

This paper analyzes the performance of energy-constrained dual-hop amplify-and-forward relaying systems with multi-antenna nodes in the presence of multiple co-channel interferers at the destination. To maximize the overall signal-to-interference-plus-noise ratio, as well as the harvested energy so as to mitigate the severe effects of fading and enable long-distance wireless power transfer, hop-by-hop information and energy beamforming is proposed where the transmitted signal is steered along the strongest eigenmode of each hop. The wirelessly powered relay scavenges energy from the source information radio frequency signal through energy beamforming, where both the time-switching receiver and power-splitting receiver are considered, and then uses the harvested energy to forward the source message to the destination. To this end, tight lower and upper bound expressions for the outage probability and ergodic capacity are presented in closed form. These are employed to investigate the throughput of the delay-constrained and delay-tolerant transmission modes. In addition, the asymptotic high signal-to-noise ratio outage probability and ergodic capacity approximations are derived, where the achievable diversity order is also presented. Numerical results sustained by Monte Carlo simulations show the tightness of the proposed analytical expressions. The impact of various parameters, such as energy harvesting time, power-splitting ratio, source transmit power, and the number of antennas on the system throughput, is also considered.