# Performance Analysis of PLNC using Hierarchical Modulation

# Abstract:

In this paper, we propose and analyze the performance of a two-way relay network (TWRN) using physical layer network coding (PLNC) with hierarchical modulation (HM). The performance is evaluated for additive white Gaussian noise (AWGN) channels. The TWRN consists of two end nodes and a relay, where each node has a single antenna and operates in a half-duplex mode. Using an analytical approach, we derive the end-to-end symbol error rate (SER) performance expression of the 4/16-QAM HM for the high priority (HP) and the low priority (LP) streams, respectively, as a function of signal-to-noise ratio (SNR). It has been found the analytical and simulation results are in close agreement. The utilization of the proposed HM-PLNC system minimizes the computational complexity of the denoise and forward (DNF) operations at the relay by reducing the number of Euclidean distance computations required to 18 compared to the 49 required in an equivalent 16-QAM based PLNC system.