

## RESOLUTION 167 (WRC-19)

**Use of the frequency band 31-31.3 GHz by high-altitude platform stations in the fixed service**

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

*considering*

- a) that there is a need for greater broadband connectivity in underserved communities and in rural and remote areas;
- b) that WRC-15 invited the ITU Radiocommunication Sector (ITU-R) to study additional spectrum needs for fixed high-altitude platform station (HAPS) links to provide broadband connectivity and to facilitate the use of HAPS links on a global or regional basis, recognizing that the existing HAPS identifications were established without reference to today's broadband capabilities;
- c) that ITU-R has conducted studies dealing with compatibility between systems using HAPS and passive services in the frequency band 31.3-31.8 GHz, leading to Report ITU-R F.2473;
- d) that Report ITU-R F.2439 provides deployment and technical characteristics of broadband HAPS systems;
- e) that Report ITU-R F.2438 contains worldwide spectrum needs of HAPS systems;
- f) that ITU-R has conducted studies dealing with sharing between systems using HAPS in the fixed service and other types of systems in the fixed service in the frequency band 31-31.3 GHz, leading to Report ITU-R F.2473,

*considering further*

that current technologies, such as HAPS, can be used to deliver broadband applications for broadband connectivity and disaster-recovery communications with minimal ground network infrastructure,

*recognizing*

that, during periods of rain, the equivalent isotropically radiated power (e.i.r.p.) of the HAPS beam suffering rain fade may be increased by a level commensurate with the level of rain fade, by up to 20 dB above the e.i.r.p. under clear-sky conditions indicated in Appendix 4,

*noting*

- a) that WRC-2000 adopted No. **5.543A**, which was modified at WRC-03 and then again at WRC-07 to permit the use of HAPS in the fixed service in the frequency band 31-31.3 GHz in certain Region 1 and 3 countries on a non-harmful interference, non-protection basis;
- b) that the frequency band 31-31.3 GHz is widely used or planned to be used by a number of different services and a number of other types of applications in the fixed service;

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c) that, while the decision to deploy HAPS can be taken on a national basis, such deployment may affect neighbouring administrations, particularly in small countries;

d) that results of some ITU-R studies indicate that, in the frequency band 31-31.3 GHz, sharing between fixed-service systems using HAPS and other conventional fixed-service systems in the same area is subject to appropriate interference mitigation techniques to be developed and implemented,

*resolves*

1 that, for the purpose of protecting fixed-service systems in the territory of other administrations in the frequency band 31-31.3 GHz, the power flux-density (pfd) level per HAPS produced at the surface of the Earth in the territory of other administrations shall not exceed the following limits, developed for clear-sky conditions, unless the explicit agreement of the affected administration is provided at the time of notification of HAPS:

0.875 $\theta$ – 143	dB(W/(m <sup>2</sup> · MHz))	for	0° ≤ $\theta$ < 8°
2.58 $\theta$ – 156.6	dB(W/(m <sup>2</sup> · MHz))	for	8° ≤ $\theta$ < 20°
0.375 $\theta$ – 112.5	dB(W/(m <sup>2</sup> · MHz))	for	20° ≤ $\theta$ < 60°
–90	dB(W/(m <sup>2</sup> · MHz))	for	60° ≤ $\theta$ ≤ 90°

where  $\theta$  is the angle of arrival of the incident wave above the horizontal plane, in degrees;

2 that, with regard to the protection of fixed-service stations with pointing elevation beyond 5°, an administration believing that unacceptable interference may still be caused shall, within four months of the date of publication of the relevant International Frequency Information Circular (BR IFIC), provide its comments with the relevant justification to the notifying administration;

3 that, in order to ensure the protection of the Earth-exploration satellite service (EESS) (passive), the level of unwanted power density in the frequency band 31.3-31.8 GHz into the antenna of a HAPS ground station operating in the frequency band 31-31.3 GHz shall be limited to –83 dB(W/200 MHz) under clear-sky conditions, and may be increased under rainy conditions to mitigate fading due to rain, provided that the effective impact on the passive satellite does not exceed the impact under clear-sky conditions;

4 that, in order to ensure the protection of the EESS (passive), the level of unwanted emission e.i.r.p. density per HAPS transmitter operating in the frequency band 31-31.3 GHz into the frequency band 31.3-31.8 GHz shall be limited to:

– $\theta$ – 13.1	dB(W/200 MHz)	for	–4.53° ≤ $\theta$ < 22°
–35.1	dB(W/200 MHz)	for	22° ≤ $\theta$ < 90°

where  $\theta$  is the elevation angle in degrees at the platform height;

5 that, in order to ensure the protection of the radio astronomy service (RAS), the pfd level produced by any HAPS ground station operating in the frequency band 31-31.3 GHz at RAS station locations at a height of 50 m shall not exceed –141 dB(W/(m<sup>2</sup> · 500 MHz)) in the frequency band 31.3-31.8 GHz; this limit relates to the pfd which would be obtained under assumed propagation conditions predicted by the most recent version of Recommendation ITU-R P.452 using a time percentage of 2%;

6 that, in order to ensure the protection of the RAS, the pfd level produced by unwanted emissions from HAPS downlink transmissions in the frequency band 31-31.3 GHz shall not exceed  $-171 \text{ dB(W/(m}^2 \cdot 500 \text{ MHz))}$  for continuum observations in the frequency band 31.3-31.8 GHz at an RAS station location at a height of 50 m; this limit relates to the pfd which would be obtained using a time percentage of 2% in the relevant propagation model;

To verify compliance, the following formula shall be used:

$$pfd(\theta) = e.i.r.p._{nominal \ clear \ sky}(Az, \theta) + Att_{618p=2\%} - 10 \log(4\pi d^2) - GasAtt(\theta)$$

where:

*e.i.r.p.\_nominal clear sky*: nominal unwanted emission e.i.r.p. density towards the RAS station at which the HAPS operates under clear-sky conditions in dB(W/500 MHz) in the RAS frequency band

*Az*: azimuth in degrees from the HAPS towards the RAS station

*θ*: elevation angle in degrees at the HAPS towards the RAS station

*Att<sub>618p=2%</sub>*: attenuation in dB from Recommendation ITU-R P.618 corresponding to  $p = 2\%$  of the time at the radio astronomy location

*d*: separation distance in metres between the HAPS and the RAS station

*pfd(θ)*: pfd at the Earth's surface per HAPS station in dB(W/(m<sup>2</sup> · 500 MHz))

*GasAtt(θ)*: gaseous attenuation for an elevation angle of  $\theta$  (see Recommendation ITU-R SF.1395);

7 that *resolves* 5 and 6 apply at any radio astronomy station that was in operation prior to 22 November 2019 and has been notified to the Radiocommunication Bureau (BR) in the frequency band 31.3-31.8 GHz before 22 May 2020, or at any radio astronomy station that was notified before the date of receipt of the complete Appendix 4 information for notification, for the HAPS system to which *resolves* 5 and 6 apply; radio astronomy stations notified after this date may seek an agreement with administrations that have authorized HAPS;

8 that administrations planning to implement a HAPS system in the frequency band 31-31.3 GHz shall notify the frequency assignments by submitting all mandatory elements under Appendix 4 to BR for the examination of compliance with respect to this Resolution with a view to their registration in the Master International Frequency Register,

*instructs the Director of the Radiocommunication Bureau*

to take all necessary measures to implement this Resolution.

