

Detector Summary and Plans

MICE Collaboration Meeting

Harbin

January, 2009

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Overview

- In general we have made great progress in getting our detector systems on the floor, installed, commissioned and ready for beam
- All groups are now looking forward to more beam time and can now make very good use of beam exposures and need beam data to complete commissioning.



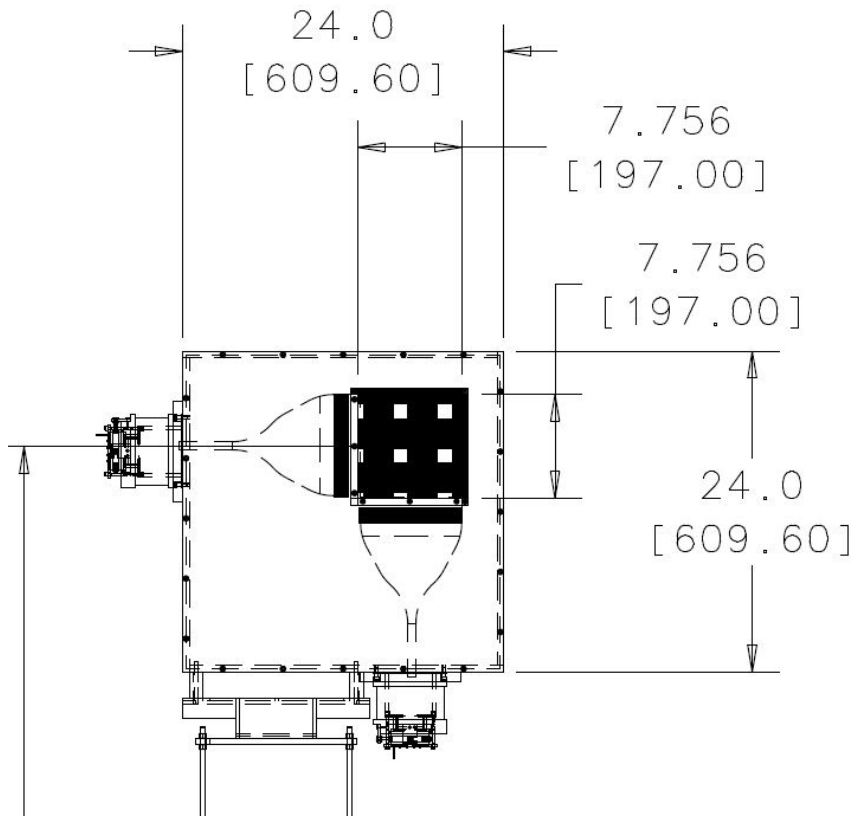
MICE Detector Systems

- Beam Profile Monitors
- TOF 0, 1 & 2
- CKOV
- Trackers
- KL
- EMR (Electromagnetic Ranger)

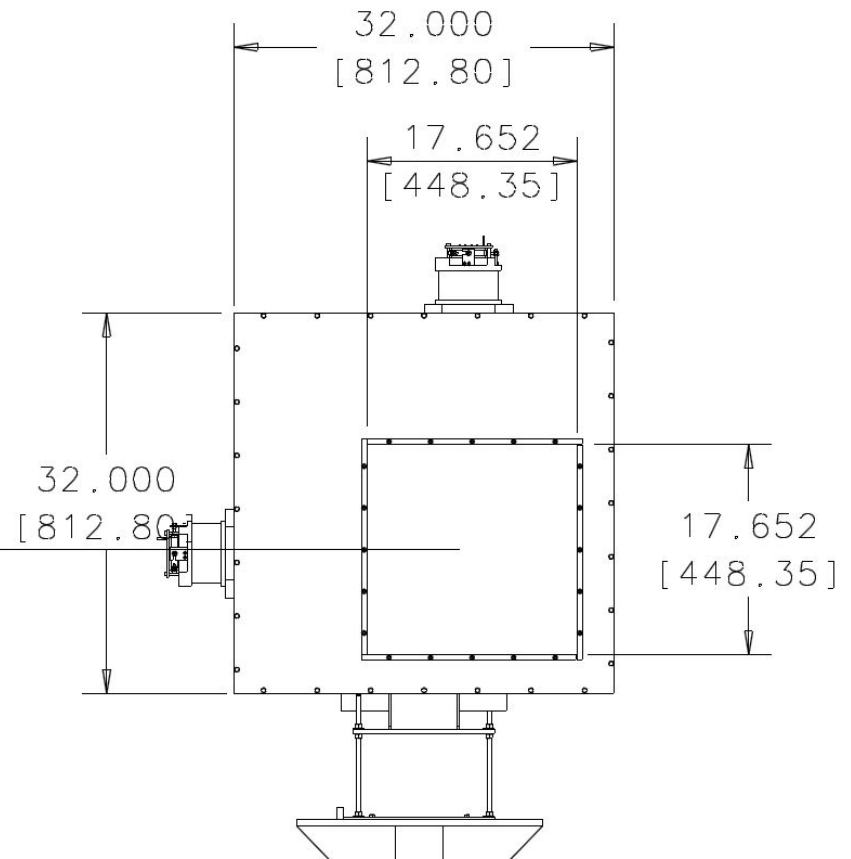


Beam Profile Monitors

- Small (20 X 20 cm)



- Large (45 X 45 cm)





Commissioning Status

- The Electronic Noise that was seen has now been completely removed
 - Cable shielding
- Both BPMs have been calibrated to some extent with a ^{60}Co source
 - However the activity was so low that we had some difficulty
- Final calibration with beam was, unfortunately, not done due to the Target failure in December
- We did get some beam data with the small BPM, however



Time of Flight

- TOF0 and 1 are installed and working
- BAD PMTs in TOF0 have been replaced
- TOF0 Commissioning well along
- TOF1 Commissioning just start
 - Target failure in December prevented more complete studies
- So far TOF0 and TOF1 performance as expected
 - More to do
- TOF2 to follow soon
 - TOF2 counters assembled, but still not wrapped
 - TOF2 PMTs under repair at Hamamatsu: delivery expected by January/February 09

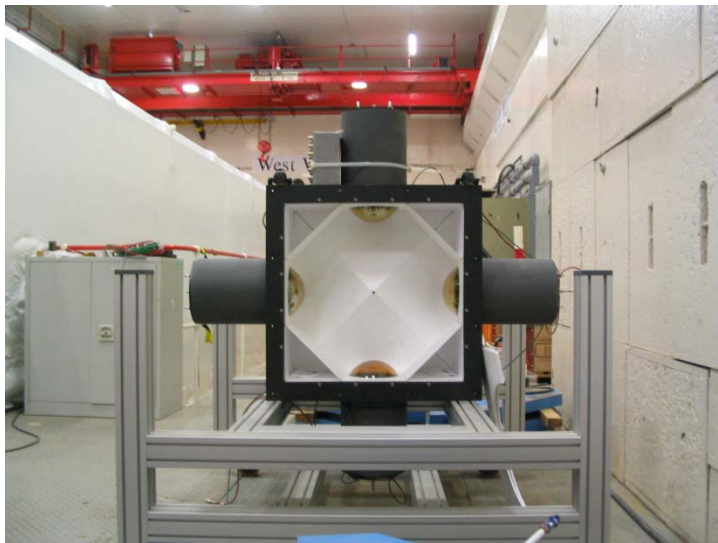


TOF1



Cerenkov

- CKOV1/2 Installed and cabled in DSA
- T %RH recording
- Pulser Runs Aug '08 to set HV - MICE Note 225
- Electron run Sep '08 - MICE Note 226 (more Nov/Dec '08)
- Nov/Dec '08 run analyses in progress

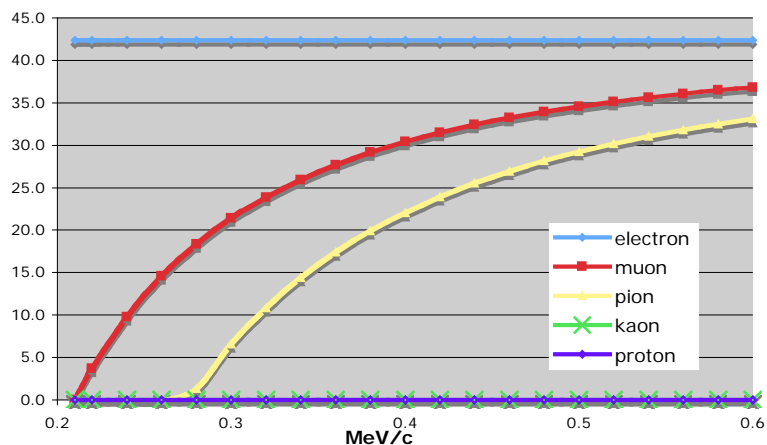




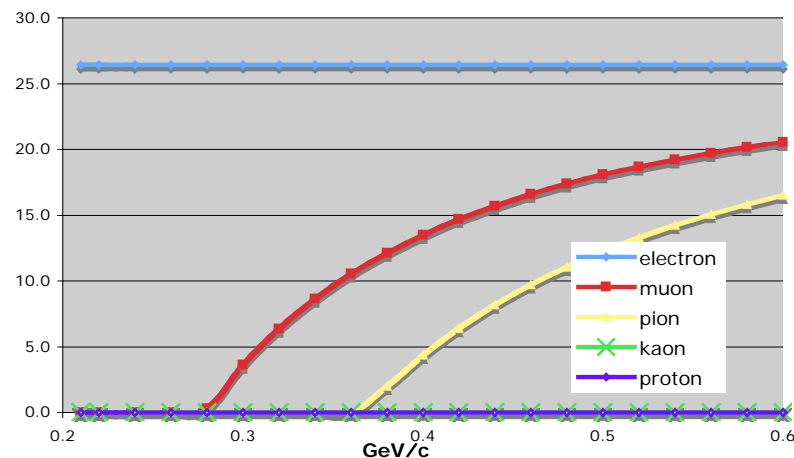
Cerenkov Performance

- CKOVa and CKOVb have good response to $\beta=1$ electron beam. Used for $\beta=1$ gain calibration.
- 300 MeV pions will leave 1-2 PE in CKOVa. Can be used for 1PE determination.
- 400 MeV protons below threshold and can be used for noise level determination

Cherenkov Threshold Curves- 1.12 Aerogel



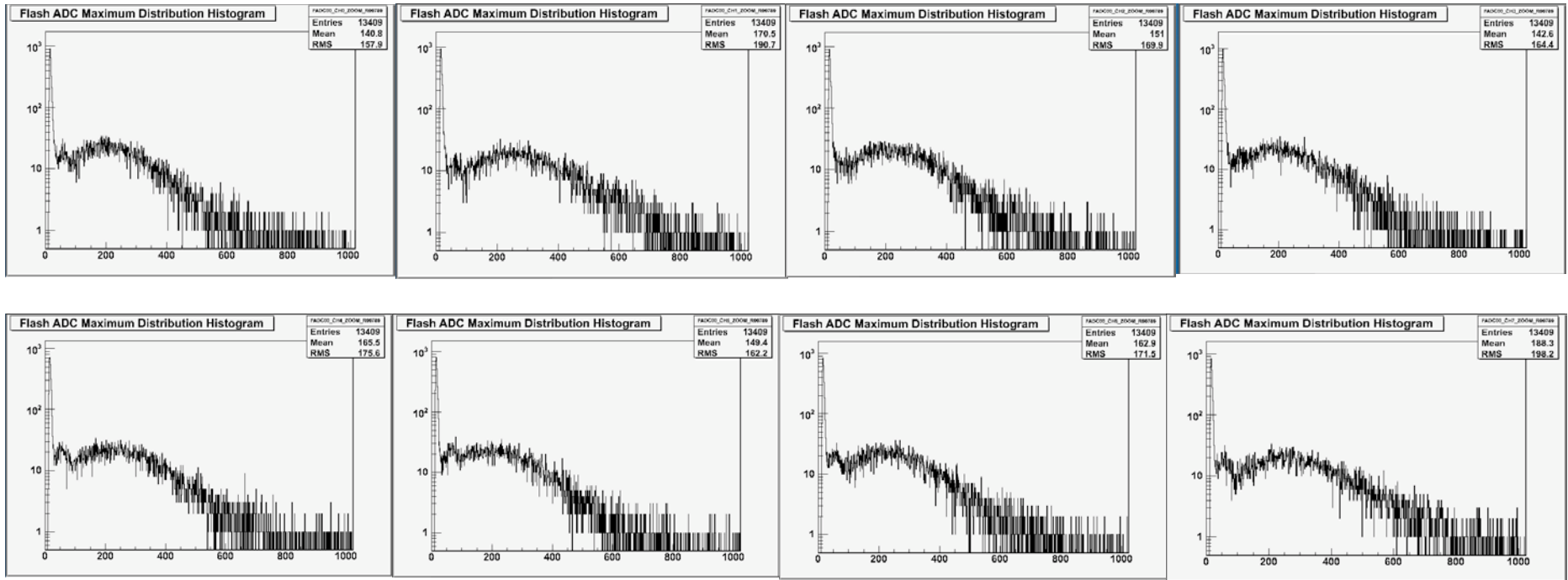
Cherenkov Threshold Curves- 1.07 Aerogel





Cerenkov Data

Run 789 100 MeV/c electrons TOFO Trig

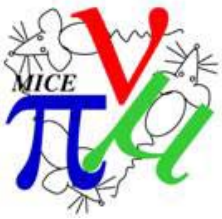


- Data look good, however there may be a cable swap

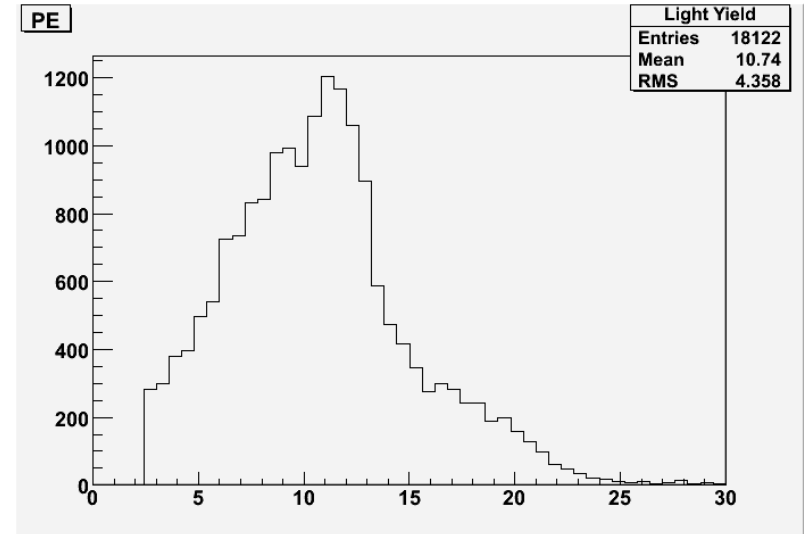


Cerenkov - Plans

- Work on LED Calibration Pulser.
- Rework T/%H Monitor.
 - Sensors died and need to be replaced
- Install 500 MHz fADC
- More analysis with G4MICE package - tagged beam.



Trackers

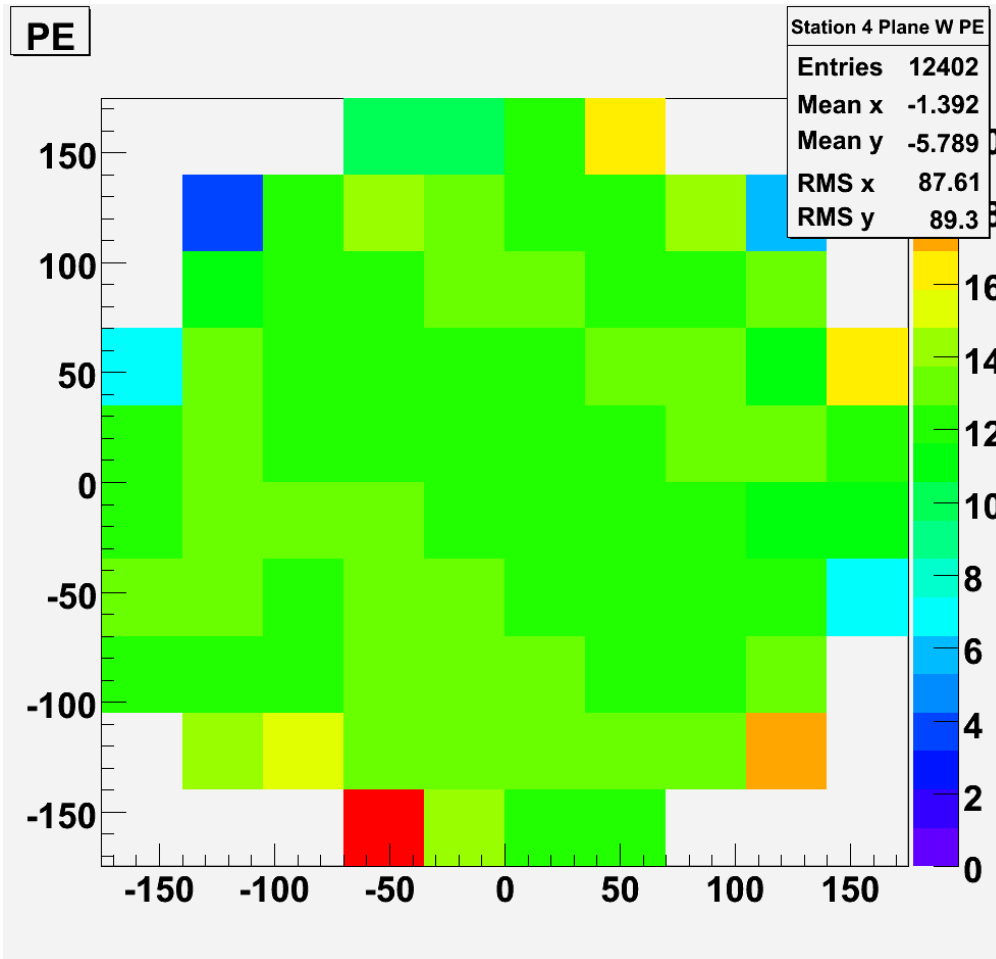


Light Yield: ~ 11 PE

- Review
 - Tracker 1 is working well and light yield is very High
 - However, saw some problems



Station 4 Plane W - Fixed!



Mapping Problem
Fixed



Next Steps *Tracker 2 Cryo*

- Cryostats 3 and 4 are now both working to specification.
- Problems with #3 were related to the thermal links and were solved by the persistence Russ Rucinski's Group
 - Make and remake connections
 - *"It's not Rocket Science - It's Harder"*



Next Steps

Tracker2 Readout System

- Two cryostats
 - Each powered by new Wiener power supply
- Each cryostat has 2 VLPC cassettes
- Each VLPC cassette has 2 AFE II boards
 - total of 8 AFE boards
- In rack:
 - 9 VLSB modules: 1 master to control timing and 8 slaves (one for each AFE board)
 - 1553 module: controls AFE initialization, bias voltage controls, temp controls, data taking
 - Fanout: sends correct timing signal to all AFE boards
- Goals:
 - characterize VLPC cassettes
 - get everything working correctly together in layout to be used at RAL

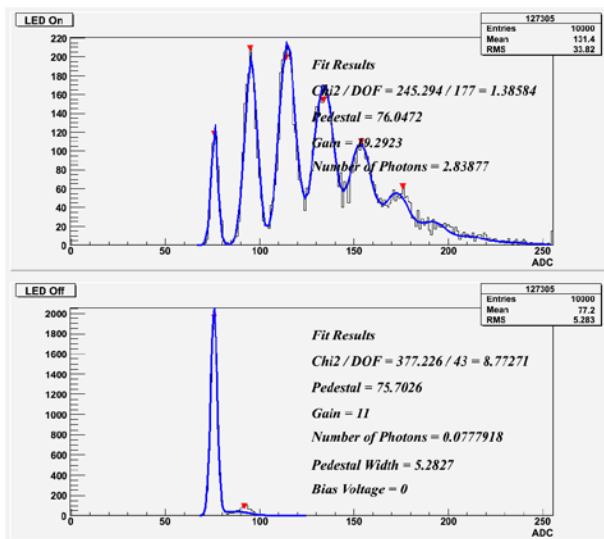




Tracker 2

Cassette Characterization **DONE**

- Took data with LED pulser to determine correct bias voltage for each VLPC cassette
- **Cryostat #4**
 - Cassette 102 ✓
 - Cassette 110 ✓
- **Cryostat #3**
 - Cassette 109 ✓
 - Cassette 104 ✓





Remaining Tasks for Tracker 2

- Test spare AFE boards
 - Test new method for remote monitor/control of power supplies using daisy chained Wieners and CANBUS interface
 - Ship to RAL for installation in Lab 7 and cosmic ray test of Tracker2
 - Tracker2 assembly starts this month
 - Lab7 infrastructure ready for cryo systems by end of January
 - Ship electronics end Jan/beginning Feb
 - Begin reassembly second week Feb
 - **Continue investigation of zero suppression?**
 - There are questions as to whether or not this will work (reservations expressed by DØ experts)
 - Cosmics recommended as best way to test zero-suppression
 - **Make use of buffering on TripTs?**
-

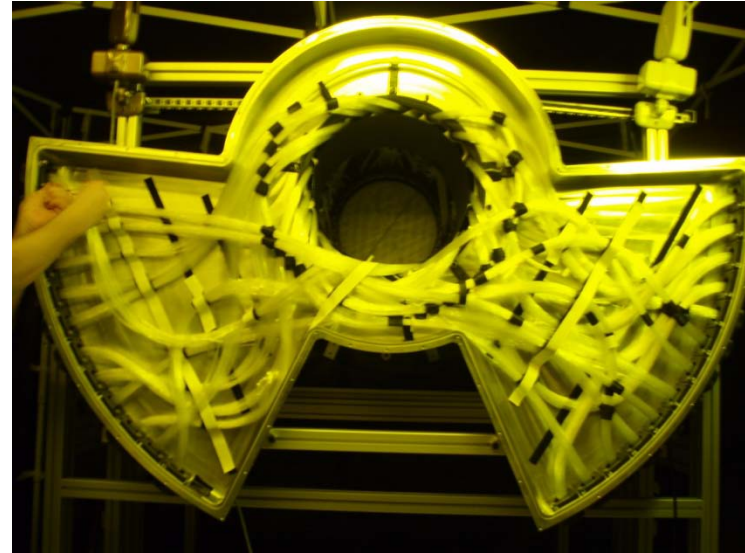
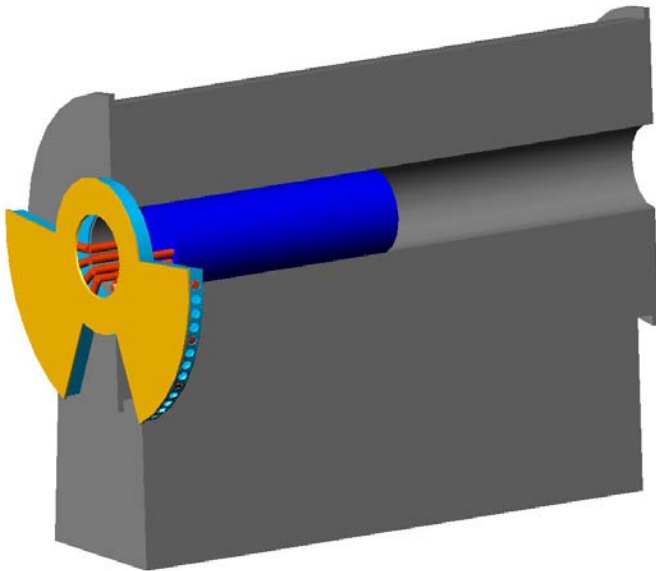


Tracker Integration Issues

- **Interface Between the Tracker and the Solenoid**
 - There are two areas of integration between the solenoid and the Tracker:
 - The actual tracker assembly which needs to slide into the bore of the solenoid and be aligned with the axis of the experiment.
 - The patch panel which forms a light/gas tight seal to the outside world allowing the optical fibres to be routed to the VLPC's
 - It is proposed to visit Wang in February to see the solenoid and to check for any possible clashes/problems. We have manufactured a go no go gauge which will not only highlight any possible problems of straightness and roundness of the magnet bore but will also tell us how much freedom we have for alignment and we can then manufacture the adjuster cams that align the structure to suit the 'real' gap.
 - Hall Probes must be installed



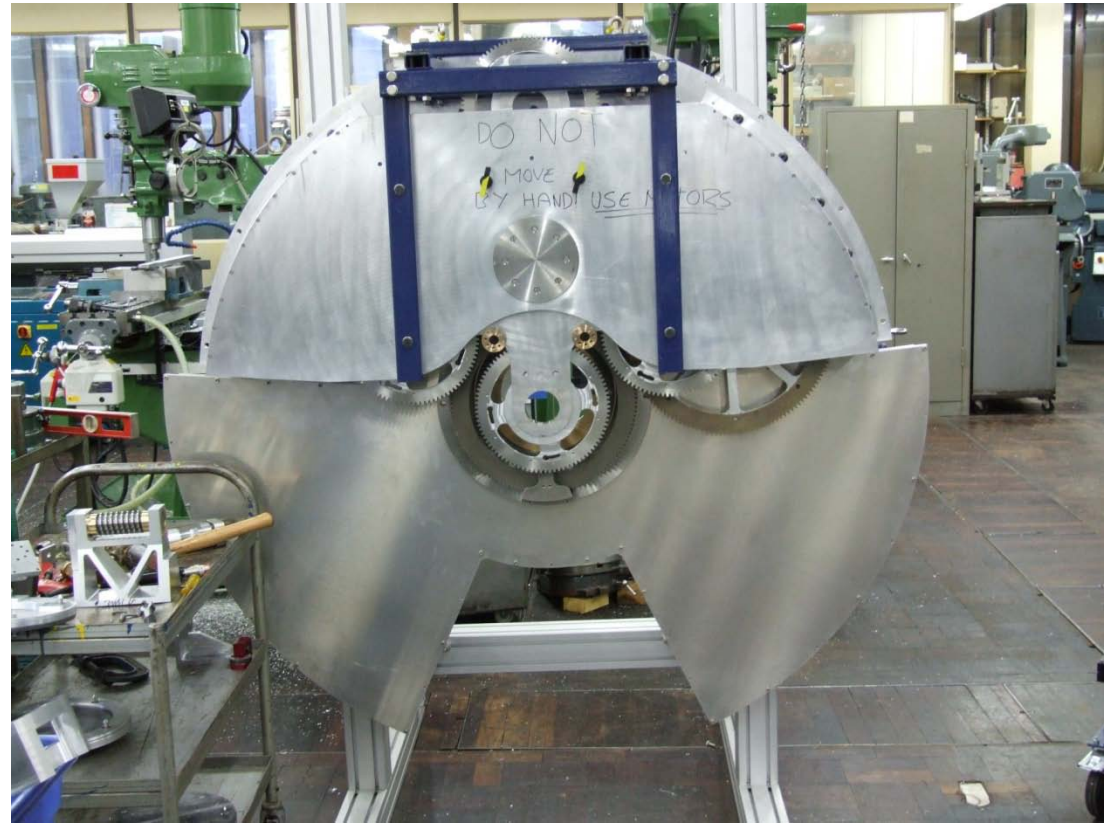
Interfaces MUST be FULLY Understood



- Final details of Tracker-Diffuser still need some work



Tracker-Diffuser Interface Issues *Still Need Some Work*

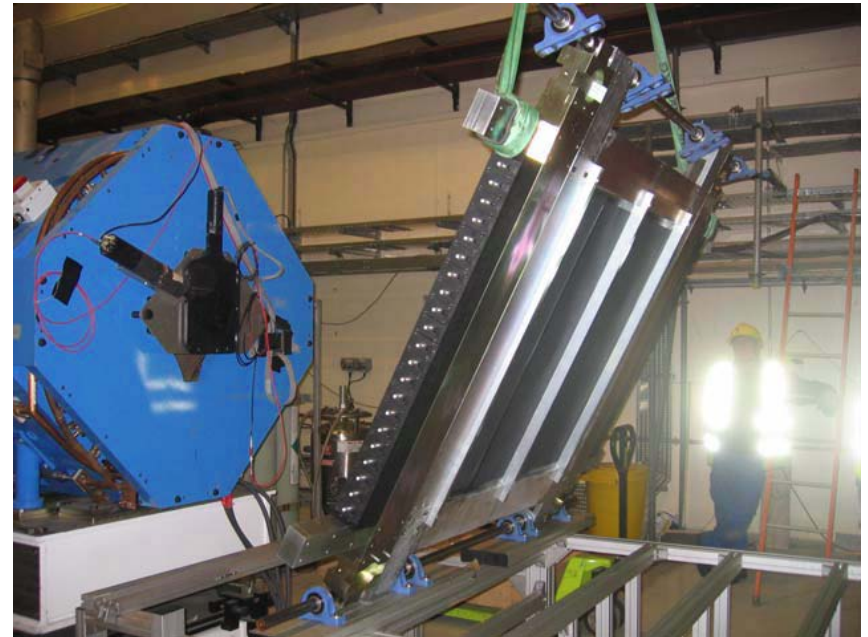




KL

KLOE-Like lead-scintillating fiber calorimeter

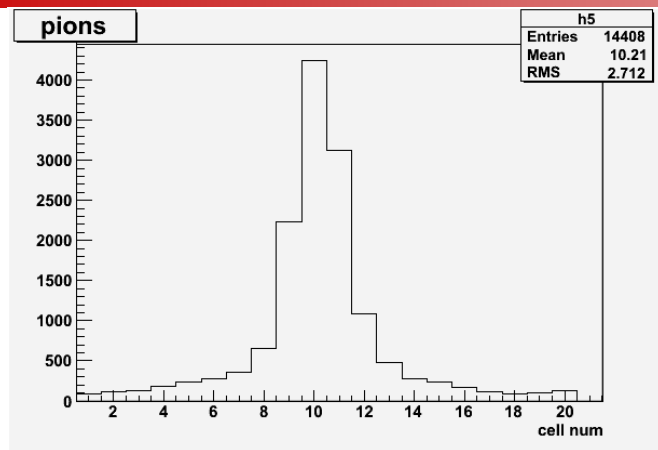
- KL has been installed and operational
 - First part of e - μ calorimeter
- Cosmic-ray commissioning completed at the end of July 2008
- Pion and positron exposures in November



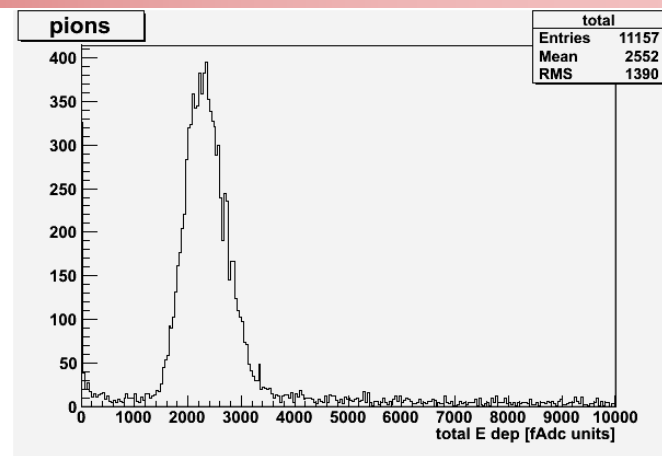


KL

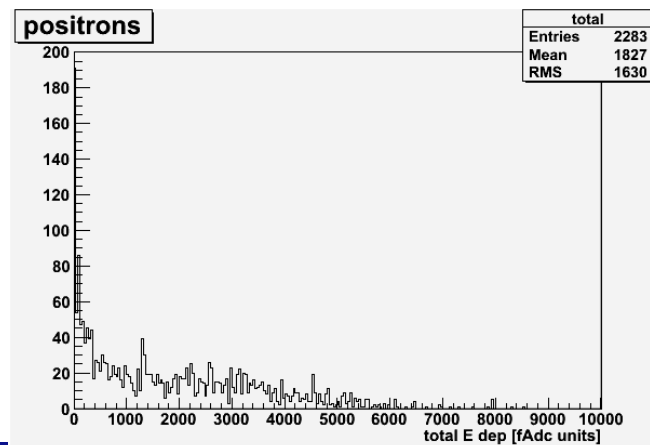
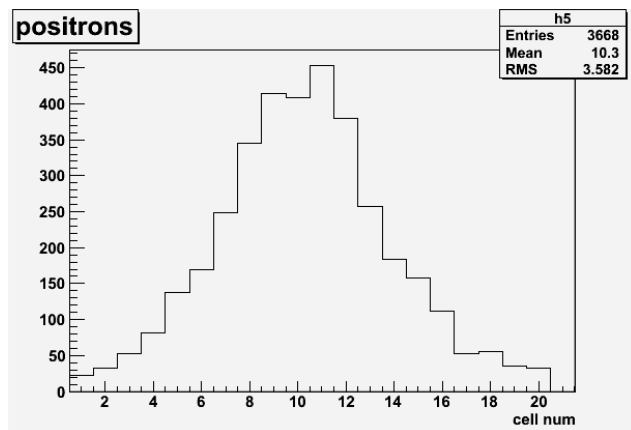
π^+ and e^+ exposures



Beam Profile

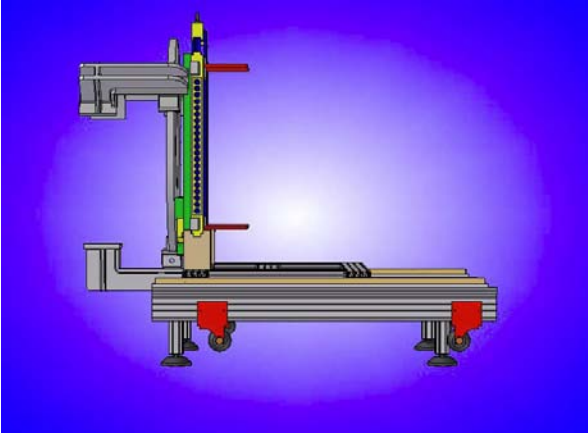
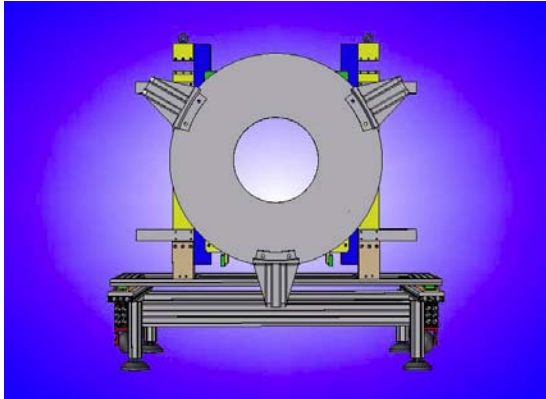
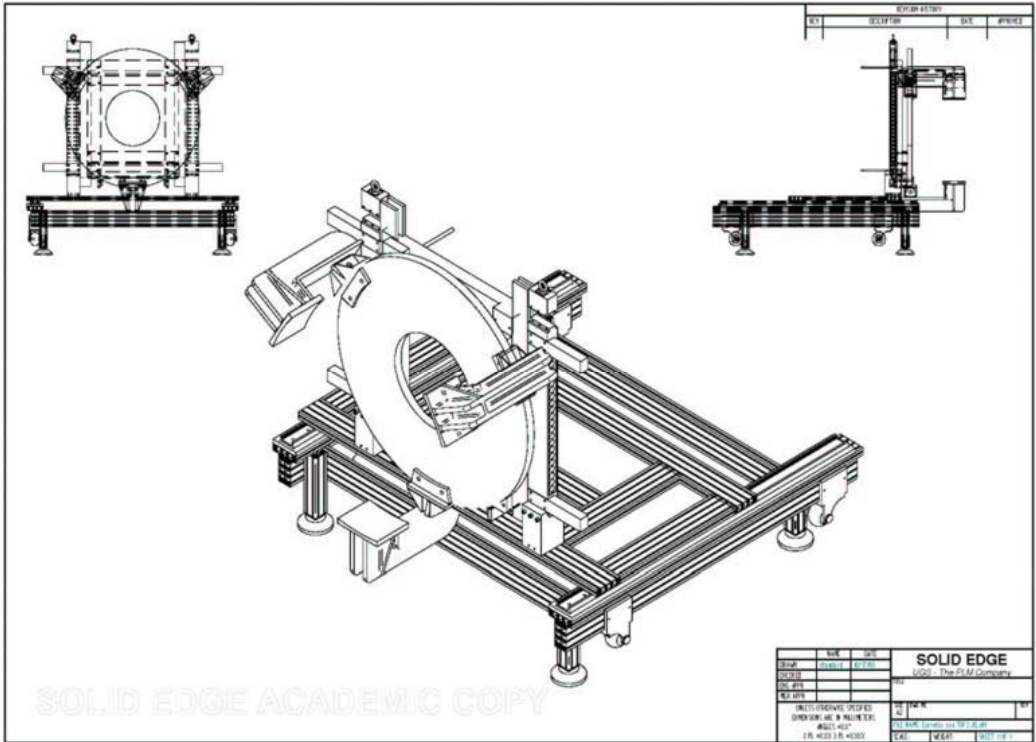


dE/dx





KL - Plans

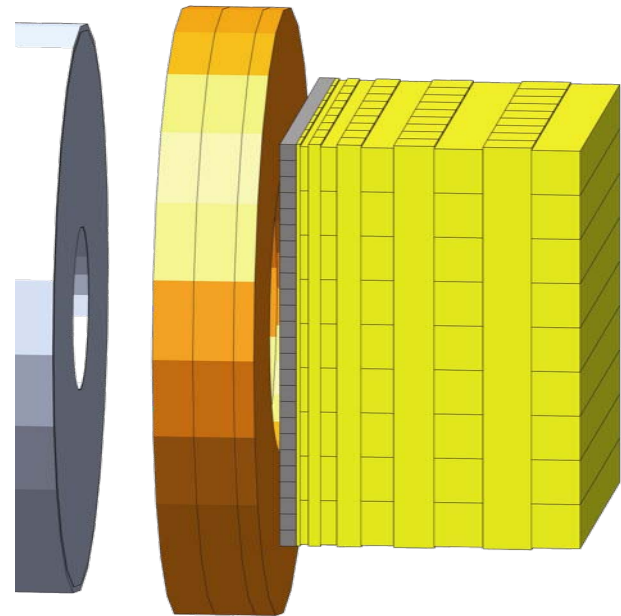


- Planning for integration with Spectrometer Solenoid Magnetic shield



Electromagnetic Ranger

- EMR: Electron Muon Ranger
 - Aka EMCal/SW
- 70 cm of fully active scintillator, highly segmented readout with WLS fiber + MAPMTs
 - Track Properties:
 - Muons show tracks;
 - Electrons converted in EM showers in KL show scattered hits
 - dE/dx along Z
 - Muons have constant dE/dX up to the Bragg peak
 - Electrons have large fluctuations in Energy loss which tends to decrease with Z



- Prototype has been built
 - Tested at CERN
- Current design uses triangular shape (a la Minerva)
 - Base: 33mm, height:17 mm (nominal), Length: 990 mm
 - 59 bars per layer
 - 40 layers
 - Total thickness: 680 mm
- Front-end electronics is defined
- TB has signed off on plan

Full prototype mounted





EMR- Plans

- Schedule

- Mechanical assembly takes ~6 months
- Electronics production takes ~3 months
 - BUT it requires prototyping first (~6 months)
 - Moreover, prototype tests should use final detector...

- Goal EMR at RAL in December 2009

- Already very tight schedule

- Total Cost 170 kEUR

- Not included
 - Developing cost for Electronics (Como)
 - Board production, FPGAs, etc
 - HV system (Geneva Surplus)

- Trieste, Como, Geneva, FNAL

Our Italian Colleagues are
Waiting for INFN Funding Decision



Conclusions



- The beam line and PID detectors are for the most part in place and working
 - Much of TOF2 Ready
 - EMR Design ready, TB has signed off on it
- Tracker 1&2 commissioning in Lab 7 to begin soon
 - Both should be ready to move into Hall by the time the Hall is in appropriate condition to accept them