Turkish Journal

of

Electrical Engineering & Computer Sciences

Keywords
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Turkish Journal of Electrical Engineering & Computer Sciences

Zero-Crossing Based Demodulation of Minimum Shift Keying

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Abstract: Minimum shift keying (MSK) modulation has features such as constant envelope, compact spectrum and good error performance, which are all desirable in many digital applications including mobile radio. Numerous receiver structures to demodulate MSK have been suggested, such as correlation receivers, differential detectors and frequency discriminators. MSK is a form of biphase keying and can be detected by a zero-crossing based phase demodulator which gives near optimum performance. In this paper, the bit error performance of a zero-crossing based coherent MSK demodulator is theoretically investigated and a closed-form expression for the bit error rate is derived. The results indicate that the demodulator performs within 0.8-1 dB of the theoratical optimum for MSK. Towards the goal of deriving probability of bit error, it is also shown that under additive white Gaussian noise (AWGN) zero-crossing locations of MSK signals are Gaussian distributed except at very low signal-to-noise ratios.

Key Words: Minimum shift keying modulation, receiver performance, zero-crossing properties, non-parametric testing

Turk. J. Elec. Eng. & Comp. Sci., **11**, (2003), 75-94.
Full text: pdf
Other articles published in the same issue: Turk. J. Elec. Eng. & Comp. Sci.,vol.11,iss.2.