

## Secrecy Performance for Underlay Cooperative Cognitive Radio Network with Energy Harvesting and Transmit Antenna Selection Using MIMO Over Nakagami-m Fading

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**Abstract:** This paper introduces underlay multiple input multiple output (MIMO) cooperative communication involving source, destination, eavesdropper, primary nodes and decode and forward (DF) relay. To improve the energy and spectral efficiencies, the source and relay are powered by the energy, harvested from the primary transmitter. All the channel state information (CSI) is assumed to be available at the source and relay. Here, transmit antenna selection/maximal ratio combining (TAS/MRC) is also implemented at the secondary relay. Moreover, to enhance the security performance, MRC technique is utilized at both the destination and the eavesdropper. Precise closed-form secrecy outage performance for the secondary relay with an active eavesdropper is derived over Nakagami-m fading channel. The obtained results indicate that when the number of antennas - at the intermediate relay and/or destination - increases, the secrecy outage performance - of the proposed system model over Nakagami-m fading channel - enhances for large average channel gain in the main channel. The secrecy outage probability (SOP) is used in this work as a performance metric. It is found to be equal to 0.1 when setting  $\gamma = 1$  for the Rayleigh fading channel, and greater than 0.01 when setting  $\gamma = 2$  for the Nakagami-m fading channel