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Superconducting Tunnel Junction Quantum Sensors for the BeEST Experiment[1] STEPHAN FRIEDRICH, Lawrence Livermore National Laboratory, BEEST COLLABORATION — The BeEST experiment searches for a keV sterile neutrino signal in the electron capture decay of ^{7}Be that is implanted into superconducting tunnel junction (STJ) quantum sensors. STJs consist of two superconducting films separated by a thin insulating tunnel barrier. They exploit the small meV energy gap in superconductors to be sensitive to phonons from the recoiling ^{7}Li daughter and to provide an energy resolution of a few eV FWHM for recoil energies below 100 eV. Since the ^{7}Li recoil energy depends on the mass of the emitted neutrino, the high resolution can be used to separate a hypothetical sterile neutrino signal from the recoils for decay channels with active neutrinos. In addition, STJs stand out among superconducting quantum sensors for their fast signal decay, which enables STJ operation at several 1000 counts/s per pixel and makes them ideally suited for this high-sensitivity search. This talk will show the design and performance of current STJ detectors which were initially developed for astronomy and material science in the 1990s in the BeEST experiment. We will also discuss ongoing STJ development to improve energy resolution and sensitivity of the BeEST sterile neutrino search by several orders of magnitude.

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