

UNITED STATES OF AMERICA

DRAFT PROPOSAL FOR THE WORK OF THE CONFERENCE

AGENDA ITEM 1.20: *To consider the results of ITU-R studies and spectrum identification for gateway links for high altitude platform stations (HAPS) in the range between 5 850-7 075 MHz in order to support operations in the fixed and mobile services, in accordance with Resolution 734 (Rev.WRC-07)*

BACKGROUND

WRC-97 made provisions for the operation of HAPS gateway links within the FS in the bands 47.2-47.5 GHz and 47.9-48.2 GHz by Resolution **122 (Rev.WRC-07)**. Since the 47 GHz bands are susceptible to rain attenuation, WRC-2000 adopted RR Nos. **5.537A** and **5.543A**, which were modified at WRC-03 and then again at WRC-07 to permit the use of HAPS in the fixed service in the band 27.9-28.2 GHz and in the band 31-31.3 GHz in certain Region 1 and 3 countries on a non-harmful interference, non-protection basis by Resolution **145 (Rev.WRC-07)**. In addition, countries in Region 2 may use this frequency band for HAPS on a non-harmful interference, non-protection basis in accordance with Resolution **145 (Rev.WRC-07)**. Considering the high rain attenuation levels in higher frequency bands and the desirability to have greater flexibility in the choice of spectrum for gateway operations in support of HAPS networks, consideration is being given to the potential use of the 6 GHz band for HAPS gateway links.

HAPS gateway links can support backhaul connections of all types (e.g. for cellular networks and complex wireless multi-protocol networks), access to terrestrial public and private networks, data collection, exploration data, surveillance information, safety radar data, and broadcast and interactive video. Telemetry, tracking, command and control information related to the operation of the HAPS vehicle itself can also be contained in the HAPS gateway link. HAPS applications can also provide a broad spectrum of disaster response, emergency communications, remote medical assistance, distance learning, public safety and government system applications on a real time multi-mode and global basis.

PROPOSAL

MOD USA/1.20/01

5 570-7 250 MHz

Allocation to services		
Region 1	Region 2	Region 3
5 570-5 650	MARITIME RADIONAVIGATION MOBILE except aeronautical mobile 5.446A 5.450A RADIOLOCATION 5.450B 5.450 5.451 5.452	
5 650-5 725	RADIOLOCATION MOBILE except aeronautical mobile 5.446A 5.450A Amateur Space research (deep space) 5.282 5.451 5.453 5.454 5.455	
5 725-5 830 FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur 5.150 5.451 5.453 5.455 5.456	5 725-5 830 RADIOLOCATION Amateur 5.150 5.453 5.455	
5 830-5 850 FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur Amateur-satellite (space-to-Earth) 5.150 5.451 5.453 5.455 5.456	5 830-5 850 RADIOLOCATION Amateur Amateur-satellite (space-to-Earth) 5.150 5.453 5.455	
5 850-5 925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.150	5 850-5 925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Amateur Radiolocation 5.150	5 850-5 925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Radiolocation 5.150
5 925-6 700	FIXED ADD 5.A120 FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B MOBILE 5.457C 5.149 5.440 5.458	
6 700-7 075	FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.441 MOBILE 5.458 5.458A 5.458B 5.458C	

ADD 5.A120 For Administrations, [to be identified here and as indicated by these administrations at WRC-12], wishing to implement HAPS gateway links in the following bands that are identified for use by HAPS. The allocation to the fixed service in the bands 6 440 – 6 520 MHz (HAPS-to-ground direction) and 6 560 – 6 640 MHz (ground-to-HAPS direction) may also be used by gateway links for high altitude platform stations (HAPS) within the territory of these countries. Such use of two channels of 80 MHz in the fixed service allocation by HAPS in the above countries is limited to operation in HAPS gateway links and shall not claim protection from other types of fixed service systems or other co-primary services. Resolution [A120-HAPS-GATEWAY] (WRC-12) shall also apply. (No. 5.43A does not apply). Furthermore, the development of these other services shall not be constrained by HAPS gateway links.

Reason: A 6 GHz spectrum identification for HAPS gateway links with specified technical and operations constraints required by a Resolution would allow an operational HAPS system to provide real-time voice and data services while ensuring the protection of existing services.

ADD USA/1.20/02

PROPOSED RESOLUTION [A120-HAPS-GATEWAY] (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 (HAPS) 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-2000 networks;
- d) that at WRC-07, a need for adequate provision for gateway links to serve HAPS operations was expressed;
- e) that WRC-07 revised Resolution 734 to invite 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 the band 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;

g) that in order to accommodate the need stated in *considering d*), WRC-12 adopted No. **5.A120** 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 countries listed in the footnote, based on the study results in *considering e*);

h) that while the deployment HAPS gateway links in the band 6 440 – 6 520 MHz and 6 560 – 6 640 MHz is taken on a national basis, such deployment may affect neighbouring administrations,

recognizing

a) that ITU-R has studied technical and operational characteristics of HAPS gateway links in the fixed services in part of the 6 GHz band resulting in Recommendation ITU-R F.[HAPS CHAR];

b) that ITU-R has also conducted sharing studies between HAPS gateway links and other existing services leading to Recommendations ITU-R F.[HAPS GATEWAY] and ITU-R F.[HAPS MODELLING] to provide interference evaluation methodologies based on Recommendation ITU-R F.[HAPS CHAR] referred to in *recognizing a*);

c) 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 underserved regions and areas,

noting

1 that for the purpose of protecting the Earth exploration-satellite service (passive) in the band 6 425-7 075 MHz, No. **5.458** shall apply;

2 that for the purpose of protecting the radio astronomy service in the band 6 650-6 675.2 MHz, No. **5.149** shall apply,

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:

$$G(\psi) = G_m - 3(\psi/\psi_b)^2 \quad \text{dBi} \quad \text{for} \quad 0^\circ \leq \psi \leq \psi_1$$

$$G(\psi) = G_m + L_N \quad \text{dBi} \quad \text{for} \quad \psi_1 < \psi \leq \psi_2$$

$$G(\psi) = X - 60 \log(\psi) \quad \text{dBi} \quad \text{for} \quad \psi_2 < \psi \leq \psi_3$$

$$G(\psi) = L_F \quad \text{dBi} \quad \text{for} \quad \psi_3 < \psi \leq 90^\circ$$

where:

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

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

ψ_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.

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

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

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

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

The 3 dB beamwidth ($2\psi_b$) is estimated by:

$$(\psi_b)^2 = 7442/(10^{0.1G_m}) \quad \text{degrees}^2;$$

- 2 that the maximum angle of deviation of the HAPS airborne antenna from the nadir should be limited to 60 degrees corresponding to the UAC of the HAPS;
- 3 that for the purpose of protecting the FSS (Earth-to-space), the pfd of the HAPS uplink shall be limited to a maximum of -177.7 dBW/m² in 4 kHz toward the geostationary arc;
- 4 that for the purpose of protecting the fixed wireless systems in other administrations in the band 5 850-6 725 MHz, the e.i.r.p. of the HAPS downlink shall be limited to a maximum of -0.5 dBW/10 MHz for off-axis angles from nadir below 60 degrees;

Reason: A resolution is need to specify the technical and operation constraints required of HAPS systems in order to ensure the protections of services already allocated to the band.

SUP USA/1.20/03

RESOLUTION 734 (Rev.WRC-07)

Studies for spectrum identification for gateway links for high-altitude platform stations in the range from 5 850 to 7 075 MHz

Reason: Resolution 734 is no longer relevant since the requested studies have been completed.
