3GPP TSG-RAN WG4 Meeting #116bis R4-251xxxx

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

**Agenda item:** 8.1

**Source:** CMCC

**Title:** WF for [116bis][108] 6G spectrum sharing

**Document for:** Approval

# Sub-topic 1-0: Agenda handling

* Online Agreements

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 scenarios 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 without MRSS.

Revisit this agenda arrangement after Feb. meeting in 2026 for potentially merging the discussion under the single agenda.

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

# Sub-topic 1-1: General aspects

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

* Ad-hoc Agreements
* RAN4 focus on MRSS between 6GR and NR until further RANP guidance
* RAN4 focus on inter-RAT mobility between 6GR and NR

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

* For operating frequency range or band for MRSS between 6GR and NR
* Ad-hoc Agreements
* Start RAN4 6G-5G MRSS study in FR1
* Whether to consider 6G-5G MRSS in FR2-1 is further discussed
* For deployment scenario
* Way forward
* FFS: both co-located and non co-located scenario are considered

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

* Proposals
	+ P1 (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
	+ P2 (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
	+ P3 (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
* Way forward
	+ Further discuss 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

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

* Proposals:
	+ P1 (Samsung): RAN4 to discuss the spec impacts for semi-static MRSS and dynamic MRSS respectively before down-selection is made if needed
	+ P2 (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
	+ P3 (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.
	+ P4 (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.
	+ P5 (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
	+ P6 (OPPO): For MRSS operation, 6G design shall consider the in-channel coexist with 5G, and study how to avoid the interference from NR SSB
	+ P7(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.
	+ P8 (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.
* Way forward
* To facilitate MRSS between 6GR and NR, take following aspects as starting point for RAN4 study
* System parameters
* RF requirements
* RRM requirements
* Interference handling
* Taking following table as starting point to discuss which system parameters are impacted by MRSS.

|  |  |
| --- | --- |
| **System parameters**  | **Whether impacted by MRSS** |
| Numerology | Maybe impacted |
| Channel raster | Maybe impacted |
| Sync raster | Maybe impacted |
| Waveform | FFS |
| Modulation | FFS |
| Channel bandwidth | FFS |

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

* Proposals:
	+ P1 (Apple): 7.5kHz shifting is not needed for 6G-5G MRSS.
	+ P2 (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.
	+ P3 (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
	+ P4 (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
	+ P5 (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  |

* Way forward
	+ Discuss following impact
		- Whether 7.5kHz shifting is 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
		- Other impacts are not precluded

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

* Proposals:
	+ P1 (CATT): The new sync raster design for 6G could be leveraged in the design of the multi-RAT spectrum sharing mechanism.
	+ P2 (Xiaomi): RAN4 needs to further evaluate sync raster design for 6GR on 5G migration bands pending on RAN1 progress
	+ P3 (Spreadtrum, UNISOC): Keep a single set of sync raster s in 6G with and without MRSS
* Way forward
	+ Discuss whether following can be considered 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:
	+ P1(Apple): Do not consider MRSS between 6G&5G for small channel bandwidths, e.g., 3MHz (or even 5MHz).
	+ P2(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
* Way forward
	+ Discuss whether to have some restriction on supported bandwidth for 5G-6G MRSS

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

* Proposals:
	+ 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
* Way forward
	+ Discuss whether and how the waveform are impacted by MRSS.

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

* Proposals:
	+ P1 (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.
	+ P2 (OPPO): For MRSS operation via FDD sharing, 6G should adopt the same SCS with 5G when sharing carrier/channel
	+ P3 (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
	+ P4 (Ericsson): During the discussion on system parameters, take into account that alignment between 5G and 6G slot length and numerology will facilitate MRSS
	+ P5 (Xiaomi): On 5G migration spectrum/bands, harmonize the numerology between 5G and 6G by taking existing NR commercialization deployment choice into account.
* Way forward
	+ Further discuss above proposals

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

* Proposals:
	+ P1(ZTE): for MRSS BS, apply new 6GR BS RF requirements to MRSS BS supporting both 5G and 6G.
	+ P2 (LGE): RAN4 to start RF discussion on the spectrum aggregation with MRSS e.g., 6G PCell(MRSS)+6G SCell
	+ P3 (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
	+ P4 (ISSDU): RAN4 to evaluate 5G/6G RF coexistence in FR1 under MRSS with a quantifiable baseline approach.
* Way forward
	+ Further discuss above proposals

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

* Proposals:
	+ P1 (LGE): RAN4 to start RRM discussion on the MRSS depending on the progress of other WGs.
	+ P2 (Ericsson): RAN4 should study MRSS based measurement and handover requirements if needed, taking into account the RAN1/2 design of MRSS.
	+ P3 (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.
* Way forward
	+ Further discuss above proposals

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

* Proposals:
	+ P1 (Samsung): NR signals/channels (e.g., SSB) should not be reused for 6GR in MRSS.
	+ P2 (CATT): The multi-RAT spectrum sharing should accommodate different synchronization signals design of NR and 6G.
	+ P3 (vivo): For MRSS, from RRM measurement point of view, reusing of legacy NR signal/channels for 6G UE’s measurement purpose is not preferred
	+ P4 (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.
* Way forward
	+ Further discuss above proposals

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

* Proposals:
	+ P1(OPPO): For MRSS operation via TDD/dynamic sharing, the switching time between 5G configuration and 6G configuration need study.
* Way forward
	+ Further discuss above proposal

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

* Proposals:
	+ P1 (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.
	+ P2 (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
* Way forward
	+ Further discuss above proposals

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

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

* Proposals
	+ Option 1 (CMCC): it is proposed to minimize handover interruption time for inter-RAT handover between NR and 6GR.
* Way forward
	+ 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
	+ 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.
* Way forward
	+ Discuss inter-RAT measurement impact
		- Inter-RAT measurement without gap
		- Inter-RAT measurement with gap