

RESOLUTION 229 (REV.WRC-19)

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 wireless access systems including radio local area networks

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

- a)* 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);
- b)* that WRC-03 decided to make an additional primary allocation for the Earth exploration-satellite service (EESS) (active) in the frequency band 5 460-5 570 MHz and the space research service (SRS) (active) in the frequency band 5 350-5 570 MHz;
- c)* that WRC-03 decided to upgrade the radiolocation service to a primary status in the frequency band 5 350-5 650 MHz;
- d)* that the frequency band 5 150-5 250 MHz is allocated worldwide on a primary basis to the fixed-satellite service (FSS) (Earth-to-space), this allocation being limited to feeder links of non-geostationary-satellite (non-GSO) systems in the mobile-satellite service (MSS) (No. **5.447A**);
- e)* that the frequency band 5 150-5 250 MHz is also allocated to the mobile service, on a primary basis, in some countries (No. **5.447**) subject to agreement obtained under No. **9.21**;
- f)* that the frequency band 5 250-5 460 MHz is allocated to the EESS (active) and the frequency band 5 250-5 350 MHz to the SRS (active) on a primary basis;
- g)* that the frequency band 5 250-5 725 MHz is allocated on a primary basis to the radiodetermination service;
- h)* that there is a need to protect the existing primary services in the frequency bands 5 150-5 350 MHz and 5 470-5 725 MHz;
- i)* that results of studies in the ITU Radiocommunication Sector (ITU-R) indicate that sharing in the frequency band 5 150-5 250 MHz between WAS, including RLANs, and the FSS is feasible under specified conditions;
- j)* that studies have shown that sharing between the radiodetermination and mobile services in the frequency bands 5 250-5 350 MHz and 5 470-5 725 MHz is only possible with the application of mitigation techniques such as dynamic frequency selection;
- k)* that there is a need to specify an appropriate equivalent isotropically radiated power (e.i.r.p.) limit and, where necessary, operational restrictions for WAS, including RLANs, in the mobile service in the frequency bands 5 250-5 350 MHz and 5 470-5 570 MHz in order to protect systems in the EESS (active) and SRS (active);

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l) that the deployment density of WAS, including RLANs, will depend on a number of factors including intrasystem interference and the availability of other competing technologies and services;

m) that the means to measure or calculate the aggregate power flux-density (pfd) level at FSS satellite receivers specified in Recommendation ITU-R S.1426 are currently under study;

n) that certain parameters contained in Recommendation ITU-R M.1454 related to the calculation of the number of RLANs tolerable by FSS satellite receivers operating in the frequency band 5 150-5 250 MHz require further study;

o) that an aggregate pfd level has been developed in Recommendation ITU-R S.1426 for the protection of FSS satellite receivers in the frequency band 5 150-5 250 MHz;

p) that the attenuation offered by the car and train hulls, when WAS including RLANs are located inside automobiles and trains, could facilitate a level of protection to incumbent services from WAS including RLANs,

considering further

a) that the interference from a single WAS, including RLANs, complying with the operational restrictions under *resolves 2* will not on its own cause any unacceptable interference to FSS receivers on board satellites in the frequency band 5 150-5 250 MHz;

b) that such FSS satellite receivers may experience an unacceptable effect due to the aggregate interference from these WAS, including RLANs, especially in the case of a prolific growth in the number of these systems;

c) that the aggregate effect on FSS satellite receivers will be due to the global deployment of WAS, including RLANs, and it may not be possible for administrations to determine the location of the source of the interference and the number of WAS, including RLANs, in operation simultaneously,

noting

a) that, prior to WRC-03, a number of administrations developed regulations to permit indoor and outdoor WAS, including RLANs, to operate in the various frequency bands under consideration in this Resolution;

b) that, in response to Resolution **229 (WRC-03)***, ITU-R developed Report ITU-R M.2115, which provides testing procedures for implementation of dynamic frequency selection,

recognizing

a) that in the frequency band 5 600-5 650 MHz, ground-based meteorological radars are extensively deployed and support critical national weather services, according to footnote No. **5.452**;

* *Note by the Secretariat:* This Resolution was revised by WRC-12 and WRC-19.

- b) that the performance and interference criteria of spaceborne active sensors in the EESS (active) are given in Recommendation ITU-R RS.1166;
- c) that a mitigation technique to protect radiodetermination systems is given in Recommendation ITU-R M.1652;
- d) that Recommendation ITU-R RS.1632 identifies a suitable set of constraints for WAS, including RLANs, in order to protect the EESS (active) in the frequency band 5 250-5 350 MHz;
- e) that Recommendation ITU-R M.1653 identifies the conditions for sharing between WAS, including RLANs, and the EESS (active) in the frequency band 5 470-5 570 MHz;
- f) that the stations in the mobile service should also be designed to provide, on average, a near-uniform spread of the loading of the spectrum used by stations across the frequency band or bands in use to improve sharing with satellite services;
- g) that WAS, including RLANs, provide effective broadband solutions;
- h) that the demand for WAS/RLAN, including outdoor services, has increased since WRC-03;
- i) that there is a need for administrations to ensure that WAS, including RLANs, meet the required mitigation techniques, for example, through equipment or standards compliance procedures;
- j) that some sharing studies submitted to ITU-R between WAS/RLANs and the FSS for non-GSO MSS feeder uplinks, in the frequency band 5 150-5 250 MHz, have shown that WAS/RLAN outdoor relaxation up to 3 per cent of the total number of WAS/RLANs can be feasible;
- k) that measures to control the number of outdoor WAS/RLANs, in the frequency band 5 150-5 250 MHz, can include: authorization approach, registration procedures, domestic notification, limited application, limitation to fixed WAS/RLAN access points, etc.,

resolves

- 1 that the use of these frequency bands by the mobile service is for the implementation of WAS, including RLANs, as described in the most recent version of Recommendation ITU-R M.1450;
- 2 that, in the frequency band 5 150-5 250 MHz, stations in the mobile service shall be restricted to indoor use, including inside trains, with a maximum mean e.i.r.p.¹ of 200 mW and a maximum mean e.i.r.p. density of 10 mW/MHz in any 1 MHz band or equivalently 0.25 mW/25 kHz in any 25 kHz band; mobile stations inside automobiles shall operate with a maximum e.i.r.p. of 40 mW;

¹ In the context of this Resolution, “mean e.i.r.p.” refers to the e.i.r.p. during the transmission burst which corresponds to the highest power, if power control is implemented.

3 that in the frequency band 5 150-5 250 MHz, administrations may exercise some flexibility by taking appropriate measures that would allow controlled and/or limited outdoor usage with a maximum mean e.i.r.p.¹ of 200 mW; administrations have a further option to permit stations in the mobile service, for indoor or controlled outdoor use, to operate up to a maximum mean e.i.r.p. of 30 dBm; in the case of indoor or controlled outdoor use, administrations are requested to either ensure that the maximum e.i.r.p. at any elevation angle above 5 degrees as measured from the horizon shall not exceed 200 mW (23 dBm), or to ensure that the maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon shall not exceed 125 mW (21 dBm) or to apply the emission mask described in *resolves 5* below to maintain protection to the incumbent services; in that case, administrations shall take all appropriate measures, such as those described in *recognizing k*), to control the number of these higher power outdoor WAS/RLAN stations up to 2 per cent of the estimated total amount of WAS/RLAN stations; if the maximum e.i.r.p. is raised above 200 mW, unwanted emissions shall not increase above the existing levels already authorized within administrations for the existing systems that operate with an in-band e.i.r.p. of not greater than 200 mW; in all cases, administrations are requested to maintain protection to the other primary services;

4 that administrations may monitor whether the aggregate pfd levels given in Recommendation ITU-R S.1426² are exceeded as a consequence of a prolific growth in the number of WAS/RLANs;

5 that, in the frequency band 5 250-5 350 MHz, stations in the mobile service shall be limited to a maximum mean e.i.r.p. of 200 mW and a maximum mean e.i.r.p. density of 10 mW/MHz in any 1 MHz band; administrations are requested to take appropriate measures that will result in the predominant number of stations in the mobile service being operated in an indoor environment; furthermore, stations in the mobile service that are permitted to be used either indoors or outdoors may operate up to a maximum mean e.i.r.p. of 1 W and a maximum mean e.i.r.p. density of 50 mW/MHz in any 1 MHz band, and, when operating above a mean e.i.r.p. of 200 mW, these stations shall comply with the following e.i.r.p. elevation angle mask, where θ is the angle above the local horizontal plane (of the Earth):

-13 dB(W/MHz)	for $0^\circ \leq \theta < 8^\circ$
$-13 - 0.716(\theta - 8)$ dB(W/MHz)	for $8^\circ \leq \theta < 40^\circ$
$-35.9 - 1.22(\theta - 40)$ dB(W/MHz)	for $40^\circ \leq \theta \leq 45^\circ$
-42 dB(W/MHz)	for $45^\circ < \theta$;

6 that administrations may exercise some flexibility in adopting other mitigation techniques, provided that they develop national regulations to meet their obligations to achieve an equivalent level of protection to the EESS (active) and the SRS (active) based on their system characteristics and interference criteria as stated in Recommendation ITU-R RS.1632;

² $-124 - 20 \log(h_{SAT}/1\ 414)$ dB(W/(m² · 1 MHz)), or equivalently, $-140 - 20 \log(h_{SAT}/1\ 414)$ dB(W/(m² · 25 kHz)), at the FSS satellite orbit, where h_{SAT} is the altitude of the satellite (km).

7 that, in the frequency band 5 470-5 725 MHz, stations in the mobile service shall be restricted to a maximum transmitter power of 250 mW³ with a maximum mean e.i.r.p. of 1 W and a maximum mean e.i.r.p. density of 50 mW/MHz in any 1 MHz band;

8 that, in the frequency bands 5 250-5 350 MHz and 5 470-5 725 MHz, systems in the mobile service shall either employ transmitter power control to provide, on average, a mitigation factor of at least 3 dB on the maximum average output power of the systems, or, if transmitter power control is not in use, then the maximum mean e.i.r.p. shall be reduced by 3 dB;

9 that, in the frequency bands 5 250-5 350 MHz and 5 470-5 725 MHz, the mitigation measures for systems in the mobile service found in Annex 1 to Recommendation ITU-R M.1652-1 as well as the characteristics and interference criteria for systems in the radiolocation service stated in Annex 5 to Recommendation ITU-R M.1652-1 shall be used by systems in the mobile service to ensure compatible operation with radiodetermination systems,

invites administrations

1 to consider appropriate measures, when allowing the operation of stations in the mobile service using the e.i.r.p. elevation angle mask referred in *resolves* 5 above, to ensure the equipment is operated in compliance with this mask;

2 to take appropriate measures, such as the examples in *recognizing k*), to control the number of outdoor stations in the frequency band 5 150-5 250 MHz, if implementing *resolves* 3 above, in order to ensure the protection of incumbent services,

invites the ITU Radiocommunication Sector

1 to continue studies on mitigation techniques to provide protection of EESS from stations in the mobile service;

2 to continue studies on suitable test methods and procedures for the implementation of dynamic frequency selection, taking into account practical experience.

³ Administrations with existing regulations prior to WRC-03 may exercise some flexibility in determining transmitter power limits.

