

RECOMMENDATION ITU-R M.1842-1

Characteristics of VHF radio systems and equipment for the exchange of data and electronic mail in the maritime mobile service RR Appendix 18 channels

(2008-2009)

Scope

This Recommendation describes characteristics of VHF radio systems and equipment used for the exchange of data and electronic mail in the maritime mobile service RR Appendix 18 channels. It also provides a guideline on the use of digital technologies by VHF systems of different bandwidth in the maritime mobile service.

The ITU Radiocommunication Assembly,

considering

a) that Resolution 342 (Rev.WRC-2000) of the World Radiocommunication Conference invites ITU-R to finalize studies currently ongoing, *inter alia*:

- identify the future requirements of the maritime mobile service;
- identify suitable technical characteristics of the system or interoperable systems;
- identify necessary modifications to the table of frequencies contained in Appendix 18;

b) that IMO has stated that the maritime industry has a need for radiocommunications for business and safety. At IMO the future need for harmonization of systems using maritime VHF channels was considered, and ITU-R has been informed of the possible future need for worldwide systems for the exchange of data and electronic mail on maritime VHF channels,

recognizing

that in accordance with RR Appendix 18 channels used for VHF data shall not cause harmful interference to and shall not claim protection from other stations operating in accordance with RR Article 5. This includes SOLAS applications such as GMDSS on channel 70 and AIS 1 and AIS 2,

recommends

- 1 that the characteristics for VHF data described in the Annexes to this Recommendation should be considered as examples of such systems;
- 2 this Recommendation should be used as a guideline for future digital technologies in the maritime mobile service VHF bands;
- 3 that new VHF data systems introduced should provide characteristics that are compatible with the existing voice and data system, particularly the AIS.

Annex 1**VHF data system example 1**

The following characteristics should be indicative of a VHF radio system for the exchange of data and electronic mail in the maritime mobile service.

1 General characteristics

- 1.1 The class of emission should be 16K0F1DDN.
- 1.2 The necessary band should cater for the channels in RR Appendix 18 designated with footnote o), each with 25 kHz bandwidth.
- 1.3 The modulation may be either $\pi/4$ DQPSK at 28.8 kbit/s or $\pi/8$ D8-PSK at 43.2 kbit/s, depending on required station-station radio range and channel signal fidelity.
- 1.4 The access method may be carrier sense time division multiple access (CSTDMA).
- 1.5 The following area coverage techniques may be used:
 - cellular channel reuse;
 - time sharing transmission.
- 1.6 The following handover techniques may be utilized:
 - uninterrupted handover (channel and base station);
 - uninterrupted file transfer.
- 1.7 The equipment should be designed so that frequency changes between assigned channels can be carried out in less than 100 ms.
- 1.8 Switching between reception and transmission should not take more than 2 ms.
- 1.9 The serial communication channels (SCC) on a single radio modem may be:
 - Ethernet;
 - RS232 (NMEA).
- 1.10 The radio equipment should meet the following norms:
 - radio parameters: ETSI EN 300 113-1;
 - EMC: ETSI EN 301 489-5.

2 Transmitters

- 2.1 The frequency tolerance for coast station transmitters should not exceed 5 parts in 10^6 , and that for ship station transmitters should not exceed 10 parts in 10^6 .
- 2.2 Spurious emissions should be in accordance with the provisions of RR Appendix 3.
- 2.3 The carrier power for coast station transmitters should not exceed 50 W.
- 2.4 The carrier power for ship station transmitters should not exceed 25 W.
- 2.5 The cabinet radiated power should not exceed 25 μ W.
- 2.6 The adjacent channel power ratio (ACPR) should be at least 70 dB (see Fig. 3).

3 Receivers

- 3.1 The receiver sensitivity for bit error rate (BER) 10^{-3} should be better than -107 dBm.
- 3.2 The adjacent channel selectivity should be at least 70 dB.
- 3.3 The spurious response rejection ratio should be at least 70 dB.
- 3.4 The radio frequency intermodulation rejection ratio should be at least 70 dB.
- 3.5 The power of any conducted spurious emission at the antenna terminals should not exceed 2.0 nW.

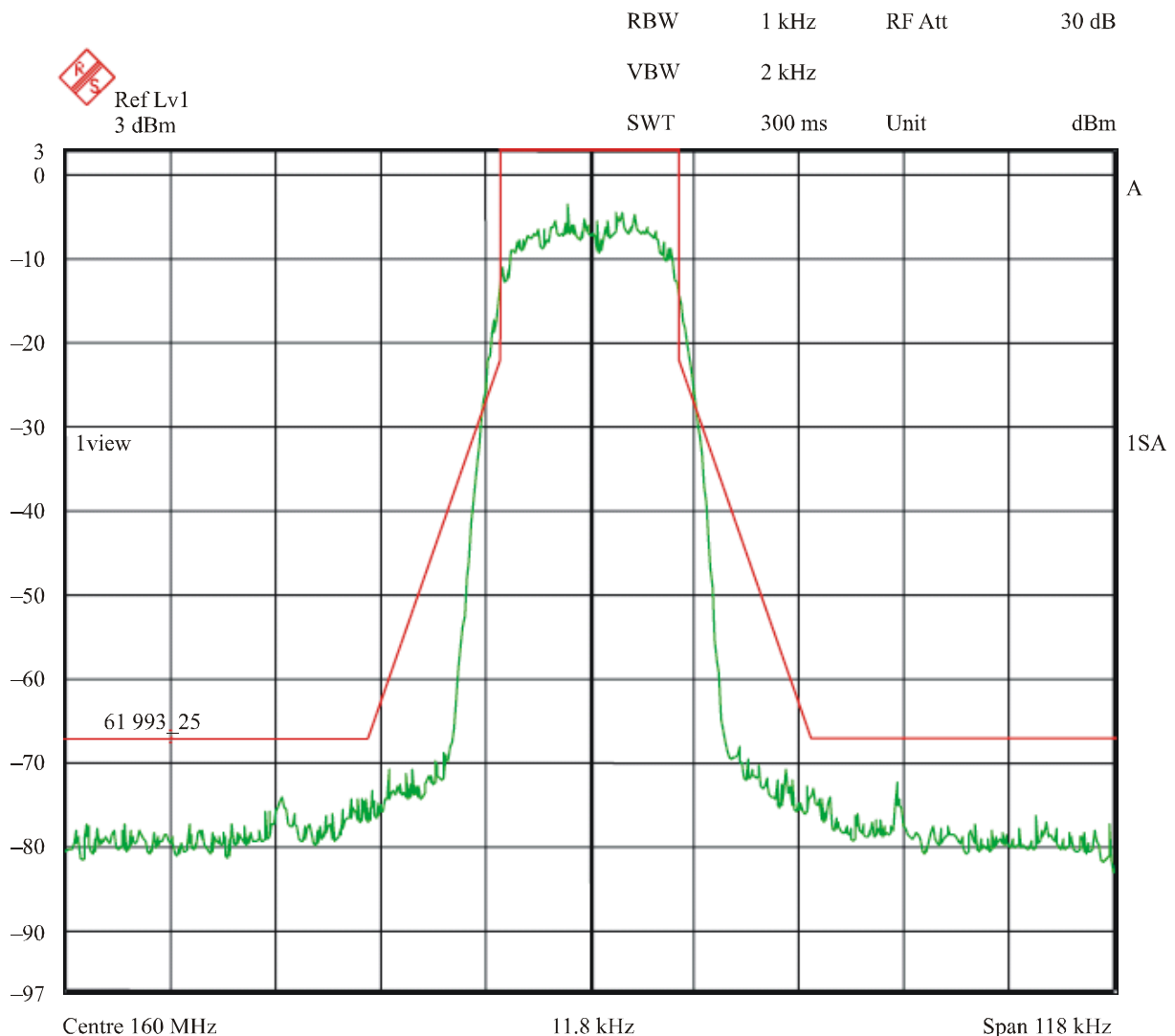
4 Sample emissions spectrum based on variations of ETSI TETRA standard modulation

This proposal refers to the work of RTCM Special Committee 123 (RTCM SC123) which evaluated the ETSI TETRA modulation schemes for use in RR Appendix 18.

FIGURE 1
36 kbit/s $\pi/4$ -DQPSK and 54 kbit/s $\pi/8$ -D8-PSK modulation spectra
RTCM SC123 test results for TETRA-TEDS modulation

Results

Figure 1 presents the spectra for TETRA and TEDS modulations, at their normal 36/54 kbit/s data rates, along with the IEC 61993-2 25 kHz mask for comparison. It is apparent these modulations fail to meet the mask; their power exceeds the -25 dBm limit at a 10 kHz offset from the carrier.



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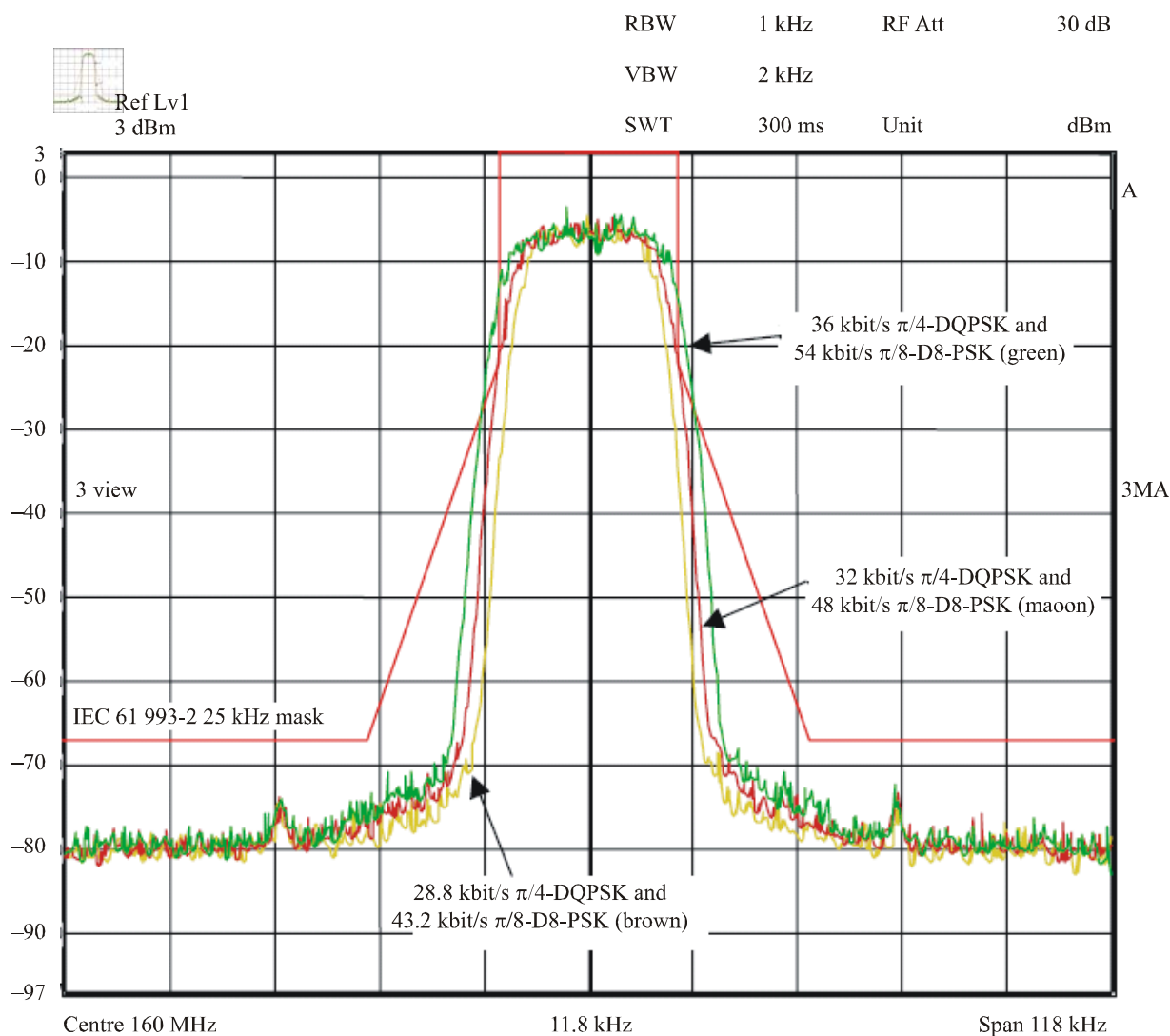
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FIGURE 2

Family of spectrum plots for different data rates

RTCM test results for slightly reduced data rates to fit Appendix 18 emissions mask

Somewhat lower 32/48 kbit/s and 28.8/43.2 kbit/s data rate combinations were then tested. Figure 2 overlays these results with those of Fig. 1. It is evident 32 kbit/s $\pi/4$ -DQPSK and 48 kbit/s $\pi/8$ -D8-PSK modulations just barely fit or violate the mask whereas 28.8 kbit/s $\pi/4$ -DQPSK and 43.2 kbit/s $\pi/8$ -D8-PSK modulations comfortably fit the mask.



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