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The Low-Energy Neutrino Spectrometer (LENS) and miniLENS: Progress Toward a Precision Solar Neutrino Measurement

The Low-Energy Neutrino Spectrometer (LENS) experiment will perform a precision measurement of the solar neutrino spectrum above 115 keV. This will allow for a precision determination of the solar luminosity via neutrinos rather than photons, probe the transition region between vacuum and matter dominated neutrino oscillations, help resolve the solar metalicity problem, and provide tests for physics beyond the standard model. The LENS detector employs a charged-current capture reaction of electron neutrinos on In-115 with the outgoing electron having a kinetic energy equal to the energy of the incident neutrino minus the Q-value. The residual isomeric state of the Sn-115 nucleus has a mean lifetime of 4.76 μs and decays with the emission of two gamma rays providing a unique tag for neutrino events in the LENS detector. Despite the fact that In-115 is a beta emitter and produces substantial background in the pp region of the spectrum, a signal to background ratio of approximately 3 to 1 can be achieved through the use of the spatial and temporal coincidence of a neutrino event and tag. To demonstrate key components and technology for LENS, the miniLENS prototype is being designed and constructed. This poster will present the LENS experiment, its background rejection techniques, and the development of the miniLENS prototype.

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