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A New Closed-form of ASEP and Channel Capacity with MRC and Selection Combining over Inverse Gaussian Shadowing

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Abstract

This paper analyse and investigate the performance of communication system with maximal ratio combining (MRC) and selection combining (SC) over Inverse Gaussian (IG) fading distribution. All formats of coherent and non-coherent modulation schemes are considered and novel analytical expressions of average symbol error probability (ASEP) with diversity are derived. Gamma and IG fading distributions are popularly used as a mathematically less complex solution to lognormal in the open literature. Hence, we provide a comparative analysis between IG and gamma fading with the aim to provide a quantitative measure of the difference between the two distributions in the context of ASEP. Moreover, the novel closed-form expressions of channel capacity under transmission schemes such as optimal rate adaptation (ORA) and channel inversion fixed rate (CIFR) are derived and analysed with MRC and SC diversity over IG fading. The analytical results have been validated with the Monte Carlo simulations and the exact numerical results.

Keywords: Channel fading; probability distribution function; average symbol error probability; channel capacity; diversity

1. Introduction

In wireless radio propagation, fading is the most spurious effect that causes degradation in the performance of wireless communication system. Signal fluctuation at small scale level is generally modelled by multipath distributions such as Rayleigh, Rice, Weibull, Nakagami-m and Hoyt distribution depending on the propagation scenario [1]. In the recent years [2], more versatile models such as $\eta - \mu$, $\kappa - \mu$ to fit the multipath effects have been proposed. Such

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