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Secrecy Outage Performance with EH and TAS for Realistic Underlay Cognitive Radio Networks Using MIMO Systems

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Abstract: This work studies the physical layer security performance for Multiple Input Multiple Output (MIMO) secondary nodes. The proposed model is assumed to operate in underlay Cognitive Radio Network (CRN) that contains a primary node of a single antenna with the presence of an active eavesdropper. Furthermore, Transmit Antenna Selection (TAS) scheme is applied at the secondary transmitter side which also has a suitable battery to charge the energy collected from the Radio Frequency (RF) signals broadcasted from the primary transmitter to enhance collaboratively the power and spectral efficiencies. The security performance for the secondary system is achieved where the exact closed-form phrase is derived over Nakagami-m fading channels. The mathematical results show that the security performance can be improved by increasing the number of the antennas at the source and/or the destination or by decreasing the number of the antennas at the eavesdropper. The same target can be achieved by increasing the transmit power at the source, or improving the quality of the main channel. Greater harvested energy can be obtained at the secondary transmitter by selecting proper time slot that is dedicated for energy harvesting which further improved the security performance(CR) system with energy harvesting over Nakagami-m fading channel. This system consists of a secondary source, a secondary receiver, a primary receiver and a single eavesdropper. The source in the secondary network has one antenna and transmits information to the secondary receiver equipped with two separated antennas to operate in a Full-Duplex (FD) mode. The upper and lower bounds for the Strictly Positive Secrecy Capacity (SPSC) are derived and the numerical results demonstrate that the performance of the proposed system can be improved by increasing the average channel power gain between the source and the destination. Here, the lower and upper bounds a