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Abstract Title: Performance and Commissioning of Super BigBite Scintillator Detectors for Nucleon Form Factor Experiments at Jefferson Lab

Presentation Type: Oral

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Category Type: Experimental

Abstract Body: The Super BigBite Spectrometer (SBS) is a Jefferson Lab (JLab) Hall A Collaboration project that has and continues to measure nucleon electromagnetic form factors (EMFF). This spectrometer included the Timing Hodoscope which provided high resolution particle timing data for scattered electrons in the electron arm of BigBite. The focus of this detector research project was the construction, commissioning, calibration, and performance of the BigBite Timing Hodoscope before and during the first (GMn - neutron magnetic FF) of five nucleon EMFF experiments at JLab Hall A.

Once the Timing Hodoscope was built, commissioned, and well-calibrated, data-taking commenced and the beam on-target data was used to characterize the Timing Hodoscope performance during run-time. After application of physics cuts to ensure a data set comprised of particle tracks corresponding to elastic electrons, which is the main data of interest for measurement of GMn, the Timing Hodoscope is shown on average across all kinematic settings to have a >98% tracking efficiency, a position resolution of 4-6 cm in the non-dispersive plane and 1.5-2 cm in the dispersive plane, and a time resolution of 500-750 ps. These performance results are compared to a GEANT4 based performance simulation of the BigBite Timing Hodoscope.

For the final SBS form factor experiment (GEp - proton electric FF) set to run in the near future, SBS will include the Coordinate Detector (CDet). The focus of this detector research project covers, thus far, CDet's commissioning and installation progress, which is scheduled to finish in 2024.

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