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**Efficient Communication Over the Discrete-Time Memoryless Rayleigh Fading
Channel with Turbo Coding/Decoding**

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Abstract

Communication over the discrete time memoryless Rayleigh fading channel is investigated. Codes achieving bit error rate (BER) lower than 10^{-4} at bit energy over the noise spectral density ratio (E_b/N_o) of 1 to 2dB from the channel capacity limit were found with a coding rate of 0.05 to 0.36 bits per channel use. Similar codes with rates of up to 0.57 also performed reasonably close to the capacity limit. The codes are serial concatenation of turbo code and a modulation code such as Pulse Position Modulation (PPM). The receiver is based on joint iterative decoding of the turbo code and the modulation code. The results are applicable also to fast frequency hopping spread spectrum and to a certain multiuser communication scenario over a rapidly varying fading channel.