Quantum Energy Lines and the optimal output ergotropy problem

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We study the transferring of useful energy (work) along a transmission line that allows for partial preservation of quantum coherence. As a figure of merit we adopt the maximum values that ergotropy, total ergotropy, and non-equilibrium free-energy attain at the output of the line for an assigned input energy threshold. For Phase-Invariant Bosonic Gaussian Channels (BGCs) models, we show that coherent inputs are optimal. For (one-mode) not Phase-Invariant BGCs we solve the optimization problem under the extra restriction of Gaussian input signals.