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Steady-state entanglement of spatially separated qubits via quantum bath engineering CAMILLE ARON, Princeton University, MANAS KULKARNI, New York City College of Technology, HAKAN TURECI, Princeton University — We propose a scheme for driving a dimer of spatially separated qubits into a maximally entangled non-equilibrium steady state. A photon-mediated retarded interaction between the qubits is realized by coupling them to two tunnel-coupled leaky cavities where each cavity is driven by a coherent microwave tone. The proposed cooling mechanism relies on striking the right balance between the unitary and driven-dissipative dynamics of the qubit subsystem. We map the dimer to an effective transverse-field XY model coupled to a non-equilibrium bath that can be suitably engineered through the choice of drive frequencies and amplitudes. We show that both singlet and triplet states can be obtained with remarkable fidelities. The proposed protocol can be implemented with a superconducting circuit architecture that was recently experimentally realized and paves the way to achieving large-scale entangled systems that are arbitrarily long lived.

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