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Quantum Bath Engineering of Permanent Chiral Currents in Cavity-Qubit Systems MANAS KULKARNI, International Centre for Theoretical Sciences - Tata Institute of Fundamental Research, SVEN HEIN, Technische Universitat Berlin, Germany, ELIOT KAPIT, Tulane University, USA, CAMILLE ARON, Ecole normale suprieure, Paris and Instituut voor Theoretische Fysica, Belgium — Motivated by recent remarkable experiments [P. Roushan et al, arXiv arXiv:1606.00077] on creating and measuring chiral currents using superconducting qubits, we study here the case when such systems are subject to inevitable environmental effects. The experiments demonstrate the existence of a chiral current. However, such currents are not persistant given typical decoherence and decay times. Using quantum bath engineering techniques, we develop a scalable protocol for generating persistant currents even in the presence of such imperfections. This is done by striking a delicate balance between drive and dissipation to activate, with high fidelity, specific entangled states which are capable of carrying current. This demonstrates the power of quantum bath engineering approaches to realize highly non-trivial non-equilibrium steady states in Open Quantum Systems.

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