Calibrations for Charged Particle Tracking with the GlueX Detector

Michael Staib

The charged particle tracking system for the GlueX experiment consists of two gas detectors, the Central Drift Chamber (CDC) and the Forward Drift Chamber (FDC). The CDC is a cylindrical straw-tube detector extending between polar angles of 6° and 168° relative to center of the target, with optimal coverage between 29° and 132°. The CDC is designed to provide a measurement of the drift distance in each straw with a resolution of ∼150 μm. The FDC is a Cathode Strip Chamber consisting of four packages, each with six alternating layers of anode wires and cathode strips. The FDC is designed to track forward-going charged particles with polar angles between 1° and 20° with a spatial resolution of ∼200 μm. Both tracking detectors are instrumented with 125 MHz flash-ADC modules to record timing information as well as energy loss measurements useful for particle identification.

During the Fall 2014 and Spring 2015 run periods, the first photon beam was delivered on target for commisioning of the GlueX detector in Hall-D at Jefferson Lab. These data are currently being used in a large effort to calibrate the individual detector subsystems to achieve design performance. Methods and results for calibrations of each of the tracking detectors are presented. Techniques for alignment of the tracking system using a combination of cosmic rays and beam data is discussed. Finally, some early results of physics measurements including charged final-state particles are presented.