

ALERT AI-assisted Tracking and Particle Identification

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Abstract

A broad scientific program emphasizing the study of the nuclear Generalized Parton Distributions (GPDs), EMC effects, and the nature and origin of nuclear effects are enabled by the ongoing construction of a low-energy recoil tracker (ALERT). The addition of ALERT to the existing capabilities of the CLAS12 spectrometer will permit the challenging detection of the low momentum recoiling spectator system in a large kinematic range ($1 < Q^2 < 7\text{GeV}^2$ and $0.1 < x_B < 0.7$). Proposed exclusive and semi-inclusive measurements depend on robust identification of ^4He , ^3He , ^3H , deuterons, and protons in a high-rate environment. The aforementioned criteria will be met via the ALERT setup consisting of a low-gain stereo drift chamber and a scintillator array for track reconstruction and time-of-flight measurements. The optimization of its tracking accuracy and overall particle identification performance can be achieved via advanced machine-learning techniques. This talk will present the AI-assisted ALERT tracking development status and the path toward its implementation and deployment during the experimental running period planned for fall 2024.

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