****

***Communications for all in East Africa***

**3rd EACO WRC-23 preparatory meeting (17th-19th/08/2021)**

CHAPTER 3 (Science issues)

|  |
| --- |
| **Input Document**  |

**Agenda Item 9.1 Topic A**

|  |
| --- |
| ***Part A: Description*** |
| *“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”.*Resolution 657 (Rev.WRC-19): Protection of radio spectrum-reliant space weather sensors used for global prediction and warnings |
| ***Part B: Key Elements – the notables*** |
| Below are the key issues:1. definition of technical and operational characteristics;
2. identification of spectrum requirements;
3. definition of appropriate service designation;
4. definition of appropriate protection in the Radio Regulations

The identification described in the invite of the Resolution 657 (Rev. WRC-19) should consider determining.* if receive-only space weather sensors shall be designated as applications of the metAids service;
* the appropriate radiocommunication service, if any, for cases where it is determined that receive-only space weather sensors do not fall under the metAids service.

Space weather observations are made from ground and space-based systems and they are important for detecting solar activity events that impact services critical to the economy, safety and security of administrations and their population. Some of sensors operate by receiving signals of opportunity, including but not limited to, low-level natural emissions of the Sun, Earth’s atmosphere and other celestial bodies, and therefore may suffer harmful interference at levels which could be tolerated by other radio systems. Although a wide variety of spectrum reliant space weather sensors currently operate relatively free from interference, their technology and systems have been developed and without much regard for domestic or international spectrum regulations, or for potential need for protection from interference, due to developing Radio Regulations. The new spectrum requirements being fulfilled through creation of new frequency allocations jeopardizes the relatively stable environment where the sensor system have operated. These systems may be vulnerable to interference from both terrestrial and space borne system and protection is required, especially for those systems that are used operationally in the production of forecast and warnings of space events that can cause harm to human welfare and national security.The conditions established by Resolution 811 (WRC-19) and Resolution 657 (Rev. WRC-19) indicate that any action with regard to protecting space weather sensors is limited ensuring protection to future new allocations. Space weather sensors, already deployed globally, cannot be protected from relative to existing allocated services since those services have regulatory status and space weather sensors do not have status.It should also be noted that some receive-only space weather sensors in Table 12 in the Report ITU-R RS2456-0 are radio-telescope operating under RAS. Also, some of the frequency ranges used by these systems overlap with frequency bands allocated to RAS on a primary and secondary basis. |
| ***Part C: Current Status of Band*** |
| Several bands are highlighted being used by majorly two types of sensors together with other existing radio communication services. Major sensor types/systems include;1. **Solar \Flux monitors,** and **Riometers**

| Space weather sensor type | Frequency ranges (MHz) | Incumbent Radio Services |
| --- | --- | --- |
| Solar Flux Monitors | 10-90 | AERONAUTICAL MOBILE (OR)AERONAUTICAL MOBILE(R)AERONAUTICAL RADIONAVIGATIONAMATEURAMATEUR-SATELLITEBROADCASTINGFIXEDLAND MOBILEMARITIME MOBILEMOBILEMOBILE except aeronautical mobileRADIO ASTRONOMYRADIOLOCATIONSPACE OPERATION (satellite identification)SPACE RESEARCHSTANDARD FREQUENCY AND TIME SIGNAL |
| 110-190 | AERONAUTICAL MOBILE (OR)AERONAUTICAL MOBILE (R)AERONAUTICAL RADIONAVIGATIONAMATEURAMATEUR-SATELLITEBROADCASTINGFIXEDMARITIME MOBILEMETEOROLOGICAL-SATELLITEMOBILEMOBILE except aeronautical mobileMOBILE-SATELLITERADIO ASTRONOMYRADIOLOCATIONSPACE OPERATIONSPACE RESEARCH |
| 170-250 | AERONAUTICAL RADIONAVIGATIONAMATEURBROADCASTINGFIXEDMARITIME MOBILEMOBILERadiolocationSPACE OPERATION |
| 322-332 | AERONAUTICAL RADIONAVIGATIONFIXEDMOBILERADIO ASTRONOMY |
| 408-412 | FIXEDMOBILE except aeronautical mobileRADIO ASTRONOMY |
| 607-613 | BROADCASTINGFIXEDMOBILE 5.296AMobile-satellite exceptaeronautical mobile-satelliteRADIO ASTRONOMYRADIONAVIGATION |
| 1 401-1 429 | RADIO ASTRONOMYSPACE OPERATIONFIXEDMOBILE except aeronautical mobile |
| 2 645-2 745 | AERONAUTICAL RADIONAVIGATIONBROADCASTING-SATELLITEFIXEDFIXED-SATELLITEMOBILE except aeronauticalmobileRADIO ASTRONOMYRadiolocation |
| 2 790-2 810 | AERONAUTICAL RADIONAVIGATIONRadiolocation |
| 4 970-5 020 | AERONAUTICAL MOBILE-SATELLITE (R) AERONAUTICAL RADIONAVIGATIONFIXEDMOBILE MOBILE except aeronautical mobileRADIO ASTRONOMYRADIONAVIGATION-SATELLITE |
| 8 775-8 825 | AERONAUTICAL RADIONAVIGATIONRADIOLOCATION |
| 15 300-15 500 | AERONAUTICAL RADIONAVIGATIONFIXEDFIXED-SATELLITEMOBILESpace researchRADIO ASTRONOMY RADIOLOCATION |
| Riometers | 19.5-21.5 | AMATEURAMATEUR-SATELLITEBROADCASTING FIXEDMobileMARITIME MOBILE STANDARD FREQUENCY AND TIME SIGNALSpace research |
| 29-31 | AMATEURAMATEUR-SATELLITEFIXEDMOBILESPACE OPERATION (satellite identification)SPACE RESEARCH |
| 37.2-39.2 | FIXEDMOBILERadio astronomyRadiolocation |
| 41-61 | AMATEUR BROADCASTING FIXEDMOBILESpace researchRadiolocation |

 |
| ***Part D: Conclusion of the results of studies if any*** |
| Currently, WP7C and contributing groups are undertaking proposed revisions to Report RS.2456. The Report provides summary of space weather sensor systems using radio spectrum which are used for detection of solar activity and the impact of solar activity on the Earth, its atmosphere and its geospace. The preliminary draft revision of the Report ITU-R RS.2456-0 is currently being developed.Spectrum requirements and applicable radio service designation for receive only space sensors that provide critical data for predictions and warning is currently being developed in WP 7C. A working document towards a **Preliminary Draft New Report ITU-R RS [SPEC\_REQTS\_RX\_SPACE\_WEATHER]** has been developed and contributions being incorporated.Compatibility issues relating to the operation of receive only space weather sensors are currently being addressed under the working documents towards **Preliminary Draft New Report ITU-R RS. [RXSW\_SHARING\_STUDIES]**. WP 7C-1 will hold a joint meeting between WP 7C and WP 7D in September 2021 to establish a common understanding of the relationship between space weather sensor operations and the radio astronomy service to aid the work of relating to the topic under study.Note:1. Since a receive-only system cannot cause interference to incumbent services, compatibility studies of the interference from receive-only sensor systems to incumbent radio services are not necessary
2. Resolution**657** **(Rev.WRC-19)** states that additional constraints may not be placed on incumbent services. Since constraints on existing services are not permitted, compatibility and sharing studies of interference from incumbent services into receive-only sensors will provide no relevant information for addressing the issue and are not necessary.

Therefore;All studies will be focused on establishing the necessary information for future studies as new allocations are considered. |
| ***Part E: Options and Associated Implications*** |
|

| Approach | Advantages | Disadvantages |
| --- | --- | --- |
| Regional or Global Allocations the meteorological aids service in Article **5** | • Will cover any future requirements for new or relocated space weather sensor stations | • Excessively difficult and complex approach for protection of a limited number of stations• New allocations would be required in many frequency band from 10 MHz to 18 GHz• Successful outcome unlikely |
| Regulatory provision or WRC Resolution protecting station locations operating under the meteorological aids service | • Does not require populating Table of Allocations with many new allocations • Focused approach to recognize/protect the critical sites supporting predictions and warnings• Less complex relative to incumbent radio services | • Not a commonly used approach• A site-specific solution will require WRC action for future changes. |

*Potential Approaches for incorporation into future agenda item for providing regulatory recognition and/or protection to receive-only space weather sensors.* *Options for addressing changes in Article 1 and 4 of the RR** *MetAids service may be designated as applicable radio service for receive-only space sensors, these will ensure that no changes to Article 1 of the RR are necessary.*
* *No information with regard to changes to Article 4 are envisaged at this time*
* *Solar measurements are part of radio astronomy, however, the frequencies of interest to support space weather predictions and warnings are not exactly the same as those of RAS.*
 |
| ***Part F: Proposed EACO Common View and/or Position*** |
| Support the recognition and protection of the application given the importance of space weather system in human welfare and national security while ensuring that services, in the identified Broadcasting, Broadcasting and Fixed satellites, Radio Astronomy and other incumbent service are protected. |
| ***Part G: Recommendations and Way Forward*** |
| *EACO invites member to:* *Follow-up the studies under this agenda item to identify critical bands for recognition and protection of space weather systems without imposing any restrictions on any existing services.* |
| ***Part H: Regional Groups and international organizations Preliminary Positions*** |
|

|  |  |
| --- | --- |
| ***RCC*** | *RCC supports the studies to protect space weather sensors without placing additional constraints on incumbent services.* |
| ***CEPT*** | *Supports identification of priority frequency bands which provide data critical for space weather forecasting/warning and the development of appropriate recognition in the Radio Regulations (RR) for frequency bands used by space weather sensors without placing additional constraints on incumbent services.*  |
| ***CITEL*** | *No positions yet.* |
| ***ASMG*** | *Follow-up the studies under this agenda item without imposing any restrictions on existing services.*  |
| ***APT*** | *APT Members support the ITU-R studies relating to the identification of space weather sensors, their technical and operational characteristics, spectrum requirements and appropriate radio service designations with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services* |

 |