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On Iterative Decoding for Coded Noncoherent MPSK Communications over Phase-Noisy AWGN Channel

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Abstract

A family of interleaved systems for communicating over the Additive White Gaussian Noise (AWGN) channel with noisy or unknown phase is investigated. Each system comprises convolutional code or turbo code, interleaver, Binary Phase Shift Keying (BPSK) or Quaternary Phase Shift Keying (QPSK) modulation and differential or similar encoding. The receiver performs jointly and iteratively the decoding and the channel demodulation in the presence of unknown phase utilizing an observation interval exceeding two symbols. All systems exhibit good performance with various levels of phase noise. The convolutional code outperforms the turbo code slightly over AWGN channels due to limited capability of the iterative algorithm in this setting, the turbo code is superior in bursty channels, modeling for example a block erasures fading environment. A good tradeoff between AWGN and fading performance is achieved by using a simpler turbo code. When the carrier phase is unknown but constant over an interval of 10 symbols, Bit Error Rate lower than 10^{-3} is achieved at Bit Energy over Noise Spectral Density ratio (E_b/N_o) 1.3dB from the capacity limit of this channel.