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Comparison of ToF vs Unfolding Methods for Neutron Spectroscopy Studies of with CATRiNA[1] JESUS PERELLO, ASHTON MORELOCK, SERGIO ALMARAZ-CALDERON, LAGY BABY, KENNETH HANSELMAN, NATHAN GERKEN, Florida State Univ — The (d,n) reaction, the analog to the (d,p) reaction, is an important spectroscopic tool, yet hardly any measurements involve the detection of an outgoing neutron due to the difficulty of extracting neutron energy. The standard method for measuring neutron energies is time-of-flight (ToF) where the arrival time of neutrons are measured in reference to gamma-rays. Recently, deuterated liquid scintillators have gained great interest in nuclear physics research due to their pulse-shape discrimination capabilities, and a distinct peak in their pulse-height (PH) spectrum that can be directly related to the incident neutron energy. At FSU, we have built a response matrix for the CATRiNA deuterated neutron detector array as well as an unfolding algorithm to obtain neutron energies from their PH spectra. In this work we present results from a direct comparison of spectroscopic information obtained using CATRiNA by ToF and PH unfolding methods . Both, ToF and PH spectra unfolding, techniques have been used to obtain differential cross-sections and spectroscopic factors for states populated in the ^{12}C(d,n)^{13}N and d(d,n)^{3}He reactions at beam energies of E_{lab}= 4-8 MeV.

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