Differential cross section measurements for (n,α) reactions with a Time Projection Chamber

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Data for the ^{12}C(n,α) and ^{16}O(n,α) differential cross sections are important for several different areas of nuclear physics such as understanding neutron transmutation in nuclear reactors.

The TexAT Time Projection Chamber was used to measure the differential and angle-integrated cross sections in active-target mode. The chamber was filled with CO_2 gas and used a quasi-monoenergetic neutron beam from the d(d,n) reaction at Edwards Accelerator Lab at Ohio University.

A comparison between our current and previous results at overlapping energies and angles which showed good agreement in angular dependence and absolute cross section. A broader angular coverage than previous results demonstrated that the integrated cross section for the ^{16}O(n,$a_{1,2,3}$) reaction deviates from ENDFVIII.0 evaluations.

This talk will discuss the first instance of neutron-induced measurements with an active-target Time Projection Chamber demonstrating the use of this method for high-quality differential cross section data across a broad angular range, generating good statistics with a relatively low-intensity beam [1].

[1] J. Bishop et al. arXiv:2601.02841 [nucl-ex]