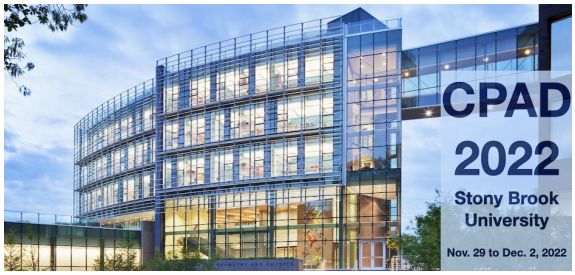

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Quantum Capacitance Detectors with sub-eV resolution for astroparticle applications

Tuesday, 29 November 2022 13:50 (20 minutes)

Sub-eV threshold particle detectors are an area of burgeoning interest, driven in part by needing to probe the increasingly theoretically relevant sub-GeV mass dark matter parameter space. One promising technology to use is Quantum Capacitance Detectors (QCDs), which are superconducting quantum mechanical circuitry that have heritage in the quantum computing world. QCDs have been demonstrated in previous literature as excellent far-IR photon counters with NEP of $< 10^{-20}$ W/$\sqrt{\text{Hz}}$. We seek to extend their applicability by directly coupling the QCD to interaction induced athermal phonons generated within a crystalline silicon substrate. Such a scheme will enable the literal counting of quasiparticles (broken Cooper-pair electrons) within the QCD superconducting absorber, as produced by single meV phonons. In this talk we will discuss preliminary design progress and challenges and lay out a two-year R&D roadmap for demonstrating eV and subsequently lower energy resolution.

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