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## **M3Or3C-01 [Invited]: Correlation of Lifetime Fluctuations in Superconducting Qubits**

*Wednesday, July 24, 2019 2:00 PM (30 minutes)*

While the energy relaxation times ( $T_1$ ) of superconducting qubits have improved greatly since the birth of the field, much work remains to better understand the limitations on lifetimes and how best to extend them. It is widely observed that qubits exhibit time-dependent fluctuations of their  $T_1$  times, but the main sources of this process remain a mystery. Among the leading candidates are spurious resonant two-level systems in the dielectric surrounding the device, which are frequency-specific, and excess quasiparticles near the junction, which are not. We monitor the  $T_1$  fluctuations for the first two excited states of 3D flux-tunable transmon and fluxonium qubits and examine correlations between the decay rates. We measure  $T_1$  of the  $|e\rangle$  state at a flux bias such that the  $|g\rangle - |e\rangle$  transition frequency matches that of the unbiased  $|e\rangle - |f\rangle$  transition. This allows us to resolve frequency dependence of the  $T_1$  fluctuations. We believe this is a helpful general tool to distinguish between the effects of dielectric and quasiparticle loss across a range of devices.

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