



Recommendation ITU-R P.842-5
(09/2013)

**Computation of reliability and
compatibility of HF radio systems**

P Series
Radiowave propagation



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P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
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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.842-5*

Computation of reliability and compatibility of HF radio systems

(1992-1994-1999-2005-2007-2013)

Scope

This Recommendation provides methods for the prediction of the reliability and compatibility of HF radio systems.

The ITU Radiocommunication Assembly,

considering

- a) that the reliability of a radio system is defined as the probability that a required performance is achieved;
- b) that reliability is a figure of merit of performance;
- c) that compatibility is a measure of the degradation caused by interference to the performance of a radio system;
- d) that predicted reliabilities and compatibilities are valuable in the selection of preferred combinations of antennas (including, where necessary, their design optimization), frequencies and necessary transmitter power to achieve a desired performance,

recommends

that the following methods for calculating the various types of reliability and compatibility should be used in the planning and design of radio systems.

1 Introduction

The reliabilities discussed in this Recommendation form a hierarchy as illustrated in Fig. 1. Basic reliabilities are discussed in §§ 2 to 5, overall reliability in § 6, reliability in HF networks in § 7 and compatibility in § 8. The computation of basic circuit reliability (BCR) for digital modulation systems is described in Recommendation ITU-R P.533-12.

Specific definitions of different types of reliability are given in Appendix 1.

2 Inputs to the basic reliability computation

For the computation of BCR the method involves the following parameters: monthly median available receiver signal power (Recommendation ITU-R P.533); monthly median atmospheric, man-made and galactic noise powers (Recommendation ITU-R P.372); upper and lower decile deviations from the monthly median signal and noise powers – long term (day-to-day) and short term (within-the-hour); required signal-to-noise ratio (Recommendation ITU-R F.339).

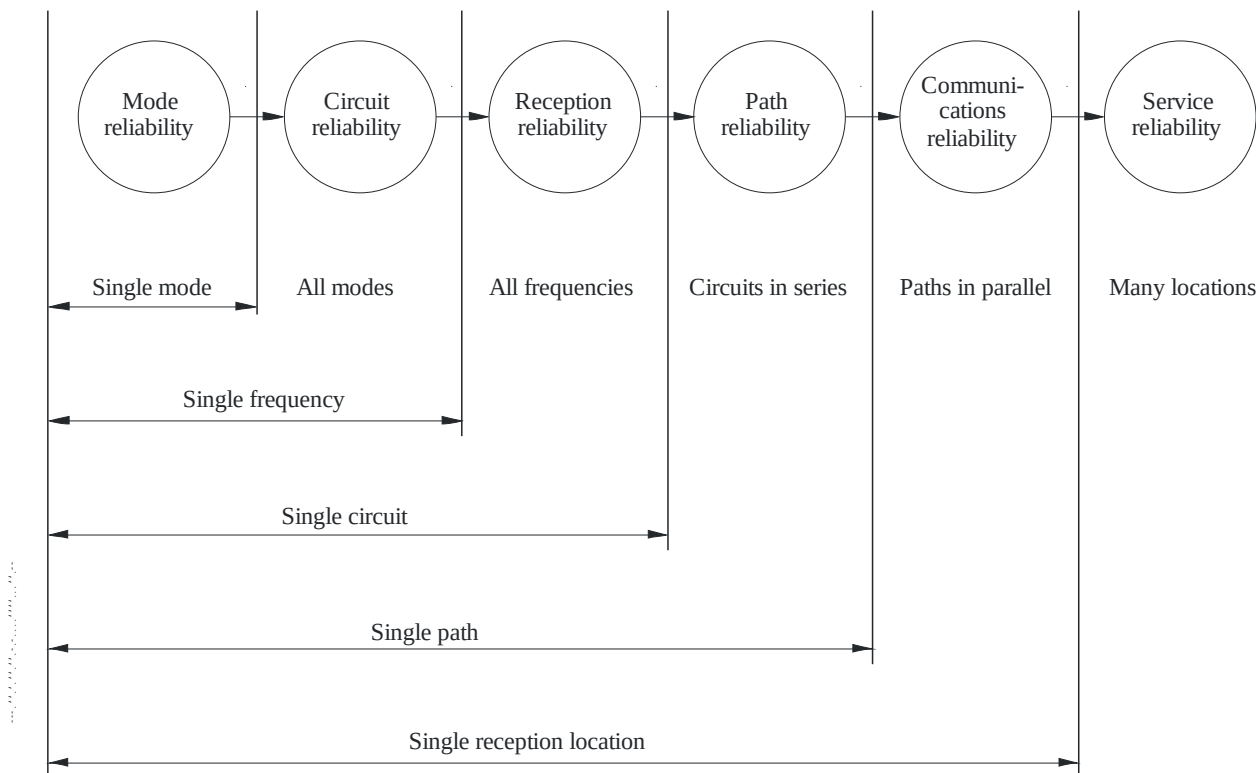
* Radiocommunication Study Group 3 made editorial amendments to this Recommendation in 2000 in accordance with Resolution ITU-R 44.

3 Computation of basic circuit reliability (BCR)

BCR may be estimated according to the procedure outlined in Table 1 using the information in Table 2.

This procedure involves the intermediate calculation of the composite median available receiver power of the wanted signal (Step 1), the median signal-to-noise ratio (Steps 2 and 3), the resultant upper decile of the signal-to-noise ratio (Steps 4 to 6), and the resultant lower decile of the signal-to-noise ratio (Steps 7 to 9).

FIGURE 1
Chart of reliabilities



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The required signal-to-noise ratio (Step 10) is user defined (Recommendation ITU-R F.339 tabulates signal-to-noise ratios required to provide specific performances). The BCR is then estimated using the statistical distribution given in Step 11.

4 Basic reception reliability (BRR)

For n frequencies

$$BRR = 100 \left[1 - \prod_{i=1}^n \left(1 - \frac{BCR(f_i)}{100} \right) \right] \quad \%$$

where $BCR(f_i)$ is the percentage BCR for frequency f_i .

For a single operational frequency, BRR is equal to BCR.