

In this paper, we study systematic Luby transform (SLT) codes over binary input additive white Gaussian noise (BIAWGN) channels. To improve the bit-error-rate (BER) performance of SLT codes on the BIAWGN channel, this paper presents a novel optimization design of degree distributions. First, we apply the Gaussian approximation (GA) to analyze the asymptotic BER performance of SLT codes and calculate overhead thresholds for successful decoding. Second, we derive an approximate closed-form expression for lower bound on BER by applying the GA and further simplify the expression in low and high signal-to-noise ratio regimes, respectively. Third, we adopt the conventional linear programming (CLP) constrained by the GA to optimize the degree distribution of SLT codes. The objective of CLP is to minimize the average degree of the degree distribution that may result in bad error floor. To improve the error floor caused by CLP, we put forth a novel optimization model constrained by the lower bound on BER, and using the model we can design the degree distribution more flexibly with any desired BER. Simulation results show that the proposed degree distribution can provide better BER performance of SLT codes over the BIAWGN channel.