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Non-Markovian Dynamics of a Qubit Due to Photon Scattering in a Waveguide[1] YAO-LUNG L. FANG, Duke Univ, FRANCESCO CICCARELLO, NEST, Pisa and Universit degli Studi di Palermo, Italy, HAROLD U. BARANGER, Duke Univ — We study the dynamics of a few photons in a 1D waveguide scattered off a qubit. We present a simple and elegant approach leading to exact solutions of the space-time evolution. A mirror terminating the waveguide drastically changes the behavior of the system by creating a feedback loop. We show that in this case the two-excitation wavefunction is described by a delayed partial differential equation, thereby extending the well-known result in the one-excitation sector. We contrast the results with and without the mirror, and address the non-Markovian properties induced by the feedback loop.

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