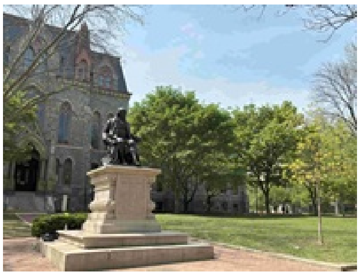

Contribution ID: **164** Type: **Parallel session talk**

Event reconstruction analysis on radiation-induced correlated errors in superconducting qubits

Wednesday 8 October 2025 12:00 (15 minutes)

When an ionizing particle interacts with the substrate of a superconducting qubit chip, it generates athermal phonons that propagate through the material, breaking Cooper pairs in the superconducting film and inducing quasiparticle poisoning. This process increases correlated error rates, posing a significant challenge for the development of fault-tolerant quantum computing. Additionally, the sensitivity of superconducting qubits to Cooper pair breaking makes them promising detectors for dark matter searches and coherent elastic neutrino nucleus scattering, given the meV-scale energy required for quasiparticle generation in most superconductors. In recent years, this field has gained significant interest, leading to extensive experimental studies on the response of superconducting qubits to ionizing radiation. Concurrently, theoretical models have been developed to describe the dynamics of ballistic phonons in the qubit substrate and their impact on quasiparticle relaxation, aiming to establish connections between these processes and qubit design. In this work, I present an advanced analysis aimed at validating these theoretical models using real experimental data. By refining our understanding of phonon and quasiparticle dynamics, this study provides deeper insights into their influence on qubit performance, with implications for both quantum computing and particle detection applications.

Author: CELI, Emanuela (Northwestern University)

Presenter: CELI, Emanuela (Northwestern University)

Session Classification: RDC 8 Quantum & Superconducting Sensors

Track Classification: RDC 8 Quantum & Superconducting Sensors