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| A close up of a sign  Description automatically generated | **World Radiocommunication Conference (WRC-23) Dubai, 20 November - 15 December 2023** | |  |
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| PLENARY MEETING | | **Addendum 1 to Document 142(Add.24)-E** | |
|  | | **29 October 2023** | |
|  | | **Original: English** | |
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| United States of America | | | |
| Proposals for the work of the conference | | | |
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| Agenda item 9.1(9.1-a) | | | |

9 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the ITU Convention;

9.1 on the activities of the ITU Radiocommunication Sector since WRC‑19:

(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;

Resolution **657 (Rev.WRC-19)** – Protection of radio spectrum-reliant space weather sensors used for global prediction and warnings

Background

Space weather refers to the physical processes occurring in the space environment that ultimately affects human activities on Earth and in space. Space weather is influenced by the solar wind and the interplanetary magnetic field (IMF) carried by the solar wind plasma. These disturbances can result in a hazardous radiation environment for satellites and humans at high altitudes, ionospheric disturbances, geomagnetic field variations, and the aurora. These effects can in turn impact a number of services and infrastructure located on the Earth’s surface, airborne, or in Earth orbit. These disturbances are measured by sensors at various frequencies. Further, disturbances in the ionosphere and atmosphere have important impacts on radio communication, satellite navigation systems and heat the atmosphere which increases the atmospheric drag experienced by LEO satellites, including the International Space Station and Earth exploration-satellite service systems. Radionavigation-satellite service (RNSS) signals, which are used for a growing number of precision positioning, navigation, and timing applications, as well as for sounding the atmosphere using radio-occultation, are affected by space weather as they propagate through the ionosphere.

In response to Resolution **657 (Rev.WRC‑19)**, the ITU‑R has undertaken the study of the technical and operational characteristics and spectrum requirements of active and receive-only spectrum-reliant space weather sensor systems. Resolution **657 (Rev.WRC-19)** also invited the ITU‑R to conduct studies with the objective of determining the appropriate radio service or services that would apply to space weather sensors. The ITU‑R conducted a review of existing radiocommunications services as potential candidates under which space weather sensors can operate.

Receive-only space weather sensors enable observations through the detection of signals from natural origin as well as receiving signals of opportunity from other radiocommunication services (e.g. radionavigation-satellite service (RNSS)). All receive-only space weather observations should be operated in the same radiocommunication service, in order to allow for a consistent framework for the protection of these applications. Thus, the appropriate radiocommunication service for the receive-only usage of space weather sensors needs to have a suitable definition which can cover all of these different types of sensors and observation methodologies. While the radio astronomy service (RAS) could be an appropriate radiocommunication service for sensors observing signals from cosmic origin, its definition does not cover the observations of signals of opportunity. On the other hand, the definition of the meteorological aids service (MetAids) may be able to accommodate all space weather sensors.

Active space sensors generally emit radio pulses which are then mainly reflected by the ionosphere back to the same sensor system. The reflection in the high atmospheric layers depends on the applied frequency of the radio pulse, where the reflected signal provides information on the physical characteristics of these layers which are important for characterising impacts on RNSS and HF signals in general. Active sensor systems could also be included under the MetAids.

It should be noted that frequency selection for the sensor systems is dependent upon the scientific parameters being measured and their associated physics and includes frequency bands from 0.01 MHz to 80 GHz (see latest version of Report ITU‑R RS.2456).

Resolution **657 (Rev.WRC-19)** asks for necessary sharing studies with incumbent systems operating in frequency bands used by space weather sensors. No sharing or compatibility studies were undertaken by the ITU‑R.

Proposals

NOC USA/142A24A1/1

ARTICLES

**Reasons:** Changes to the Radio Regulations are outside the scope of WRC‑23 agenda item 9.1.

NOC USA/142A24A1/2

APPENDICES

**Reasons:** Changes to the Radio Regulations are outside the scope of WRC‑23 agenda item 9.1.

SUP USA/142A24A1/3

RESOLUTION 657 (REV.WRC‑19)

Protection of radio spectrum-reliant space weather sensors used for global prediction and warnings

**Reasons:** While the current version of Resolution **657 (Rev.WRC-19)** lacks specificity on the application radio service, candidate frequency bands, and regulatory provisions for continued studies, it is also associated with a preliminary agenda item for WRC-27. Action here is consistent with action being taken under the preliminary agenda item.

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