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Atomic Tritium for Neutrino Mass Measurement in Project 8

Project 8 aims to determine the absolute neutrino mass via tritium β-decay using Cyclotron Radiation Emission Spectroscopy (CRES).
Good energy precision, high statistics, and well-controlled systematics will enable $m_\beta \leq$ 40-meV sensitivity. We have achieved eV resolution at 17.8 keV and will instrument our fiducial volume with spatially-resolving antennae to minimize pileup.

Project 8 is the first m_β experiment with atomic tritium (T), which is free of the $\sim$ 1-eV energy smearing rovibrational final states induce in T_2 decay. The collaboration is preparing to produce, cool, and store $\sim 10^{12}$ atoms/cm^3 at $\sim$ 30 mK in a 2 T-deep, multi-cubic-meter magnetic trap. Here we discuss results from atomic-source test stands and studies of loading and trapping for a single-cubic-meter-scale Atom Trapping Demonstrator to be built before the final Phase IV experiment.

Mini-abstract

Project 8 is preparing to measure the ν mass with 40-meV sensitivity using atomic tritium.

Experiment/Collaboration

Project 8

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