

# Inelastic Neutron Scattering Studies Relevant to Neutrinoless Double-Beta Decay

Monday

February 16

4 P.M.

Rm 124 NSH

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The search for neutrinoless double-beta decay ( $0\nu\beta\beta$ ) is a large international effort, with hopes of discovering physics beyond the standard model. One candidate for  $0\nu\beta\beta$ , the decay of  $^{76}\text{Ge}$  to  $^{76}\text{Se}$ , is the focus of two major experiments, GERDA and MAJORANA. In these experiments, the signature of  $0\nu\beta\beta$  would appear as a sharp peak in the energy spectrum at 2039 keV. Due to the high sensitivity of such a measurement, knowledge of background  $\gamma$  rays is critical. One such concern is the 2040.70(25)-keV  $\gamma$  ray from the 3951.70(14)-keV level in  $^{76}\text{Ge}$ , found in a study of  $^{76}\text{Ga}$   $\beta^-$  decay. This level could be populated via cosmic-ray-induced inelastic neutron scattering in the large experiments searching for the 2039-keV signature of  $0\nu\beta\beta$ . The neutron-induced cross section of this level was measured at the University of Kentucky Accelerator Laboratory (UKAL). In this seminar, I will discuss the capabilities of UKAL and how we are using this facility to investigate topics related to  $0\nu\beta\beta$  searches in  $^{76}\text{Ge}$ , ranging from the structure of the parent and daughter nuclei to potential backgrounds from decays in  $^{76}\text{Ge}$  itself. In particular, we have found that the 2039-keV region of the  $\gamma$ -ray spectrum following neutron scattering in  $^{76}\text{Ge}$  is more complex than was previously thought.

Refreshments  
served prior to  
the seminar in  
Rm 124.