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Approximate SER for M-PSK using MRC and STTD Techniques over Fading Channels

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Abstract: In this study, approximate symbol error rate (SER) expressions for M-ary phase shift keying (M-PSK) modulation scheme over independent and identically distributed (i.i.d) slow-flat Rician and Rayleigh fading channels are derived. Simulation results show the superior impact of using the maximum ratio combining (MRC) space diversity technique on the overall performance. In particular, the communication reliability (i.e., capacity and coverage) will increase by increasing the diversity order (i.e., the number of the combiner?s branches), where less power is needed to achieve the same probability of error. Then, a comparison between the approximate and exact probability of symbol error is performed and the results are shown to be comparable (1?2 dB). Next, approximate SER expression is derived over i.i.d slow-flat Nakagami-m fading channels. In particular, space time transmit diversity (STTD) technique is used to enhance the reliability of the proposed model using two transmit antennas and one receive antenna. The simulation results show the effect of the Nakagami-m parameter, m, on the SER where the performance will improve by increasing the value of m where fading is less severe in this case. Furthermore, the performance of the SER is lower for higher values of SNR and is worse for high order PSK modulation schemes.