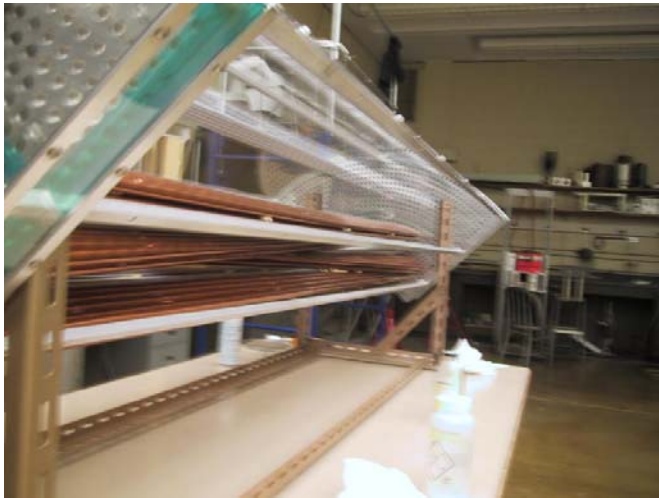
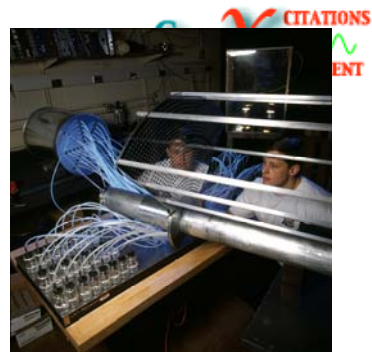


# The GlueX Central Drift Chamber

Curtis A. Meyer, Carnegie Mellon University



9/02/2007

The GlueX CDC

# Outline



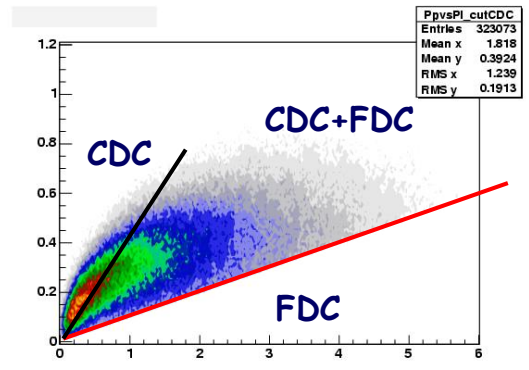
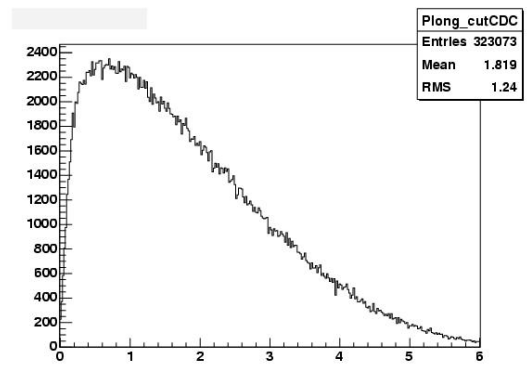
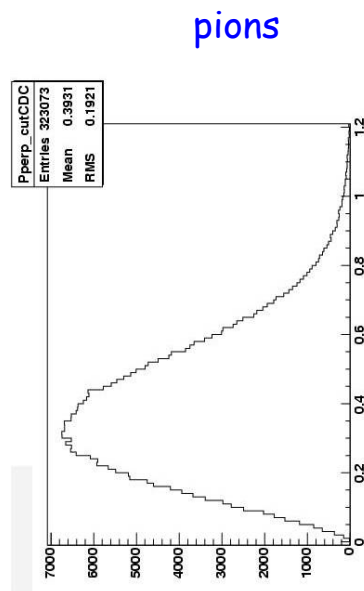
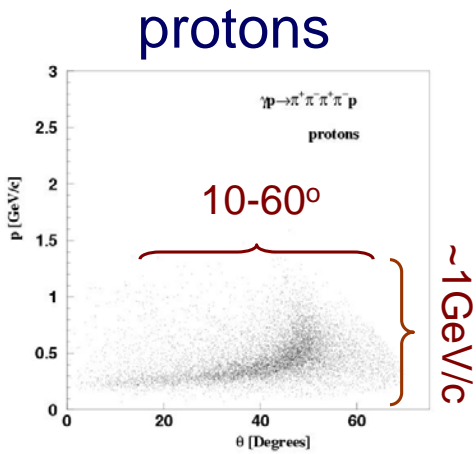
# Physics Requirements



99% Charged particle acceptance  
98% Photon acceptance

Momentum of tracks in the CDC

$$\gamma p \rightarrow \eta_1(1800)p \rightarrow 2\pi^+2\pi^-\pi^0p$$

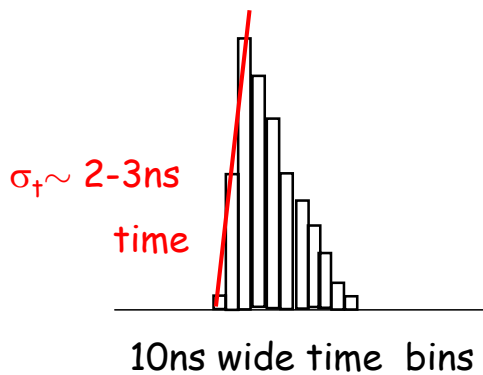
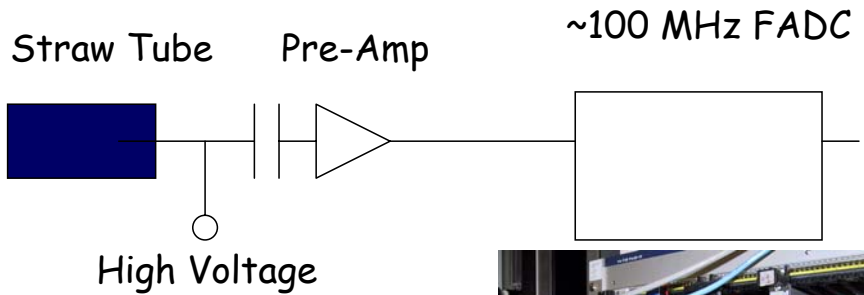


# Electronics



FADC: JLab/IU

Preamp: Alberta/JLab



ADC yields  $dE/dx$  information

JETSET: NIM A367, 248 (1995)  
 $dE/dx$  at 10% resolution in straw tubes.

# Resolution



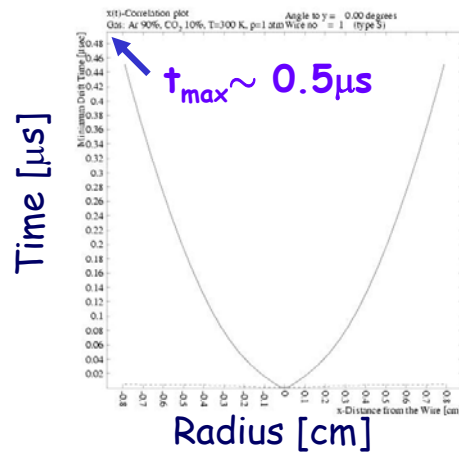
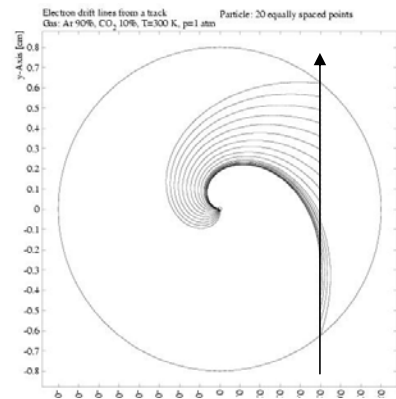
## Contributions to Resolution

Geometrical Precision	40 $\mu\text{m}$
Gravitational Sag	56 $\mu\text{m}$
Timing Resolution	45 $\mu\text{m}$
Electrostatic Deflection	10 $\mu\text{m}$
Gas Diffusion	120 $\mu\text{m}$
<b>Total</b>	<b><math>\sim 145\mu\text{m}</math></b>

We have a gas mixture that should work, but we would like to optimize this .

Would like to use the same gas in both the FDC and the CDC.

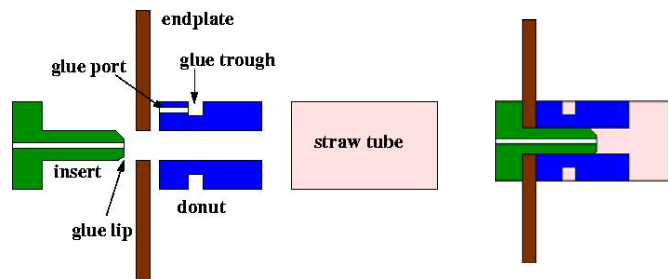
90-10 Ar-CO<sub>2</sub>



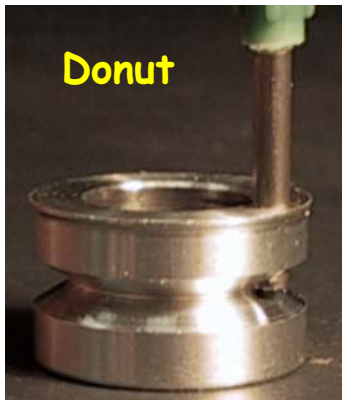
# Gas Leaks

A problem with straw tube chambers is that the glue joints leak.

Designed, built and tested a feed through system that forms a solid glue seal.



System has held several psi overpressure for nearly a year.



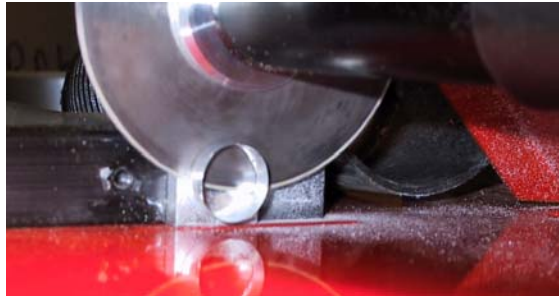


# Stringing The Chamber

Select tube



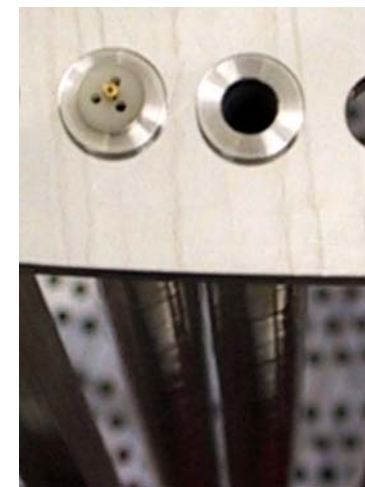
Cut to length



Glue donut



Glue in chamber



Magnetic Feeds



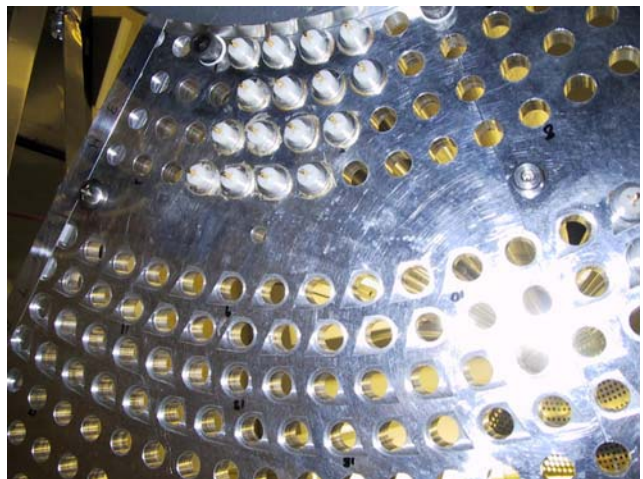
Pneumatic crimper



Vertical stringing



# Prototype Construction





# Final Chamber



Machine Endplates in industry  
Acquire Shells  
Machine Al and Delrin Donuts  
Acquire Crimp pins  
Acquire Straw tubes  
Acquire Wire

Parts need to be spec'd, ordered and checked.

Tube building takes about 15 minutes per tube (1 person)

Tube installation takes about 15 minutes per tube (2 people)

Tube stringing takes about 15 minutes per tube (2 people)

Electrical and gas hookup times are still not definitive.

3 to 3.5 year to build the final chamber

# Chamber Requirements

To achieve the overall momentum and vertex goals of the experiment, the CDC needs to achieve:

$$\sigma_{r\phi} \sim 150-200\mu\text{m} \quad \sigma_z \sim 2\text{mm}$$

Stereo Layers  $\sigma_z = \sigma_{r\phi} / \tan(\theta_{st}) \sim 1.4 \text{ mm}$

Charge Division  $\sigma_z \sim 1.5\% (2L) \sim 6 \text{ cm}$

Sweep time should be as short as possible  $\sim 600-700\text{ns}$

Electrostatics need to be very well understood and regular due to the large Lorentz Angle.

Particle ID using  $dE/dx$  for  $p \leq 450 \text{ MeV}/c$  (proton/ pion)