REPORT 1035

MINIMUM REQUIRED FREQUENCY SEPARATION BETWEEN RECEIVE AND TRANSMIT FREQUENCIES USED FOR DUPLEX MF/HF RADIOTELEPHONY

(Question 64/8)

(1986)

1. Introduction

Minimum frequency separation is a function of 4 variables:

- transmit/receive antenna isolation;
- performance of any high power receiving antenna filters which may be used;
- transmitter performance; and
- receiver rejection performance.

The fourth variable is considered in this Report and a generalized receiver rejection characteristic has been derived from measurements made on actual receivers.

2. Measurements

Measurements were made on maritime MF/HF receivers of "good commercial quality" as follows:

- the receiver was tuned to frequency, f_0, and its function switched to class J3E. A wanted signal, *W*, consisting of a single frequency at f_0 + 1 kHz was then applied to the receiver input and a minimum usable sensitivity (MUS) measurement made, that is, the minimum RF input voltage level required to achieve a 20 dB SINAD at its output;
- in addition to the wanted signal, *W*, an unwanted signal, *U*, consisting of a single frequency, was applied to the receiver input. The level of this unwanted signal was then increased until it interfered with the wanted signal. The interference criteria decided upon were: a reduction in MUS SINAD to 14 dB (reciprocal mixing); a reduction in receiver output of 3 dB (blocking). The ratio in dB of the wanted to unwanted signal *W*/*U* and their frequency separation were then noted;
- this measurement was repeated on each receiver with the wanted signal in each of the 2, 4, 8, 16 and 24 MHz bands in turn with the unwanted signal being swept across the range 30 kHz to 30 MHz.

RF pre-selectors were not switched in on any of these receivers and in all cases reciprocal mixing was the dominant interference effect. For no receiver was the minimum usable signal level found to exceed 8 dB(μV).

3. Conclusion

The derived curve, given in Fig. 1 is a composite of the worst-value figures of all receivers in the five frequency bands. It is believed that this figure is a representative rejection characteristic achievable by most modern maritime receivers of good commercial quality.

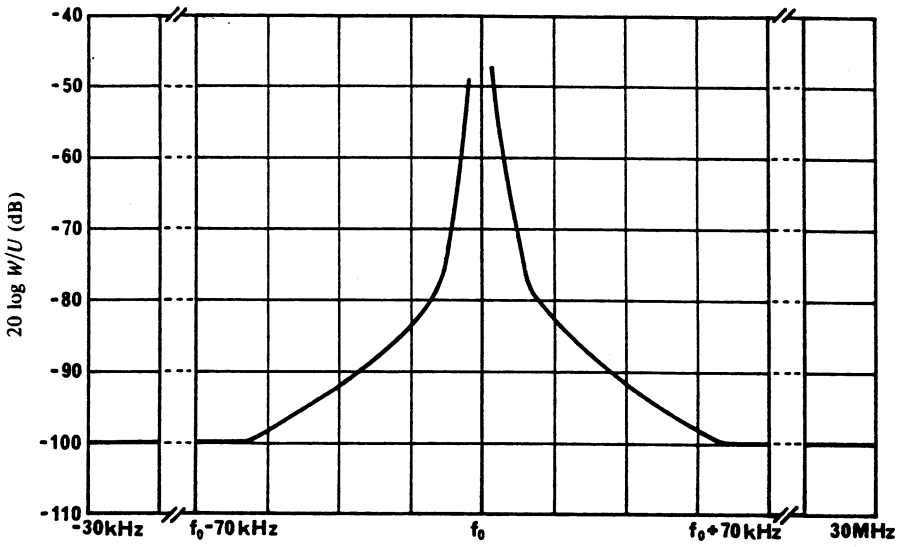

FIGURE 1 – *Maritime receiver rejection characteristic*