

Recommendation ITU-R P.1409-3

(08/2023)

P Series: Radiowave propagation

Propagation data and prediction methods for systems using high altitude platform stations and other elevated stations in the stratosphere at frequencies greater than about 0.7 GHz

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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Series of ITU-R Recommendations

(Also available online at <https://www.itu.int/publ/R-REC/en>)

Series	Title
BO	Satellite delivery
BR	Recording for production, archival and play-out; film for television
BS	Broadcasting service (sound)
BT	Broadcasting service (television)
F	Fixed service
M	Mobile, radiodetermination, amateur and related satellite services
P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

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 P.1409-3

Propagation data and prediction methods for systems using high altitude platform stations and other elevated stations in the stratosphere at frequencies greater than about 0.7 GHz

(1999-2012-2021-2023)

Scope

This Recommendation provides information on the propagation prediction methods appropriate in the consideration of radiocommunication systems or networks involving the use of high-altitude platform stations, or other stations in the stratosphere. The propagation methods are provided separately for two different goals: prediction methods for interference assessment between systems or networks involving the use of high-altitude platform stations and other radiocommunication systems or networks, and prediction methods for the design of radiocommunication systems or networks involving the use of high-altitude platform stations.

Keywords

Basic transmission loss, high-altitude platform stations, interference

Abbreviations/Glossary

HAPS High-altitude platform station

LOS Line-of-sight

TEC Total electron content

Related ITU Recommendations, Reports

Recommendation ITU-R P.528

Recommendation ITU-R P.531

Recommendation ITU-R P.618

Recommendation ITU-R P.619

Recommendation ITU-R P.680

Recommendation ITU-R P.833

Recommendation ITU-R P.2109

NOTE – In every case the latest edition of the Recommendation in force should be used.

The ITU Radiocommunication Assembly,

considering

- a) that the Radio Regulations include provisions designating the use of systems employing high-altitude platform stations in the fixed service at up to 48.2 GHz and in the mobile service at about 2 GHz;
- b) that the frequency bands designated are also allocated for use by other services;
- c) that studies have been made into systems and networks using elevated platforms, which may be at lower heights in the stratosphere,

recommends

that the propagation mechanisms and effects set out in Annex 1 be taken into account in the assessment of interference between systems or networks involving the use of high-altitude platform stations and other radiocommunication systems or networks, and in the design of systems using high-altitude platform stations and other elevated platforms in the stratosphere.

Annex 1

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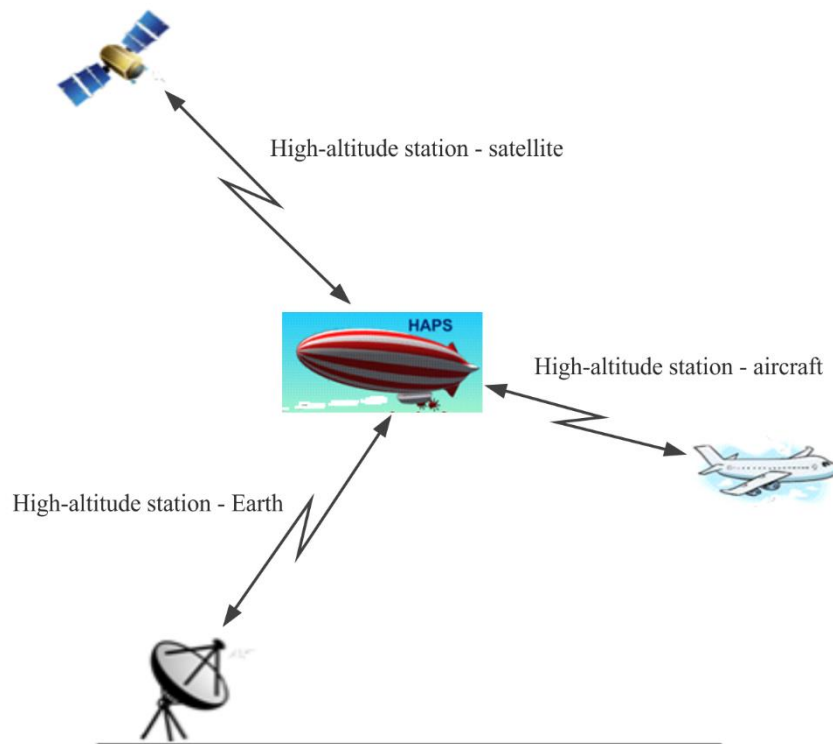
1 Introduction

This Recommendation provides information on the propagation methods appropriate in the consideration of radiocommunication systems or networks involving the use of high-altitude platform stations, or other stations in the stratosphere. For brevity, the phrase “high-altitude station” is used to refer both high-altitude platform stations and other stations in the stratosphere.

As shown in Fig. 1, three following paths for high-altitude stations should be considered:

- “high-altitude station – stations on the surface of the Earth”;
- “high-altitude station – stations in the atmosphere”;
- “high-altitude station – stations in space”.

FIGURE 1
Propagation paths for high-altitude station



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For the “high-altitude station – stations on the surface of the Earth” path two different tasks may be considered:

- design of systems using high-altitude stations;
- interference assessment between high-altitude station and station on the surface of the Earth.

For the “high-altitude station – stations in the atmosphere” and “high-altitude station – stations in space” paths only the interference assessment should be considered.

Section 2 of this Recommendation provides advice on interference between the high-altitude station and stations on the surface of the Earth (e.g. terrestrial systems), between the high-altitude station and the stations in space, and between the high-altitude station and stations in atmosphere. It provides guidance on the prediction of the relevant interference mechanisms by reference to other recommendations including Recommendations ITU-R P.619 and ITU-R P.528. Section 3 of this Recommendation provides advice on propagation issues in the design of systems using high-altitude stations.

2 Propagation prediction methods for frequency sharing and compatibility studies

2.1 Between high-altitude platform stations and other terrestrial stations

For these propagation paths, the following mechanisms and effects should be considered as appropriate:

- free-space basic transmission loss;
- atmospheric attenuation due to gaseous absorption in the troposphere;