**UNITED STATES OF AMERICA**

DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE

**Agenda Item 9.1 (Issue 9.1.5)**

**Agenda Item 9.1/Issue 9.1.5**: **Resolution 764 (WRC-15)** 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

**Background Information**: Radio Local Area Networks (RLANs) and Radars in the 5 250-5 350 MHz and 5 470-5 725 MHz bands provide valuable services as part of national infrastructures, and sharing between RLANs and Radars in these bands has been proven feasible for some applications. The sharing of spectrum by RLANs under the mobile service and Radars under the radiolocation service in these bands is pursuant to RR Nos. 5.447F and 5.450A. The challenge of WRC-19 Agenda Item 9.1/Issue 9.1.5 is to determine what, if any, are 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 while ensuring that no undue constraints are imposed on any of the services referenced in Nos. 5.447F and 5.450A.

The global demand for RLANs (e.g., Wi-Fi devices) is evidenced by widespread adoption of devices, increasing connection speeds, data traffic volumes and other metrics. The surging popularity of Wi-Fi for internet traffic and mobile data traffic means that Wi-Fi is an essential component of the global telecommunications infrastructure that requires a stable regulatory framework to continue to bring users the benefits of spectrum access and functionality.

Radiolocation radars in the bands 5 250-5 350 MHz and 5 470-5 725 MHz perform a variety of functions, such as tracking space launch vehicles and aeronautical vehicles, sea and air surveillance, environmental measurements in the study of ocean water cycles and weather phenomena such as hurricanes, and Earth imaging. Airborne meteorological radars are used for both hurricane research and reconnaissance. New radar technologies for ground, ship, and airborne platforms are deploying and being developed in support of the above functions as part of the critical infrastructure.

During the ITU-R study cycle leading up to WRC-15, Recommendation ITU-R M.1638‑0, which is incorporated by reference into both Nos. **5.447F** and **5.450A**, was revised. In this revision process, several new radars with different system characteristics were included in Recommendations ITU-R M.1638-1 and M.1849-1.[[1]](#footnote-1) The revisions also included placing ground-based meteorological radars that were initially included in Recommendation ITU-R M.1638-0 into the revision of Recommendation ITU-R M.1849-0. In light of proposals to modify Nos. 5.447F and 5.450A to replace the reference to Recommendation ITU‑R M.1638‑0 with Recommendations ITU‑R M.1638-1 and M.1849-1, WRC-15 adopted agenda item 9.1/Issue 9.1.5 and associated Resolution **764 (WRC-15)** with the objective to investigate the technical and regulatory impacts on RLANs and radiolocation and radiodetermination services that would result from changing these references. It is important to emphasize that WRC-15 explicitly sought to ensure that no undue constraints are imposed on any of the services referenced in Nos. 5.447F and 5.450A as the result of the updating of references to ITU-R recommendations (see Resolution **764 (WRC-15)**, *resolves* 1 and 2).

The Dynamic Frequency Selection (DFS) mitigation technique from Annex 1 to Recommendation ITU-R M.1652-1 is required to be implemented by systems in the mobile service in the bands 5 250-5 350 MHz and 5 470-5 725 MHz to ensure compatible operation with radiodetermination systems and is incorporated by reference in *resolves* 8of Resolution **229 (Rev.WRC-12)** through No. **5.446A**. Taking this into account, the ITU-R has carried out a significant amount of work to study coexistence between RLANs and new types of radar systems (not included in Recommendation ITU‑R M.1638-0), in particular bi-static radars and fast frequency-hopping radars which operate in the 5250-5850 MHz frequency range. These studies sought to identify mitigation techniques that RLANs can implement to protect some of these new radar systems that is not yet possible under the mitigation technique of DFS. However, some of the new radar system characteristics included in the revision to Recommendation ITU‑R M.1638-0 are able to be protected with the DFS mitigation technique from Annex 1 to Recommendation ITU-R M.1652-1.

Recommendation ITU‑R M.1849‑1 provides technical and operational aspects of ground-based meteorological radars. Ground-based meteorological radars were initially included in Recommendation ITU-R M.1638-0, but were removed from the revision ITU-R M.1638-1 and placed in ITU-R M.1849-0, including additional radars. The comparison of the meteorological radar characteristics given in Recommendations ITU‑R M.1638-0 and M.1849-1, operating in the frequency ranges 5 250-5 350 MHz and 5 470-5 725 MHz, indicates that the protection requirements are similar, and that no undue constraints would thus be required for RLANs in the mobile service to protect the additional ground-based meteorological radars in Recommendation ITU-R M.1849-1 that were not also in Recommendation ITU-R M.1638-0. The required protection of all of the ground-based meteorological radars operating in the frequency ranges 5 250-5 350 MHz and 5 470-5 725 MHz is thus not assured without reference to Recommendation ITU-R M.1849-1 in Nos. 5.447F and 5.450A.

In summary, radars that can be protected using existing protection criteria and mitigation techniques (i.e., without any additional constraints to RLAN mobile operation), should be covered and protected through appropriate revisions to Nos. 5.447F and 5.450A. This includes all radars that were included in Recommendation ITU-R M.1638-0 (some of which are now in Recommendation ITU-R M.1638-1, and others of which are now in Recommendation ITU-R M.1849-1), as well as all of the new ground-based meteorological radars in Recommendation ITU-R M.1849-1, but only some of the new radars in Recommendation ITU-R M.1638-1.

To achieve these results, the following approach is proposed:

* Modify Nos. 5.447F and 5.450A to incorporate by reference Recommendation ITU-R M.1849-1 and provide a non-mandatory reference, in accordance with Resolution **27**, to Recommendation ITU-R M.1638-1 by applying a revised version of Resolution **764**. The incorporation by reference of Recommendation ITU-R M.1638-0 is retained.
* Modify Resolution **764** so that it does three things:
  + Specify that for radars that are in Recommendation ITU-R M.1638-1 but that were not in Recommendation ITU-R M.1638-0, mobile systems implementing WAS including RLANs in the subject bands protect radars having characteristics in Recommendation ITU-R M.1638-1 only to the extent provided by Annex 1 to Recommendation ITU-R M.1652-1;
  + Continue ITU-R studies to develop mitigation measures for mobile systems that would enable compatible operation with bi-static and fast frequency hopping radiodetermination systems in the 5 250-5 350 MHz and 5 470-5 725 MHz bands if implemented;
  + Continue the approach of current Resolution **764**, which requires that there be no undue constraints on the services mentioned in Nos. **5.447F** and **5.450A**.
* Propose firm no change to No. **5.446A**, which makes Resolution **229** **(Rev.WRC-12)** mandatory, and to Resolution **229** itself.

Under this proposal, through the adoption of the revised Resolution **764**, new bi-static and fast frequency hopping radars are protected only to the extent available via Annex 1 to Recommendation ITU-R M.1652-1.

Proposals to effect these provisions follow.

**Proposals:**

**MOD USA/9.1.5/1**

ARTICLE 5

Frequency allocations

**Section IV – Table of Frequency Allocations**

|  |  |  |
| --- | --- | --- |
| 5 250-5 570 MHz | | |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 5 250-5 255 EARTH EXPLORATION-SATELLITE (active)  MOBILE except aeronautical mobile 5.446A MOD5.447F  RADIOLOCATION  SPACE RESEARCH 5.447D  5.447E 5.448 5.448A | | |
| 5 255-5 350 EARTH EXPLORATION-SATELLITE (active)  MOBILE except aeronautical mobile 5.446A MOD5.447F  RADIOLOCATION  SPACE RESEARCH (active)  5.447E 5.448 5.448A | | |
| . . . | | |
| . . . | | |
| 5 470-5 570 EARTH EXPLORATION-SATELLITE (active)  MOBILE except aeronautical mobile 5.446A MOD5.450A  RADIOLOCATION 5.450B  MARITIME RADIONAVIGATION  SPACE RESEARCH (active)  5.448B 5.450 5.451 | | |
| 5 570-5 650 MOBILE except aeronautical mobile 5.446A MOD5.450A  RADIOLOCATION 5.450B  MARITIME RADIONAVIGATION  5.450 5.451 5.452 | | |
| 5 650-5 725 MOBILE except aeronautical mobile 5.446A MOD5.450A  RADIOLOCATION  Amateur  Space research (deep space)  5.282 5.451 5.453 5.454 5.455 | | |

MOD **USA/9.1.5/2**

5.447F In the frequency band 5 250-5 350 MHz, stations in the mobile service shall not claim protection from the radiolocation service, the Earth exploration-satellite service (active) and the space research service (active). These services shall not impose on the mobile service more stringent protection criteria, based on system characteristics and interference criteria, than those stated in Recommendations ITU‑R M.1638‑0, ITU-R M.1849-1, and ITU‑R RS.1632‑0. With respect to radiolocation radars included in Recommendation ITU-R M.1638‑1, but not in Recommendation ITU‑R M.1638-0, see Resolution **764** **(Rev.WRC-19)**.      (WRC-19)

**Reason**: Modifying the footnote to incorporate Recommendation ITU-R M.1849-1, would ensure that all meteorological radar types currently protected from harmful interference by RLAN and any other mobile service operations in the 5 250-5 350 MHz band continue to be protected. The inclusion of new radars in Recommendation ITU-R M.1638-1 is addressed by the citation of revised Resolution **764** (see Proposal USA/9.1.5/6) using non-mandatory language.

**MOD USA/9.1.5/3**

5.450A In the frequency band 5 470-5 725 MHz, 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 Recommendations ITU‑R M.1638‑0 and ITU-R M.1849-1. With respect to radiodetermination radars included in Recommendation ITU-R M.1638‑1, but not in Recommendation ITU‑R M.1638‑0, see Resolution **764** **(Rev.WRC-19)**. (WRC-19)

**Reason**: Modifying the footnote to incorporate Recommendation ITU-R M.1849-1, would ensure that all meteorological radar types currently protected from harmful interference by RLAN and any other mobile service operations in the 5 470-5 725 MHz band continue to be protected. The inclusion of new radars in Recommendation ITU-R M.1638-1 is addressed by the citation of revised Resolution **764** (see Proposal USA/9.1.5/6) using non-mandatory language.

**NOC USA/9.1.5/4**

**5.446A**

**Reason**: Retaining the mandatory reference to Resolution **229 (Rev.WRC-12)** in No. **5.446A**, which leads to the incorporation by reference of Recommendation ITU-R M.1652-1, is essential.

**NOC USA/9.1.5/5**

RESOLUTION 229 (Rev.WRC‑12)

Use of the bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz   
by the mobile service for the implementation of wireless access systems   
including radio local area networks

**Reason**: For the bands 5 250-5 350 MHz and 5 470-5 725 MHz, Resolution **229 (Rev.WRC-12)**, *resolves* 8 provides that Annex 1 to Recommendation ITU-R M.1652-1 contains mitigation measures that “shall be implemented by systems in the mobile service to ensure compatible operation with radiodetermination systems.” No. **5.446A** and Resolution **229 (Rev.WRC-12)** must remain in place for the approach proposed here to be effective.

**MOD USA/9.1.5/6**

RESOLUTION 764 (Rev.WRC‑19)

Technical and regulatory treatment of Recommendation ITU‑R M.1638‑1, as referenced in Nos. 5.447F and 5.450A of the Radio Regulations

The World Radiocommunication Conference (TBD, 2019),

considering

*a)* that the frequency bands 5 250-5 350 MHz and 5 470-5 725 MHz are allocated worldwide on a primary basis to the radiolocation service;

*b)* that WRC‑03 allocated the frequency bands 5 150-5 350 MHz and 5 470-5 725 MHz on a primary basis to the mobile service for the implementation of wireless access systems (WAS) including radio local area networks (RLANs);

*c)* that Resolution **229 (Rev.WRC‑12)** defines the conditions for the use of the frequency bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz by the mobile service for the implementation of WAS including RLANs while protecting existing primary services;

*cbis)* that one of the conditions in Resolution **229 (Rev.WRC-12)** for mobile service use of the bands 5 520-5 350 MHz and 5 470-5 725 MHz is that the mitigation measures in Annex 1 to Recommendation ITU-R M.1652-1 shall be implemented by systems in the mobile service to ensure compatible operation with radiodetermination systems;

*d)* that No. **5.447F**, as revised by WRC-19, states that in the frequency band 5 250-5 350 MHz, stations in the mobile service shall not claim protection from the radiolocation service, the Earth exploration-satellite service (active) and the space research service (active) and that these services shall not impose on the mobile service more stringent protection criteria, based on system characteristics and interference criteria, than those stated in Recommendations ITU‑R M.1638‑0, ITU-R M.1849-1, and ITU‑R RS.1632‑0;

*e)* that No. **5.450A**, as revised by WRC-19, states that in the frequency band 5 470-5 725 MHz, stations in the mobile service shall not claim protection from radiodetermination services and that radiodetermination services shall not impose on the mobile service more stringent protection criteria, based on system characteristics and interference criteria, than those stated in Recommendations ITU‑R M.1638‑0 and ITU-R M.1849-1;

*f)* that Nos. **5.447F** and **5.450A**, as revised by WRC-19, also state with respect to Recommendation ITU-R M.1638-1 that Resolution **764 (Rev.WRC-19)** applies,

noting

*a)* that Recommendation ITU‑R M.1638‑0 identifies the characteristics of, and protection criteria for sharing studies for, radiolocation, aeronautical radionavigation and meteorological radars operating in the frequency range 5 250-5 850 MHz;

*b)* that Recommendation ITU‑R M.1638‑1 identifies 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;

*c)* that Recommendation ITU-R M.1638-1 contains characteristics for radar systems that were contained in Recommendation ITU‑R M.1638‑0 as well as characteristics for radar systems that were not contained in Recommendation ITU-R M.1638-0;

*d)* that Annex 1 of Recommendation ITU‑R M.1652‑1 provides mitigation measures that must be used by systems in the mobile service for the implementation of wireless access systems (WAS) including radio local area networks (RLANs) to ensure compatible operation with radiodetermination systems in the 5250-5350 MHz and 5470-5725 MHz band, including radars having characteristics contained in Recommendation ITU‑R M.1638‑0,

further noting

*a)* that the references to Resolution **764 (Rev.WRC-19)** and Recommendation ITU‑R M.1638-1 in Nos. **5.447F** and **5.450A** of the Radio Regulations are not made using mandatory language;

*b)* that, according to *Principle 4* of Annex 1 to Resolution **27** **(Rev.WRC‑12)**, texts which are of a non-mandatory nature shall not be considered for incorporation by reference,

recognizing

*a)* that the mitigation measures provided in Annex 1 of Recommendation ITU-R M.1652-1 will assure protection of only some of the radars having characteristics in Recommendation ITU-R M.1638-1 that are not contained in Recommendation ITU-R M.1638-0;

b) that other mitigation measures have yet to be developed to protect bi-static and fast frequency hopping radars having characteristics included in Recommendation ITU-R M.1638-1 from RLAN interference in the 5 250-5 350 MHz and 5 470-5 725 MHz bands,

resolves

that radiolocation radars in the 5 250-5 350 MHz band and radiodetermination radars in the 5 470-5 725 MHz band with system characteristics and interference criteria included in Recommendation ITU-R M.1638-1, but not in Recommendation ITU-R M.1638-0, shall not claim more interference protection from systems in the mobile service than what is provided by the application of the mitigation measures in Annex 1 of Recommendation ITU-R M.1652-1;

resolves to invite the ITU Radiocommunication Sector

to continue efforts to develop a new or revised recommendation containing mitigation measures that, if implemented by systems in the mobile service, would provide the protection of all other radiolocation systems in the 5 250 -5 350 MHz band and radiodetermination systems in the 5 470-5 725 MHz band referred to in *recognizing* b) and would not impose undue constraints on either the mobile service or the radiodetermination services.

**Reason**: Addresses the need to develop mitigation techniques to protect newer Radars that are not adequately protected by the mitigation measures in Annex 1 of Recommendation ITU-R M.1652-1, while assuring no undue constraints on systems in the mobile service for the implementation of wireless access systems (WAS) including radio local area networks (RLANs).

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1. Consistent with the provisions of Resolution **27 (WRC-07)**, the reference in the Radio Regulations shall continue to apply to the earlier version incorporated by reference until such time as a competent WRC agrees to incorporate the new version. [↑](#footnote-ref-1)