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Programmable distribution of multi-qubit entanglement in dual-rail waveguide QED

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We investigate the autonomous generation of multi-partite entangled states in a dual-rail waveguide QED configuration. Here, qubits arranged along two separated photonic waveguides are illuminated by the output of a nondegenerate parametric amplifier, which drives them into a strongly correlated steady state. We show that in this setup, there exists a large family of pure steady states, for which the connectivity and the degree of multi-qubit entanglement can be selectively adjusted by simply changing the applied pattern of qubit-photon detunings. This offers intriguing new possibilities for distributing ready-to-use multi-partite entangled states across large quantum networks, which do not require any precise pulse control and rely on Gaussian entanglement sources only.

Abstract category

Quantum Optics

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