



Recommendation ITU-R F.1891
(05/2011)

**Technical and operational characteristics
of gateway links in the fixed service
using high altitude platform stations
in the band 5 850-7 075 MHz to be
used in sharing studies**

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Fixed service



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Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

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Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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RECOMMENDATION ITU-R F.1891*

Technical and operational characteristics of gateway links in the fixed service using high altitude platform stations in the band 5 850-7 075 MHz to be used in sharing studies

(2011)

Scope

This Recommendation provides the technical and operational characteristics of high altitude platform stations (HAPS) gateway links in the fixed service (FS) in the band 5 850-7 075 MHz. It is intended to provide administrations with information on HAPS gateway links for use in sharing studies with conventional types of FS systems and with systems and networks of other services in the band above and in adjacent bands. Information on the relationship between gateway links and user links can also be found in this text.

The ITU Radiocommunication Assembly,

considering

- a) that WRC-07 recognized that it would be desirable to have greater flexibility in the choice of spectrum for gateway operations in support of HAPS networks;
- b) that WRC-07 requested the studies to consider identification of spectrum for HAPS gateway links in the range 5 850-7 075 MHz;
- c) that HAPS gateway links could be used to support operations in the fixed and mobile services;
- d) that HAPS gateway links in this band would need to share with systems operating in the fixed, mobile, and fixed-satellite services and may have an impact on passive services such as the Earth exploration-satellite service (EESS) and radio astronomy;
- e) that gateway links in a HAPS system would be limited in number and would need to employ higher performance antennas and higher transmitted power in comparison with user links, which would permit the use of higher order modulation methods and more complex coding;
- f) that based on *considering* e), HAPS gateway links would be more spectrally efficient than the user links;
- g) that technical and operational characteristics of HAPS gateway links in the FS are required in order to perform studies of sharing with other types of FS system and with systems and networks of other services in the 5 850-7 075 MHz band, as well as to take into account the out-of-band emissions to or from services in nearby or adjacent bands,

recognizing

- a) that Resolution 734 (Rev.WRC-07) considered that it is desirable to have adequate provision for gateway links to serve HAPS operations;

* This Recommendation has been prepared in support of World Radiocommunication Conference 2012 (WRC-12) Agenda item 1.20. In the event that WRC-12 does not identify spectrum for gateway links for high altitude platform stations in this band, the Recommendation will be suppressed.

b) that Resolution 734 (Rev.WRC-07) also resolved to invite ITU-R to extend sharing studies, with a view to identifying two channels of 80 MHz each for gateway links for HAPS in the range from 5 850-7 075 MHz, in bands already allocated to the fixed service, while ensuring the protection of existing services,

recommends

1 that the technical and operational characteristics of HAPS gateway links as contained in Annex 1 to this Recommendation should be used in analysing the feasibility of sharing involving HAPS gateway links in the frequency range from 5 850-7 075 MHz.

Annex 1

Technical and operational characteristics of gateway links for high altitude platform stations in the fixed service operating in the 5 850-7 075 MHz band

1 Introduction

The technical and operational characteristics of the HAPS system described herein are based on a realizable generic design of the HAPS payload, stratospheric platform and network.

2 HAPS platform stability

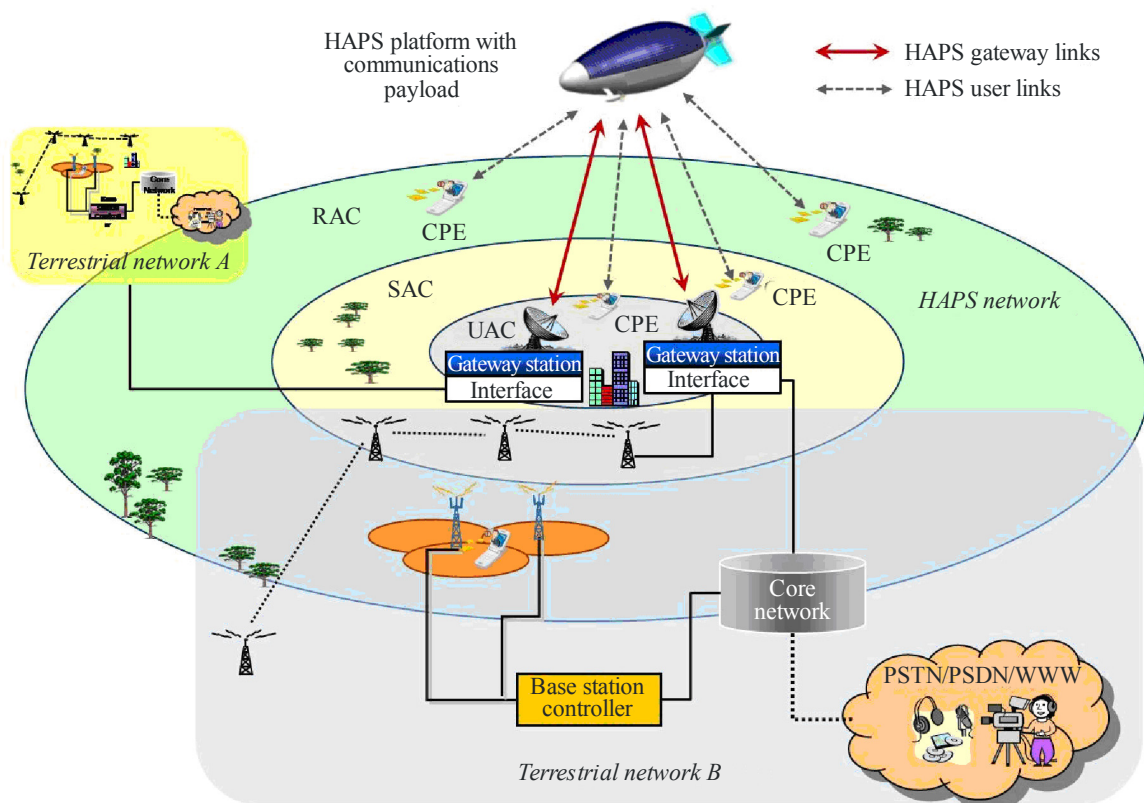
HAPS obtains its movement stability, relative to the Earth, by controlled flight in the low-density, steady flowing, low-velocity and non-turbulent air stream that exists at particular stratospheric altitudes. HAPS operates at a nominally fixed location in the stratosphere at a height of 20 to 25 km. The relatively smooth flowing air stream combined with state-of-the-art propulsion, aerodynamic, thermodynamic and material design will provide a stable and controlled flight that will result in accurate position maintenance and minimal axial (pitch, roll, yaw) rotation. The rate of change of the velocity of stratospheric winds is well within the capability of the propulsion and control systems of the platform to maintain the desired position and heading. The same levels of stability, altitude and position maintenance can be achieved by the heavier-than-air (HTA) and lighter-than-air (LTA) platforms.

Typically HAPS will maintain its position to well within 0.5 km, will have less than 1/2°/h change in heading, will have changes of altitude less than 45 m/h and will have virtually no axial rotation. In addition, the application of electronically steerable beam-forming antennas on the HAPS and at its ground stations will further add to the directivity, selectivity and effectiveness of the gateway links and easily neutralize any minimal platform movement.

3 HAPS network architecture

HAPS have the capability of carrying a large variety of wireless communication payloads that can deliver high-capacity broadband services to end users. The high-level HAPS telecommunication network architecture is shown in Fig. 1, and described in more detail in this, and other, sections that follow. There are two types of links between the payload and the ground equipment: gateway links and user links. This text only describes the technical and operational characteristics of the HAPS gateway links which are proposed to operate in the 5 850-7 075 MHz band.

FIGURE 1

HAPS network configuration including gateway links and user links

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For the user links, the communication is between the platform and customer premises equipment (CPE) on the ground in a cellular arrangement permitting substantial frequency reuse. The CPE is described as being within one of three zones: urban, suburban and rural area coverage (UAC, SAC and RAC, respectively)¹. HAPS CPE may communicate with the payload on the HAPS platform directly and communications between HAPS CPE is switched by the payload containing a large switch through the user links. The transmitted signal from a HAPS CPE is transferred into the receiving section of payload in the HAPS platform. The on-board switch in the payload determines the cell to link the signal. Then, it is transferred to the cell in which other HAPS CPE to be connected exists. It is emphasized that the user links utilize frequency spectrum outside of the 5 850-7 075 MHz band in accordance with the relevant provisions of the RR. For the gateway links, communication is established in the 5 850-7 075 MHz band between the platform and gateway stations on the ground, located in the UAC, which provide interconnection with other telecommunication networks.

The HAPS telecommunication payload architecture consists of six basic subsystems as depicted in Fig. 2.

¹ See Recommendation ITU-R F.1500 for a more detailed description of these coverage areas.