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The First Result on the BeEST keV-scale Sterile Neutrino Search[1] GEON-BO KIM, Lawrence Livermore Natl Lab, BEEST COLLABORATION — The BeEST experiment is a direct search for keV-scale sterile neutrinos using ^{7}Be atoms that are implanted into superconducting tunnel junction (STJ) detectors. The two-body electron capture decay of ^{7}Be produces a neutrino and a ^{7}Li nucleus whose momenta and energies are uniquely determined by the mass of the emitted neutrino. We modeled the eV-scale ^{7}Be decay spectrum using Voigt and Gaussian functions for ^{7}Li recoil peaks, Levinger functions for atomic shaking effects, exponentially modified Gaussian functions for Auger-electron escape, and exponential functions for gamma-ray background events in the substrate. Parameters for nuclear and atomic processes are used to constrain the model shape. We applied a statistical method using the modeled spectral shape and experimental data to find evidence of keV-scale neutrino emission that results in a shift of the ^{7}Li recoil peaks in the spectrum. In this talk, we present results of the statistical analysis for the first physics run data obtained with a single-pixel STJ detector, which improves current exclusion limits on keV-scale neutrinos by an order of magnitude. We will also discuss projected sensitivities of next-phase experiments including 10,000-pixel STJ detector arrays with improved energy resolution.

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