

## RESOLUTION 418 (REV.WRC-19)

**Use of the frequency band 5 091-5 250 MHz by the aeronautical mobile service for telemetry applications**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that there is a need to provide global spectrum to the mobile service for wideband aeronautical telemetry systems;
- b)* that the operation of aircraft stations is subject to national and international rules and regulations;
- c)* that the frequency band 5 030-5 150 MHz is allocated to the aeronautical radionavigation service on a primary basis;
- d)* that the allocation of the frequency band 5 091-5 250 MHz to the fixed-satellite service (FSS) (Earth-to-space) is limited to feeder links of non-geostationary-satellite systems in the mobile-satellite service;
- e)* that the frequency band 5 091-5 150 MHz is also allocated to the aeronautical mobile-satellite (R) service on a primary basis, subject to agreement obtained under No. **9.21**;
- f)* that WRC-07 allocated the frequency band 5 091-5 150 MHz to the aeronautical mobile service (AMS) on a primary basis subject to No. **5.444B**;
- g)* that the frequency band 5 150-5 250 MHz is also allocated to the mobile, except aeronautical mobile, service on a primary basis;
- h)* that WRC-07 additionally allocated the frequency band 5 150-5 250 MHz to the AMS on a primary basis, subject to No. **5.446C**;
- i)* that aeronautical mobile telemetry (AMT) in the AMS is not considered an application of a safety service as defined in No. **1.59**,

*noting*

- a)* that results of studies show the feasibility of using the frequency band 5 091-5 250 MHz for the AMS on a primary basis, limited to transmissions of telemetry for flight testing, under certain conditions and arrangements as provided in Recommendation ITU-R M.2122;
- b)* that the identification by ITU Radiocommunication Sector (ITU-R) of technical and operational requirements for aircraft stations operating in the frequency band 5 091-5 250 MHz should prevent unacceptable interference to other services;
- c)* that the frequency band 5 091-5 150 MHz is to be used for the operation of international standard microwave landing system (MLS) for precision approach and landing;
- d)* that MLS can be protected through the implementation of an adequate separation distance between an AMS transmitter to support telemetry and MLS receivers;

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e) that ITU-R studies have generated methods, described in Report ITU-R M.2118, for ensuring compatibility and sharing between the AMS and the FSS operating in the frequency band 5 091-5 250 MHz, which result in interference of no more than 1%  $\Delta T_{\text{satellite}}/T_{\text{satellite}}$  from AMT aircraft station transmissions to FSS spacecraft receivers;

f) that a method to facilitate sharing between MLS and the AMS is contained in Recommendation ITU-R M.1829;

g) that Recommendation ITU-R M.1828 provides the technical and operational requirements for aircraft stations of the AMS, limited to transmissions of telemetry for flight testing;

h) that ITU-R compatibility studies have been performed for AMT, limited to flight testing, such application being for the testing of aircraft during non-commercial flights for the purpose of development, evaluation and/or certification of aircraft in airspace designated by administrations for this purpose,

*recognizing*

a) that priority is to be given to MLS in accordance with No. **5.444** in the frequency band 5 030-5 091 MHz;

b) that studies have been performed within ITU-R concerning the sharing and compatibility of AMT for flight testing with other services in the frequency band 5 091-5 250 MHz;

c) that Resolution **748 (Rev.WRC-19)** also provides guidance on the use of the frequency band 5 091-5 150 MHz by the AMS,

*resolves*

1 that administrations choosing to implement AMT shall limit AMT applications to those identified in *noting h)* in the frequency band 5 091-5 250 MHz, and shall utilize the criteria set forth in the Annex to this Resolution;

2 that the power flux-density limits in §§ 3 and 4 of the Annex to this Resolution which protect terrestrial services may be exceeded on the territory of any country whose administration has so agreed.

### ANNEX TO RESOLUTION 418 (REV.WRC-19)

1 In implementing aeronautical mobile telemetry (AMT), administrations shall utilize the following criteria:

- limit transmissions to those from aircraft stations only (see No. **1.83**);
- the operation of aeronautical telemetry systems within the frequency band 5 091-5 150 MHz shall be coordinated with administrations operating microwave landing systems (MLS) and whose territory is located within a distance  $D$  of the AMT flight area, where  $D$  is determined by the following equation:

$$D = 43 + 10^{(127.55 - 20 \log(f) + E)/20}$$

where:

$D$ : separation distance (km) triggering the coordination

$f$ : minimum frequency (MHz) used by the AMT system

$E$ : peak equivalent isotropically radiated power density (dBW in 150 kHz) of the aircraft transmitter.

2 For the protection of the fixed-satellite service (FSS), a telemetry aircraft station in the frequency band 5 091-5 250 MHz shall be operated in such a manner that one aircraft station transmitter power flux-density (pfd) be limited to  $-198.9 \text{ dB(W/(m}^2 \cdot \text{Hz))}$  at the FSS satellite orbit for spacecraft using Earth coverage receive antennas. Such pfd limit per aircraft transmitter has been derived under the assumptions that the FSS satellite orbit is at 1 414 km altitude and that a total of 21 co-frequency AMT transmitters operate concurrently within the field of view of the FSS satellite. In case of fewer than 21 AMT co-frequency transmitters operating simultaneously in view of the satellite, the transmitter power can be adjusted so as not to exceed an aggregate pfd at the satellite of  $-185.7 \text{ dB(W/(m}^2 \cdot \text{Hz))}$ , which corresponds to a  $\Delta T_{\text{satellite}}/T_{\text{satellite}}$  of 1%.

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

$G_r(\theta)$  represents the mobile service receiver antenna gain versus elevation angle  $\theta$  and is defined as follows:

**Wireless access system elevation antenna pattern**

Elevation angle, $\theta$ (degrees)	Gain $G_r(\theta)$ (dBi)
$45 < \theta \leq 90$	-4
$35 < \theta \leq 45$	-3
$0 < \theta \leq 35$	0
$-15 < \theta \leq 0$	-1
$-30 < \theta \leq -15$	-4
$-60 < \theta \leq -30$	-6
$-90 < \theta \leq -60$	-5

4 For the protection of the aeronautical mobile (R) service (AM(R)S) in the frequency band 5 091-5 150 MHz, the maximum pfd produced at the surface of the Earth, where AM(R)S may be deployed in accordance with No. **5.444B**, by emissions from an aircraft station of an AMS system, limited to transmissions of telemetry for flight testing, shall not exceed:  $-89.4 \text{ dB(W/(m}^2 \cdot 20 \text{ MHz))} - G_r(\theta)$ .

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$G_r(\theta)$  represents the mobile -service receiver antenna gain versus elevation angle  $\theta$  and is defined as follows:

$$G_r(\theta) = \max[G_1(\theta), G_2(\theta)]$$

$$G_1(\theta) = 6 - 12 \left( \frac{\theta}{27} \right)^2$$

$$G_2(\theta) = -6 + 10 \log \left[ \left( \max \left\{ \frac{|\theta|}{27}, 1 \right\} \right)^{-1.5} + 0.7 \right]$$

where:

$G(\theta)$  : gain relative to an isotropic antenna (dBi)

$(\theta)$  : absolute value of the elevation angle relative to the angle of maximum gain (degrees).