

MAGNETO-v: Neutrino Physics with Precision Pu-241 Decay Measurement

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Pu-241 is a newly proposed nuclide for studying the nature of neutrinos to complement tritium-based experiments. Pu-241 decays into Am-241 via first-forbidden non-unique beta minus decays with 20.8-keV Q-value and 14.3-year half-life, making it suitable for keV sterile neutrino search as well as active neutrinos mass measurement. MAGNETO-v experiment uses magnetic microcalorimeters in conjunction with quantum magnetometers to acquire the most precise Pu-241 decay spectrum. The experiment's pure source is provided by Lawrence Livermore National Laboratory. Our first experiment accumulated total 160 million counts above the 3 keV threshold, which is currently the most precise Pu-241 beta decays spectrum. The data yields a $|U_{e4}|^2 \sim 10^{-3}$ sensitivity to 10-keV neutrinos, which is compatible to the current best limit. More data acquisition is on the way and preliminary analysis results for keV neutrino and active neutrino mass will be presented. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. This work was supported by the Laboratory Directed Research and Development program of Lawrence Livermore National Laboratory (23-LW-043).

Poster prize

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