

## RESOLUTION 150 (WRC-12)

**Use of the bands 6 440-6 520 MHz and 6 560-6 640 MHz by gateway links for high-altitude platform stations in the fixed service**

The World Radiocommunication Conference (Geneva, 2012),

*considering*

- a) that ITU has among its purposes “to promote the extension of the benefit of the new telecommunication technologies to all the world’s inhabitants” (No. 6 of the Constitution);
- b) that systems based on new technologies using high-altitude platform stations (HAPS) can potentially be used for various applications such as the provision of high-capacity services to urban and rural areas;
- c) that provision has been made in the Radio Regulations for the deployment of HAPS in specific bands, including as base stations to serve IMT networks;
- d) that at WRC-07, a need for provision for gateway links to serve HAPS operations was expressed;
- e) that WRC-07 invited ITU-R to conduct sharing studies, with a view to identifying two channels of 80 MHz each for gateway links for HAPS in the range from 5 850 to 7 075 MHz, in bands already allocated to the fixed service, while ensuring the protection of existing services;
- f) that for the purpose of protecting the operations of the Earth exploration-satellite service (EESS) (passive) in the band 6 425-7 075 MHz, No. **5.458** applies;
- g) that for the purpose of protecting the radio astronomy service in the band 6 650-6 675.2 MHz, No. **5.149** applies;
- h) that the range 5 850-7 075 MHz is already heavily used or planned to be used by a number of different services and a number of other types of applications in the fixed service;
- i) that in order to accommodate the need stated in *considering d)*, WRC-12 adopted No. **5.457** to permit the use of HAPS gateway links in the fixed service in the bands 6 440-6 520 MHz and 6 560-6 640 MHz in the limited number of countries listed in the footnote;
- j) that compatibility between HAPS and affected services will largely depend on the number of administrations deploying HAPS and the total number of such systems;
- k) that while the deployment of HAPS gateway links in the bands 6 440-6 520 MHz and 6 560-6 640 MHz is taken on a national basis, such deployment would affect other administrations;
- l) that Appendix 4 does not contain all the necessary data elements pertaining to HAPS gateway links,

*recognizing*

- a) that ITU-R has studied technical and operational characteristics of HAPS gateway links in the fixed service in the range 5 850-7 075 MHz resulting in Recommendation ITU-R F.1891;
- b) that Recommendation ITU-R F.2011 contains a methodology to evaluate interference from HAPS gateway downlinks in the fixed service to conventional fixed wireless systems in the range 5 850-7 075 MHz;
- c) that Report ITU-R F.2240 contains the results of interference analyses between HAPS gateway links in the fixed service and other systems/services in the range 5 850-7 075 MHz;
- d) that the World Summit on the Information Society has encouraged the development and application of emerging technologies to facilitate infrastructure and network development worldwide with special focus on under-served regions and areas,

*resolves*

1 that the antenna pattern for both the HAPS platform and the HAPS gateway station in the bands 6 440-6 520 MHz and 6 560-6 640 MHz shall meet the following antenna beam patterns:

$$\begin{aligned}
 G(\psi) &= G_m - 3(\psi/\psi_b)^2 \quad \text{dBi} \quad \text{for} \quad 0^\circ \leq \psi \leq \psi_1 \\
 G(\psi) &= G_m + L_N \quad \text{dBi} \quad \text{for} \quad \psi_1 < \psi \leq \psi_2 \\
 G(\psi) &= X - 60 \log(\psi) \quad \text{dBi} \quad \text{for} \quad \psi_2 < \psi \leq \psi_3 \\
 G(\psi) &= L_F \quad \text{dBi} \quad \text{for} \quad \psi_3 < \psi \leq 90^\circ
 \end{aligned}$$

where:

$G(\psi)$ : gain at the angle  $\psi$  from the main beam direction (dBi)

$G_m$ : maximum gain in the main lobe (dBi)

$\psi_b$ : one-half of the 3 dB beamwidth in the plane considered (3 dB below  $G_m$ ) (degrees)

$L_N$ : near side-lobe level (dB) relative to the peak gain required by the system design, and has a maximum value of -25 dB

$L_F$ : far side-lobe level,  $G_m - 73$  dBi.

$$\psi_1 = \psi_b \sqrt{-L_N/3} \quad \text{degrees}$$

$$\psi_2 = 3.745 \psi_b \quad \text{degrees}$$

$$X = G_m + L_N + 60 \log(\psi_2) \quad \text{dBi}$$

$$\psi_3 = 10^{(X-L_F)/60} \quad \text{degrees}$$

$$\psi_b = \sqrt{7.442/(10^{0.1G_m})} \quad \text{degrees;}$$

2 that the maximum angle of deviation of the HAPS airborne antenna from the nadir for gateway links shall be limited to 60 degrees corresponding to the urban area coverage of the HAPS; and the maximum number of gateway stations operating with a single platform shall not exceed 5;

3 that the minimum antenna elevation angle of HAPS gateway stations on the ground shall be 30 degrees;

4 that for the purpose of protecting the fixed satellite service (Earth-to-space), the aggregate pfd of HAPS uplinks shall be limited to a maximum of  $-183.9$  dBW/m<sup>2</sup> in 4 kHz at any point in the geostationary arc. To meet this aggregate pfd criterion, the maximum e.i.r.p. value of a single HAPS gateway link towards the geostationary arc shall not exceed  $-59.9$  dBW/4 kHz in any direction within  $\pm 5$  degrees of the geostationary arc;

5 that for the purpose of protecting the fixed wireless systems in other administrations in the band 6 440-6 520 MHz, the e.i.r.p. of the HAPS downlink shall be limited to a maximum of  $-0.5$  dBW/10 MHz for all off-axis angles from the nadir to 60 degrees from the nadir;

6 that for the purpose of protecting EESS passive operations over oceans, HAPS gateway stations shall maintain a minimum distance of 100 kilometres for a single HAPS gateway station and 150 kilometres for several HAPS gateway stations from coast lines;

7 that administrations planning to implement HAPS gateway links in the notification to the Bureau of the frequency assignment(s) shall submit all mandatory parameters for the examination by the Bureau for compliance with respect to *resolves* 1 to 6 above, and also the explicit agreement obtained pursuant to No. **5.457**,

*invites*

administrations to consult with the Director of the Radiocommunication Bureau to determine the data elements of HAPS gateway stations necessary for notification and examination of frequency assignments in accordance with the provisions of Article **11** and Appendix **4**,

*instructs the Director of the Radiocommunication Bureau*

to implement this Resolution.

