The GlueX Experiment at Jefferson Lab

Micah Veilleux

Jefferson Lab, Christopher Newport University, Newport News, VA, USA
veilleux@jlab.org

The GlueX experiment at Jefferson Lab strives to gain a better quantitative understanding of color confinement, the phenomenon that color charged particles (quarks and gluons) cannot be isolated. All color charged particles are known to exist in color-neutral combinations, such as ($q\bar{q}$, qqq, or $\bar{q}\bar{q}\bar{q}$). Quantum chromodynamics theorizes that confinement occurs due to the presence of color charge in gluons, which serve to mediate the strong force and attract quarks to each other. But asserting that gluons have color charge complicates the naive quark model – now hadrons consisting only of gluons (gg, ggg), and hybrids consisting of quarks and valence gluons ($q\bar{q}g, qqqg$) are permitted. Some of these predicted hybrids are characterized by quantum numbers not allowed by the naive quark model. GlueX will attempt to verify that gluons do indeed have color charge by searching for low energy exotic hybrid mesons ($q\bar{q}g$).

In order to perform this search a major upgrade will take place at Jefferson Lab, providing a high energy photon beam suitable for photoproduction of hybrid mesons and a new experimental hall to house the experiment. A series of detectors are under construction that will be optimized to provide nearly hermetic detection of the decay products of exotic hybrid mesons. Among the detectors under construction are a set of forward drift chambers, which will provide position measurements of charged particles downstream of the target. A review of the entire GlueX project will be presented, as well as details on the position uncertainty in the forward drift chambers that results from non-flat cathode plane surfaces.

References:

The GlueX Collaboration. (October 2004). *GlueX Detector Review.*