

A Solution for Improving Energy Efficiency of Relay Systems

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Abstract:

This paper studies performance of two-hop relay system operating in Ricean fading environment. Implementation of a dual-polarized antenna at the receiver node is assumed, as a solution for enhancing the system energy efficiency. First, we analytically examine the level of performance improvement for decode-and-forward (DF) relay systems, in terms of bit error rate (BER), accomplished just by carefully planning the position of a relay node, in order to provide direct LoS (Line of Sight) signal component in the source-relay link, as well as in the relay-destination link. Further on, additional performance improvements obtained by implementing polarization diversity at the receiver are analysed. Two correlated and non-identical Ricean fading channels are assumed for the relay to destination link, while maximal ratio combining (MRC) of the received signals is performed at the receiver. In order to determine effects of the polarization diversity implementation, performances of the considered system are compared with the standard DF relay system with single antenna terminals. The obtained results show that, using polarization diversity, the same BER (Bit Error Rate) values can be obtained with significantly lower SNR (Signal to Noise Ratio), despite a certain level of correlation and power unbalance between the diversity branches. In that manner, compared to the system with no diversity, the total needed transmit power for achieving the same level of the relay system performances is reduced, and thus more energy efficient communication is enabled.