Performance analysis of 64-ary triangular quadrature amplitude modulation

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Abstract

The square quadrature amplitude modulation (SQAM) has been widely used as a modulation technique for digital communication systems due to its simple detection in spite that the power efficiency of the square QAM is not optimum. The triangular QAM (TQAM) provides considerable power gain while keeping low detection complexity. In this paper, the error performance of the 64-ary triangular QAM signal constellations with triangular structure is analyzed. The formula for calculating the energy for 64-ary TQAM is derived. The mathematical analysis of the simple detection scheme is also proposed. Bit stream mapping method is used to obtain the bit error rates of the proposed modulations. Theoretically, the 64-ary regular TQAM and 64-ary irregular TQAM signal constellations provide power gains of 0.55 dB and 0.76 dB over the square QAM.

Keywords: *Signal constellation, Energy, Power gain, detection, Bit stream mapping, Irregular TQAM, Symbol error rate, Bit error rate.*