

A Diamond Micro-strip Electron Detector for Compton Polarimetry

Amrendra Narayan *

Mississippi State University

The Q_{weak} experiment at Jefferson Lab aims to measure the weak charge of the proton with a precision of 4.1% by measuring the parity violating asymmetry in polarized electron-proton elastic scattering. Beam polarimetry is the largest experimental contribution to the error budget. A new Compton polarimeter was installed in Fall 2010 for a non-invasive and continuous monitoring of the electron beam polarization in Hall C at Jefferson Lab. The Compton-scattered electrons are detected in four planes of diamond micro-strip detectors. This is the first use of diamond micro-strip detectors as a tracking device in a physics experiment. These detectors are read out using custom built electronic modules that include a pre-amplifier, a pulse shaping amplifier and a discriminator for each detector micro-strip. We use Field Programmable Gate Array based general purpose logic modules for event selection and histogramming.

This polarimeter is currently being used for online monitoring of beam polarization in the experiment. We have achieved the design goals of 1% statistical uncertainty per hour and expect to achieve 1% systematic uncertainty. We will discuss the details of our polarimetry setup, the analysis approach and the preliminary results.

*This work was supported by DOE Grant Number: DE-FG02-07ER41528 (Precision Measurements at Medium Energy)