Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Hardware-efficient Bell state preparation using Quantum Zeno Dynamics in superconducting circuits. EMMANUEL FLURIN, MACHIEL BLOK, SHAY HACOHEN-GOURGY, LEIGH S. MARTIN, WILLIAM P. LIVINGSTON, ALLISON DOVE, IRFAN SIDDIQI, Quantum Nanoelectronics Laboratory,Department of Physics, University of California, Berkeley — By preforming a continuous joint measurement on a two qubit system, we restrict the qubit evolution to a chosen subspace of the total Hilbert space. This extension of the quantum Zeno effect, called Quantum Zeno Dynamics, has already been explored in various physical systems such as superconducting cavities, single rydberg atoms, atomic ensembles and BoseEinstein condensates. In this experiment, two superconducting qubits are strongly dispersively coupled to a high-Q cavity ($\chi \gg \kappa$) allowing for the doubly excited state $|11\rangle$ to be selectively monitored. The Quantum Zeno Dynamics in the complementary subspace enables us to coherently prepare a Bell state. As opposed to dissipation engineering schemes, we emphasize that our protocol is deterministic, does not rely direct coupling between qubits and functions only using single qubit controls and cavity readout. Such Quantum Zeno Dynamics can be generalized to larger Hilbert space enabling deterministic generation of many-body entangled states, and thus realizes a decoherence-free subspace allowing alternative noise-protection schemes.

Emmanuel Flurin
UC Berkeley

Date submitted: 10 Nov 2016 Electronic form version 1.4