Outage performance of underlay cognitive radio networks over mix fading environment

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ABSTRACT

In this paper, the underlay cognitive radio network over mix fading environment is presented and investigated. A cooperative cognitive system with a secondary source node S, a secondary destination node D, secondary relay node Relay, and a primary node P are considered. In this model system, we consider the mix fading environment in two scenarios as Rayleigh/Nakagami-m and Nakagami-m/Rayleigh Fading channels. For system performance analysis, the closed-form expression of the system outage probability (OP) and the integral-formed expression of the ergodic capacity (EC) are derived in connection with the system's primary parameters. Finally, we proposed the Monte Carlo simulation for convincing the correctness of the system performance.

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1. INTRODUCTION

In underlay CR (also called as spectrum sharing), a secondary user is allowed to access spectrum at any time as long as the received interference at a primary user is regulated be-low a predetermined level, i.e., interference temperature [1-12]. Due to long-distance and deep fading, a signal received at a destination may not be decoded correctly. To overcome this problem, the cooperative relay has been incorporated to transfer signals from source to destination successfully via intermediate relays. In [13], the exact closed-form expression for the outage probability of cognitive radio dual-hop amplify-and-forward relay networks is studied. The authors in [14] considered the outage performance of decode-and-forward relaying in cognitive radio networks over Rayleigh fading channels, subject to the relay location for a secondary user and the spectrum sharing of the secondary system with multiple primary transceivers, where the secondary users communicate via an energy harvesting decode-and-forward relay under the primary outage constraint is proposed in [15]. Furthermore, the performance of a multi-hop cognitive relay network, which harvests energy from a PB using a TSR protocol is investigated in [16] and authors in [17] investigated a hybrid CR system that probabilistically switches the spectrum access modes between the overlay and underlay CR modes for an increase of secondary user's throughput.