RICH Alignment & Calibration

Sharon Seun

March 22, 2007

RICH Alignment results from Pass 3

- Mirror-to-mirror alignment
- Cuts:

  $n_{fit}>10$, $0.3*n_{total}<n_{fit}<0.8*n_{total}$

  $0.2<\chi^2/ndf<2$

  $|\Delta x|<2$, $\sigma_{\Delta x}<1$, $|Error(\Delta x)|<1$, $Error(\sigma_{\Delta x})<1$

Cross-check calibration on (n-1) scaling factor, smearing and PMT efficiencies using more data with difference configuration files

- 35GeV and 120GeV empty target data sets
- Cuts on tracks

  ntrk=1

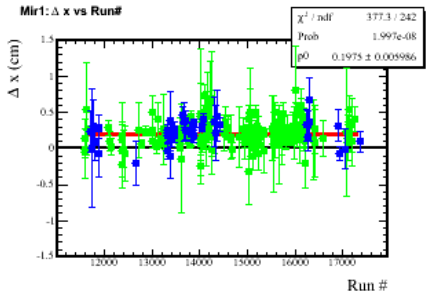
  nmatch=1

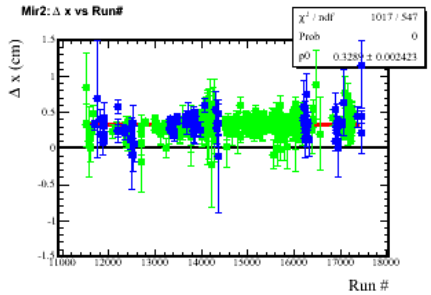
  mirror=8 or 9 (only for 120GeV data set)

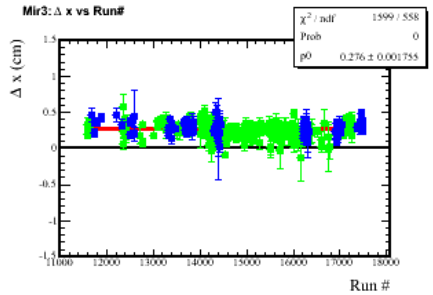
Δx vs Run#

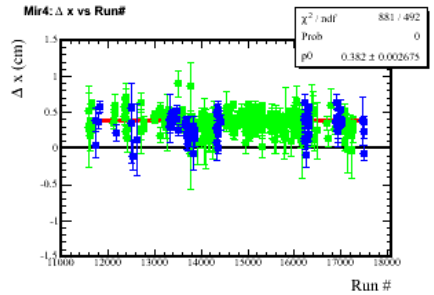
Positive momentum

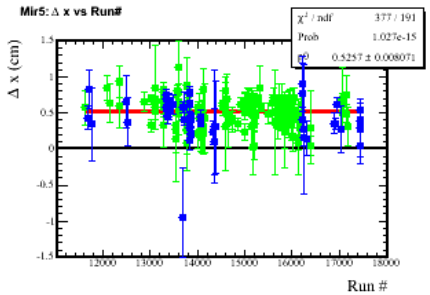
Negative momentum

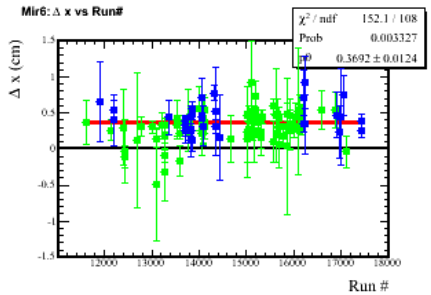


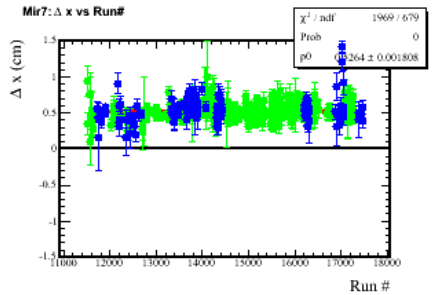


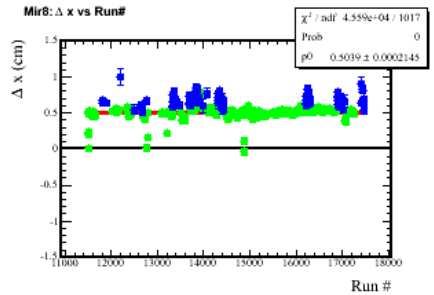


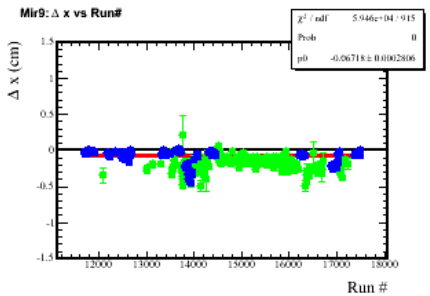


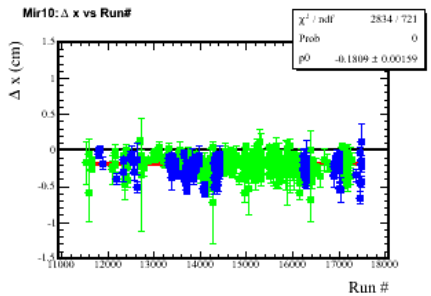


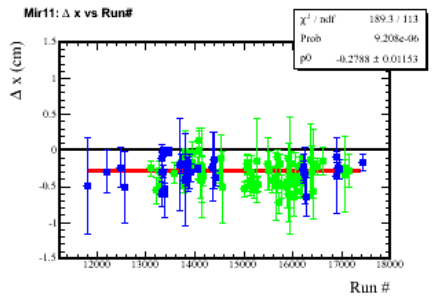


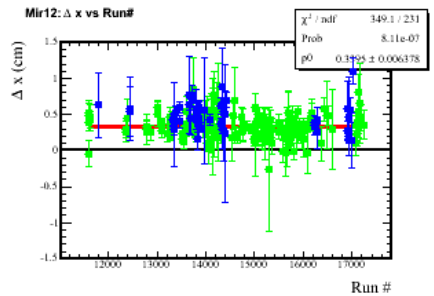


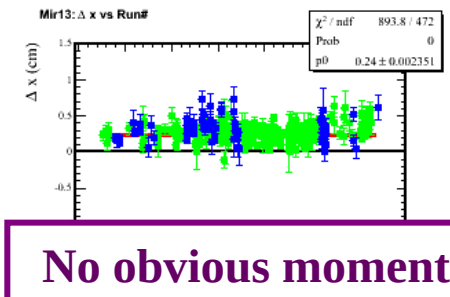


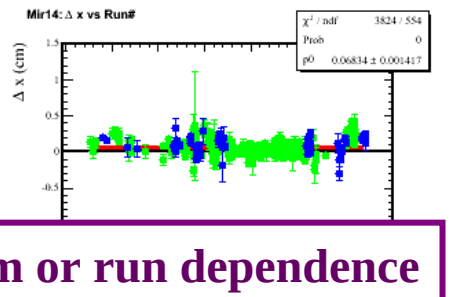


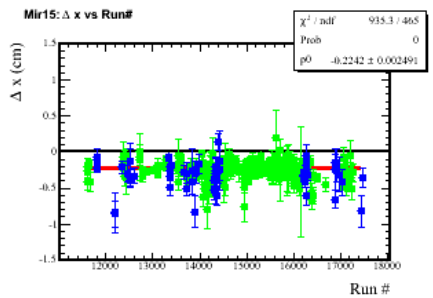


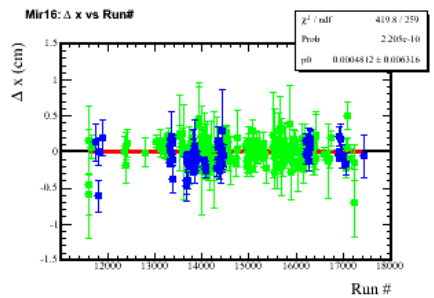










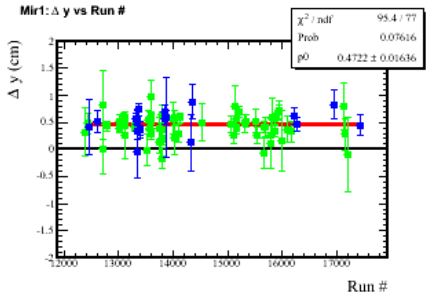


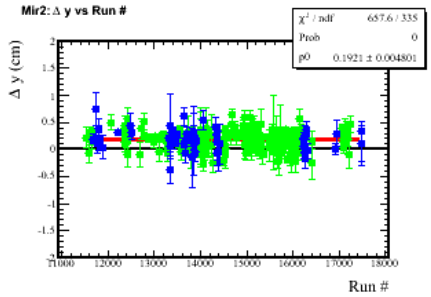
No obvious momentum or run dependence

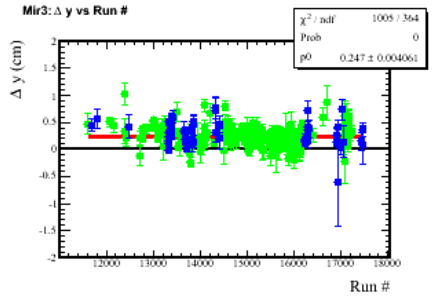
Δy vs Run#

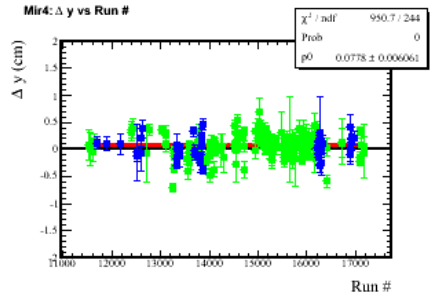
Positive momentum

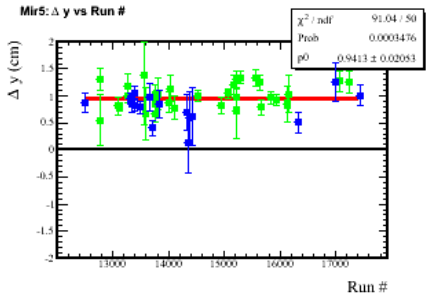
Negative momentum

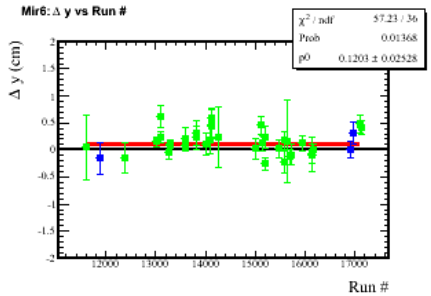


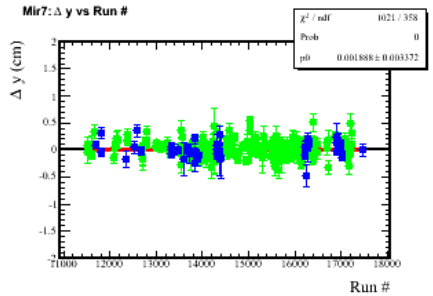


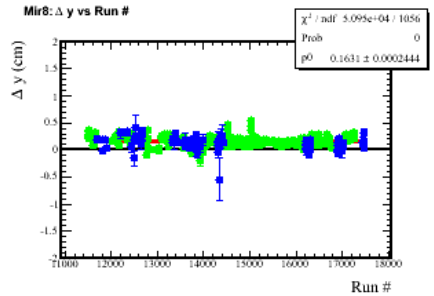


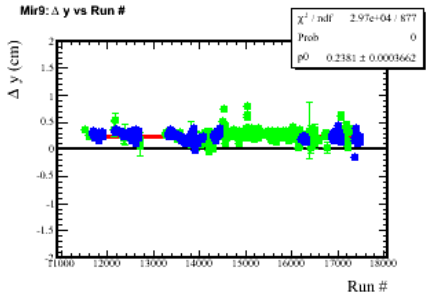


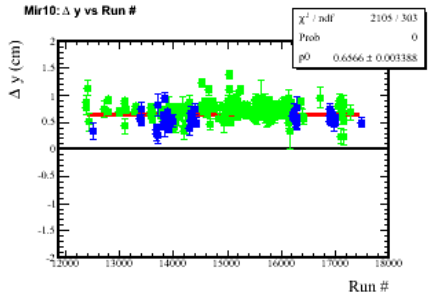


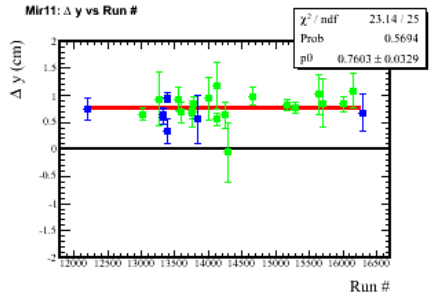


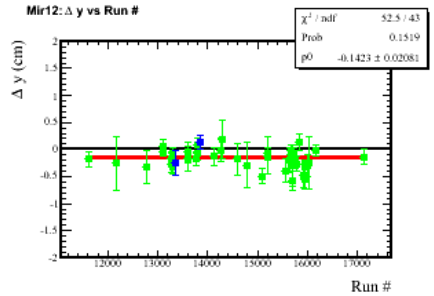


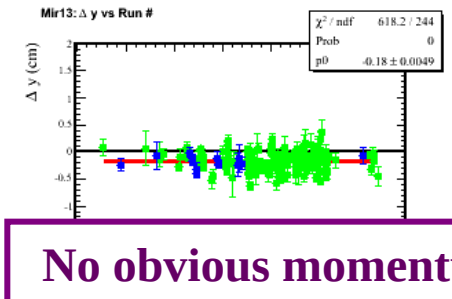


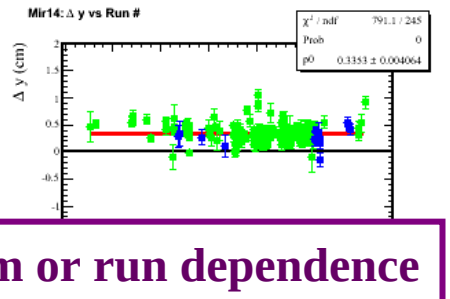


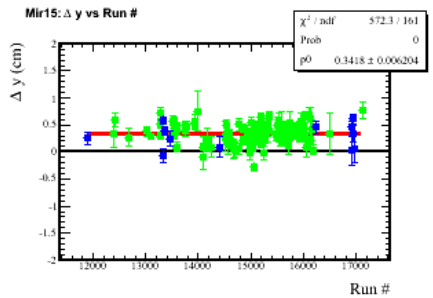


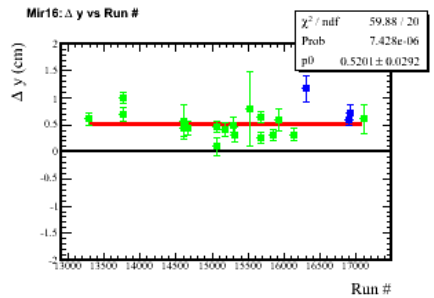










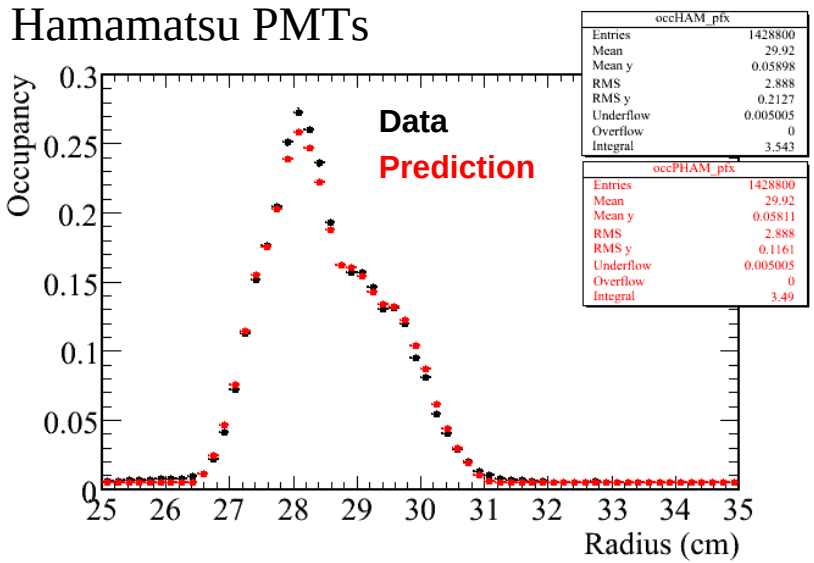


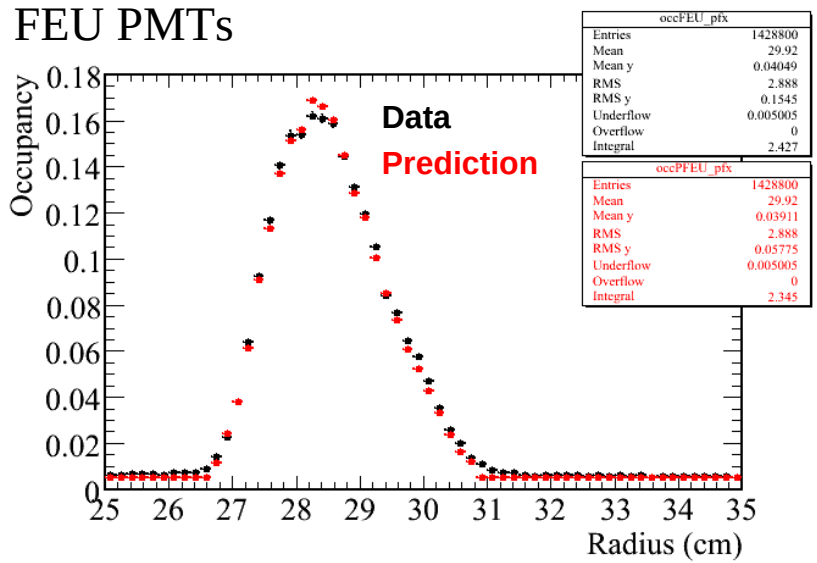
No obvious momentum or run dependence

Alignment Values

Mirror#	Δx (cm)	Δy (cm)
1	0.1975360 ± 0.00600	0.4722112 ± 0.01636
2	0.3289132 ± 0.00242	0.1921326 ± 0.00480
3	0.2760042 ± 0.00176	0.2469679 ± 0.00406
4	0.3820279 ± 0.00268	0.0777956 ± 0.00606
5	0.5257010 ± 0.00807	0.9412741 ± 0.02053
6	0.3691767 ± 0.01240	0.1203326 ± 0.02528
7	0.5263737 ± 0.00181	0.0018881 ± 0.00337
8	0.5039108 ± 0.00021	0.1630671 ± 0.00024
9	-0.0671760 ± 0.00028	0.2380995 ± 0.00037
10	-0.1808990 ± 0.00159	0.6566057 ± 0.00339
11	-0.2788303 ± 0.01153	0.7603559 ± 0.03290
12	0.3394549 ± 0.00638	-0.1423352 ± 0.02081
13	0.2400263 ± 0.00235	-0.1799764 ± 0.00490
14	0.0683410 ± 0.00142	0.3352901 ± 0.00406
15	-0.2241668 ± 0.00249	0.3418323 ± 0.00062
16	0.0004812 ± 0.00632	0.5201250 ± 0.00292

Last time:
Run 15634 (120GeV empty)





Best Fit parameters:

(n -1) Scaling factor = 0.973

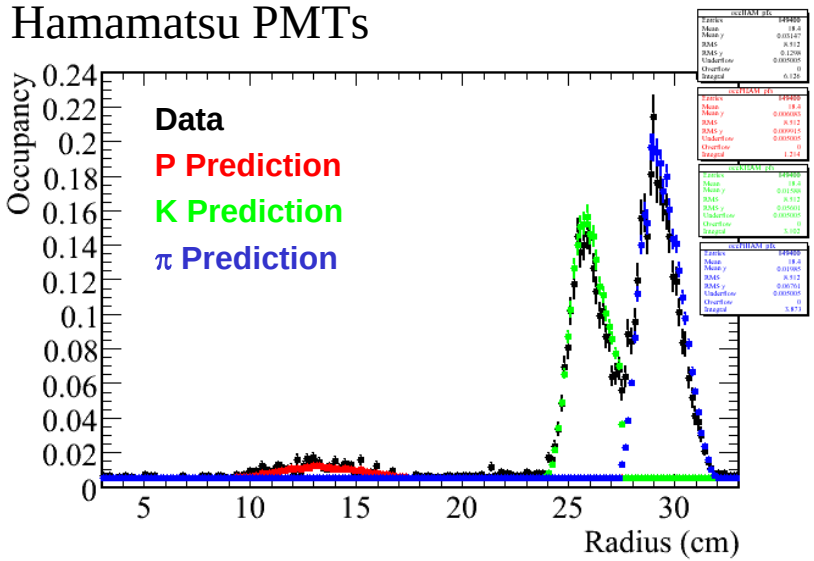
Smearing = 0.4

FEU Efficiency = 0.42

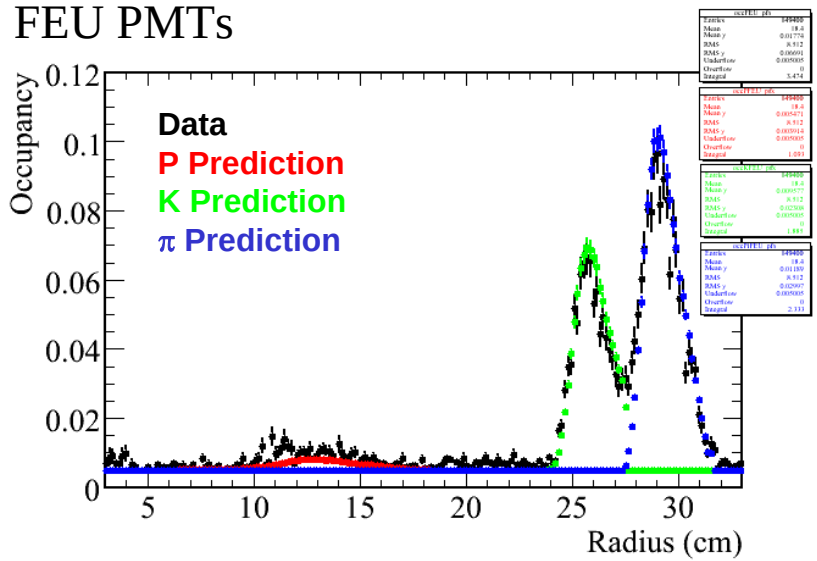
Hamamatsu Efficiency = 1.16

Run 14076 (35GeV empty) using Best Fit parameters

Hamamatsu PMTs



FEU PMTs

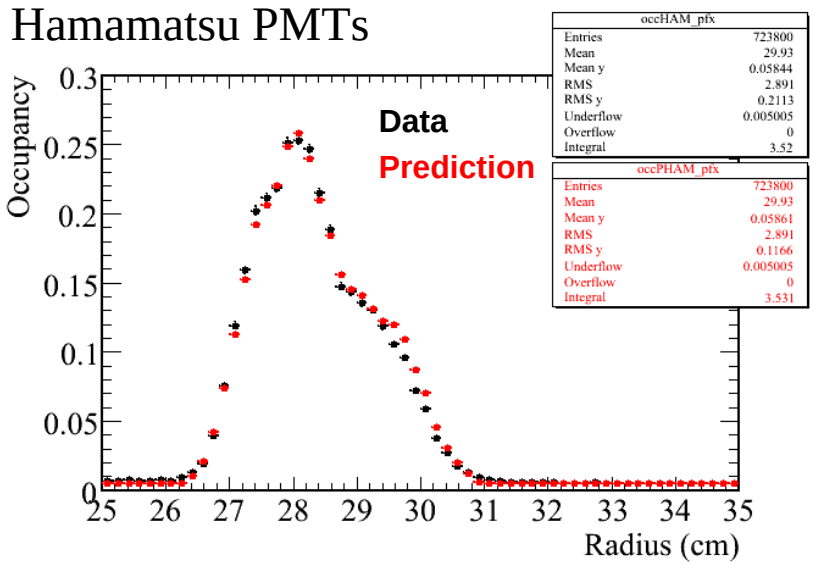


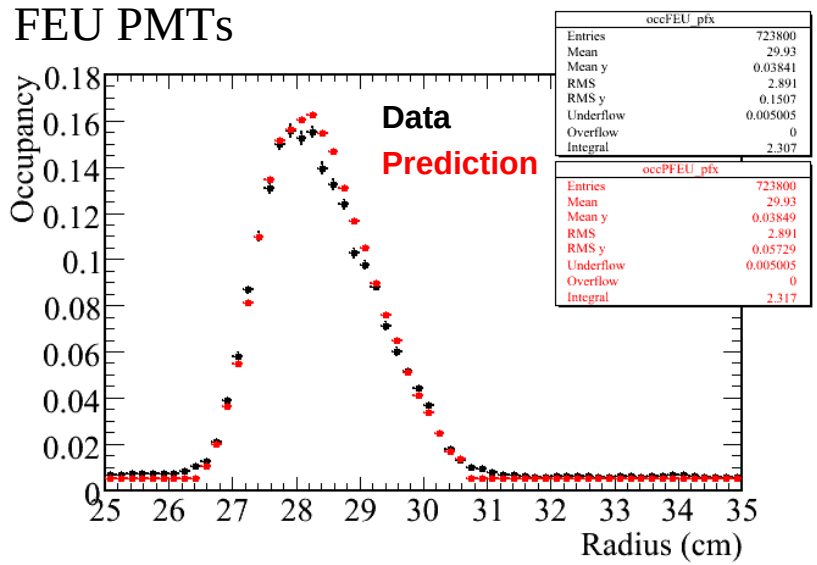
Configure file modified on

pro/rich1.xml: 2005-03-25
pro/rich2.xml: 2005-03-21
pro/rich3.xml: 2005-03-21

Best Fit parameters agree with this data set pretty well!

Run 15307 (120GeV empty) using Best Fit parameters





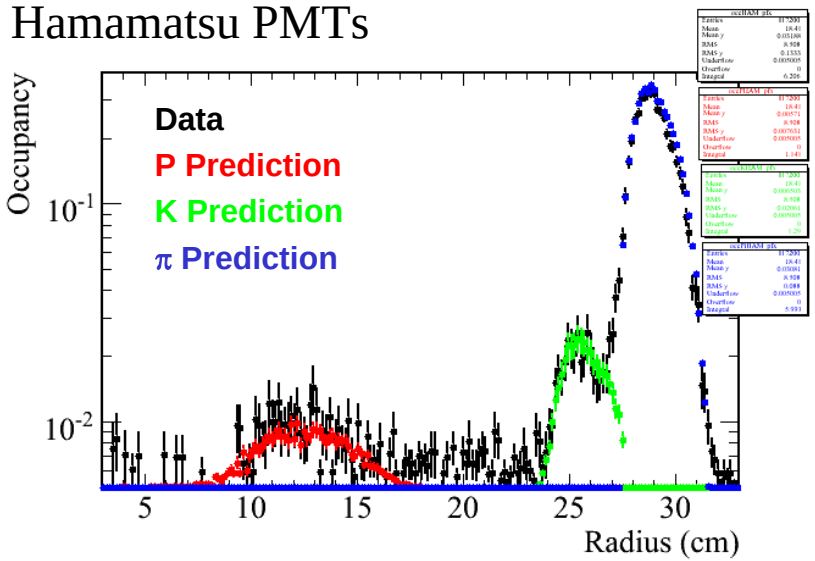
Configure file modified on

pro/rich1.xml: 2005-03-25
pro/rich2.xml: 2005-03-21
pro/rich3.xml: 2005-03-21

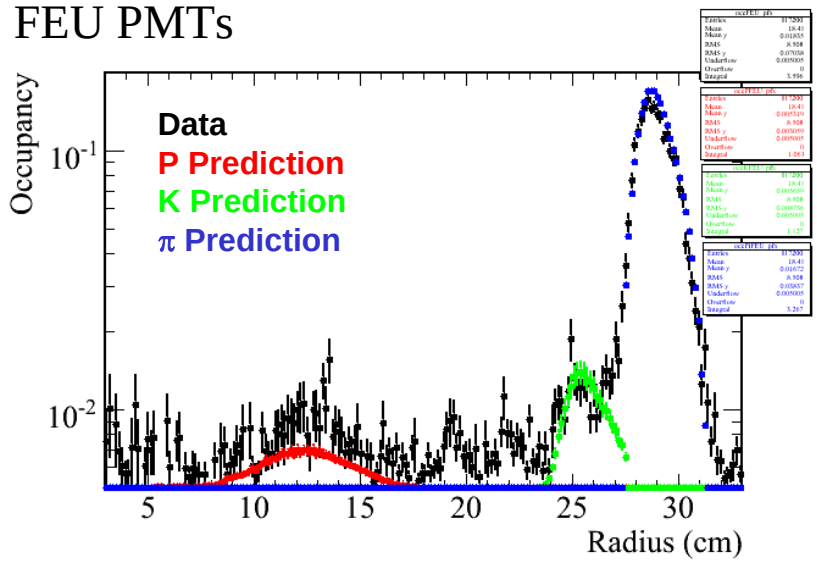
Best Fit parameters agree with this data set pretty well!

Run 12704 (35GeV empty) using Best Fit parameters

Hamamatsu PMTs



FEU PMTs



Configure file modified on

pro/rich1.xml: 2004-12-22
pro/rich2.xml: 2005-02-19
pro/rich3.xml: 2004-12-22

Best Fit parameters agree with this data set pretty well!

Conclusion

- Mirror-to-mirror alignment
  - No obvious beam momentum or run dependence
  - Alignment values < 1cm
  - Need to put alignment values in RICHReco
- Cross-checked Best Fit parameters for (n-1) scaling factor, smearing and PMT efficiencies with more 120GeV and 35GeV empty target data sets
  - All configuration files used between December 2004 and December 2005 all agree pretty well with these parameters
  - Only one set of configuration file was created after (January 5, 2006), which has higher trigger thresholds and need different light tuning