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| **US Radiocommunication Sector**  **FACT SHEET** | | | |
| **Study Group:** USWP 7C | | | **Document No:** US 7C/27-023NC |
| **Reference:** Resolution 674 (WRC-23) | | | **Date: 12** August 2024 |
| **Document Title:** NON-CONSENSUS**-** Proposal of elements for a working document towards supporting WRC-27 AI 1.19 | | | |
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| **Purpose:** Proposal of elements for a working document and support WRC-27 AI 1.19 regarding the study of frequency bands 4 200 – 4 400 MHz and 8 400 – 8500 MHz for Sea Surface Temperature (SST) measurements. | | | |
| **Abstract:** Resolution 674 (WRC-23) notes that complementary bands need to be determined to ensure the continuity of SST measurements by EESS (passive). WRC-27 AI 1.19 considers sharing and compatibility studies to determine the possibility of a new primary allocation in all regions to the EESS (passive) in the 4 200 – 4 400 MHz and 8 400 – 8500 MHz frequency bands, without protection from existing services in these frequency bands and in adjacent bands. This contribution begins the process of developing elements for a working document towards supporting WRC-27 AI 1.19.  Non-Consensus Status: Objections were raised to the mention of active services deploying in 7/8 GHz (IMT in particular) as a reason for the need of other spectrum in for conducting SST measurements. | | | |
| **Fact Sheet Preparer:** Botan Karim, NOAA | | | |

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| **Radiocommunication Study Groups** |  |
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| Source:  Subject: WRC-27 agenda item 1.19 Resolution 674 **(WRC-23)** | **xx** |
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| **Studies on possible allocations to the Earth exploration-satellite service (passive) in the bands 4200-4400 MHz and 8400-8500 MHz**  **Introduction**  Working Party 7C was identified by CPM27-1 as the responsible group for WRC-27 Agenda Item 1.19. The work under this Agenda Item includes sharing and compatibility studies to determine the possibility of a future allocation to the EESS (passive) in the frequency bands 4 200-4 400 MHz and 8 400-8 500 MHz  **Attachment:** 1  **Attachment 1**  PROPOSED NEW WORKING DOCUMENT ON  WRC-27 AGENDA ITEM 1.19 | |
| **Studies on possible allocations to the Earth exploration-satellite service (passive) in the bands 4200-4400 MHz and 8400-8500 MHz** | |

# Introduction

In *resolves* 1.19of Resolution **813 (WRC-23)**, the 2023 World Radiocommunication Conference (WRC-23) resolved “to consider possible primary allocations in all Regions to the Earth exploration-satellite service (passive) in the frequency bands 4 200 - 4 400 MHz and 8 400 - 8 500 MHz, in accordance with Resolution **674 (WRC-23)”** as part of the agenda for WRC-27.

More specifically, Resolution **674 (WRC-23)** resolves to invite the ITU Radiocommunication Sector to complete in time for the 2027 world radiocommunication conference **“**sharing and compatibility studies to determine the possibility of a future allocation to the EESS (passive) in the frequency bands 4 200 - 4 400 MHz and 8 400 - 8 500 MHz” and invites the 2027 WRC “to examine the results of these studies with a view to considering a new primary allocation in all Regions to the EESS (passive) in the frequency bands 4 200 - 4 400 MHz and 8 400 - 8 500 MHz, without protection from existing services in these frequency bands and in adjacent bands.”

# Radio Regulations Article 5 overview

TABLE 1

**Radio Regulations Article 5, 3 600 – 4 5** **00 MHz**

| **Allocation to services** | | |
| --- | --- | --- |
| **Region 1** | **Region 2** | **Region 3** |
| **3 600 – 4 200**  FIXED  FIXED-SATELLITE  (space-to-Earth)  Mobile | **3 600 – 3 700**  FIXED  FIXED-SATELLITE  (space-to-Earth)  MOBILE except aeronautical  mobile 5.434  Radiolocation 5.433 | **3 600 – 3 700**  FIXED  FIXED-SATELLITE  (space-to-Earth)  MOBILE except aeronautical mobile  Radiolocation  5.435 |
| **3 700 – 4 200**  FIXED  FIXED-SATELLITE (space-to-Earth)  MOBILE except aeronautical mobile | |
| **4 200 – 4 400** | AERONAUTICAL MOBILE (R) 5.436  AERONAUTICAL RADIONAVIGATION 5.438  5.437 5.439 5.440 | |
| **4 400 – 4 500** | FIXED  MOBILE 5.440A | |

TABLE 2

**Radio Regulations Article 5, 8 215**  **– 8 5** **50 MHz**

|  |  |  |
| --- | --- | --- |
| **Allocation to services** | | |
| **Region 1** | **Region 2** | **Region 3** |
| **8 215 – 8 400** | EARTH EXPLORATION-SATELLITE (space-to-Earth)  FIXED  FIXED-SATELLITE (Earth-to-space)  MOBILE 5.463  5.462A | |
| **8 400 – 8 500** | FIXED  MOBILE except aeronautical mobile  SPACE RESEARCH (space-to-Earth) 5.465 5.466 | |
| **8 500 - 8550** | RADIOLOCATION  5.468 5.469 | |

# EESS (passive) spectrum needs for Sea Surface Temperature (SST) measurements

Resolution **674 (WRC-23)** notes that, due to the sensitivity of the brightness temperature of the sea surface regarding frequency, it is appropriate to perform sea surface temperature (SST) measurements within the range of 4 – 9 GHz. Recommendation ITU-R RS.515 also states that “Sea surface temperature is best sensed using frequencies in the 3 to 10 GHz range, with 5 GHz being near optimum.” Under Radio Regulations (RR) No. 5.458, passive microwave sensor measurements are carried out over the oceans in the 6 425 – 7075 MHz frequency band, and passive sensor measurements are carried out in the 7 075 – 7 250 MHz band. Additionally, RR No. 5.458 states that administrations should consider the needs of the Earth exploration-satellite (passive) services in their future planning of the bands 6 425 – 7 075 and 7 075 – 7 250 MHz.

Measurements of SST are currently mainly performed in the 6 425 – 7 250 MHz range, and due to the WRC-23 decision to identify the 6 425 – 7 125 MHz range for International Mobile Telecommunications (IMT) in some countries, it is possible that SST measurements currently performed in this range may be impacted by future high-density deployments of communication systems. SST measurements provide essential data for understanding and predicting weather patterns and climate. For example, it plays a key role in atmospheric models and forecasts, and assists meteorologists predict phenomena such as hurricanes and typhoons. Changes in SST can influence atmospheric conditions and the formation of weather events, making the accurate retrieval of SST measurements crucial for reliable weather forecasting. Additional information describing the importance of SST may be found in Recommendation ITU-R RS.1859 and Report ITU-R RS.2178.

Additional spectrum to complement current SST measurements is driven because the 6 425 – 7 250 MHz band is not allocated to EESS (passive). Potential bands for consideration include the bands under study for WRC-27 agenda item (AI) 1.19 to complement the existing SST measurements in the 6 425 – 7 250 MHz band and to ensure the continuity of SST measurements by EESS (passive) through a primary allocation. These bands are 4 200 – 4 400 MHz and 8 400 – 8 500 MHz. It is worth noting that No. **5.437** states that “Passive sensing in the Earth exploration-satellite and space research services may be authorized in the frequency band 4 200 – 4 400 on a secondary basis.”

Although slightly less efficient than current SST measurements between 6 425 – 7 250 MHz, the frequency bands 4 200 – 4 400 MHz and 8 400 – 8 500 MHz are sensitive to SST, as communicated in Report ITU-R RS.2178. Section A.2.2.1 of the Report shows the sensitivity of brightness temperature to variations in the SST for a wide range of frequencies (e.g., <20 GHz). It can be noted that the most common ocean conditions lead to frequencies of peak sensitivity in the 6-7 GHz range and slightly less sensitive around 4 GHz and 8 GHz. Therefore, the 4 200 – 4 400 MHz and 8 400 – 8 500 MHz bands could complement existing SST measurements between 6 425 – 7 250 MHz. Given the unique physical traits of certain frequency bands used for SST measurement, comprehensive studies on complementary frequency bands are warranted to ensure any considered frequency bands is free of RFI to an acceptable degree, while noting protection cannot be claimed from existing services.

# Propagation models and technical and operational characteristics

This section provides the technical and operational characteristics and propagation models provided by the contributing groups to WRC-27 agenda item 1.19 for use in sharing and compatibility studies.

[US Note: the table below needs to be reviewed and updated based on inputs from contributing groups]

|  |  |  |
| --- | --- | --- |
| WP 7B/ | **Source** | **Services** |
| [65](https://www.itu.int/dms_ties/itu-r/md/23/wp7c/c/R23-WP7C-C-0065!!MSW-E.docx) | WP 5B | Aeronautical mobile (Route) service (AM(R)S)  Aeronautical radionavigation services (ARNS)  Aeronautical mobile service (AMS)  Radiolocation service |
| [71](https://www.itu.int/dms_ties/itu-r/md/23/wp7c/c/R23-WP7C-C-0071!!MSW-E.docx) | WP 5C | Fixed service (FS) |
| [80](https://www.itu.int/dms_ties/itu-r/md/23/wp7c/c/R23-WP7C-C-0080!!MSW-E.docx) | WPs 3J & 3M | Propagation models |
| TBD | TBD | TBD |

# Sharing and compatibility studies between EESS (passive) and incumbent services in the 4 200 – 4 400 MHz band

## ITU-R Recommendations and Reports

– Recommendation ITU-R RS.2017, *Performance and interference criteria for satellite passive remote sensing*

– Recommendation ITU-R RS.1861, *Typical technical and operational characteristics of Earth exploration-satellite service (passive) systems using allocations between 1.4 and 275 GHz*

– Recommendation ITU-R RS.1813, *Reference antenna pattern for passive sensors operating in the Earth exploration-satellite service (passive) to be used in compatibility analyses in the frequency range 1.4-450 GHz*

– Recommendation ITU-R RS.1883, *Use of remote sensing systems in the study of climate change and the effects thereof*

– Report ITU-R RS.2178, *The essential role and global importance of radio spectrum use for Earth observations and for related applications*

– Recommendation ITU-R RS.1859, *Use of remote sensing systems for data collections to be used in the event of natural disasters and similar emergencies*

– [working document towards a preliminary] Report ITU-R RS.[EESS(passive)6-7 GHz], *EESS (passive) in the 6 425-7 250 MHz range*

### Characteristics of EESS (passive) in the 4 200 – 4 400 MHz band

## Sharing study between EESS (passive) and Aeronautical Mobile (R) service systems in the 4 200 – 4 400 MHz band

### Aeronautical Mobile (R) service system characteristics

### Methodology and results

### Summary and conclusion

## Sharing study between EESS (passive) and Aeronautical Radionavigation service systems in the 4 200 – 4 400 MHz band

### Aeronautical Radionavigation service system characteristics

### Methodology and results

### Summary and conclusion

# C ompatibility studies between EESS (passive) in the 4 200 – 4 400 MHz band and services adjacent to this band

## EESS (passive) in the 4 200 – 4 400 MHz band and Fixed-satellite (Earth-to-space) service systems in the adjacent band 3 600 – 4 200 MHz

Under this section the feasibility of coexistence between EESS passive in 4200-4400 MHz and FSS in 3600-4200 MHz is assessed.

[TBD]

### Fixed-satellite service system characteristics

### Methodology and results

### Summary and conclusion

## EESS (passive) in the 4 200 – 4 400 MHz band and Mobile (except aeronautical mobile) service systems in the adjacent band 3 700 – 4 200 MHz

### Mobile (except aeronautical mobile) service system characteristics

### Methodology and results

### Summary and conclusion

## EESS (passive) in the 4 200 – 4 400 MHz band and Fixed service systems in the adjacent band 4 400 – 4 500 MHz

### Fixed service system characteristics

### Methodology and results

### Summary and conclusion

## EESS (passive) in the 4 200 – 4 400 MHz band and Mobile service systems[[1]](#footnote-1) in the adjacent band 4 400 – 4 500 MHz

### Mobile service system characteristics

### Methodology and results

### Summary and conclusion

# Sharing and compatibility studies between EESS (passive) and incumbent services in the 8 400 – 8 500 MHz band

## ITU-R Recommendations and Reports

The ITU-R Recommendations and Reports listed in Section 4.1 apply to conducting sharing and compatibility studies between EESS (passive) and incumbent services in the 8 400 – 8 500 MHz band.

### Characteristics of EESS (passive) in the band 8 400 – 8 500 MHz

## Sharing study between EESS (passive) and Mobile service (except aeronautical mobile) systems in the 8 400 – 8 500 MHz band

### Mobile service system characteristics

### Methodology and results

### Summary and conclusion

## Sharing study between EESS (passive) and Fixed service systems in the 8 400 – 8 500 MHz band

### Fixed service system characteristics

### Methodology and results

### Summary and conclusion

## Sharing study between EESS (passive) and Space Research (deep space) (space-to-Earth) service systems in the 8 400 – 8 500 MHz band

### Space Research (deep space) service system characteristics

### Methodology and results

### Summary and conclusion

# Compatibility studies between EESS (passive) in the 8 400 – 8 500 MHz band and services adjacent to this band

## EESS (passive) in the 8 400 – 8 500 MHz band and Earth exploration- satellite (space-to-Earth) service systems in the adjacent band 8 215 – 8 400 MHz

### Earth exploration- satellite service system characteristics

### Methodology and results

### Summary and conclusion

## EESS (passive) in the 8 400 – 8 500 MHz band and Fixed-satellite (Earth-to-space) service systems in the adjacent band 8 215 – 8400 MHz

### Fixed-satellite service system characteristics

### Methodology and results

### Summary and conclusion

## EESS (passive) in the 8 400 – 8 500 MHz band and Mobile service systems[[2]](#footnote-2) in the adjacent band 8 215 – 8400 MHz

### Mobile service system characteristics

### Methodology and results

### Summary and conclusion

## EESS (passive) in the 8 400 – 8 500 MHz band and Fixed service systems in the adjacent band 8 215 – 8400 MHz

### Fixed service system characteristics

### Methodology and results

### Summary and conclusion

## EESS (passive) in the 8 400 – 8 500 MHz band and Radiolocation service systems in the adjacent band 8 500 – 8550 MHz

### Radiolocation service system characteristics

### Methodology and results

### Summary and conclusion

# Summary of the sharing and compatibility studies between EESS (passive) and services within and adjacent to the 4 200 – 4 400 MHz and 8 400 – 8 500 MHz bands.

1. Taking into account WRC-27 agenda item 1.7. [↑](#footnote-ref-1)
2. Taking into account WRC-27 agenda item 1.7. [↑](#footnote-ref-2)