization raster***
* ***RF requirements***

***Proposal 9: it is proposed to consider the impact on MRSS when discuss the waveform for 6GR**** ***RAN1 agreed that the waveforms defined in 5G NR are supported as the basis for 6GR***
* ***For other waveform for 6GR, impact on MRSS need to be considered***

***Proposal 10: it is proposed to consider the impact on MRSS when discussing irregular channel bandwidth. The solution to support irregular channel bandwidth may have impact on MRSS support.******Proposal 11: the numerology discussion for 6GR in legacy band has impact on MRSS. It is proposed to follow RAN1 agreements to take 15KHz SCS for FDD and 30KHz SCS for TDD.******Proposal 12: For MRSS between NR and 6GR, it is proposed to discuss whether 100KHz channel raster for low band are still needed.******Proposal 13: No need to consider 7.5KHz uplink shift for MRSS between NR and 6GR.******Proposal 14: it is proposed to minimize handover interruption time for inter-RAT handover between NR and 6GR.*** ***Proposal 15: it is proposed to support inter-RAT measurements without gaps, including inter-RAT NR measurement without gap and inter-RAT 6GR measurement without gap, from 6G day-1.*** |
| [**R4-2513136**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513136.zip) | Tejas Network Limited | **Proposal 1: Initiate RAN4 studies on RF coexistence for NR-6GR MRSS; define extended ACLR for wide bandwidths, interference models for advanced beamforming such as holographic MIMO, and AI/ML-based adaptive emission control to minimize interference-related performance degradation.****Proposal 2: Define RRM procedures for MRSS that enable continuous measurements, support conditional handovers, and allow cross-RAT spectrum aggregation such as NR CA with 6GR secondary cells. Include timing alignment requirements and ensure robust mobility handling even at extremely high speeds, with a strong emphasis on supporting high handover reliability.****Proposal 3: Establish MRSS conformance testing guidelines; incorporate radiated tests for 6GR beam interference on NR UEs, AI/ML validation for interference prediction, and scenarios simulating partial 6G rollout in NR-dominant spectrum.** |
| [**R4-2513235**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513235.zip) | CATT | **Observation 1:** **RAN4 should specify the scenario of 5G/6G MRSS.****Proposal 1: The multi-RAT spectrum sharing should be discussed from network perspective and intra operator, both co-located and non co-located scenario should be considered.****Proposal 2: The multi-RAT spectrum sharing should accommodate different synchronization signals design of NR and 6G.****Proposal 3: The new sync raster design for 6G could be leveraged in the design of the multi-RAT spectrum sharing mechanism.****Proposal 4: The MRSS should incorporate NTN network in the scope, including 6G TN + 6G NTN, NR TN + 6G NTN, as well as 6G TN + NR NTN.** |
| [**R4-2513253**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513253.zip) | vivo | **Observation 1:** The scenarios of MRSS is closely related to system parameters, and would need more discussion. E.g. whether (partially) overlapping SSBs are possible for 5G/6G.**Proposal 1:** For MRSS, the impact on system parameters and RF will be clearer when more RAN1 agreements are available.**Proposal 2:** For MRSS, the impact on the RRM will only be efficiently analysed when more detail of RAN1 design is available. **Proposal 3:** For MRSS, from RRM measurement point of view, reusing of legacy NR signal/channels for 6G UE’s measurement purpose is not preferred. |
| [**R4-2513260**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513260.zip) | LG Electronics Inc. | **Proposal 1: RAN4 to start RF discussion on the spectrum aggregation with MRSS****e.g., 6G PCell(MRSS)+6G SCell****Proposal 2: RAN4 to start RRM discussion on the MRSS depending on the progress of** **other WGs** |
| [**R4-2513268**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513268.zip) | ISSDU | **Observation 1: Uncoordinated NR/6GR spectrum reuse with full overlap (ρ=1) and no power backoff (Δ=0) results in noticeable cross-RAT interference.****Observation 2: Performance trends are sensitive to interferer EIRP and deployment symmetry (symmetric vs asymmetric).****Observation 3:** **Coordinated sharing with partial overlap (ρ<1) and moderate power backoff (Δ>0) shows consistent improvement across interference levels.****Observation 4: Baseline evaluation does not capture the full benefits of advanced coordination.****Observation 5: System robustness under time-varying interference differs between static and periodic adjustment.****Observation 6: Coexistence performance shows numerology-dependent sensitivity to Doppler and interference aggregation.****Proposal 1: Evaluate baseline NR/6GR coexistence in FR1 (e.g., 3.5 GHz), comparing uncoordinated (ρ=1, Δ=0) vs coordinated sharing (ρ<1, Δ>0).****Proposal 2: Include EIRP sweeps and deployment conditions in the baseline evaluation, with KPIs such as average spectral efficiency.****Proposal 3: Use reference curves of uncoordinated vs coordinated sharing as inputs to further RAN4 discussions and potential RAN1 alignment.****Proposal 4: Extend the study to include partial overlap (ρ<1) with selective or group-based power backoff (Δ>0).****Proposal 5: Evaluate static versus periodic adaptation of overlap/guard settings.****Proposal 6: Include representative cases with 15 kHz (FDD) and 30 kHz (TDD) numerologies in the evaluation.** |
| [**R4-2513275**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513275.zip) | Xiaomi | **Observation 1: 6G standalone, Intra-RAT CA, MRSS (5G-6G), inter-RAT mobility between 5G and 6GR are considered as Day 1 feature for 6GR deployment.** **Obseravtion 2: The inclusion of LTE/6G interworking and co-existence is FFS and subject to RAN-P decision.**  **Proposal 1: On spectrum sharing, focus on MRSS between 5G and 6G case in both FR1 (400MHz ~ 7.125GHz) and FR2-1 (24.25GHz ~ 52.6GHz)****Proposal 2: For below 3GHz, further discuss co-existence between 4G and 6G** **Proposal 3: RAN4 study potential RAN4 centric solutions on handling interference between 4G/5G and 6G for always on signal e.g., control channel, PBCH and CSI-RS.** * Scenario 1: spectrum sharing between 5G/6G
* Scenario 2: 6G and 5G/4G co-existence with neighbour cell interference

**Proposal 4: RAN4 needs to further evaluate sync raster design for 6GR on 5G migration bands pending on RAN1 progress*** Postpone the discuss until there is sufficient progress from RAN1 for MRSS and initial cell access i.e., no early than Q2’ 2026

**Proposal 5: RAN4 shall study potentail inter-RAT RRM measurement impact including w/o and with gap under MRSS scenario.** **Proposal 6: RAN4 shall study potential solutions and impact on co-channel interference handling and mobility which also related to regulation update including following scenarios:*** NTN operation use TN bands/spectrum
* 5G NTN and 6G NTN share dedicated NTN spectrum
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| [**R4-2513301**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513301.zip) | Spreadtrum,UNISOC | ***Proposal 1: Co-existence between 5G and 6G for MRSS should be considered, we can focus on FR1 bands.******Proposal 2: Keep a single set of sync raster s in 6G with and without MRSS.******Proposal 3: For the re-farming bands, 6GR channel raster can be 10 kHz when these bands in NR can support 10 kHz for MRSS between 5G and 6G.******Proposal 4: There is no need to define UL shift 7.5 kHz for MRSS between 5G and 6G.*** |
| [**R4-2513311**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513311.zip) | Huawei, HiSilicon | ***Observation 1:*** *MRSS is still under discussion in RAN1, and no conclusion yet for the fundamental design especially for the initial access.****Observation 2:*** *Several challenges associated with DSS do not apply to the MRSS design.****Proposal: The RAN4 study on MRSS should be conducted in close coordination with the studies on channel raster and sync raster, while other aspects may be addressed pending further inputs from RAN1.*** |
| [**R4-2513319**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513319.zip) | OPPO | **Operating frequency range for MRSS**Proposal 1: 5G-6G MRSS operation priority on FR1 up to 7.125GHz spectrum, FR2-1 (24.25 GHz – 52.6GHz) can be considered base on the interest of industry. **Co-existence issue**Observation 1: Adjacent channel co-existence between 5G and 6G will be guaranteed by ACLR, MRSS only need study co-channel existence.Observation 2: There is no co-existence issue for NR/6G resources sharing via TDM only, the switching time between 5G configuration and 6G configuration need be considered.Observation 3: SCS alignment is necessary to avoid OFDM sub-carrier cross interference when 5G signal and 6G signal sharing frequency resource in one carrier/channel.Observation 4: NR/6G resources dynamically sharing not only need avoid OFDM sub-carrier cross interference when 5G signal and 6G signal share frequency resource in one carrier/channel, but also need consider the switching time.Proposal 2: For MRSS operation via FDD sharing, 6G should adopt the same SCS with 5G when sharing carrier/channel. Proposal 3: For MRSS operation via TDD/dynamic sharing, the switching time between 5G configuration and 6G configuration need study.Observation 5: SSB is an always-on signal for all UEs in NR.Proposal 4: For MRSS operation, 6G design shall consider the in-channel coexist with 5G, and study how to avoid the interference from NR SSB.**Channel raster**Observation 6: Channel raster for FR1 NR bands is defined based on 100kHz and SCS, and FDD bands with 100kHz channel raster can use enhance 10kHz.Proposal 5: For the 5G-6G MRSS bands, the 6G channel raster design shall make sure it is compatible with 5G. Besides of that, no other issue is foreseen in MRSS channel raster design. |
| [**R4-2513328**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513328.zip) | ZTE Corporation, Sanechips | **Proposal 1**: for MRSS study in RAN4 prior to 2026, Q1, RAN4 focus on the RF requirements of MRSS BS, spec impacts and also carrier/numerology between 5G and 6G. **Proposal 2**: For MRSS study in RAN4, focus on 5G-6G MRSS according to the 6G objective. **Proposal 3**: for the MRSS BS, the commercialized NR subcarrier spacing (e.g. FR1 FDD with 15kHz, FR1 TDD with 30kHz and FR2-1 with 120kHz SCS) should be the baseline for 6G BS.**Proposal 4**: for MRSS BS, if the power boosted channel between 5G and 6G is overlapped in the time domain, the maximum power limitation of MRSS BS and to minimize the impacts on other DL channels on the same symbol(s) should be considered.**Proposal 5**: for MRSS BS, apply new 6GR BS RF requirements to MRSS BS supporting both 5G and 6G.**Proposal 6**: for MRSS BS, it’s proposed to consider the TN BS with 5G-6G TN MRSS in the existing TN MSR specification and NTN SAN with 5G-6G NTN MRSS in the new NTN MSR specification. |
| [**R4-2513334**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513334.zip) | KDDI Corporation | ***Observation 1: Rel-17 CRS-IM feature works for mitigating 5G NR throughput degradation in Mod-3 unmatched case.******Observation 2: Proposal to mandate Rel-17 CRS-IM feature for UE was not agreed in 5G NR.******Proposal 1: RAN4 needs to know and understand whether there are technically any interference issues or not, based on outcomes and progress of 6GR control channels’ design in RAN1.******Proposal 2: If RAN4 identify possibilities on any interference issues based on RAN1’s outcomes and progress, RAN4 need to study candidate solutions for the issues and expect to mandate related features for 6GR UE.*** |
| [**R4-2513341**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513341.zip) | Nokia, Nokia Shanghai Bell | 1. Proposal 1: Based on RAN1 progress on MRSS, RAN4 shall discuss the 6G RRM requirements considering the potential to leverage 5G reference signaling to improve performance. The feasibility and applicable scenarios shall be carefully discussed based on the details of MRSS solution.
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| [**R4-2513343**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116bis/Docs/R4-2513343.zip) | Ericsson | [Proposal 1 During the discussion on system parameters, take into account that alignment between 5G and 6G slot length and numerology will facilitate MRSS](#_Toc210059139)[Proposal 2 When designing UE RF requirements, take into account that 6GR UEs will operate on the same carrier as legacy UEs due to MRSS.](#_Toc210059140)[Proposal 3 When designing BS RF requirements, take into account that compatibility between 6GR and legacy requirements is needed to facilitate multi-standard BS that can handle both 6GR and legacy RATs.](#_Toc210059141)[Proposal 4 RAN4 should study MRSS based measurement and handover requirements if needed, taking into account the RAN1/2 design of MRSS.](#_Toc210059142)[Proposal 5 Consider demodulation requirements for MRSS once the RAN1/2 design is clearer.](#_Toc210059143) |

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions..*

###  Sub-topic 1-1: General aspects

*Open issues and candidate options before meeting:*

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| **Background:** **Agreements on architecture and migration for 6G in RAN#109 (RP-252870)**The RAN design for the 6G Radio Access Technologies shall be designed to fulfil the following requirements:- The 6G RAN architecture shall support standalone RAN architecture.- The 6G RAN shall support Multi-RAT Spectrum Sharing between 6GR and NR.- The 6G RAN architecture shall support inter-RAT mobility between the 6GR and NR.- The 6G RAN architecture shall support connectivity through multiple TRPs, either collocated or non-collocated.- The 6G RAT shall support Spectrum Aggregation (e.g. Carrier Aggregation) for both uplink and downlink, and for both co-located and non-co-located TRPs.- 3GPP defined interfaces for 6G RAN shall be open for multi-vendor interoperability.- The 6G RAN architecture shall allow for control plane and user plane separation.- The 6G RAN architecture shall support sharing of the RAN between multiple operators.- The 6G RAN architecture shall allow for the operation of network slicing.- The 6G RAN architecture shall be designed considering both terrestrial network and non-terrestrial network.- The 6G RAN architecture shall support enhanced service awareness in RAN.- The design of the 6G RAN shall allow enhanced resilience compared to NR if/where applicable.- The design of the 6G RAN shall enable lower CAPEX/OPEX with respect to current networks.- The 6G RAN architecture shall allow non-public networks. |

#### **Issue 1-1-1: Migration scheme**

* Proposals from companies:
	+ Option 1 (Samsung):
* RAN4 needs to study both dual stack and MRSS for RAN4 related impact
* RAN4 needs to study both switching based dual stack and steering/splitting based dual stack respectively for RAN4 related impact
	+ Option 2 (CMCC):
* For Multi-RAT Spectrum Sharing, it is proposed that RAN4 focus on MRSS between 6GR and NR.
* For inter-RAT mobility, it is proposed that RAN4 focus on inter-RAT mobility between 6GR and NR
* It is proposed to consider the spectrum sharing between 6GR and NB-IoT, spectrum sharing between 6GR and eMTC.
	+ Option 3 (Xiaomi):
* On spectrum sharing, focus on MRSS between 5G and 6G case in both FR1 (400MHz ~ 7.125GHz) and FR2-1 (24.25GHz ~ 52.6GHz)
* For below 3GHz, further discuss co-existence between 4G and 6G
	+ Option 4 (ZTE): For MRSS study in RAN4, focus on 5G-6G MRSS according to the 6G objective.
* Recommended WF

To discuss the following points:

* RAN4 focus on MRSS between 6GR and NR
* RAN4 focus on inter-RAT mobility between 6GR and NR,
* FFS other migration schemes

ZTE: last bullet is unclear. Agree with the first one

OPPO:agree with the first two bullets. Dual-stack has NW impact and is dependent on other WG’s work.

CHTTL: first two bullets are agreeable and aligned with the existing SID. Regarding the sharing between 6G and NBIOT, shall it be considered as part of MRSS?

Ericsson:MRSS should be considered in some of the system parameter discussion, e.g. SCS and sync raster etc. NBIOT and 6G sharing can be considered.

Huawei:the third bullet is pending on plenary decision. System parameter discussion should be coordinated with MRSS.

Samsung: OK with all bullets.

Xiaomi:the last bullet should be depend on RAN decision. Also, other WG dependency should be considered. Coordination with other topics e.g. system parameter, is needed.

Nokia:don’t need to start this work ahead of RAN1

Apple:the first bullet should be prioritized in RAN4 discussion. The third one depends on RAN decision.

MTK: OK with first two bullets. RAN decision is needed for the last one.

Qualcomm:we can hold this work until RAN1 makes sufficient progress.

LGE:this topic concerns multiple other topics as well as is dependent on other WG’s work.

Vivo: need the input from RAN1 before RAN4 starts this work.

FL: the last bullet is related to dual stack proposal.

Agreement:

MRSS should be considered in the ultimate RAN4 decision, including RAN4’s input to interim milestone.

Regarding some of the system parameters (e.g. SCS, sync raster, channel raster etc.), separated agenda will be designated for the scenairos of with (in spectrum sharing) and without (in system parameter) MRSS considered.

* If feasible, RAN4 strives to define unified system parameters for the scenarios with and withtout MRSS.
* Revisit this agenda arrangement after Feb. meeting in 2026 for potentially merging the discussion under the single agenda.

 Before RAN4 recevies concrete design from RAN1/2, RAN4 discussion will be based on the agreed hypothesis.

#### **Issue 1-1-2: Scenarios for MRSS between 6GR and NR**

* Proposals from companies:
	+ Option 1 (Apple):
* RAN4 should prioritize 6G-5G MRSS in FR1.
* Prefer not to support MRSS in FR2 or treat it with low priority.
	+ Option 2 (Samsung): RAN4 to focus on FR1 bands in MRSS discussion.
	+ Option 3 (CMCC):
* For MRSS between 6GR and NR, it is proposed to focus on legacy bands where there is commercial NR deployment in FR1. FFS whether to consider MRSS for FR2-1.
* For the legacy bands where there is no commercial NR deployment e.g. U6G, and new 6G spectrum, no need to consider MRSS
* it is proposed to support MRSS in both TDD and FDD
	+ Option 4 (CATT): both co-located and non co-located scenario should be considered
	+ Option 6 (Xiaomi):
* On spectrum sharing, focus on MRSS between 5G and 6G case in both FR1 (400MHz ~ 7.125GHz) and FR2-1 (24.25GHz ~ 52.6GHz)
	+ Option 7 (Spreadtrum, UNISOC): Co-existence between 5G and 6G for MRSS should be considered, we can focus on FR1 bands.
	+ Option 8 (OPPO): 5G-6G MRSS operation priority on FR1 up to 7.125GHz spectrum, FR2-1 (24.25 GHz – 52.6GHz) can be considered base on the interest of industry
* Recommended WF

For operating frequency range for MRSS between 6GR and NR, to discuss the following points

* RAN4 prioritize 6G-5G MRSS in FR1
* FFS whether to consider 6G-5G MRSS in FR2-1
* No need to consider MRSS for legacy bands where there is no commercial NR deployment e.g. U6G, and new 6G spectrum

For deployment scenario, suggest to discuss whether both co-located and non co-located scenario are considered

#### **Issue 1-1-3: Spectrum sharing with NTN**

* Proposals from companies:
	+ Option 1 (CATT): The MRSS should incorporate NTN network in the scope, including 6G TN + 6G NTN, NR TN + 6G NTN, as well as 6G TN + NR NTN
	+ Option 2 (Xiaomi):
* RAN4 shall study potential solutions and impact on co-channel interference handling and mobility which also related to regulation update including following scenarios:
* NTN operation use TN bands/spectrum
* 5G NTN and 6G NTN share dedicated NTN spectrum
	+ Option 3 (ZTE): for MRSS BS, propose to consider the TN BS with 5G-6G TN MRSS in the existing TN MSR specification and NTN SAN with 5G-6G NTN MRSS in the new NTN MSR specification
* Recommended WF
	+ To discuss the following points:
		- Whether to consider spectrum sharing with NTN
		- If spectrum sharing with NTN is considered, which scenario is considered:
			* NR NTN + 6G NTN
			* NR TN + 6G NTN
			* NR NTN + 6G TN

###  Sub-topic 1-2: Aspects to facilitate MRSS

*Open issues and candidate options before meeting:*

#### **Issue 1-2-0: General consideration**

* Proposals from companies:
	+ Option 1 (Samsung): RAN4 to discuss the spec impacts for semi-static MRSS and dynamic MRSS respectively before down-selection is made if needed
	+ Option 2 (CMCC):
		- it is proposed to firstly identify the aspects that RAN4 need to study for MRSS.
		- to facilitate MRSS, it is proposed to taking following aspects as starting point for RAN4 study
			* Waveform
			* CBW
			* Numerology
			* Channel/Synchronization raster
			* RF requirements
	+ Option 3 (vivo):
		- For MRSS, the impact on system parameters and RF will be clearer when more RAN1 agreements are available.
		- For MRSS, the impact on the RRM will only be efficiently analysed when more detail of RAN1 design is available.
	+ Option 4 (Xiaomi): RAN4 study potential RAN4 centric solutions on handling interference between 4G/5G and 6G for always on signal e.g., control channel, PBCH and CSI-RS.
	+ Option 5 (Huawei, HiSilicon): The RAN4 study on MRSS should be conducted in close coordination with the studies on channel raster and sync raster, while other aspects may be addressed pending further inputs from RAN1
	+ Option 6 (OPPO): For MRSS operation, 6G design shall consider the in-channel coexist with 5G, and study how to avoid the interference from NR SSB
	+ Option 7(ZTE): for MRSS study in RAN4 prior to 2026, Q1, RAN4 focus on the RF requirements of MRSS BS, spec impacts and also carrier/numerology between 5G and 6G.
	+ Option 8 (KDDI):
		- RAN4 needs to know and understand whether there are technically any interference issues or not, based on outcomes and progress of 6GR control channels’ design in RAN1.
		- If RAN4 identify possibilities on any interference issues based on RAN1’s outcomes and progress, RAN4 need to study candidate solutions for the issues and expect to mandate related features for 6GR UE.
* Recommended WF
	+ To check whether following suggestion is agreeable:
* To facilitate MRSS between 6GR and NR, take following aspects as starting point for RAN4 study
* System parameters
* Waveform
* CBW
* Numerology
* Channel/Synchronization raster
* RF requirements
* RRM requirements
* Interference handling

#### **Issue 1-2-1: Channel rater**

* Proposals from companies:
	+ Option 1 (Apple): 7.5kHz shifting is not needed for 6G-5G MRSS.
	+ Option 2 (CMCC):
		- For MRSS between NR and 6GR, it is proposed to discuss whether 100KHz channel raster for low band are still needed.
		- No need to consider 7.5KHz uplink shift for MRSS between NR and 6GR.
	+ Option 3 (Spreadtrum, UNISOC):
		- For the re-farming bands, 6GR channel raster can be 10 kHz when these bands in NR can support 10 kHz for MRSS between 5G and 6G
		- There is no need to define UL shift 7.5 kHz for MRSS between 5G and 6G
	+ Option 4 (OPPO): For the 5G-6G MRSS bands, the 6G channel raster design shall make sure it is compatible with 5G. Besides of that, no other issue is foreseen in MRSS channel raster design
	+ Option 5 (Xiaomi): Support 5kHz channel raster in day 1 for below 3GHz
		- Remove per band channel raster concept with following value per sub-frequency range basis

|  |  |
| --- | --- |
| **Frequency range**  | **Channel raster**  |
| **<3GHz** | 5kHz |
| **3GHz ~ 24.25kHz**  | 30kHz |
| **24.25GHz ~ 52GHz**  | 120kHz  |

* Recommended WF
	+ To discuss the following points
		- 7.5kHz shifting is not needed for 5G-6G MRSS
		- Whether 100KHz channel raster for low band are needed for 6G-5G MRSS
		- Whether 6GR channel raster can be 10 kHz when the bands in NR can support 10 kHz for MRSS between 5G and 6G

#### **Issue 1-2-2: Sync rater**

* Proposals from companies:
	+ Option 1 (CATT): The new sync raster design for 6G could be leveraged in the design of the multi-RAT spectrum sharing mechanism.
	+ Option 2 (Xiaomi): RAN4 needs to further evaluate sync raster design for 6GR on 5G migration bands pending on RAN1 progress
	+ Option 3 (Spreadtrum, UNISOC): Keep a single set of sync raster s in 6G with and without MRSS
* Recommended WF
	+ To discuss the following points
		- Whether following can be agreed as a high level principle for sync raster design
			* Keep a single set of sync raster in 6G with and without MRSS

#### **Issue 1-2-3: Channel bandwidth**

* Proposals from companies:
	+ Option 1 (Apple): Do not consider MRSS between 6G&5G for small channel bandwidths, e.g., 3MHz (or even 5MHz).
	+ Option 2 (CMCC): it is proposed to consider the impact on MRSS when discussing irregular channel bandwidth. The solution to support irregular channel bandwidth may have impact on MRSS support
* Recommended WF：
	+ Discuss whether to have some restriction on supported bandwidth for 5G-6G MRSS

#### **Issue 1-2-4: Waveform**

* Proposals from companies:
	+ Option 1 (CMCC):
		- it is proposed to consider the impact on MRSS when discuss the waveform for 6GR
			* RAN1 agreed that the waveforms defined in 5G NR are supported as the basis for 6GR
			* For other waveform for 6GR, impact on MRSS need to be considered
* Recommended WF：
	+ For the waveform other than the one defined in 5G NR, discuss the impact on MRSS.

#### **Issue 1-2-5: Numerology**

* Proposals from companies:
	+ Option 1 (CMCC): the numerology discussion for 6GR in legacy band has impact on MRSS. It is proposed to follow RAN1 agreements to take 15KHz SCS for FDD and 30KHz SCS for TDD.
	+ Option 2 (OPPO): For MRSS operation via FDD sharing, 6G should adopt the same SCS with 5G when sharing carrier/channel
	+ Option 3 (ZTE): for the MRSS BS, the commercialized NR subcarrier spacing (e.g. FR1 FDD with 15kHz, FR1 TDD with 30kHz and FR2-1 with 120kHz SCS) should be the baseline for 6G BS
	+ Option 4 (Ericsson): During the discussion on system parameters, take into account that alignment between 5G and 6G slot length and numerology will facilitate MRSS
	+ Option 5 (Xiaomi): On 5G migration spectrum/bands, harmonize the numerology between 5G and 6G by taking existing NR commercialization deployment choice into account.
* Recommended WF：
	+ To discuss the following points
		- Alignment between 5G and 6G numerology will facilitate MRSS
			* For FR1, at least take 15KHz SCS for FDD and 30KHz SCS for TDD, FFS other SCS

#### **Issue 1-2-6: RF requirements**

* Proposals from companies:
	+ Option 1 (ZTE): for MRSS BS, apply new 6GR BS RF requirements to MRSS BS supporting both 5G and 6G.
	+ Option 2 (LGE): RAN4 to start RF discussion on the spectrum aggregation with MRSS e.g., 6G PCell(MRSS)+6G SCell
	+ Option 3 (Ericsson):
		- When designing UE RF requirements, take into account that 6GR UEs will operate on the same carrier as legacy UEs due to MRSS.
		- When designing BS RF requirements, take into account that compatibility between 6GR and legacy requirements is needed to facilitate multi-standard BS that can handle both 6GR and legacy RATs
	+ Option 4 (ISSDU): RAN4 to evaluate 5G/6G RF coexistence in FR1 under MRSS with a quantifiable baseline approach.
* Recommended WF：
	+ To be further discussed

#### **Issue 1-2-7: RRM requirements**

* Proposals from companies:
	+ Option 1 (LGE): RAN4 to start RRM discussion on the MRSS depending on the progress of other WGs.
	+ Option 2 (Ericsson): RAN4 should study MRSS based measurement and handover requirements if needed, taking into account the RAN1/2 design of MRSS.
	+ Option 3 (ISSDU): RAN4 to study adaptive RRM coordination for MRSS under partial frequency overlap and different numerology configurations, focusing on dynamic stability and measurable RRM performance.
* Recommended WF：
	+ To be further discussed

#### **Issue 1-2-8: Whether to reuse legacy NR signals/channels for 6GR**

* Proposals from companies:
	+ Option 1 (Samsung): NR signals/channels (e.g., SSB) should not be reused for 6GR in MRSS.
	+ Option 2 (CATT): The multi-RAT spectrum sharing should accommodate different synchronization signals design of NR and 6G.
	+ Option 3 (vivo): For MRSS, from RRM measurement point of view, reusing of legacy NR signal/channels for 6G UE’s measurement purpose is not preferred
	+ Option 4 (Nokia): based on RAN1 progress on MRSS, RAN4 shall discuss the 6G RRM requirements considering the potential to leverage 5G reference signaling to improve performance. The feasibility and applicable scenarios shall be carefully discussed based on the details of MRSS solution.
* Recommended WF：
	+ [Moderator]:

To check whether following suggestion is agreeable:

* Whether to reuse/share legacy NR signals/channels for 6GR is up to RAN1 decision

#### **Issue 1-2-9: switching time**

* Proposals from companies:
	+ Option 1 (OPPO): For MRSS operation via TDD/dynamic sharing, the switching time between 5G configuration and 6G configuration need study.
* Recommended WF：
	+ To be further discussed

#### **Issue 1-2-10: Others**

* Proposals from companies:
	+ Option 1 (Tejas Networks):
		- Initiate RAN4 studies on RF coexistence for NR-6GR MRSS; define extended ACLR for wide bandwidths, interference models for advanced beamforming such as holographic MIMO, and AI/ML-based adaptive emission control to minimize interference-related performance degradation.
		- Define RRM procedures for MRSS that enable continuous measurements, support conditional handovers, and allow cross-RAT spectrum aggregation such as NR CA with 6GR secondary cells. Include timing alignment requirements and ensure robust mobility handling even at extremely high speeds, with a strong emphasis on supporting high handover reliability.
		- Establish MRSS conformance testing guidelines; incorporate radiated tests for 6GR beam interference on NR UEs, AI/ML validation for interference prediction, and scenarios simulating partial 6G rollout in NR-dominant spectrum.
	+ Option 2 (ISSDU):
		- Evaluate baseline NR/6GR coexistence in FR1 (e.g., 3.5 GHz), comparing uncoordinated (ρ=1, Δ=0) vs coordinated sharing (ρ<1, Δ>0)
		- Include EIRP sweeps and deployment conditions in the baseline evaluation, with KPIs such as average spectral efficiency
		- Use reference curves of uncoordinated vs coordinated sharing as inputs to further RAN4 discussions and potential RAN1 alignment
		- Extend the study to include partial overlap (ρ<1) with selective or group-based power backoff (Δ>0).
		- Evaluate static versus periodic adaptation of overlap/guard settings
		- Include representative cases with 15 kHz (FDD) and 30 kHz (TDD) numerologies in the evaluation
* Recommended WF：
	+ To be further discussed

###  Sub-topic 1-3: Inter-RAT mobility between 6GR and NR

*Open issues and candidate options before meeting:*

#### **Issue 1-3-1: Inter-RAT handover interruption**

* Proposals from companies:
	+ Option 1 (CMCC): it is proposed to minimize handover interruption time for inter-RAT handover between NR and 6GR.
* Recommended WF
	+ Discuss whether and how to minimize handover interruption time for inter-RAT handover between NR and 6GR

#### **Issue 1-3-2: Inter-RAT measurement**

* Proposals from companies:
	+ Option 1 (CMCC): it is proposed to support inter-RAT measurements without gaps, including inter-RAT NR measurement without gap and inter-RAT 6GR measurement without gap, from 6G day-1.
	+ Option 2 (Xiaomi): RAN4 shall study potential inter-RAT RRM measurement impact including w/o and with gap under MRSS scenario.
* Recommended WF
	+ Discuss inter-RAT measurement impact
		- Inter-RAT measurement without gap
		- Inter-RAT measurement with gap