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Project 8: Using Radio-Frequency Techniques to Measure Neutrino Mass

Thursday, 15 August 2013 17:00 (20 minutes)

The Project 8 experiment aims to measure the neutrino mass using tritium beta decays. Beta-decay electron energies will be measured with a novel technique: as the electrons travel in a uniform magnetic field their cyclotron radiation will be detected. The frequency of each electron's cyclotron radiation is inversely proportional to its total relativistic energy; therefore, by observing the cyclotron radiation we can make a precise measurement of the electron energies. The advantages of this technique include scalability, excellent energy resolution, and low backgrounds. The collaboration is using a prototype experiment to study the feasibility of the technique with a ^{83m}Kr source. Demonstrating the ability to see the 17.8~keV and 30.2~keV conversion electrons from ^{83m}Kr will show that it is possible to measure tritium beta-decay electron energies ($Q \approx 18.6$~keV) with their cyclotron radiation. Progress on the prototype, analysis and signal-extraction techniques, and an estimate of the potential future of the experiment will be discussed. This research is supported in part by DOE grant DE-FG02-97ER41020 and the National Science Foundation.

APS member ID

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Primary author: Dr OBLATH, Noah (MIT)

Presenter: Dr OBLATH, Noah (MIT)

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