

PLENARY MEETING

**Addendum 1 to
Document 6136(Add.16)-
E
28 August 2019
Original: English**

Member States of the Inter-American Telecommunication Commission (CITEL)

PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda item 1.16

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)**;

Part 1 – Frequency band 5 150-5 250 MHz

BACKGROUND

Radio Local Area Networks (RLANs) have proven to be a tremendous success in providing affordable and ubiquitous broadband connectivity. Introduced by some administrations in limited spectrum in the 2.4 GHz band and subsequently expanded into the 5 GHz band, RLANs, specifically Wi-Fi devices, now are an integral component of the world's connectivity infrastructure. According to the latest statistics, more than 50% of all global IP traffic will be delivered over Wi-Fi¹, and forecasts suggest that with the introduction of 5G and gigabit wireless technologies, the demand will continue to grow rapidly in the coming years. In spite of the growing demand, however, the spectrum available globally for RLAN access has remained unchanged since World Radiocommunication Conference 2003 (WRC-03). This lack of adequate spectrum threatens to degrade RLAN performance and limit connectivity for billions of consumers worldwide. This problem is particularly acute for RLAN outdoor deployments. Since WRC-03, requirements for RLAN outdoor deployments have evolved, for example:

- Smart cities and communities;²

¹ <https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/vni-hyperconnectivity-wp.html>

² <https://www.itu.int/en/ITU-T/ssc/Pages/default.aspx>

- Mobile Data – volume of mobile data traffic offloaded to Wi-Fi significantly exceeds traffic carried (remaining) on cellular networks;³
- Locations which are increasingly expected to offer ubiquitous Wi-Fi access including outdoor areas such as sports arenas, municipal/private networks, parks, and other high traffic areas as well as indoor areas such as shopping malls, airports, hotels, restaurants office buildings and schools;
- Sensors and connectivity for public transport, automotive, utilities, etc. rely on Wi-Fi connectivity;
- Internet of Things (IoT) technologies entail both indoor and outdoor deployments;
- Connected wearables and other consumer applications rely on Wi-Fi to support various use cases.

The problem of inadequate spectrum access for RLANs is exacerbated further by the fact that except for the band 5 150-5 250 MHz, other spectrum in the 5 GHz range harmonized for RLANs on a world-wide basis is subject to the dynamic frequency selection (DFS) constraint. The DFS constraint, albeit necessary, reduces spectrum access and raises equipment cost and complexity for RLAN implementation. Thus, the 5 150-5 250 MHz band offers unique advantages in addressing the growing need for RLAN outdoor access. Recognizing this fact, some administrations have adopted regulations that protect other operations while allowing limited RLAN operations outdoors in the 5 150-5 250 MHz band in co-existence with mobile-satellite-service (MSS) operations through E.I.R.P. limitations at higher antenna elevation angles. These rules are intended to prevent harmful interference to MSS Earth-to-space communications by limiting the aggregate noise received by the satellite.

The 5 150- 5 250 MHz band is allocated to the fixed satellite service (limited to feeder links of the non-geostationary satellite systems in the mobile satellite service), the aeronautical radionavigation service and the mobile service. In addition, RR No. 5.446C provides an additional allocation via country footnote for some countries to the aeronautical mobile service on a primary basis, limited to aeronautical telemetry transmissions from aircraft stations.

In Brazil, the frequency band 5 150-5 250 MHz band is essential for future aeronautical mobile telemetry transmissions, flight tests safety, and evaluation and aeronautical industry development.

The proposal below establishes an international regulatory framework that will enable much-needed RLAN outdoor deployments while ensuring protection of other operations (including aeronautical mobile telemetry in Brazil) in the 5 150-5 250 MHz band.

³ <https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/vni-hyperconnectivity-wp.html>

MOD IAP/6136A16A1/1

RESOLUTION 229 (REV.WRC-1992)

**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**

The World Radiocommunication Conference ([Sharm el-Sheikh, 2019](#)~~Geneva, 2012~~),

considering

- a) that WRC-03 allocated the 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 band 5 460-5 570 MHz and space research service (SRS) (active) in the band 5 350-5 570 MHz;
- c) that WRC-03 decided to upgrade the radiolocation service to a primary status in the 5 350-5 650 MHz band;
- d) that the 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 systems in the mobile-satellite service (No. **5.447A**);
- e) that the 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 band 5 250-5 460 MHz is allocated to the EESS (active) and the band 5 250-5 350 MHz to the SRS (active) on a primary basis;
- g) that the 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 5 150-5 350 MHz and 5 470-5 725 MHz bands;
- i) that results of studies in ITU-R indicate that sharing in the 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 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 e.i.r.p. limit and, where necessary, operational restrictions for WAS, including RLANs, in the mobile service in the bands 5 250-5 350 MHz and 5 470-5 570 MHz in order to protect systems in the EESS (active) and SRS (active);
- 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 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 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 5 150-5 250 MHz band,

further considering

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 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 have developed regulations to permit indoor and outdoor WAS, including RLANs, to operate in the various 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 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**;

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

~~c) 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 band 5 150-5 250 MHz require further study;~~

bd) that the performance and interference criteria of spaceborne active sensors in the EESS (active) are given in Recommendation ITU-R RS.1166;

ce) that a mitigation technique to protect radiodetermination systems is given in Recommendation ITU-R M.1652;

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

dg) 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 5 250-5 350 MHz band;

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

eh) that Recommendation ITU-R M.1653 identifies the conditions for sharing between WAS, including RLANs, and the EESS (active) in the 5 470-5 570 MHz band;

fi) 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 band or bands in use to improve sharing with satellite services;

gj) that WAS, including RLANs, provide effective broadband solutions, future demand has increased since the frequency range was first identified for this application;

hk) 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,

resolves

1 that the use of these bands by the mobile service ~~will be~~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 band 5 150-5 250 MHz, stations in the mobile service shall be restricted to indoor use with a maximum conducted output of 1 W provided the maximum antenna gain does not exceed 6 dBi (i.e. a total maximum e.i.r.p. of 36 dBm)mean e.i.r.p.¹, and, -in addition, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band, and, for the outdoor operation of stations in the mobile service 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), and finally, for WAS/RLAN transmitters operating in the 5 150-5 250 MHz band, all unwanted emissions outside of the 5 150-5 350 MHz band shall not exceed an e.i.r.p. of -27 dBm/MHzof 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;

~~3 that administrations may monitor whether the aggregate pfd levels given in Recommendation ITU-R S.1426² have been, or will be exceeded in the future, in order to enable a future competent conference to take appropriate action;~~

34 that in the 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.⁴. 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.

¹ For WAS/RLAN transmitters operating in the 5 150-5 250 MHz band, the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement. 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.

² ~~—124 – 20 log₁₀ (h_{SAT}/1 414) dB(W/(m² · 1 MHz)), or equivalently, —140 – 20 log₁₀ (h_{SAT}/1 414) dB(W/(m² · 25 kHz)), at the FSS satellite orbit, where h_{SAT} is the altitude of the satellite (km).~~

⁴ 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.

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	$45^\circ < \theta$;

~~45~~ 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;

~~56~~ that in the 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;

~~67~~ that in the 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;

~~78~~ that, in the bands 5 250-5 350 MHz and 5 470-5 725 MHz, the mitigation measures found 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,

invites administrations

to ~~consider appropriate~~ measures when allowing regulation if they intend to permit the operation of stations in the mobile service using the e.i.r.p. elevation angle mask referred in resolves 34 above, to ensure the equipment is operated in compliance with this mask,

invites ITU-R

~~1~~ to continue work on regulatory mechanisms and further mitigation techniques to avoid incompatibilities which may result from aggregate interference into the FSS in the band 5 150-5 250 MHz from a possible prolific growth in the number of WAS, including RLANs;

~~12~~ to continue studies on mitigation techniques to provide protection of EESS from stations in the mobile service,

~~23~~ to continue studies on suitable test methods and procedures for the implementation of dynamic frequency selection, taking into account practical experience.

Reasons: The band 5 150-5 250 MHz is the only worldwide harmonized spectrum for RLANs in the 5 GHz range that is not subject to the dynamic frequency selection constraint. Studies confirm that RLAN operations outdoors in the band 5 150-5 250 MHz will not cause harmful interference to other operations in the band. The results of these studies are further confirmed by the real-world operational experience with some countries allowing RLAN operations outdoors in the 5 150-5 250

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

MHz with appropriate constraints. Allowing RLAN access to outdoor use in the band 5 150-5 250 MHz would address the growing demand for continuous and ubiquitous connectivity.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations (See No. 2.1)

MOD IAP/6136A16A1/2

5.446A The use of the bands 5 150-5 350 MHz and 5 470-5 725 MHz by the stations in the mobile, except aeronautical mobile, service shall be in accordance with Resolution **229 (Rev.WRC-19~~2~~)**. (WRC-19~~2~~)

Reasons: Consequential change to update reference to the revised Resolution **229 (Rev.WRC-19)**.

MOD IAP/6136A16A1/3

5.446C *Additional allocation:* in Region 1 (except in Algeria, Saudi Arabia, Bahrain, Egypt, United Arab Emirates, Jordan, Kuwait, Lebanon, Morocco, Oman, Qatar, Syrian Arab Republic, Sudan, South Sudan and Tunisia) ~~and in Brazil~~, the band 5 150-5 250 MHz is also allocated to the aeronautical mobile service on a primary basis, limited to aeronautical telemetry transmissions from aircraft stations (see No. **1.83**), in accordance with Resolution **418 (Rev.WRC-12)***. These stations shall not claim protection from other stations operating in accordance with Article 5. No. **5.43A** does not apply. (WRC-12)

Reasons: To separate Brazil (Region 2) from the Region 1 countries.

ADD IAP/6136A16A1/4

5.446D *Additional allocation:* in Brazil, the band 5 150-5 250 MHz is also allocated to the aeronautical mobile service on a primary basis, limited to aeronautical telemetry transmissions from aircraft stations (see No. 1.83), in accordance with Resolution **418 (Rev.WRC 12)**. (WRC-19)

Reasons: In Brazil, the 5150-5250 MHz band is used extensively for Aeronautical Telemetry (AMT).

* *Note by the Secretariat:* This Resolution was revised by WRC-15.

MOD IAP/6136A16A1/5

4 800-5 250 MHz

Allocation to services		
Region 1	Region 2	Region 3
5 150-5 250	FIXED-SATELLITE (Earth-to-space) 5.447A MOBILE except aeronautical mobile 5.446A 5.446B AERONAUTICAL RADIONAVIGATION 5.446 <u>MOD</u> 5.446C 5.447 5.447B 5.447C <u>ADD</u> 5.446D	

Reasons: Consequential change due to changes above.