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Closing a quantum feedback loop for a superconducting qubit inside a cryostat CHRISTIAN KRAGLUND ANDERSEN, Aarhus University, JOSEPH KERCKHOFF, KONRAD W LEHNERT, BENJAMIN J CHAPMAN, JILA, University of Colorado, Boulder, KLAUS MLMER, Aarhus University — Several quantum information protocols relies upon efficient feedback (or feed-forward) schemes. Recently, within the field of superconducting qubits, many experiments have shown tremendous progress towards high fidelity quantum feedback scheme. Some experiments work by traditional measurement based schemes where the classical output is processed on a classical "computer" before a signal is fed back to the qubits. Other approaches are working in a continuous coherent manner, where the full quantum description of the system creates an effective bath that relaxes the system into the desired state. This talk will present a different approach that aims to close a measurement based feedback loop inside a cryostat and, thus, the scheme works completely autonomous. This approach sidesteps many of the inefficiencies inherent in two-way communication between temperature stages in typical systems with room temperature controllers, and avoids increasing the cryogenic heat load. This controller may find a broad range of uses in multi-qubit systems, but here I analyze two specific demonstrative cases in single qubit-control and show simulations of the time evolution for the full system dynamics.

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