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SPECTRUM ASPECTS

World Meteorological Organization

PRELIMINARY POSITION ON WRC-19 AGENDA

This document provides the preliminary WMO positions on WRC-19 agenda, agreed within the January 2017 meeting of WMO Steering-Group on Radio-Frequency Coordination (SG-RFC).

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Attachment: 1

* Note by the Secretariat: For reference, this document has also been issued as Document 1A/153 – 1B/133 – 4A/242 – 4C/147 – 5-1/37 – 5A/334 – 5B/220 – 5C/209 – 5D/531 – 7B/132 – 7C/106 on 21 March 2017.

PRELIMINARY WMO POSITION ON WRC-19 AGENDA (JANUARY 2017)

1 Introduction

Timely warning of impending natural and environmental disasters, accurate climate prediction and detailed understanding of the status of global water resources: these are all critically important everyday issues for the global community. National Meteorological and Hydrological Services (NMHS) around the world are responsible for providing this information, which is required for the protection of the environment, economic development (transport, energy, agriculture, ...) and the safety of life and property.

Radio-frequencies represent scarce and key resources used by National Meteorological and Hydrological Services to measure and collect the observation data upon which analyses and predictions, including warnings, are based or processed, and to disseminate this information to governments, policy makers, disaster management organizations, commercial interests and the general public.

Nowadays radio-based remote sensors (active and passive) are the main tools for environment and climate monitoring, disaster prediction, detection and mitigating negative effects of disasters. These sensors obtain environmental data by measuring level and parameters of natural and artificial radio waves that inherently contain information about the environment with which they have been in contact. Terrestrial and space-borne remote sensing applications form the backbone of the WMO Integrated Global Observing System (WIGOS).

WMO information systems also make extensive use of radiocommunication systems and radio-frequency spectrum, and although they are also using commercially provided services such as communication satellites for the distribution of data, meteorological related radiocommunication systems are an essential and indispensable component of WMO's critical data collection and distribution systems (e.g. Earth-to-space and space-to-Earth transmissions). WMO Members in remote or isolated areas are most dependent on these special services and will benefit most from many of the new initiatives such as wireless broadband that are putting new stress on the demand for spectrum bandwidth.

The Report ITU-R RS.2178, referred to in Resolution **673 (Rev.WRC-12)** on "The importance of Earth observation radiocommunication applications", concluded in particular that:

"Most of this societal value is incommensurable in financial terms, as it relates to preventing large losses of lives or threats to socio-political stability and security. Scientific use of spectrum has also a direct impact in many economic areas, which can be estimated, by producing spin-offs in technology and economic developments in energy, transportation, agriculture, communications, etc. "

The development of new, mass-market and value-added radio applications is putting increasing pressure on the frequency bands used for meteorological purposes. This presents the potential risk of limiting meteorological and other related applications in the future.

On a more general basis, the utmost importance of radio-frequencies for all Earth Observation activities is also to be stressed. WMO in its role of coordinating observations, in particular with regard to global warming and climate change, is also an important Participating Organization of the intergovernmental Group on Earth Observations (GEO)¹.

This document reflects the preliminary position of the World Meteorological Organization (WMO) on the agenda of the World Radiocommunication Conference 2019 (WRC-19) as given in Resolution **809 (WRC-15)** “Agenda for the 2019 World Radiocommunication Conference”, subsequently approved by the ITU Council 2016 in its Resolution 1380.

2 General comments

WIGOS comprises components which make use of a wide number of different radio applications and services, some of which may be affected by WRC-19 Decisions.

Space-borne sensing of the Earth’s surface and atmosphere has an essential and increasing importance in operational and research meteorology, in particular for mitigating the impact of weather and climate-related disasters, and in the scientific understanding, monitoring and prediction of climate change and its impacts.

The impressive progress made in the recent years in weather and climate analysis and forecasts, including warnings for dangerous weather phenomena (heavy rain, storms, cyclones) that affect all populations and economies, is to a great extent attributable to space-borne observations and their assimilation in numerical models.

Space-borne passive sensing for meteorological applications is performed in bands allocated to the Earth exploration-satellite (passive) and meteorological-satellite services. Passive sensing requires the measurement of naturally-occurring radiations, usually of very low power levels, which contain essential information on the physical process under investigation.

The relevant frequency bands are determined by fixed physical properties (molecular resonance) that cannot hence be changed or ignored, nor are these physical properties able to be duplicated in other bands. Therefore, these frequency bands are an important natural resource. Even low levels of interference received by a passive sensor may degrade its data. In addition, in most cases these sensors are not able to discriminate between natural and man-made radiations.

For passive sensing bands shared with active services, the situation is tending to be more and more critical with the increased density of terrestrial active devices and serious cases of interference already being reported.

In the more critical passive sensing frequency bands, RR No. **5.340** stating that “all emissions are prohibited” enables in principle passive services to deploy and operate their systems with the highest reliability.

¹ GEO has the objective to realize a future wherein decisions and actions for the benefit of humankind are informed by coordinated, comprehensive and sustained Earth observations and information. GEO focuses on nine Social Benefits Areas: Agriculture, Biodiversity, Climate, Disasters, Ecosystems, Energy, Health, Water and Weather. GEO strongly advocates full and open data sharing to ensure that all countries benefit from data and information mostly at no cost to users. The availability, reliability and protection of suitable frequency bands required for the operation of Earth observation systems is of critical importance to GEO, its 90 Member countries, its participating organizations and ultimately all citizens.

However, in some cases this protection appears to be insufficient due to unregulated and potentially mass-market short range devices allowed nationally to operate in these bands or unwanted emissions from not properly regulated adjacent bands. One example is the significant interference in the passive band 1 400-1 427 MHz being observed worldwide by the radiometers on SMOS and Aquarius satellites.

Several geophysical parameters contribute, at varying levels, to natural emissions, which can be observed at a given frequency which presents unique properties. Therefore, measurements at several frequencies in the microwave spectrum must be made simultaneously in order to isolate and to retrieve each individual contribution, and to extract the parameters of interest from the given set of measurements.

As a consequence, interference that could impact a given “passive” frequency band could thus have an impact on the overall measurement of a given atmospheric component.

Each passive frequency band cannot hence be considered on its own but should be seen as a complementary component of a complete space-borne passive sensing system. Current scientific and meteorological-satellite payloads are not dedicated to one given band but include many different instruments performing measurements in the entire set of passive bands.

It should also be noted that full global data coverage is of particular importance for most weather, water and climate applications and services.

Space-borne active sensing, performed in particular by altimeters, rain and cloud radars, scatterometers and Synthetic Aperture Radars² provides meteorological and climatology activities with important information on the state of the ocean, ice and land surfaces and atmospheric phenomena.

In addition, **meteorological radars and wind-profiler radars** are important surface-based instruments in the meteorological observation processes. Radar data are input to nowcasting and to the numerical weather prediction models for short-term and medium-term forecasting. There are currently about one hundred wind-profiler radars and several hundreds of meteorological radars worldwide that perform precipitation and wind measurements and play a crucial role in the immediate meteorological and hydrological alert processes. Meteorological radar networks represent the last line of defence in a disaster warning strategy against loss of life and property in flash flood or severe storm events, such as in several recent dramatic cases.

Meteorological aids systems, mainly radiosondes, are the main source of atmospheric in situ measurements with high vertical resolution (temperature, relative humidity and wind speed) to provide real time vertical atmospheric profiles that are and will remain essential for operational meteorology, including weather analysis prediction and warnings, as well as for climate monitoring. In addition, these in situ measurements are essential for calibrating space-borne remote sensing, in particular passive.

Also of great importance is the availability of sufficient and well-protected Earth exploration and meteorological-satellite services radio-frequency spectrum for telemetry/telecommand as well as for satellite downlink of the collected data.

² Synthetic Aperture Radars (SAR) provide complementary information useful for flood disaster management.

The Seventeenth World Meteorological Congress (Geneva, June 2015), attended by 167 Member countries, confirmed serious concern at the continuous threat to radio frequency bands allocated for meteorological and related environmental systems and adopted the Resolution 29 (Cg-XVII) – Radio frequencies for meteorological and related environmental activities – in which all WMO Member countries are urged to make all efforts to do their utmost to ensure the availability and protection of suitable radio frequency bands required for meteorological and related environmental operations and research.

The Seventeenth World Meteorological Congress (Geneva, June 2015) “...expresses its serious concern at the continuing threat to several radio-frequency bands allocated to the meteorological aids, meteorological-satellite, Earth-exploration satellite and radiolocation (weather and wind profiler radars) services posed by the development of other radiocommunication services”, and “...urged the pursuance of, in an organized manner, to ensure the availability and protection of suitable radio-frequency bands required for meteorological and related environmental operations and research.”

The dependency of observing systems on radio-frequency management has long term ramifications on the sustainability and usability of essential climate variables and other weather, water and climate related observations that contribute to the Observations and Monitoring pillar of the Global Framework for Climate Services (GFCS) as identified at the Seventeenth World Meteorological Congress (Geneva, June 2015).

3 WMO preliminary position on WRC-19 Agenda

Among WRC-19 agenda items, thirteen items are related to frequency bands or issues of prime interest or concern for meteorology and the related fields.

Agenda item **1.1**: Amateur service in the 50-54 MHz band (see section 3.1)

Agenda item **1.2**: Satellite hard limits at 400 MHz (see section 3.2)

Agenda item **1.3**: METSAT and EESS at 460-470 MHz (see section 3.3)

Agenda item **1.6**: Non GSO FSS at 37.5-51.4 GHz (see section 3.4)

Agenda item **1.7**: Small satellites (see section 3.5)

Agenda item **1.13**: IMT 5G (see section 3.6)

Agenda item **1.14**: HAPS (see section 3.7)

Agenda item **1.15**: FS/MS above 275 GHz (see section 3.8)

Agenda item **1.16**: RLAN 5 GHz (see section 3.9)

Agenda item **9.1.5**: RLAN 5 GHz and reference to radar ITU-R recommendations (see section 3.10)

Agenda item **9.1.6**: Wireless Power Transmission (WPT) (see section 3.11)

Agenda item **9.1.9**: FSS at 51.4-52.4 GHz (see section 3.12)

Agenda item **10**: Agenda for next WRCs (see section 3.13)

There are also seven WRC-19 agenda items that are currently not involving specific frequency bands used for meteorological operations but that may potentially have an impact on WMO interests. These are addressed in section 4.

The WRC-19 Decisions on the following WRC-19 agenda items may have positive or negative effect on development and operation of meteorological systems and applications:

3.1 Agenda item 1.1

“to consider an allocation of the frequency band 50-54 MHz to the amateur service in Region 1, in accordance with Resolution **658 (WRC-15)**.”

Footnote RR No. **5.162A** provides an additional allocation to the radiolocation service on a secondary basis in the frequency 46-68 MHz in a number of countries, limited to the operation of wind profiler radars in accordance with Resolution **217 (WRC-97)**;

This secondary status provided to wind profiler radars by this footnote could create difficulties if a new allocation for amateur service is based on a primary status. Furthermore, a new allocation for the amateur-satellite service is not excluded under the agenda item. This could lead to harmful interference produced in the WPR main beam.

WMO Position on WRC-19 agenda item 1.1:

WMO does not oppose an allocation to amateur service in the 50-54 MHz provided that: appropriate protection of radiolocation service allocated by RR No **5.162A** is ensured and the status of the new allocation to amateur service provides the radiolocation service equality or precedence relative to the amateur service.

WMO opposes any new allocation to amateur-satellite service in this frequency band

3.2 Agenda item 1.2

“to consider in-band power limits for earth stations operating in the mobile-satellite service, meteorological-satellite service and Earth exploration-satellite service in the frequency bands 401-403 MHz and 399.9-400.05 MHz, in accordance with Resolution **765 (WRC-15)**.”

Globally, tens of thousands of data collection system (DCS) stations are operating in the 401-403 MHz frequency band communicating to sensitive receivers on GSO and non-GSO satellites for the purpose of collecting essential weather and climate data. These stations operate with low power. Use of earth stations, using higher e.i.r.p. than those related to these DCS systems, in particular for telecommand links (Earth to space), would negatively impact on the operation of those systems.

A set of in band power/e.i.r.p. limits will have to be tailored to ensure the operations of both non-GSO and GSO DCS systems.

WMO Position on WRC-19 agenda item 1.2:

WMO supports the establishment of an appropriate set of in band power/e.i.r.p. limits to ensure the protection of existing and future use of meteorological operations (e.g. METSAT and EESS (Earth-to-space)) in the 401-403 MHz frequency band for both non-GSO and GSO DCS systems.

3.3 Agenda item 1.3

“to consider possible upgrading of the secondary allocation to the meteorological satellite service (space-to-Earth) to primary status and a possible primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz, in accordance with Resolution **766 (WRC-15)**.”

Data collection systems (DCS) operate in the meteorological satellite service (MetSat) and the Earth exploration-satellite service (EESS) (Earth to-space) systems in the frequency band 401-403 MHz (Earth-to-space) and 460-470 MHz (space-to-Earth). DCS are essential for monitoring and predicting climate change, monitoring ocean, and water resources, weather forecasting and assisting in protecting biodiversity, as well as improving maritime security. The 460-470 MHz is used for a

downlink component of DCS for commanding and interrogating with DCS stations providing an essential element of DCS.

According to RR No. **5.289**, Earth exploration-satellite service applications may also be used in the bands 460-470 MHz for space-to-Earth transmissions providing the necessary protection to incumbent primary services but also constrains such operations to be secondary to the MetSat operations permitted under that footnote.

A primary allocation to the MetSat service and EESS (downlink) in the frequency band 460-470 MHz would provide regulatory stability for space and meteorological agencies deeply involved in satellite data collection programs and the public sectors funding the development and operation of such systems. However, it has to be noted a potential risk regarding the results of the studies if a too stringent of a pfd value is applied to protect the existing services.

WMO Position on WRC-19 agenda item 1.3:

WMO supports the upgrade of the METSAT (space-to-Earth) allocation to primary in the frequency band 460-470 MHz with the use of an appropriate PFD limit to protect incumbent services.

WMO also supports creation of a primary allocation to the EESS (space-to-Earth) in the frequency band 460-470 MHz with the use of an appropriate PFD limit to protect incumbent services, while retaining the priority of MetSat over EESS as currently expressed in footnote RR No. **5.289**.

3.4 Agenda item 1.6

“to consider the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with Resolution **159 (WRC-15)**.”

Under this agenda item, studies will be conducted providing the opportunity to revise Resolution **750 (Rev.WRC-15)** to ensure protection of the EESS (passive) in the frequency bands 36-37 GHz and 50.2-50.4 GHz from non-GSO FSS transmission, including study of aggregate FSS interference effects from networks and systems operating or planned to operate in the frequency bands 37.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space).

Studies will also have to be conducted on sharing between non-GSO FSS and EESS (Earth-to-space) in the band 40-40.5 GHz.

In addition, regarding the 50.4-51.4 GHz frequency band, ground based radiometer operations are at risk of interference due to their unprotected status.

WMO Position on WRC-19 agenda item 1.6:

WMO supports the development of a regulatory framework (including revisions to Resolution **750 (Rev.WRC-15)** for non-GSO FSS satellite systems in the 37.5-51.4 GHz range provided that protection of EESS (Earth-to-space) in the band 40-40.5 GHz and EESS (passive) in the bands 36-37 GHz and 50.2-50.4 GHz is ensured by including appropriate unwanted emission limits in Resolution **750 (Rev. WRC-15)**.

WMO would appreciate the development of a solution to ensure the effective operation of the ground-based radiometers in the 50.4-51.4 GHz frequency band.

3.5 Agenda item 1.7

“to study the spectrum needs for telemetry, tracking and command in the space operation service for non-GSO satellites with short duration missions, to assess the suitability of existing allocations to the space operation service and, if necessary, to consider new allocations, in accordance with Resolution **659 (WRC-15)**.”

WMO is only concerned regarding the considerations of a new allocation to the space operation service (SOS) within the frequency range 400.15-406 MHz which is extensively used on a worldwide basis by radiosondes and meteorological satellite (Data Collection System) operations.

WMO recognizes that some of the satellites that would use spectrum allocated under this agenda item would perform meteorological and Earth science missions.

WMO notes the link with WRC-19 AI 1.2 on in-band power limits for earth stations operating in the mobile-satellite service, meteorological-satellite service and Earth exploration-satellite service in the frequency band 401-403 MHz.

WMO Position on WRC-19 agenda item 1.7:

WMO emphasises that the frequency band 400.15-406 MHz is the key band for radiosondes and DCS worldwide operations and is concerned about its consideration under this agenda item.

3.6 Agenda item 1.13

“to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **238 (WRC-15)**.”

This agenda item considers possible new spectrum allocations suitable for delivery of terrestrial wireless broadband in the frequency range between 24.25 GHz and 86 GHz. This will encompass the following elements, set out in full in Resolution **238 (WRC-15)**:

Spectrum needs for the terrestrial component of IMT

Sharing and compatibility studies for the following frequency bands:

- 24.25-27.5 GHz , 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz;
- 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz.

These studies will cover compatibility with services in adjacent bands, when needed.

WMO has concerns with the following issues:

- Sharing with EESS (s-E) in the band 25.5-27 GHz.
- Sharing with ISS in the band 25.25-27.5 GHz.
- Sharing with EESS (E-s) in the band 40-40.5 GHz.

- Compatibility between IMT and EESS (passive) in the bands 23.6-24 GHz, 31.5-31.8 GHz, 36-37 GHz, 50.2-50.4 GHz, 52.6 - 54.25 GHz and 86-92 GHz.

WMO points out the need to ensure the protection of existing earth stations but also the future deployment of receiving earth stations under the EESS (space-to-Earth) allocation in the frequency band 25.5-27 GHz.

Regarding the 22-28 GHz and 50.4-51.4 GHz frequency bands, an interference problem could occur with ground-based radiometers.

WMO notes the frequency overlaps with WRC-19 agenda items 1.6 and 1.14 which need to be taken into account.

WMO Position on WRC-19 agenda item 1.13:

WMO supports the need to conduct studies under agenda item 1.13. WMO does not oppose new IMT 5G identification/allocations provided that protection of ISS, EESS (Earth-to-space and space-to-Earth) and EESS (passive) is ensured and that guarantees are given on the long-term usage and future deployment of receiving EESS earth stations (in particular in the 25.5-27 GHz band).

The protection of EESS (passive) would require appropriate unwanted emission limits in Resolution **750 (Rev. WRC-15)**.

Furthermore, WMO would appreciate the development of a solution to ensure the effective operation of the ground-based radiometers in the 22-28 GHz and 50.4-51.4 GHz frequency bands.

3.7 Agenda item 1.14

“to consider, on the basis of ITU-R studies in accordance with Resolution **160 (WRC-15)**, appropriate regulatory actions for high-altitude platform stations (HAPS), within existing fixed-service allocations.”

Resolution **160 (WRC-15)** calls for studies to identify additional spectrum needs for gateway and fixed terminal links for HAPS in order to facilitate access to broadband applications delivered by HAPS. If the existing allocations for HAPS are not suitable, then studies could be conducted to assess the spectrum needs of HAPS in the frequency bands of 38-39.5 GHz on a global level and 21.4-22 and 24.25-27.5 GHz in Region 2.

WMO is concerned with potential compatibility issues between HAPS and:

- the EESS (passive) in the frequency band 21.2-21.4 GHz;
- ISS in the frequency band 25.25-27.5 GHz, and
- EESS (s-E) in the frequency band 25.5-27 GHz.

WMO notes that HAPS downlinks will have a more severe impact in EESS and SRS receiving earth stations than HAPS uplinks.

Regarding the 22-28 GHz frequency band, an interference problem could occur with ground-based radiometers.

Furthermore, WMO notes the frequency overlaps with WRC-19 1.6 and 1.13 Agenda Items which need to be taken into account.

WMO Position on WRC-19 agenda item 1.14:

WMO does not oppose new HAPS band identifications provided that studies show a need for identification of additional spectrum for HAPS and that protection of ISS, EESS (space-to-Earth), and EESS (passive) is ensured and that guarantees are given on the long-term usage and future deployment of receiving EESS earth stations (in particular in the 25.5-27 GHz band).

The protection of EESS (passive) would require appropriate unwanted emission limits in Resolution **750 (Rev. WRC-15)**.

Furthermore, WMO would appreciate the development of a solution to ensure the effective operation of the ground-based radiometers in the 22-28 GHz frequency band.

3.8 Agenda item 1.15

“to consider identification of frequency bands for use by administrations for the land mobile and fixed services applications operating in the frequency range 275-450 GHz, in accordance with Resolution **767 (WRC-15)**.”

Resolution **767 (WRC-15)** invites the ITU-R to conduct sharing and compatibility studies regarding the introduction of land-mobile and fixed services into the frequency range 275-450 GHz. Before any new allocations, technical characteristics and spectrum requirements of these future systems need to be documented. RR No. **5.565** lists several frequency bands in the range 275-1 000 GHz identified for EESS (passive), SRS (passive) and Radioastronomy .

WMO Position on WRC-19 agenda item 1.15:

WMO does not oppose the identification of land-mobile and fixed services in the 275-450 GHz band provided that protection of EESS (passive) is ensured and the identification is consistent with footnote RR No. **5.565**.

If allocations for active service are envisaged, the same approach would have to be applied to passive service.

3.9 Agenda item 1.16

“to consider issues related to wireless access systems, including radio local area networks (WAS/RLAN), in the frequency bands between 5 150 MHz and 5 925 MHz, and take the appropriate regulatory actions, including additional spectrum allocations to the mobile service, in accordance with Resolution **239 (WRC-15)**.”

This agenda item will consider the results of studies concerning Wireless Access Systems including radio local area networks (WAS/RLAN) in the frequency bands between 5 150 MHz and 5 925 MHz and take appropriate actions according to Resolution **239 (WRC-15)**. WMO interests are related to the following frequency bands:

5250-5350 MHz

This frequency band is already allocated to mobile service for RLAN use, the aim of this agenda item is to relax the access conditions (outdoor use) applicable to WAS/RLANs. Studies will have to show that sharing and compatibility could be achieved with EESS (active) under this proposed relaxed conditions. Initial studies presented in ITU-R show that this compatibility would be difficult to achieve.

5 350-5 470 MHz

This frequency band is used by a number of EESS (active) instruments of different types, i.e. altimeters, scatterometers and Synthetic Aperture Radars (SAR). SARs, in particular, were specifically designed to operate solely within these 120 MHz as this frequency band is the only one left in the 5 GHz frequency range where the EESS (active) allocation is not shared with an allocation to the mobile service. Introduction of RLANs to this band would result in severe interference into SARs such as CSAR on Sentinel 1 and RadarSat, scatterometers such as SCA on Metop-SG and altimeters such as Poseidon on Jason satellites.

This frequency band was already studied during the last study period under WRC-15 agenda item 1.1. Based on the ITU-R study results related to the protection of EESS (active) systems/applications, it is concluded that sharing would only be feasible if further additional mitigation techniques could be applied even if the RLAN systems are limited to indoor use only.

This frequency band is also used by ground-based meteorological radars. Any proposed new allocations would require the protection of all the existing and future radars deployed in this frequency band (development of any appropriate mitigation techniques to be applied to RLAN and not to meteorological radars).

As far as mitigation techniques are concerned:

- WMO notes that no appropriate mitigation techniques have been proposed to ensure compatibility with EESS (active) systems in the 5350-5470 MHz frequency band.
- WMO is of the view that the current mitigation technique (i.e. Dynamic Frequency Selection) specified in the 5600-5650 MHz for the protection of meteorological radar would be applicable in the 5350-5470 MHz band to protect the meteorological radar in that band.

However, WMO stresses the fact that the number of interference cases experienced in the 5600-5650 MHz is continuing to increase worldwide mainly due to non-compliant and illegal use of RLAN systems by-passing the regulated mitigation technique.

To this respect, WMO would be concerned if an allocation was made to the RLAN in the 5350-5470 MHz band under the obvious knowledge of this intentional illegal use and non-compliant equipment and without efficient solutions to solve this problem.

WMO Position on WRC-19 agenda item 1.16:

Due to potential for increasing interference to the EESS (active), WMO opposes relaxed restrictions that would allow the outdoor use of RLAN devices in the 5250-5350 MHz frequency band.

WMO is highly concerned and opposed to an allocation/identification for RLAN in the frequency band 5 350-5 470 MHz, since it will in particular endanger the operation of current and planned EESS (active) systems.

Furthermore WMO is concerned that the current situation in the band 5600-5650 MHz, regarding intentional illegal use and non-compliant RLAN systems by-passing the regulated mitigation technique and leading to interference to meteorological radars, will be repeated in the 5350-5470 MHz band and additionally affect EESS (active) and meteorological radars.

3.10 Agenda item 9.1.5

“consideration of the technical and regulatory impacts of referencing Recommendations ITU-R M.1638-1 and ITU-R M.1849-1 in Nos. **5.447F** and **5.450A** of the Radio Regulations (Resolution **764 (WRC-15)**).”

Agenda item 9.1.5 addresses possible references to Recommendation ITU R M.1638-1 and Recommendation ITU R M.1849-1 in place of the original Recommendation ITU R M.1638-0 in both footnotes RR Nos. **5.447F** and **5.450A** which gives protection to radiolocation service, including meteorological radars, from RLANs.

Recommendation ITU-R M.1638-0 is incorporated in Radio Regulations by reference in footnote Nos. **5.447F** and **5.450A**. These footnotes mention that “stations in the mobile service shall not claim protection from radiodetermination services. Radiodetermination services shall not impose on the mobile service more stringent protection criteria, based on system characteristics and interference criteria, than those stated in Recommendation ITU R M.1638 0”.

Since the allocation for WAS/RLAN made at WRC-03, Recommendation ITU R M.1638-0 has been revised by Recommendation ITU R M.1638-1 which gives the characteristics of and protection criteria for sharing studies for radiolocation (except ground based meteorological radars) and aeronautical radionavigation radars operating in the frequency bands between 5 250 and 5 850 MHz. This revision includes the addition of new radiolocation systems in the 5 GHz frequency bands.

In addition, Recommendation ITU-R M.1849-1 was developed, focusing on ground based meteorological radars, providing technical and operational characteristics, some of which were not present in Recommendation ITU R M.1638-0 such as radar equation, emission schemes, operational scenarios.

Currently, Recommendation ITU R M.1849-1 is not incorporated into the Radio Regulations but such reference would allow inclusion of the most up to date information on meteorological radars operating in the frequency band.

WMO Position on WRC-19 agenda item 9.1.5:

WMO supports referencing Recommendation ITU-R M.1849-1 in No 5.450A of the Radio Regulations in order to ensure the continued protection of meteorological radars from WAS/RLAN systems operating under the mobile service allocation in the 5470-5725 MHz frequency band.

3.11 Agenda item 9.1.6

“Studies concerning Wireless Power Transmission (WPT) for electric vehicles.”

Resolution **958 (WRC-15)** calls to complete ITU-R studies concerning Wireless Power Transmission (WPT) for electric vehicles to assess the impact of WPT for electric vehicles on radiocommunication services and to study suitable harmonized frequency ranges which would minimize the impact on radiocommunication services from WPT for electrical vehicles.

The frequency range initially mentioned under this Agenda Item is 20 to 6800 kHz. If this frequency range is confirmed, details on WPT principles and related propagation conditions will be needed to assess the potential impact of WPT on lightning detection networks and oceanographic radars deployed by the meteorological community.

WMO Position on WRC-19 agenda item 9.1.6:

WMO does not oppose to study the suitable harmonized frequency ranges for WPT provided that it does not impact operation of lightning detection networks operating in the 20-350 kHz range and oceanographic radars operating in the 5250-5275 kHz frequency band.

3.12 Agenda item 9.1.9

“studies relating to spectrum needs and possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (Earth-to-space) (Resolution **162 (WRC-15)**).”

WMO is concerned with the appropriate protection of EESS (passive) in the bands 50.2-50.4 GHz and 52.6-54.25 GHz from GSO FSS (E-s) in the band 51.4-52.4 GHz.

Regarding the 50.4-51.4 GHz frequency band, an interference problem could occur with ground-based radiometers.

WMO Position on WRC-19 agenda item 9.1.9:

WMO does not oppose to the possible allocation of the frequency band 51.4-52.4 GHz to the FSS (E-s) provided that protection of EESS (passive) in the bands 50.2-50.4 GHz and 52.6-54.25 GHz is ensured.

The protection of EESS (passive) would require appropriate unwanted emission limits in Resolution **750 (rev. WRC-15)**.

Furthermore, WMO would appreciate the development of a solution to ensure the effective operation of the ground-based radiometers in the 50.4-51.4 GHz frequency band.

3.13 Agenda item 10

“to recommend to the Council items for inclusion in the Agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, in accordance with Article 7 of the Convention, (Resolution **808 (WRC-12)**).”

WMO will provide possible additional agenda items, as appropriate, and its position on other proposals in time for WRC-19. There are currently two items on the WRC-23 Preliminary Agenda that are of prime interest to WMO:

- WRC-23 Preliminary agenda item 2.2- “to conduct, and complete in time for WRC-23, studies for a possible new 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, in accordance with Resolution **656 (WRC-15)**;”
- WRC-23 Preliminary agenda item 2.3- “in accordance with Resolution **657 (WRC-15)**, to 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 providing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services;”

WRC-19 will make a final determination on retention of these agenda items on the WRC-23 Agenda when the agenda is finalized under WRC-19 agenda item 10.

WMO Position on WRC-19 agenda item 10:

WMO supports retention of both of the preliminary agenda items on the WRC-23 Agenda, related to EESS (active) around 45 MHz and to space weather sensors.

4 Other WRC-19 agenda items that may have an impact on WMO interests

Other WRC-19 agenda items that may potentially have an impact on WMO interests are listed below. WMO will monitor the development under these agenda items and react accordingly in order to protect meteorological interests.

Agenda item 1.11

“to take necessary actions, as appropriate, to facilitate global or regional harmonized frequency bands to support railway radiocommunication systems between train and trackside within existing mobile service allocations, in accordance with Resolution **236 (WRC 15)**.”

Since no specific frequency bands have currently been proposed for study, WMO does not have a specific concern on this agenda item. Consideration of frequency bands used for meteorological operations would increase WMO concerns.

Agenda item 1.12

“to consider possible global or regional harmonized frequency bands, to the maximum extent possible, for the implementation of evolving Intelligent Transport Systems (ITS) under existing mobile-service allocations, in accordance with Resolution **237 (WRC 15)**.”

Since no specific frequency bands have been currently proposed for study, WMO does not have a specific concern on this agenda item. Consideration of frequency bands used for meteorological operations would increase WMO concerns.

Agenda item 2

“to examine the revised ITU R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with Resolution **28 (Rev.WRC 15)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with the principles contained in Annex 1 to Resolution **27 (Rev.WRC 12)**.”

WMO will monitor this AI to ensure that any possible change to the RR will not adversely impact any service used for meteorological needs.

Agenda item 4

“in accordance with Resolution **95 (Rev.WRC 07)**, to review the resolutions and recommendations of previous conferences with a view to their possible revision, replacement or abrogation.”

WMO will monitor this AI to ensure that any possible change to the RR will not adversely impact any service used for meteorological needs.

Agenda item 7

“to consider possible changes, and other options, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, an advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86 (Rev.WRC 07)**, in order to facilitate rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary satellite orbit.”

This standing agenda item to the WRCs deals with any possible changes to the Radio Regulations affecting the advance publication, coordination, notification and recording of satellite networks.

WMO will support changes to the Radio Regulations that would improve the advance publication, coordination, notification and recording procedures for satellite networks.

Agenda item 9.1.4

“Stations on board sub-orbital vehicles (see Resolution **763 (WRC-15)**).”

Resolution 763 calls, in particular, for studies to identify any required technical and operational measures, in relation to stations on board sub-orbital vehicles, that could assist in avoiding harmful interference between radiocommunication services.

WMO will monitor this AI to ensure that these measures will not adversely impact any service used for meteorological operations.

Agenda item 9.1.7

“Unauthorized terminals (see Resolution **958 (WRC-15)**)”

Resolution **958 (WRC-15)** calls for studies to examine whether there is a need for possible additional measures in order to limit uplink transmissions of terminals to those terminals authorized in accordance with No. 18.1 and the possible methods that will assist administrations in managing the unauthorized operation of earth station terminals deployed within its territory, as a tool to guide their national spectrum management program, in accordance with Resolution ITU-R 64 (RA 15).

WMO will monitor this AI to ensure that any possible change will not adversely impact any service used for meteorological operations.

Agenda item 9.1.8

“M2M (see Resolution **958 (WRC-15)**).”

Resolution **958 (WRC-15)**, specifically Issue 3) in its Annex, states: “Studies on the technical and operational aspects of radio networks and systems, as well as spectrum needed, including possible harmonized use of spectrum to support the implementation of narrowband and broadband machine-type communication infrastructures, in order to develop Recommendations, Reports and/or Handbooks, as appropriate, and to take appropriate actions within the ITU Radiocommunication Sector (ITU-R) scope of work.”

WMO will monitor this AI to ensure that the results of these studies will not adversely impact any service used for meteorological operations.
