Contribution ID: **97** Type: **Poster (participant)**

Compact High-Energy Electron Spectroscopy via Nuclear-Static-Field Deflection

Monday, 14 April 2025 17:10 (1h 30m)

The measurement of electron energy spectra can be understood as distinguishing high-energy and low-energy electrons by electromagnetic deflection at varying angles. When the deflection distance is constrained, the deflection force determines the upper energy limit of the measurement. Given that static magnetic fields in the macroscopic world are limited to ~10 T, magnets ~1 m in length are typically required to measure electron spectra above 10 GeV. However, utilizing the static electric fields near atomic nuclei could enable stronger deflection forces, facilitating high-energy electron spectrum measurements. In our experiment, a 0.86 mm Sn foil scattered electrons with a peak energy of ~2 GeV. By analyzing the angular distribution of scattered electrons via Molière theory and gradient descent optimization, we successfully reconstructed the electron energy spectrum. The results were cross-verified against magnetic spectrometer measurements, confirming the method's validity. Extensive GEANT4 simulations further suggest this approach may extend to measuring electron spectra at 10 GeV or even 100 GeV scales. This work demonstrates a compact, high-efficiency alternative to conventional magnetic spectrometers for ultra-high-energy electron detection.

Primary authors: DOWNER, Michael (The University of Texas at Austin); ZGADZAJ, Rafal (University of Texas at Austin); CHENG, Xiantao (Shanghai Jiaotong Unversity)

Presenter: CHENG, Xiantao (Shanghai Jiaotong Unversity)

Session Classification: Poster Session

Track Classification: Diagnostics