Jordan University of Science and Technology

Effect of best relay selection scheme on secrecy outage of underlay cognitive radio networks with energy harvesting: Design and simulation

Authors: Mahmoud A. Khodeir, Saja M. Alquran

Abstract: In this paper, the secrecy outage performance is studied for optimal relay selection (ORS) schemes with energy harvesting system deployed at the secondary transmitter to improve both energy efficiency and spectral efficiency. This investigation is based on the use of a cooperative underlay cognitive radio network (CRN) consists of one primary transmitter, one primary receiver, one secondary source, N secondary relays, one secondary destination, and one active eavesdropper. Further, multiple antenna techniques are utilized at both the destination and the eavesdropper, where maximal ratio combining (MRC) diversity scheme is adopted to enhance the quality of the signal. Next, the security performance with ORS and energy harvesting (EH) schemes is derived over mixed Rayleigh and Nakagami-m fading channels. Here, the channel state information (CSI) is assumed available to both the secondary source and the relay, while the eavesdropper will try to overhear the transmitted information between the selected relay and the destination through a wiretap channel. Depending on these assumptions, a closed-form expression for the secrecy outage probability is derived with ORS scheme. The mathematical results indicate that the secrecy outage performance of the proposed system model improves when the number of antennas at the destination increases or by decreasing the number of antennas at the eavesdropper. Moreover, increasing the number of decode-and-forward (DF) relays improves the secrecy outage performance as well. Finally, the least value of secrecy outage probability can be achieved by increasing the average channel power gain between the source and relay (i.e., the key factor in cooperative communication). The accuracy of all derivations are validated through the MonteCarlo simulations