

PART 1

SECTION P-A: TEXTS OF GENERAL INTEREST

RECOMMENDATION ITU-R P.1144

GUIDE TO THE APPLICATION OF THE PROPAGATION METHODS
OF RADIOCOMMUNICATION STUDY GROUP 3

(1995)

The ITU Radiocommunication Assembly,

considering

a) that there is a need to assist users of Radiocommunication Study Group 3 ITU-R Recommendations,

recommends

1 that the information contained in Table 1 be used for guidance on the application of the various propagation methods developed by Radiocommunication Study Group 3.

NOTE 1 – For each of the ITU-R Recommendations in Table 1, there are associated information columns to indicate:

Application: the service(s) or application for which the Recommendation is intended.

Type: the situation to which the Recommendation applies, such as point-to-point, point-to-area, line-of-sight, etc.

Output: the output parameter value produced by the method of the Recommendation, such as path loss.

Frequency: the applicable frequency range of the Recommendation.

Distance: the applicable distance range of the Recommendation.

% time: the applicable time percentage values or range of values of the Recommendation; % time is the percentage of time that the predicted signal is exceeded during an average year.

% location: the applicable per cent location range of the Recommendation; % location is the percentage of locations within, say, a square with 100-200 m sides that the predicted signal is exceeded.

Terminal height: the applicable terminal antenna height range of the Recommendation.

Input data: a list of parameters used by the method of the Recommendation; the list is ordered by the importance of the parameter and, in some instances, default values may be used.

The information, as shown in Table 1, is already provided in the Recommendations themselves; however the table allows users to quickly scan the capabilities (and limitations) of the Recommendations without the requirement to search through the text.

TABLE 1
ITU-R propagation prediction methods for the frequency range 10 kHz to 40 GHz

Method	Application	Type	Output	Frequency	Distance	% time	% location	Terminal height	Input data
Rec. ITU-R P.368	All services	Point-to-point	Field strength	10 kHz to 30 MHz	1 to 10 000 km	Not applicable	Not applicable	Ground-based	Frequency Ground conductivity
Rec. ITU-R P.370	Broadcasting	Point-to-area	Field strength	30 MHz to 1 000 MHz	10 to 1 000 km	1, 5, 10, 50	1 to 99	Tx: effective height from less than 0 m to greater than 1 200 m Rx: 1.5 to 40 m	Distance Tx antenna height Frequency Percentage time Rx antenna height Terrain clearance angle Terrain irregularity Percentage locations
Rec. ITU-R P. 1147	Broadcasting	Point-to-point	Sky-wave field strength	0.15 to 1.7 MHz	300 to 12 000 km	10, 50	Not applicable	Not applicable	Latitude and longitude of Tx Latitude and longitude of Rx Distance Sunspot number Tx power Frequency
Rec. ITU-R P.452	Services employing stations on the surface of the Earth; interference and coordination	Point-to-point	Path loss	700 MHz to 30 GHz	Not specified but up to and beyond the radio horizon	0.001 to 50 Average year and worst month	Not applicable	No limits specified	Path profile data Frequency Percentage time Tx antenna height Rx antenna height Latitude and longitude of Tx Latitude and longitude of Rx Meteorological data

TABLE 1 (continued)

Method	Application	Type	Output	Frequency	Distance	% time	% location	Terminal height	Input data
Rec. ITU-R P.528	Aeronautical mobile	Point-to-area	Path loss	125 MHz to 15 GHz	0 to 1 800 km (For aeronautical applications 0 km horizontal distance does not mean 0 km path length)	5, 50, 95	Not applicable	H1: 15 m to 20 km H2: 1 to 20 km	Distance Transmitter height Frequency Receiver height Percentage time
Rec. ITU-R P.1146	Land mobile Broadcasting	Point-to-area	Field strength	1 to 3 GHz	1 to 500 km	1 to 99	1 to 99	Tx: ≥ 1 m Rx: 1 to 30 m	Distance Frequency Tx antenna height Rx antenna height Percentage time Percentage location Terrain information
Rec. ITU-R P.529	Land mobile	Point-to-area	Field strength	30 MHz to 3 GHz (Limited application above 1.5 GHz)	VHF: 10 to 600 km UHF: 1 to 100 km	VHF: 1, 10, 50 UHF: 50	Unspecified	Base: 20 m to 1 km Mobile: 1 to 10 m	Distance Base antenna height Frequency Mobile antenna height Percentage time Ground cover
Rec. ITU-R P.530	Line-of-sight Fixed links	Point-to-point Line-of-sight	Path loss Diversity improvement (clear air conditions) XPD	Approximately 150 MHz to 40 GHz	Up to 200 km	All percentages of time in clear-air conditions; 1 to 0.001 in precipitation conditions ⁽¹⁾	Not applicable	High enough to ensure specified path clearance	Distance Transmitter height Frequency Receiver height Percentage time Path obstruction data Climate data

TABLE 1 (continued)

Method	Application	Type	Output	Frequency	Distance	% time	% location	Terminal height	Input data
Rec. ITU-R P.533	Broadcasting Fixed Mobile	Point-to-point	Basic MUF Sky-wave field strength Available receiver power Signal-to-noise ratio LUF Circuit reliability	2 to 30 MHz	0 to 40 000 km	All percentages	Not applicable	Not applicable	Latitude and longitude of Tx Latitude and longitude of Rx Sunspot number Month Time(s) of day Frequencies Tx power Tx antenna type Rx antenna type
Rec. ITU-R P.534	Fixed Mobile Broadcasting	Point-to-point via sporadic E	Field strength	30 to 100 MHz	0 to 4 000 km	0 to 50	Not applicable	Not applicable	Distance Frequency
Rec. ITU-R P.616	Maritime mobile	As for Rec. ITU-R P.370							
Rec. ITU-R P.617	Trans-horizon fixed links	Point-to-point	Path loss	>30 MHz	100 to 1 000 km	20, 50, 90, 99, and 99.9	Not applicable	No limits specified	Frequency Tx antenna gain Rx antenna gain Path geometry
Rec. ITU-R P.618	Fixed satellite	Point-to-point	Path loss. Diversity gain and (for precipitation condition) XPD	1 to 30 GHz	Any practical orbit height	0.001, 0.01, 0.1, and 1 (for both rain attenuation and XPD) ⁽¹⁾	Not applicable	No limit	Meteorological data Frequency Elevation angle Height of earth station Separation and angle between earth station sites (for diversity gain) Antenna diameter and efficiency (for scintillation) Polarization angle (for XPD)

TABLE 1 (continued)

Method	Application	Type	Output	Frequency	Distance	% time	% location	Terminal height	Input data
Rec. ITU-R P.620	Earth station frequency coordination	Coordination distance	Distance of which the required propagation loss is achieved	1 to 40 GHz	100 to 1 200 km	0.001 to 1	Not applicable	No limits specified	Frequency Percentage of time Earth-station elevation angle
Rec. ITU-R P.680	Maritime mobile satellite	Point-to-point	Sea-surface fading Fade duration Interference (adjacent satellite)	1 to 2 GHz	Any practical orbit height	To 0.001% via Rice-Nakagami distribution Limit of 0.01% for interference ⁽¹⁾	Not applicable	No limit	Frequency Elevation angle Maximum antenna boresight gain
Rec. ITU-R P.681	Land mobile satellite	Point-to-point	Path fading Fade duration Non-fade duration	0.8 to 3 GHz	Any practical orbit height	Not applicable Percentage of distance travelled 1 to 20% ⁽¹⁾	Not applicable	No limit	Frequency Elevation angle Percentage of distance travelled Approximate level of optical shadowing
Rec. ITU-R P.682	Aeronautical mobile satellite	Point-to-point	Sea-surface fading	1 to 2 GHz	Any practical orbit height	To 0.001% via Rice-Nakagami distribution ⁽¹⁾	Not applicable	No limit	Frequency Elevation angle Polarization Maximum antenna boresight gain Antenna height
Rec. ITU-R P.684	Fixed	Point-to-point	Sky-wave field strength	30 to 500 kHz	0 to 40 000 km	50	Not applicable	Not applicable	Latitude and longitude of Tx Latitude and longitude of Rx Distance Tx power Frequency
Rec. ITU-R P.843	Fixed Mobile Broadcasting	Point-to-point via meteor-burst	Received power Burst rate	30 to 100 MHz	100 to 1 000 km	0 to 5	Not applicable	Not applicable	Frequency Distance Tx power Antenna gains

⁽¹⁾ Time percentage of outage; for service availability, subtract value from 100.