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The HUNTER Sterile Neutrino Search

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The HUNTER experiment (Heavy Unseen Neutrinos from Total Energy-momentum Reconstruction) is a search for sterile neutrinos with masses in the 10-300 keV range. The neutrino missing mass will be reconstructed from ^{131}Cs electron capture decays occurring in a magneto-optically trapped, laser-cooled sample. Reaction-microscope spectrometers will be used to measure the vector momenta of all charged decay products with high solid angle acceptance, and LYSO scintillators read out by silicon photomultiplier arrays detect x-rays, each with sufficient resolution to reconstruct the neutrino missing mass as a peak separated from the near-zero-mass active neutrinos. The stand-alone apparatus to do this has dimensions of a few meters. The overall design of this W.M. Keck Foundation-funded experiment will be discussed and simulated performance shown. The initial phase of the experiment can improve on existing limits by about an order of magnitude. Upgrades that would improve the mixing angle sensitivity by many further orders of magnitude will be described.

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