

**1<sup>st</sup> ITU INTER-REGIONAL WORKSHOP  
ON WRC-23 PREPARATION**  
13 – 15 December 2021 (online event)



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Subject: WRC-23 agenda items 1.12, 1.13, 1.14  
and topics 9.1a) and 9.1d)

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**29 November 2021**  
**English only**

**CPM-23 Rapporteur, Chapter 3 – Science Issues**  
**REPORT ON THE CPM-23 CHAPTER 3 ISSUES**  
**(AND CHAPTER 5 SCIENCE TOPICS)**

## **CPM-23 RAPPORTEUR, CHAPTER 3 – SCIENCE ISSUES**

### **REPORT ON THE CPM-23 CHAPTER 3 ISSUES (AND CHAPTER 5 SCIENCE TOPICS)**

This Report, provided by the Chapter 3 Science issues Rapporteur, Tarcísio Aurélio Bakaus (B), brings updated information about the WRC-23 science agenda items 1.12, 1.13 and 1.14.

In addition it provides information on the development of Chapter 5 topics 9.1a) and 9.1d), which also deals of science subjects.

The Report is divided in 4 attachments as follows:

1. Attachment I –CPM FIRST SESSION – STRUCTURE OF THE CPM TEXT CHAPTERS;
2. Attachment II – CHAPTER 3 SCIENCE ISSUES - ABSTRACT AND ONGOING STUDIES;
3. Attachment III – CHAPTER 5 SCIENCE TOPICS – ABSTRACT AND ONGOING STUDIES;
4. Attachment IV – MEETING RESULTS OF THE WG 7B AND 7C ON WRC-23 SCIENCE ISSUES AND TOPICS.

Information on the WRC-23 agenda items and topics are available on the site of [ITU-R preparatory studies for WRC-23](#).

It's very important to highlight that the deadline for the responsible groups to provide the draft CPM text to the relevant CPM Chapter Rapporteur is on 21 October 2022 ([CA/251 Add1](#)).

If there is a suggestion, error or need for correction in this report, please contact the Chapter 3 Science issues Rapporteur.

**Tarcísio Aurélio Bakaus (B)**  
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**Chapter 3 Science issues Rapporteur – CPM23**

## ATTACHMENT I

### CPM FIRST SESSION – STRUCTURE OF THE CPM TEXT CHAPTERS

The results of the first session of the Conference Preparatory Meeting for WRC 23 (CPM23 1), held in Sharm el-Sheikh from 25-26 November 2019, are informed at the [ITU-R Administrative Circular CA/251](#).

Beyond the WRC-23 Agenda ([Resolution 811 \(WRC-19\)](#)) and the WRC-27 preliminary Agenda ([Resolution 812 \(WRC-19\)](#)), the circular content the Report on the first session of the CPM-23 and the allocation of ITU-R preparatory works for these conferences, among other important information on the WRC-23 and 27 environment as follow.

The CA/251 annex 5 five deals with the duties of the Chapter Rapporteurs and CPM-23 working procedures. According to this annex, the duties of the rapporteurs are:

- a) To act for the Chairman of the CPM to ensure that the consistency of format and structure and the guidelines of amount of text are observed.
- b) To ensure integration of the most recent Working Party outputs into consolidated CPM text by consultation with or assistance from Working Party Chairmen to ensure that CPM work is complete and on time.

The CA/251 annex 6 five establishes the structure for the agenda item sections in the chapters as follow:

- a) CHAPTER 1 - Fixed, Mobile and Broadcasting issues
  - Agenda items 1.1, 1.2, and 1.4  
Co-Rapporteur Dr. Hiroyuki ATARASHI (J), [hiroyuki.atarashi.yt@nttdocomo.com](mailto:hiroyuki.atarashi.yt@nttdocomo.com).
  - Agenda items 1.3 and 1.5  
Co-Rapporteur Mr. Usman Aliyu MAHMUD (NIG), [ualiyu@ncc.gov.ng](mailto:ualiyu@ncc.gov.ng).
- b) CHAPTER 2 - Aeronautical and maritime issues
  - Agenda items: 1.6, 1.7, 1.8, 1.9, 1.10, 1.11  
Rapporteur Mr. Mohammed ALHASSANI (UAE), [mohammed.alhassani@tra.gov.ae](mailto:mohammed.alhassani@tra.gov.ae).
- c) CHAPTER 3 - Science issues
  - Agenda items: 1.12, 1.13, 1.14  
Rapporteur Mr. Tarcisio Aurélio BAKAUS (B), [bakaust@anatel.gov.br](mailto:bakaust@anatel.gov.br).
- d) CHAPTER 4 - Satellite issues
  - Agenda items: 1.15, 1.16, 1.17, 1.18, 1.19  
Co-Rapporteur Ms. Florence Magnier (F), [fmagnier@eutelsat.fr](mailto:fmagnier@eutelsat.fr).
  - Agenda item: 7  
Co-Rapporteur Mr. Georges KWIZERA (RRW), [george.kwizera@rura.rw](mailto:george.kwizera@rura.rw).
- e) CHAPTER 5 - General issues
  - Agenda items: Agenda items: 2, 4 and 9.1 topics a) Res. 657 (Rev.WRC-19), b) Res. 744 (WRC-19), c) Res. 175 (WRC-19), and d) WRC-19 Doc. 535, 2nd section of the Annex  
Co-Rapporteurs Mr. Jia HUANG (CHN), [ferrero.huang@srrc.org.cn](mailto:ferrero.huang@srrc.org.cn), and Dr. Jong Min PARK (KOR), [jongmin@etri.re.kr](mailto:jongmin@etri.re.kr).

**ATTACHMENT II**  
**CHAPTER 3 SCIENCE ISSUES - ABSTRACT AND ONGOING STUDIES**

**1. Chapter 3 Agenda Items**

The [Resolution 811 \(WRC-19\)](#) establishes the Agenda for the WRC-23 which include four science issues (1.12, 1.13, 1.14) and the science topic 9.1a). As in the [WRC-19 Minutes of the twelfth plenary meeting](#), Section 35.2, sub-section "Protection of EESS in the frequency band 36-37 GHz", WRC-19 decided that the WRC-23 needs to consider a new science topic (9.1d).

As decided at the CPM23-1 the responsible groups to carry on studies on these agenda items are Working Parties [7B \(WP 7B\) "Space radiocommunication applications"](#) (Agenda item 1.13) and [7C \(WP 7C\) "Remote sensing systems"](#) (Agenda items 1.12 and 1.14).

The CPM23-1 Chapter 3 deals with three science issues as follow:

- a) Agenda Item 1.12: to conduct, and complete in time for WRC 23, studies for a possible new secondary allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, including in adjacent bands, in accordance with Resolution 656 (Rev.WRC 19);
- b) Agenda Item 1.13: to consider a possible upgrade of the allocation of the frequency band 14.8-15.35 GHz to the space research service, in accordance with Resolution 661 (WRC 19);
- c) Agenda Item 1.14: 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).

Upcoming sessions present summaries and current studies on the development of the WRC-23 scientific agenda.

**2. Agenda Item 1.12 – New secondary allocation to EESS around 45 MHz**

Agenda Item 1.12 to conduct, and complete in time for WRC 23, studies for a possible new secondary allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, including in adjacent bands, in accordance with Resolution 656 (Rev.WRC 19).

**ABSTRACT**

There is significant interest in measurements of the Earth's subsurface with the intention of locating water/ice/deposits and examining sub-ice glacial bed surfaces. Sounding radars in the 40-50 MHz

band must be operated exclusively in uninhabited or sparsely populated areas of the Greenland and Antarctic ice sheets and the deserts of North Africa and the Arabian Peninsula. These sensors will operate for a period not exceeding 10 minutes duration per orbit of 92.7 minutes and they can provide such sub-surface data with a vertical resolution of 5-7 m. The data acquired by these types of sensors, which will be operated by some space agencies, are to the benefit of all the global society.

## ONGOING ITU-R STUDIES

After four meetings, the following documents are still under development in WP 7C:

- Preliminary draft revised Report ITU-R RS.2455-1 - Results of sharing studies between a 45 MHz radar sounder and in-band and selected out-of-band incumbent services over the 40-50 MHz frequency range (Chairman's Report [Annex 4](#)).
- Working document towards preliminary draft revised Recommendation ITU-R RS.2042-1 - Typical technical and operating characteristics for spaceborne radar sounder systems using the 40-50 MHz band (Chairman's Report [Annex 5](#)).
- Draft CPM text for WRC-23 agenda item 1.12 was continued (Chairman's Report [Annex 6](#)).

### **3. Agenda Item 1.13 – Update to a primary allocation to SRS at the 14.8-15.35 GHz**

Agenda Item 1.13: to consider a possible upgrade of the allocation of the frequency band 14.8-15.35 GHz to the space research service, in accordance with Resolution 661 (WRC 19);

## ABSTRACT

The frequency band 14.8-15.35 GHz is currently allocated to the space research on a secondary basis and the international space agencies are currently planning on implementing high data rate space research missions with bandwidth requirements up to 400 MHz. Satellites for these missions will carry telescopes and/or other passive instruments to measure phenomenon such as the Earth's magnetosphere and solar flares. These space programmes represent long-term effort and investment that span across decades, from the time when the programme is officially decided, through the development period and the launch phase to the time when the corresponding satellites are in operation and the space agencies are investing resources in the continuation of these programmes, providing subsequent satellites and payloads, links, which permits the establishment of communications with satellites in nongeostationary orbits (non-GSO), including manned flights in the SRS. The frequency band 14.8-15.35 GHz is also used by existing high-speed data links from non-GSO satellites within the SRS and is planned for use in future systems. Upgrading to primary status the allocation of the frequency band 14.8-15.35 GHz for the SRS will provide certainty for administrations and space agencies participating in satellite space programmes.

## ONGOING ITU-R STUDIES

After four meetings, the following documents are still under development in WP 7B:

- Draft CPM text framework for WRC-23 agenda item 1.13 (Chairman's Report [Annex 1](#)).

- Working document towards a preliminary draft new Report ITU-R SA.[15 GHZ SRS SHARING] - Sharing and Compatibility Studies for the SRS in the band 14.8-15.35 GHz NEW REPORT ITU-R SA.[15 GHZ SRS SHARING] (Chairman's Report [Annex 2](#)).
- Proposed Working Party 7B draft work plan for WRC-23 agenda item 1.13 - Possible upgrade of the SRS allocation in the 14.8-15.35 GHz band was revised and updated (Chairman's Report [Annex 3](#)).
- Draft New Recommendation ITU-R SA.[15 GHZ SRS CHARACTERISTICS] - Characteristics of SRS Systems in the frequency range 14.8-15.35 GHz (sent out for simultaneous adoption and approval by administrations).

#### 4. Agenda Item 1.14 – New primary allocation to EESS in the 231.5-252 GHz

Agenda Item 1.14: 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).

##### ABSTRACT

Ice clouds, covering more than 33% of Earth's surface, have important effects on Earth's climate and hydrological cycle by affecting precipitation, atmospheric structure, and cloud processes. Thus, global measurements of ice cloud are critically needed. Today, numerical weather and climate models are not fully able to represent the effects of ice clouds; this is especially problematic because these effects couple to the global circulation. Clouds and their interaction with the circulation are therefore one of the biggest sources of uncertainty in climate predictions. The ability of passive microwave remote sensing instruments to measure ice clouds depends on specific microwave frequencies where this important atmospheric component for weather forecasting can best be observed, and the set of frequencies for measuring centers of ice clouds is around 183 GHz, 243 GHz, 325GHz, 448GHz and 664GHz. In line with the scientific observation requirements, the need for ice cloud measurements with passive microwave sensors was identified in the bands 239.2-242.2 GHz and 244.2-247.2 GHz.

##### ONGOING ITU-R STUDIES

After four meetings, the following documents are still under development in WP 7C:

- Working document towards preliminary draft new Report ITU-R RS.[231.5-252 GHz EESS] - WRC-23 agenda item 1.14 - Studies related to possible EESS (passive) allocations in the frequency range 231.5-252 GHz (Chairman's Report [Annex 18](#)).
- Working document towards preliminary draft CPM Text - WRC-23 agenda item 1.14 (Chairman's Report [Annex 19](#)).

It was established a [Correspondence Group on WRC-23 agenda item 1.14](#), chaired by Mr. Philippe Tristant/EUMETSAT (Terms of Reference: WP 7C Chairman's Report [Annex 20](#)), in order to advance the work on this agenda item.

## ATTACHMENT III

### CHAPTER 5 SCIENCE TOPICS – ABSTRACT AND ONGOING STUDIES

#### 1. Chapter 5 Science Topics

The [Resolution 811 \(WRC-19\)](#) establishes the Agenda for the WRC-23 which include four science issues (1.12, 1.13, 1.14) and the science topic 9.1a). As in the [WRC-19 Minutes of the twelfth plenary meeting](#), Section 35.2, sub-section "Protection of EESS in the frequency band 36-37 GHz", WRC-19 decided that the WRC-23 needs to consider a new science topic (9.1d).

The two science topics included on the WRC-23 are 9.1a) and 9.1d) and both are under the responsibility of WP 7C studies, and included at the CPM text Chapter 5 – General Issues, as follow:

- a) Topic 9.1 a): In accordance with Resolution 657 (Rev.WRC-19), review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services;
- b) Topic 9.1d): Protection of EESS (passive) in the frequency band 36-37 GHz.

Upcoming sessions present summaries and current studies on the development of the WRC-23 scientific topics.

#### 2. Topic 9.1 a) – Space Weather Sensors

Topic 9.1 a): In accordance with Resolution 657 (Rev.WRC-19), review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services;

#### ABSTRACT

The space weather refers to the physical processes occurring in the space environment that ultimately affects human activities on Earth and in space. It is influenced by the solar wind and the interplanetary magnetic field (IMF) carried by the solar wind plasma, as the solar radiation storms, solar flares, solar cycle, among other variety of physical phenomena. Severe space weather events can results in power grid outages, disruption to GNSS/GPS, radio communications outages, satellite damage, and increased radiation levels at high altitude, with a significative impact in some industries. Some examples where the space weather forecast can help: Energy companies to minimise the impact of geomagnetic storms, improving the design and modelling of future, more resilient, systems and increased monitoring of impacted systems; Aviation companies to rerouting of high latitude flights, and to alert aircraft in flight of possible loss of communications; Mariners to advise of potential degradation or failures in the GNSS service; Rail Network Operators

understand when rail systems may be at risk; Satellite operators can use space weather forecasts to advise of potential degradation or failures in the services they provide.

## ONGOING ITU-R STUDIES

After four meetings, the following documents are still under development in WP 7C:

- Working Document towards preliminary draft new Report ITU-R RS.[RXSW\_INTERF\_CRITERIA] - Interference criteria of receive-only space weather sensors (Chairman's Report [Annex 7](#));
- Views on working document towards a preliminary draft new Report ITU-R RS.[SPEC\_USE\_RX\_SPACE\_WEATHER] - Spectrum use and applicable radio service designations for receive only space weather sensors that provide data used for predictions and warnings (Chairman's Report [Annex 8](#));
- Working document towards a preliminary draft new Report ITU-R RS.[SPEC\_REQTS\_TX\_SPACE\_WEATHER] - Spectrum requirements and applicable radio service designations for active space weather sensors that provide data critical for predictions and warnings (Chairman's Report [Annex 9](#));
- Preliminary draft revision of the Report ITU-R RS.2456-0 - Space weather sensor systems using radio spectrum (Chairman's Report [Annex 10](#));
- Elements regarding agenda item 9.1 topic a) (Chairman's Report [Annex 11](#));
- Draft CPM text on WRC-23 agenda item 9.1, topic a) (Chairman's Report [Annex 12](#));
- Terms of Reference for Working Party 7C [Correspondence Group on WRC-23 agenda item 9.1, topic a\)](#), chaired by Mr. Eric Allaix/France (Chairman's Report [Annex 13](#)).

### 3. Topic 9.1 d) – Protection of EESS (passive) in 36-37 GHz

Topic 9.1 d): Protection of EESS (passive) in the frequency band 36-37 GHz from non-GSO FSS space stations)

#### ABSTRACT

Passive microwave sensors measure in 36.5 GHz band the atmospheric water vapour and liquid water content. These measurements are performed in support of an altimeter instrument on-board of the same satellite and it provides correction factors for the amount of water vapour and liquid water in the sub-satellite atmospheric column to be induced into the measurement data of the altimeter. Such altimeters, e.g. on Sentinel-3 satellites of the EU COPERNICUS program, perform sea and lake surface topology measurements, i.e. surface height, significant wave height, surface wind speed, and sea ice height and thickness. Among the studies considered for WRC 19 agenda item 1.6, was a preliminary study on the protection of EESS (passive) sensors operating in the 36-37 GHz from NGSO constellations in the uplink (47.5-50.2 and 50.4-51.4 GHz) and downlink (37.5-42 GHz) directions. As WRC-19 did neither achieve consensus on the relevant regulatory provision nor where to include it, the WRC 19 invited ITU-R to conduct further studies on this topic and to develop Recommendations and/or Reports, as appropriate, and report back to WRC 23 to take action, if necessary.



## ONGOING ITU-R STUDIES

After four meetings, only one document are under development in WP 7C:

- Working document towards a preliminary draft new report on studies related to agenda item 9.1, topic d) - Protection of EESS (passive) in the frequency band 36-37 GHz from non-GSO FSS space stations (Chairman's Report [Annex 23](#)).

**ATTACHMENT IV**  
**MEETING RESULTS OF THE WG 7B AND 7C ON WRC-23 SCIENCE ISSUES AND TOPICS**

*Editor Note: This attachment has a WRC-23 science issues and topics summary of the WP 7B and 7C meetings from 2020 April (Item 1) and September (Item 2), and 2021 April (item 3) and September (Item 4).*

**1. 2020 April Meetings**

The WP 7B and 7C met in form of a virtual e-meeting with separate plenary sessions every day from 21 to 24 April 2020. The WP 7B was chaired by Ms. Catherine Sham (NTIA, USA), chairman report at document [7B/14](#), and the WP 7C meeting was chaired by Mr Markus Dreis (EUMETSAT, Germany), chairman report at the document [7C/22](#).

The following results were achieved on the WRC-23 science issues agenda items and topics.

**1.1 Progress of the studies on Chapter 3 - science agenda items**

**1.1.1 Agenda Item 1.12: to conduct, and complete in time for WRC 23, studies for a possible new secondary allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, including in adjacent bands, in accordance with [Resolution 656 \(Rev.WRC 19\)](#)**

The preparations for this WRC-23 agenda item are under the responsibility of WP 7C.

For performing the necessary sharing and compatibility studies with the incumbent services a liaison statement was developed on the basis of input documents and agreed to be send to WP 5A, 5C and 6A, asking them to provide their relevant technical and operational characteristics and protection criteria.

**1.1.2 Agenda Item 1.13: to consider a possible upgrade of the allocation of the frequency band 14.8-15.35 GHz to the space research service, in accordance with [Resolution 661 \(WRC-19\)](#)**

Two framework documents were introduced to initiate the work of WP 7B on AI 1.13 to begin a review of the relevant SRS characteristics in the frequency range of 14.8 15.35 GHz and to identify sharing scenarios. No further discussion was held as both documents will be carried forward in the Chairman's Report for future review and development through contributions ([Annex 1 to Working Party 7B Chairman's Report WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT NEW RECOMMENDATION ITU-R SA.\[15 GHZ SRS CHARACTERISTICS\]](#) and [Annex 2 to Working Party 7B Chairman's Report WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT NEW REPORT ITU-R SA.\[15 GHZ SRS SHARING\]](#)).

A draft work plan for WRC-23 agenda item 1.13 was started ([Annex 3 to Working Party 7B Chairman's Report](#)).

A liaison statement to WPs 3M, 5A, 5B, 5C, 7C and 7D was agreed requesting characteristics for use in sharing studies under this agenda item.

**1.1.3 Agenda Item 1.14: 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 \(WRC-19\)](#)**

The preparations for this WRC-23 agenda item are under the responsibility of WP 7C.

For this WP 7C will have 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 observation requirements of passive microwave sensors and to study, as appropriate, possible adjustments or additional allocations to the EESS (passive) in the frequency range 231.5-252 GHz.

Consequently, possible impact that any change or addition of EESS (passive) allocations in the frequency range 231.5-252 GHz might have on the other primary services in these frequency bands will have to be assessed.

WP 7C agreed on a liaison statement to WPs 4A, 4C, 5A, 5B and 5C asking for the relevant technical and operational characteristics of the allocated services, planned or operating, in the frequency range 231.5-252 GHz and in the adjacent bands, as appropriate. This information would then be used to conduct relevant sharing studies between primary services and EESS (passive) systems under this agenda item in accordance with Resolution 662 (WRC-19).

## **1.2 Progress of the studies on the CPM23 Chapter 5 science topics**

**1.2.1 Topic 9.1a) (Space Weather) In accordance with [Resolution 657 \(Rev.WRC-19\)](#), review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services**

The preparations for this WRC-23 topic are under the responsibility of WP 7C.

At this meeting no discussion took place on this agenda item. Future work on this issue will build upon the work of WP 7C in the last study cycle which resulted in Report ITU-R RS.2456-0 (06/2019) on Space weather sensor systems using radio spectrum.

**1.2.2 Topic 9.1d): Protection of EESS (passive) in the frequency band 36-37 GHz**

The preparations for this WRC-23 topic are under the responsibility of WP 7C.

Under studies considered for WRC-19 agenda item 1.6, a preliminary study on the protection of EESS (passive) sensors operating in the 36-37 GHz was submitted to the ITU R. This preliminary study indicated that it may be necessary to not exceed an out-of-band e.i.r.p. of -34 dBW/100 MHz, for all angles greater than 71.4 degrees from nadir, for FSS non-GSO space stations operating in the frequency greater band 37.5-38 GHz. In addition, interference into the cold calibration channel of the EESS (passive) sensor operating in the frequency band 36-37 GHz has not been studied.

WRC-19 invites ITU-R to conduct further study of this topic and develop Recommendations and/or Reports, as appropriate, and report back to WRC-23 to take action, if necessary.

### **1.3 Other information**

The document “Principles for studies relating to WRC-23 agenda items”, presented by administration of Iran (Islamic Republic of), are included for reference in [Annex 10](#) and [Annex 9](#) to the Chairmen Reports of the WP 7B and 7C respectively.

## **2. 2020 September Meetings**

The WP 7B met in form of a virtual e-meeting every day from September 21 to 25, 2020. It was chaired by Ms. Catherine Sham (NTIA, USA) and the meeting chairman report is available at the document [7B/66](#).

The WP 7C met in form of a virtual e-meeting every day from September 28 to October 2, 2020. It was chaired by Mr Markus Dreis (EUMETSAT, Germany) and the meeting chairman report is available at the document [7C/105](#).

The following results were achieved on the WRC-23 science issues agenda items and topics.

### **2.1 Progress of the studies on Chapter 3 - science agenda items**

**2.1.1 Agenda Item 1.12: to conduct, and complete in time for WRC 23, studies for a possible new secondary allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, including in adjacent bands, in accordance with [Resolution 656 \(Rev.WRC 19\)](#)**

The preparations for this WRC-23 agenda item are under the responsibility of WP 7C.

WP 7C received three reply Liaison Statements from WP 5A, 5B and 5C ([7C/29](#), [7C/37](#) and [7C/42](#)) in response to the liaison statement WP 7C sent from the April 2020 meeting, which will be used in planning and conducting the work for WRC-23 agenda item 1.12.

WMO preliminary position on the agenda item was received in document [7C/24](#).

It was made some edits to Report ITU-R RS.2455 which is converted in a working document towards a preliminary draft revised REPORT ITU-R RS.2455-1 - Preliminary results of sharing studies between a 45 MHz radar sounder and incumbent fixed, mobile, broadcasting and space research services operating in the 40-50 MHz frequency range (Chairman's Report [Annex 5](#)).

**2.1.2 Agenda Item 1.13: to consider a possible upgrade of the allocation of the frequency band 14.8-15.35 GHz to the space research service, in accordance with [Resolution 661 \(WRC-19\)](#)**

The preparations for this WRC-23 agenda item are under the responsibility of WP 7B.

The Workplan was updated which is attached to the Chairman's Report as [Annex 3](#).

The working document towards a preliminary draft new Recommendation ITU-R SA.[15 GHZ SRS CHARACTERISTICS] - Characteristics of SRS Systems in the frequency range 14.8-15.35 GHz was updated and is attached to the Chairman's Report [Annex 2](#).

The working document towards a preliminary draft new Report ITU-R SA.[15 GHZ SRS SHARING] - Sharing and compatibility studies for the SRS in the band 14.8-15.35 GHz was updated and is attached to the Chairman's Report [Annex 1](#).

Five liaison statements were received as follow:

- a) From WP 5B: Doc. [7B/22](#) provides information on radiodetermination and aeronautical characteristics in or adjacent to frequency band 14.8-15.35 GHz.

- b) From WP 5A: Doc. [7B/24](#) provides relevant technical and operational characteristics of the systems under the purview of WP 5A operating in the 14.8-15.35 GHz frequency band.
- c) From WP 5C: Doc. [7B/31](#) provides characteristics and protection criteria for fixed service (FS) systems operating in the 14.8-15.35 GHz frequency band.
- d) From WP 3M: Doc. [7B/38](#) addresses the application of propagation models for sharing and compatibility studies relevant to WRC-23 AI 1.13.
- e) From WP 7D: Doc. [7B/62](#) provides characteristics and protection criteria of the radio astronomy service operating in the frequency band 15.35-15.4 GHz.

In response to these liaison statements, the WG approved a reply liaison statement stating that the characteristics received will be used by WP 7B in conducting sharing and compatibility studies with respect to the space research service for WRC-23 agenda item 1.13 and also acknowledging the receipt of the information on the applicability of propagation models.

**2.1.3 Agenda Item 1.14: 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 \(WRC-19\)](#)**

The preparations for this WRC-23 agenda item are under the responsibility of WP 7C.

At this meeting, WP 7C developed a first draft for a reference document, called elements related to WRC-23 agenda item 1.14, which is attached to the Chairman's Report as [Annex 21](#).

WMO preliminary position on the agenda item was received in document [7C/24](#).

WP 7C received liaison statements from Working Parties 5A, 5B, 5C informing that, at current stage, there is no information and characteristics of active services available. This has been noted in a reply liaison statement back to these WPs ([5A/138](#) – [5B/131](#) – [5C/92](#)).

WP 7C considered a liaison statement from WP 7D raising potential collateral effect of this agenda item on RAS usage and possible new RAS identification in the EESS (passive) allocation that would result from WRC-23 agenda item 1.14. WP 7C in a reply liaison statement informed WP 7D about the status of discussions on this WRC-23 agenda item 1.14 ([7D/32](#)).

## **2.2 Progress of the studies on Chapter 5 science topics**

### **2.2.1 Topic 9.1a) (Space Weather) In accordance with [Resolution 657 \(Rev.WRC-19\)](#), review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services**

The preparations for this WRC-23 topic are under the responsibility of WP 7C.

WMO preliminary position on the agenda item was received in document [7C/24](#).

A work plan for completing the work necessary for WRC-23 was generated as an attachment to the Chairman's Report as [Annex 6](#).

Working documents towards ITU-R Reports on space weather sensor spectrum requirements and on space weather sensor interference criteria, respectively, were attached to the Chairman's Report for further work at future meetings as [Annexes 8](#) and [9](#), respectively.

Proposing edits to Report ITU-R RS.2456 was converted to an attachment to the Chairman's Report as [Annex 7](#).

A liaison statement to the contributing groups under topic was send ([1B/18](#) – [3J/62](#) – [3K/68](#) – [3L/32](#) – [3M/104](#) – [4A/104](#) – [4C/63](#) – [5A/146](#) – [5B/139](#) – [5C/97](#) – [5D/362](#) – [6A/102](#) – [7D/36](#)).

The document [7C/98](#) proposed the inclusion of additional sensor systems, in addition to the systems addressed until this meeting, and contributions on these additional systems was welcome and encouraged.

### **2.2.2 Topic 9.1d): Protection of EESS (passive) in the frequency band 36-37 GHz**

The preparations for this WRC-23 topic are under the responsibility of WP 7C.

WP 7C developed a liaison statement to WP 4A ([4A/74](#)) on the issue of the protection of EESS (passive) in the band 36-37 GHz from unwanted emissions of NGSO FSS systems operating in the band 37.5-38 GHz. This liaison statement requests additional information on parameters, including unwanted emission masks, to be considered in the studies under this agenda item.

### **3. 2021 April Meetings**

The WP 7B met in form of a virtual e-meeting from April 6 to 14, 2021. It was chaired by Ms. Catherine Sham (NTIA, USA) and the meeting chairman report is available at the document [7B/109](#).

The WP 7C met in form of a virtual e-meeting from April 15 to 23, 2021. It was chaired by Mr Markus Dreis (EUMETSAT, Germany) and the meeting chairman report is available at the document [7C/186](#)

#### **3.1 Progress of the studies on Chapter 3 - science agenda items**

**3.1.1 Agenda Item 1.12: to conduct, and complete in time for WRC 23, studies for a possible new secondary allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, including in adjacent bands, in accordance with [Resolution 656 \(Rev.WRC 19\)](#)**

The preparations for this WRC-23 agenda item are under the responsibility of WP 7C.

WP 7C received one reply Liaison Statements from WP 6A ([7C/106](#)) in response to the liaison statement WP 7C sent from the April 2020 meeting, which will be used in planning and conducting the work for WRC-23 agenda item 1.12.

WMO and IARU preliminary positions on the agenda item was received in document [7C/138](#) and [7C/164](#), respectively.

Iran (Islamic Republic of) presented the list of assignments which the administration had notified to the bureau and that are within the frequency bands subject to WRC-23 agenda items in the document [7C/112](#).

Take in account the document [7C/176](#), from IEEE, and some discussions, it was developed a Draft CPM text for WRC-23 agenda item 1.12 (Chairman´s Report [Annex 5](#)).

Take in account the document [7C/143](#), from USA, and some discussions, it was made some edits to Report ITU-R RS.2455 which is converted in a preliminary draft revised Report ITU-R RS.2455-1 - Results of sharing studies between a 45 MHz radar sounder and incumbent fixed, mobile, broadcasting and space research services operating in the 40-50 MHz frequency range (Chairman´s Report [Annex 6](#)).

Finally the group approved a liaison statement to Working Parties 3K, 3L, 3M, 5A, 5B, 5C and 6A (copied for information to Working Parties 7A and 7D) - WRC-23 agenda item 1.12, where it requests that the WPs to review the preliminary draft revised Report ITU-R RS.2455 and the Draft CPM Text for WRC-23 agenda item 1.12.

**3.1.2 Agenda Item 1.13: to consider a possible upgrade of the allocation of the frequency band 14.8-15.35 GHz to the space research service, in accordance with [Resolution 661 \(WRC-19\)](#)**

The preparations for this WRC-23 agenda item are under the responsibility of WP 7B.



WP 7B received one reply Liaison Statements from WP 7C ([7B/68](#)) which informs that there are currently no characteristics of Earth exploration-satellite service (EESS) (passive) systems available for this band.

Iran (Islamic Republic of) presented the list of assignments which the administration had notified to the bureau and that are within the frequency bands subject to WRC-23 agenda items in the document [7B/75](#).

WMO preliminary positions on the agenda item was received in document [7B/85](#).

Take in account documents [7B/89](#), and [7B/95](#) from USA, [7B/97](#) from Russian Federation, and [7B/101](#) from China (People's Republic of), some discussions and according to the specific theme, the results of the work are attached to the Chairman Report as follow:

- a) Working document towards a preliminary draft new Report ITU-R SA.[15 GHZ SRS SHARING] -Sharing and Compatibility Studies for the SRS in the band 14.8-15.35 GHz NEW REPORT ITU-R SA.[15 GHZ SRS SHARING] (Chairman's Report [Annex 1](#))
- b) Preliminary draft new Recommendation ITU-R SA.[15 GHZ SRS CHARACTERISTICS] - Characteristics of SRS Systems in the frequency range 14.8-15.35 GHz (Chairman's Report [Annex 2](#))
- c) Proposed working Party 7B draft work plan for WRC-23 agenda item 1.13 - Possible upgrade of the SRS allocation in the 14.8-15.35 GHz band (Chairman's Report [Annex 3](#))

**3.1.3 Agenda Item 1.14: 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 \(WRC-19\)](#)**

The preparations for this WRC-23 agenda item are under the responsibility of WP 7C.

WP 7C received two reply Liaison Statements from WP 4C ([7C/113](#)) and WP 7D ([7C/182](#)) in response to the liaison statements WP 7C sent from the April 2020 meeting, which will be used in planning and conducting the work for WRC-23 agenda item 1.14.

WMO and IARU preliminary positions on the agenda item was received in document [7C/138](#) and [7C/164](#), respectively.

Iran (Islamic Republic of) presented the list of assignments which the administration had notified to the bureau and that are within the frequency bands subject to WRC-23 agenda items in the document [7C/112](#).

Take in account documents [7C/155](#), from USA, and [7C/166](#), from Eumetsat/ESA, and some discussions, it was made some edits at the elements related to WRC-23 agenda item 1.14, which is attached to the Chairman's Report as [Annex 20](#).

Finally the group approved a liaison statement to Working Parties 4A, 4C, 5A, 5B, 5C, 7D (copied for information to Working Parties 3J and 3M) - WRC-23 agenda item 1.14: system characteristics of primary services to be used for sharing and compatibility studies in the frequency range 231.5-252 GHz, stating that it appreciates receiving any update on the technical and operational characteristics of services in the 231.5-252 GHz frequency band.

### 3.2 Progress of the studies on Chapter 5 science topics

#### 3.2.1 Topic 9.1a) (Space Weather) In accordance with Resolution 657 (Rev.WRC-19), review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services

The preparations for this WRC-23 topic are under the responsibility of WP 7C.

WP 7C received ten documents with reply Liaison Statements from WP 6A ([7C/107](#)), WP 4C ([7C/116](#)), WP 4A ([7C/119](#)), WP 5C ([7C/123](#)), WP 5B ([7C/124](#)), WP 5D ([7C/126](#)), WP 5A ([7C/128](#)), WP 1B ([7C/129](#)), ICAO ([7C/133](#)), and WP 7D ([7C/183](#)), in response to the liaison statements WP 7C sent from the September 2020 meeting, which will be used in planning and conducting the work for WRC-23 agenda topic 9.1a).

WMO and IARU preliminary positions on the agenda item was received in document [7C/138](#) and [7C/164](#), respectively.

Take in account document [7C/148](#) from USA, and some discussions, it was approved a Liaison Statement to Working Parties 1B, 3J, 3K, 3L, 3M, 4A, 4C, 5A, 5B, 5C, 5D, 6A and 7D - Update for contributing working parties under agenda item 9.1, topic a).

Take in account documents [7C/135](#) and [7C/165](#) from Germany, [7C/136](#) and [7C/137](#) from Switzerland, [7C/147](#), [7C/149](#), [7C/152](#), and [7C/156](#) from USA, [7C/157](#) and [7C/158](#) from Korea (Republic of), and [7C/160](#) from Japan, some discussions and according to the specific theme, the results of the work are attached to the Chairman Report as follow:

- a) Work plan for WRC-23 agenda item 9.1, topic a) (Chairman's Report [Annex 7](#));
- b) Working document towards preliminary draft new Report ITU-R RS.[RXSW\_INTERF\_CRITERIA] - Interference criteria of receive-only space weather sensors (Chairman's Report [Annex 8](#));
- c) Working document towards a preliminary draft new Report ITU-R RS.[SPEC\_REQTS\_RX\_SPACE\_WEATHER] - Spectrum requirements and applicable radio service designations for receive only space weather sensors that provide data critical for predictions and warnings (Chairman's Report [Annex 9](#));
- d) Working document towards a preliminary draft new Report ITU-R RS.[RXSW\_SHARING\_STUDIES] - Compatibility issues relating to the operation of receive-only space weather sensors (Chairman's Report [Annex 10](#));
- e) Elements regarding agenda item 9.1 topic a) - Update for contributing working parties under agenda item 9.1, topic a) (Chairman's Report [Annex 11](#));
- f) Preliminary draft revision of the Report ITU-R RS.2456-0 - Space weather sensor systems using radio spectrum (Chairman's Report [Annex 12](#)).

#### 3.2.2 Topic 9.1d): Protection of EESS (passive) in the frequency band 36-37 GHz

The preparations for this WRC-23 topic are under the responsibility of WP 7C.

WMO preliminary positions on the agenda item was received in document [7C/138](#).

WP 7C developed a new liaison statement to WP 4A (copy to Working Parties 5A, 5C and 5D for information) once there is no response from that group to the first liason statement sent on the issue in October 2020 ([4A/74](#)).

#### **4. 2021 September Meetings**

The WP 7B met in form of a virtual e-meeting from September 8 to 15, 2021. It was chaired by Ms. Catherine Sham (NTIA, USA) and the meeting chairman report is available at the document [7B/158](#).

The WP 7C met in form of a virtual e-meeting from September 16 to 23, 2021. It was chaired by Mr Markus Dreis (EUMETSAT, Germany) and the meeting chairman report is available at the document [7C/283](#).

#### **4.1 Progress of the studies on Chapter 3 - science agenda items**

##### **4.1.1 Agenda Item 1.12: to conduct, and complete in time for WRC 23, studies for a possible new secondary allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, including in adjacent bands, in accordance with [Resolution 656 \(Rev.WRC 19\)](#)**

The preparations for this WRC-23 agenda item are under the responsibility of WP 7C.

WP 7C received one reply Liaison Statements from WP 5B ([7C/201](#)) in response to the liaison statement WP 7C sent from the April 2021 meeting, which will be used in planning and conducting the work for WRC-23 agenda item 1.12.

Take in account the document [7C/255](#), from USA, and some discussions, it was made some edits to the Preliminary draft revised Report ITU-R RS.2455-1 - Results of sharing studies between a 45 MHz radar sounder and in-band and selected out-of-band incumbent services over the 40-50 MHz frequency range (Chairman's Report [Annex 4](#)).

Take in account the document [7C/274](#), from ESA, and some discussions, it was started the Working document towards preliminary draft revised Recommendation ITU-R RS.2042-1 - Typical technical and operating characteristics for spaceborne radar sounder systems using the 40-50 MHz band (Chairman's Report [Annex 5](#)).

Finally, take in account the document [7C/238](#), from USA, and some discussions, the development of the Draft CPM text for WRC-23 agenda item 1.12 was continued (Chairman's Report [Annex 6](#)).

##### **4.1.2 Agenda Item 1.13: to consider a possible upgrade of the allocation of the frequency band 14.8-15.35 GHz to the space research service, in accordance with [Resolution 661 \(WRC-19\)](#)**

The preparations for this WRC-23 agenda item are under the responsibility of WP 7B.

WP 7B received three Liaison Statements from WP 7C ([7B/114](#)), WPs 3K and 3M ([7B/130](#)), and WP 5C ([7B/118](#)) which will be used in planning and conducting the work for WRC-23 agenda item 1.13. In response to these Liaisons Statements WP 7B approved a response and sent it to WPs 3K, 3M, 4A, 5A, 5B, 5C, 7C, and 7D, summarizing its progress on this AI, and also seeks some additional information from WP 5B ([5B/382](#)).

Take in account document [7B/147](#), from WP 7B Chairman, it was approved the Draft CPM text framework for WRC-23 agenda item 1.13 (Chairman's Report [Annex 1](#)).

Take in account documents [7B/134](#) and [7B/152](#), from Japan, [7B/136](#), from USA, [7B/145](#), from EGY, and [7B/148](#), from China, after some discussions the results of the work are attached at the Working document towards a preliminary draft new Report ITU-R SA.[15 GHZ SRS SHARING] - Sharing and Compatibility Studies for the SRS in the band 14.8-15.35 GHz NEW REPORT ITU-R SA.[15 GHZ SRS SHARING] (Chairman's Report [Annex 2](#)).

The document Proposed Working Party 7B draft work plan for WRC-23 agenda item 1.13 - Possible upgrade of the SRS allocation in the 14.8-15.35 GHz band was revised and updated (Chairman's Report [Annex 3](#)).

Finally, take in account documents [7B/135](#), from USA, and [7B/109 \(Annex 2\)](#), after discussions and modifications that resulted in the upgrade of the working document to a Draft New Recommendation ITU-R SA.[15 GHZ SRS CHARACTERISTICS] - Characteristics of SRS Systems in the frequency range 14.8-15.35 GHz, the document [7/30](#) was considered at the SG 7 (meeting of September 24,2021), where it was agreed with amendments and sent out for simultaneous adoption and approval by administrations.

**4.1.3 Agenda Item 1.14: 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 \(WRC-19\)](#)**

The preparations for this WRC-23 agenda item are under the responsibility of WP 7C.

WP 7C received two reply Liaison Statements from WP 5A ([7C/193](#)), WP 5C ([7C/196](#)), WP 4C ([7C/218](#)) and WP 5B ([7C/202](#)), in response to the liaison statements WP 7C sent from the April 2021 meeting, and one Liaison statement from WP 4A ([7C/222](#)), which will be used in planning and conducting the work for WRC-23 agenda item 1.14.

Take in account the document [7C/246](#), from USA, the document “elements related to WRC-23 agenda item 1.14” was discussed and elevated to the Working document towards preliminary draft new Report ITU-R RS.[231.5-252 GHz EESS] - WRC-23 agenda item 1.14 - Studies related to possible EESS (passive) allocations in the frequency range 231.5-252 GHz (Chairman's Report [Annex 18](#)).

Take in account documents [7C/224](#), from EGY, and [7C/236](#), from USA, and some discussions, it was started Working document towards preliminary draft CPM Text - WRC-23 agenda item 1.14 (Chairman's Report [Annex 19](#)).

Finally the group approved the Terms of Reference for Working Party 7C [Correspondence Group on WRC-23 agenda item 1.14](#), chaired by Mr. Philippe Tristant/EUMETSAT (Chairman's Report [Annex 20](#)).

## **4.2 Progress of the studies on Chapter 5 science topics**

### **4.2.1 Topic 9.1a) (Space Weather) In accordance with Resolution 657 (Rev.WRC-19), review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services**

The preparations for this WRC-23 topic are under the responsibility of WP 7C.

WP 7C received four documents with reply Liaison Statements from WP 5A ([7C/192](#)), WP 5B ([7C/198](#)), WP 5D ([7C/209](#)), and WP 4C ([7C/219](#)), in response to the liaison statements WP 7C sent from the September 2020 meeting, which will be used in planning and conducting the work for WRC-23 agenda topic 9.1a).

Take in account the last chairman report and documents [7C/226](#), [7C/227](#) and [7C/228](#) from Japan, [7C/230](#), [7C/231](#), [7C/232](#), [7C/233](#), [7C/235](#) and [7C/271](#) from Germany, [7C/234](#) from Canada, [7C/241](#), [7C/242](#) and [7C/243](#) from USA, [7C/256](#) from Indonesia, [7C/265](#), [7C/266](#) and [7C/267](#) (CRAF), [7C/269](#), [7C/270](#), [7C/276](#) and [7C/277](#) from France, some discussions and according to the specific theme, the results of the work are attached to the Chairman Report as follow:

- Working Document towards preliminary draft new Report ITU-R RS.[RXSW\_INTERF\_CRITERIA] - Interference criteria of receive-only space weather sensors (Chairman's Report [Annex 7](#));
- Views on working document towards a preliminary draft new Report ITU-R RS.[SPEC\_USE\_RX\_SPACE\_WEATHER] - Spectrum use and applicable radio service designations for receive only space weather sensors that provide data used for predictions and warnings (Chairman's Report [Annex 8](#));
- Working document towards a preliminary draft new Report ITU-R RS.[SPEC\_REQTS\_TX\_SPACE\_WEATHER] - Spectrum requirements and applicable radio service designations for active space weather sensors that provide data critical for predictions and warnings (Chairman's Report [Annex 9](#));
- Preliminary draft revision of the Report ITU-R RS.2456-0 - Space weather sensor systems using radio spectrum (Chairman's Report [Annex 10](#));
- Elements regarding agenda item 9.1 topic a) (Chairman's Report [Annex 11](#));
- Draft CPM text on WRC-23 agenda item 9.1, topic a) (Chairman's Report [Annex 12](#));
- Terms of Reference for Working Party 7C [Correspondence Group on WRC-23 agenda item 9.1, topic a](#)), chaired by Mr. Eric Allaix/France (Chairman's Report [Annex 13](#)).

#### **4.2.2 Topic 9.1d): Protection of EESS (passive) in the frequency band 36-37 GHz**

The preparations for this WRC-23 topic are under the responsibility of WP 7C.

WP 7C received one reply Liaison Statements from WP 4A ([7C/221](#)) in response to the liaison statements WP 7C sent from the September 2020 and April 2021 meetings, which will be used in planning and conducting the work for WRC-23 topic 9.1d).

The document [7C/264](#) from ESA/EUM presented Elements for the draft CPM text - Agenda item 9.1, topic d) - Protection of EESS (passive) in the frequency band 36-37 GHz from non-GSO FSS space stations and resulted in the Working document towards a preliminary draft new report on studies related to agenda item 9.1, topic d) - Protection of EESS (passive) in the frequency band 36-37 GHz from non-GSO FSS space stations (Chairman's Report [Annex 23](#)).