



Recommendation ITU-R SM.2060-0
(08/2014)

**Test procedure for measuring
direction finder accuracy**

SM Series
Spectrum management



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SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
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Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

Electronic Publication
Geneva, 2014

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Test procedure for measuring direction finder accuracy

(2014)

Scope

The accuracy of direction finding systems is an important consideration to regulatory authorities and others who have to locate signals. It is often difficult to compare different systems due to a number of factors, such as the particular system basic design architecture, typical use/purpose, size requirements, installation requirements, and other issues. In order to facilitate some basic comparisons between different direction finding (DF) systems, this Recommendation provides some guidance on standard methods of testing DF accuracy and reporting results.

Keywords

DF accuracy, measurement, test site, open-air-test-site, OATS

Related ITU Recommendations, Reports

Recommendation ITU-R SM.2061-0.

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

The ITU Radiocommunication Assembly,

considering

- a) that ITU-R has published the typical specifications for direction finding (DF) accuracy in the ITU Handbook on Spectrum Monitoring (Edition 2011);
- b) that the Handbook refers to Report ITU-R SM.2125 – Parameters of and measurement procedures on H/V/UHF monitoring receivers and stations, which defines the DF accuracy and provides some relevant test procedures;
- c) that the specification of DF accuracy strongly depends on the test procedures applied;
- d) that the DF accuracy parameter may have direct influence on the suitability of a direction finder to fulfil certain monitoring tasks such as mobile or fixed use or usefulness to measure digital wideband signals, especially when used in typical operating environments;
- e) that a defined set of test procedures for DF accuracy must be independent of the DF design;
- f) that a well-defined set of test procedures for DF accuracy, if adopted by all manufacturers of DF intended for civil radio monitoring, will have the advantage for the users of such DF, that an easier and more objective assessment of products from different manufacturers is possible;
- g) that performance data in specifications of DF equipment usually show the performance under ideal test conditions or one specific condition;
- h) that for considering DF accuracy in multi-path environment, DF accuracy will not be defined, instead DF immunity against multi-path propagation will be addressed according to the test procedure defined in Recommendation ITU-R SM.2061-0;
- i) that for considering DF accuracy under operational conditions, the test procedure defined in Report ITU-R SM.2125 should be used,

recommends

- 1 that the test procedure in Annex 1 should be used to determine and report the DF accuracy.

2 that for each DF accuracy performance specification given in the specifications of the DF system, the test procedure and test conditions should be specified.

Annex 1

1 Introduction

This Recommendation proposes a general test procedure that can be used to evaluate the DF accuracy of radio direction-finding systems. The aim of this document is to provide a definition of DF accuracy and a standard method that can be used to conduct testing, so that administrations can have some basis for comparison of DF systems from different manufacturers, based on their requirements.

The DF accuracy is defined as the root mean square (RMS) value of the difference between the true azimuth and the displayed bearing.

The method proposed here is used to determine the “system accuracy” in a defined set of test conditions simulated on a test range under ideal/controlled propagation conditions, and can be used, for example, for calibration purposes.

Considering the objective to simplify the measurement, effects of modulation type (including phase and time variant signals), signal duty cycle, bandwidth, signal polarization, and signal duration, noise and other signal and DF quality parameters (e.g. DF sensitivity), the integration time of the DF as well as external uncontrollable conditions such as multi-wave/multipath propagation conditions, are intentionally ignored to reduce the complexity of the tests procedure and the time duration of the measurements.

For DC accuracy tests, the DF system can be placed in an open-air-test-site (OATS), which is addressed in § 2.1, but a DF system can be also placed on an anechoic chamber, which is addressed in § 2.8.

While this document aims to establish a basic guide for standard test procedures, a further discussion of DF accuracy considerations can be found in the ITU Handbook on Spectrum Monitoring (Edition 2011), Chapter 3.4 and in Report ITU-R SM.2125 – Parameters of and measurement procedures on H/V/UHF monitoring receivers and stations.

The remainder of this document describes this test procedure in more detail, in order to establish a common guidance for conducting this test across different manufacturers.

2 Definition of test conditions

2.1 General considerations for OATS

A system can be placed on an OATS, in an electromagnetically clean environment without (or reduced) reflections or structures that could provide scattering, resonances or re-radiation, and tested with strong signals.