2022

Report on Frequency Management related topics

Presented to CGMS-52 [Working Group I] session, agenda item [2.1]

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Executive summary of the WP CGMS-52-CGMS-WP-01 (1/2)

- 42nd annual meeting of the Space Frequency Coordination Group (SFCG), 30 May – 7 June 2023:
  - SFCG dealt with efficient utilization of the bands 2200–2290 MHz and 2025-2110 MHz, starting by updating the corresponding Resolution 24-1R1 regarding the downlink band 2200-2290 MHz with the newly established ITU-R Recommendation SA.2155-0 (see Attachment 1), followed by an action for the forthcoming SFCG-43 for updating SFCG Resolution 27-1 for the companion uplink frequency band 2025-2110 MHz to align Recommendation ITU-R SA.2156 (see Attachment 2);
  - SFCG continued updating the remote sensing information (SFCG 40-1R2) and proposed updates to OSCAR/Space database. In this context, SFCG will further discuss the pros and cons of other frequency information in OSCAR/Space, e.g. for telemetry and telecommand of the satellites, or data downlinks;
- Outcome of World Radiocommunication Conference 2023 (WRC-23), 20 November – 15 December 2023:
  - All WRC-23 agenda items of relevance for CGMS were positively concluded with the views expressed in the corresponding HLPP, also in-line with the WMO positions as presented to WRC-23 in document 66, summary see slide 6.

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Executive summary of the WP CGMS-52-CGMS-WP-01 (2/2)

- Outlook to WRC-27 on agenda items of potential interest/concern to CGMS:
  - Establishment of protection for passive microwave sensors in the bands 50.2-50.4 GHz, 52.6-54.25 GHz and in bands above 86 GHz from unwanted emissions from active services in neighbouring frequency bands (WRC-27 agenda items 1.1, 1.3, 1.8 and 1.18);
  - Possible new primary frequency allocations to the EESS (passive) in the 4200-4400 MHz and 8400-8500 MHz bands for Sea Surface Temperature (SST) measurements to complement the SST measurements in the 6/7 GHz range (WRC-27 agenda item 1.19);
  - Possible identification of the frequency range 7125-8400 MHz, or parts thereof, for future IMT use with potential overlap with data downlinks and/or broadcasts of MetSat and Earth observation (EO) satellite systems;
  - Regulatory provisions and protection of receive-only space weather sensors in some particular frequency bands (WRC-27 agenda item 1.17);
  - First version of the WMO position for WRC-27 agenda items was developed at the 5th meeting of WMO Expert Team on Radio Frequency Coordination (ET-RFC), 20 – 22 February 2024, is provided in Attachment 1.

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Introduction

This report provides an overview on the outcome of the following meeting/conferences on issues of interest to CGMS:

- 42nd annual meeting of the Space Frequency Coordination Group (SFCG), 30 May – 7 June 2023;
- World Radiocommunication Conference 2023 (WRC-23), 20 November – 15 December 2023;
- 5th meeting of WMO Expert Team on Radio Frequency Coordination (ET-RFC), 20 – 22 February 2024.

Issues of relevance for CGMS from SFCG-42:

- Efficient utilization of the bands 2200–2290 MHz and 2025-2110 MHz;
- Update of SFCG Remote Sensing information in OSCAR;
- RFI reporting section on SFCG website.

WRC-23/27:

- Outcome on items of relevance to CGMS;
- Outlook to WRC-27 on agenda items of potential interest/concern to CGMS;
- First version of the WMO position for WRC-27 agenda items is provided in Attachment 1.

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Relevant issues from SFCG-42, 30 May – 7 June:

- SFCG aligned its Resolution 24-1R1 (Interference mitigation techniques for future systems planning to operate in the 2200-2290 MHz band) with the newly established ITU-R Recommendation SA.2155-0 (see Attachment 1) on the **optimisation of the use of the band 2200-2290 MHz:**
  - **Only transmitting when in visibility of its Earth stations;**
  - **Reducing the operational bandwidth to no more than 6.2MHz when not using spread spectrum techniques;**
  - **Consideration of implementation of interference mitigation techniques (see list in resolves 3 to Res 24-1R1);**
  - **Use of higher bands for higher bandwidth demand, e.g. 26 GHz.**

- SFCG action item 42/9 on updating SFCG Resolution 27-1 for the companion uplink frequency band 2025-2110 MHz to align Recommendation ITU-R SA.2156 (see Attachment 2) which has the purpose to **limit interference within the frequency band 2025-2110 MHz** through band limitation, in particular **reducing the operational bandwidth**.

- **Update of SFCG Remote Sensing information in OSCAR:**
  SFCG revised its report on SFCG Remote Sensing Information (SFCG 40-1R2) and responded to WMO on three aspects:
  - **Updates to the OSCAR/Space database;**
  - **Inconsistent information at different levels of the database;**
  - **Frequency information other than for active and passive microwave sensors (to be further discussed).**

- RFI reporting section on SFCG website (https://www.sfcgonline.org/RFI%20to%20EESS%20Sensors/default.aspx)

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Outcome WRC-23 - Summary

- New frequency allocations for the Earth Exploration Satellite Service (passive) in the frequency bands 239.2-242.2 and 244.2-247.2 GHz in order to provide protection for the operation of passive microwave sensors for Ice cloud imaging WRC-23 Agenda Items 1.14);
- Protection of passive microwave sensor measurements in the frequency bands 18.6-18.8 GHz and 36-37 GHz from potential RFI through the establishment of appropriate power flux-density respectively e.i.r.p density limits for new non-geostationary satellite services and applications around those frequency bands (WRC-23 agenda items 1.16, 1.17, 9.1 Topic D);
- Strengthening of the status of passive microwave sensing in frequency bands covered by the special provision of RR footnote 5.340 (all emissions are prohibited) by means of corrections to RR Resolution 731, relevant for all passive microwave sensors (WRC-23 Agenda Item 4);
- No new frequency spectrum and regulations in and around the MetSat downlink band 1695-1710 MHz which could negatively impact on MetSat data downlink and broadcast (WRC-23 Agenda Items 1.4 and 1.18);
- First level of recognition of Space Weather in the RR due to a definition of space weather and its service designation under MetAids (space weather) and a new Resolution outlining the importance of space weather applications (WRC-23 Agenda Items 9.1 Topic A).

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Outlook WRC-27

1.1: Fixed Satellite service (FSS) aeronautical and maritime ESIMs in the 47.2-50.2 GHz and 50.4-51.4 GHz bands
1.2: FSS smaller antennas in the 13.75-14 GHz band
1.3: FSS gateways in the 51.4-52.4 GHz band transmitting to non-GSO systems
1.4: FSS and BSS downlinks in the 17.3 to 17.8 GHz range
1.6: Equitable access for FSS in the 37.5 to 51.4 GHz range
1.7: International Mobile Telecommunications (IMT) in the 4.4-4.8 GHz, 7.125-8.4 GHz and 14.8-15.35 GHz bands
1.8: Radiolocation service in the 231.5-275 GHz and 275-700 GHz ranges
1.11: Space-to-space links in bands allocated to the MSS in the 1518 to 1675 MHz range and the 2483.5-2 500 MHz band
1.12: Mobile Satellite service (MSS) in the 1427-1432 MHz, 1645.5-1646.5 MHz, 1880-1920 MHz and 2010-2025 MHz bands for low data rate non-GSO systems
1.13: MSS in the 694 to 2700 MHz range for direct connectivity to IMT user equipment
1.14: MSS in the bands 2 010-2 025 MHz, 2120-2160 MHz and 2 160-2 170 MHz
1.17: Regulatory provisions and protection of receive-only space weather sensors
1.18: Protection of EESS (passive) sensors from active services in adjacent bands above 86 GHz
1.19: New primary allocations to the EESS (passive) in the 4.2-4.4 GHz and 8.4-8.5 GHz bands for SST measurements
7: Satellite regulatory procedures
10: Preliminary agenda for WRC-31

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WRC-27 Agenda Items 1.1 and 1.3 (New satellite agenda items with need to protect passive sensors)

- Agenda items 1.1 and 1.3 regarding new satellite applications in existing allocations to the fixed-satellite service (FSS) requiring the establishment/update of limits to protect passive sensors in the bands 50.2-50.4 GHz and above 52.6 GHz, relevant for many operational and planned passive microwave sensors on non-geostationary MetSat.

- **Similarly to what was studied already in the past which led to the establishment of unwanted emission limits in Resolution 750 in the Radio Regulations to protect the bands 50.2-50.4 GHz and 52.6-54.25 GHz, studies will now have to be performed for these new satellite applications. Taking into account aggregation effects on potential RFI with already existing satellite applications, those existing limits will now have to be reviewed and potentially revised.**

Preliminary WMO Position on WRC-27 agenda item 1.1

The WMO does not oppose the operation of ESIMs in the bands 47.2-50.2 GHz and 50.4-51.4 GHz (Earth-to-space) provided that the protection of the EESS (passive) in the adjacent frequency band 50.2-50.4 GHz continues to be ensured through mandatory unwanted emission limits in Resolution 750 (Rev.WRC-19).

Preliminary WMO Position on WRC-27 agenda item 1.3

WMO is not opposed to the use of the frequency band 51.4-52.4 GHz to enable use by gateway earth stations transmitting to non-GSO systems in the FSS (Earth-to-space) provided that the protection of the EESS (passive) in the frequency band 52.6 –54.25 GHz is still adequately ensured through the inclusion of relevant mandatory unwanted emission limits and/or necessary adjustments to the existing limits in Resolution 750 (Rev.WRC-19). These mandatory limits must account for aggregate interference from GSO and non-GSO FSS systems into the EESS (passive).

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WRC-27 Agenda Item 1.7 (IMT in the 4.4-4.8 GHz, 7.125-8.4 GHz and 14.8-15.35 GHz bands) (1/2)

- Despite the fact that there are already a number of bands identified for IMT, including the newly identified bands, 6425-7125 MHz in Region 1 and 7025-7125 MHz in Region 3, there was still a large majority of countries at WRC-23 insisting to study even more bands for International Mobile Telecommunication (IMT). As a result of that WRC-27 agenda item 1.7 was established.

- Under this new agenda item for IMT, sharing and compatibility studies will have to be performed, with a view to ensuring the protection of services to which the frequency band is allocated on a primary basis, without imposing additional regulatory or technical constraints on those services, and also on services in adjacent bands.

- **Among the bands to be studied is also the range 7125-8400 MHz with the bands:**
  - **7450-7550 MHz for the data downlink from geostationary MetSats;**
  - **7750-7900 MHz for the data downlink from non-geostationary MetSats;**
  - **8025-8400 MHz for the downlink from Earth Observation (EO) satellites.**

- **Most of today's MetSat and EO missions are using one of the above bands in the 7/8 GHz range for the downlink and/or broadcast of the measured data. Thus, studies for a possible identification for IMT concern nearly all these missions.**

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WRC-27 Agenda Item 1.7 (IMT in the 4.4-4.8 GHz, 7.125-8.4 GHz and 14.8-15.35 GHz bands) (2/2)

Preliminary WMO Position on WRC-27 agenda item 1.7

WMO opposes any IMT identification:

– in the 7 125-7 250 MHz frequency band since SST measurements, performed in the overlapping 7 075-7 250 MHz frequency range, are of prime importance for weather forecasting, the Early Warnings for All initiative, and climate monitoring. The 7 075-7 250 MHz frequency range used for SST measurements will always be needed to ensure continuity with past and current SST measurements. Combining this frequency range with nearby channels considered under agenda item 1.19 is required to improve science retrievals and to mitigate RFI to the greatest extent.

– in the 7 450-7 550 MHz and 7 750-7 900 MHz frequency bands to ensure the protection of MetSat (space-to-Earth) allocations used for the transmission of collected data from GSO and non-GSO MetSat systems.

– in the 8 025-8 400 MHz frequency band to ensure the protection of EESS (space-to-Earth) allocations used for the transmission of data collected from Earth exploration satellites.

Introduction of widely deployed IMT networks will also limit future deployment of MetSat and EESS earth stations that are essential for the distribution of meteorological, related environmental (including space weather) and Earth observation data to the WMO user community.

– WMO requests that the impact of IMT operations in the frequency ranges 4 400-4 800 MHz and 8 215-8 400 MHz on the potential new EESS (passive) allocations under agenda item 1.19 be taken into consideration.

WRC-27 Agenda Items 1.8 (Radiolocation service in the 231.5-275 GHz and 275-700 GHz ranges)

- For these new applications in the Radiolocation service (RLS) two components are considered, a receive-only use, which is similar to passive sensors, detecting the extremely weak power that is naturally radiated by objects, and an active use. For this active component compatibility with passive sensors has to be ensured.

- **Therefore, sharing and compatibility studies (in-band and adjacent bands) will have to be performed for active millimetric and sub-millimetric wave RLS systems in bands above 231.5 GHz with passive sensors. This is relevant for many planned passive microwave sensors, such as Ice Cloud Imagers on non-geostationary MetSat.**

Preliminary WMO Position on WRC-27 agenda item 1.8

WMO opposes any new allocations to the radiolocation service in the frequency band 250-252 GHz where footnote RR No. 5.340 applies.

WMO is not opposed to new allocations to the radiolocation service on a primary basis in the frequency range 231.5 -275 GHz, except for 250-252 GHz as noted above, or to new identifications in the frequency range 275-700 GHz provided that the protection of the existing allocations/identifications to the EESS (passive) and the EESS (active) is ensured, from both in-band and/or out-of-band emissions of these possible new radiolocation service applications.

WMO is also of the view that consideration should be given to the protection of ground-based passive atmospheric sensing in the bands 235-238 GHz, 250-252 GHz and 265-275 GHz.

WRC-27 Agenda Items 1.18 (Protection of EESS (passive) sensors from active services in adjacent bands above 86 GHz)

- The work under this WRC-27 Agenda item 1.18 is split into two topics, protection of particular bands for EESS (passive) and particular bands for Radioastronomy. The interest of CGMS is related to the protection of EESS (passive) from unwanted emissions of active services operating in frequency bands adjacent to the EESS (passive) allocations as outlined in the table below, where No. 5.340 applies, with a update to Resolution 750 (Rev. WRC-19), should any regulatory measures be required to ensure the protections of the EESS (passive).
- **Establishment of unwanted emission limits in Resolution 750 in the Radio Regulations for the passive bands 86-92 GHz, 114.25-116 GHz, 164-167 GHz, 200-209 GHz, all covered by 5.340 (all emissions are prohibited), proactively before the active services are deployed, would be beneficial for many operational and planned passive microwave sensors on non-geostationary MetSat satellite systems.**
- Here it is to be highlighted that the modified Resolution 731 (Rev. WRC-23), see section 3.2, calls for compatibility studies between the EESS (passive) in the bands 100-102 GHz, 148.5-151.5 GHz, 182-185 GHz, 190-191.8 GHz and 226 -231.5 GHz and active services in adjacent bands, which are not in scope of this agenda item.

Preliminary WMO Position on WRC-27 agenda item 1.18

WMO fully supports the elaboration of mandatory regulatory provisions applicable to active services in order to ensure the protection and long-term usability of the EESS (passive) frequency bands 86-92 GHz, 114.25-116 GHz, 164-167 GHz and 200-209 GHz. WMO supports the update of Resolution 750 (Rev.WRC-19) accordingly.

WMO stresses the need to address this issue by WRC-27 before there is widespread deployment of active services in the bands to be studied.

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WRC-27 Agenda Items 1.19 (Possible new primary allocations to the EESS (passive) in the 4.2-4.4 GHz and 8.4-8.5 GHz bands for SST)

- As a consequential action to the outcome of WRC-23 Agenda item 1.2 for IMT identification in the 6/7 GHz range and its possible impact on SST measurements WRC-23 established agenda item agenda item 1.19 on possible new frequency allocations to the EESS (passive) in the bands 4200-4400 MHz and 8400-8500 MHz.

- **The aim of the studies under WRC-27 agenda item 1.19 is to determine the conditions of usage of the frequency bands 4 200-4 400 MHz and 8 400-8 500 MHz by the EESS (passive) which would then be used in conjunction with the 6/7 GHz frequency range. In this context also the merits of a multichannel instrument for future SST measurements has to be assessed, as already outlined in section 3.6 above.**

Preliminary WMO Position on WRC-27 agenda item 1.19

WMO supports new primary EESS (passive) allocations in the frequency bands 4 200-4 400 MHz and 8 400-8 500 MHz in order to ensure the long-term continuity of SST measurements, in conjunction with the existing 6/7 GHz frequency range.

WRC-23 from WMO perspective

- WMO was well represented through participation of WMO staff and several members of the ET-RFC.

- WMO provided the following input contributions to WRC-23:
  - WMO position on the World Radiocommunication Conference 2023 (WRC-23) Agenda (Document WRC-23 No 66);
  - Sea Surface Temperature Measurements - Agenda item 1.2 (Document WRC-23 No 67);
  - Space Weather Issue - Agenda item 10 (Document WRC-23 No 68).

Conclusion on WRC-23: All WRC-23 agenda items of relevance for WMO were concluded in-line with the WMO positions as presented in WRC-23 document 66.

WMO Expert Team on Radio Frequency Coordination (ET-RFC)

- The fifth meeting of the Expert Team on Radio Frequency Coordination (ET-RFC) was held at the Caribbean Telecommunications Union (CTU) Headquarters in Port of Spain, from 20 to 22 February 2024.

- One essential task and outcome of this meeting was the development of the first version of the WMO positions for WRC-27, see Attachment 3.

- During the process of development of this first version of the WMO positions to WRC-27 the following action item was identified, which was also send to CGMS members for feedback:
  - *RFC2024.17: WMO SEC: to submit the first version of WMO Position on the WRC-27 agenda to WMO Members (incl. through the network of NFPs), adding in the cover letter the call for input to verify any current and planned use of: (1) the EESS (active) allocation in the frequency band 17.2-17.3 GHz and (2) the EESS (passive) allocation in the frequency band 15.35–15.4 GHz to ensure that additional technical and operational characteristics, if any, are submitted to the ITU-R WP 7C. Also, to ask if radiosondes in 1.7 GHz are still in use.*

- Responses so far:
  - No planned use of these bands from JAXA, CMA, NSOAS, ISRO, ROSHYDROMET and EUMETSAT;
  - Canada reported their plans to utilize the 17.2-17.3 EESS (active) allocation, along with the 13.25-13.75 GHz EESS (active) allocation, for the Terrestrial Snow Mass Mission (TSMM), a dual-frequency synthetic aperture radar.

To be considered by CGMS:

CGMS is invited to note this report and to provide feedback and information on its activities via the CGMS/SFCG Liaison Officer to SFCG-43 (June 2024) on any frequency related matter as appropriate.