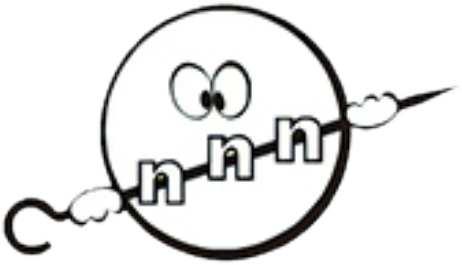

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Test of the Performance of an LGAD-Based Zero-Degree Detector on the CSNS Back-n Beamline

Thursday, 29 May 2025 14:50 (15 minutes)

To establish a comprehensive and reliable nuclear database for neutron-induced processes, the development of accelerator-driven system (ADS) technology is essential. Despite many efforts have been made, accurate measurements of light charged ions (LCIs), including protons, tritium, and α particles, at zero degrees in the beam direction remain challenges. Conventional detectors often fail to operate consistently under intense neutron beam fluxes, severely limiting their applications as zero-degree detectors (ZDDs). However, the recent development of low-gain avalanche diode (LGAD) technology, designed to meet the strong demands of the ATLAS experiment during the high-luminosity phase of the Large Hadron Collider (LHC), offers a promising solution. With its ability to withstand 2.5E15 1 MeV neq/cm2 irradiation, 50-μm active thickness, 30-ps timing resolution, cost-effectiveness, and excellent radiation hardness, the LGAD detector emerges as a strong candidate for ZDD applications in neutron-induced process measurements. This report presents a performance evaluation of the LGAD detector as a ZDD on the back-streaming neutron (Back-n) beamline at CSNS. Through cross-section measurements of the 6Li(n, T)α reaction, the LGAD demonstrates excellent performance, showing strong agreement with data from the evaluated nuclear data file (ENDF).

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