Reconstruction of Beam Position at HyCal

-Subhash Khanal

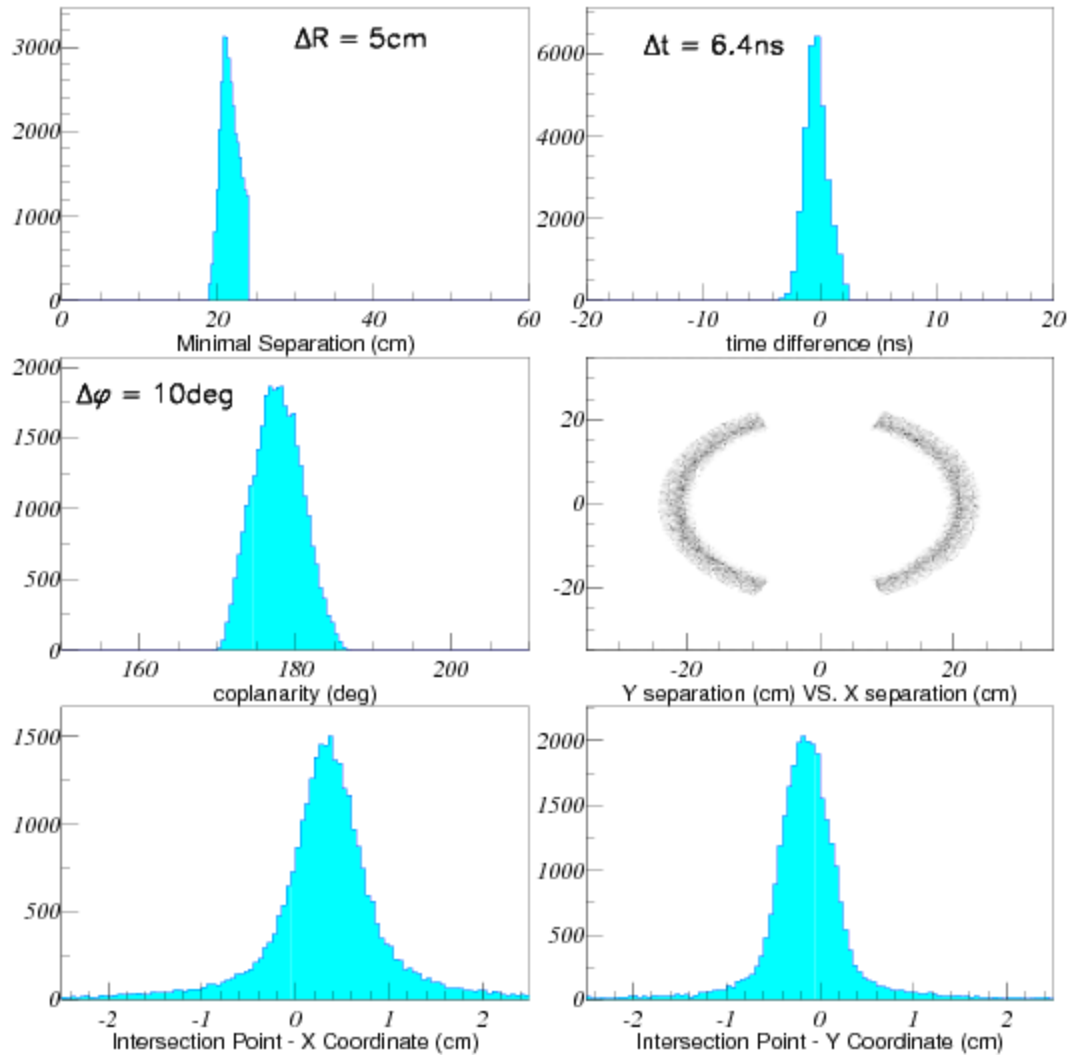NCA&T State University, NC

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Outline :

- Method
- Comparison with database values
- PrimEx Reference Frame
- Correlation between HyCal and PGP
  reference frame
- Correlation between PGP and BPM
  reference frame
- BPM, HyCal, and PGP axes orientation
- Projected beam position at PGP
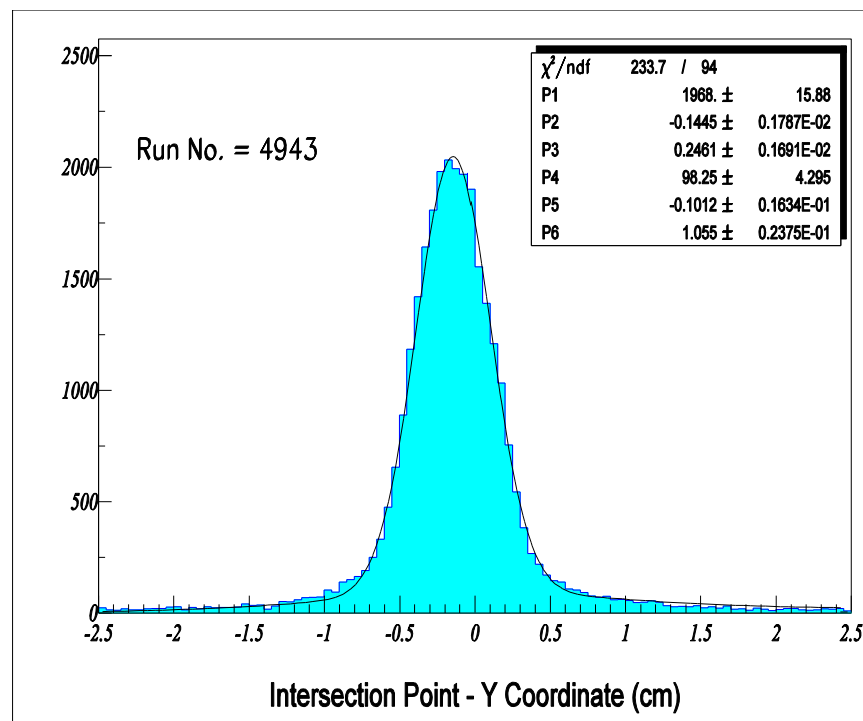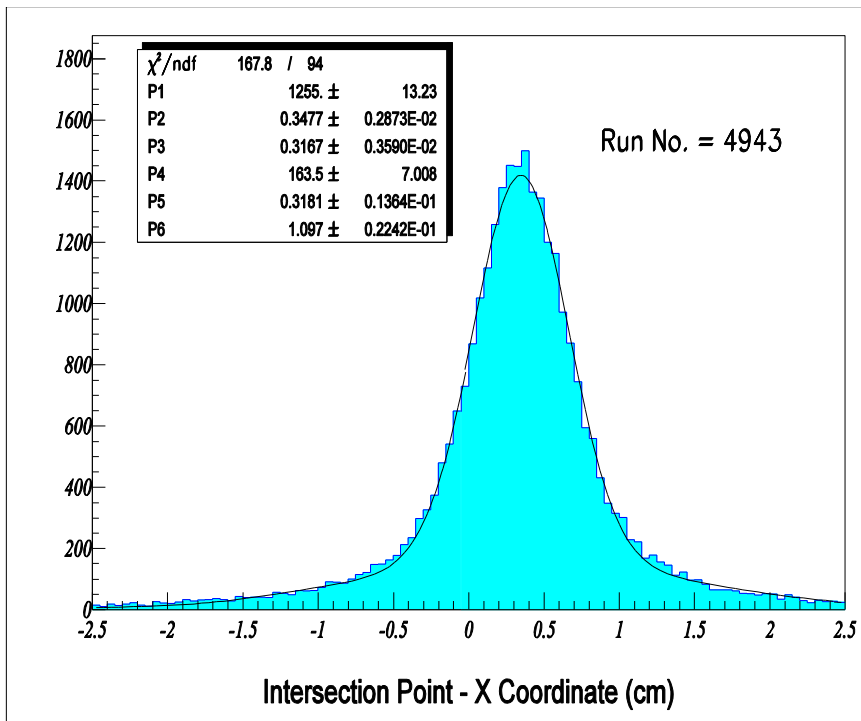- Result and Summary

Method :

- For any Compton run pick randomly two
  events – repeat many times
- One event consists of two clusters –
  construct a line joining these clusters
- Determine coordinates of the intersection
  point of these two lines
- Draw a histogram of a distribution of
  intersection point coordinates and fit it
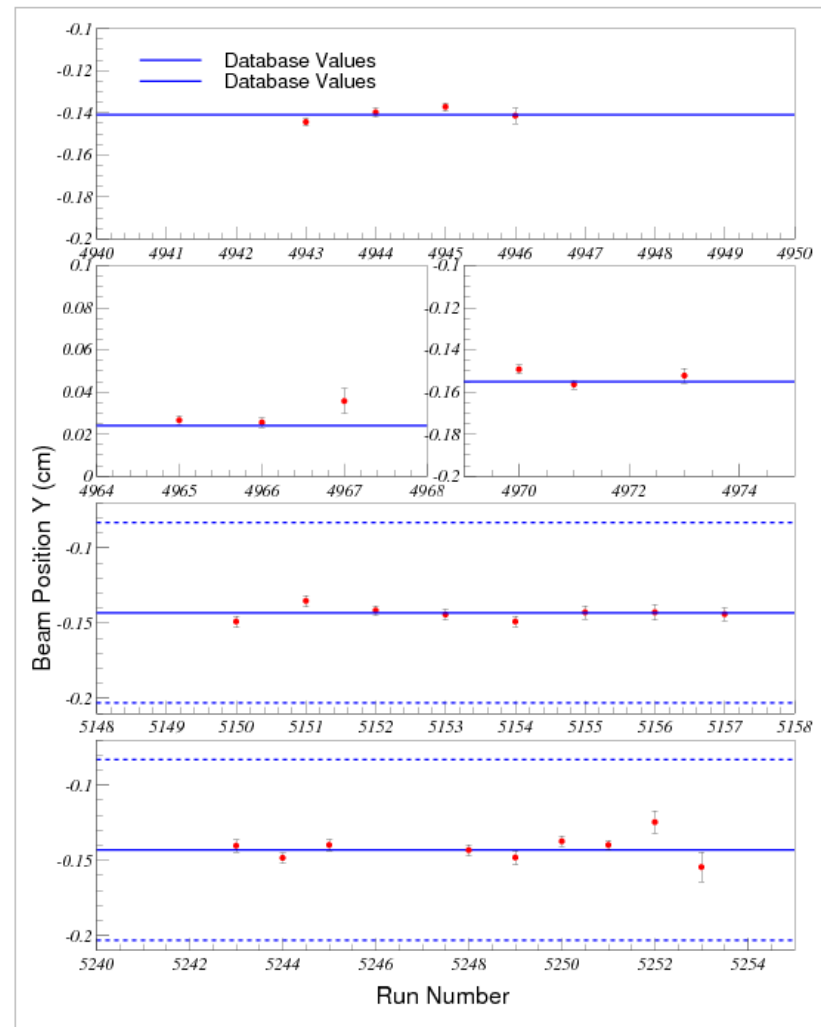- The fit gives the beam position at HyCal
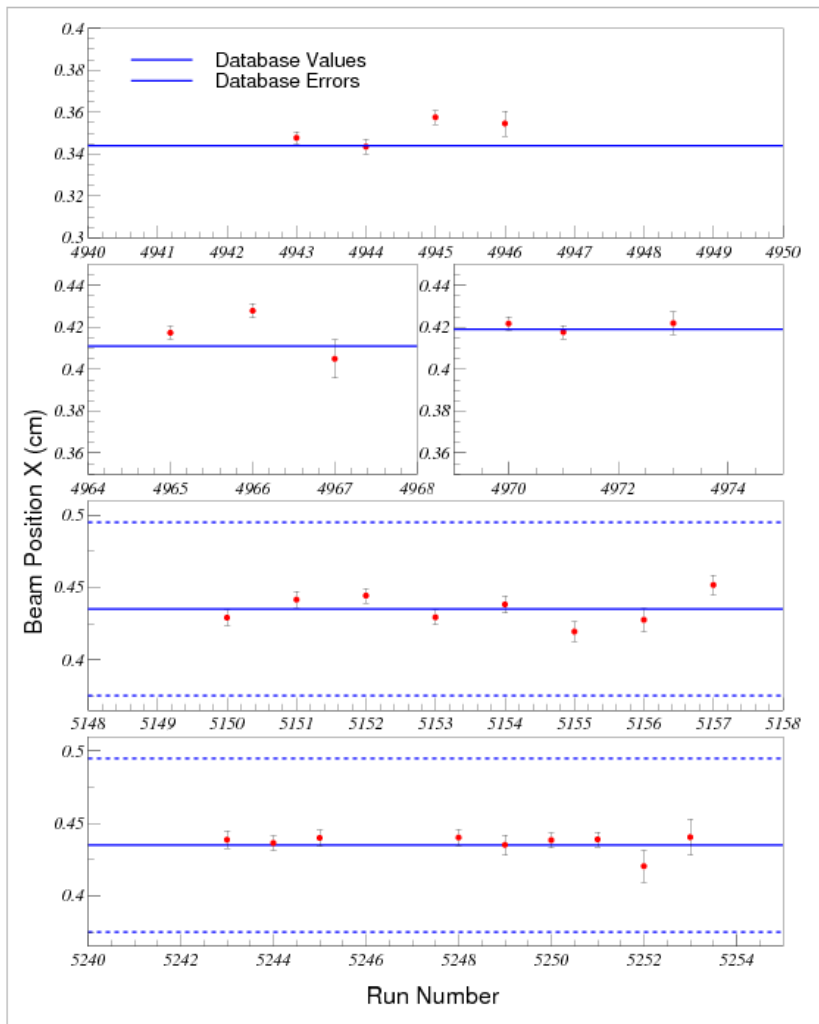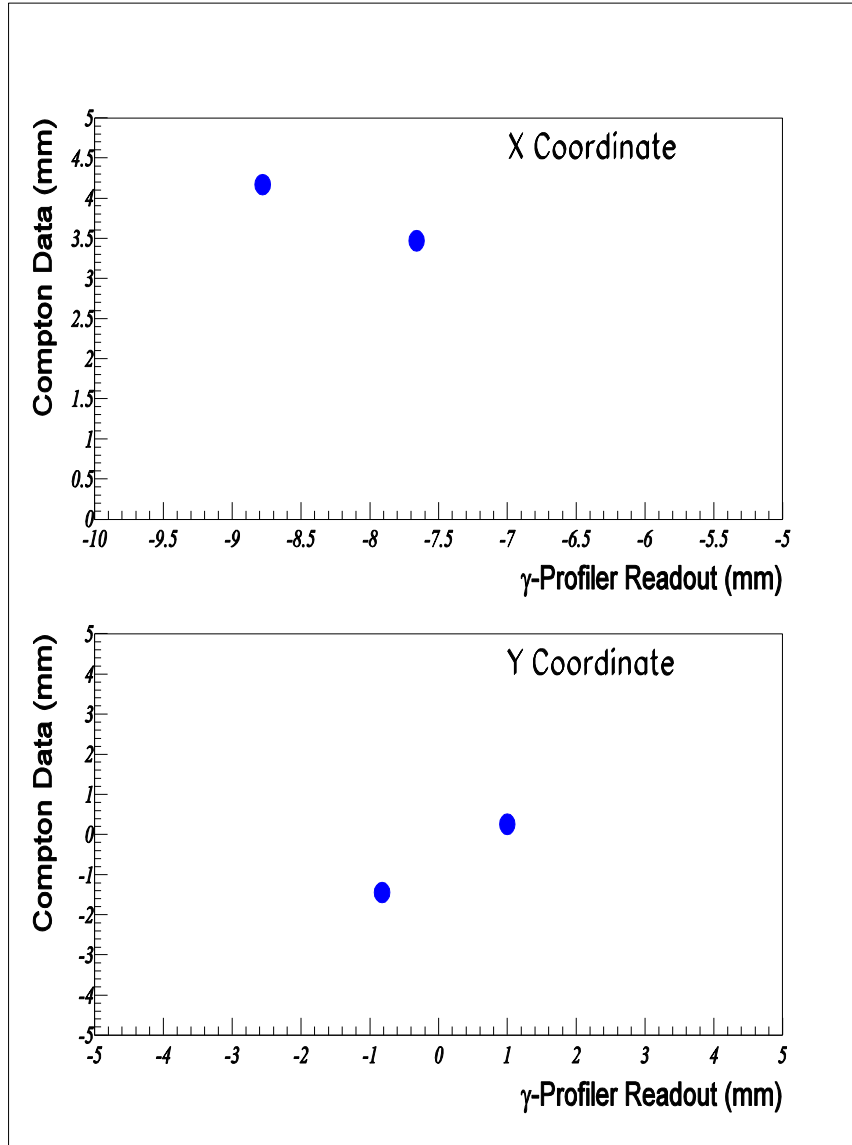 for a given run

Cuts Succession :

X- and Y- position for Run 4943:

χ²/ndf	167.8 / 94	
P1	1255. ±	13.23
P2	0.3477 ±	0.2873E-02
P3	0.3167 ±	0.3590E-02
P4	163.5 ±	7.008
P5	0.3181 ±	0.1364E-01
P6	1.097 ±	0.2242E-01

Run No. = 4943

Intersection Point - X Coordinate (cm)

χ²/ndf	233.7 / 94	
P1	1968. ±	15.88
P2	-0.1445 ±	0.1787E-02
P3	0.2461 ±	0.1691E-02
P4	98.25 ±	4.295
P5	-0.1012 ±	0.1634E-01
P6	1.055 ±	0.2375E-01

Run No. = 4943

Intersection Point - Y Coordinate (cm)

Comparison : Calculated /Database

Correlation : HyCal \ PGP

Correlation : PGP \ BPM
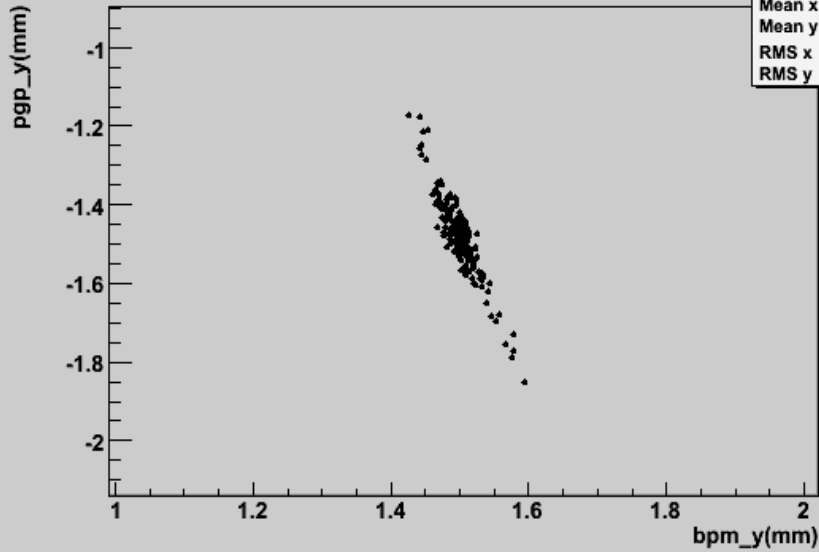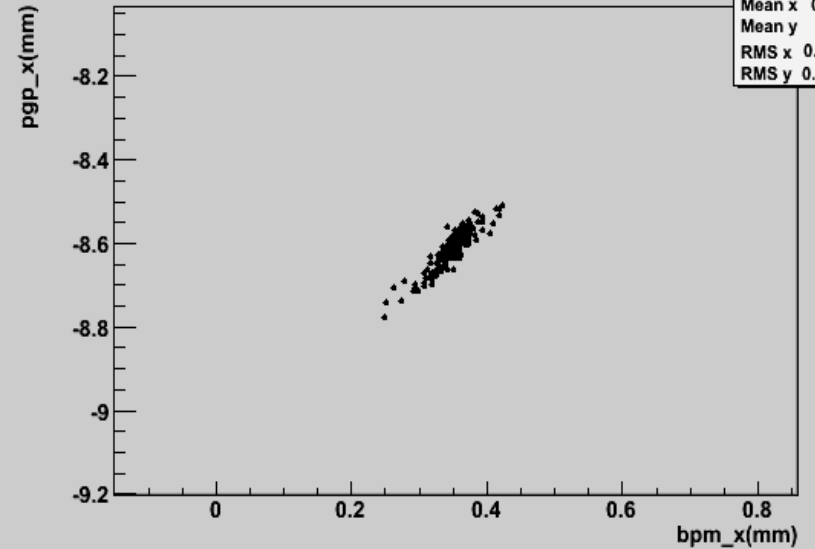
Projected beam at PGP :
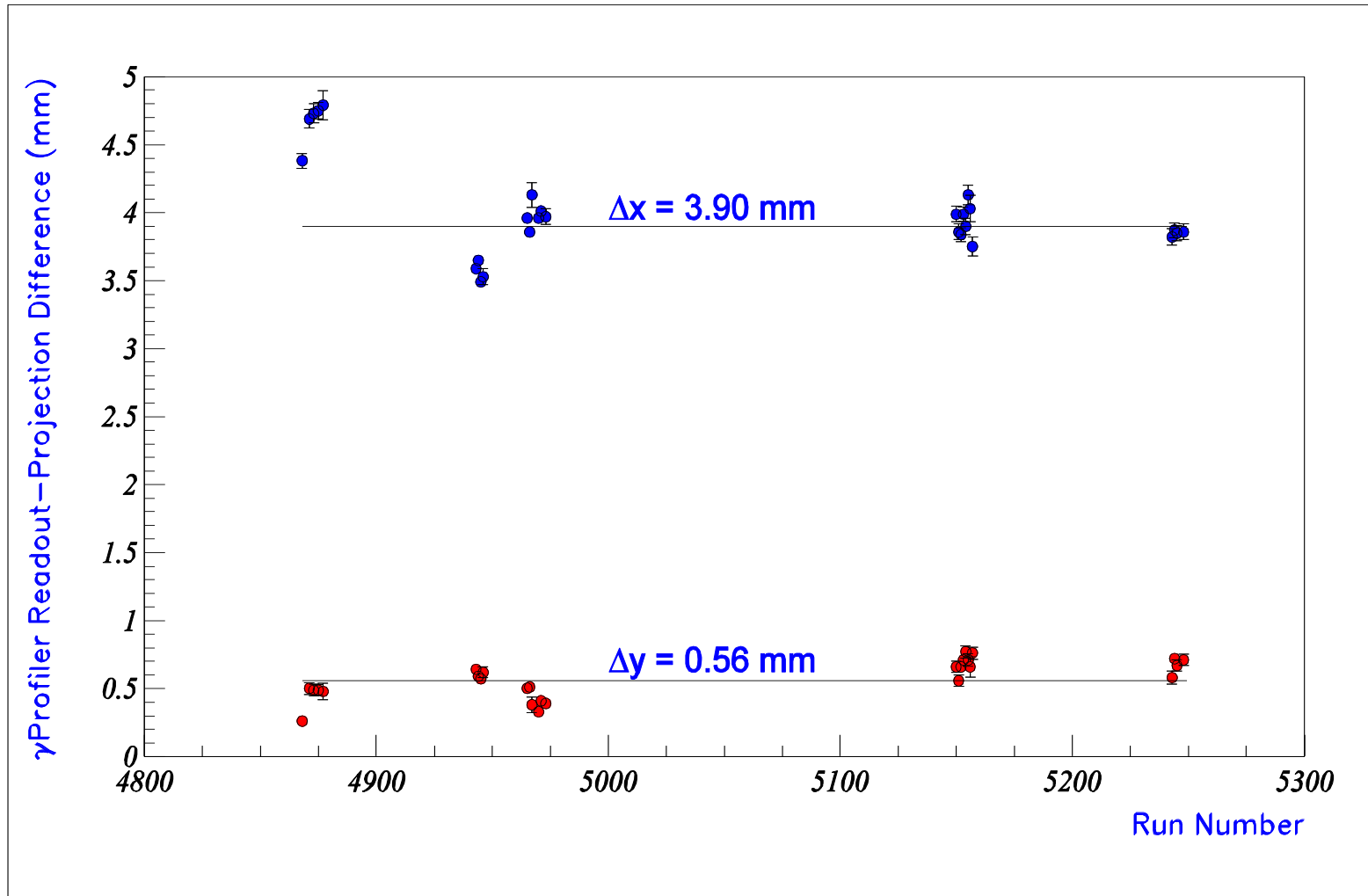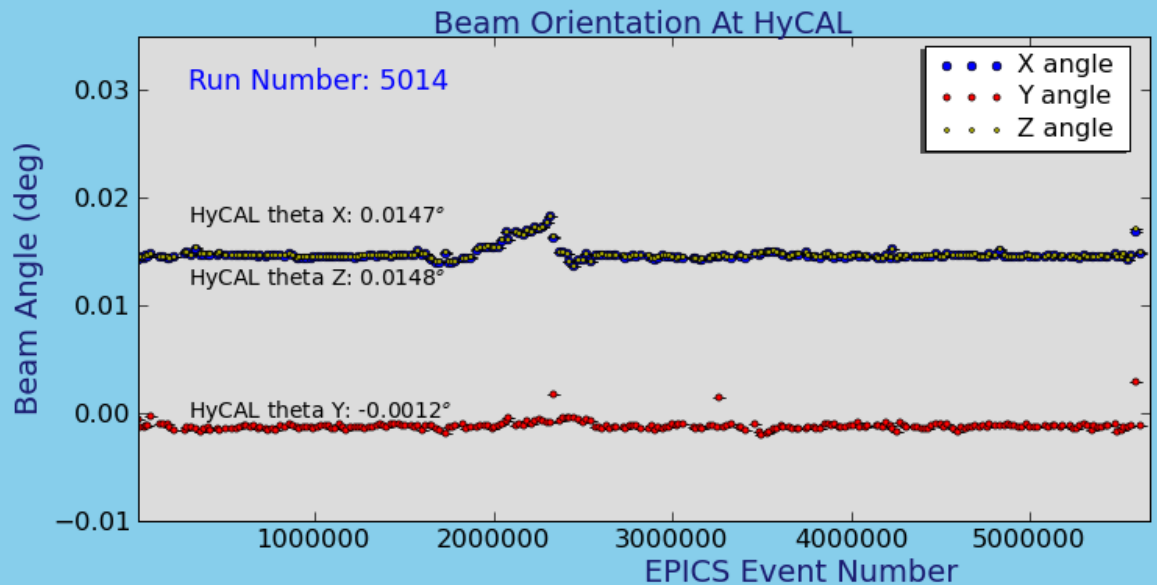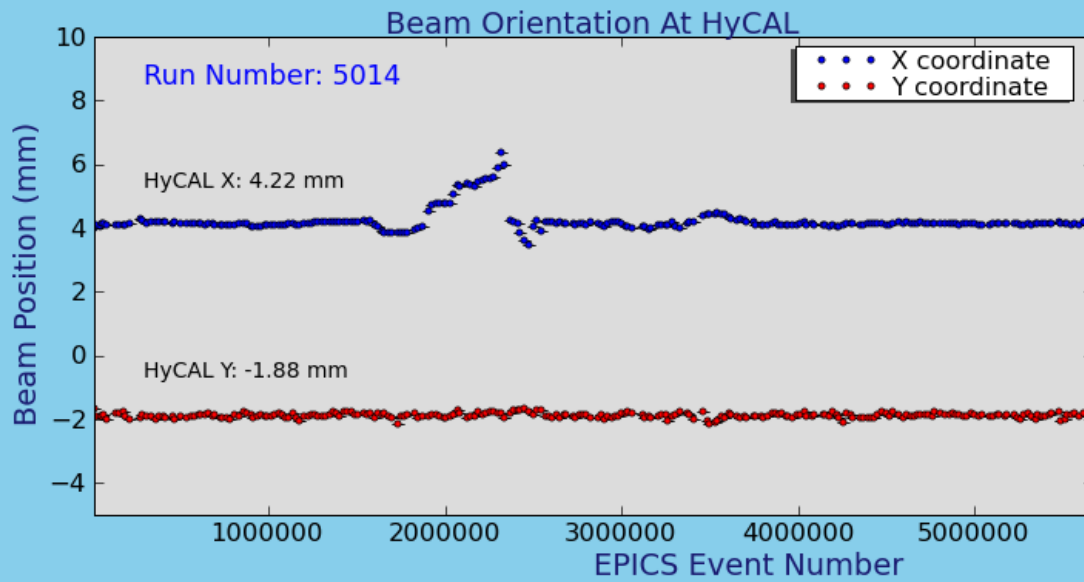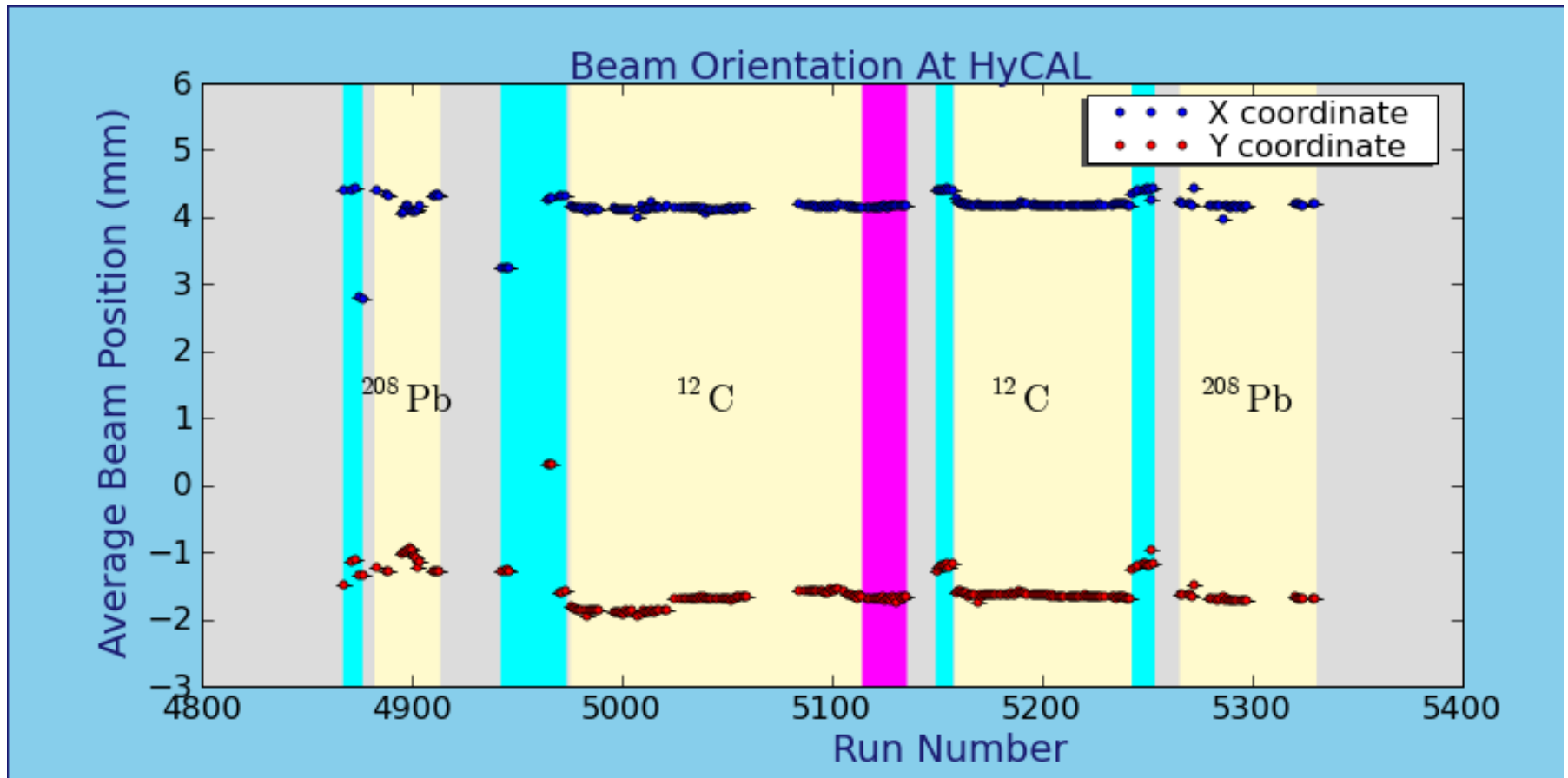
A Good Beam position run :
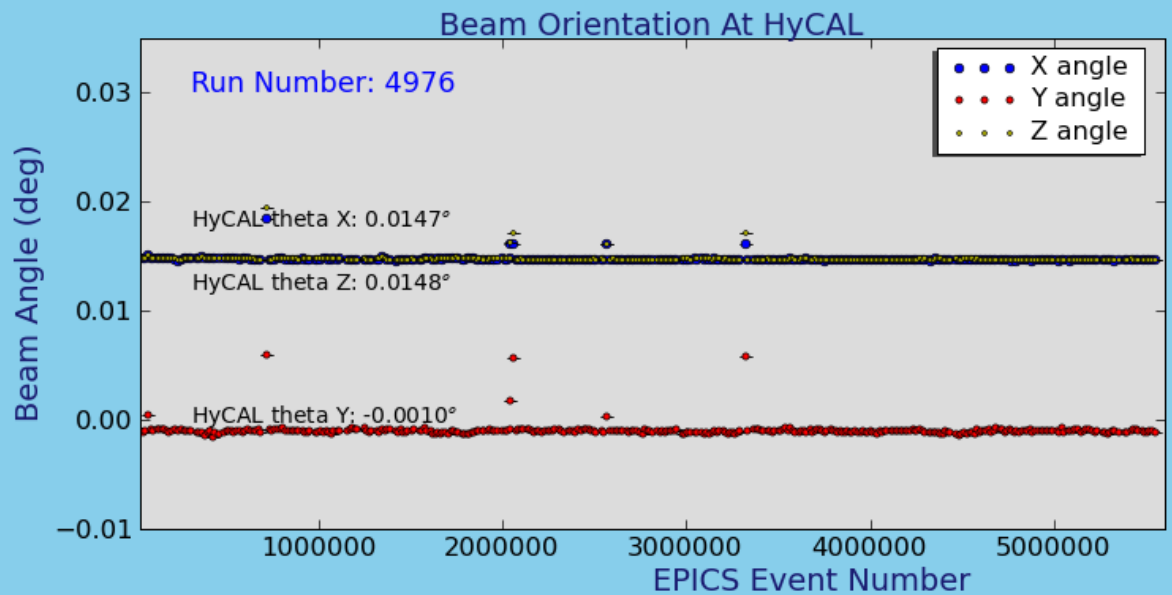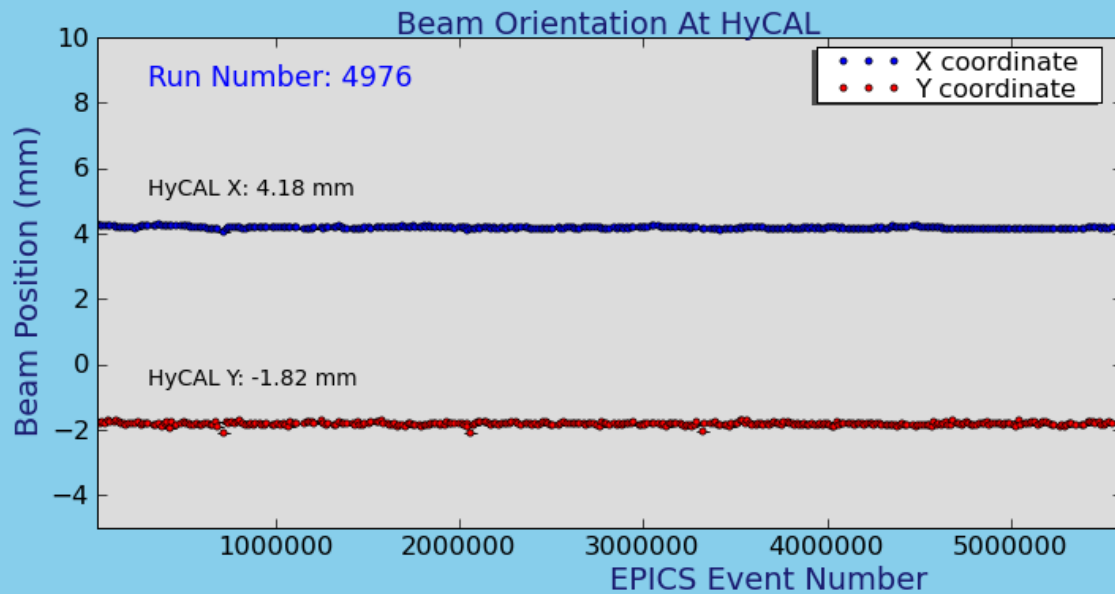
A beam fluctuating run :

Average Beam Position shown for various runs :

Summary :

- **Intersection method**
  - **confirms previous method results (database values)**
  - **error of measurement reduced by a factor of 4**
    compared to database values

- **Definition of PrimEx reference frame facilitates, for any run,**
  - **determining the beam position at HyCal**
  - **determining the beam entrance angles at HyCal**

- **Necessary changes to the analysis code are being introduced to see improvements, if any ...**