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# Peter F. Smith (UCLA): The HUNTER experiment: proposed detection of keV-range sterile neutrinos by energy-momentum reconstruction of atomic K-capture

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Right-handed or sterile neutrinos in the keV mass range have been proposed as an explanation of the galactic dark matter. Although direct detection of these is not feasible at the present time, the existence of such neutrinos could be demonstrated in the laboratory as rare events in atomic K-capture, emitting a neutrino together with atomic recoil, the K-vacancy then filled from a higher shell, emitting an X-ray, with further atomic rearrangement releasing several Auger electrons. By precise measurement of all decay products, including the recoil atom, the mass of the unseen neutrino can be calculated by four-momentum reconstruction –usually a value close to zero corresponding to standard neutrino mass eigenstates, but on rare occasions in the keV mass range corresponding to a sterile neutrino. The HUNTER experiment would utilize a large population of Cs-131 atoms suspended in high vacuum in a magneto-optical trap, measuring the vector momentum of all decay products to reconstruct individual sterile neutrino events in the mass range 5 –350 keV. The method offers the possibility of improvement to progressively lower values of sterile neutrino coupling. A first phase of this experiment has been funded by the Keck Foundation as a collaboration between Temple, Houston, and UCLA groups.

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