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A subcarrier permutation scheme for noise mitigation and multi-Access in powerline channels

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Abstract

Multiple codewords of non-binary permutation codes, selected with the maximum Hamming distance between them, are used to increase the spectral efficiency of the multicarrier orthogonal frequency division multiplexing (OFDM) with Mary frequency shift keying (MFSK) scheme. In addition, the codes can assist with the selection of a set of unique subcarrier permutations. The subcarrier combination makes the coded scheme suitable for a multicarrier, multiuser access technique. Over a powerline communication channel with impulsive noise, the peak-to-average power (PAPR) of the coded and uncoded schemes are compared. In addition, the symbol error rate (SER) performance of the single-user and multi-user schemes are shown for different threshold detection values and shared power allocation in the multi-user scheme. The SER performance is based on minimum distance, hard-decision, joint subcarrier decoding, with results showing a degradation in the multi-user, multiple permutation scheme. This performance is further improved using a soft-decision decoder, which uses the soft samples from the output of the channel.