

RECOMMENDATION ITU-R SF.1843

Methodology for determining the power level for high altitude platform stations ground terminals to facilitate sharing with space station receivers in the bands 47.2-47.5 GHz and 47.9-48.2 GHz

(2007)

Scope

This Recommendation presents a methodology and its applications to determine the power level for the ground terminals of HAPS to promote frequency sharing with an FSS space station receiver in the bands 47.2-47.5 GHz and 47.9-48.2 GHz.

The ITU Radiocommunication Assembly,

considering

- a) that new technology is being developed utilizing telecommunication relays located on high altitude platform stations;
- b) that WRC-97 made provision for the operation of high altitude platform stations (HAPS), also known as stratospheric repeaters, within the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz;
- c) that the bands 47.2-47.5 GHz and 47.9-48.2 GHz are allocated to the fixed-satellite service (FSS) in the Earth-to-space direction;
- d) that ITU-R was invited to study, as a matter of urgency, power limitations applicable for HAPS ground stations to facilitate sharing with space stations receivers;
- e) that because systems in the FS using HAPS can use the full range of elevation angles, sharing with the FSS may present difficulties;
- f) that Recommendation ITU-R F.1500 contains the characteristics of systems in the fixed service using HAPS,

recognizing

- a) that according to No. 5.552A of the Radio Regulations (RR), the allocation to the FS in the bands above, is designated for use by HAPS,

recommends

- 1** that the methodology given in Annex 1 should be used to determine the maximum level of transmit power applicable for HAPS ground terminals to facilitate sharing with space station receivers in the bands 47.2-47.5 GHz and 47.9-48.2 GHz, in the ground-to-HAPS direction.

Annex 1

Methodology

1 System characteristics

1.1 The high altitude platform system

The parameters used in this analysis are given in Recommendation ITU-R F.1500 and are as follows:

TABLE 1
HAPS coverage zones (platform at 21 km)

Coverage area	Elevation angles (degrees)	Ground range (km)
UAC ⁽¹⁾	90-30	0-36
SAC ⁽²⁾	30-15	36-76.5
RAC ⁽³⁾	15-5	76.5-203

⁽¹⁾ UAC: Urban area coverage.

⁽²⁾ SAC: Suburban area coverage.

⁽³⁾ RAC: Rural area coverage.

TABLE 2
Ground terminal transmitter parameters

Communication to	Transmitter power density (dB(W/2 MHz))	Antenna gain (dBi)
UAC ⁽¹⁾	-8.2	23
SAC ⁽²⁾	-7	38
RAC ⁽³⁾	-1.5	38

⁽¹⁾ UAC: Urban area coverage.

⁽²⁾ SAC: Suburban area coverage.

⁽³⁾ RAC: Rural area coverage.

1.2 GSO FSS satellite station

The parameters used in this analysis are given in Recommendation ITU-R SF.1481-1 and are as follows:

TABLE 3
GSO FSS satellite parameters

Maximum antenna gain (dBi)	51.8
Interference criterion (dB(W/MHz))	−150.5
Antenna pattern	Recommendation ITU-R S.672-4

2 Interference analysis

This section investigates interference from HAPS ground terminals into an FSS space station receiver. For the aggregate interference analysis, the HAPS coverage areas are populated with ground terminals and the interference received at the FSS space station is calculated for a number of trials, where each trial corresponds to a random distribution of HAPS ground terminals in full distribution based on Recommendations ITU-R F.1500 and ITU-R SF.1481-1. The parameters of HAPS ground terminals used in the analysis are shown in Table 4. It is assumed that a fully loaded platform would be able to support 100 co-channel ground terminals in each of the three coverage areas and that the main lobe of a receiving antenna beam pattern of an FSS space station receiver is always directed to the nadir of HAPS to consider the sharing condition.

TABLE 4
Transmitting parameters of HAPS ground terminals

Coverage area	RAC	SAC	UAC
Range of elevation angles (degrees)	5-15	15-30	30-90
Number of ground terminals	100	100	100
Antenna gain (dBi)	38	38	23
Power (dBW)	−1.5	−7	−8.2
Channel bandwidth (MHz)	2	2	2