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## Energy dissipation and phonon kinematics simulation in qubits with G4CMP

*Wednesday, 8 November 2023 16:30 (15 minutes)*

In order to utilize qubits as particle detectors, understanding energy dissipation in qubit substrate (Silicon and Sapphire) through electron-hole pair generation and phonon kinematics is essential. These mechanisms are strongly associated with correlated errors in qubit chips, as observed in cosmic muon and gamma ray absorption events reported recently. We present our work on phonon kinematics simulation and the expected decoherence time of the simulated Silicon qubit chip using G4CMP. Furthermore, the scattering of sub-MeV Dark Matter (for scalar and vector mediators) can produce optical phonon excitations with sub-eV energy in Sapphire. In the second half of the talk, we also present our attempt to better understand energy dissipation in Sapphire with phonon caustics and kinematics simulation.

### Early Career

No

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