RECOMMENDATION ITU-R S.1342*,**

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 non-geostationary mobile-satellite service stations providing feeder uplink services

(Question ITU-R 244/4)

(1997)

The ITU Radiocommunication Assembly,

considering

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

b) that the band 5 000 to 5 150 MHz is to be used for the operation of the international standard MLS for precision approach and landing. The requirements for this system shall take precedence over other uses of this band as per No. S5.444 of the Radio Regulations (RR). For the use of this band, RR No. S5.444A and Resolution 114 (WRC-95) from the World Radiocommunication Conference (Geneva, 1995) apply;

c) that the WRC-95, added a co-primary allocation for the fixed-satellite service (FSS) (Earth-to-space) in the 5 091-5 250 MHz band, limited to feeder links of non-geostationary-satellite (non-GSO) systems in the mobile-satellite service (MSS), and subject to coordination under Resolution 46 (Rev.WRC-95) (No. S9.11A);

d) Resolution 114 (WRC-95), which, *inter alia*:

– "urges administrations to take all practicable steps to avoid mutual interference between stations of the ARNS and stations of the fixed-satellite service (FSS)", and

– "instructs the ITU-R to study the technical and operational issues relating to sharing of this band between the ARNS and the FSS providing feeder links of the non-geostationary-satellite mobile-satellite service (Earth-to-space)";

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* The Administrations of France, United Kingdom of Great Britain and Northern Ireland, and South Africa (Republic of) reserve their opinion on this Recommendation.

This Recommendation may require updating if new information regarding MLS receiver specifications, or other information regarding protection of MLS or ARNS systems, becomes available.

This Recommendation should be brought to the attention of Radiocommunication Study Group 8 and the International Civil Aviation Organization (ICAO).

** Radiocommunication Study Group 4 made editorial amendments to this Recommendation in 2001 in accordance with Resolution ITU-R 44 (RA-2000).

e) that RR No. S4.10 provides recognition that special measures are required for the protection of radionavigation and safety services,

recognizing

a) that the FSS providing feeder links for non-GSO MSS has been allocated to the frequency band 5 150-5 250 MHz, as well as the frequency band 5 091-5 150 MHz in the short term, in order to accommodate already identified requirements;

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

c) that ICAO is currently considering the need for protecting international standard MLS and other ARNS systems operating in the band 5 000-5 150 MHz from interference caused by unwanted emissions from feeder link earth stations operating in the band 5 150-5 250 MHz (related to MLS) and in the band 5 091-5 250 MHz (related to ARNS other than MLS) (see Note 1).

NOTE 1 – Current internationally-standardized specifications are based on spectrum allocations in existence prior to WRC-95. Current and future MLS hardware may offer additional rejection of out-of-band emissions with respect to existing specifications. Additional rejection, if present and standardized in all MLS avionics, may affect R_{oob},

recommends

1 that the method for determining coordination distances between international standard MLS stations operating in the band 5 030-5 091 MHz and FSS earth stations providing Earth-to-space feeder links in the 5 091-5 150 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 MSS feeder link earth stations. Provisionally, coordination will not be required between MSS feeder link earth stations and MLS transmitter sites at the same altitude and which are separated by more than 450 km (243 nmi). Beyond 450 km, MLS airborne stations are expected to be sufficiently beyond the radio line-of-sight of the MSS feeder link 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 dependant 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 (see Note 1, § c) of *recognizing*). For the

purpose of this method, the terms "out-of-band" and "inband" are relative to the MLS band 5 030-5 091 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:

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

where P_1 is the total e.i.r.p. (dBW) of non-GSO feeder link earth station assignments and proposed assignments in the band 5 091-5 150 MHz

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

where P_2 is the peak non-GSO MSS feeder link earth station e.i.r.p. density (dB(W/150 kHz)) in the band 5 030-5 091 MHz at assigned MLS frequencies

where the e.i.r.p. density P_2 is referred to as an interference evaluation bandwidth, a value not exceeding 150 kHz (see Note 1). If both R_{oob} and R_{in} are less than the ***planned*** range based on the candidate MSS feeder link 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 MSS feeder link 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 MSS feeder link earth station uplink signal;

c) antenna orientation and directive gain characteristics of MSS feeder link earth station transmit antenna;

d) alternative locations for the MSS feeder link 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 lower channels of the MLS channel plan extending from 5 030 MHz to 5 091 MHz. This option should be at the discretion of the affected national authorities.

Items a) through d) may affect the power level of MSS feeder link 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 MSS 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.

NOTE 1 – ICAO has indicated that on the basis of the current design specifications for the MLS receiver, a 150 kHz receiver IF bandwidth is to be used when determining coordination distances. ICAO is requested to urgently determine if adjustments to this specification can be made that would facilitate improved FSS feeder link earth station coordination, if practicable, while preserving the integrity of the MLS system.