



Recommendation ITU-R P.2041
(09/2013)

**Prediction of path attenuation on links
between an airborne platform
and Space and between an airborne
platform and the surface of the Earth**

P Series
Radiowave propagation



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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.

Policy on Intellectual Property Right (IPR)

ITU-R policy on IPR is described in the Common Patent Policy for ITU-T/ITU-R/ISO/IEC referenced in Annex 1 of Resolution ITU-R 1. Forms to be used for the submission of patent statements and licensing declarations by patent holders are available from <http://www.itu.int/ITU-R/go/patents/en> where the Guidelines for Implementation of the Common Patent Policy for ITU-T/ITU-R/ISO/IEC and the ITU-R patent information database can also be found.

Series of ITU-R Recommendations

(Also available online at <http://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.2041

Prediction of path attenuation on links between an airborne platform and Space and between an airborne platform and the surface of the Earth

(2013)

Scope

This Recommendation predicts the various propagation effects needed in planning airborne systems operating in either the airborne-to-space or airborne-to-Earth direction.

The ITU Radiocommunication Assembly,

considering

- a) that, in the design of airborne systems, there is a need for an accurate knowledge of the system performance due to radiowave propagation between an airborne platform and a satellite, and between an airborne platform and the surface of the Earth;
- b) that the airborne platform may be located at any altitude between the surface of the Earth and the top of the stratosphere;
- c) that the systems may operate beyond line of sight;
- d) that the frequency bands used may be in the range from 30 MHz to 50 GHz or higher,

noting

- a) that the ITU-R has established and tested prediction methods that predict the long-term average impairments due to atmospheric effects (e.g. gas attenuation, rain attenuation, cloud attenuation, and the attenuation due to scintillation) between a terminal located on the surface of the Earth and space;
- b) that these ITU-R Earth-space propagation prediction methods can be scaled to predict the performance of airborne links between an airborne platform and a satellite and between an airborne platform and the surface of the Earth,

recommends

that the following prediction methods should be used to predict the long-term average impairments (e.g. attenuation and scintillation fading) due to atmospheric effects between an airborne platform and a satellite and between an airborne platform and the surface of the Earth.

1 Relation to other ITU-R Recommendations

Other P-series Recommendations address propagation from airborne platforms: Recommendation ITU-R P.528 – Propagation curves for aeronautical mobile and radionavigation services using the VHF, UHF, and SHF bands; and Recommendation ITU-R P.682 – Propagation data required for the design of Earth-space aeronautical mobile telecommunication systems.

- Recommendation ITU-R P.528 predicts the basic transmission losses for frequencies between 125 MHz and 15.5 GHz between two antennas at various heights and distances. While the model is predominantly intended to treat the effects of multipath, diffraction, and troposcatter, it also includes simple gaseous and rain attenuation models that are applicable to generic continental temperate locations. As a result, the model is not applicable to higher frequencies and different climates where the gaseous, rain, and cloud attenuation dominate.