AGENDA ITEMS OF THE WORLD RADIOCOMMUNICATION CONFERENCE 2023 RELEVANT TO REMOTE SENSING

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ABSTRACT

The important task of deciding and revising frequency allocations at international level falls under the responsibility of the World Radiocommunication Conference (WRC) which is organized by a specialized agency of the United Nations, the Radiocommunications Sector of the International Telecommunications Union (ITU-R). A WRC is held every approximately four years for the purpose of updating the international Radio Regulations (RR). The most recent of these conferences, WRC-19, held at the end of 2019, also defined the Agenda Items for the next WRC that is scheduled to occur in 2023. Here, we review and discuss the WRC-23 Agenda Items that are likely to have the most impact on future remote sensing operations.

Index Terms— *Spectrum Management, International Telecommunications Union, World Radiocommunication Conference*

1. INTRODUCTION

The World Radiocommunication Conference 2019 (WRC-19) took place in Sharm el-Sheikh, Egypt, from October 28 to November 22, 2019, and was immediately followed by the first Conference Preparatory Meeting (CPM) for WRC-23 (CPM23-1) which was held on November 25-26, 2019. Based on the Agenda Items identified by WRC-19 for WRC-23 and WRC-27, this first session of the CPM prepared a draft structure for the draft CPM Report and assigned the responsibilities to the ITU-R Study Groups for studying the Agenda Item topics and, where modifications to the RR were to be considered, develop methods to satisfy those Agenda Items [1]. Each Agenda Item (AI) has been assigned to a Responsible Group and one or more Contributing Groups have been identified.

Working Party 7C (Remote Sensing Systems) will be responsible for studies related to four Agenda Items and will contribute to five other Agenda Items [2]. The Agenda Items of concern to Working Party 7C (WP 7C) are shown in Figure 1 along with their Responsible Groups. Agenda Items for which WP 7C is responsible or contributing are discussed in Sections 2 and 3 respectively. Other WRC-23 Agenda Items of interest for remote sensing are considered in Section 4.

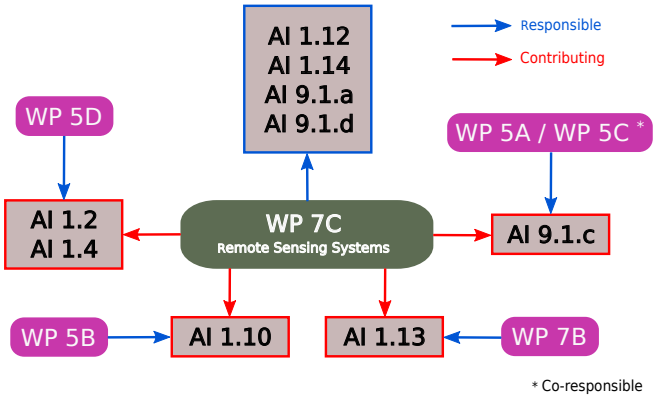

Figure 1: WRC-23 Agenda Items for which ITU-R WP 7C is responsible or contributing (WP 5A: Land mobile service excluding IMT, Amateur and Amateur-satellite service; WP 5B: Maritime mobile service including the Global Maritime Distress and Safety System (GMDSS), Aeronautical mobile service, Radiodetermination service; WP 5C: Fixed wireless systems; HF systems in the fixed and land mobile services; WP 5D: IMT Systems; WP 7B: Space radiocommunication applications).

2. AGENDA ITEMS UNDER THE RESPONSIBILITY OF WP 7C

Some of the Agenda Items for WRC-23 focus on issues entirely relevant to remote sensing and they have been therefore attributed to the ITU-R WP 7C [2].

AI 1.12: Possible new secondary frequency allocation to EESS (active) at 45 MHz

The creation of a new Radio Regulation allocation to the Earth Exploration-Satellite Service (EESS) (active) in the

vicinity of 45 MHz has been an interest of the scientific community for years. Climate researchers have proposed using these remote measurements of the Earth surface to provide radar maps of subsurface scattering layers with the intent of locating presence of water or ice and of examining sub-ice glacial bodies using spaceborne systems. The sensors that would operate at this frequency and their applications are described in an ITU-R Recommendation [3].

AI 1.14: Possible adjustments of frequency allocations to EESS (passive) in the range 231.5-252 GHz

Realignment of EESS (passive) spectrum allocations at these frequencies may be warranted to reflect the development of new EESS (passive) instruments such as the Ice Cloud Imager (ICI) of the second generation EUMETSAT Polar System. The ICI aims at providing measurements of the ice cloud mass and is expected to improve numerical weather prediction models [4].

AI 9.1.a: Review of the needs of space weather sensors

Even though space weather monitoring has become operational in recent years, regulation providing protection to operation of these sensors still does not exist. This Agenda Item considers several aspects pertaining to the regulatory protection of active space weather sensors. However, it should be noted that under this agenda item no regulatory revisions are to be considered at WRC-23.

AI 9.1.d: Protection of EESS band at 36-37 GHz

Studies submitted to the ITU-R in regards to the WRC-19 AI 1.6 have suggested the potential need for limits for non-GSO FSS station operation to protect EESS (passive) operations in the 36-37 GHz band, which is shared on a co-primary basis with the fixed and mobile services. These studies have also noted that the cold-sky calibration of these EESS (passive) instruments has not been taken into account in the studies to date. The ITU-R work performed under this WRC-23 AI will further study these issues in order to develop ITU-R Recommendations and Reports as necessary. The Director of the ITU-R is to submit a Report to WRC-23 summarizing the results of ITU-R studies that have been conducted under this WRC-23 Agenda Item 9 sub-topic.

3. AGENDA ITEMS TO WHICH WP 7C IS A CONTRIBUTING GROUP

Six other WRC-23 Agenda Items with potential impact to remote sensing operations are not under the responsibility of WP 7C, however WP 7C has been identified as a Contributing Group. Among them, AI 1.2 is related to frequency bands used by remote sensing, while AI 1.4 and AI 1.10 consider frequency bands that are adjacent to EESS (passive) allocations [2].

As a Contributing group, WP 7C may submit studies and comments to the specific Agenda Item Responsible Group and the Responsible Group is expected to keep WP 7C informed on the progress of the Agenda Item studies.

AI 1.2: Identification of the frequency bands 3300-3400 MHz, 3600-3800 MHz, 6425-7025 MHz, 7025-7125 MHz and 10.0-10.5 GHz for International Mobile Telecommunications (IMT)

This AI considers potential new allocations to the mobile service in several frequency ranges. Among the frequency ranges included in this AI are the 6425-7025 MHz frequency range where AMSR-2 operates (6.75-7 GHz) and 10-10.5 GHz band that is close to the 10.6-10.7 GHz spectrum allocation to EESS (passive) used by AMSR-2 and GMI. The 10-10.5 GHz frequency band considered under this AI also overlaps with the EESS (active) allocation at 10-10.4 GHz. This EESS (active) band is already shared (co-primary) with the mobile service, but an increase in the number of emitters in this band may have a growing detrimental impact on EESS operations.

AI 1.4: Use of high-altitude platform stations as IMT base stations (HIBS) in the mobile service in certain frequency bands below 2.7 GHz already identified for International Mobile Telecommunications (IMT)

The cellular phone industry is interested in deploying high altitude platforms to support IMT base station operation. HIBS operations have not been studied before in the ITU-R, therefore, it is not known under what conditions, if any, they will be compatible with other affected services or what their impact to current IMT systems will be. This Agenda Item has been established for the purpose of conducting studies and identifying possible modifications to the RR that may be necessary for HIBS operations to be implemented. The frequencies under considerations are 694-960 MHz, 1710-1885 MHz and 2500-2690 MHz. The main concern for remote sensing is for 2500-2690 MHz, to be used for uplink only, due to its proximity with the 2690-2700 MHz band where EESS (passive) has a secondary allocation. For this reason, WP 7C has been identified as a Contributing Group.

AI 1.10: Possible new allocations for the aeronautical mobile service for the use of non-safety aeronautical mobile applications

This Agenda Item considers new allocations to non-safety aeronautical mobile applications at frequencies adjacent spectral bands allocated to EESS (passive). For one of the two frequency bands considered, EESS (passive) has a primary allocation in the adjacent 15.35-15.4 GHz frequency band, which is designated as a RR No. **5.340** frequency band where no emissions are permitted [5].

AI 1.13: Possible upgrade of the allocation of the band 14.8-15.35 GHz to the space research service

This frequency band is being considered to be used for communication purposes by deep space missions under the space research service (SRS). SRS already has a secondary allocation in this band and this Agenda Item proposes that WRC-23 consider elevation of its secondary status to primary. SRS (passive) and EESS (passive) have secondary allocation in the 15.20-15.35 GHz frequency band by RR No. **5.339** [5]. Therefore, WP 7C has been identified as a Contributing Group.

AI 9.1.c: Study the use of IMT systems for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis

IMT systems have achieved a more global reach than fixed wireless broadband. This Agenda Item will study the use of IMT systems to expand fixed wireless broadband while using only frequency bands allocated to the fixed services on a primary service. The results of these studies will not lead to a modification of the RR at WRC-23, however, the studies may support a potential proposal by an administration for a WRC-27 Agenda Item on this topic. Due to the broad nature of these studies, Contributing Groups have been identified as all the ITU-R working parties which are responsible for services as well as WP 1B which is responsible for "*spectrum management fundamentals, including economic strategies, spectrum management methodology, national spectrum management organization, national and international regulatory framework ...*" etc.

4. OTHER AGENDA ITEMS OF RELEVANCE FOR REMOTE SENSING

Four other Agenda Items not included in Sections 2 and 3 consider frequency bands adjacent to EESS allocations [2]. Excessive out-of-band emissions from adjacent band operations can adversely impact EESS active and passive operations. For this reason, it is necessary to also closely follow activities on these Agenda Items:

- **AI 1.15** will seek to harmonize the use of the 12.75-13.25 GHz frequency band, which is adjacent to the EESS (active) band at 13.25-13.75 GHz;
- **AI 1.16** will examine sharing and compatibility criteria for non-GSO FSS, supporting Earth Stations in Motion (ESIM), and other services in a number of frequency bands, including 17.7-18.6 GHz and 18.8-19.3 GHz for FSS downlink operations; EESS (passive) has a primary allocation in the adjacent band 18.6-18.8 GHz and may be susceptible to RFI resulting from surface reflections of out-of-band FSS downlink emissions, which is of a particular concern for passive remote sensing operations over ocean surfaces.
- **AI 1.17** will determine technical and operational issues, and regulatory provisions for satellite-to-satellite links, by potentially adding an inter-satellite service allocation at 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz, which could affect the adjacent 18.6-18.8 GHz EESS (passive) band;
- **AI 1.19** will consider possible new allocations for the fixed-satellite service in the 17.3-17.7 GHz frequency band, which is adjacent to the EESS (active) allocation at 17.2-17.3 GHz.

5. REFERENCES

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