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Superconducting Tunnel Junction Radiation Detectors for Nuclear Science

Tuesday, 26 May 2020 11:00 (18 minutes)

Superconducting tunnel junction (STJ) radiation detectors combine the high energy resolution of low-temperature operation with the high speed of athermal non-equilibrium devices. They utilize the small superconducting energy gap (˜1 meV) to achieve an energy resolution of a few eV FWHM for energies below 1 keV. Furthermore, the short signal charge life time (˜10s of μs) enables rates of several 1000 counts/s per detector pixel, placing them among the fastest quantum detection technologies. We have recently started a program to adapt STJs to search for sterile neutrinos with unprecedented sensitivity. We will discuss the basic physics of STJ radiation detectors, their operation at temperatures of ˜0.1 K and recent applications in nuclear science. These include accurate measurements of ultra-low energy nuclear transitions for the development of nuclear clocks, L/K branching ratios in the electron capture decay of Be-7 and beyond Standard Model physics searches.

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Primary authors: Dr FRIEDRICH, Stephan (Lawrence Livermore National Laboratory); Prof. LEACH, Kyle G. (Colorado School of Mines); Mr FRETWELL, Spencer (Colorado School of Mines); Mr BRAY, Connor (Colorado School of Mines); Dr PONCE, Francisco (Stanford University); Mr HALL, J. Ad (STAR Cryoelectronics); Dr CANTOR, Robin (STAR Cryoelectronics)

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