

## Joint Seminar Series

# ***Fast and Orderly Decoherence: A Systems Engineering View of Superconducting Qubit Readout and Reset***



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**Tuesday, December 10, 2024**

**2:00 pm**

**In-person: EEB 248**

**Via Zoom:**

**<https://usc.zoom.us/j/92584409725>**

### **Abstract:**

This presentation is a systems engineer's look at the superconducting qubit system, with focus on the two parts where we need fast and orderly decoherence: readout and reset. We introduce the basic theory of operation of the transmon qubit with focus on readout and reset and discuss the constraints placed by these operations on the off-chip physical apparatus, including package, wiring, cryostat, and the control electronics. Then, we give an in-depth tour of the mechanism, known as Measurement Induced State Transitions (MIST), through which the readout process kicks the qubit out of the computational subspace and into so-called "leakage states" which are poisonous for quantum error correction. Finally, we bring everything together to show how we design devices to respect the constraints introduced by readout and reset while still performing with sufficient speed and accuracy to support quantum error correction.

Hosted by

Quntao Zhuang, Eli Levinson-Falk, Jonathan Habif, Daniel Lidar, Kelly Luo, Todd Brun, Tony Levi, Stephan Haas