

## RECOMMENDATION ITU-R M.1828

**Technical and operational requirements for aircraft stations of aeronautical mobile service limited to transmissions of telemetry for flight testing in the bands around 5 GHz**

(2007)

**Scope**

This Recommendation provides the technical and operational requirements for aircraft stations of aeronautical mobile service limited to transmissions of telemetry for flight testing that should be used by administrations as a technical guideline for establishing conformance requirements for aircraft stations for worldwide use.

The ITU Radiocommunication Assembly,

*considering*

- a) that various technically and operationally different aeronautical mobile service (AMS) limited to transmissions of telemetry systems for flight testing networks have been designed to commence operation in the near future;
- b) that the operation of aircraft station is usually a subject of a number of national and international rules and regulations including satisfactory conformance to a mutually agreed technical standard and operational requirements;
- c) that there is a need for identifying the technical and operational requirements for the conformance testing of aircraft stations;
- d) that the identification of technical and operational requirements for aircraft stations would provide a common technical basis for facilitating conformance testing of aircraft station by various national and international authorities and the development of mutual recognition arrangements for conformance of aircraft stations;
- e) that the technical and operational requirements need to achieve an acceptable balance between radio equipment complexity and the need for effective use of the radio-frequency spectrum,

*considering also*

- a) that in the frequency band 5 150-5 250 MHz there are allocations to aeronautical radionavigation, fixed-satellite (Earth-to-space) and mobile services on a primary basis;
- b) that there is a requirement to fully protect all primary services in the band 5 030-5 250 MHz;
- c) that WRC-03 adopted Resolution 229 which governs use of band 5 150-5 250 MHz by the mobile service for the implementation of wireless access systems (WAS) including radio local area networks (RLANs);
- d) that the identification by ITU-R of technical and operational requirements for aircraft stations operating in the band 5 030-5 250 MHz should prevent unacceptable interference to other services;

- e) that technical and operational characteristics should be continuously and accurately measurable and controllable;
- f) that the band 5 030-5 150 MHz is allocated to the aeronautical radionavigation service on a primary basis;
- g) that the MLS can be protected through the implementation of an adequate separation distance between a radiating aeronautical mobile service (AMS) transmitter to support telemetry and MLS receivers;
- h) that the ITU-R is in the process of developing guidance material on the application of the methodology described in Recommendation ITU-R M.1829,

*recognizing*

- a) that the band 5 030-5 150 MHz is to be used 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),

*recommends*

- 1 that the technical and operational requirements for aircraft stations of AMS limited to transmissions of telemetry for flight testing operating in the 5 GHz band given in Annexes 1 and 2 should be used by administrations as guidelines to facilitate compatibility with other services;
- 2 that all aircraft stations of AMS limited to transmissions of telemetry for flight testing and transmitting simultaneously within one AMS network should use non-overlapping spectrum.

## Annex 1

### Technical and operational requirements for aircraft stations of AMS limited to transmissions of telemetry system for flight testing networks in the bands around 5 GHz

#### Part A

#### Essential requirements related to the protection of FSS networks in the band 5 091-5 250 MHz

An aircraft station of AMS in the band 5 091-5 250 MHz should be designed in such a manner that one aircraft station transmitter power flux-density be limited to  $-138 \text{ dB(W/(m}^2 \cdot 1.23 \text{ MHz))}$  at the FSS satellite orbit for spacecraft using full Earth coverage receive antennas.

The maximum aggregate interference level of  $1\% \Delta T_s/T_s$  tolerable at the receiver input is  $I_{\text{Agg-Rec}}$ :

$$I_{\text{Agg-Rec}} = KTB - 20 \text{ dB} = -160.3 \text{ dB(W / 1.23 MHz)}$$

where:

- $K$ : Boltzmann's constant (1.38 e-23)  
 $T$ : represents the receiver noise temperature: 550 K  
 $B$ : receiver bandwidth: 1.23 MHz.

Therefore at the satellite receiver antenna input the maximum pfd level produced by one AMT transmitter is:

$$\begin{aligned} pfd_{Max} &= I_{Agg-Rec} - G_r + L_{Feed} + L_P - 10 \log_{10}(21) + 10 \log\left(\frac{4\pi}{\lambda^2}\right) \\ &= -160.3 - 4 + 2.9 + 1 - 13.2 + 35.6 \\ &= -138 \text{ dBW}/(\text{m}^2 \times 1.23 \text{ MHz}) \end{aligned}$$

where:

- $G_r$ : FSS receiver antenna gain  
 21: maximum number of AMT station emitting simultaneously in the FSS receiver bandwidth.

NOTE 1 – The aforementioned limit relate to the pfd would be obtained under free-space propagation conditions.

NOTE 2 – An e.i.r.p. mask can be derived from the aforementioned pfd value by applying the method given in Part A of Annex 2. Simplification of the resulting e.i.r.p. mask could also be considered.

NOTE 3 – The afore-mentioned limit corresponds to  $-198.9 \text{ dB(W}/(\text{m}^2 \cdot \text{Hz}))$ .

NOTE 4 – The pfd limit defined in this section is based on ensuring that the increase in noise temperature of the FSS satellite (i.e.  $\Delta T_{sat}/T_{sat}$ ) due to operation of the AMT does not exceed 1%. The methodology assumes 21 co-channel AMT transmitters operating concurrently within the field of view of the FSS satellite.

## Part B

### Essential requirements related to the protection of the mobile service in the band 5 150- 5 250 MHz

The essential requirements which follow only represent a technical guideline.

In the 5 150-5 250 MHz frequency band, the maximum pfd produced at the surface of the Earth by emissions from an aircraft station, of an AMS system limited to transmissions of telemetry for flight testing network should not exceed:  $-79.4 \text{ dB(W}/(\text{m}^2 \cdot 20 \text{ MHz})) - G_r(\theta)$ .

Administrations may choose to implement different AMS technical and operational requirements which are more stringent than those referenced in this section to protect the mobile service. Further study may be necessary if different parameters are used than those assumed in developing this guideline.