CDC Design

Curtis A. Meyer

Carnegie Mellon University

May 12^{th}, 2009

GlueX Collaboration Meeting, May 2009

Outline

Outline

2008 Chamber Design

- Chamber Length: 150 cm
- Layers: 24 (**3**-2-2-**5**-2-2-**8**)
- Inner Active Radius: 10.2 cm
- Outer Active Radius: 55.4 cm
- 1.6 cm diameter kapton straws.
- Open-pack geometry.

Outline

Wire Layout

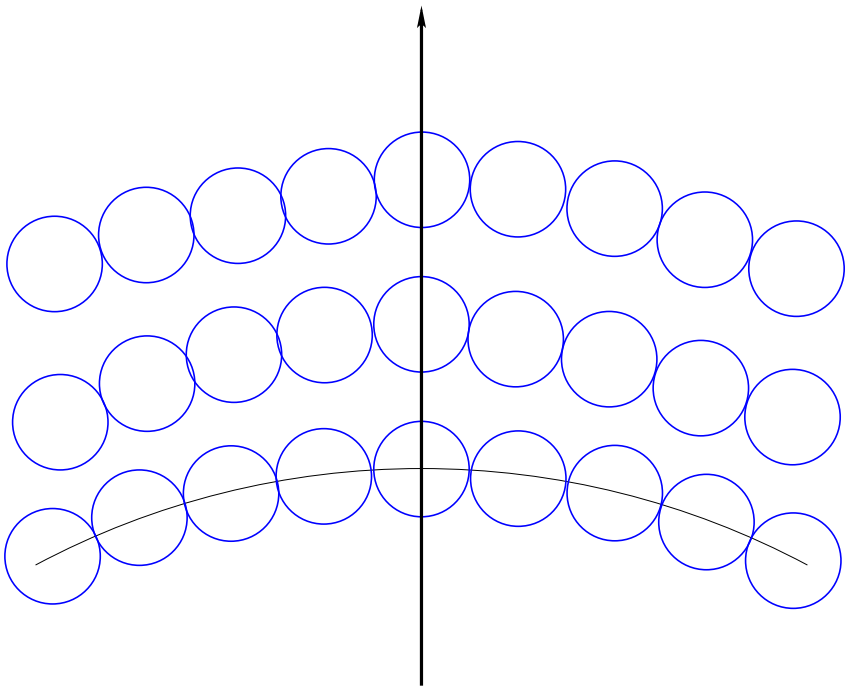
During the late summer of 2008, David Lawrence discovered a number of tracking inefficiencies in the reconstruction of charged tracks in the CDC. After detailed Monte Carlo studies using different wire lay-out designs, the efficiency using the current software increased substantially.

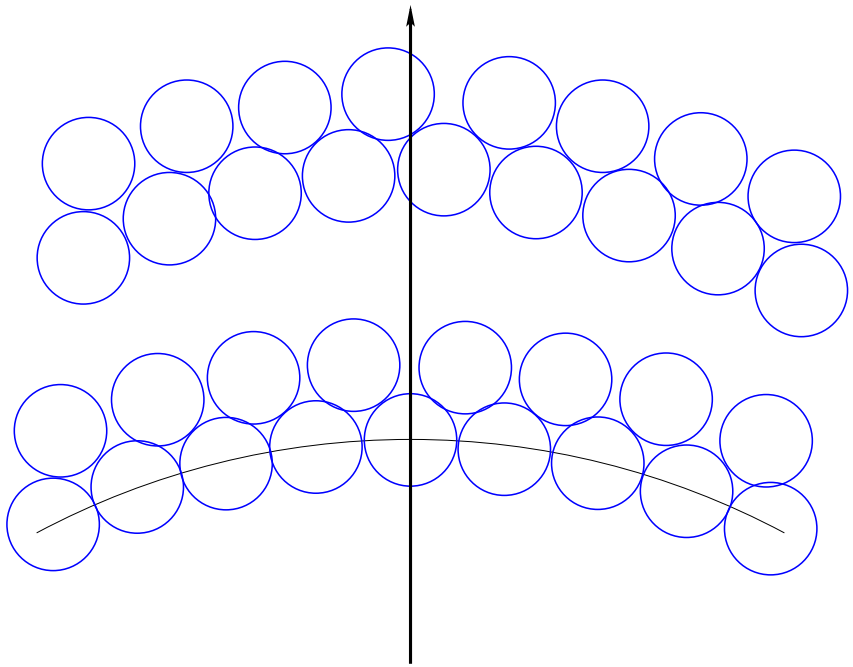
- Have a minimum of 3 of the same type of layer next to each other.
- Have as many layers as possible.
- Try to prevent straws from lining up exactly along a radius.

2008 Chamber Design

- Chamber Length: 150 cm
- Layers: 28 (**4**-4-4-**4**-4-4-**4**)
- Inner Active Radius: 9.9 cm
- Outer Active Radius: 55.5 cm
- 1.6 cm diameter mylar straws.
- Close-pack geometry.

2008 Chamber Design





Wire layouts in the two designs. Left is the original design with the open-pack geometry. Right is the new design with the close-pack geometry.

Outline

Straw Tubes

Based on the properties of the tube samples that we had been able to obtain during prototype construction, we had decided on an aluminized kapton material. This was springy enough to be resistant to damage, but did sag more than the mylar sample we had. The vapour-deposition on the kapton was done by Shedahl and the tubes were then made by Stone Industrial.

Straw Tubes

A third company was identified that had made most of the straws for the chambers done in Europe (Lumina of the U.K.). Tim obtained several samples of mylar straws from them. These are quite different from the mylar samples that we had originally obtained from Euclid. They are at least as robust as the kapton and have less gravitational sag. They are also about 30% the cost of kapton straws.

Straw Tubes

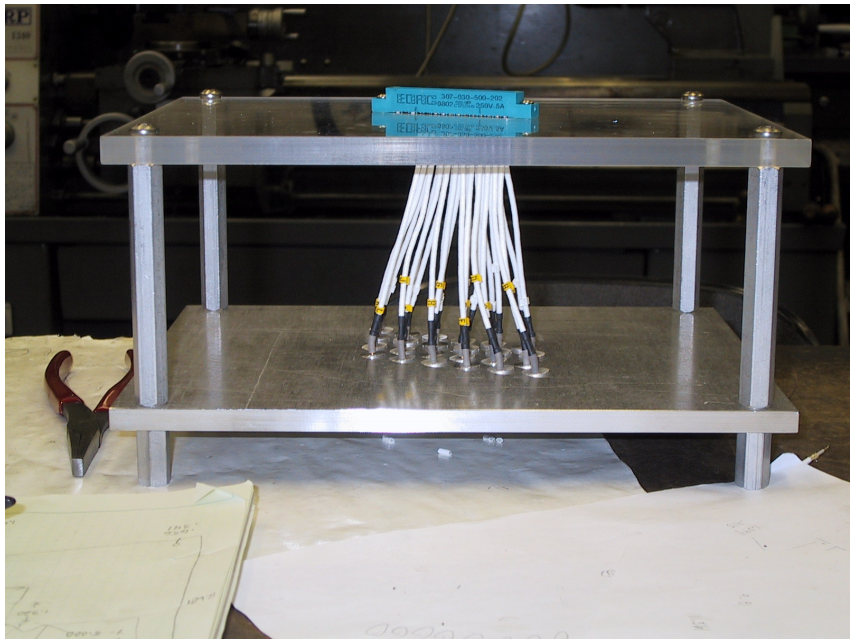
In looking at the straws, we found that in vapor deposition, it was not possible to get thicker than 1 μm. We want at least 4-5 μm to eliminate ageing damage to the aluminum surface. This is traditionally done by using a thin foil. Lumina has ready access to 9 μm foils, while Stone has 12 μm ones. Our current preference is to go with the Lumina mylar straws.

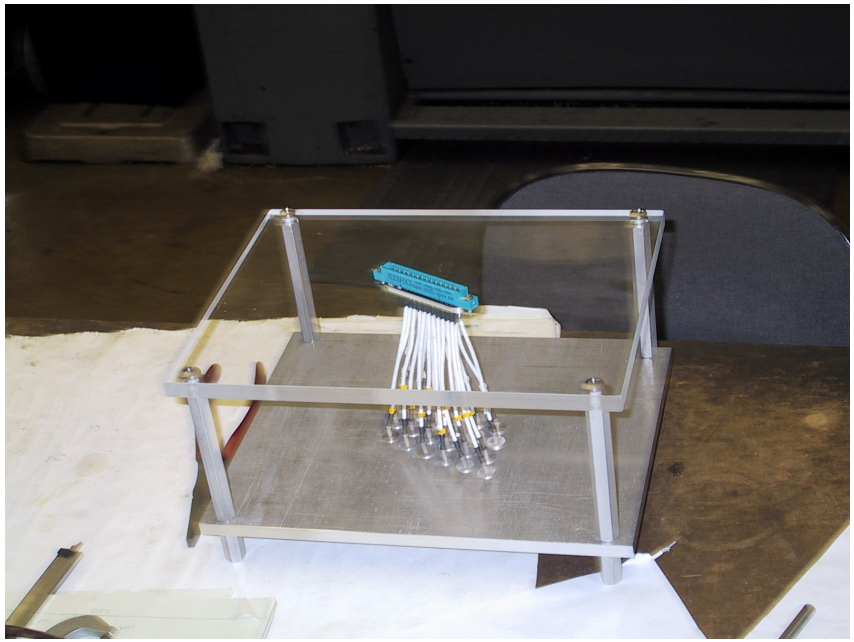
Outline

Electrical Hook Ups

The electrical signals need to be taken off the wires (at high voltage), brought through the end gas plenum, and then capacitively decoupled before amplification. We have been trying to hold the length of the wire from the chamber to the high-voltage board to be 10cm or less. Shown are two designs using a coaxial high-voltage wire.

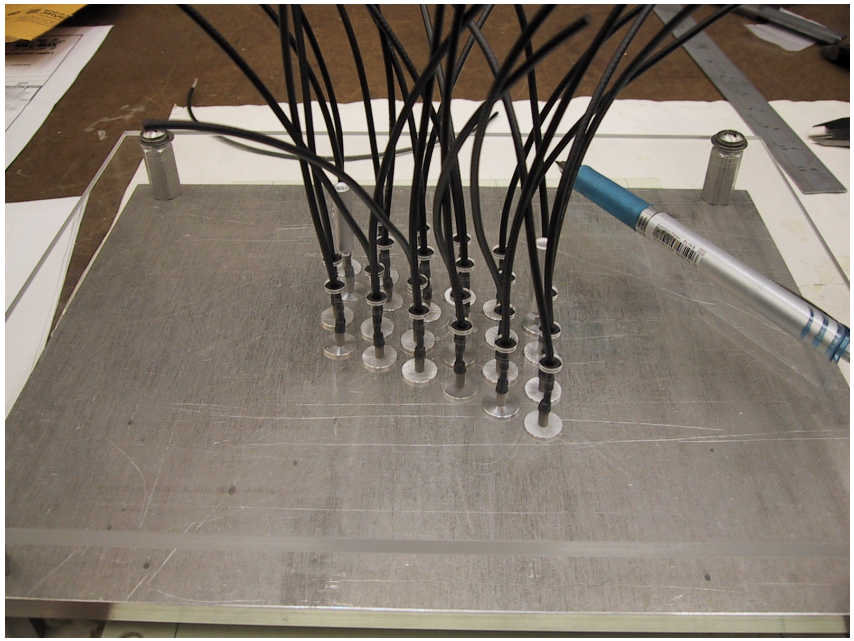
Electrical Hook Ups

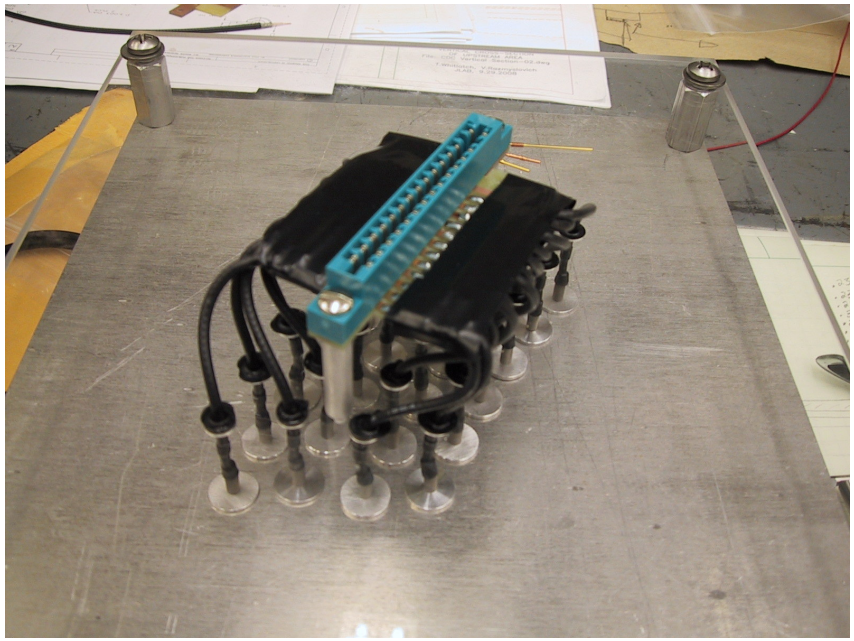




In this design, a gas-tight connector is made. The wires are up to about 12cm long and are attached to the chamber wires by reaching in from the side.

Electrical Hook Ups





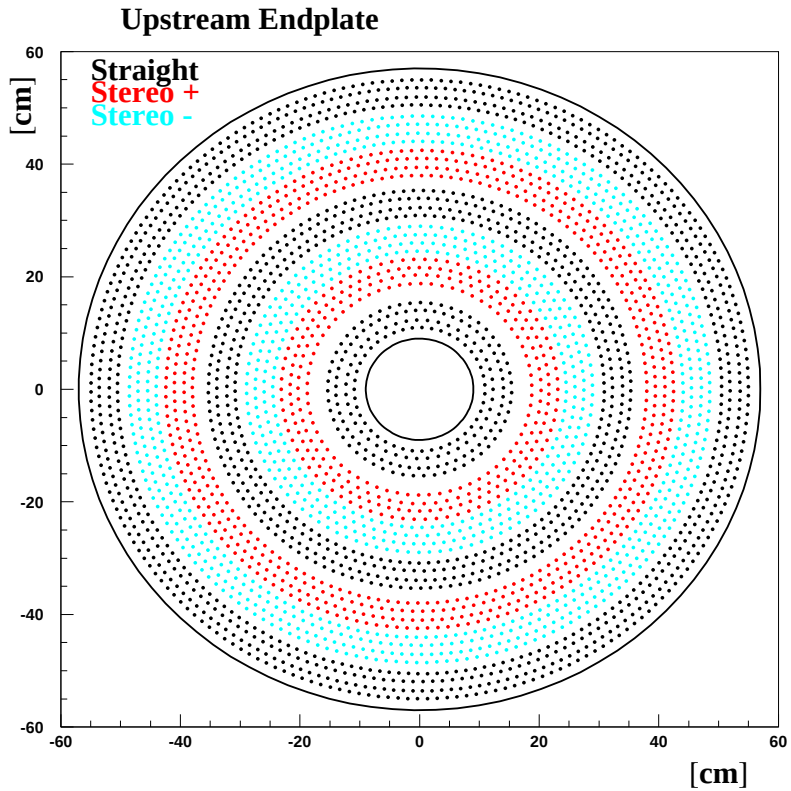
In this design, a gas-tight connection is made around the coaxial cable. We are still checking this. The wires are up to about 9cm long and are attached to the chamber wires pushing through a

Outline

CDC End Plates

- Probably the most *complicated* parts in GlueX.
- Wire hole pattern finalized in early March.
- Finalizing the additional features needed for construction.

CDC End Plates



The hole pattern on the up-stream end plate.

Outline

Summary

- Major Changes to wire layout to improve pattern recognition finished.
- Changes in fixing features on the end plates were also needed.
- The exact size of the straws is slightly dependent on the wire layout, which cascades down to feed throughs.