

Introduction

In satellite links where the carrier spacing is pushed to the limit, the impact on performance must be known in order to allocate impairment to the link budget. Data was taken using the CDM-600 Modem, operating with Turbo coding, to measure Eb/No degradation with decreasing carrier spacing, so it is possible to estimate performance in the presence of two equally-spaced like-modulated carriers.

The modem was set up at IF with noise to operate at a nominal or reference Eb/No corresponding to a BER $\approx 10^{-8}$ with no adjacent carrier present. Then, a like-modulated adjacent carrier was added and the Eb/No degradation recorded. The test was conducted with a single adjacent carrier for test purposes, but this is equivalent to two equally spaced adjacent carriers on either side of the desired carrier, each 3 dB less than a single adjacent carrier. The configurations tested were:

CDM-600

Modulation	Forward Error Correction	Reference Eb/No At BER $\approx 10^{-8}$	Data Rate	Symbol Rate
QPSK	3/4 Turbo	3.9 dB	2048 kbps	1365.333 ksps
8-PSK	3/4 Turbo	6.3 dB	2048 kbps	910.222 ksps
16-QAM	3/4 Turbo	7.7 dB	2048 kbps	682.667 ksps

The results were plotted as Eb/No degradation versus relative carrier spacing where:

- ◆ Eb/No degradation is the difference between the reference Eb/No and the Eb/No read from the modem in the presence of the interfering adjacent carrier.
- ◆ Relative Carrier Spacing is the distance between the centers of the desired and adjacent carriers divided by the symbol rate.

The test was repeated with a single adjacent carrier at progressively higher levels. The results are presented for two equally spaced adjacent carriers at -3 dB, 0 dB, +3 dB and +6 dB each, relative to the desired carrier, to produce a family of operating curves. Figure 1, Figure 2 and Figure 3 plot the results for the QPSK, 8-PSK and 16-QAM cases.

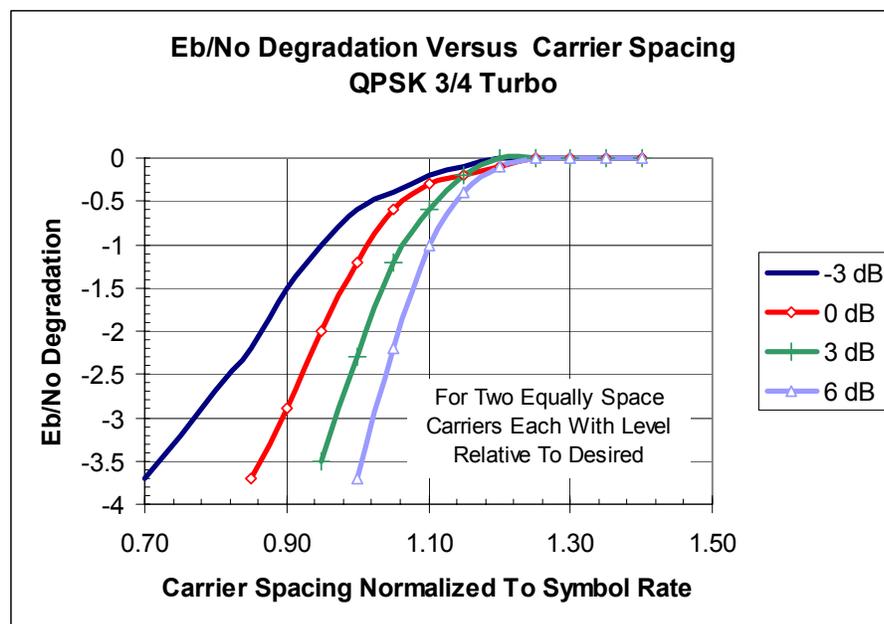


Figure 1. QPSK 3/4 Turbo degradation versus relative carrier spacing (for two adjacent carriers)

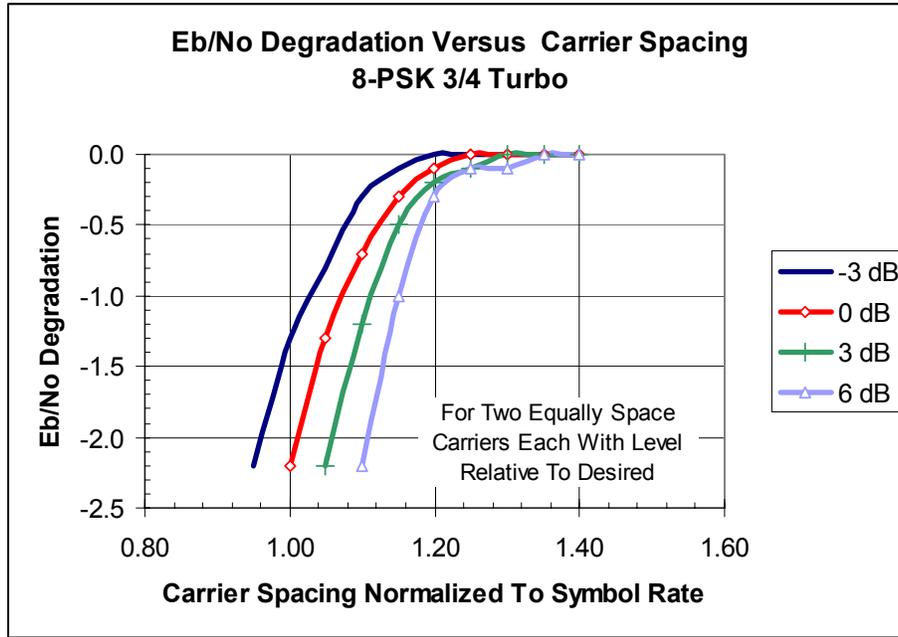


Figure 2. 8-PSK 3/4 Turbo degradation versus relative carrier spacing (for two adjacent carriers)

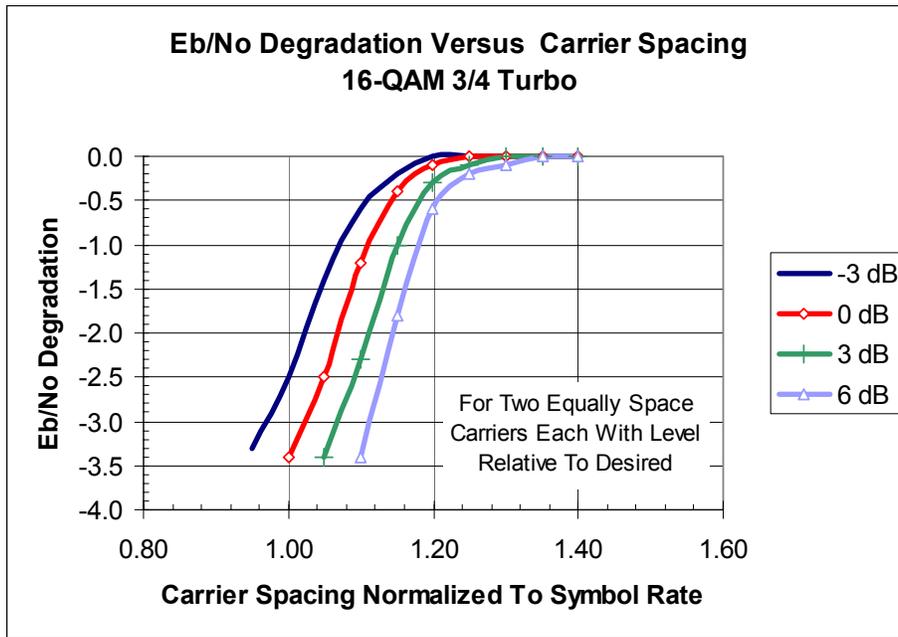


Figure 3. 16-QAM 3/4 Turbo degradation versus relative carrier spacing (for two adjacent carriers)



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