

Working Group 3

Agenda Item 1.14

Part A: Description

to review and consider possible adjustments of the existing or possible new primary frequency allocations to EESS (passive) in the frequency range 231.5-252 GHz, to ensure alignment with more up-to-date remote-sensing observation requirements, in accordance with **Resolution 662 (WRC-19)**.

Resolution 662 (WRC-19): The World Radiocommunication Conference (Sharm el-Sheikh, 2019) resolved to invite the ITU Radiocommunication Sector to review the existing primary allocations to the EESS (passive) in the frequency range 231.5-252 GHz in order to analyse if these allocations are aligned with the observation requirements of passive microwave sensors.

Part B: Key Elements - the notables

Passive microwave remote sensing instruments has the ability to measure ice clouds, based on the microwave frequencies being employed. The currently deployed microwave sensors typically operate in frequencies less than 200 GHz and are sensitive only to thick ice because the interaction of millimeter-wave radiation with cloud particles is not very strong. This interaction improves with increasing frequency and at intermediate frequencies in the frequency band 231.5 – 252 GHz the sensitivity to ice clouds is significantly more than in lower frequencies. The measurement of ice particles is used to measure the hydrometeor properties of cirrus clouds, higher altitude convective and anvil clouds. Ice clouds have important effects on the Earth's climate and hydrological cycle by affecting precipitation, atmospheric structure and cloud processes. The main objective in measuring ice clouds is to improve the current Numerical Weather Prediction (NWP) Models.

Furthermore, various portions of this frequency range play an important role in the measurement of chemical processes and compounds within Earth's atmosphere such as Nitric

acid (HNO₃) which is a primary reservoir for reactive nitrogen, serving as a key component to upper tropospheric processes that maintain ozone abundances and clouds.

The allocation to the Earth exploration-satellite service (EESS) (passive) for the use of passive microwave remote sensing system were agreed at WRC-2000, under agenda item 1.16 relating to Resolution 723 (WRC-97). The development in science and technology for passive microwave sensor measurements have evolved over the last 20 years and it is appropriate to ensure that frequency allocations to the EESS (passive) agreed in 2000 correspond to up-to-date for the observation requirements for passive microwave sensing.

However, a number of services are allocated in the band 231.5 – 252 GHz, any change to the EESS (passive) allocation to ensure the alignment with more up-to-date remote-sensing observational requirements should take into account the results of ITU-R studies while also ensuring that no undue constraints should be imposed on existing service services.

NB: The set of frequencies for the measurement of ice clouds centers around 183 GHz, 243 GHz, 325 GHz, 448 GHz and 664 GHz

Part C: Current Status of Band(s) or Issue(s)

ITU-R Table of Frequency Allocation

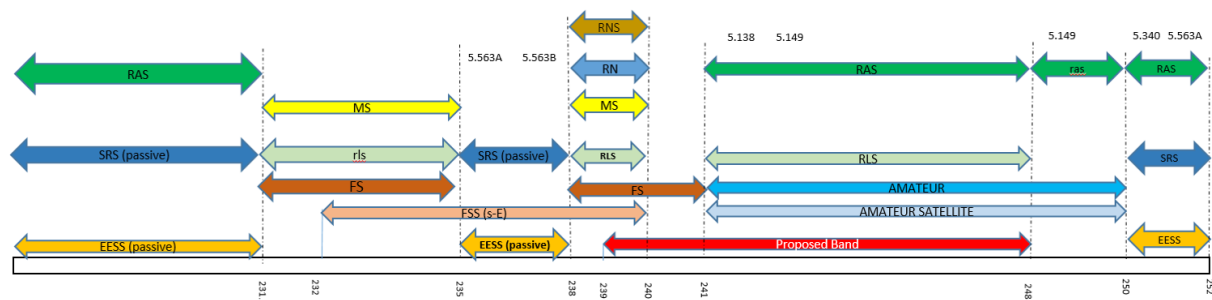


Figure 1: The current and proposed allocations in the band 231.5 – 252 GHz.

The frequency band under consideration is 231.5 – 252 GHz, however, passive sensors systems under development plan to operate in the frequency range 239 – 248 GHz, given the specific characteristics of this frequency band for ice-cloud analysis.

231.5-232	FIXED MOBILE Radiolocation
232-235	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Radiolocation
235-238	EARTH EXPLORATION-SATELLITE (passive) FIXED-SATELLITE (space-to-Earth) SPACE RESEARCH (passive) 5.563A 5.563B
238-240	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE RADIOLOCATION RADIONAVIGATION RADIONAVIGATION-SATELLITE
240-241	FIXED MOBILE RADIOLOCATION
241-248	RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite 5.138 5.149
248-250	AMATEUR AMATEUR-SATELLITE Radio astronomy 5.149
250-252	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.563A

Figure 2: ITU-R Table of frequency allocation.

Part B – Draft AfriSAP:

1. Frequency allocation is exactly the same as in the ITU-R Table of frequency allocation in the frequency band 231.5 – 252 GHz.
2. SRDs applications are the currently identified typical applications in the band 241 – 248, while radio astronomy observations are identified in the band 241 – 252 GHz.
3. No other typical applications are identified in the band 231.5 – 252 GHz

Part D: Conclusion of the results of studies, or Summary of the ongoing study work

- ✓ A compilation of information on passive sensor measurements in the frequency range 231.5-252 GHz is gathered in Working document towards a preliminary draft new Report ITU-R RS.[231.5-252 GHz EESS]. In this document the bands 239.2- 242.2 GHz and 244.2- 247.2 GHz are identified as most appropriate for future ice cloud measurements.

Notable:

1. No compatibility studies are performed as space research (passive) will be compatible with EESS (passive) service in the band (235 -252 GHz),
 2. No compatibility studies are performed as there is no technical characteristics for radiolocation service in the frequency band 238-248 GHz in ITU-R Recommendation or Reports,
 3. No compatibility studies are performed as there is no technical characteristics for radionavigation and radionavigation satellite services in the frequency band 238-240 GHz in ITU-R Recommendation or Reports,
 4. No compatibility studies are performed as the radioastronomy service is passive service and will be compatible with EESS (passive) service.
- ✓ In response to resolves to invite ITU-R 1 of Resolution 662, it can be concluded that the existing allocations to EESS (passive) are not aligned with the operational requirements of passive microwave sensors.
 - ✓ Consequently, necessary sharing and compatibility studies would have to be carried out with the services already allocated in the bands 239.2-242.2 GHz and 244.2- 247.2 GHz which are currently not covered by EESS (passive) allocations,



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Part E: Options and Associated Implications

TBD.

Part F: Proposed African Common View and/or Position

WG3 invites EACO to:

Support the ITU-R studies to review frequency allocation and consider some adjustment/extension of the EESS (passive) allocation to accommodate up-to-date observation requirements of passive microwave sensing, taking into account the benefits of this application of passive microwave sensing. However, the effect on the primary services in the frequency range 231.5 – 252 GHz would have to be studied to ensure protection and that no additional requirements are imposed on the following services and affected bands:

1. **Radionavigation services** in the band 238 – 240 GHz.
2. **Radionavigation satellites** services in the band 238 – 240 GHz.
3. **Radiolocation services** in the band 238 – 240 GHz and 241 – 248 GHz.
4. **Fixed services** in the band 238 – 241 GHz.
5. **Radio Astronomy** in the band 241 – 248 and 248 - 252 GHz.
6. **Fixed Satellite services** in the band 232 – 240 GHz.

Part G: Recommendations and Way Forward

WG3 invites EACO administrations to:

1. **Continue** active participation in ongoing studies with the intent of positively influencing the outcome of the studies.
2. **Follow-up** the studies under this agenda item to review the existing primary allocation to the EESS (passive) in the frequency range 231.5 – 252 GHz in order to analyse if these allocations are aligned with the observation requirements of passive microwave sensors.
3. **Ensure** the any adjustment to EESS (passive) satisfies the protection criteria of RAS services in the bands 241 – 248 GHz and 248 – 252 GHz, as described in the Recommendation ITU-R RA. 769.

Part H: Other Regional Groups and international organizations preliminary positions or positions

RCC, CEPT, CITEL, ASMG, APT, ATU: as of the IR Workshop on WRC-23 Preparation, 15-December 2021

All support to cover relevant requirements of passive microwave sensor measurements within the frequency range 231.5-252 GHz with frequency allocations to EESS (passive) without unduly constraining the other primary services currently allocated in this frequency range.