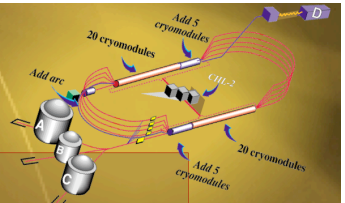
GLUEXcitations
GLUEXperiment

Experimental HALL-D

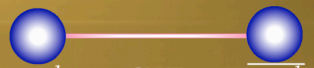


A New State of Matter?

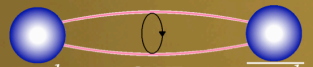
From the furthest stars to the molecules in your fingernail, everything in the universe is made of tiny particles called quarks. Quarks have a peculiar behavior called "confinement" which means they are always bound together in groups of two, three or more quarks. The "glue" which binds them is made up of particles called "gluons".

The GlueX experiment in Hall-D will attempt to produce and detect 2-quark particles in which the "glue" has been excited. The signature we will look for is to find particles with properties which cannot be explained by two quarks alone. At the same time, these "exotic" signatures will not match the known spectrum of 3 quark states.

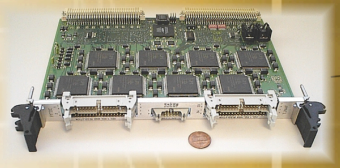
Observing and measuring states with excited glue will give us insight into the nature of "glue" and thus, the nature of confinement. Understanding confinement is considered one of the most important scientific questions of our time.



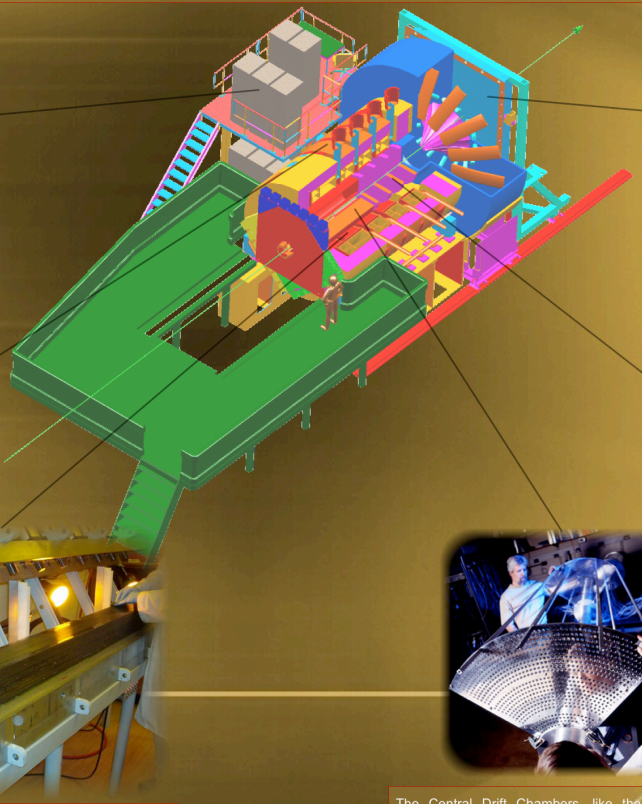
Meson in Ground State

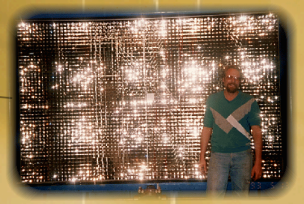


Meson in Excited State



Electronics play a critical role in modern accelerator physics experiments. Events will be recorded at a rate of 200,000/second. Modular electronics such as the F1 TDC shown here are used to record things such as times and sizes of electronic pulses. The F1 TDC was designed here at JLab based partly on requirements of the GlueX experiment.



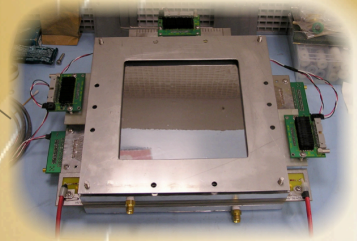


The forward calorimeter is used to measure energy of electrons and photons. It is composed of approximately 2500 modules made of lead-glass. When an energetic particle enters the calorimeter, it creates a "shower" of particles which will spread into several modules. Having many modules allows us to determine where the particle hit in addition to its energy.

The superconducting solenoid provides a very intense magnetic field (about 2 Tesla). The magnet is actually made of 4 separate superconducting coils. The photograph here shows one of the coils being tested at the Indiana University Cyclotron Facility.

The Barrel Calorimeter is a large cylindrical detector that can measure the energy of photons or electrons. The calorimeter is made by gluing together many layers of scintillating fibers and lead. This photo shows one section being made at the University of Regina in Saskatchewan, Canada, one of a number of international collaborators on the GlueX experiment.

The Central Drift Chambers, like the planar drift chambers, detect electrically charged particles as they pass through. This photo shows R & D work being done at Carnegie Melon University on a prototype. The chambers amplify small signals using gas which can be ionized and wires at high voltage.



This picture shows a prototype of one of the planar Drift Chambers being designed for use in the GlueX detector by Ohio University. A Drift Chamber can detect charged particles as they pass through. The magnet will cause the charged particles to travel in a spiral though the chambers. The size and shape of the spiral tells us the momentum and direction of the particle at the time it was created.

http://www.halld.org
http://www.gluex.org
http://www.jlab.org/Hall-D

Jefferson Lab
Thomas Jefferson National Accelerator Facility