

ITU-R

Radiocommunication Sector of ITU

Recommendation ITU-R M.1638-1 (01/2015)

Characteristics of and protection criteria for sharing studies for radiolocation (except ground based meteorological radars) and aeronautical radionavigation radars operating in the frequency bands between 5 250 and 5 850 MHz

M Series
**Mobile, radiodetermination, amateur
and related satellite services**



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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 M.1638-1

Characteristics of and protection criteria for sharing studies for radiolocation (except ground based meteorological radars) and aeronautical radionavigation radars operating in the frequency bands between 5 250 and 5 850 MHz

(2003-2015)

Scope

This Recommendation describes the technical and operational characteristics of, and protection criteria for, radars operating in the frequency band 5 250-5 850 MHz, except ground based meteorological radars which are contained in Recommendation ITU-R M.1849. These characteristics are intended for use when assessing the compatibility of these systems with other services.

Keywords

Radar, shipborne, land-based, aeronautical, protection, multi-function

Abbreviations/Glossary

ARNS Aeronautical radionavigation service

ECCM Electronic counter-measures

The ITU Radiocommunication Assembly,

considering

- a) that antenna, signal propagation, target detection, and large necessary bandwidth characteristics of radar to achieve their functions are optimum in certain frequency bands;
- b) that the technical characteristics of radiolocation (except ground based meteorological radars) and radionavigation radars are determined by the mission of the system and vary widely even within a band;
- c) that the radionavigation service is a safety service as specified by No. **4.10** of the Radio Regulations (RR) and requires special measures to ensure its freedom from harmful interference;
- d) that representative technical and operational characteristics of radiolocation (except ground based meteorological radars) and radionavigation radars are required to address sharing and compatibility with these systems as necessary;
- e) that procedures and methodologies to analyse compatibility between radars and systems in other services are provided in Recommendation ITU-R M.1461;
- f) that radiolocation, radionavigation and meteorological radars operate in the frequency bands between 5 250-5 850 MHz;
- g) that ground-based radars used for meteorological purposes are authorized to operate in the frequency band 5 600-5 650 MHz on a basis of equality with stations in the aeronautical radionavigation service (ARNS) (see RR No. **5.452**);
- h) that Recommendation ITU-R M.1849 contains technical and operational aspects of ground based meteorological radars and can be used as a guideline in analysing sharing and compatibility between ground based meteorological radars with systems in other services,

recommends

- 1 that the technical and operational characteristics of the radiolocation (except ground based meteorological radars) and radionavigation radars described in Annex 1 should be considered representative of those operating in the frequency bands between 5 250 and 5 850 MHz;
- 2 that Recommendation ITU-R M.1461 should be used as a guideline in analysing sharing and compatibility between radiolocation (except ground based meteorological radars) and radionavigation radars with systems in other services;
- 3 that the criterion of interfering signal power to radar (except to ground based meteorological radars) receiver noise power level I/N , of -6 dB should be used as the required protection trigger level for the radiodetermination sharing studies with other services. This protection criterion represents the net protection level if multiple interferers are present.

Annex 1

Characteristics of radiolocation (except ground based meteorological radars) and aeronautical radionavigation radars

1 Introduction

The frequency bands between 5 250 and 5 850 MHz that are allocated to the ARNS, radionavigation and radiolocation services on a primary basis as shown in Table 1.

TABLE 1

Band (MHz)	Allocation
5 250-5 255	Radiolocation
5 255-5 350	Radiolocation
5 350-5 460	Aeronautical radionavigation Radiolocation
5 460-5 470	Radiolocation Radionavigation
5 470-5 570	Maritime radionavigation Radiolocation ⁽¹⁾
5 570-5 650	Maritime radionavigation Radiolocation
5 650-5 725	Radiolocation
5 725-5 850	Radiolocation

- ⁽¹⁾ In accordance with RR No. 5.452, between 5 600 and 5 650 MHz, ground-based radars for meteorological purposes are authorized to operate on a basis of equality with stations in the maritime radionavigation service. Recommendation ITU-R M.1849 contains characteristics of ground based meteorological radars.

The radiolocation radars perform a variety of functions, such as:

- tracking space launch vehicles and aeronautical vehicles undergoing developmental and operational testing;
- sea and air surveillance;
- environmental measurements (e.g. study of ocean water cycles and weather phenomena such as hurricanes);
- Earth imaging; and
- national defense and multinational peacekeeping.

The aeronautical radionavigation radars are used primarily for airborne weather avoidance and windshear detection, and perform a safety service (see RR No. **4.10**).

In Table 2, there are multifunction radars.

Multifunction radar can perform search, tracking, radionavigation including weather detection, functions with the same antenna in a single frequency band. For example in airborne applications, mechanically steered antennas or phase array antennas are commonly used, and the functions typically include search and tracking of aerial and surface target search, and terrain and weather avoidance.

In shipborne applications mechanically steered antennas or phase array antennas are commonly used, and the functions typically include search and tracking of aerial and surface target search and weather avoidance. These multifunction radars provide space and weight (essential in the airborne applications) saving, and adaptable operating modes base on changing requirements.

2 Technical characteristics

The frequency bands between 5 250 and 5 850 MHz are used by many different types of radars on land-based fixed, shipborne, airborne, and transportable platforms. Table 2 contains technical characteristics of representative systems deployed in these bands. This information is generally sufficient for general calculations to assess the compatibility between these radars and other systems. These radars are conventionally operated as monostatic radar with transmitter and receiver at the same location (Fig. 1a). However, Radars 10A and 14A of Table 2 are additionally operated as bistatic radar where the transmitter and receiver are spatially separated (Fig. 1b).

The advantage of the separation of transmitter and receiver is the possible enhancement of the radar cross-section of an object. The effect is exemplarily shown in Fig. 1c for a square plane. This is especially important if the object to be detected does not reflect much energy in the direction of the incident radar signal.

The distance between the transmitter and receiver (baseline) is typically in the range of 30-50 km. Synchronization of the transmitter and receiver can be achieved by a radio link or global navigation satellite service or by time standards. This operation mode with passive receiver at a different location than the transmitter should be taken into account in compatibility studies. Since the receivers are not changed, the protection criteria of the mono-static and bi-static radar receiver are equal.