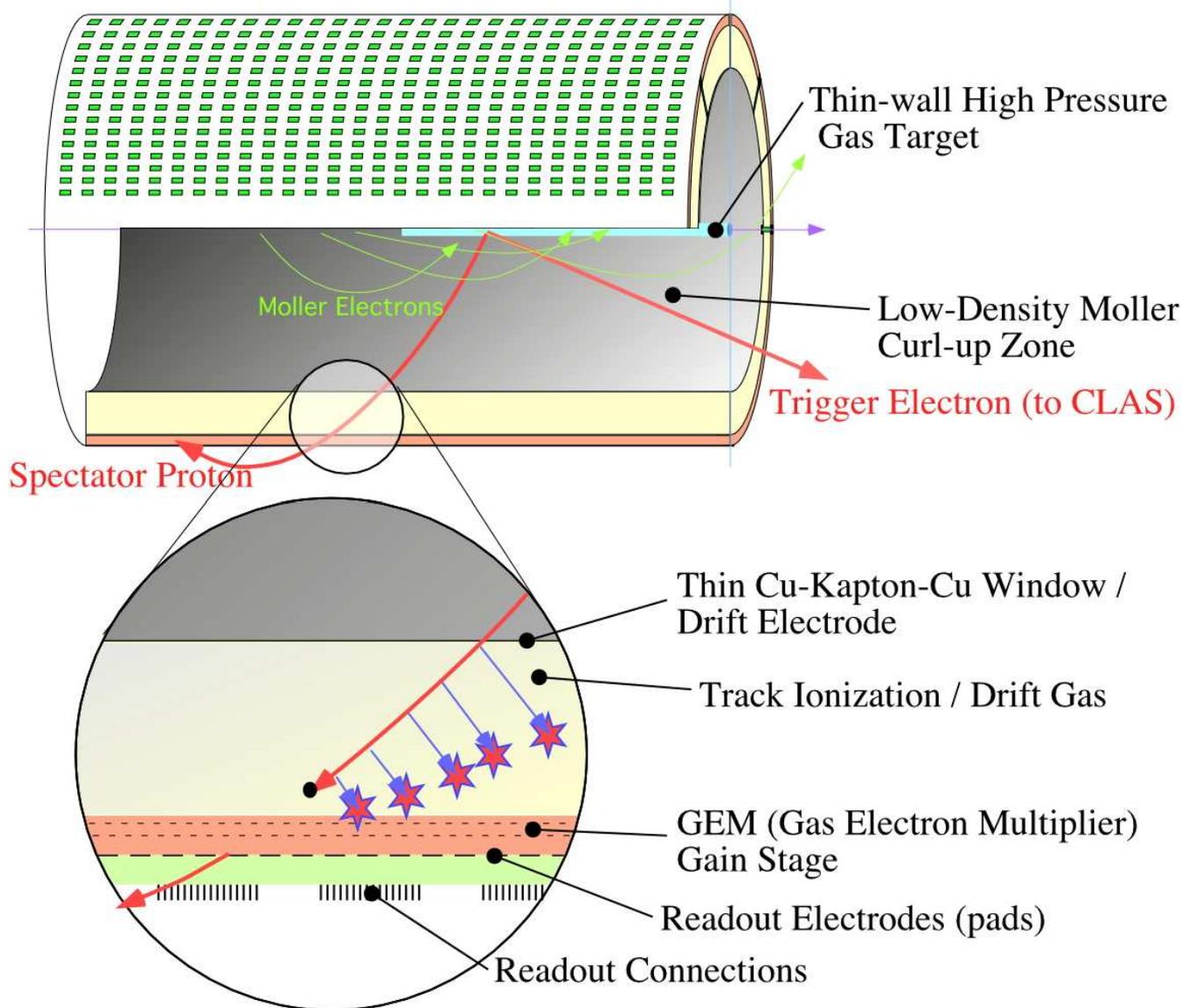


The BoNuS Detector

Concept
Design
Status

Howard Fenker March 11, 2005

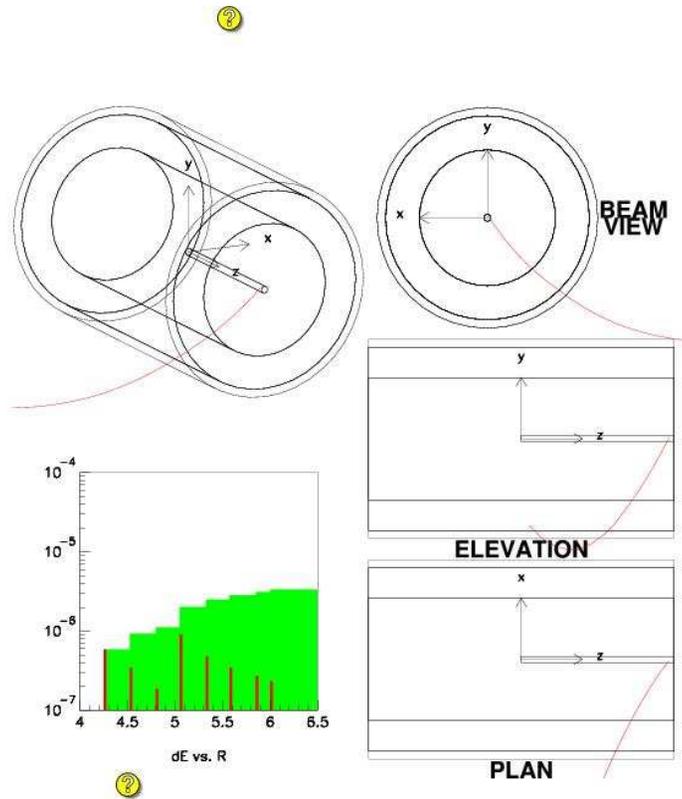
Detector Concept



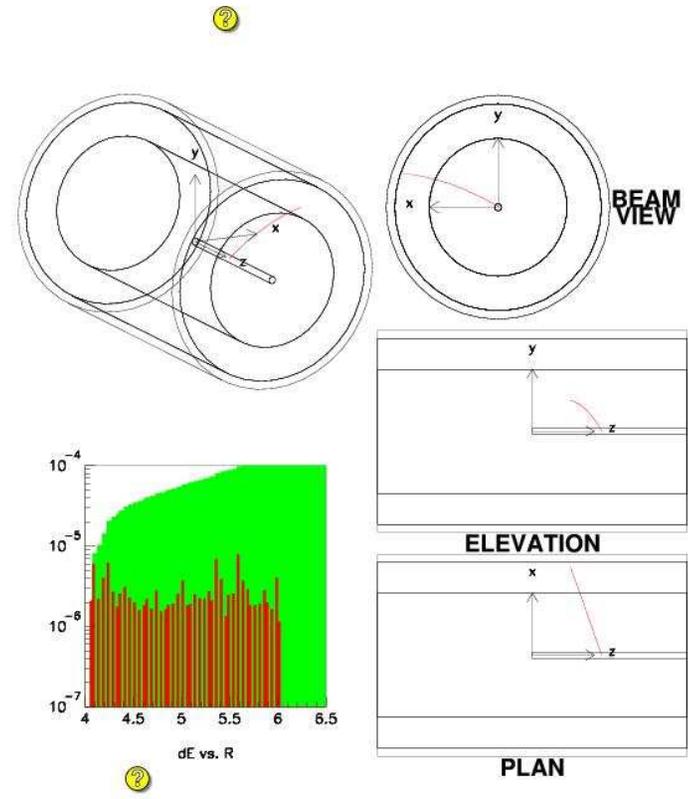
Detector Parameters

- Geometric Acceptance
 - Sensitive over 148 deg. In phi, 20cm in Z.
- Momentum Acceptance
 - Protons from ~ 70 MeV/c
- Proton Identification (*next slide*)
- Vertex Z resolution $< \sim 10$ mm
- Track Momentum Resolution
- Track E information from dE/dx - *studying*
- Rate & Timing Issues

Proton ID by dE/dx & Curvature



100 MeV/c pion



100 MeV/c proton

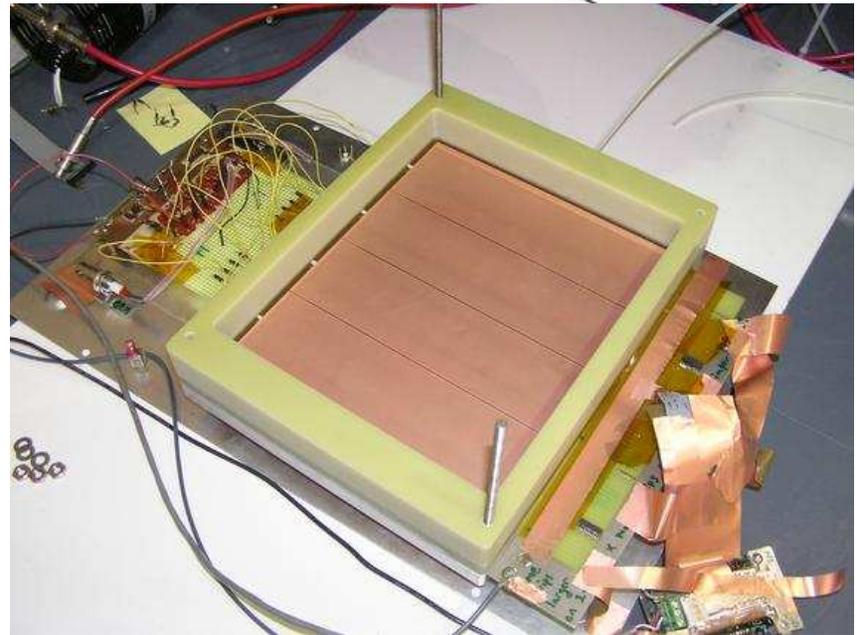
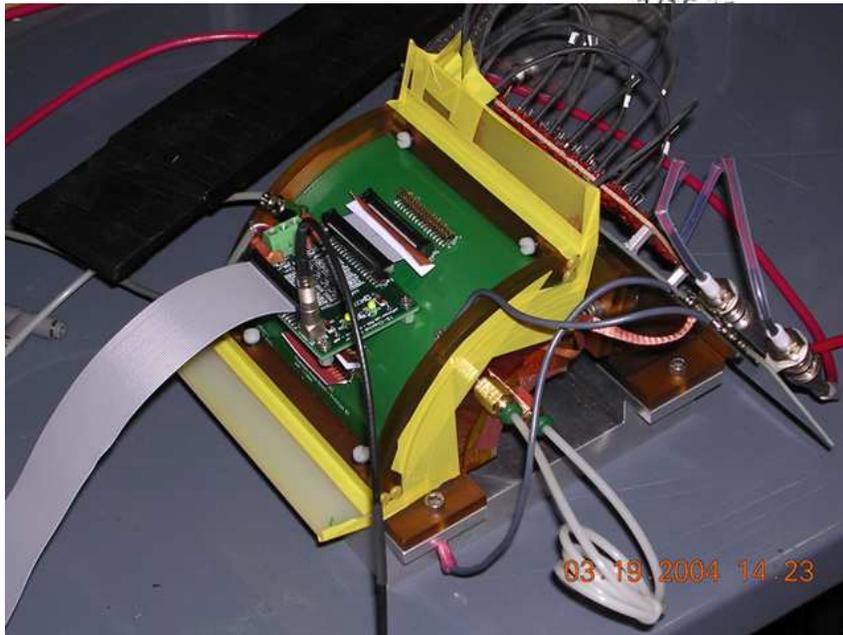
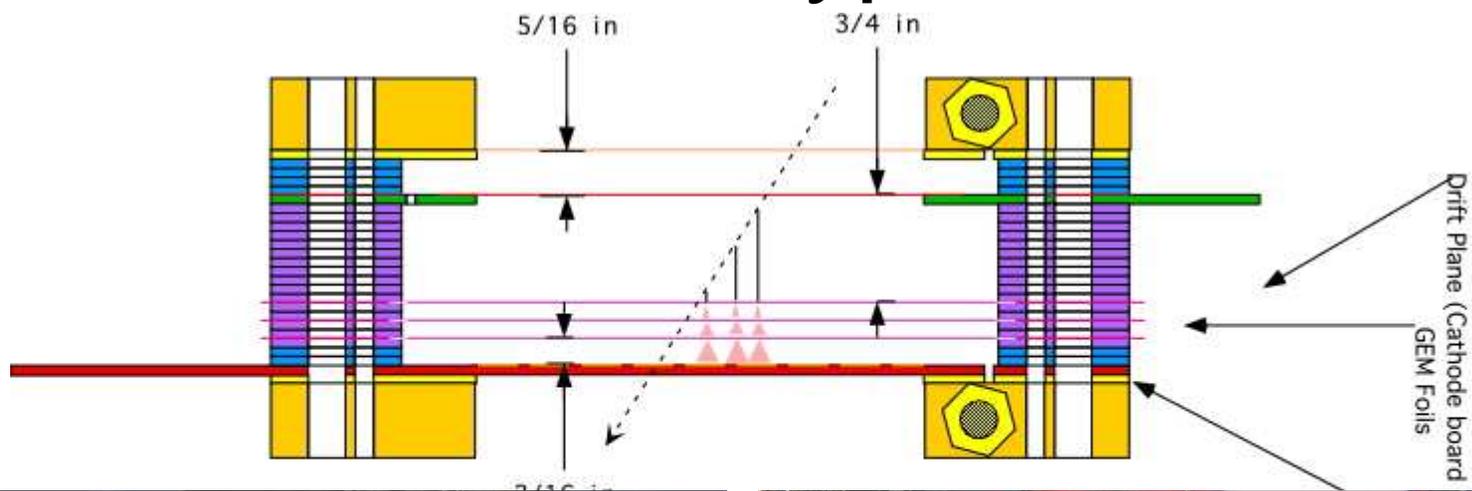
Detector Parameters

- Rate & Timing Issues
 - Track latency in sensitive gas: 1-2 us
 - Electronic memory prior to trigger: 1.5 us
 - Event Size: 0.5 – 10 kBytes (background?)
 - Deadtime
 - Trigger: \sim charge collection interval. ALTRO is ready for new trigger immediately afterwards.
 - Data Readout Rate: > 20 Mbytes/second
 - Expected event rate capability: 2 kHz

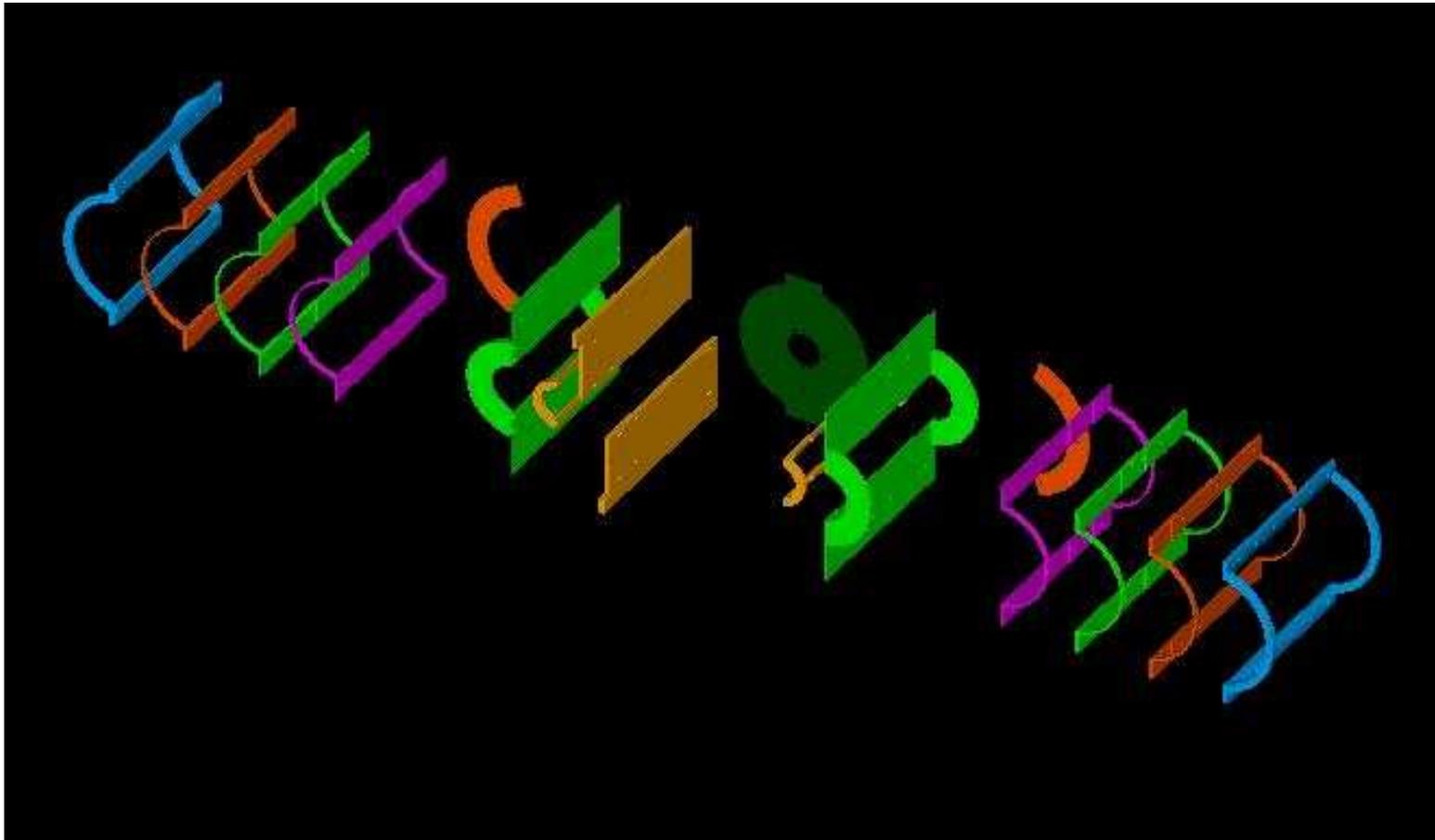
Detector Development

- Prototype – flat, ‘standard’ GEMs
- **Test**
- Prototype – curved, ‘standard’ GEMs
- **Test**
- Prototype – flat, custom GEMs
- **Test**
- Production – curved, custom GEMs
- **June test run in CLAS**

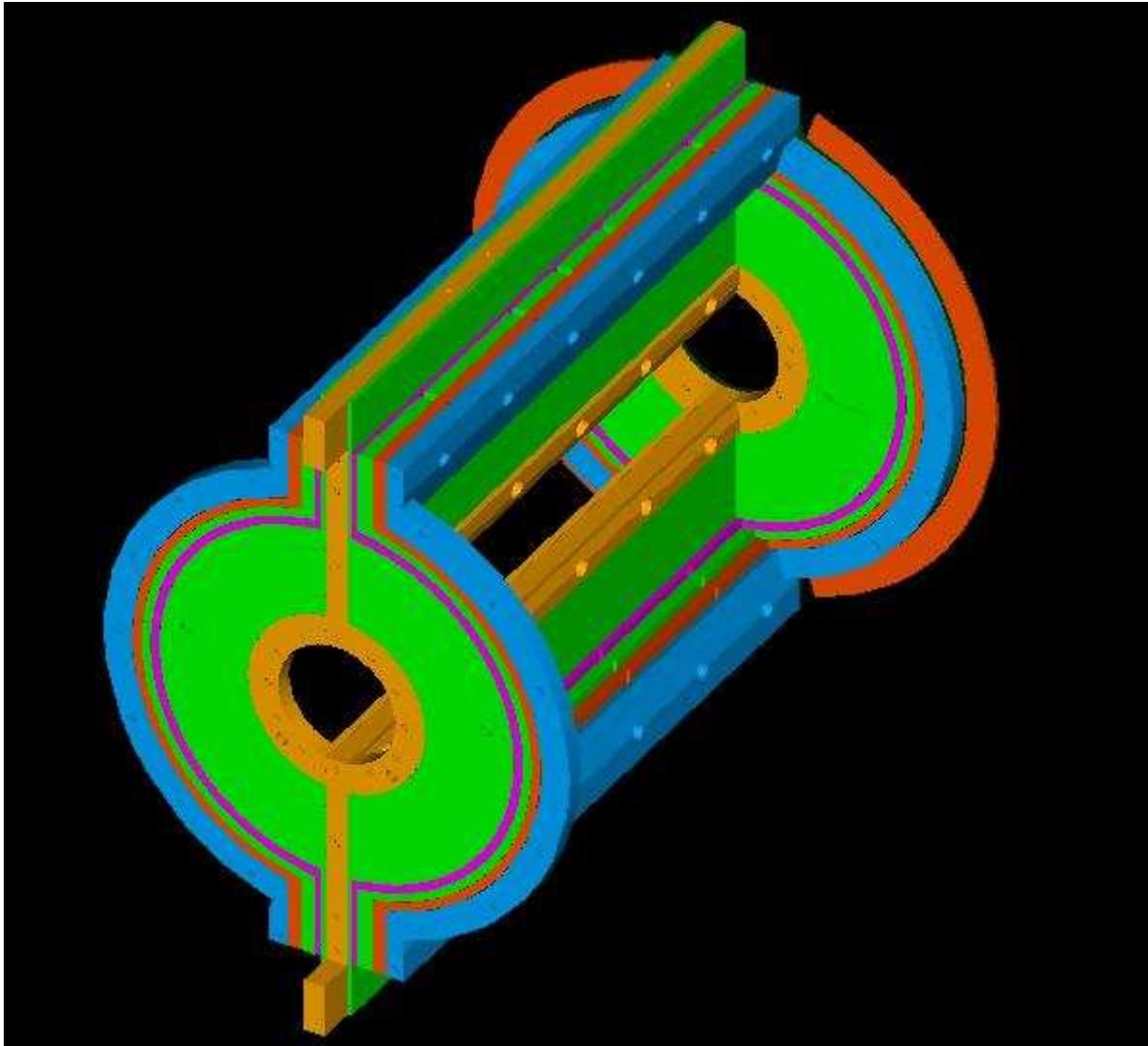
Prototypes



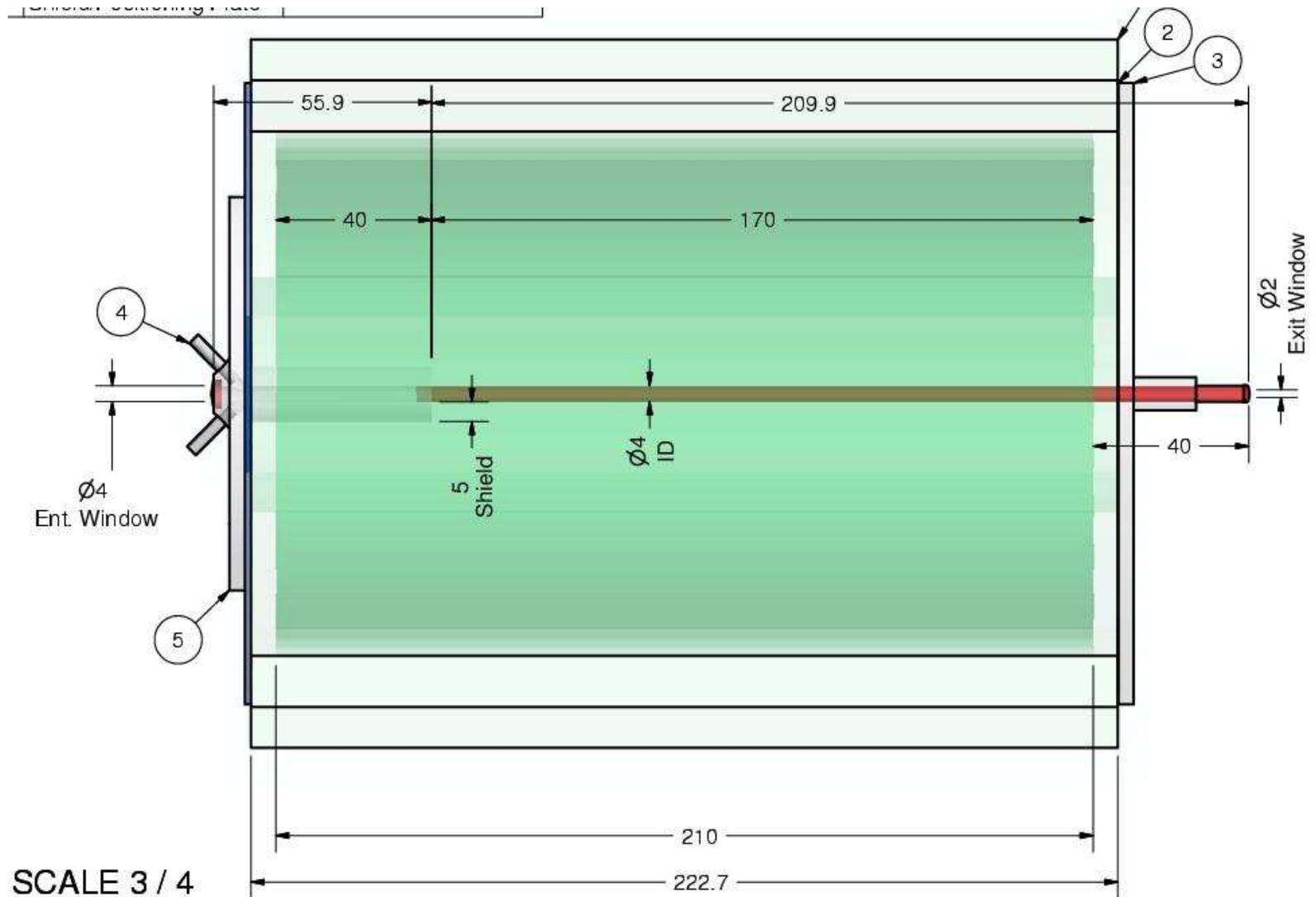
Production Model: Exploded View



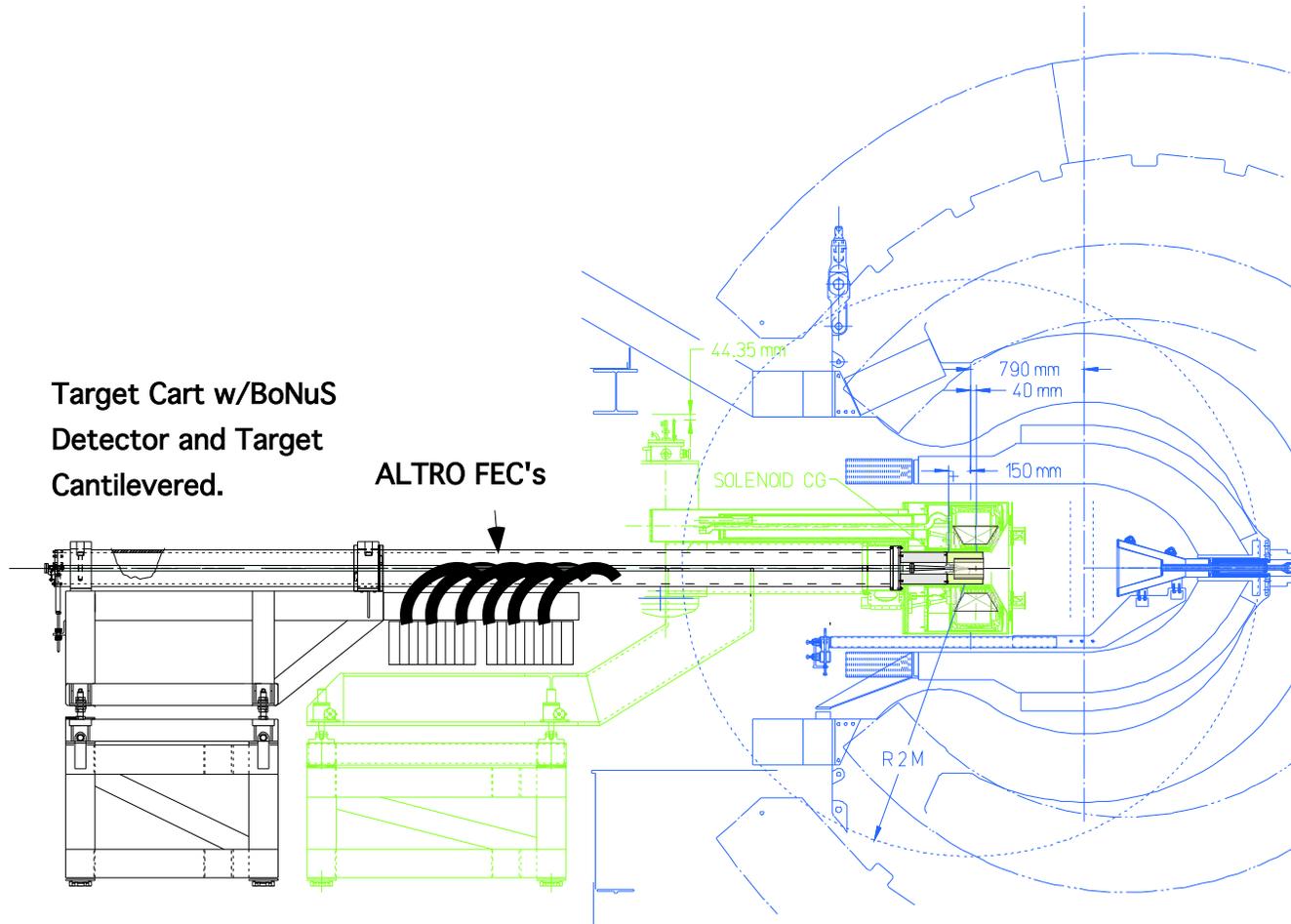
Production Model



BoNuS Target (11/04)



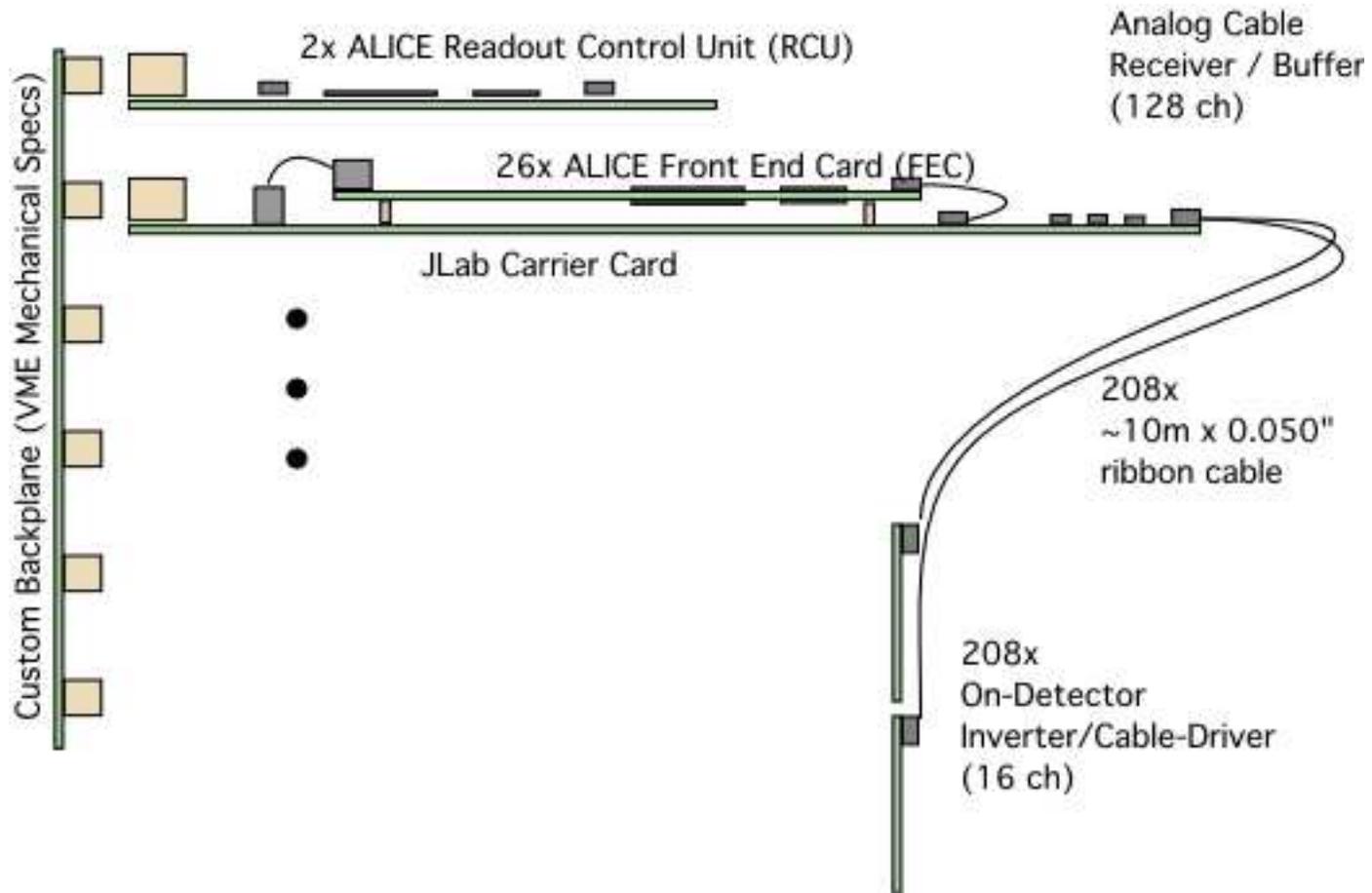
BoNuS in CLAS



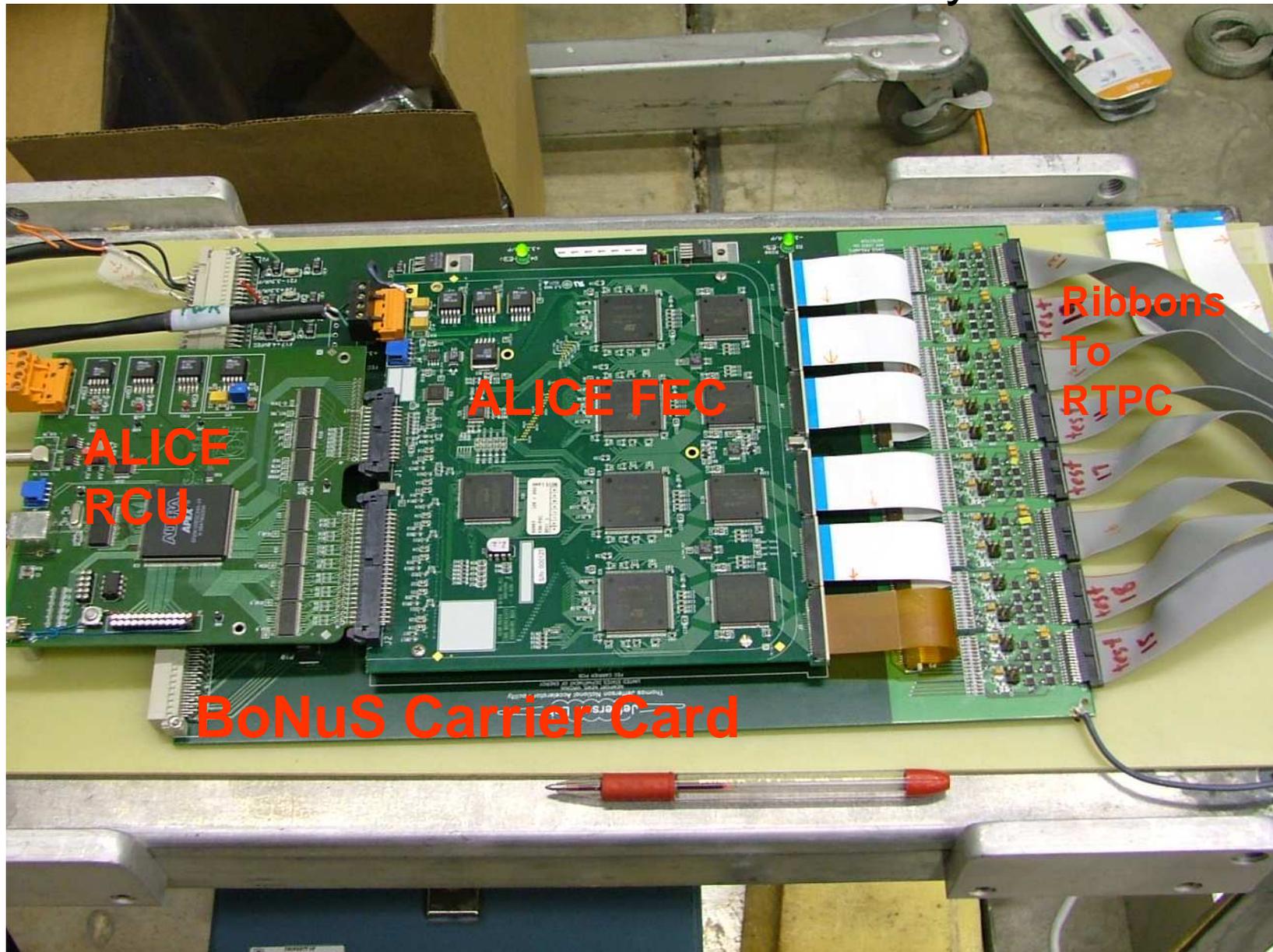
Electronics Development

- Commercial CAMAC Modules – 8 ch.
- Test the whole concept
 - Cosmic / Source / TUNL Run1
- ALTRO Test Board – 16 ch.
 - Cosmic / Source / TUNL Run 2
- ALTRO Production System – 128 ch.
 - Cosmic / Source / TUNL Run 3
- Final ALTRO System – 3200 ch.

BoNuS Signal Readout System

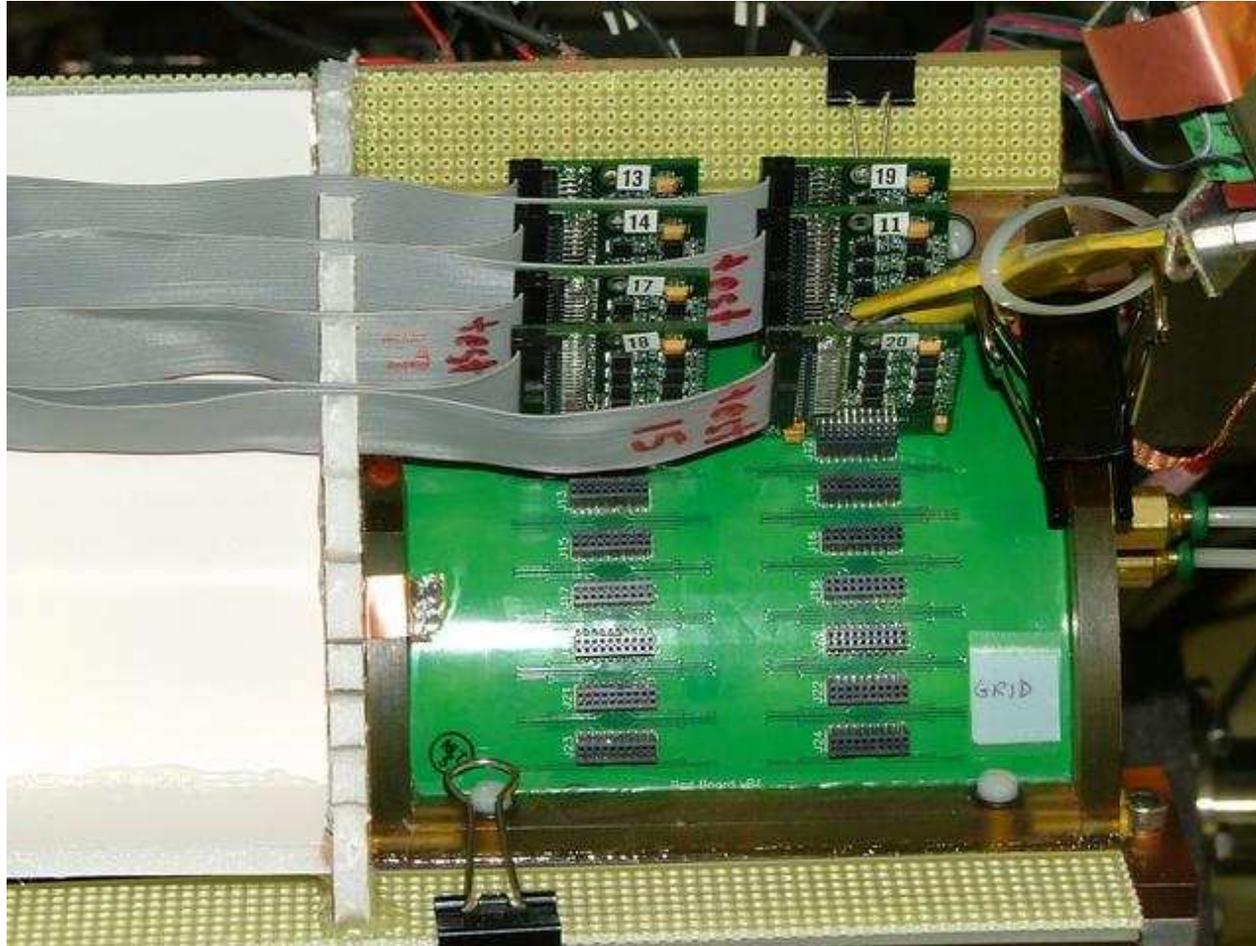


ALICE and BoNuS Readout System



pRTPC w/ Inverter/Driver Cards

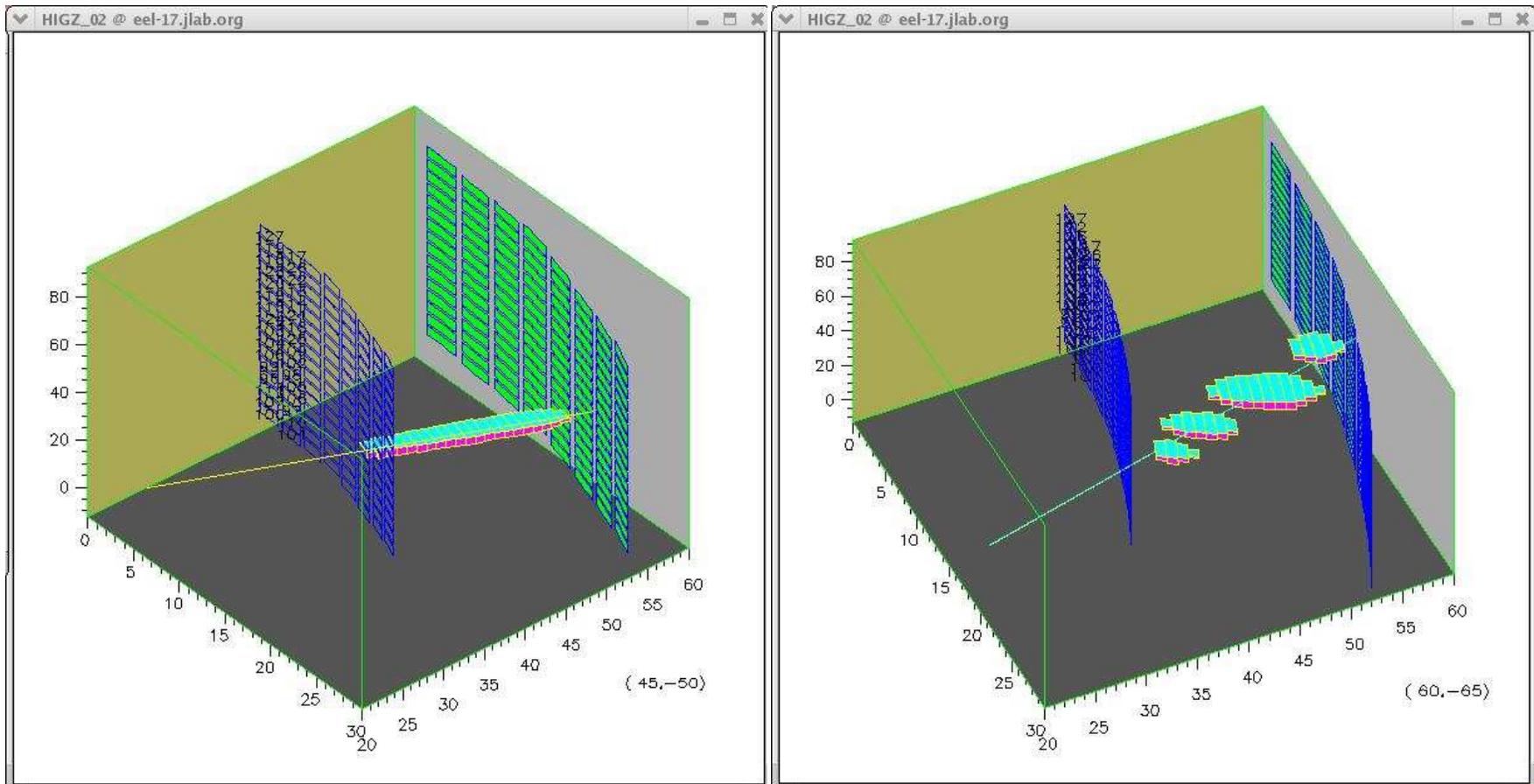
Ribbons
To
Readout
System



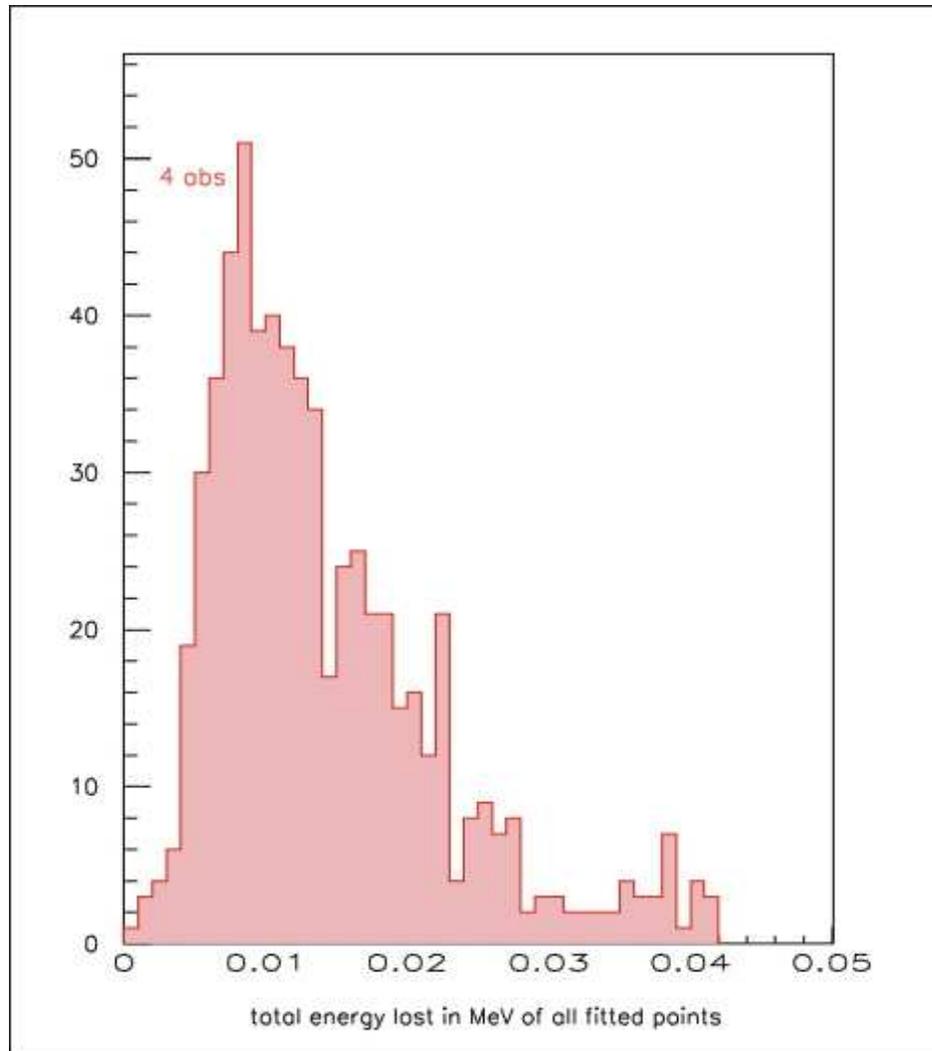
Detector System Tests

- Readout
 - 128 channel tests
 - Analog Electronics
- Prototype test results.
 - Software
 - Straight tracks
 - dE/dx

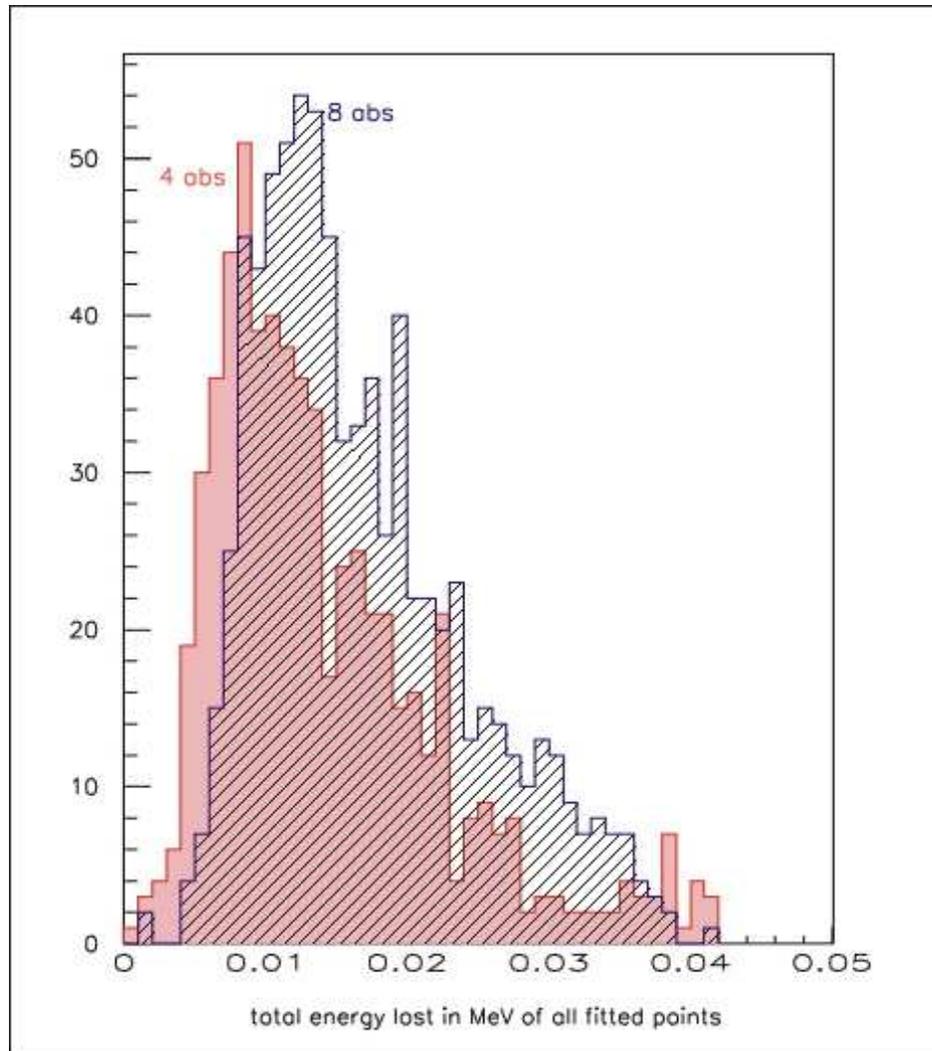
Proton Tracks at TUNL



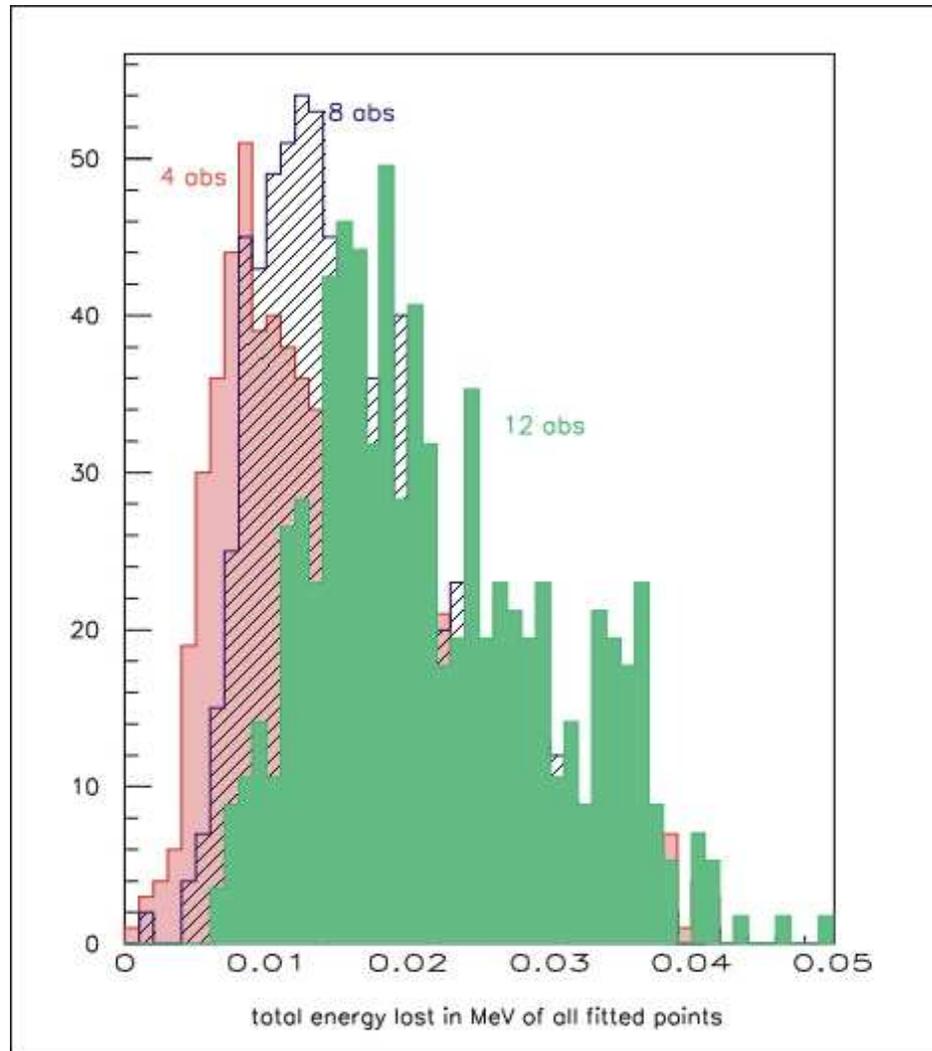
dE/dx Analysis from TUNL



dE/dx Analysis from TUNL



dE/dx Analysis from TUNL



Detector Status (1/2)

- Detector Module
 - Parts Fabrication complete by 4/1
 - Assembly Complete by 5/1
- Electronics
 - ALTRO working. Needs faster microcode
 - \$40K fabrication order going out next week
 - Uncertain how much available for June test
 - 6% (256 ch) available on prototypes NOW

Detector Status (2/2)

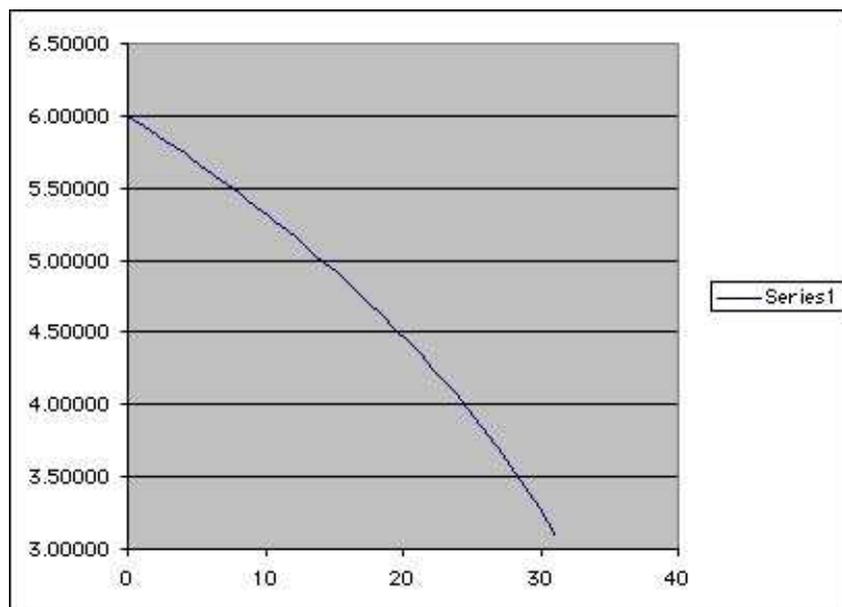
- Target, Support & Alignment System
 - Design nearing completion
 - Fabrication needed by 5/1
- Infrastructure
 - Gas Lines & Cables pulled in Hall-B
 - Power available
 - Need slow controls, DAQ Interface
 - Detector / Target Gas Panels by 5/1

Bonus Detector Outlook

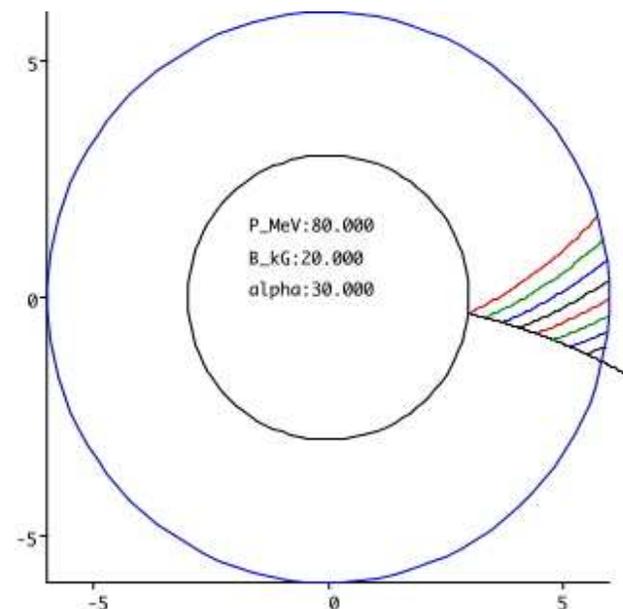
- Detector Parts Delivery 4/1
- Detector Assembly 4/1-5/1
- Electronics Fabrication 3/15-5/1-??
- Assemble Detector, Target, Support, Readout 5/1-5/15
- Checkout: 5/15 – 5/30
- Hall-B Install & Test 5/31 – 6/8
- Physics Run October 20 – December 22

Software Needs Work, too!

- DAQ: Interface w/CLAS data structure
- Event visualization – OK and improving
- Track Fitting - Straight Tracks OK and improving
- Need to incorporate
 - $V_{drift}(R)$ (ongoing)
 - B-Field
 - Lorentz angle
- Need Simulation and Simulated Data



R_{HIT} vs. Time Bin
(V_{drift} varies with R)



Curved e^- Drift
N.B.: nonuniform B

BoNuS Detector

- Much done.
 - .
 - .
 - .
- Plenty to do.