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A Resonant Cavity-Based CRES Demonstrator on the Path to a Neutrino Mass Measurement with Project 8

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Measurements of the β^- spectrum of tritium give the most precise directly measured limits on neutrino mass. The Project 8 collaboration is using Cyclotron Radiation Emission Spectroscopy (CRES), a new experimental technique developed to surmount the systematic and statistical limitations of current-generation direct measurement methods to reach an electron-weighted antineutrino mass sensitivity of $\sim$40 meV/c^2. Since setting the first CRES-based neutrino mass limit in its Phase II experiment, Project 8 has been developing techniques to scale in volume and energy resolution. A new Cavity CRES Apparatus (CCA) is the first CRES detector with a resonant cavity geometry, with several expected benefits: increased signal-to-noise ratio via enhanced spontaneous emission on resonance; scalability to larger volumes; sub-eV energy resolution; event-by-event magnetic field corrections; and improved signal morphology via suppression of the Doppler effect. This apparatus is under construction at the University of Washington, with expected sub-eV energy resolution and plans for spectroscopy of both conversion electrons from Kr-83m and of electrons from a calibration electron gun.

Poster prize

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