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Radiocommunication Sector of ITU

Recommendation ITU-R M.1582
(07/2002)

Method for determining coordination distances, in the 5 GHz band, between the international standard microwave landing system stations operating in the aeronautical radionavigation service and stations of the radionavigation-satellite service (Earth-to-space)

M Series

Mobile, radiodetermination, amateur and related satellite services

Foreword

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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.1582*, **

Method for determining coordination distances***, in the 5 GHz band, between the international standard microwave landing system stations operating in the aeronautical radionavigation service and stations of the radionavigation-satellite service (Earth-to-space)

(2002)

Scope

This Recommendation provides the method for determining coordination distances between the international-standard MLS stations operating in the band 5 030-5 150 MHz and stations of the radionavigation-satellite (Earth-to-space) in the 5 000-5 010 MHz band.

The ITU Radiocommunication Assembly,

considering

a) that the band 5 000-5 250 MHz is allocated to the aeronautical radionavigation service on a primary basis;

b) that the band 5 030-5 150 MHz is intended for the operation of the international standard microwave landing system (MLS) for precision approach and landing; the requirements for this system shall take precedence over other uses of this band in accordance with No. 5.444 of the Radio Regulations (RR);

c) that the World Radiocommunication Conference (Istanbul, 2000) (WRC-2000) added a co-primary allocation for the radionavigation-satellite service (RNSS) (Earth-to-space) in the 5 000-5 010 MHz band;

d) that emissions from RNSS stations may cause interference to aeronautical MLS receivers during approach and landing;

e) that the MLS can be well protected through the implementation of an adequate separation distance between RNSS (Earth-to-space) transmitters and MLS receivers, and other mitigation techniques;

f) that RR No. 4.10 provides recognition that special measures are required for the protection of radionavigation and safety services,

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* Radiocommunication Study Group 8 made editorial amendments to this Recommendation in 2004 in accordance with Resolution ITU-R 44.

** Radiocommunication Study Group 5 made editorial amendments to this Recommendation in November 2010.

*** Within this Recommendation, a coordination distance must be understood to be the minimum required separation distance beyond which Earth-to-space stations of the RNSS will not cause harmful interference into MLS receivers. However, these protection distances may be decreased on a case-by-case basis, as the result of an agreement between the administrations concerned.

recognizing

a) that the methods contained herein are based on current specifications for international standard MLS receiving equipment,

recommends

1 that the method for determining coordination distances between international standard MLS stations operating in the band 5 030-5 150 MHz and RNSS (Earth-to-space) stations in the 5 000-5 010 MHz band, described in Annex 1, should be used.

Annex 1

Method for determining coordination distances

This Annex sets forth a method for determining coordination distances relative to current and planned MLS stations that may be used to enable implementation of stations of the RNSS (Earth-to-space). Coordination will not be required between RNSS (Earth-to-space) and MLS transmitter sites at the same altitude and which are separated by more than 450 km. Beyond 450 km, MLS airborne stations are expected to be sufficiently beyond the radio line-of-sight of the RNSS (Earth-to-space) earth station to protect the MLS. This coordination distance is subject to further review.

For separation distances provisionally less than 450 km, the need for coordination is identified and dependent on the mitigation factors a) to e), as identified below. Range separation triggers for coordination may be defined as a result of internationally standardized specifications for MLS out-of-band and inband interference susceptibility criteria. For the purpose of this method, the terms “out-of-band” and “inband” are relative to the MLS band 5 030-5 150 MHz (see also item e) below). These triggers may be denoted R_{oob} for the out-of-band range separation trigger, and R_{in} for the inband range separation trigger, as defined below:

$$R_{oob}\ (\text{km})^2 = (4.775 \times 10^{-6})\, 10^{((P_1 + 91)/20)} + 43 \qquad (1)$$

where P_1 is the total e.i.r.p. (dBW) of RNSS (Earth-to-space) earth station in the band 5 000-5 010 MHz, based on free space propagation from the RNSS station to an MLS equipped aircraft within the MLS service volume.

$$R_{in}\ (\text{km})^2 = (4.775 \times 10^{-6})\, 10^{((P_2 + 160)/20)} + 43 \qquad (2)$$

where P_2 is the peak RNSS (Earth-to-space) earth station e.i.r.p. density (dB(W/150 kHz)) in the band 5 030-5 150 MHz, based on free space propagation from the RNSS station to an MLS equipped aircraft within the MLS service volume, and an MLS inband interference threshold of −160 dBW.

When performing this initial calculation care must be taken to ensure that no fixed-satellite service earth stations, which have been coordinated using Recommendation ITU-R S.1342 or other RNSS (Earth-to-space) earth stations, lie within the coordination distance of the MLS. If such an earth station exists, then the potential aggregate effect must be taken into account.

The MLS service volume is 43 km in radius with the MLS transmitter at the centre. If both R_{oob} and R_{in} are less than the planned range based on the candidate RNSS (Earth-to-space) earth station location and current or planned MLS transmitter location(s), MLS operations will be unaffected and further analysis and coordination is not required. If either R_{oob} or R_{in} exceeds the planned range based on the candidate RNSS (Earth-to-space) earth station location and current or planned MLS transmitter location(s), further analysis and coordination is required. Some factors identified below may be considered in a more detailed analysis:

a) site-specific signal attenuation factors such as terrain blocking and radio horizon;

b) increased filtering of the transmitted RNSS earth station uplink signal;

c) antenna orientation and directive gain characteristics of RNSS (Earth-to-space) earth station transmit antenna;

d) alternative locations for the RNSS (Earth-to-space) earth station;

e) in regions where current and projected MLS deployments are expected to be limited, consideration may optionally be given to the additional frequency separation afforded by MLS operation in the upper channels of the MLS channel plan extending from 5 030 MHz to 5 150 MHz. This option should be at the discretion of the affected national authorities.

Items a) through d) may affect the power level of RNSS (Earth-to-space) earth station emissions in the direction of MLS service volumes. Item e) may affect the operating frequency(ies) of MLS. This, in turn, may reduce the level of relevant RNSS spurious emissions in the 2.4 MHz band centred on the MLS frequency assignment, which affects R_{in}. Additional factors may be considered on an individual basis; however, the need to maintain the reliability and integrity requirements of MLS, consistent with the safety of flight service it provides, needs to be addressed.