Error rate analysis of M-PSK with magnitude modulation envelope control

Abstract

Magnitude modulation (MM) envelope control is an efficient way of reducing the peak-to-average power ratio (PAPR) of single-carrier (SC) signals and improves an SC system's overall power efficiency. However, MM techniques reduce the PAPR at the cost of introducing distortion, highlighting a need to characterise the symbol error rate (SER) performance loss due to MM. This reported work focuses on the M-PSK case. An exact probability density function (PDF) based on the generalised extreme value distribution is proposed to model the statistical distribution of MM factors generated by MM techniques applied to SC constant amplitude constellations. By considering MM distortion as a form of fading, it is shown that this PDF may be used to derive an accurate union bound of the SER of M-PSK transmission on the additive white Gaussian channel channel when using MM envelope control.

Keywords: error statistics; statistical distributions; minimum shift keying; signal processing; phase shift keying; AWGN channels