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Neutron-neutron quasifree scattering in nd breakup at 10 MeV[1]

RONALD MALONE, Duke University and Triangle Universities Nuclear Laboratory

— The neutron-deuteron system provides a rich environment for testing theoretical models of the neutron-neutron (nn) interaction. Theoretical predictions based on rigorous ab-initio calculations using modern nucleon-nucleon (NN) interaction potentials agree well with most experimental data for this system. However, some discrepancies remain, such as the nn quasifree scattering (QFS) cross section in neutron-deuteron breakup. Recent experiments at incident neutron energies of 26 and 25 MeV have measured cross sections for this process that are larger than theoretical predictions by almost 20%. These results suggest substantially larger charge-symmetry breaking than is in current models of the NN interaction and the possible existence of a di-neutron bound state. Due to the significant implications of these results, we are performing measurements of the nn QFS cross section at Triangle Universities Nuclear Laboratory. These measurements utilize time-of-flight techniques with a pulsed neutron beam at energies below 20 MeV. Data has been collected at an incident neutron energy of 10 MeV for one angular configuration. Preliminary results from this measurement will be presented and plans for future measurements at higher energies at several angles will be discussed.

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Ronald Malone
Duke University and Triangle Universities Nuclear Laboratory

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