Temp Work

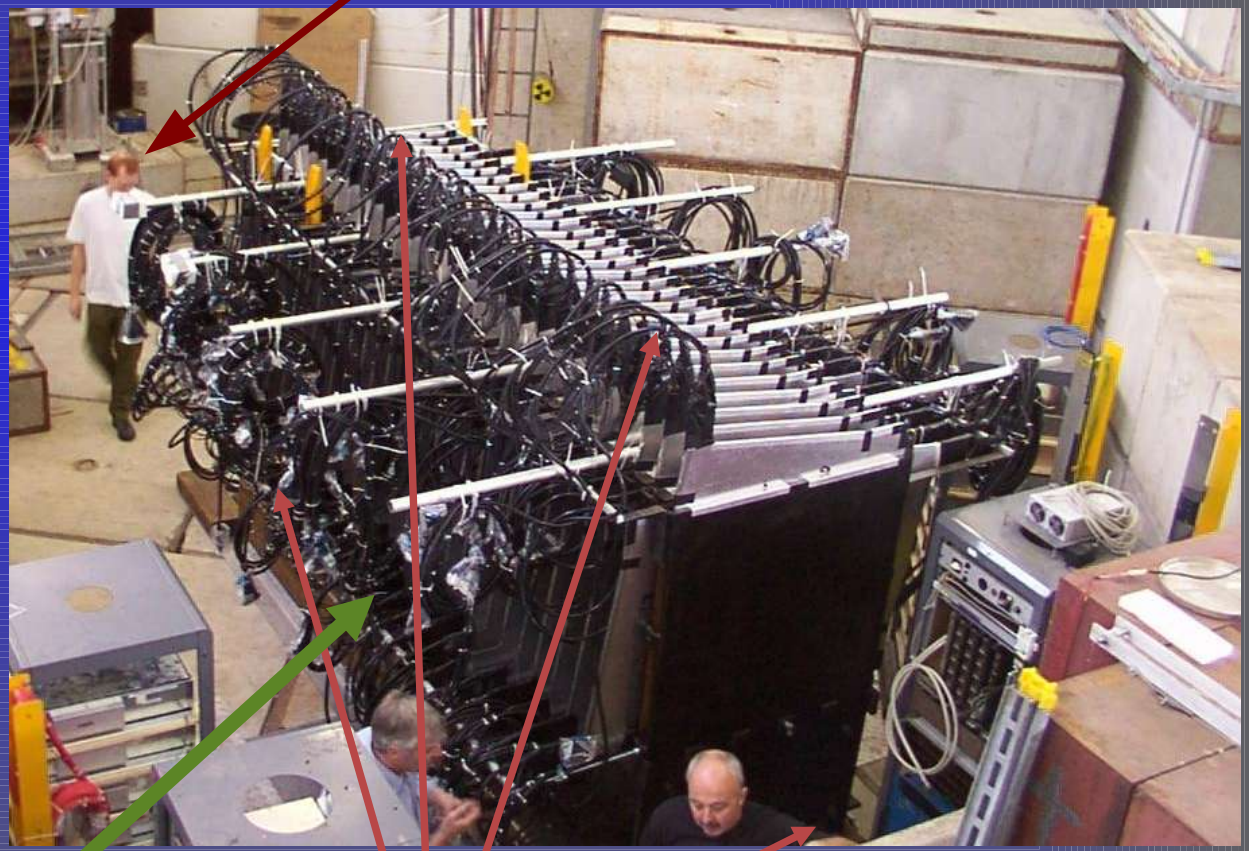
and other MINOS projects

D. Jason Koskinen

UCL

Thermocouple addition

- The Thermocouple (DCS) probes were installed in the summer of 2003. Previously a single Radio Shack probe was used.
- Little has been known about the responsiveness of the DCS probes in comparison to the Radio Shack (RS) probe

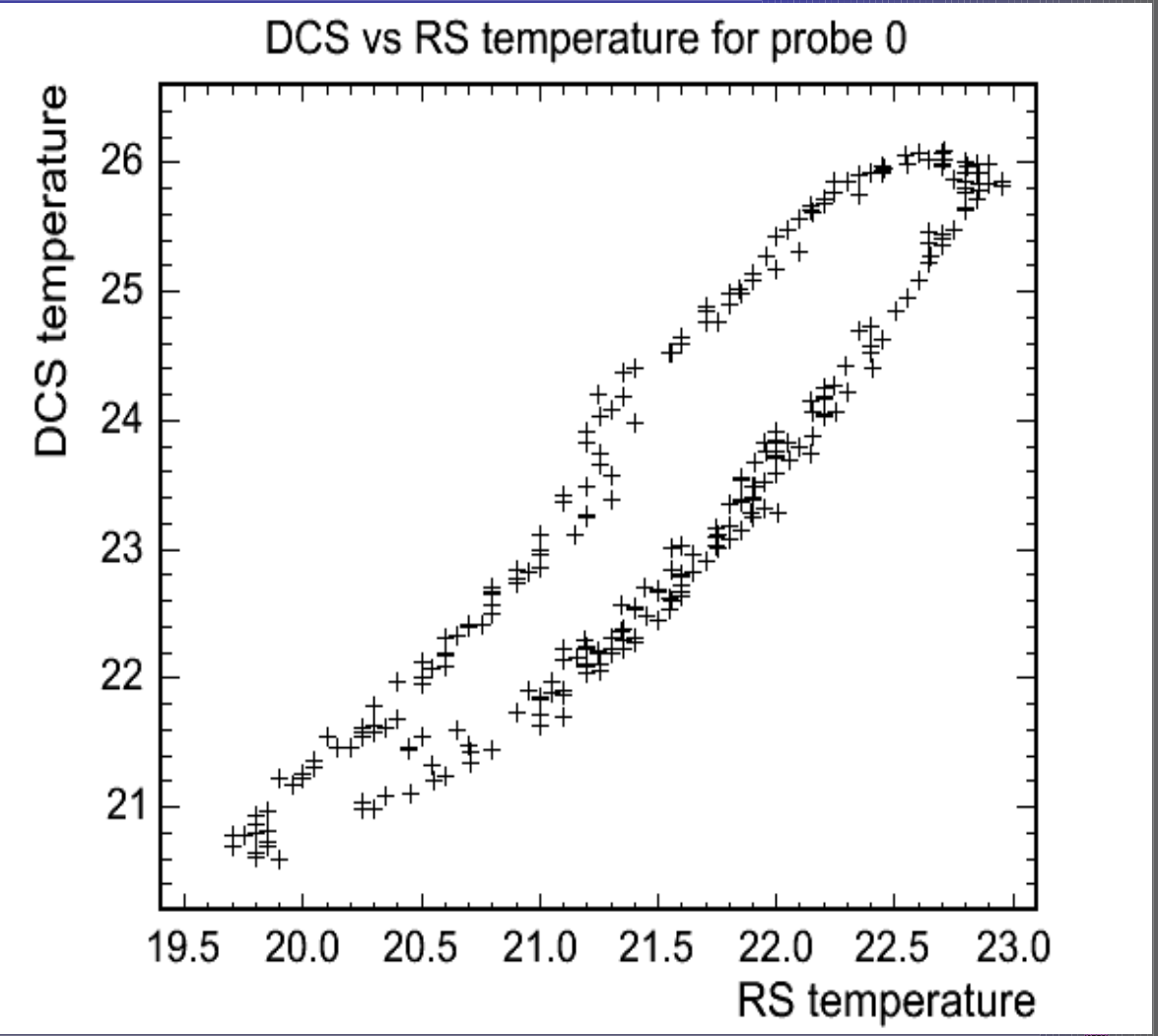


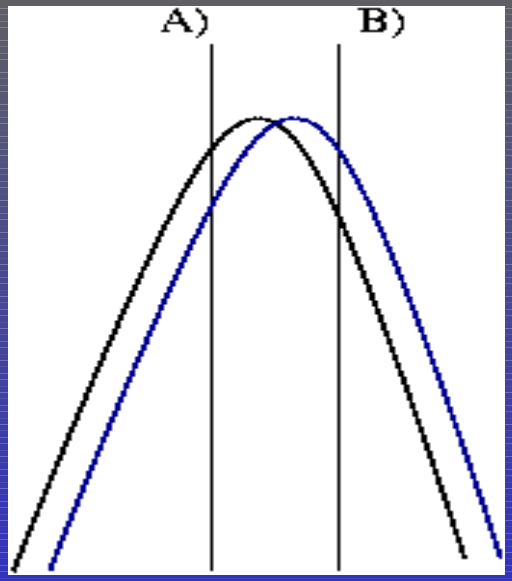
Calibration

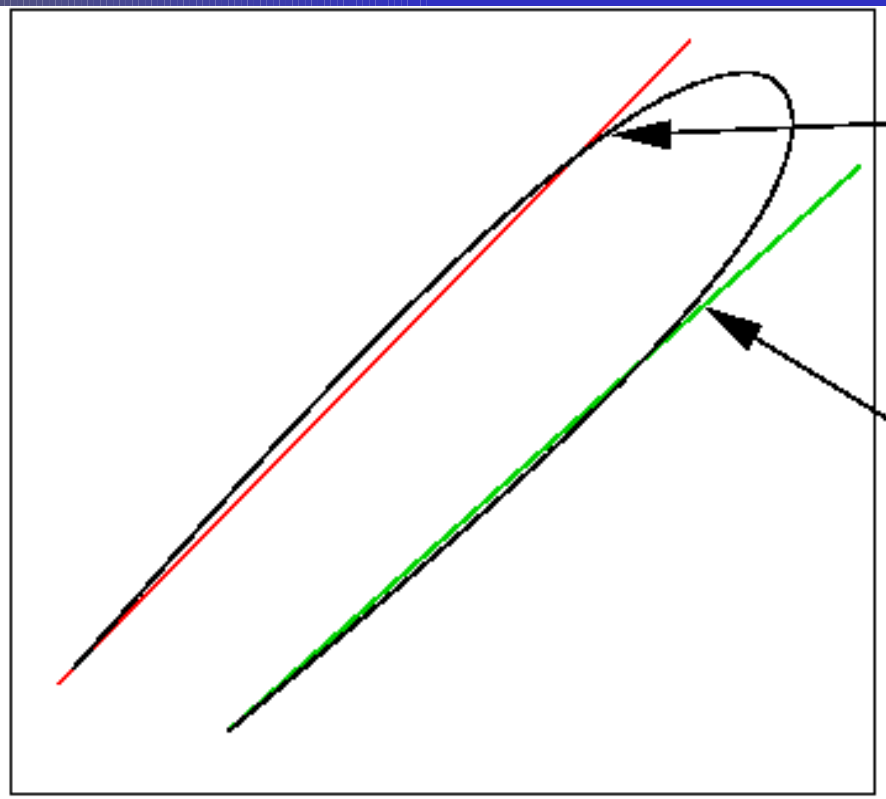
- Looking at plots of the DCS Thermocouple Probes temperature vs the Radio Shack probe temperature
  - A line with a slope of 1 will equate to a perfect calibration between the Thermocouples and Radio Shack probe i.e. 1 degree incease in DCS corresponds to 1 degree increase in RS
- The data used was 11 days during the 2003 near/far run in the T7 Hall

DCS vs RS plots insight

- The Slope is not 1, which means that the DCS has a different temperature response
- There is a lag between values of the DCS probes and the RS probe
  - CalDet heat capacity?





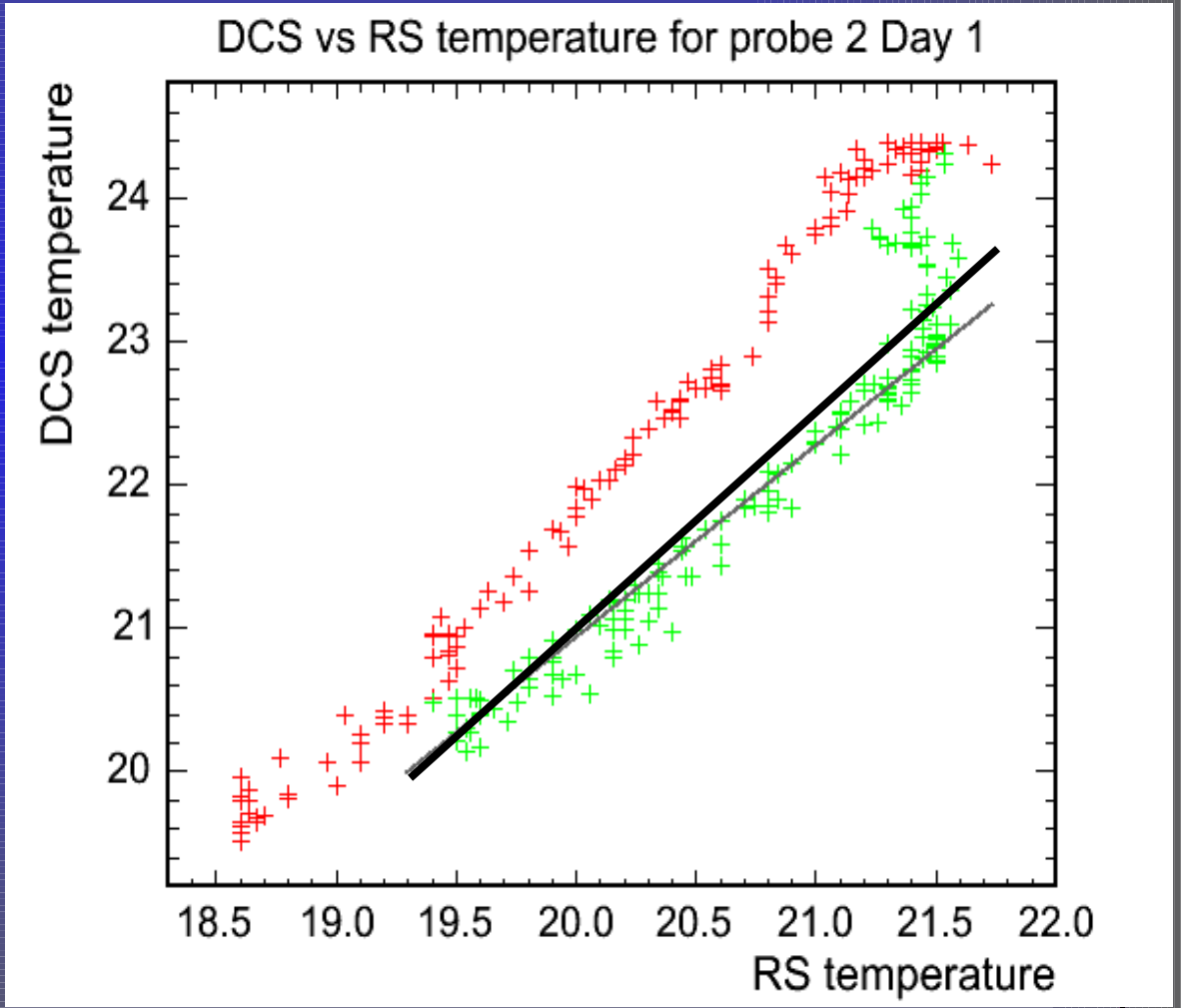


A) This is the point where the **DCS** Temp starts to curve near it's peak and is no longer linear, but the **RS** Temp still is linear.

B) This is where both **RS** and **DCS** are once again both in the linear regime.

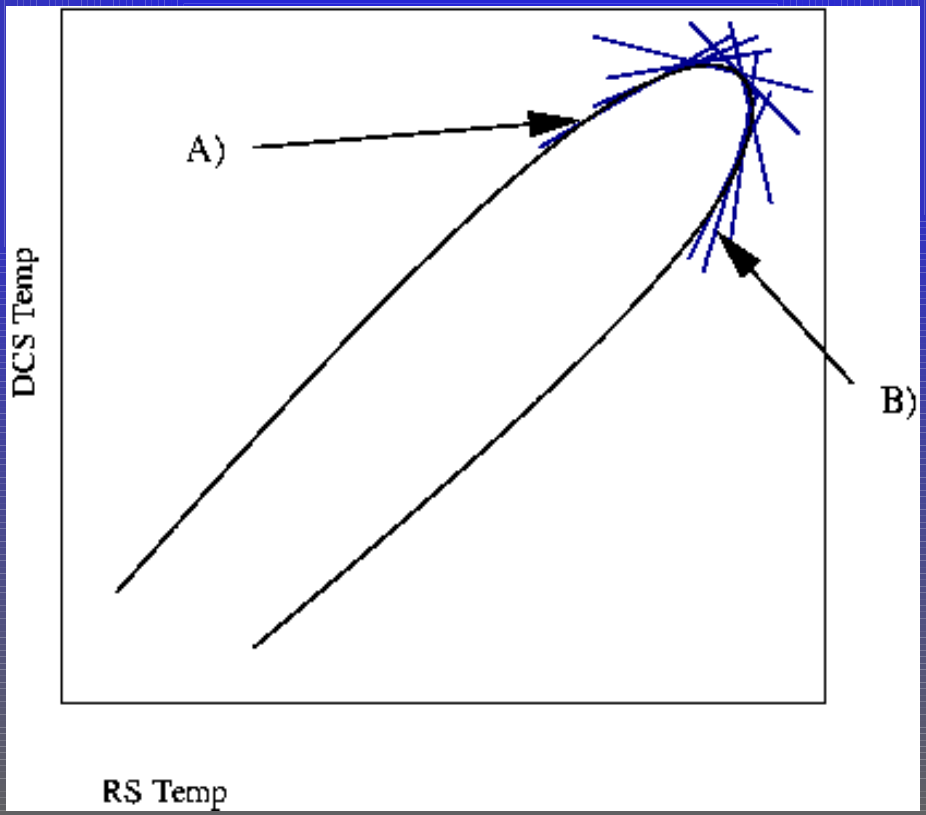
Fixes

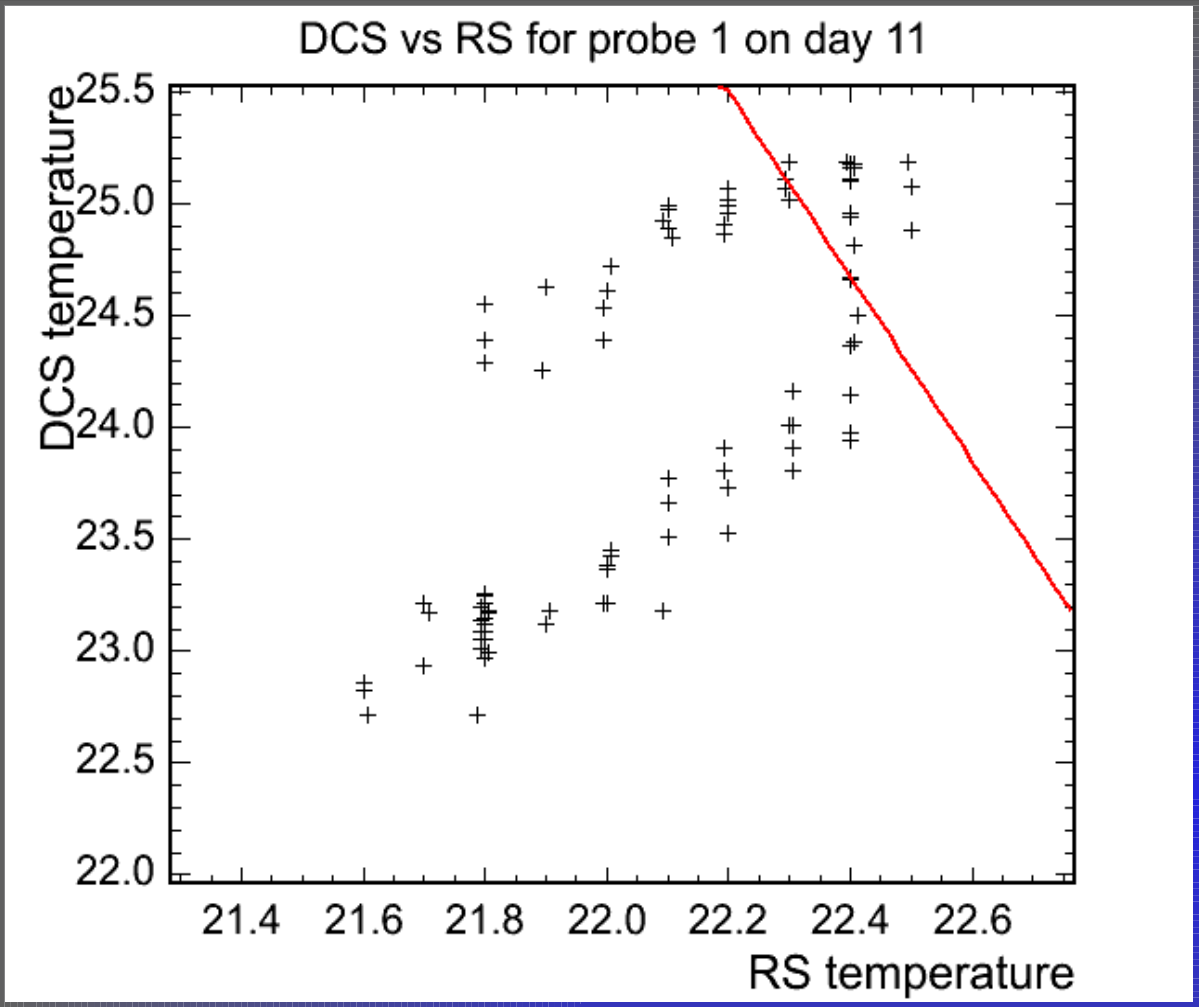
- The jaunt at the top right of plot is due to a dip in the RS temp near its peak
- To avoid the anomalous data over the coolest range as well as the rounded peak over the warmest range an offset of ~1hr was used
  - Fitting over the whole cooling range will give an errant slope



Running Average

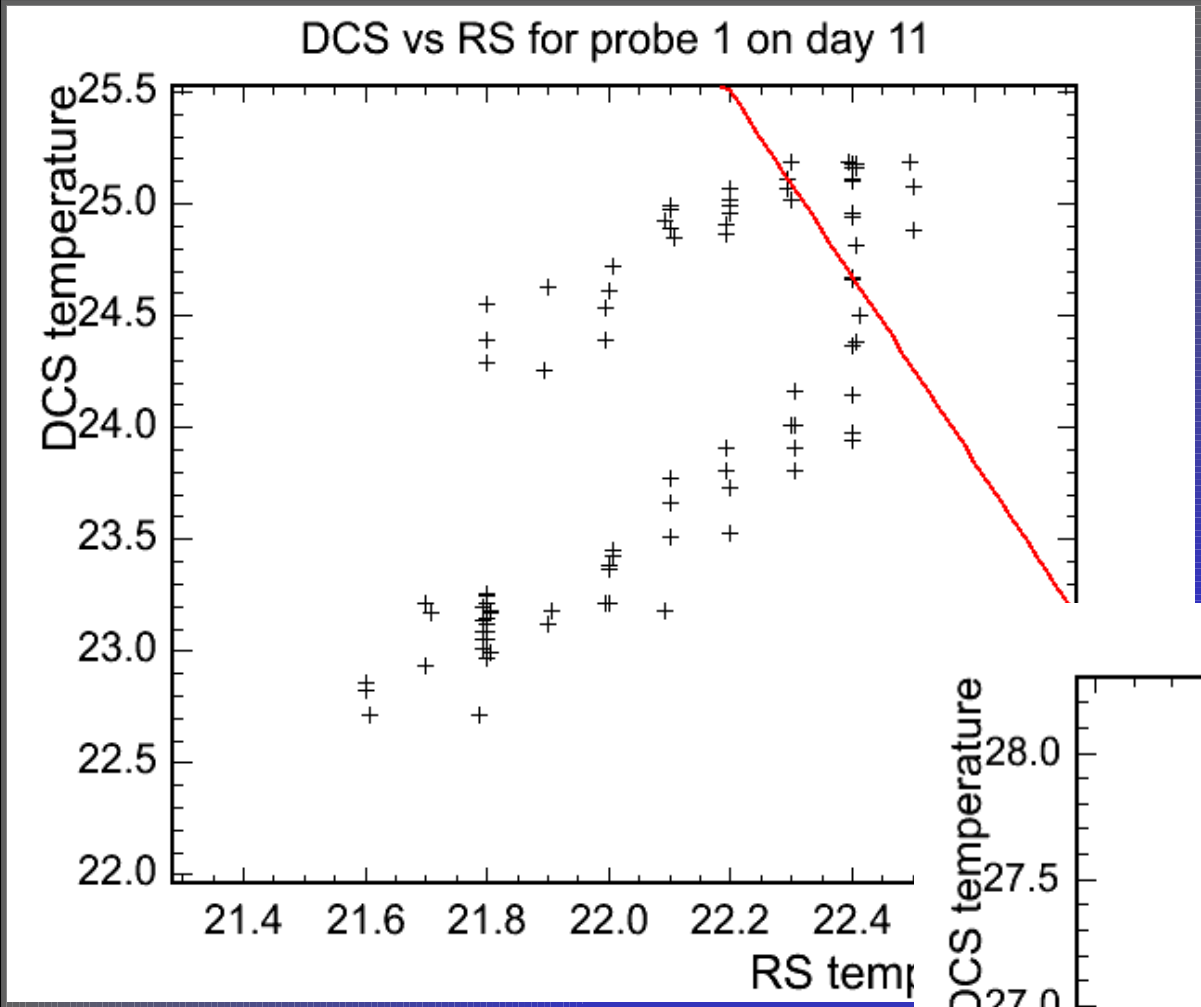
- There is a temperature lag from thermocouples attached to the CalDet and the RS probe
- A method of running averages has been implemented to examine the offset

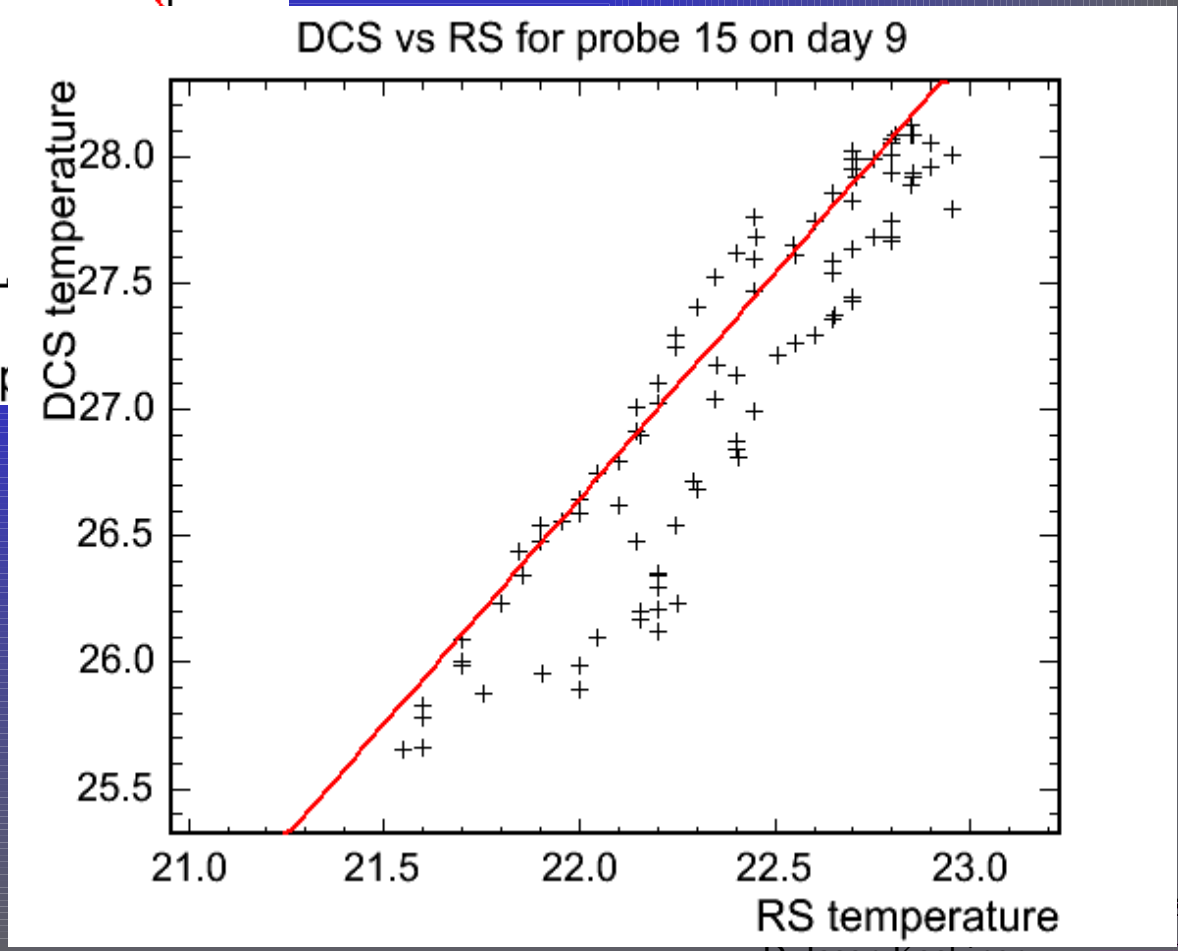




Pretty Decent

D. Jason Koskinen

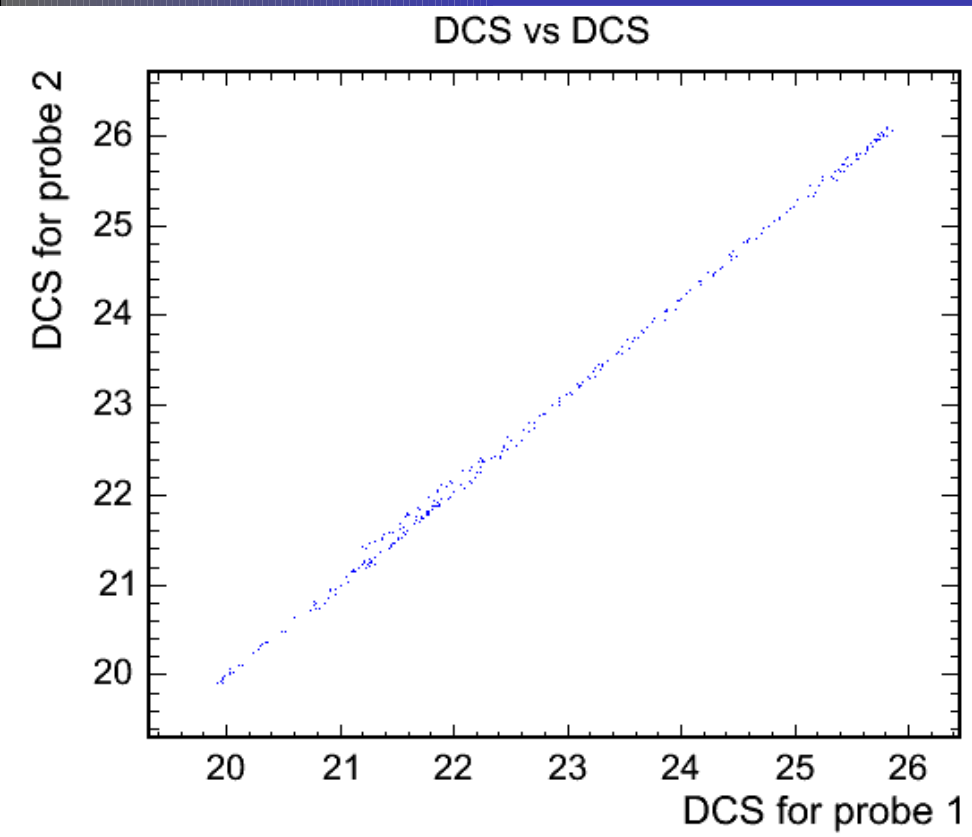


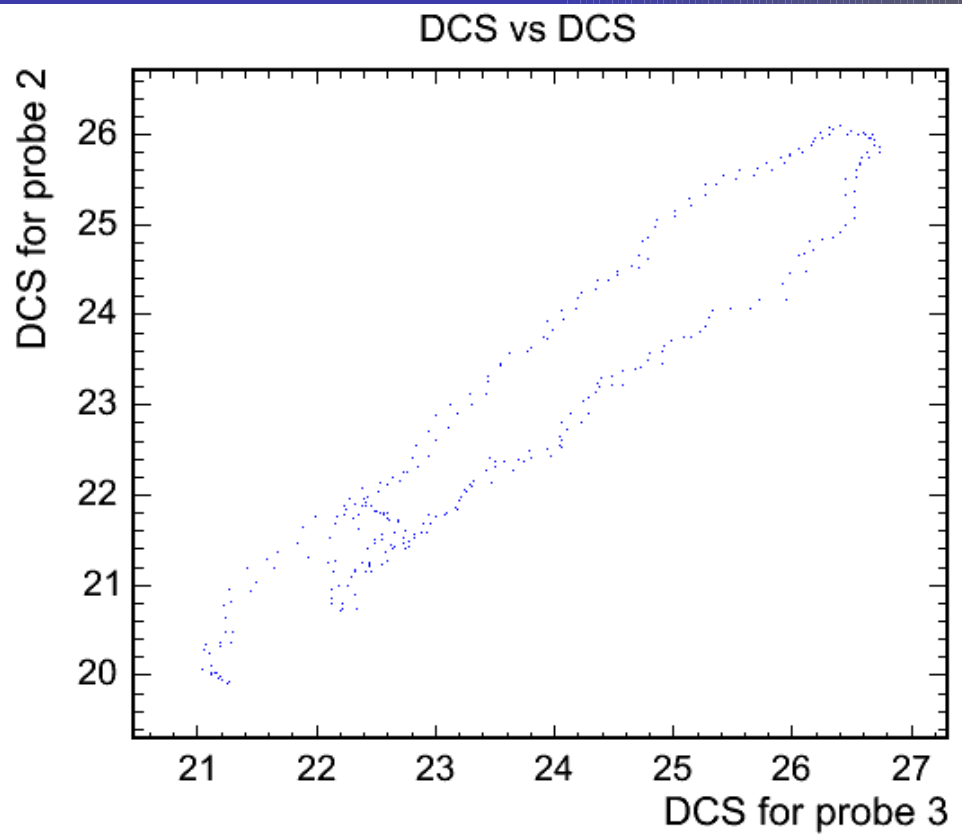


Not so decent

Show Stopper

- Reversing the wiring of the thermocouple leads creates a hysteresis. Game over.





- Extracting whether the hysteresis comes from reverse wired thermocouples or from heat capacity becomes impossible.

D. Jason Koskinen

Non-Temp Work

Monte Carlo/Data comparison
Near Detector Efficiency

D. Jason Koskinen

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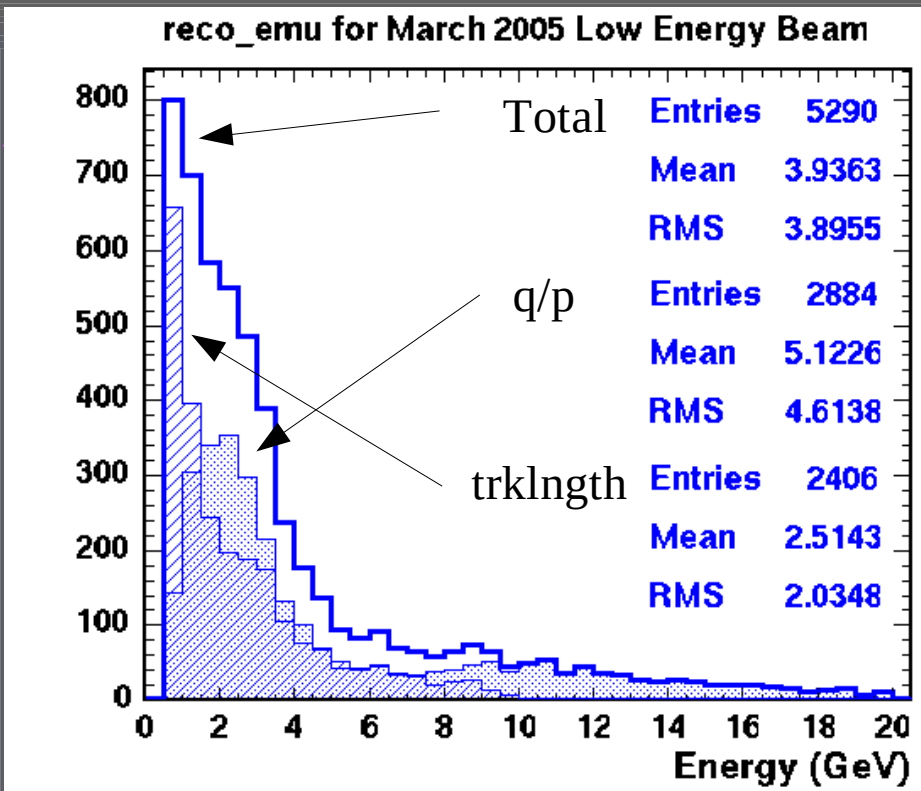
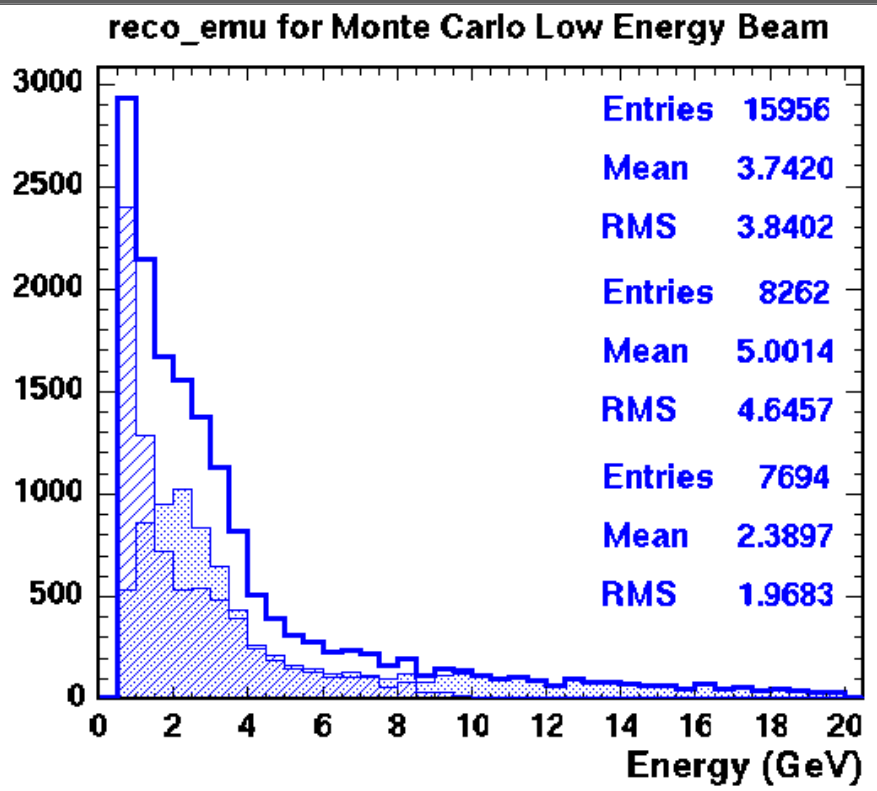
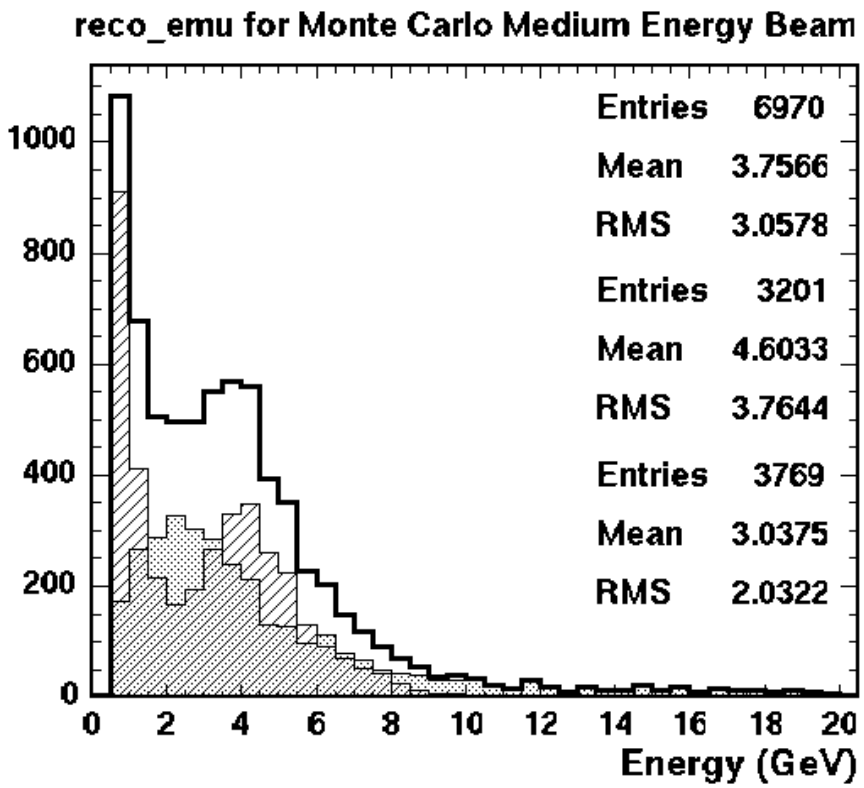
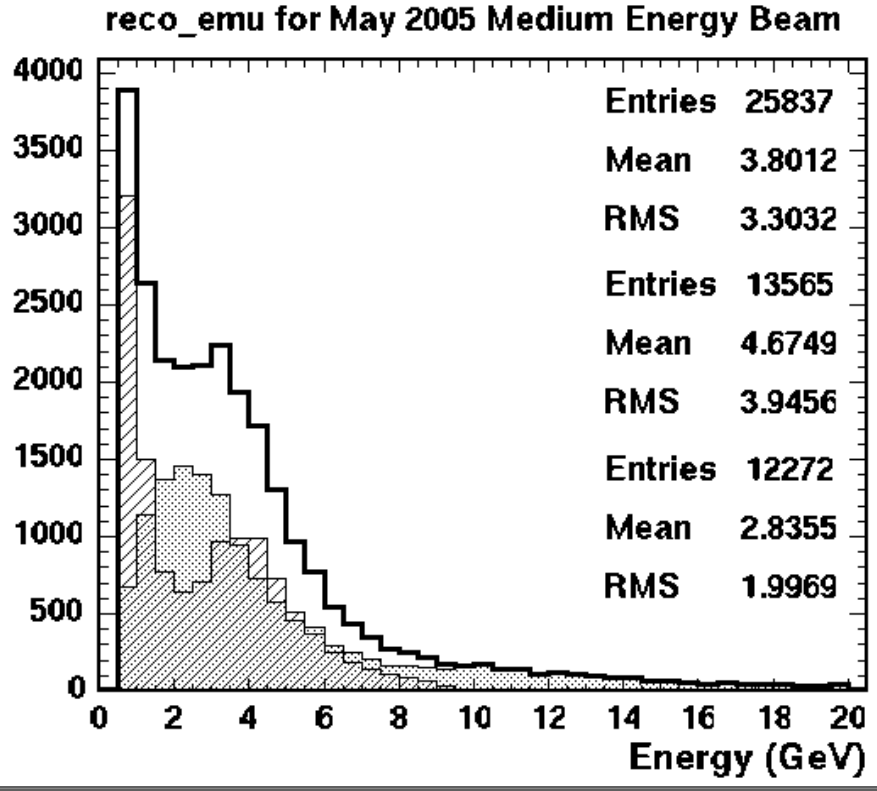
Monte Carlo/Data comparison

- MINOS is in the data taking, beam-on mode.
  - March and May provided sufficient data in the Near Detector for a MC comparison
- One of the most important comparisons is that of muon energy
  - Reconstructed muon energy can be broken up into two methods of reconstruction
    - Track Curvature (q/p) for events leaving the detector
    - Track Length for contained events


reco_emu for March 2005 Low Energy Beam
Total
Entries 5290
Mean 3.9363
RMS 3.8955
q/p
Entries 2884
Mean 5.1226
RMS 4.6138
trklngth
Entries 2406
Mean 2.5143
RMS 2.0348
Energy (GeV)


reco_emu for Monte Carlo Low Energy Beam
Entries 15956
Mean 3.7420
RMS 3.8402
Entries 8262
Mean 5.0014
RMS 4.6457
Entries 7694
Mean 2.3897
RMS 1.9683
Energy (GeV)


reco_emu for Monte Carlo Medium Energy Beam
Entries 6970
Mean 3.7566
RMS 3.0578
Entries 3201
Mean 4.6033
RMS 3.7644
Entries 3769
Mean 3.0375
RMS 2.0322
Energy (GeV)

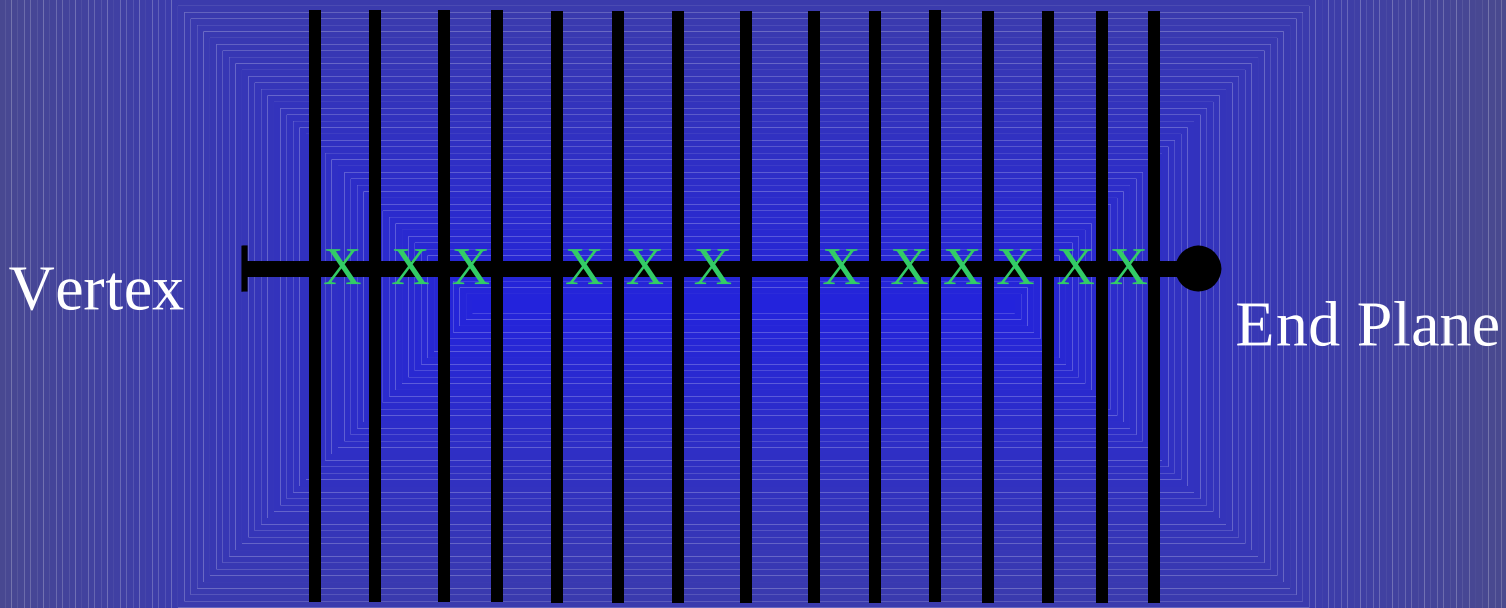

reco_emu for May 2005 Medium Energy Beam
Entries 25837
Mean 3.8012
RMS 3.3032
Entries 13565
Mean 4.6749
RMS 3.9456
Entries 12272
Mean 2.8355
RMS 1.9969
Energy (GeV)

	LE total	mean	RMS	LE q/p	mean	RMS	LE trklngth	mean	RMS
March 2005	5290	3.94	3.9	2884	5.12	4.61	2406	2.51	2.03
May 2005	0	0	0	0	0	0	0	0	0
Monte Carlo	15956	3.74	3.84	8262	5	4.65	7694	2.39	1.97

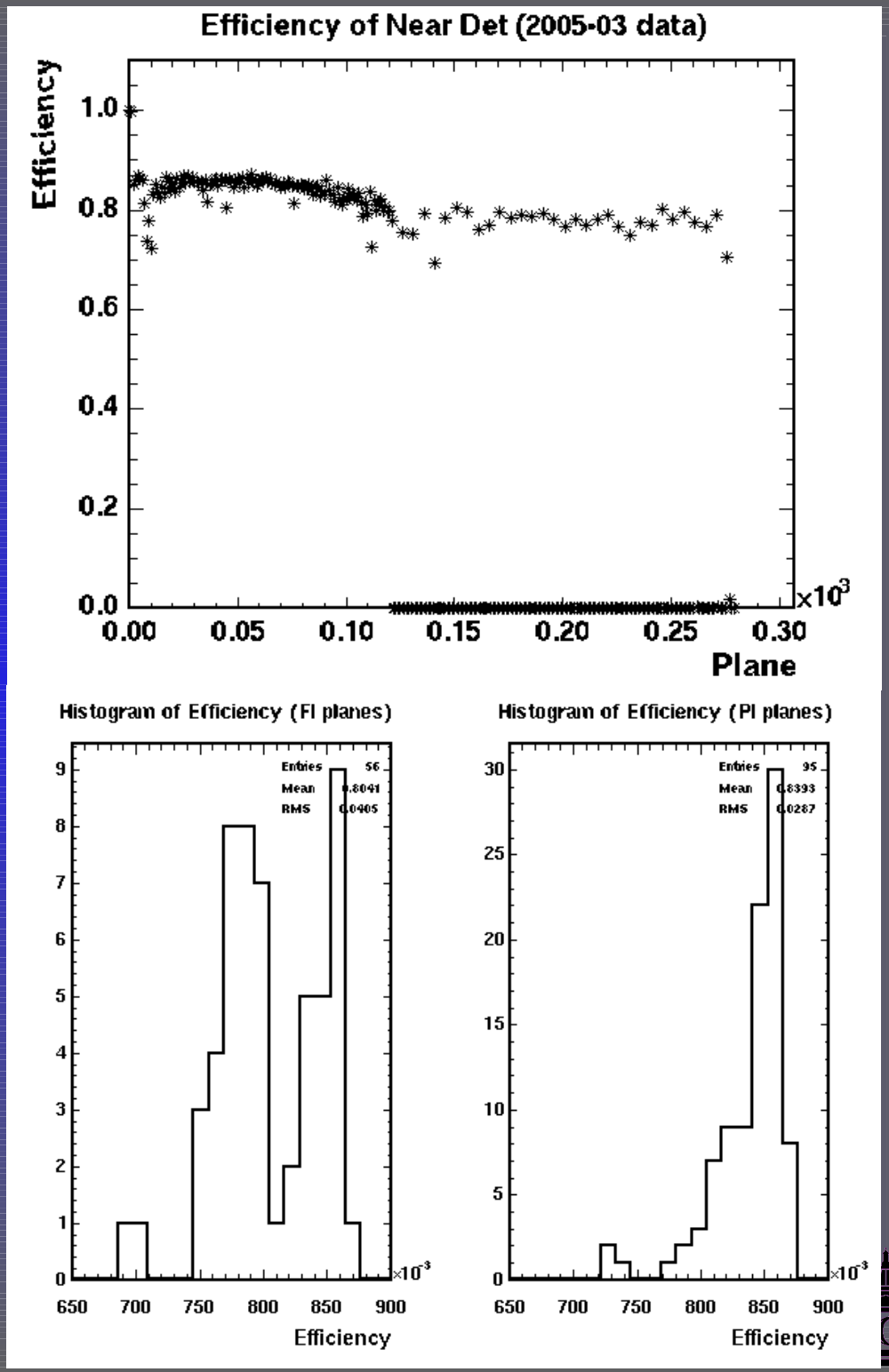
	ME total	mean	RMS	ME q/p	mean	RMS	ME trklngth	mean	RMS
March 2005	/	/	/	/	/	/	/	/	/
May 2005	25837	3.8	3.3	13565	**4.67**	3.95	12272	2.84	2
Monte Carlo	6970	3.76	3.06	3201	**4.6**	3.76	3769	3.04	2.03

	HE total	mean	RMS	HE q/p	mean	RMS	HE trklngth	mean	RMS
March 2005	/	/	/	/	/	/	/	/	/
May 2005	85173	4.52	3.88	46417	**5.76**	4.42	38756	3.04	2.38
Monte Carlo	2486	5.12	3.97	1261	**6.52**	4.54	1225	3.68	2.58

- There is some initial agreement with Monte Carlo, but also some misses
  - This is the beginning of the lengthy process to tune Monte Carlo
- Ultimately the quality of data is dependent on detector effectiveness
  - Efficiency can be measured using full length of muon track


Vertex
End Plane

- Every plane up to 120 is instrumented, either fully or partially. 120+ only every 5th is instrumented.
  - Totally instrumented
    - Mean : .8041
    - RMS : .0405
  - Partially instrumented
    - Mean : .8393
    - RMS : .0287
- Fiducial cuts only



In the End

- Exciting time to be working on MINOS
  - Some stuff is working and some is breaking
- Examing irregularities in attenuated light output at Near Detector
- Geant simulation of Hadron Absorber