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A permutation coding and OFDM-MFSK modulation scheme for power-line communication

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ABSTRACT

Power-line communication offers a networking communication over existing power lines and finds important applications in smart grid, home and business automation and automatic meter reading. However, the power-line channel is one of the harshest known communication channels currently in use and it requires robust forward error correction techniques. Powerful decoding algorithms tend to be complex and increase latency while robust modulation schemes offer lower data rates and reduced spectral efficiency. The presented research is a frequency domain error-correcting scheme that extends the existing narrowband power-line communication forward error correction concatenated scheme of Reed-Solomon and Convolutional codes in the OFDM framework. It introduces a combination of M-ary phase shift keying as an OFDM subcarrier modulation scheme and a permutation sequence encoding between subcarriers to combat narrowband interference and carrier frequency offsets by introducing frequency diversity. The scheme offers improved BER performance over OFDM and OFDM-MFSK in high narrowband disturbance and impulse noise probability channels and improves the performance of OFDM in the presence of carrier frequency offsets.