

RECOMMENDATION ITU-R M.1458*

**USE OF THE FREQUENCY BANDS BETWEEN 2.8-22 MHz BY
THE AERONAUTICAL MOBILE (R) SERVICE FOR DATA
TRANSMISSION USING CLASS OF EMISSION J2D**

(Question ITU-R 221/8)

(2000)

The ITU Radiocommunication Assembly,

considering

- a) that the use of the frequencies in the frequency bands allocated to the aeronautical mobile (R) service (AM(R)S) in the bands between 2.8-22 MHz is governed by the provisions of RR Appendix S27;
- b) the provisions of No. S27/15 of RR Appendix S27 on the use of frequencies with classes of emission other than J3E or H2B;
- c) the operational need for the introduction of data link services in the HF band (HF data link) for messages related to the safety and regularity of flight for use by international civil aviation;
- d) that ICAO has completed standards and recommended practices (SARPs) for HF data link; and operation in the frequency bands between 2.8-22 MHz, allocated to the AM(R)S;
- e) that the Radio Regulations Board (RRB) approved procedures concerning the use of the channels identified in RR Appendix S27 for various classes of emission other than J3E and H2B,

recommends

- 1 that coordination between administrations of frequency assignments to stations providing HF data link with class of emission J2D in the frequency bands between 2.8-22 MHz, allocated to the AM(R)S, be based on the technical characteristics contained in Annex 1;
- 2 that the technical and operational principles used for the establishment of the Plan of allotment of frequencies in the AM(R)S, as contained in RR Appendix S27, are also applicable for assignments with class of emission J2D that conform with the provisions of Annex 1.

ANNEX 1

1 Frequency bands

HF data link installations should be capable of operating at any single-sideband (SSB) carrier (reference) frequency available to the AM(R)S in the frequency bands between 2.8-22 MHz, and in compliance with the relevant provisions of the RR.

2 Channels

Channel utilization should be in conformity with the table of carrier (reference) frequencies of No. S27/16 of RR Appendix S27.

* This Recommendation should be brought to the attention of the International Civil Aviation Organization (ICAO).

3 Sideband

The sideband used for transmission should be on the higher side of its carrier (reference) frequency.

4 Modulation

HF data link should employ M -ary phase shift keying (M -PSK) to modulate the radio-frequency carrier at the assigned frequency.

M -PSK carrier

The M -PSK carrier expressed mathematically should be defined as:

$$s(t) = A \sum (p(t - kT) \cos [2\pi f_0 t + \varphi(k)]) \quad \text{for } k = 0, 1, \dots, N - 1$$

where:

- N : number of M -PSK symbols in transmitted physical layer protocol data unit
- $s(t)$: analogue waveform or signal at time t
- A : peak amplitude
- f_0 : SSB carrier (reference) + 1 440 Hz
- T : M -PSK symbol period (1/1 800 s)
- $\varphi(k)$: phase of k -th M -PSK symbol
- $p(t - kT)$: pulse shape of k -th M -PSK symbol at time t .

NOTE 1 – The number of M -PSK symbols sent, N , defines the length (duration = NT s) of the physical layer protocol data unit.

5 Pulse shape

The pulse shape, $p(t)$, should determine the spectral distribution of the transmitted signal. The Fourier transform of the pulse shape, $P(f)$, shall be defined by:

$$\begin{aligned} P(f) &= 1 & \text{if } 0 < |f - f_0| < (1 - b)/2T \\ P(f) &= \cos(\pi(2|f|T - 1 + b)/4b) & \text{if } (1 - b)/2T < |f - f_0| < (1 + b)/2T \\ P(f) &= 0 & \text{if } |f - f_0| > (1 + b)/2T \end{aligned}$$

where the spectral roll-off parameter, $b = 0.31$, has been chosen so that the -20 dB points of the signal are at SSB carrier (reference) + 290 Hz and SSB carrier (reference) + 2 590 Hz and the peak-to-average power ratio of the waveform is less than 5 dB.

6 Frequency tolerance for high frequency data links (HFDL)

The frequency tolerance should be as follows:

- 20 Hz for HFDL aircraft station subsystems, and
- 10 Hz for HFDL ground station subsystems.

7 Protection

A 15 dB desired to undesired signal ratio should apply for the protection of co-channel assignments for HFDL as follows:

- data versus data,
- data versus voice, and
- voice versus data.

NOTE 1 – See also Nos. S27/25 and S27/28 of RR Appendix S27.