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INPP Seminar | From Neutrino Oscillations to Stellar Nucleosynthesis: Recent Measurements of the 13C(α,n)16O Reaction at Notre Dame and ORNL, Oct. 10

Ohio University College of Arts & Sciences

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The Institute of Nuclear and Particle Physics (INPP) presents Michael T. Febbraro, of Oak Ridge National Lab, on "From Neutrino Oscillations to Stellar Nucleosynthesis: Recent Measurements of the $^{13}C(\alpha,n)^{16}O$ Reaction at Notre Dame and ORNL" on Tuesday, Oct 10, at 4 p.m. in Edwards Accelerator Lab, Roger W. Finlay Conference Room.

Abstract: The $^{13}C(\alpha,n)^{16}O$ reaction is of broad interest to both nuclear physics and applied nuclear science communities. Ranging from the s-process and stellar nucleosynthesis, to a dominate background source for large scale reactor and geo-neutrino detectors, and also constraining the important $^{16}O(n,\alpha)^{13}C$ cross section needed for advanced reactor modeling and materials recycling. In s-process stellar nucleosynthesis, the $^{13}C(\alpha,n)^{16}O$ reaction serves as the dominant source fueling the production of heavy nuclei near the line of β-stability. Approximately half of the elements from Fe to Bi along the line of β-stability are synthesized via s-process nucleosynthesis in asymptotic giant branch stars. In measurements of reactor and geo-neutrinos with organic scintillators, alpha-emitting radionuclide impurities can induce $^{13}C(\alpha,n)^{16}O$ reactions within the carbon-rich detector volume. These signals are often indistinguishable from true antineutrino signals . The $^{13}C(\alpha,n)^{16}O$ cross section is then required to understand and account for this important background contribution to the measured spectra. This talk will focus on two recent measurements of the $^{13}C(\alpha,n)^{16}O$ reaction ranging from 0.4 to 6.5 MeV performed at the University of Notre Dame and the Multicharged Ion Research Facility (MIRF) at Oak Ridge National Laboratory. An emphasis will be given to the enabling advances in neutron detection technologies which made these measurements possible.