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Title: Entanglement dynamics in quantum Gaussian channels

Abstract:

We analyze general laws of continuous-variable entanglement dynamics during the deterministic attenuation and amplification of the physical signal carrying the entanglement. These processes are inevitably accompanied by noises, so we find fundamental limitations on noise intensities that destroy entanglement of Gaussian and non-Gaussian input states. The local phase-insensitive amplification with the power gain ≈3 dB is shown to destroy entanglement of any N-mode Gaussian state even in the case of quantum-limited performance. In contrast, we demonstrate non-Gaussian states with the energy of a few photons such that their entanglement survives within a wide range of noises beyond quantum-limited performance for any degree of attenuation or gain [1]. Gaussian states of high energy are shown to be robust to very asymmetric attenuations, whereas non-Gaussian states are at an advantage in the case of symmetric attenuation and general amplification [2].

[1] S. N. Filippov, M. Ziman. Entanglement sensitivity to signal attenuation and amplification. Phys. Rev. A 90, 010301(R) (2014).

[2] S.N. Filippov. Influence of deterministic attenuation and amplification of optical signals on entanglement and distillation of Gaussian and non-Gaussian quantum states. EPJ Web of Conferences 103, 03003 (2015).