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Analyzing the Structure of 14O with TwinSol and AT-TPC

LOUIS JENSEN, Univ of Notre Dame, PROF. AHNS RESEARCH GROUP TEAM, TWINSOL GROUP COLLABORATION — Nuclei are known to exhibit clustering, a phenomenon in which the structure of the nucleus forms clusters resembling alpha particles. Understanding the origins of alpha clusterization is an important aspect of nuclear structure and the formation of light elements in astrophysical environments. One of the places in which these cluster structures have been found is in the 14C nucleus. Due to isospin symmetry, the symmetry between a proton and neutron with respect to the nuclear force, we expect cluster structures to exist in 14C's mirror nucleus, 14O. In order to look for cluster states in 14O, we will use resonant scattering of a 10C beam with a 4He target. The first step wasto study the viability of producing a radioactive 10C beam using a 10B + 3He reaction. The 10C beam will separated from other reaction products using a pair of superconducting solenoid magnets called TwinSol. The production yields of 10C have been measured using a beta-decay detector and silicon gamma detector. By fitting the beta and gamma decay data, we have been able to analyze the reactions yields of the 10B + 3He reaction and determined this to be a viable reaction to create a 10C beam. Now we will implant our 10C beam onto a 4He active-target in a time projection chamber. The time projection chamber will allow us to measure the paths and times of the reactions in the 4He gas chamber. Using this data, we will study the properties and structures of the 14O nucleus.

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