Status of β* Measurement at D0

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Luminosity Task Force Meeting

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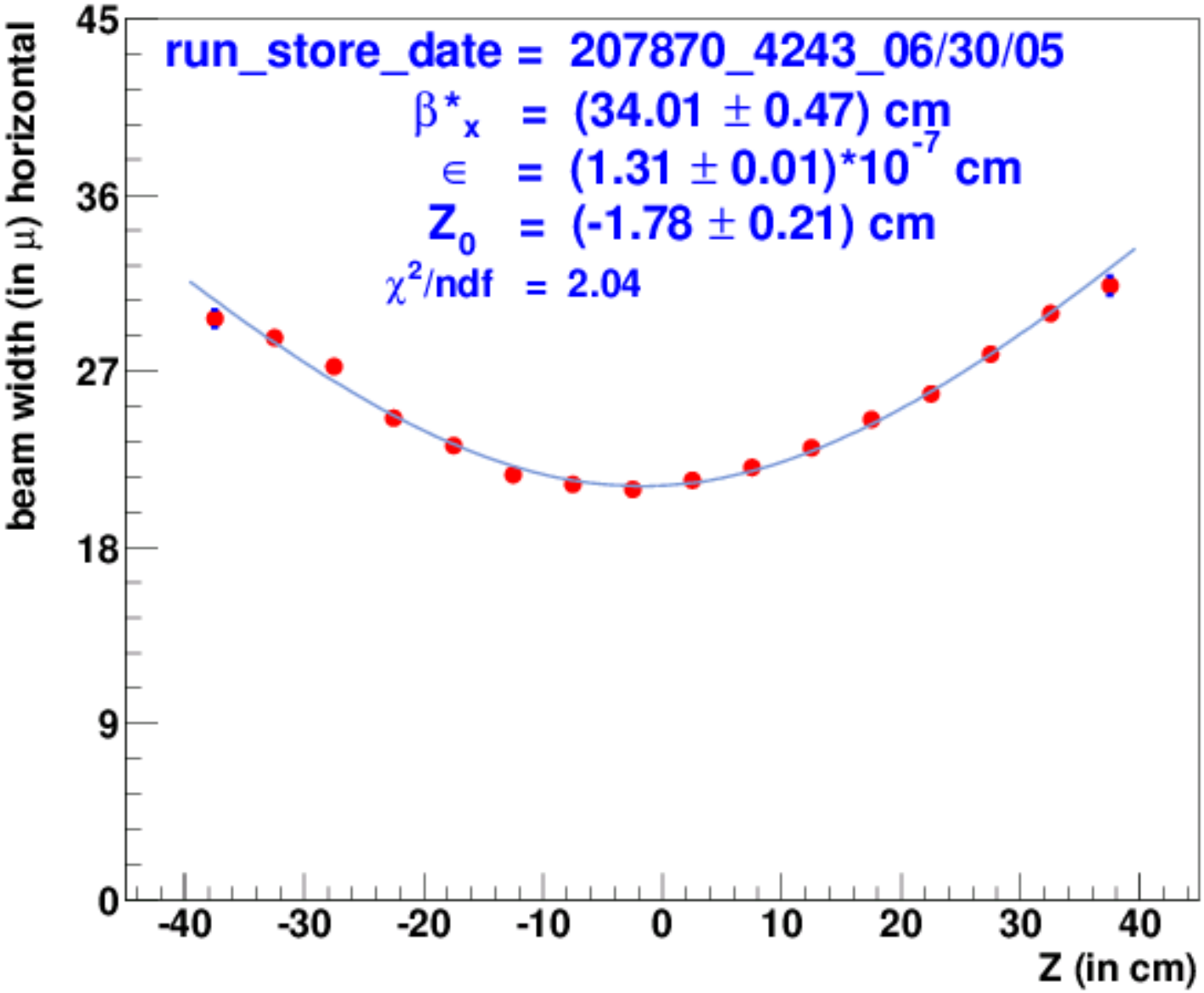
Status

- Post-shutdown results are at:

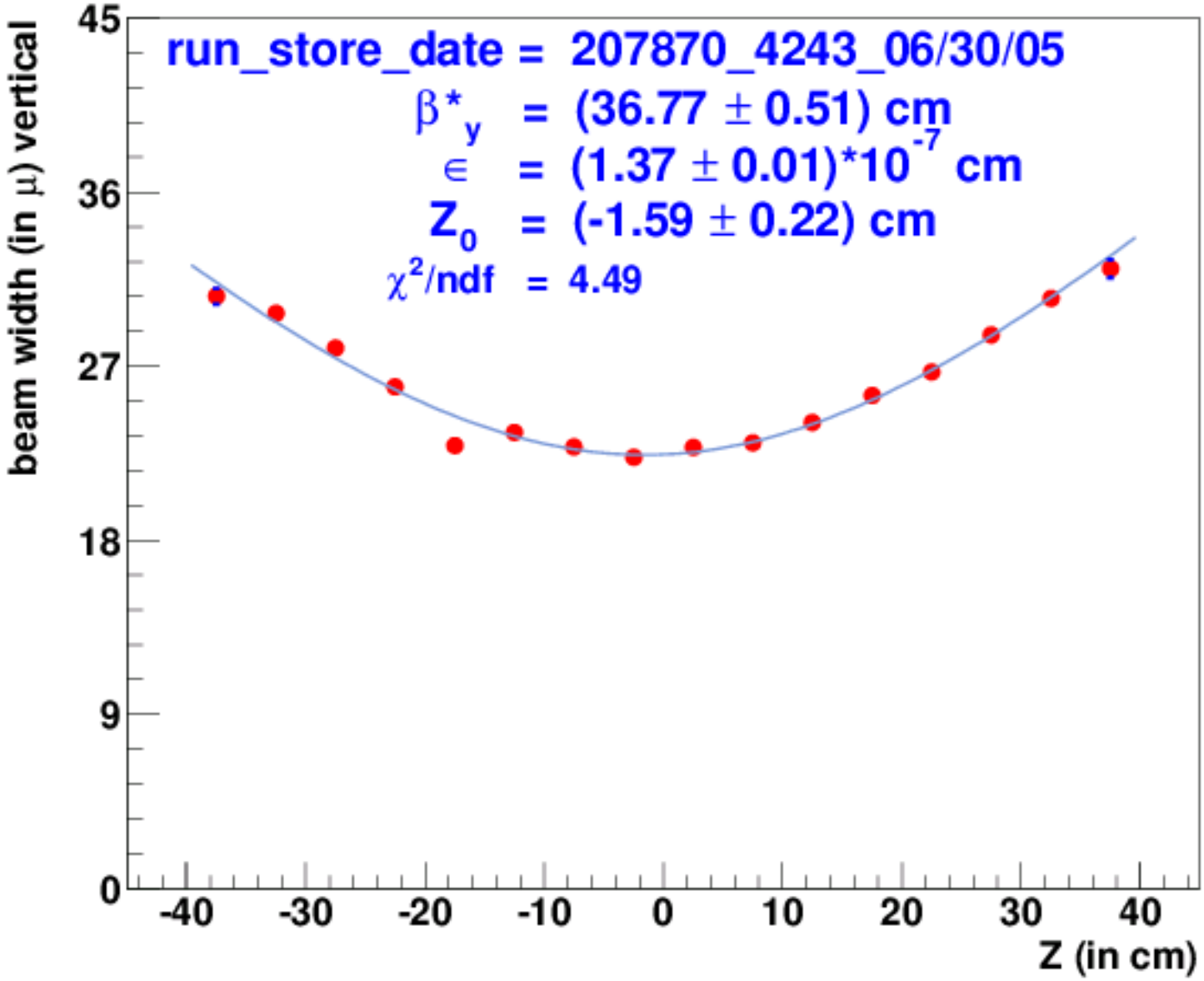
  http://www-clued0.fnal.gov/~avdhesh/Beam_main.html

- For Post-shutdown data:
  - Results are available till store number 4255.
  - Series of β^* measurement with time for many stores
  - No unexpected behavior

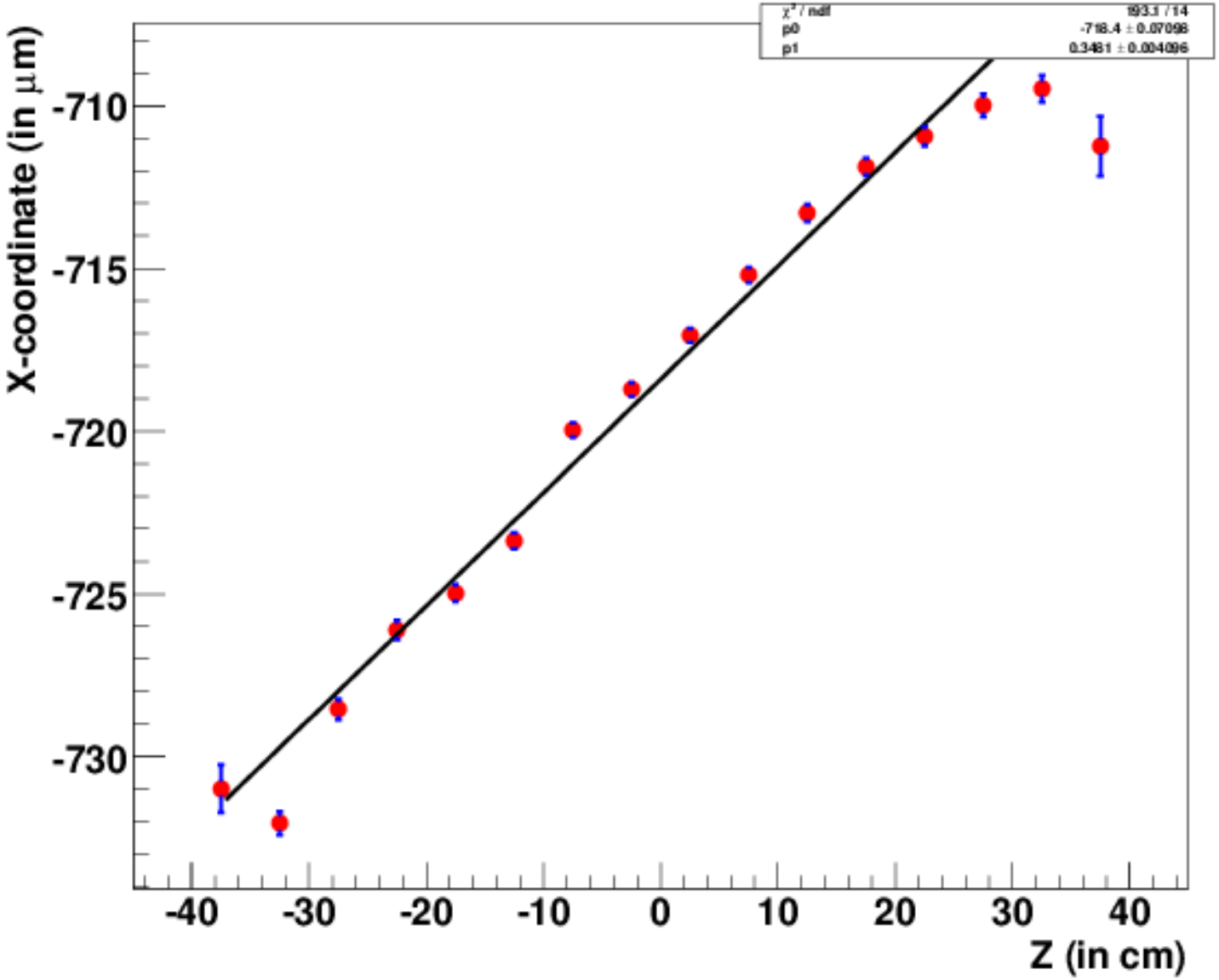
Snap Shot


run_store_date = 207870_4243_06/30/05
β*x = (34.01 ± 0.47) cm
∈ = (1.31 ± 0.01)*10^-7 cm
Z0 = (-1.78 ± 0.21) cm
χ²/ndf = 2.04
beam width (in μ) horizontal
Z (in cm)
45
36
27
18
9
0
-40
-30
-20
-10
0
10
20
30
40

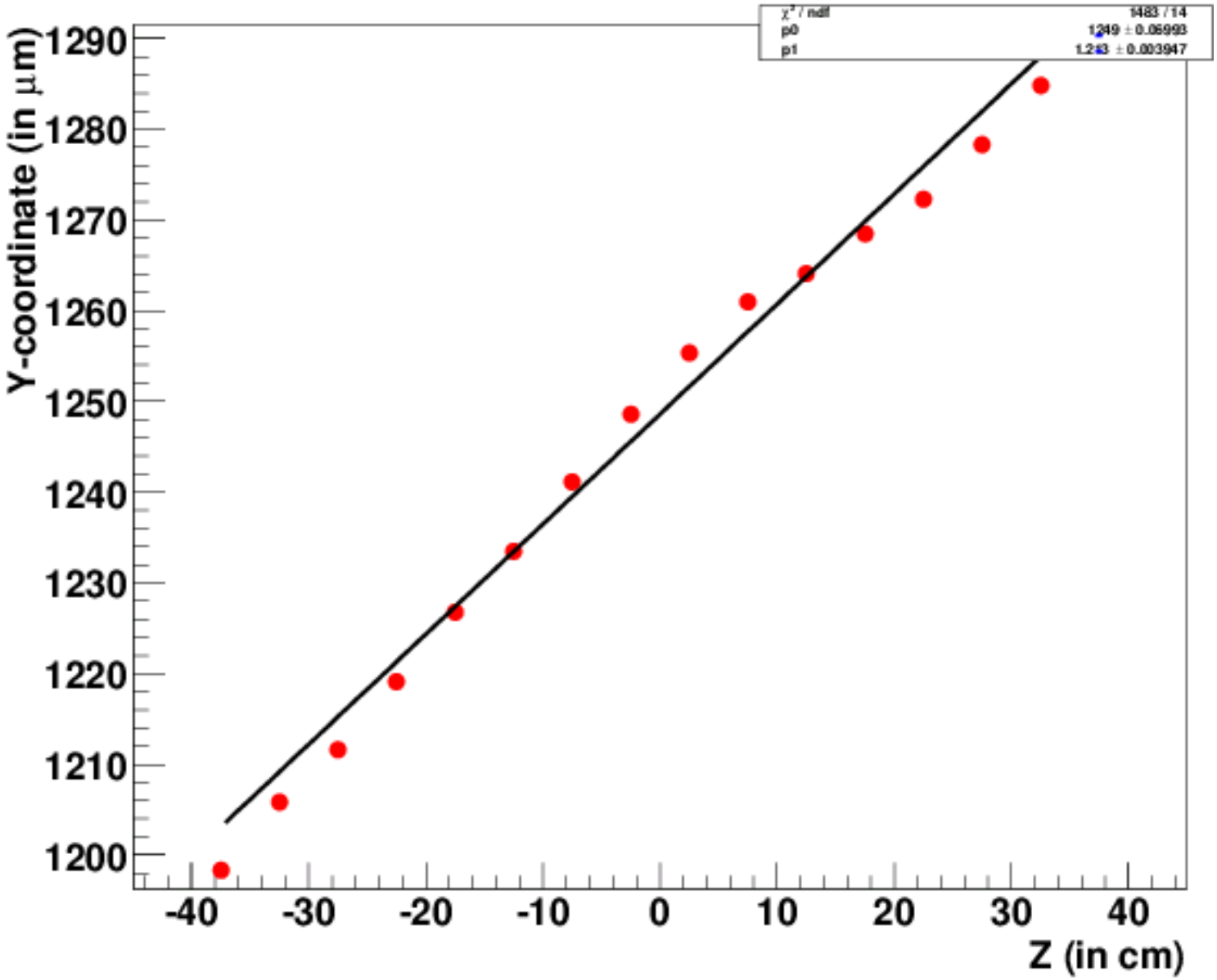
Snap Shot

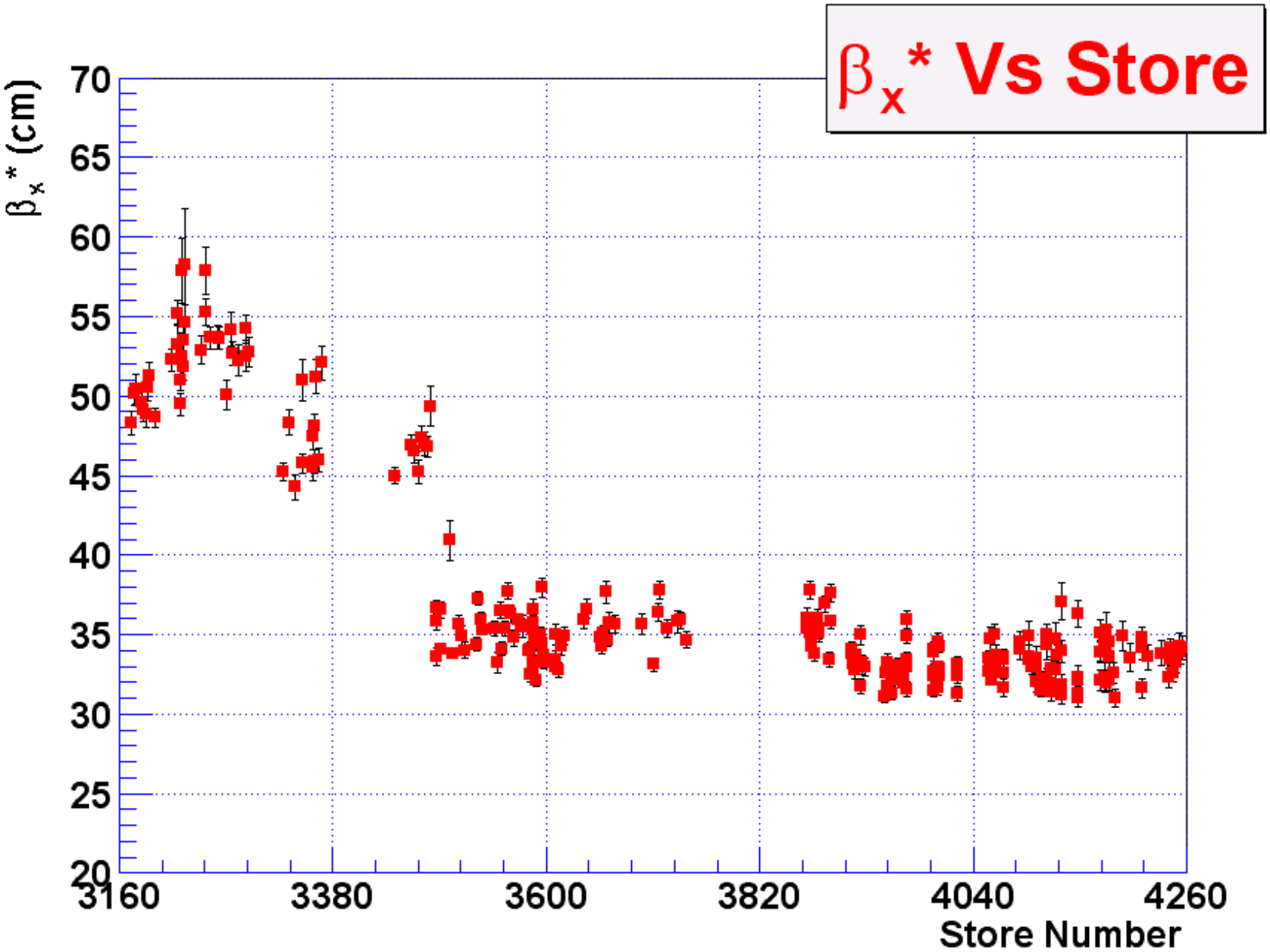

run_store_date = 207870_4243_06/30/05
β*y = (36.77 ± 0.51) cm
∈ = (1.37 ± 0.01)*10^-7 cm
Z0 = (-1.59 ± 0.22) cm
χ²/ndf = 4.49
beam width (in μ) vertical
Z (in cm)
45
36
27
18
9
0
-40
-30
-20
-10
0
10
20
30
40

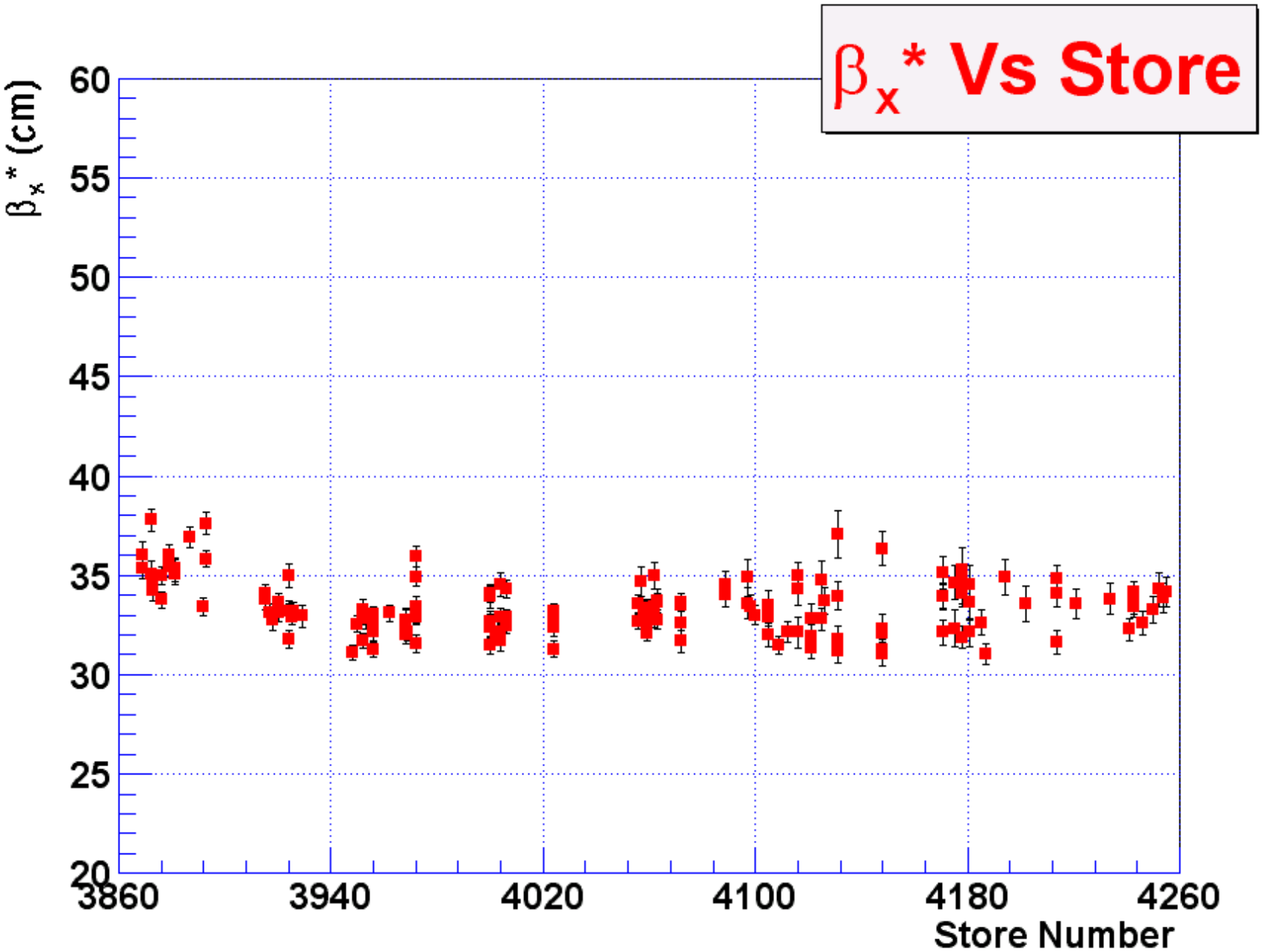
Snap Shot

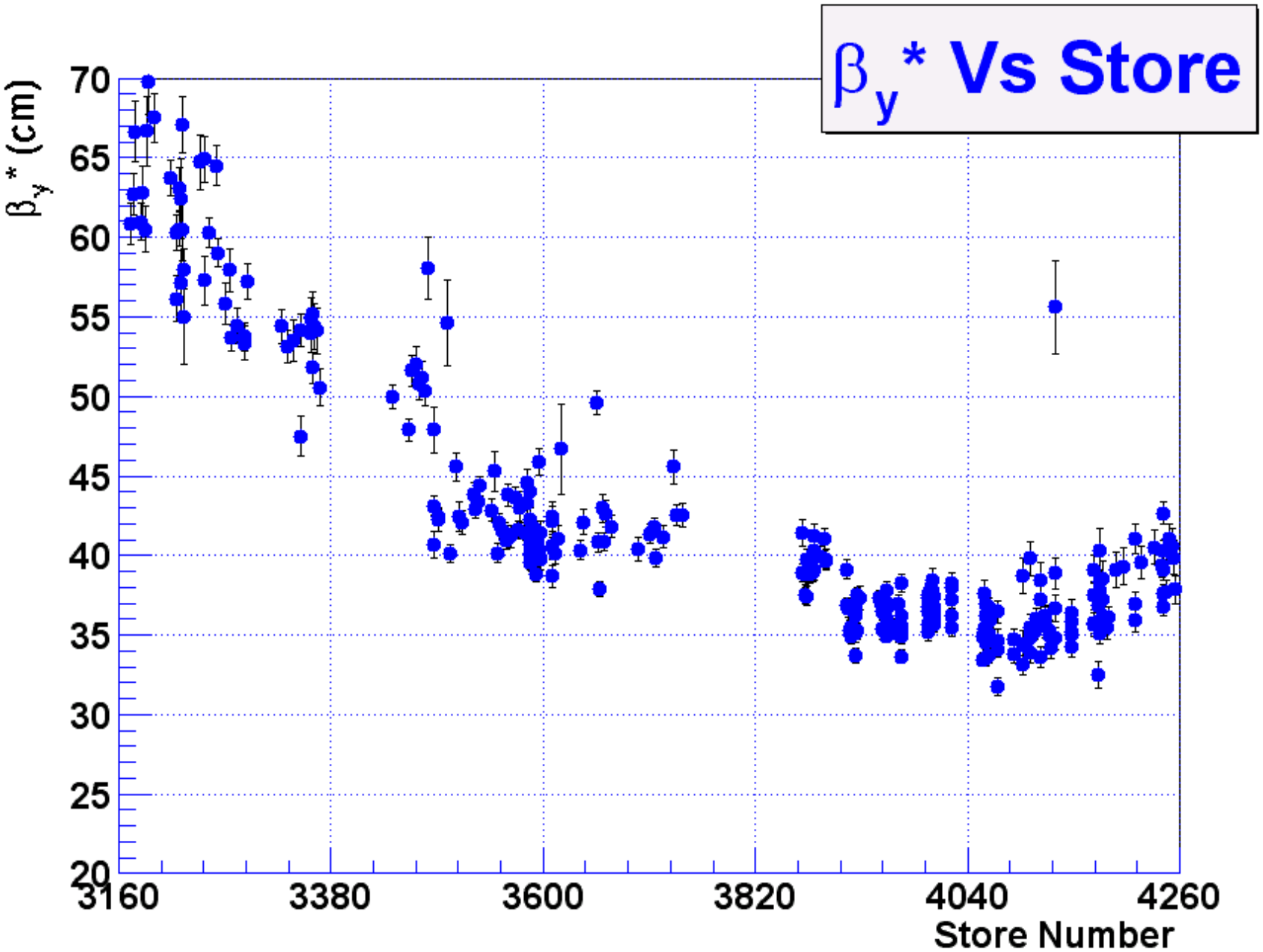

χ² / ndf
193.1 / 14
p0
-718.4 ± 0.07098
p1
0.3481 ± 0.004096
X-coordinate (in μm)
-710
-715
-720
-725
-730
-40
-30
-20
-10
0
10
20
30
40
Z (in cm)

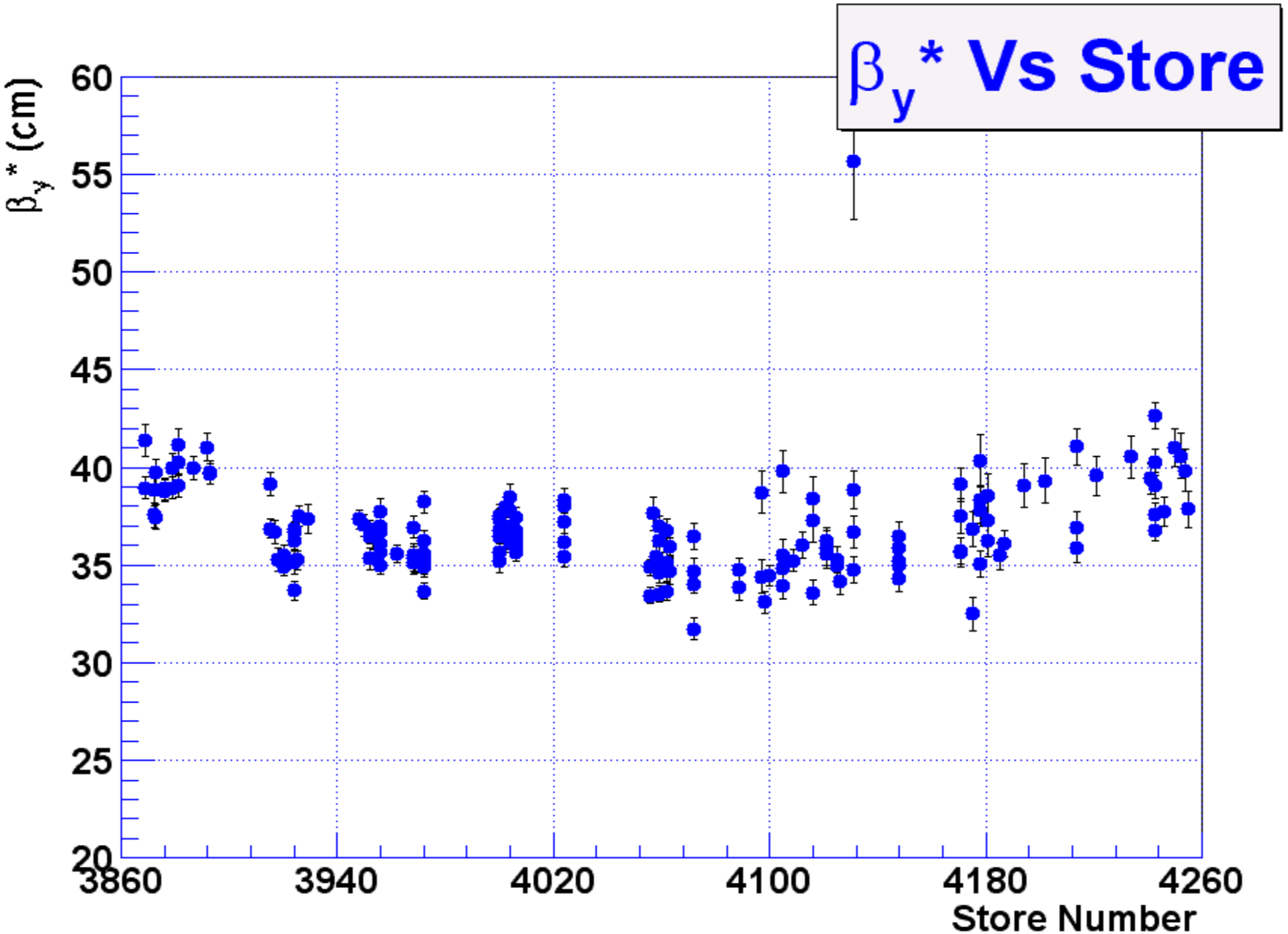
Snap Shot


χ² / ndf
1483 / 14
p0
1249 ± 0.06993
p1
1.243 ± 0.003947
Y-coordinate (in μm)
1290
1280
1270
1260
1250
1240
1230
1220
1210
1200
-40
-30
-20
-10
0
10
20
30
40
Z (in cm)

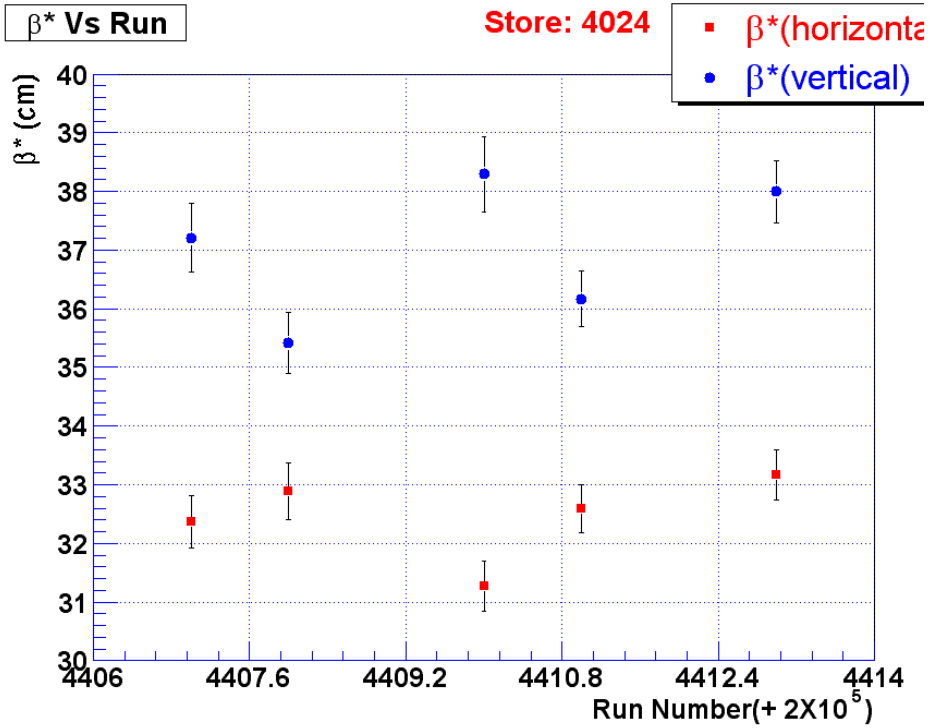

β_x* Vs Store
β_x* (cm)
70
65
60
55
50
45
40
35
30
25
20
3160
3380
3600
3820
4040
4260
Store Number

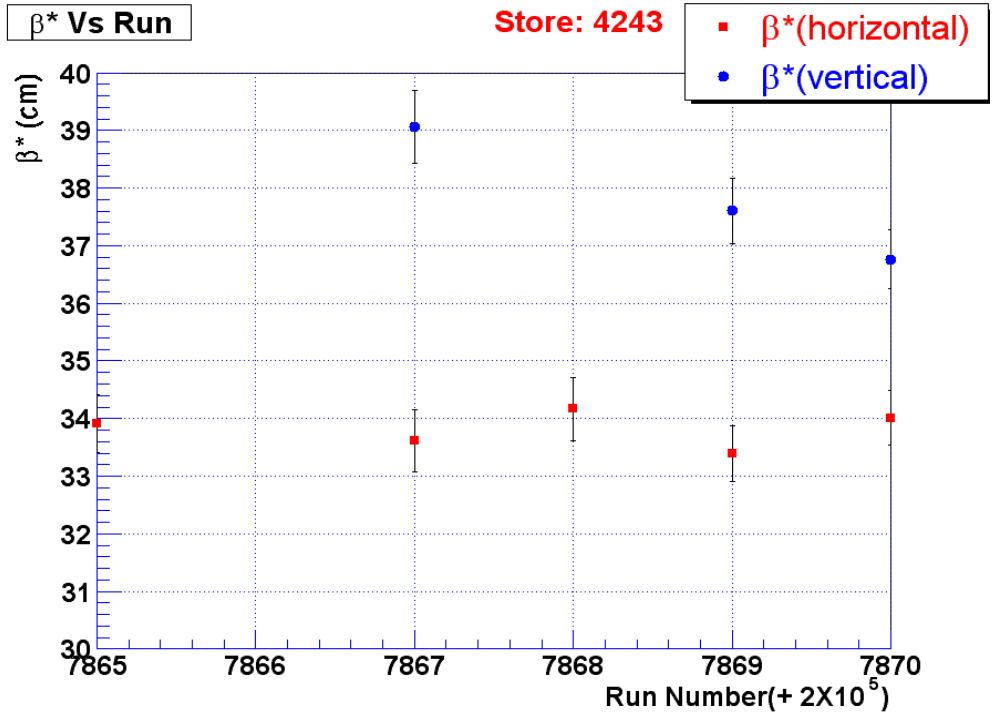

β_x* Vs Store
β_x* (cm)
60
55
50
45
40
35
30
25
20
3860
3940
4020
4100
4180
4260
Store Number

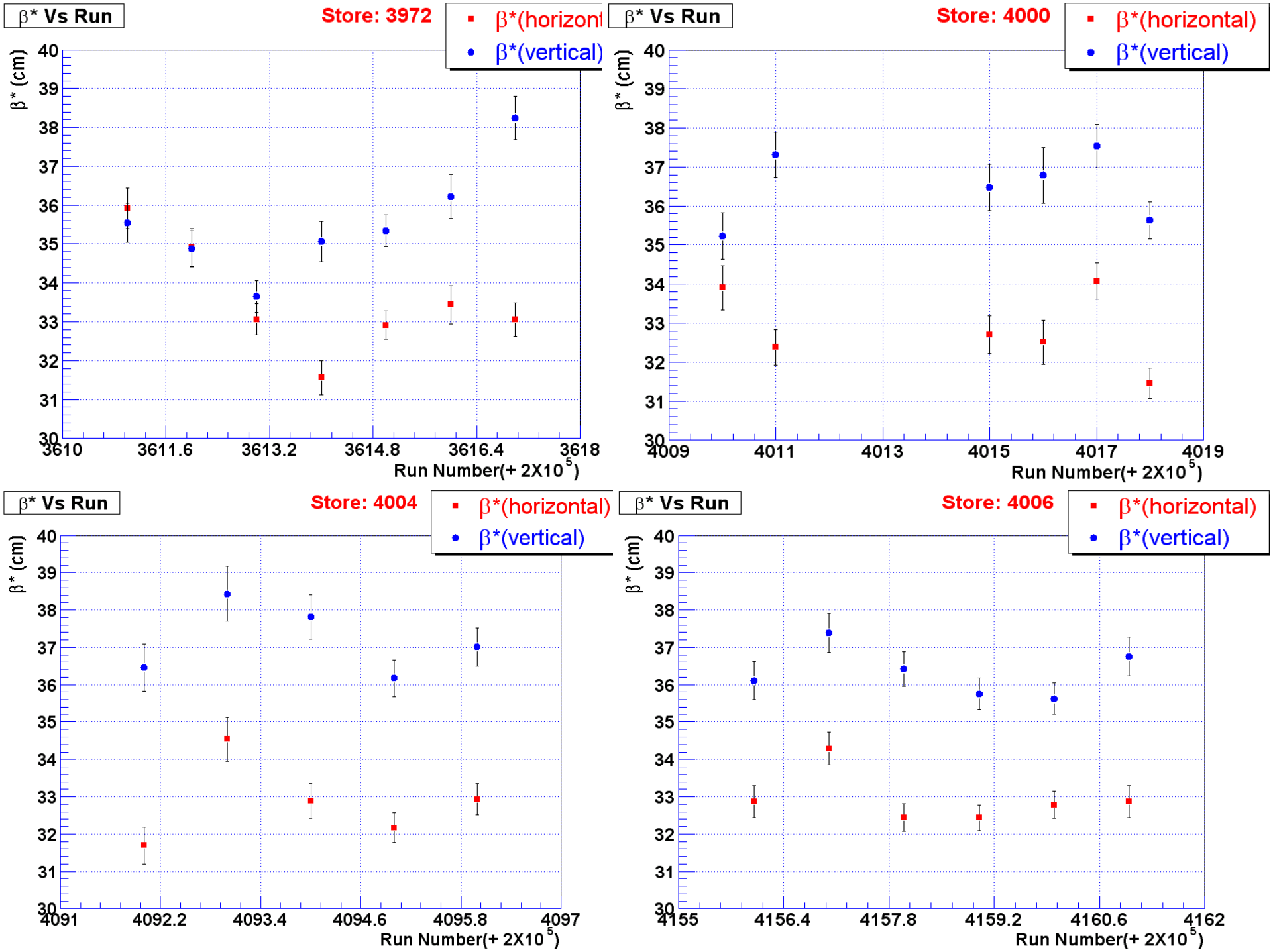

β_y* Vs Store
β_y* (cm)
70
65
60
55
50
45
40
35
30
25
20
3160
3380
3600
3820
4040
4260
Store Number

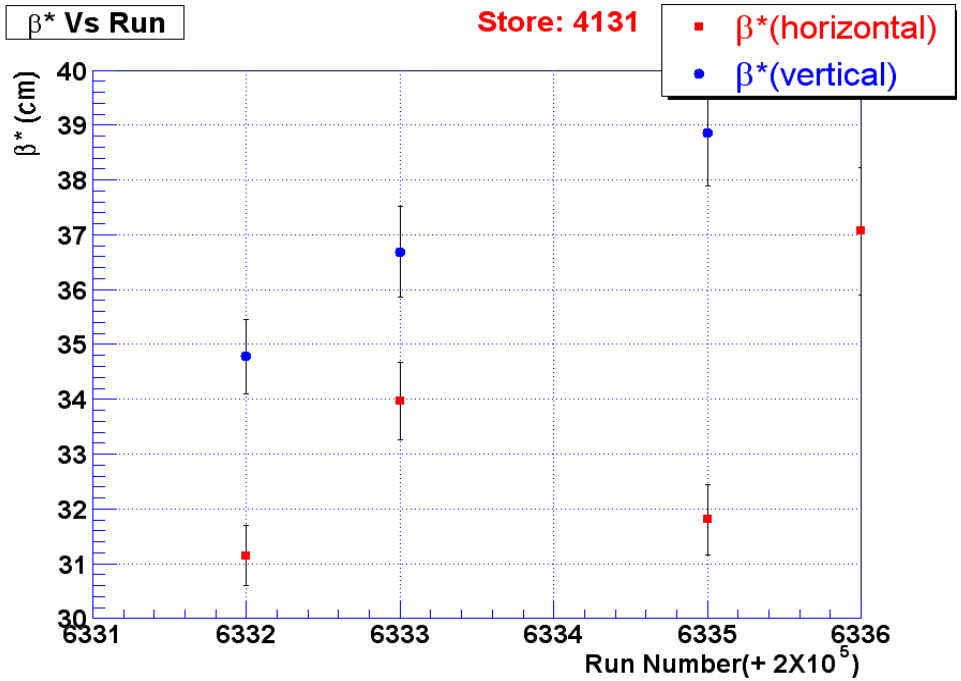

β_y* Vs Store
β_y* (cm)
60
55
50
45
40
35
30
25
20
3860
3940
4020
4100
4180
4260
Store Number

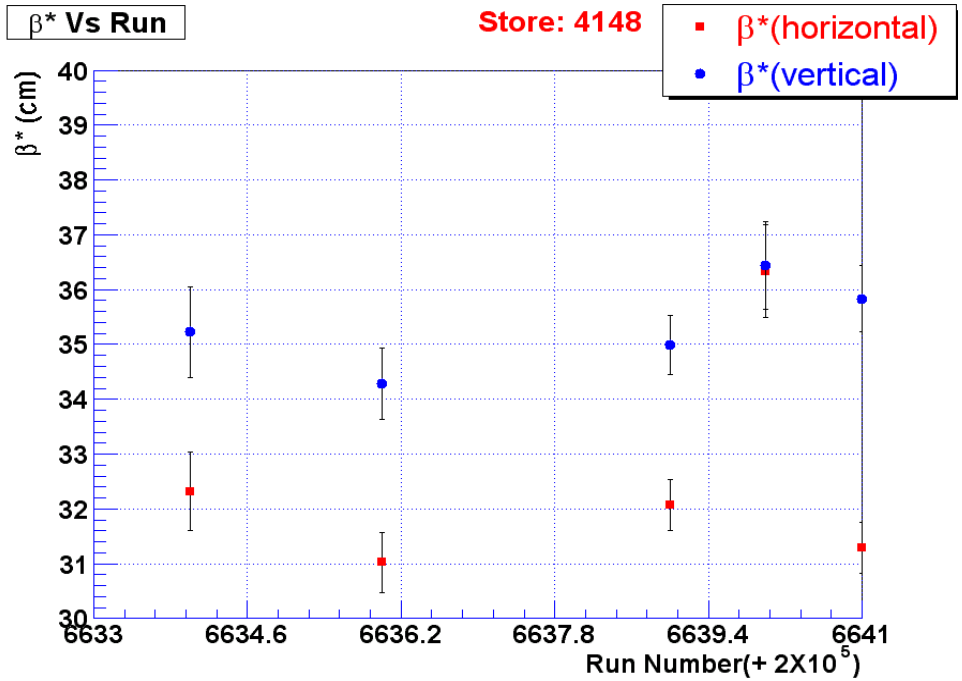
β* Measurement as time progress during a store

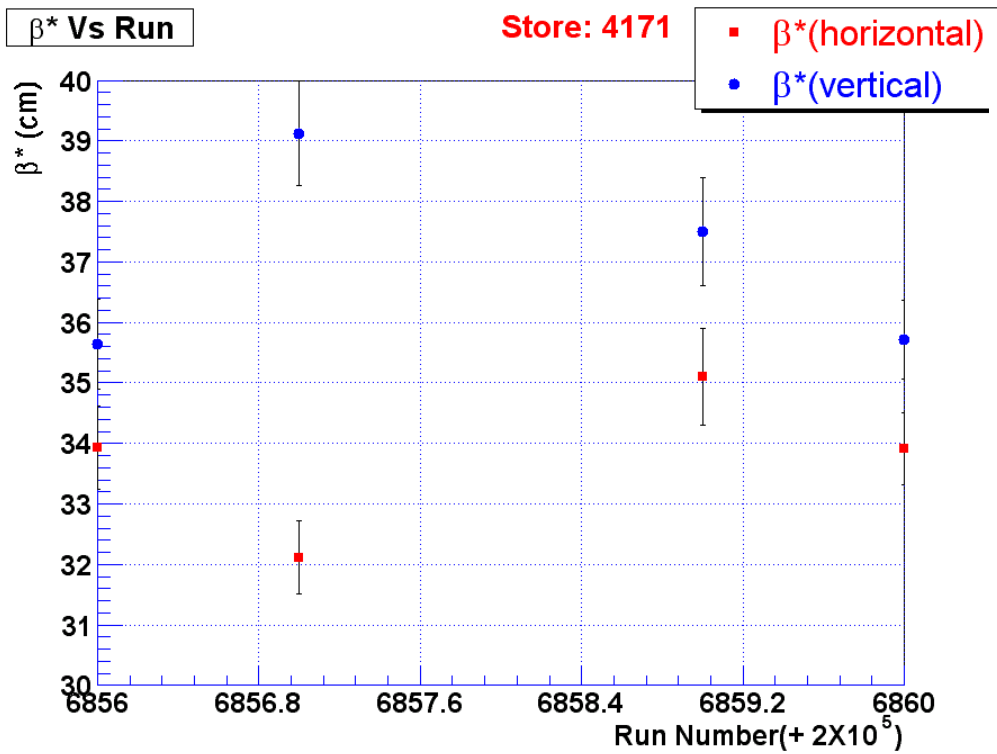


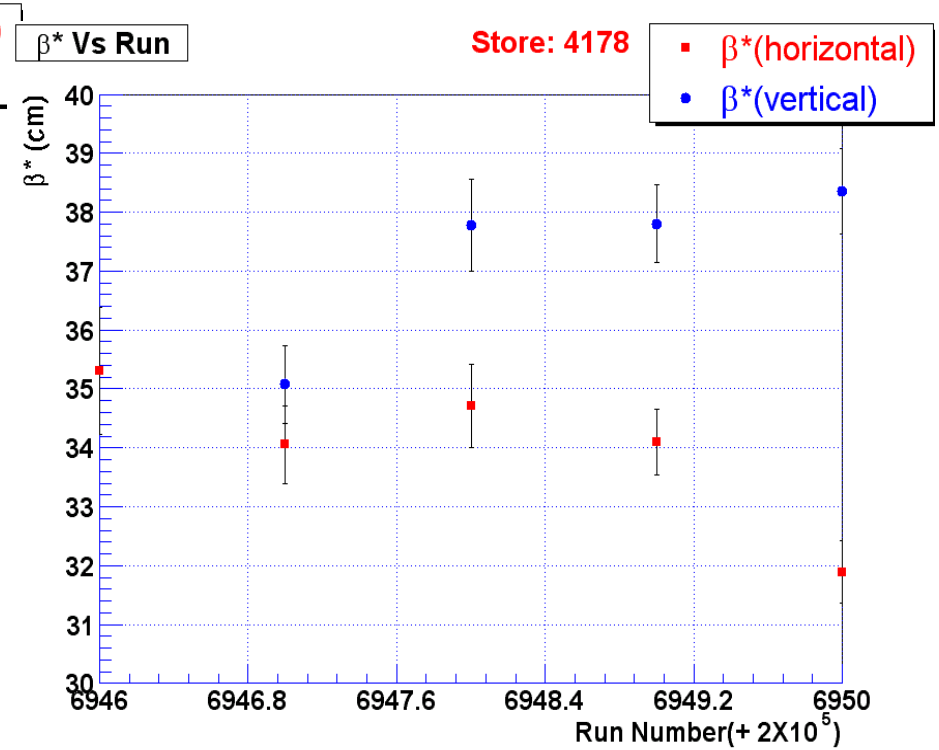



β* Vs Run
Store: 3972
β*(horizont
β*(vertical)
β* (cm)
Run Number(+ 2X10^5)
β* Vs Run
Store: 4000
β*(horizontal)
β*(vertical)
β* (cm)
Run Number(+ 2X10^5)
β* Vs Run
Store: 4004
β*(horizontal)
β*(vertical)
β* (cm)
Run Number(+ 2X10^5)
β* Vs Run
Store: 4006
β*(horizontal)
β*(vertical)
β* (cm)
Run Number(+ 2X10^5)

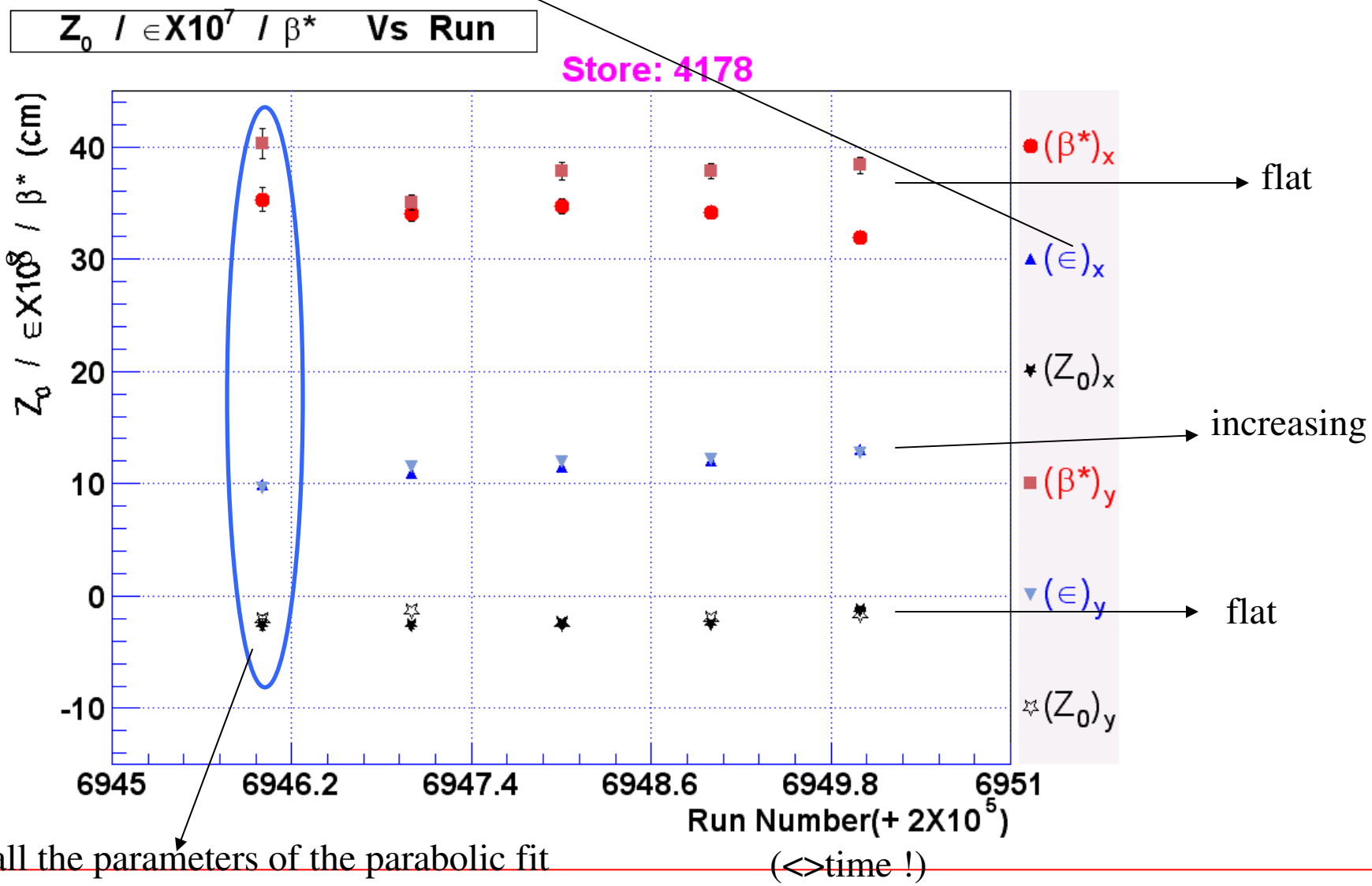

β* Vs Run
Store: 4131
β*(horizontal)
β*(vertical)
β* (cm)
Run Number(+ 2X10^5)


β* Vs Run
Store: 4148
β*(horizontal)
β*(vertical)
β* (cm)
Run Number(+ 2X10^5)


β* Vs Run
Store: 4171
β*(horizontal)
β*(vertical)
β* (cm)
Run Number(+ 2X10^5)

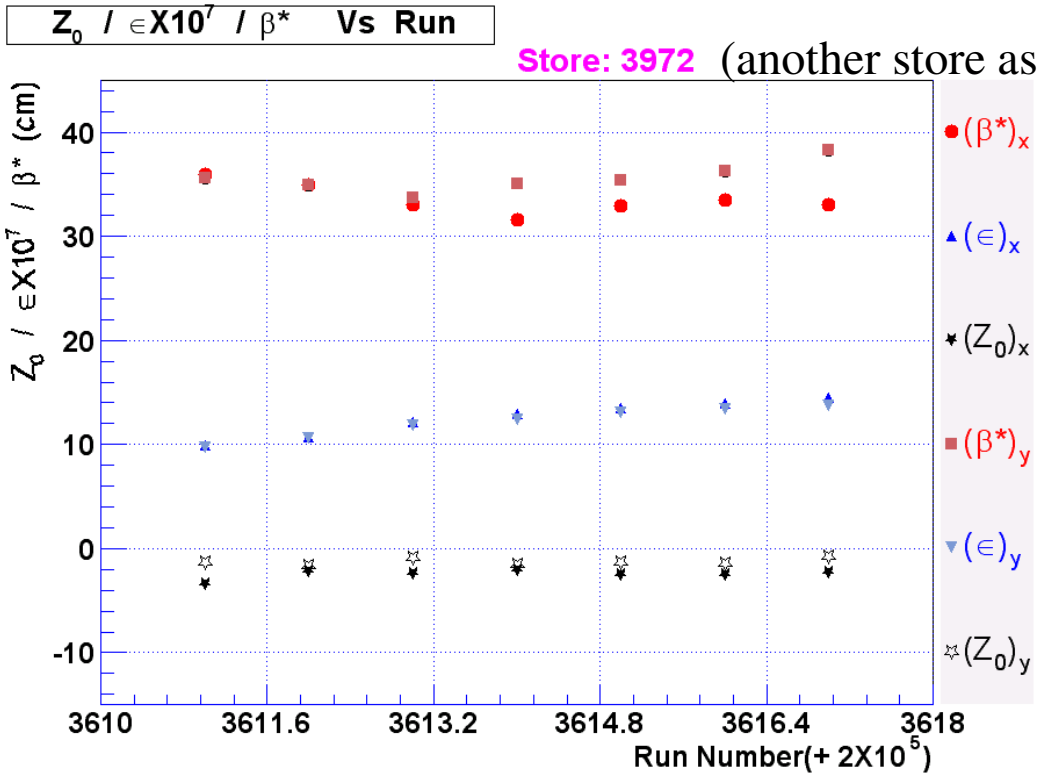

β* Vs Run
Store: 4178
β*(horizontal)
β*(vertical)
β* (cm)
Run Number(+ 2X10^5)

Emittance: $\in = \frac{\varepsilon_n}{6\pi(\beta\gamma)} \Rightarrow \varepsilon_n = \in \cdot 18.5\times10^7$ mmPimrad/cm



all the parameters of the parabolic fit

(<>time !)

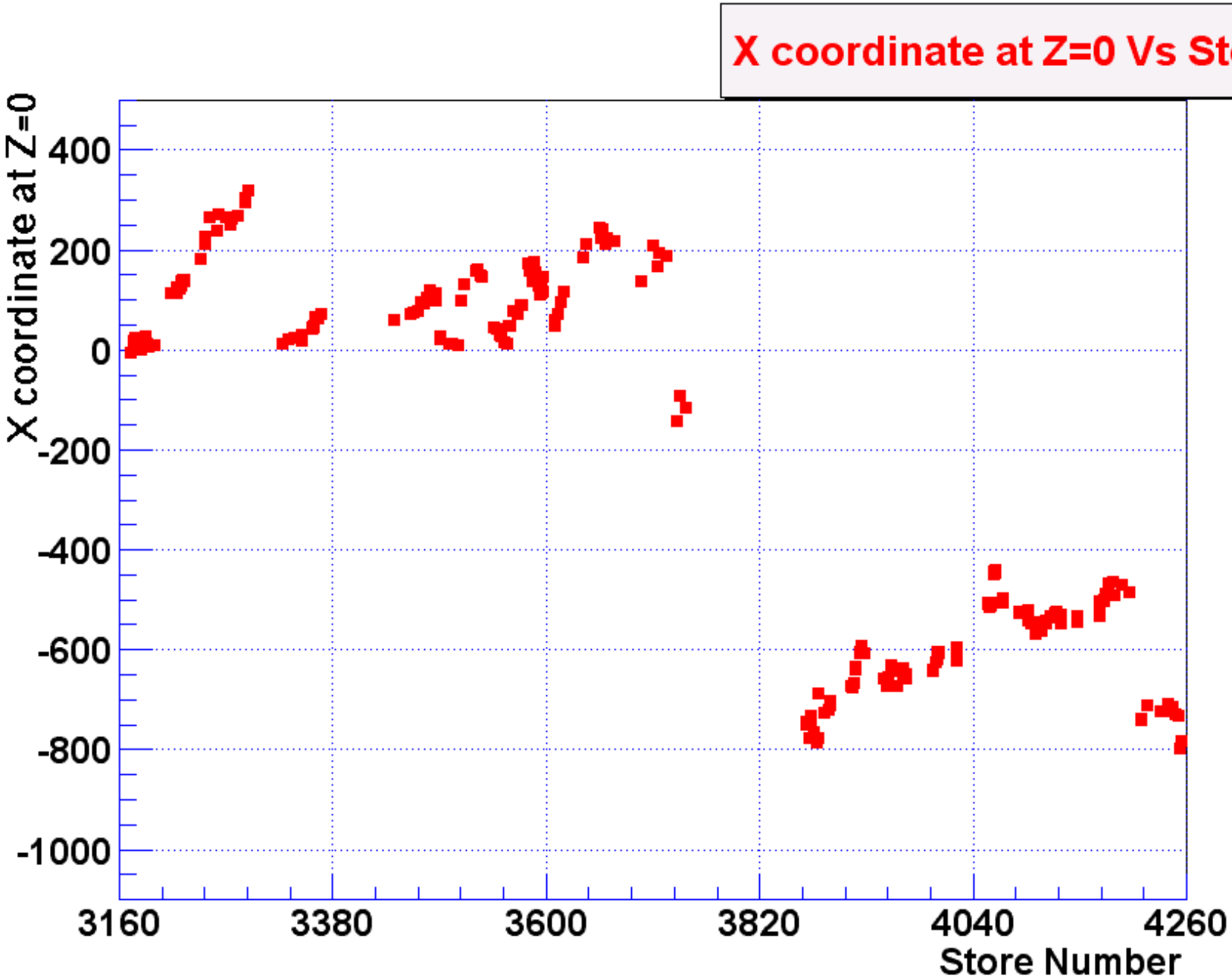


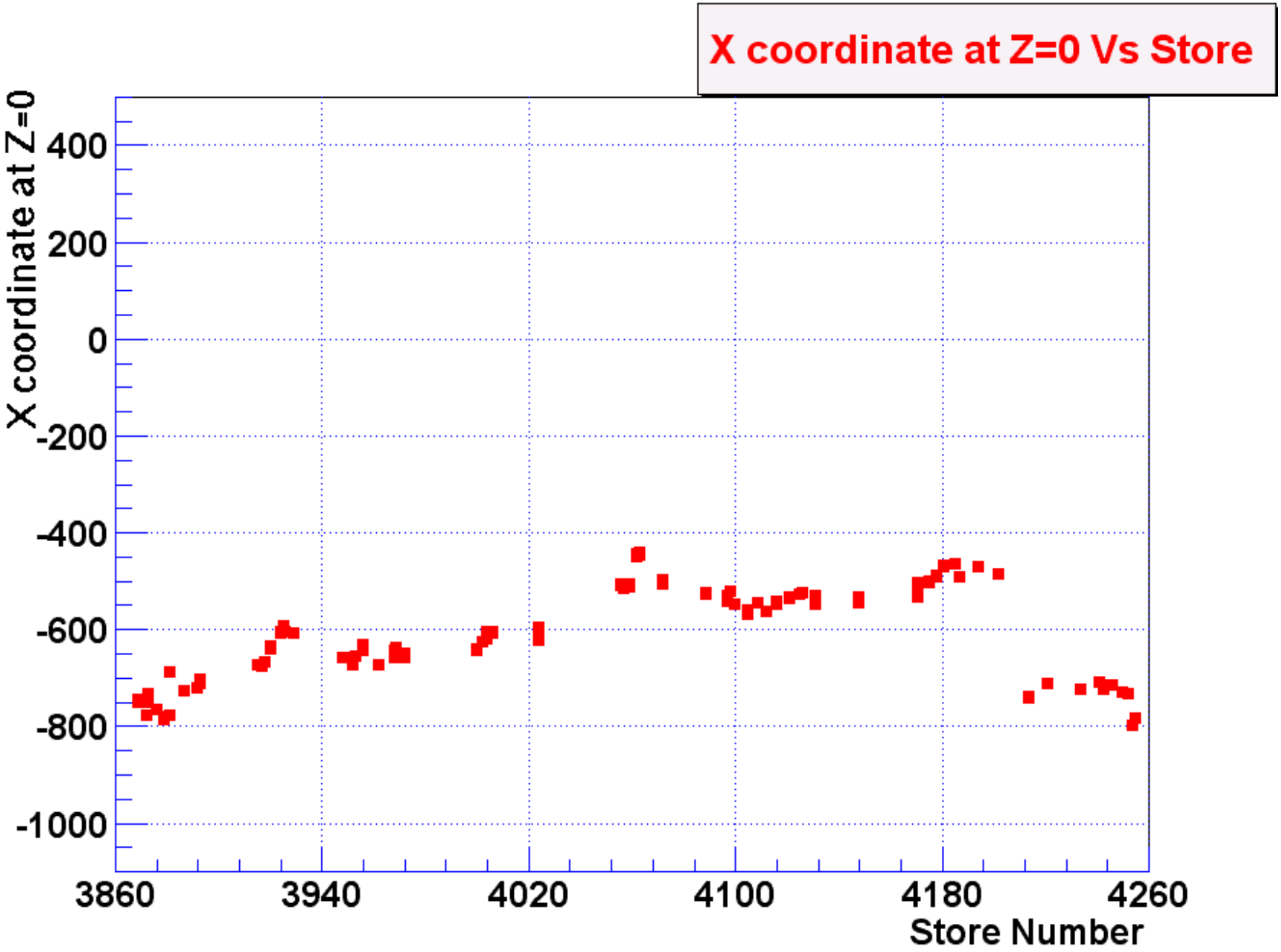
(another store as previous page)

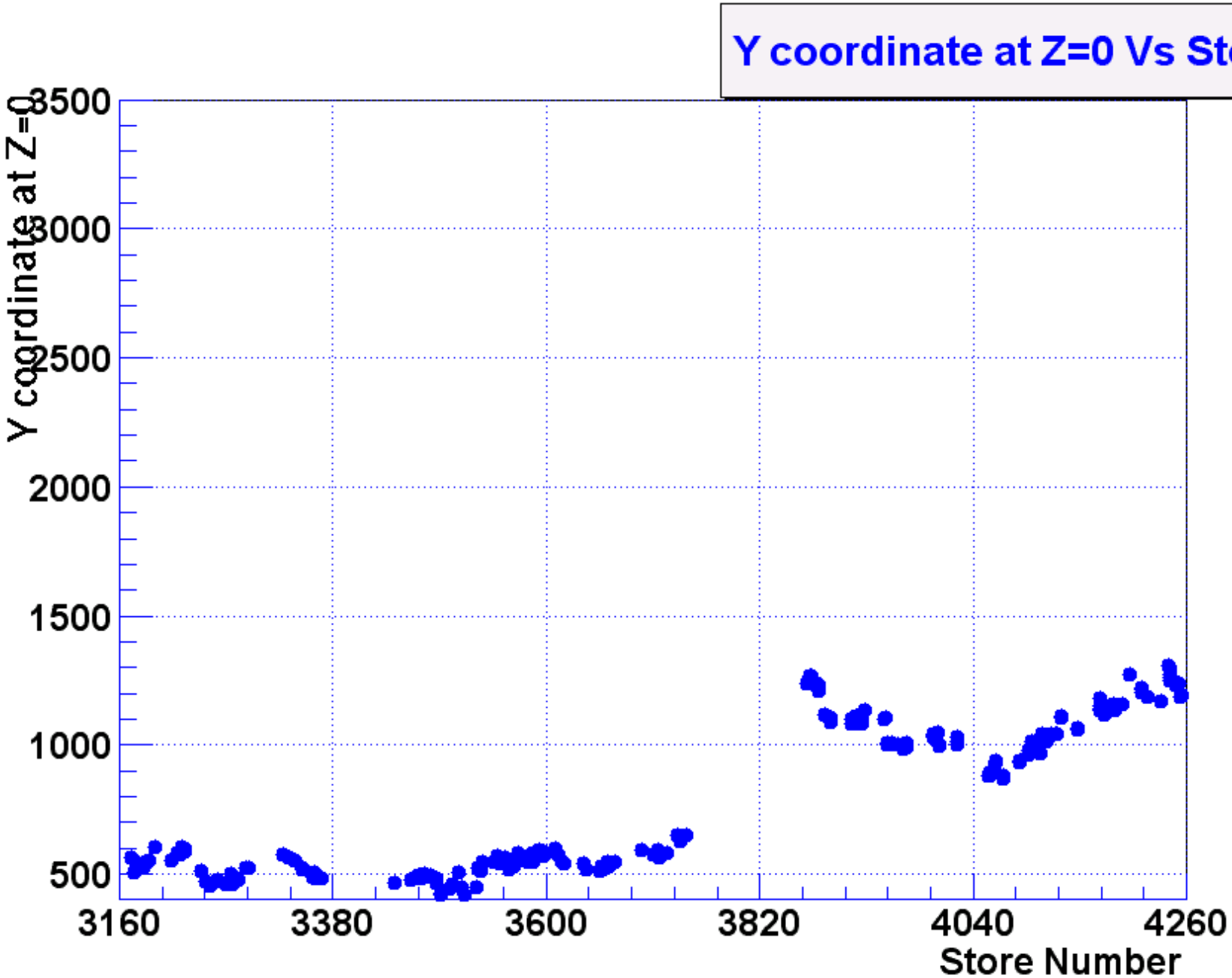
Looks OK

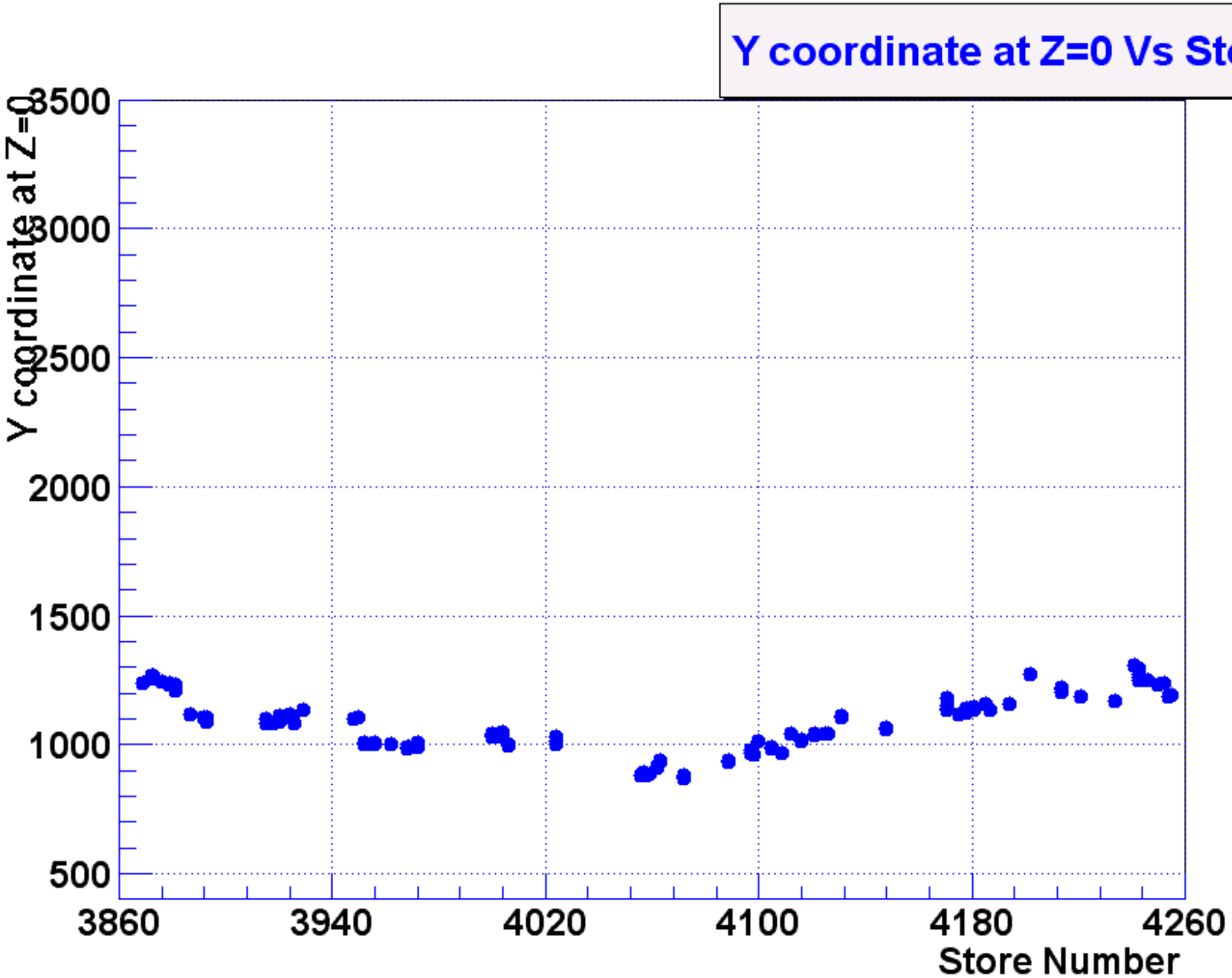
Next steps:

- compare these emittances to SDA emittances
- calculate luminosity from these numbers and compare to measured luminosity


X coordinate at Z=0 Vs Store
X coordinate at Z=0
400
200
0
-200
-400
-600
-800
-1000
3160
3380
3600
3820
4040
4260
Store Number


X coordinate at Z=0 Vs Store
X coordinate at Z=0
400
200
0
-200
-400
-600
-800
-1000
3860
3940
4020
4100
4180
4260
Store Number

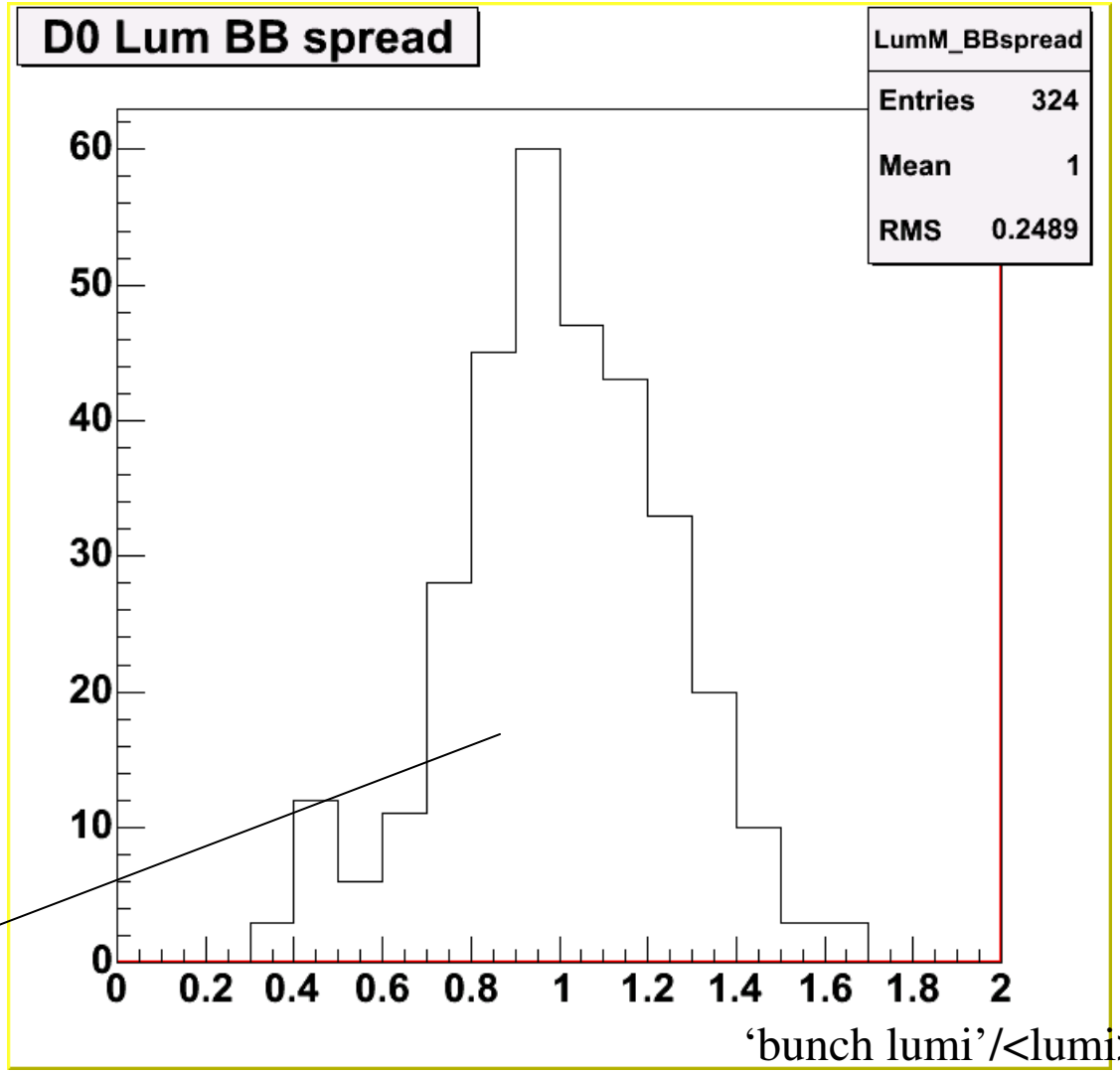

Y coordinate at Z=0 Vs Store
Y coordinate at Z=0
3500
3000
2500
2000
1500
1000
500
3160
3380
3600
3820
4040
4260
Store Number


Y coordinate at Z=0 Vs Store
Y coordinate at Z=0
3500
3000
2500
2000
1500
1000
500
3860
3940
4020
4100
4180
4260
Store Number

Bunch by bunch study (using code by R.Rossin)

Stores:
4048
4052
4053
4075
4088
4089
4095
4098
4105

one data set per store from beginning of HEP



9*36)

interestingly nice peak…

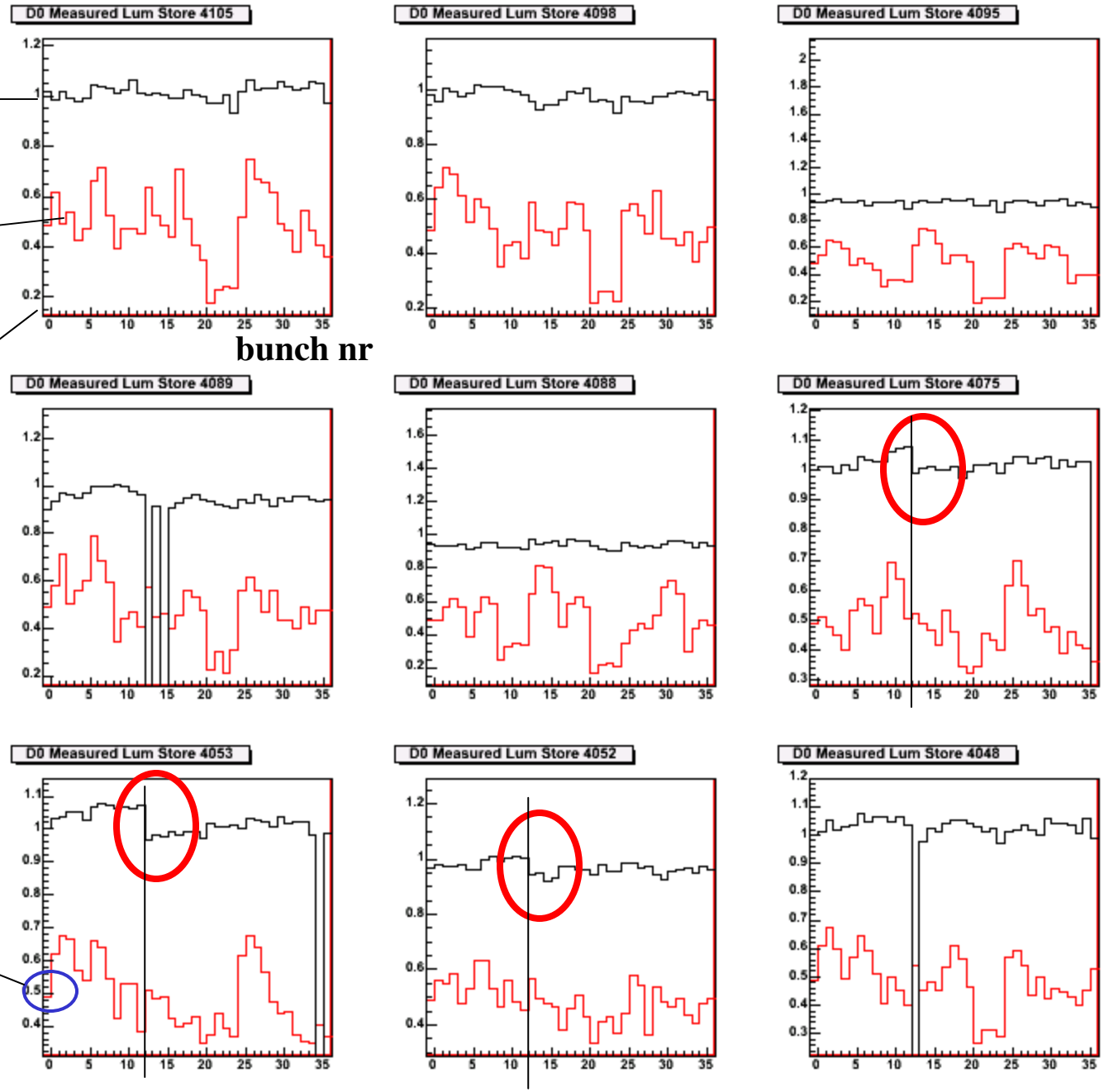
'bunch lumi'/<lumi>

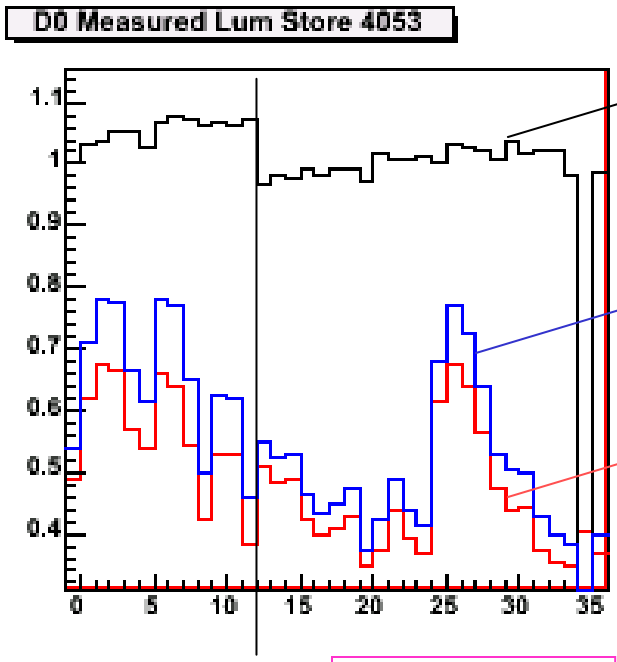
calc./meas.

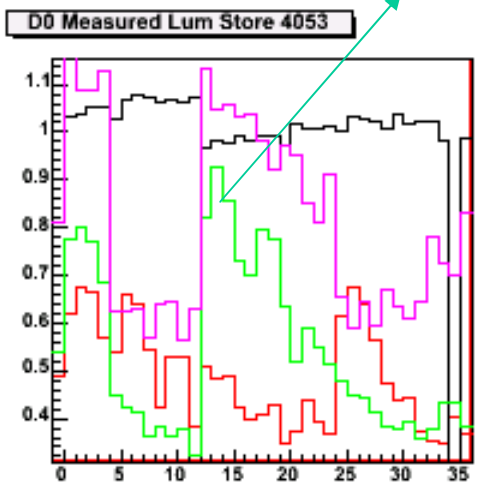
measured lumi / 2
(in E31/cm^2/s)

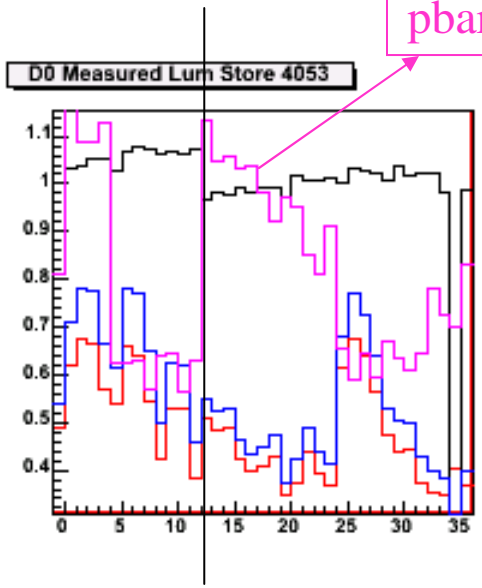
one plots is:
at beginning
of HEP
of one store

bin-0 is
the average









This is not a luminosity effect, but intensity and emittance.
Is this a limitation of the model used ?

Summary

- **Interaction point is stable.**

- **Measurement shows that β^*_x and β^*_y did not change significantly, since last meeting.**

- **During a store there is no definite pattern for β^*_x and β^*_y, but β^*_x oscillate between 31→36, and β^*_y oscillate between 33→39.**

- **Study of many more store indicate that during a store β^* is not changing such that it can cause for effective luminosity change**

- **Updated results will be available at the usual place:**
  http://www-clued0.fnal.gov/~avdhesh/Beam_main.html