

EUROPEAN COMMON PROPOSALS

PART 33

Agenda Item 1.33 : HAPS within IMT-2000 bands

Introduction

- 1) In accordance with No. **5.388A**, in Regions 1 and 3, the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz and, in Region 2, the bands 1 885-1 980 MHz and 2 110-2 160 MHz may be used by high altitude platform stations as base stations to provide International Mobile Telecommunications-2000 (IMT-2000), in accordance with Resolution **221 (WRC-2000)**.
- 2) ITU-R studies have shown that a limited relaxation (by 4.5 dB) of the pfd threshold could be afforded for the specific case of the protection of IMT-2000 mobile reception.
- 3) In order to avoid interference from HAPS stations into IMT-2000 stations, transmission from HAPS station should be limited to the bands 2110-2170 MHz in Regions 1 and 3 or 2110-2160 MHz in Region 2.
- 4) HAPS is currently not subject to any coordination under **Article 9**. Coordination between HAPS and other terrestrial systems and services is purely on a bilateral basis without any action from the Bureau. It is proposed to modify this framework to ensure that administration notifying HAPS stations commit themselves in applying the Resolution and the associated limits. This will give regulatory clarity for all IMT-2000 operators.
- 5) It was implicitly understood at WRC-2000 that No. 11.3 is creating an obligation for HAPS stations to be notified. It is proposed to make explicit this obligation, in order to ensure the effectiveness of the bilateral coordination.

ARTICLE 11

Notification and recording of frequency assignments^{1, 2, 3, 4}

ADD EUR/1.33/1

11.8bis g) if that assignment is subject to Resolution 221

Reasons : to have explicitly in the RR the obligation of notification of HAPS in the IMT-2000 bands.

APPENDIX 4 (WRC-2000)

ANNEX 1A

List of characteristics of stations in the terrestrial services¹

ADD EUR/1.33/2

Item 11B *Compliance of HAPS with limits in Resolution 221*

For HAPS stations operating under article 5.388A, the maximum power flux-density (pfd) at the Earth's surface within each other administration's territory where limits of resolves 1) in Resolution 221 are exceeded and the explicit agreement of these concerned administrations.

Reasons : to ensure that other administrations will be informed about pfd level within their own territory and that the notifying administration will provide the explicit agreement.

MOD EUR/1.33/3

RESOLUTION 221 (WRC-2000)

Use of high altitude platform stations providing IMT-2000 in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2

The World Radiocommunication Conference (Geneva, 2003),

considering

- a) that the bands 1 885-2 025 MHz and 2 110-2 200 MHz are identified in No. **5.388** as intended for use on a worldwide basis for IMT-2000, including the bands 1 980-2 010 MHz and 2 170-2 200 MHz for the terrestrial and satellite component of IMT-2000;
- b) that a high altitude platform station (HAPS) is defined in No. **1.66A** as "a station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth";

- c) that HAPS may offer a new means of providing IMT-2000 services with minimal network infrastructure as they are capable of providing service to a large footprint together with a dense coverage;
- d) that the use of HAPS as base stations within the terrestrial component of IMT-2000 is optional for administrations, and that such use should not have any priority over other terrestrial IMT-2000 use;
- e) that, in accordance with No. **5.388** and Resolution **212 (Rev.WRC-97)**, administrations may use the bands identified for IMT-2000, including the bands referred to in this Resolution, for stations of other primary services to which they are allocated;
- f) that these bands are allocated to the fixed and mobile services on a co-primary basis;
- g) that, in accordance with No. **5.388A**, HAPS may be used as base stations within the terrestrial component of IMT-2000 in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2; the use by IMT-2000 applications using HAPS as base stations does not preclude the use of these bands by any station in the services to which they are allocated and does not establish priority in the Radio Regulations,
- h) that ITU-R has studied sharing and coordination between HAPS and other stations within IMT-2000, has considered compatibility of HAPS within IMT-2000 with some services having allocations in the adjacent bands, and has approved Recommendation ITU-R M.1456;
- i) that radio interfaces of-IMT-2000 HAPS are compliant with recommendation ITU-R M.1457
- j) that ITU-R has addressed sharing between systems using HAPS and some existing systems, particularly PCS (personal communication system), MMDS (multichannel multipoint distribution system) and systems in the fixed service, which are currently operating in some countries in the bands 1 885-2 025 MHz and 2 110- 2 200 MHz;
- k) that HAPS stations are intended to transmit in the band 2 110-2 170 MHz in Regions 1 and 3 and in the band 2110-2160 MHz in Region 2

resolves

1 that:

1.1 for the purpose of protecting IMT-2000 mobile stations In neighbouring countries from co-channel interference, a HAPS operating as a base station to provide IMT-2000 shall not exceed a co-channel power flux-density (pfd) of $-117 \text{ dB(W/(m}^2 \cdot \text{MHz))}$ at the Earth's surface outside a country's borders unless explicit agreement of the affected administrations is provided at the time of notification of the HAPS station;

1.2a HAPS operating as an IMT-2000 base station shall not transmit outside the frequency band 2110-2170 MHz in Regions 1 and 3 and 2110-2160 MHz in Region 2.

1.3 in Region 2, for the purpose of protecting MMDS stations in some neighbouring countries in the band 2 150-2 160 MHz from co-channel interference, a HAPS operating as an IMT-2000 base station shall not exceed the following co-channel power-flux density (pfd) at the Earth's surface outside an country's administration's borders unless explicit agreement of the affected administration is provided at the time of the notification of the HAPS station:

- $-127 \text{ dB(W/(m}^2 \cdot \text{MHz))}$ for angles of arrival (θ) less than 7° above the horizontal plane;
- $-127 + 0.666 (\theta - 7) \text{ dB(W/(m}^2 \cdot \text{MHz))}$ for angles of arrival between 7° and 22° above the horizontal plane; and
- $-117 \text{ dB(W/(m}^2 \cdot \text{MHz))}$ for angles of arrival between 22° and 90° above the horizontal plane;

1.4 a HAPS operating as a base station to provide IMT-2000, in order to protect fixed stations from interference, shall not exceed the following limits of out-of-band power flux density (pfd) at the Earth's surface in the bands 2 025-2 110 MHz:

- $-165 \text{ dB(W/(m}^2 \cdot \text{MHz))}$ for angles of arrival (θ) less than 5° above the horizontal plane;
- $-165 + 1.75 (\theta - 5) \text{ dB(W/(m}^2 \cdot \text{MHz))}$ for angles of arrival between 5° and 25° above the horizontal plane; and
- $-130 \text{ dB(W/(m}^2 \cdot \text{MHz))}$ for angles of arrival between 25° and 90° above the

2 that the limits referred to in this Resolution shall apply to all HAPS stations operating in accordance with No. 5.388A as of 1 January 2002;

3 that administrations wishing to implement HAPS within a terrestrial IMT-2000 system shall comply with the following:

3.1 for the purpose of protecting IMT-2000 stations operating in neighbouring countries from co-channel interference, a HAPS operating as a base station within IMT-2000 shall use antennas that comply with the following antenna pattern:

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

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 in 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 again estimated by:

$$(\psi_b)^2 = 7\,442 / (10^{0.1 G_m}) \quad \text{degrees}^2$$

where G_m is the peak aperture gain (dBi);

3.2 for the purpose of protecting mobile earth stations within the satellite component of IMT-2000 from interference, a HAPS operating as an IMT-2000 base station, shall not exceed an out-of-band pfd of $-165 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$ at the Earth's surface in the bands 2 160-2 200 MHz in Region 2 and 2 170-2 200 MHz in Regions 1 and 3;

invites ITU-R

to develop an ITU-R Recommendation providing technical guidance to facilitate consultations with neighbouring administrations.

Instructs the Bureau

to review the findings made under No. 11.31 with respect to the conformity of HAPS stations operating in accordance with No. 5.388, and notified to the Bureau after 1 January 2002.