

Abstract Submitted  
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**Persistent Quantum Beats and Long-Distance Entanglement from Waveguide-Mediated Interactions**<sup>1</sup> HUAIXIU ZHENG, HAROLD U. BARANGER, Duke University — We study photon-photon correlations and entanglement generation in a one-dimensional waveguide coupled to two qubits with an arbitrary spatial separation [1]. Such a system can be realized by coupling a 1D open transmission line to superconducting qubits. To treat the combination of nonlinear elements and 1D continuum, we develop a novel Green function method. The vacuum-mediated qubit-qubit interactions cause quantum beats to appear in the second-order correlation function. We go beyond the Markovian regime and observe that such quantum beats persist much longer than the qubit lifetime. A high degree of long-distance entanglement can be generated, increasing the potential of waveguide-QED systems for scalable quantum networking. [1] H. Zheng, and H. U. Baranger, arXiv:1206.4442 (2012).

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Huaixiu Zheng  
Duke University

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