

# Optimal Power Allocation in Multi-Hop Cooperative Network Using Non-Regenerative Relaying Protocol

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**Abstract**—Cooperative transmission is one of the promising techniques in wireless communication systems that enables the cooperating node in a wireless sensor network to share their radio resources by employing a distributed transmission and processing operation. This technique offers significant diversity gains as several cooperating nodes forward source node's data to the destination node over independently fading channels. The benefits offered by cooperative transmission can only be exploited fully if the power is allocated between source and cooperating nodes in an optimal manner instead of equal power allocation (EPA). Therefore, in this paper using moment generating function (MGF) approach a closed-form expression of probability of error has been derived for multi-hop cooperative network employing amplify-and-forward (AF) over Rayleigh fading channel. Moreover, using two different network scenarios, optimal power allocation (OPA) scheme has been further investigated on the basis of channel link qualities between the communicating nodes. Numerical and simulation results validate the performance improvement of OPA over EPA and further the improvement due to relay location in the cooperative network.

**Keyword**—Cooperative transmission, Amplify-and-forward, Maximal ratio combining, Optimal power allocation, Moment generation function



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