Understanding of RHIC Absolute Luminosity in pp

A. Drees, BNL

July 29, 2002

for

RHIC Spin Collaboration Meeting XI

RIKEN BNL Research Center

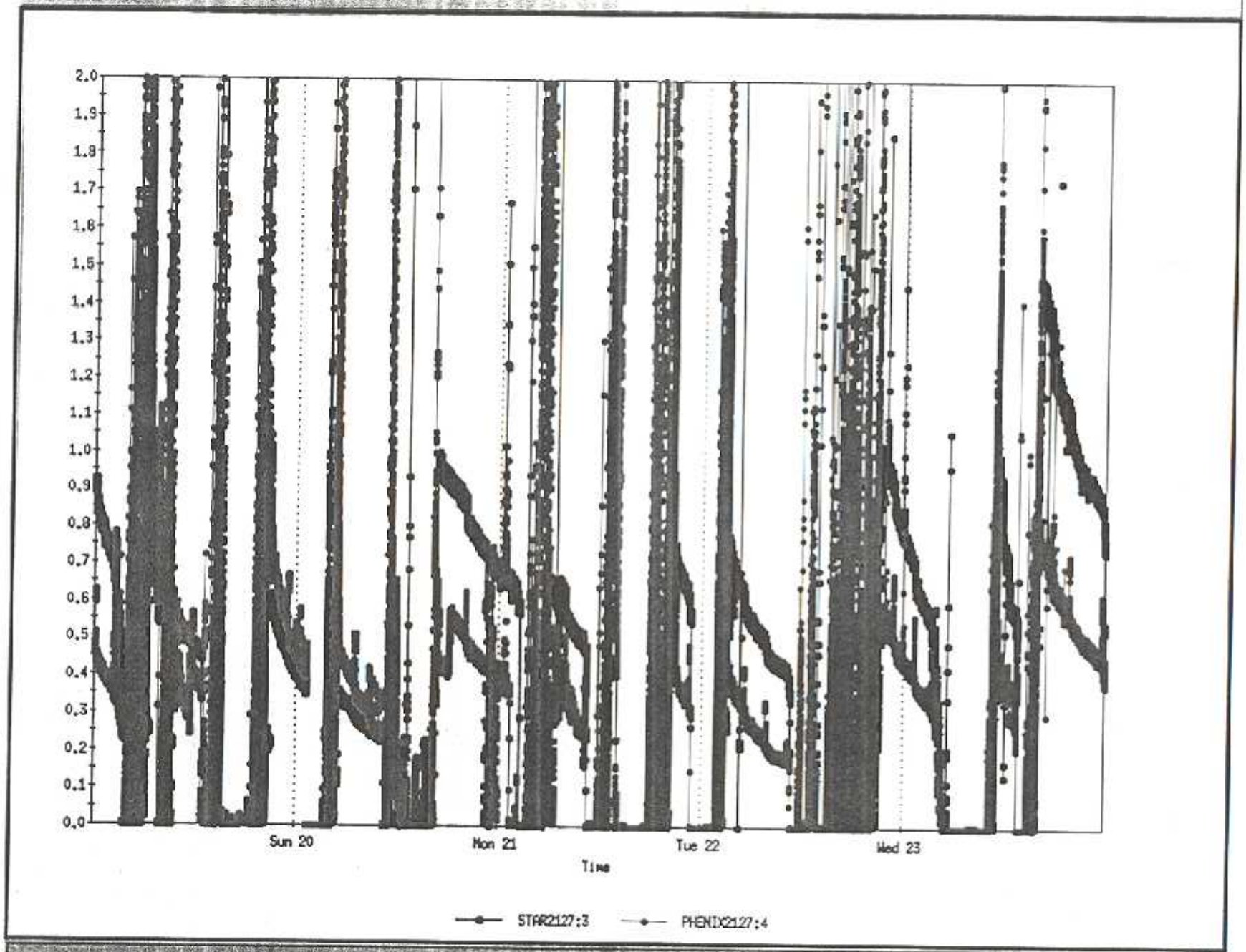
Luminosity during RHIC PP_FY02 Run

Issues:

- ⋆ **Background/Noise**
  - => during monitoring
  - => during Vernier Scans
- ⋆ **Detector Acceptance**
  - => Vernier Scans (some results)
  - => cross section normalization
- ⋆ **Comparability IR<–>IR**
  - => ZDCs

Printed: Mon Jul 29 12:58:40 2002

Window Event



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PHENIX successfully displayed
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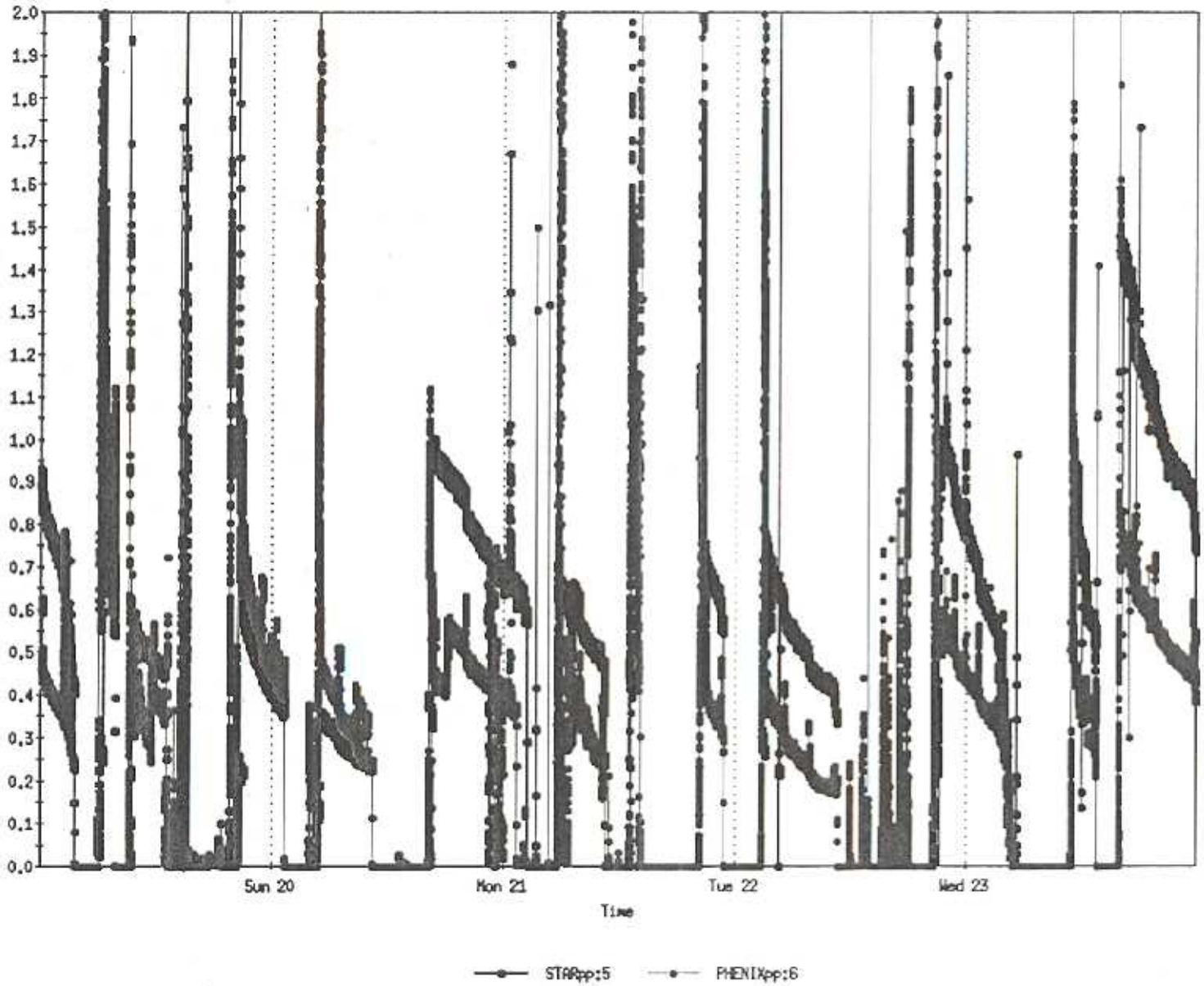
PHENIX successfully displayed

Window - Event



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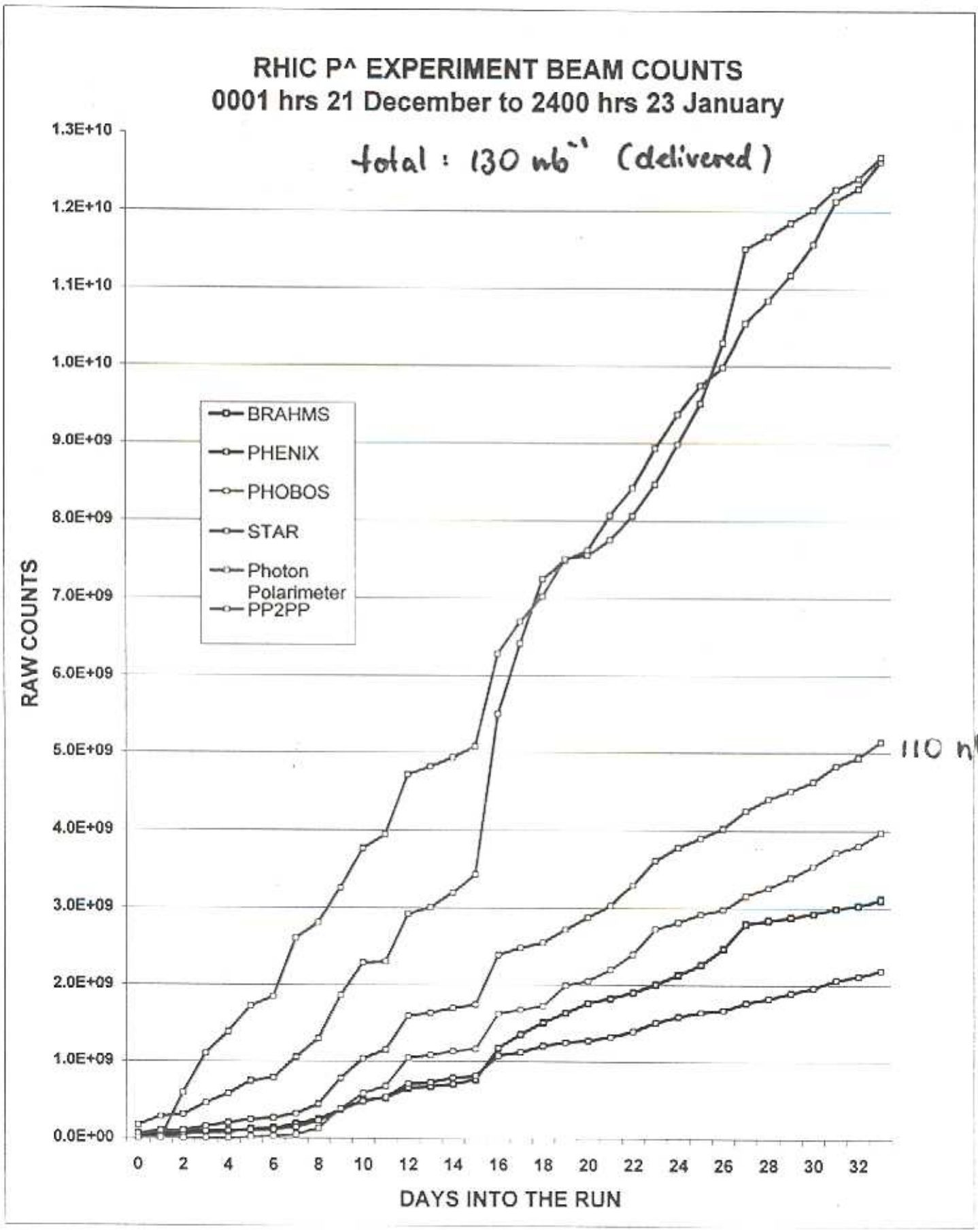
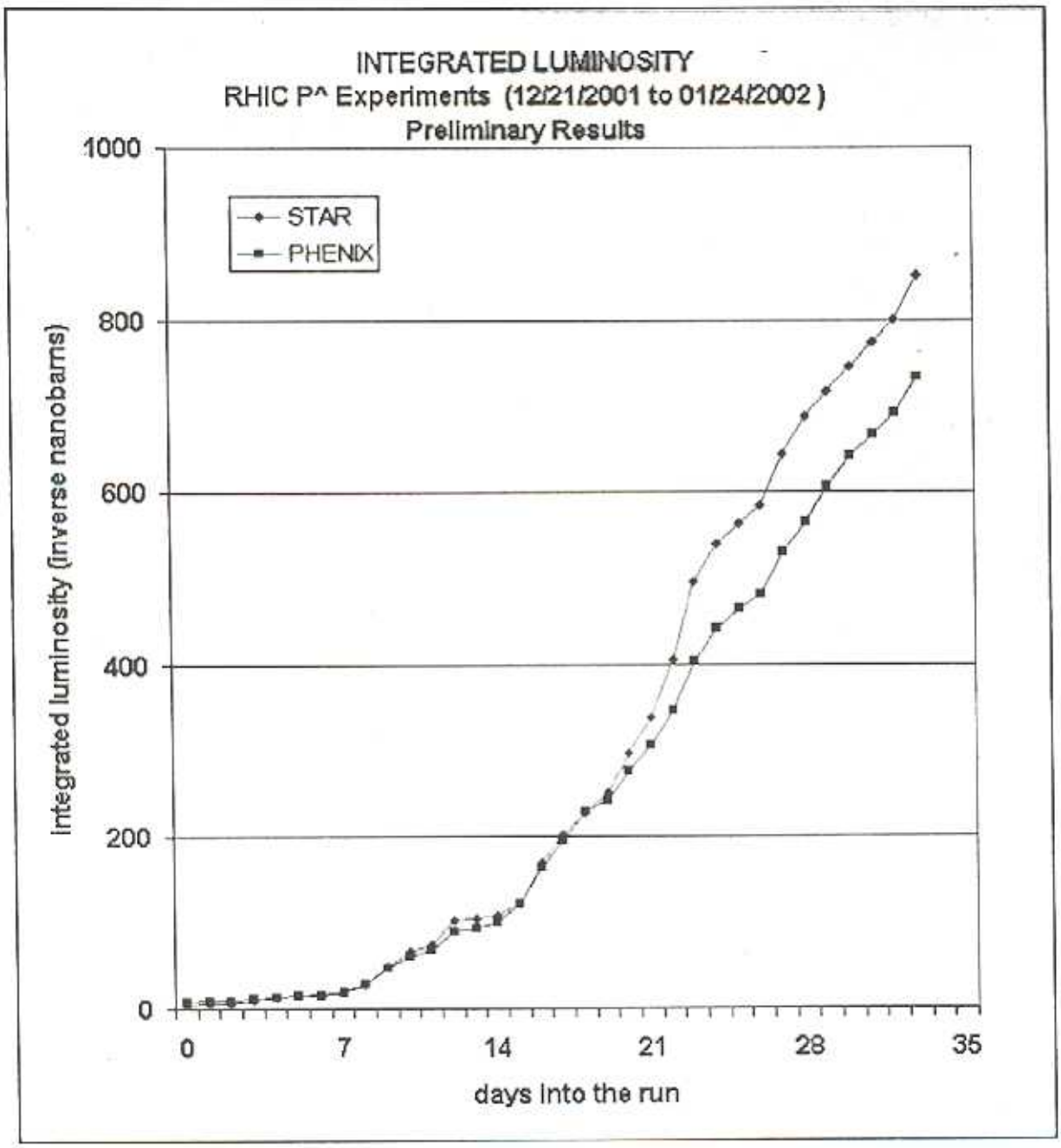
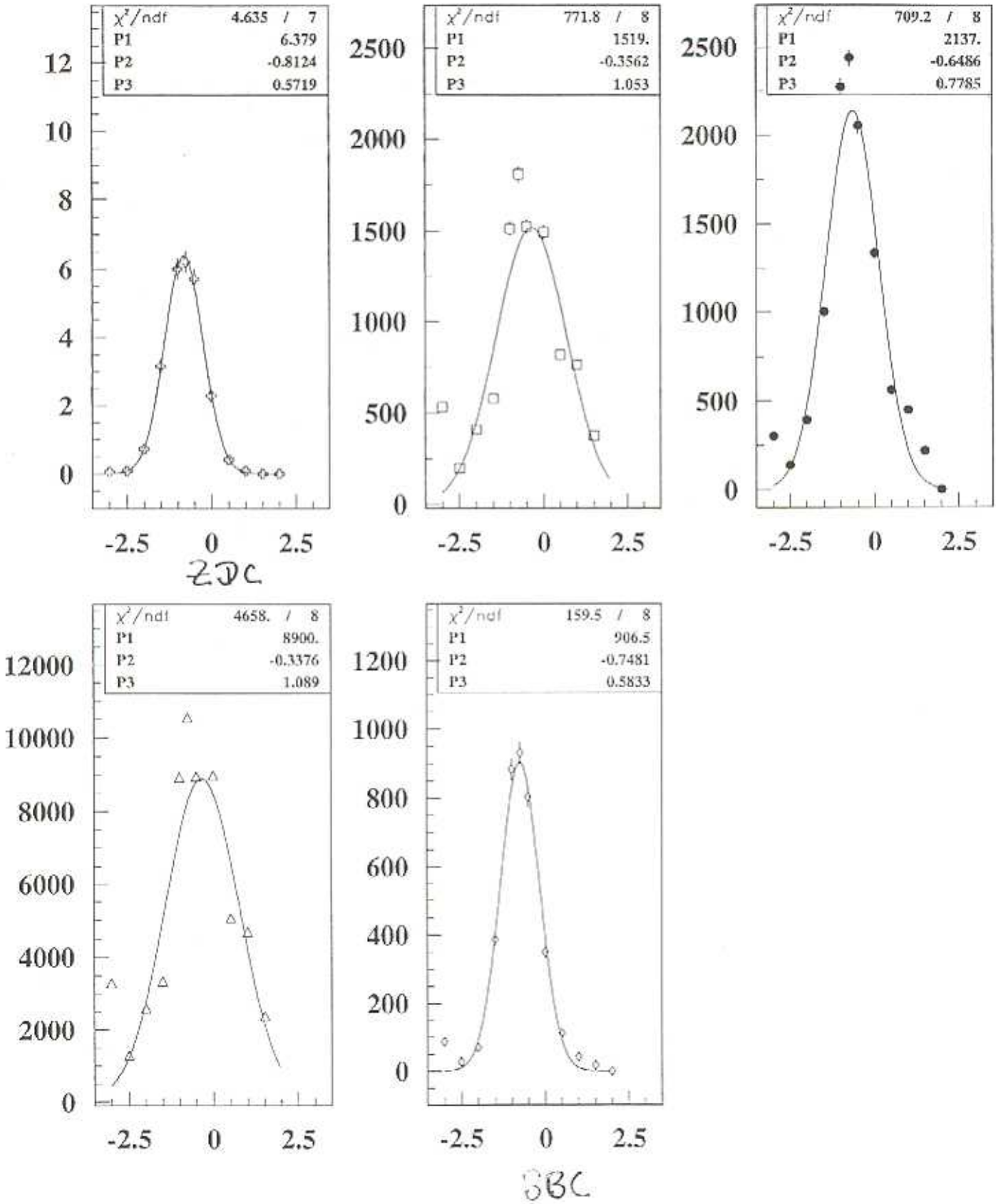

RHIC P^ EXPERIMENT BEAM COUNTS
0001 hrs 21 December to 2400 hrs 23 January
total : 130 nb⁻¹ (delivered)
110 nb⁻¹
RAW COUNTS
1.3E+10
1.2E+10
1.1E+10
1.0E+10
9.0E+09
8.0E+09
7.0E+09
6.0E+09
5.0E+09
4.0E+09
3.0E+09
2.0E+09
1.0E+09
0.0E+00
BRAHMS
PHENIX
PHOBOS
STAR
Photon Polarimeter
PP2PP
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
DAYS INTO THE RUN

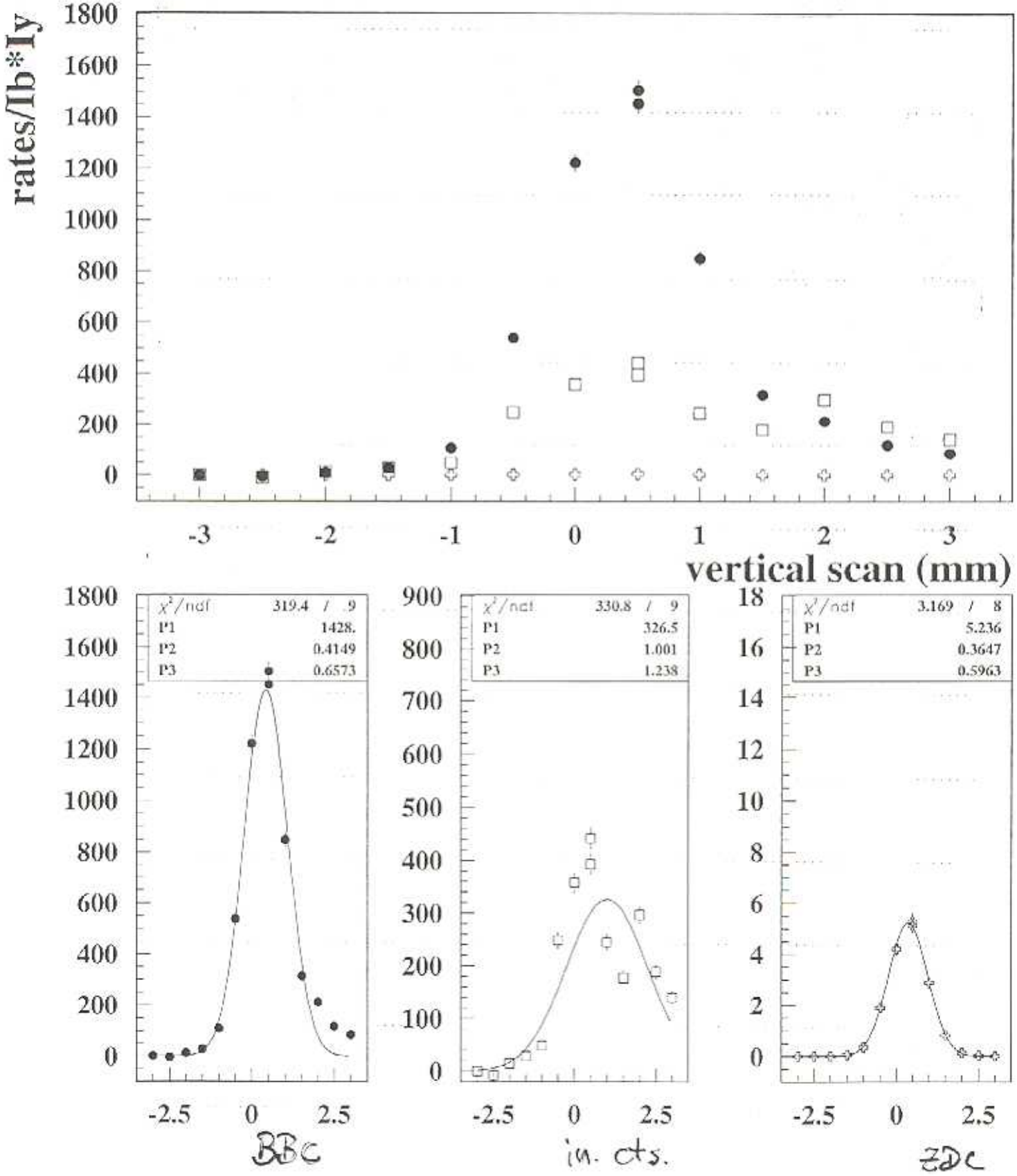

INTEGRATED LUMINOSITY
RHIC P^ Experiments (12/21/2001 to 01/24/2002)
Preliminary Results
STAR
PHENIX
Integrated luminosity (inverse nanobarns)
1000
800
600
400
200
0
0
7
14
21
28
35
days into the run

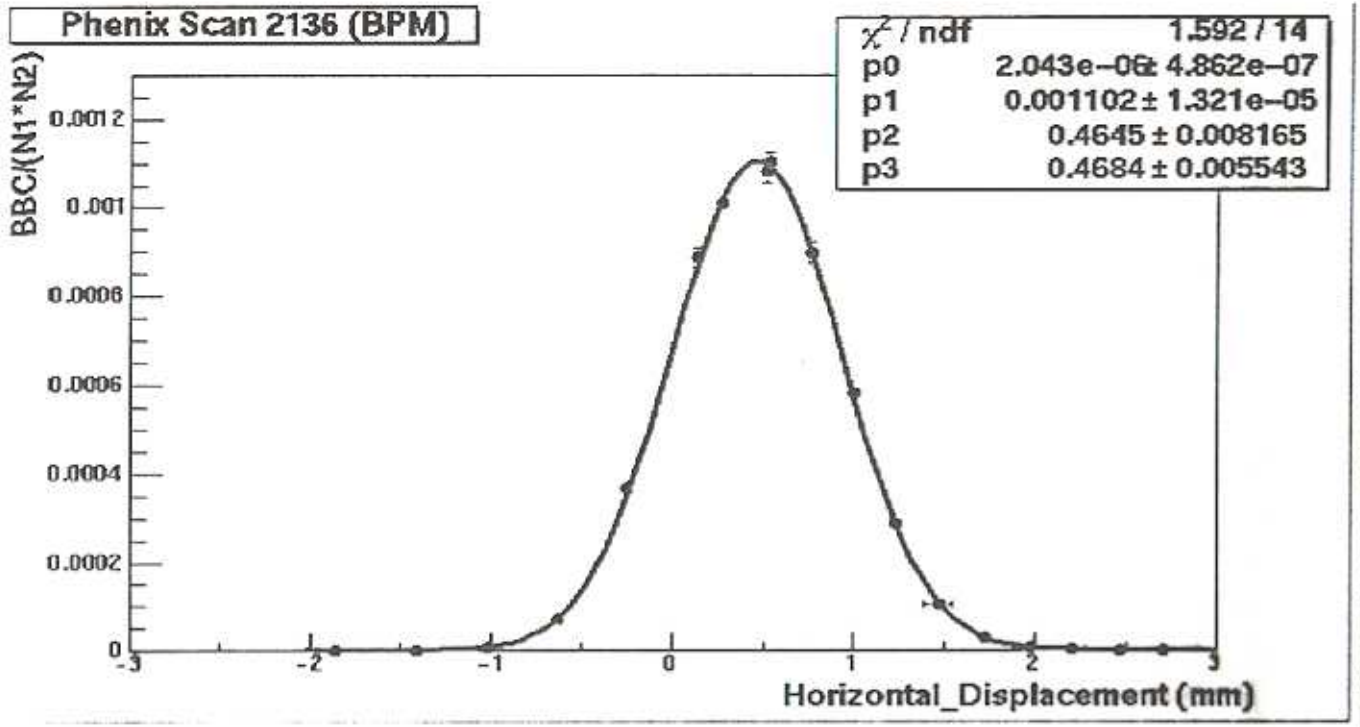
0 nb⁻¹

IR2 pp2233 V

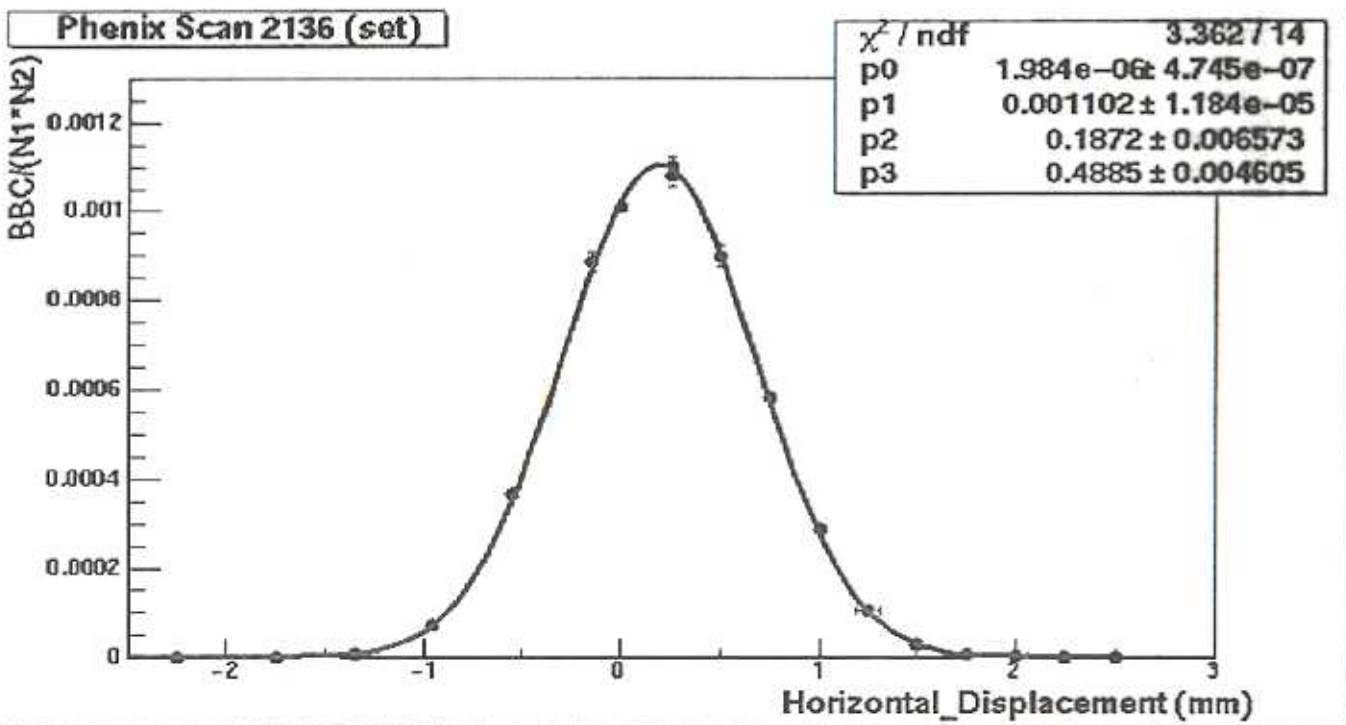

χ²/ndf 4.635 / 7
P1 6.379
P2 -0.8124
P3 0.5719
χ²/ndf 771.8 / 8
P1 1519.
P2 -0.3562
P3 1.053
χ²/ndf 709.2 / 8
P1 2137.
P2 -0.6486
P3 0.7785
ZDC
χ²/ndf 4658. / 8
P1 8900.
P2 -0.3376
P3 1.089
χ²/ndf 159.5 / 8
P1 906.5
P2 -0.7481
P3 0.5833
BBC

BRAHMS pp2193

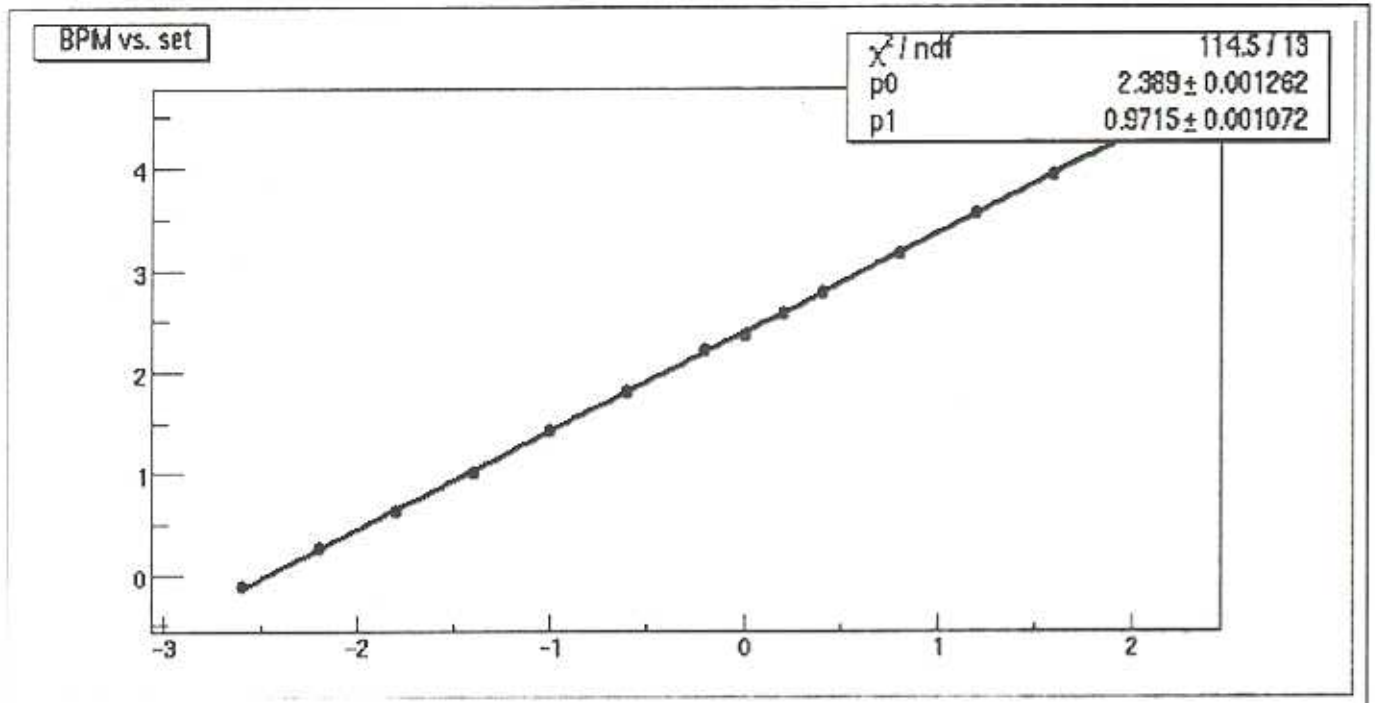




BPM =(BPM_7+BPM_8)/2
measured by horizontal
DX BPMs

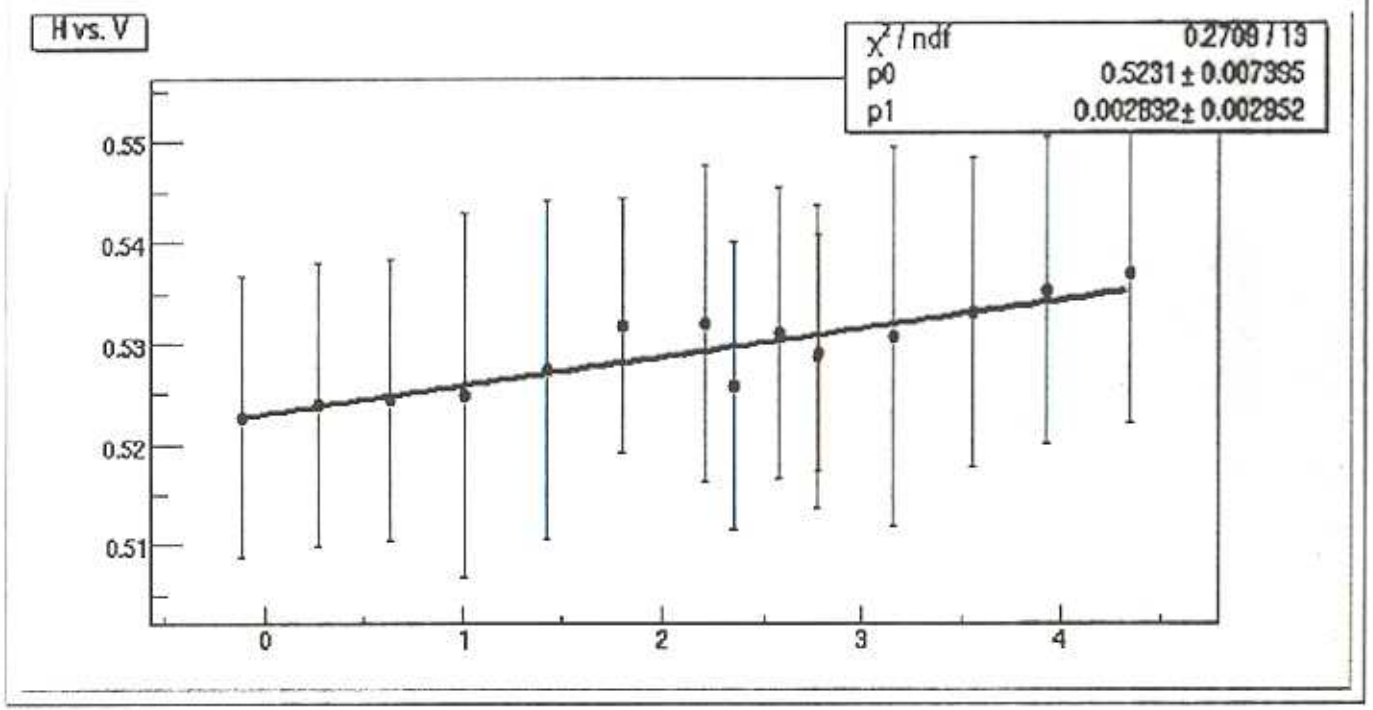


Set = from model



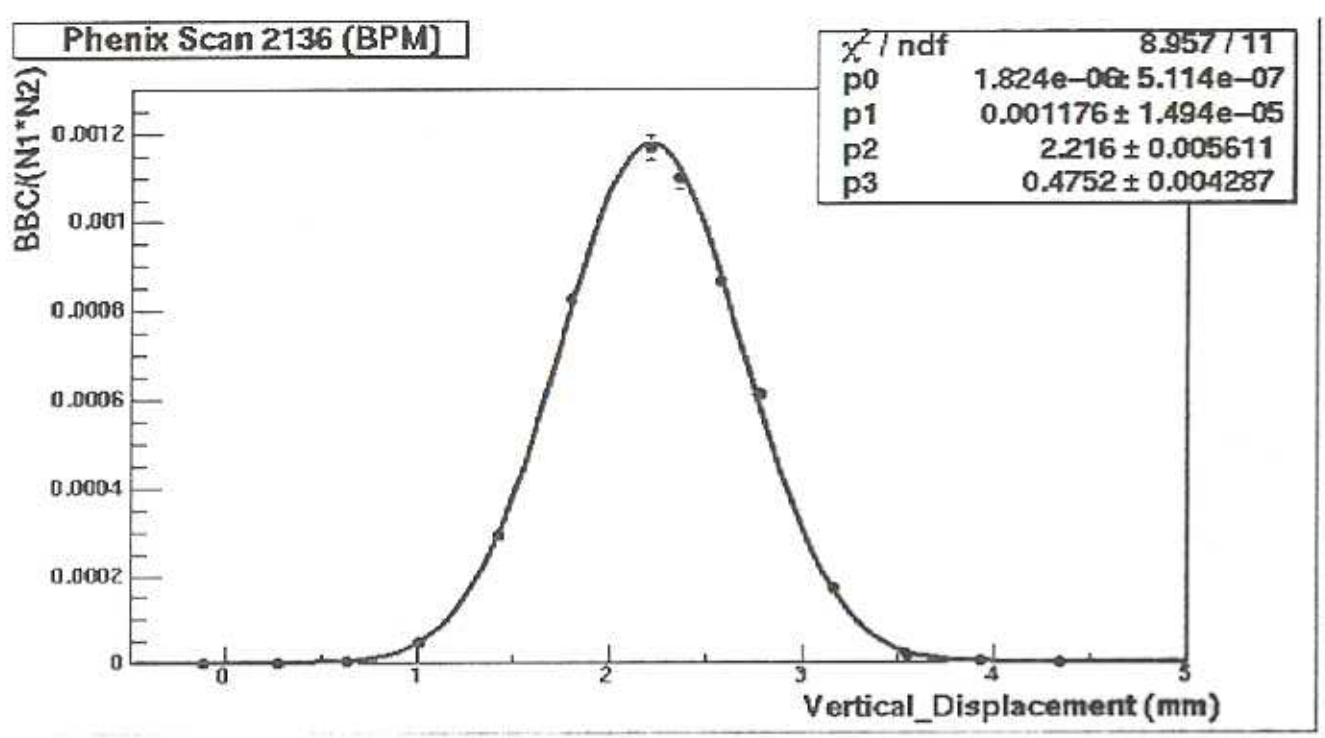
about 3% "contraction"

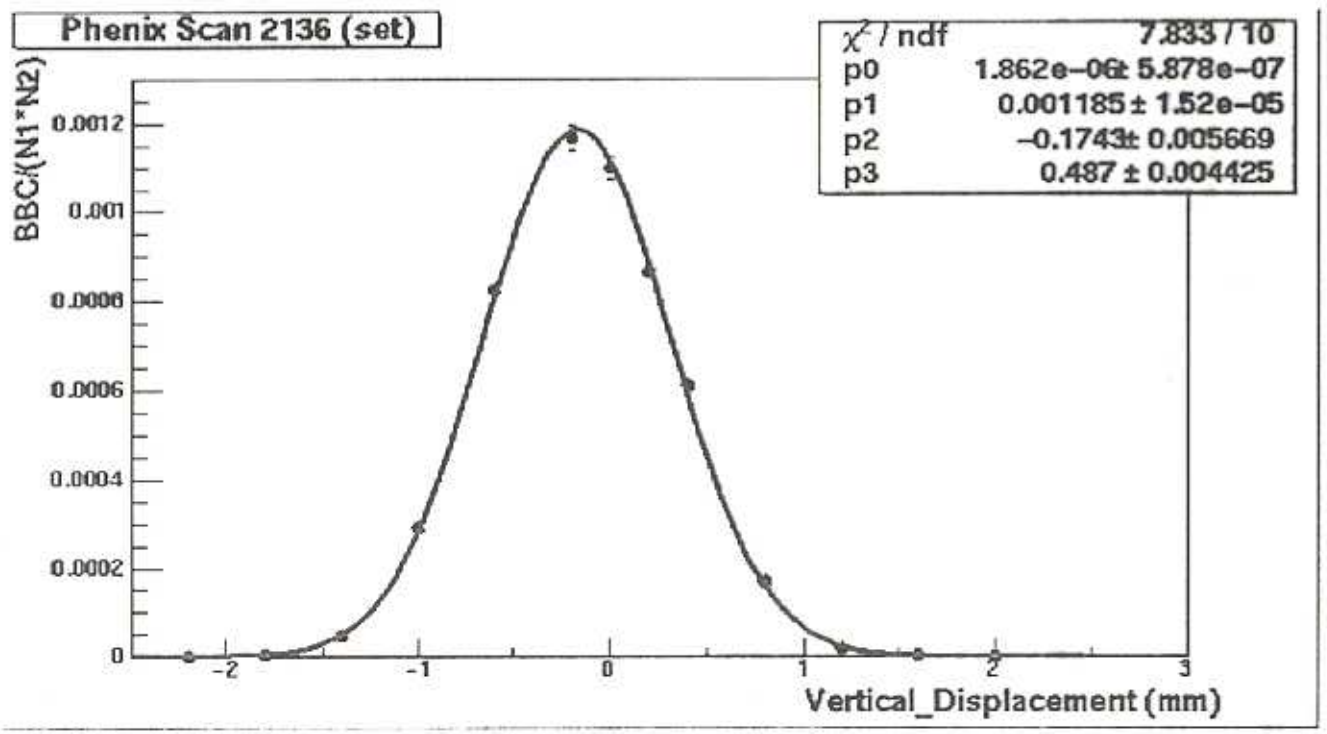
expected for $\beta^* = 3m$



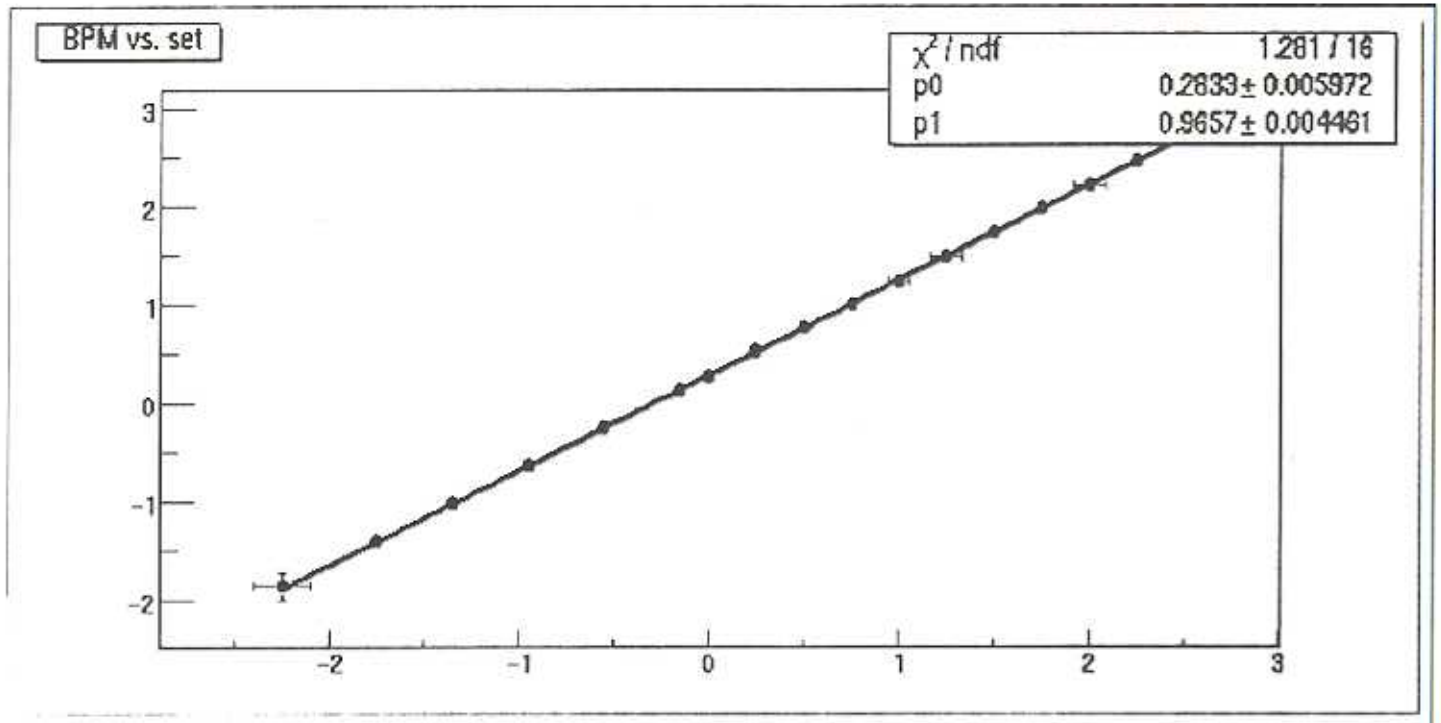
H = (BPM7+BPM8)/2
V = (BPM7+BPM8)/2

about 20 μm drifts
in other plane during
the H scan measured



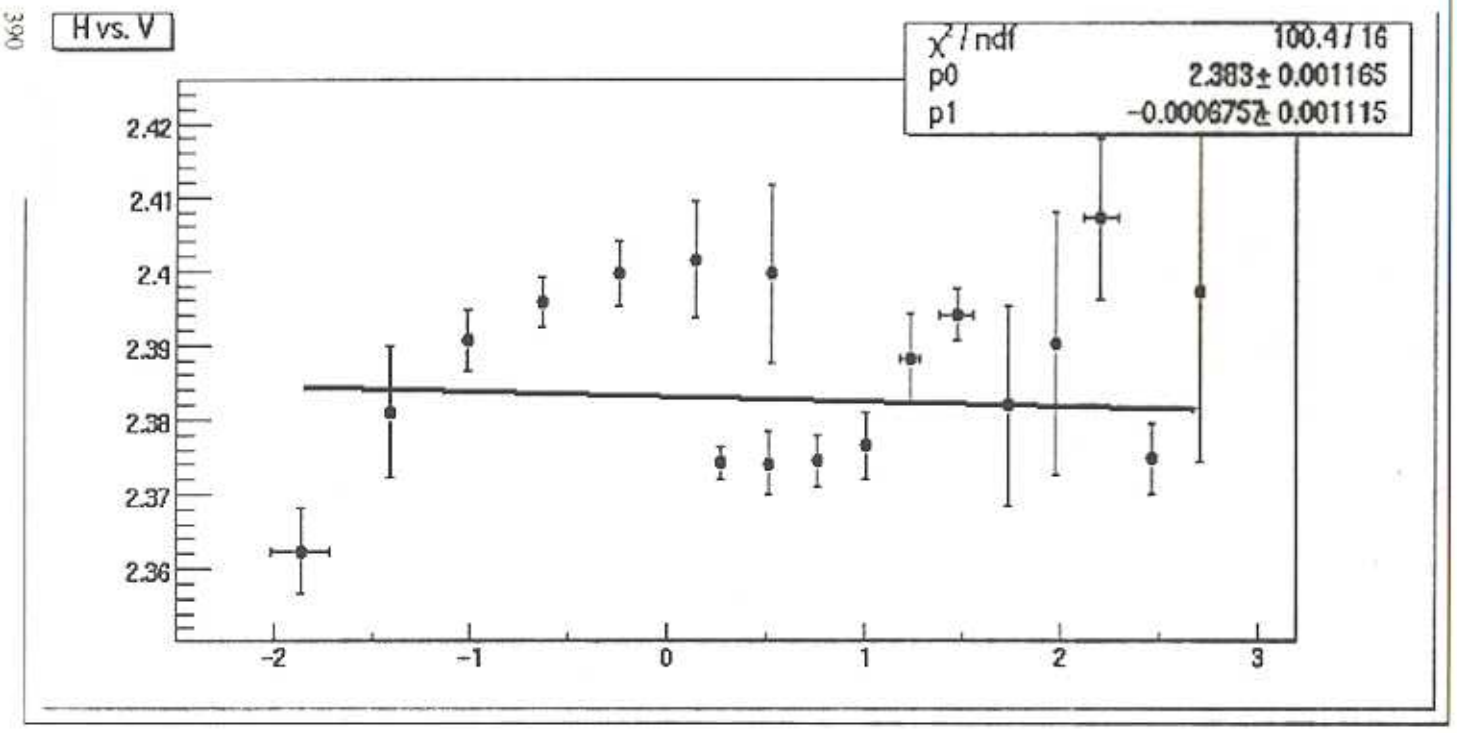


BPM =(BPM_7+BPM_8)/2
measured by vertical
DX BPMs



about 3% "contraction"

expected for $\beta^* = 3m$



H = (BPM7+BPM8)/2
V = (BPM7+BPM8)/2

about 50 μm drifts in other plane during the V scan measured

don't understand distribution yet

IR<–>IR

<u>Vernier Scan during fill 2161 with ZDC data:</u>

σ_{ZDC}(STAR) = 0.33 ± 0.05 mbarn

σ_{ZDC}(PHENIX) = 0.30 ± 0.05 mbarn

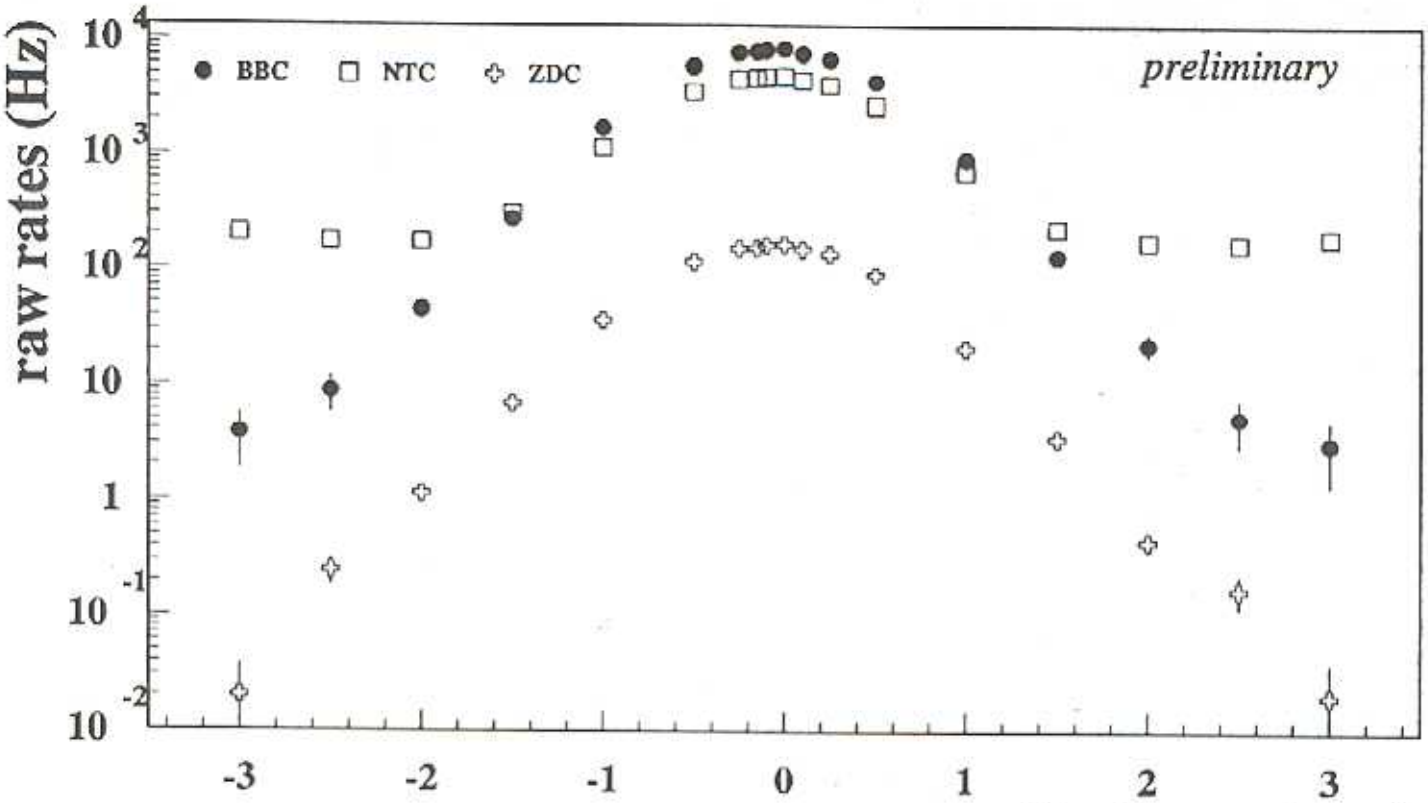
consistent within (stat.!) errors

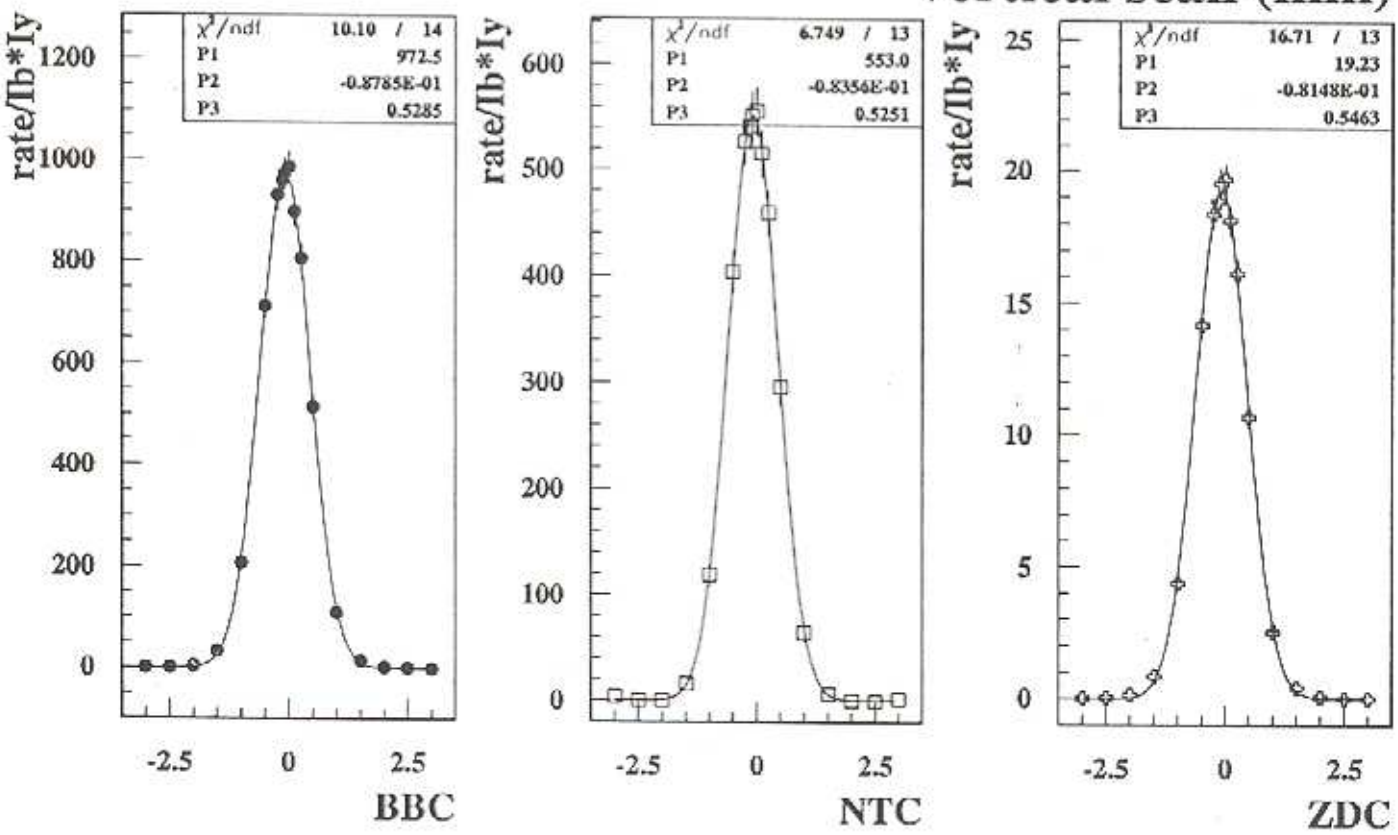
Luminosity from Scan:

STAR: $0.6 \pm 0.1\ 10^{30}\ cm^{-2}\ s^{-1}$

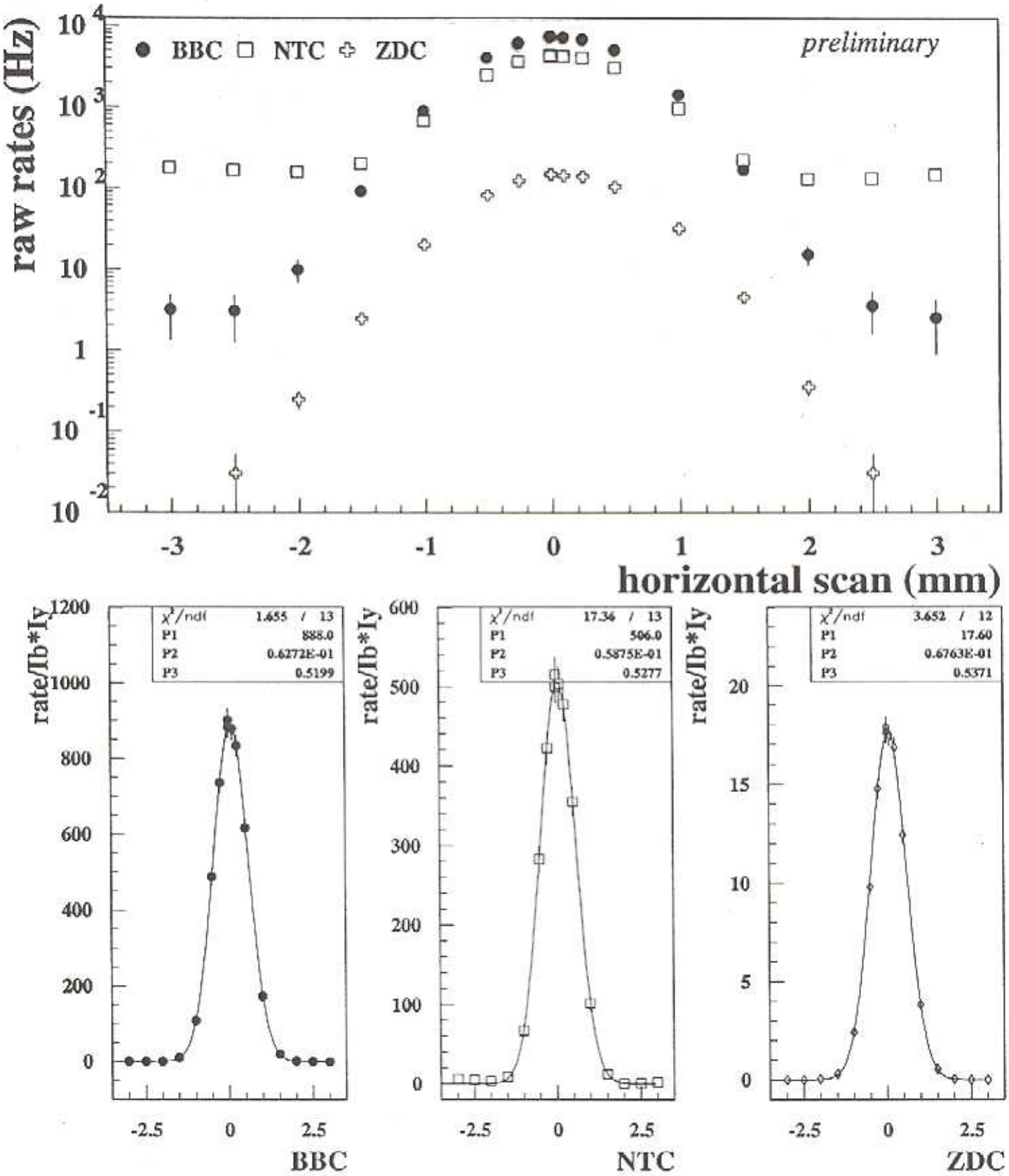
PHENIX: $0.54 \pm 0.1\ 10^{30}\ cm^{-2}\ s^{-1}$

PHENIX pp2161

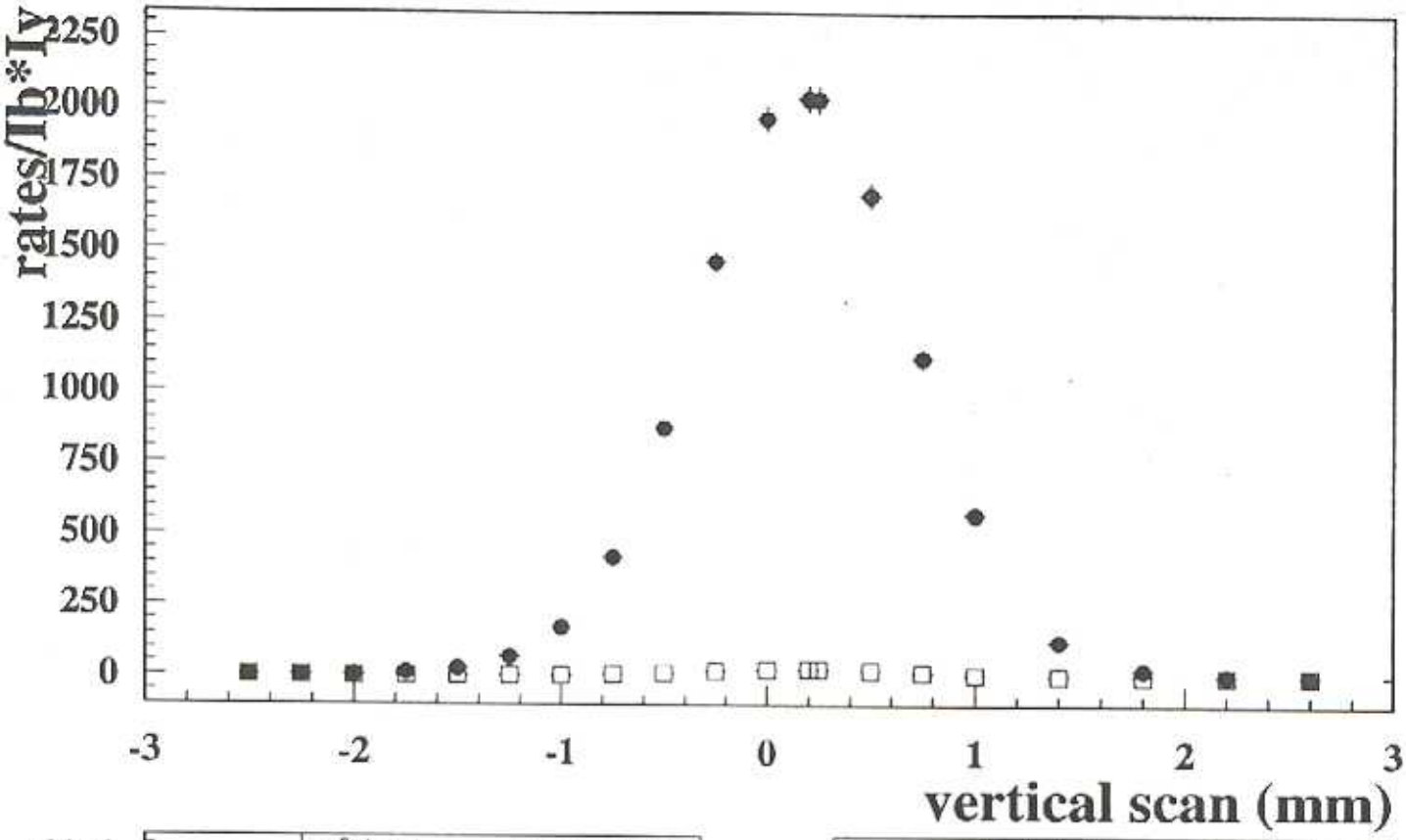


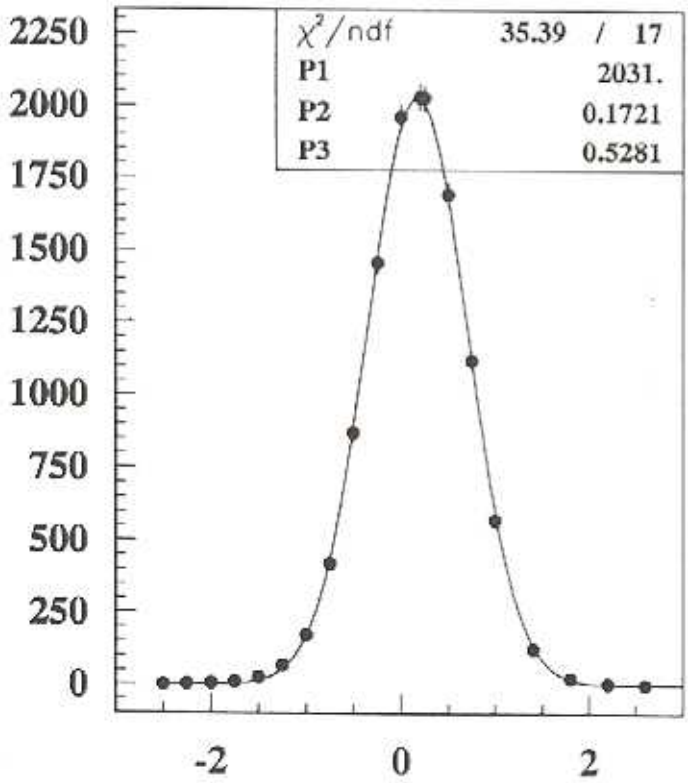


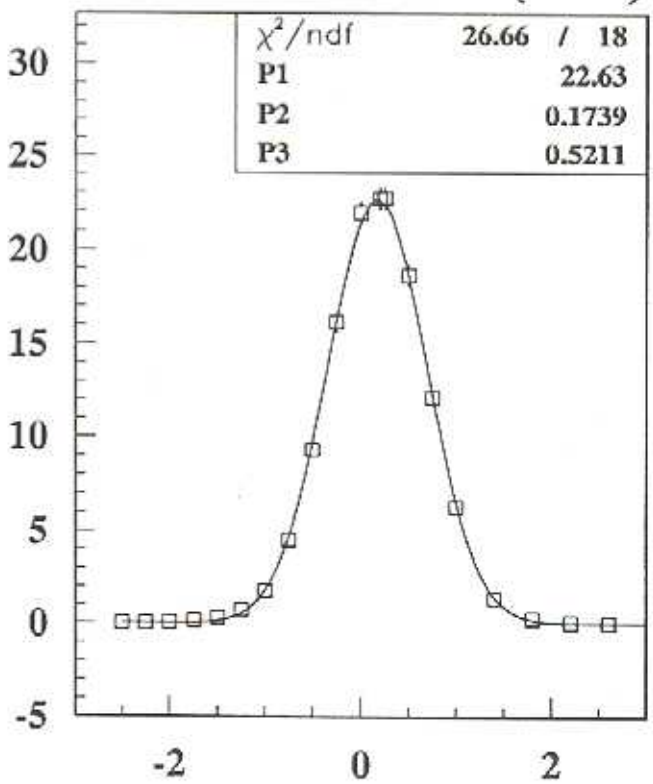
PHENIX pp2161



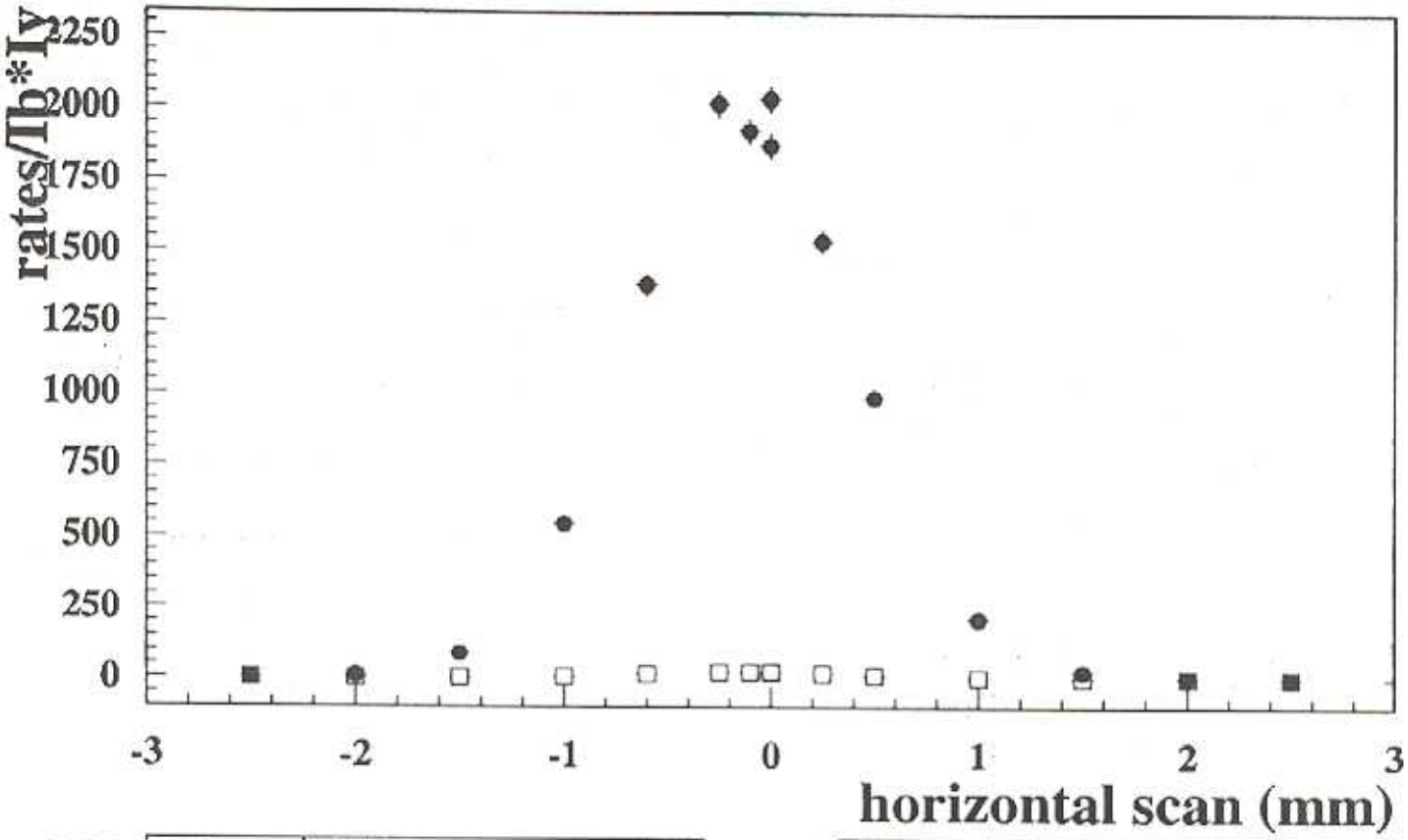
STAR pp2161

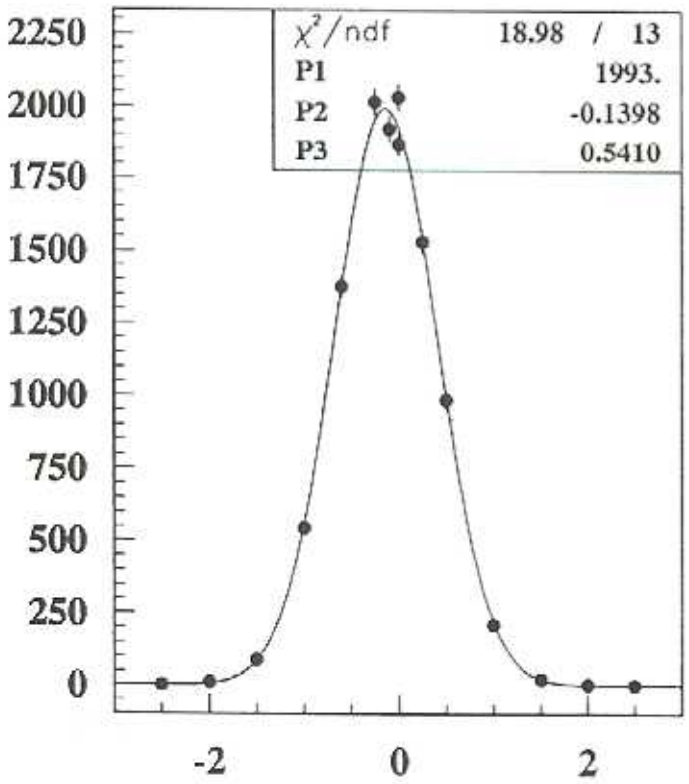

rates/Ib*Iy
2250
2000
1750
1500
1250
1000
750
500
250
0
-3
-2
-1
0
1
2
3
vertical scan (mm)

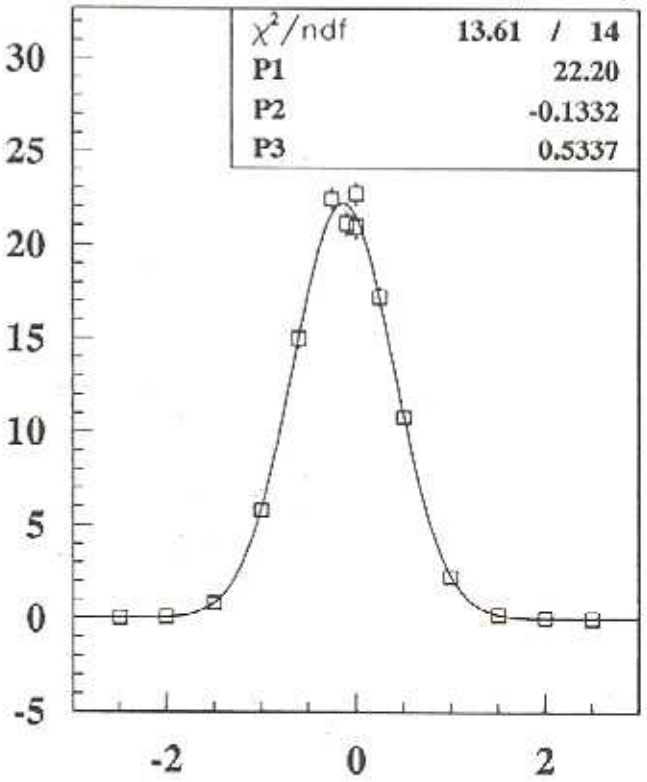

χ²/ndf 35.39 / 17
P1 2031.
P2 0.1721
P3 0.5281
2250
2000
1750
1500
1250
1000
750
500
250
0
-2
0
2


χ²/ndf 26.66 / 18
P1 22.63
P2 0.1739
P3 0.5211
30
25
20
15
10
5
0
-5
-2
0
2

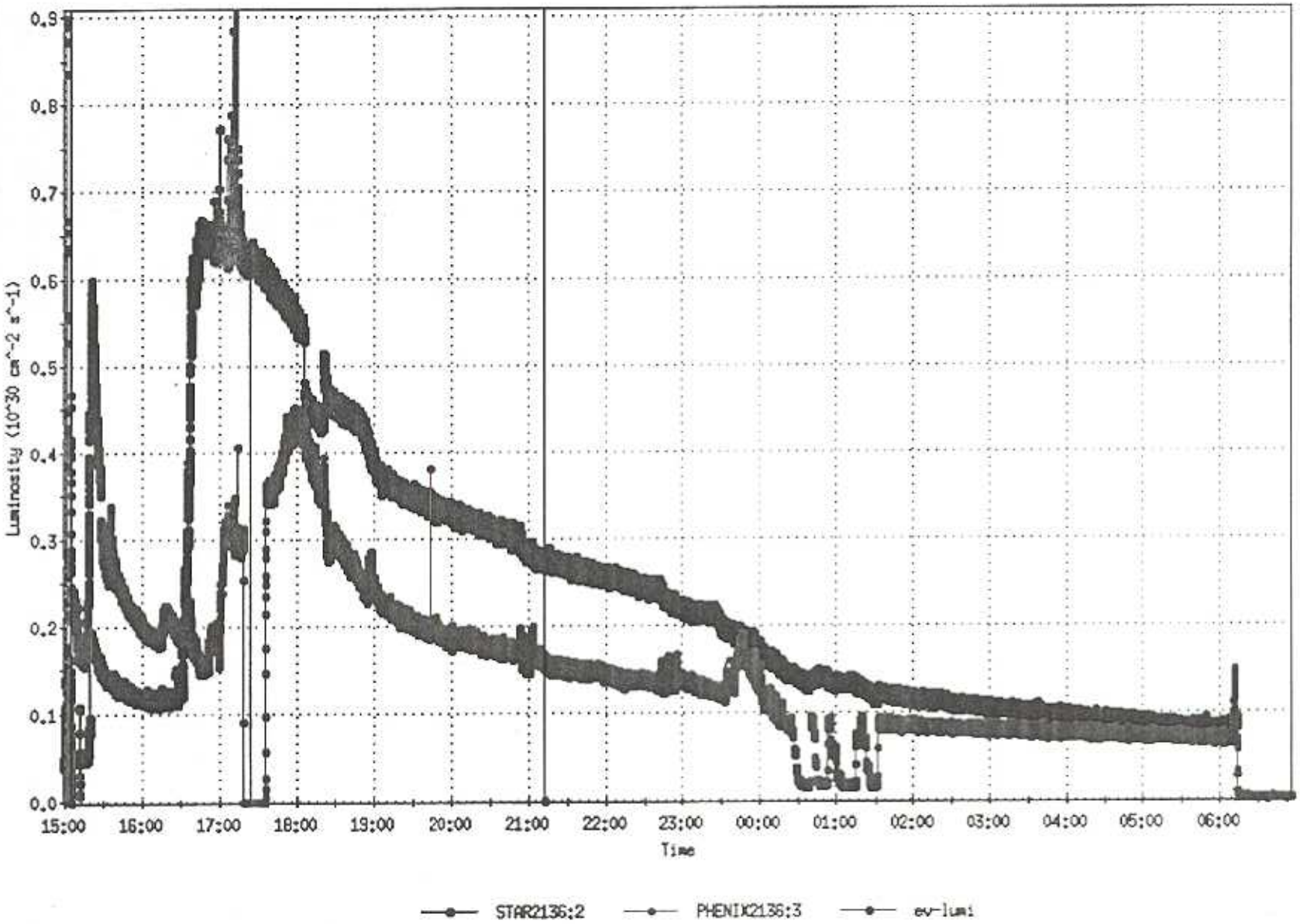
STAR pp2161


rates/Ib*Iy
2250
2000
1750
1500
1250
1000
750
500
250
0
-3
-2
-1
0
1
2
3
horizontal scan (mm)


χ²/ndf 18.98 / 13
P1 1993.
P2 -0.1398
P3 0.5410
2250
2000
1750
1500
1250
1000
750
500
250
0
-2
0
2


χ²/ndf 13.61 / 14
P1 22.20
P2 -0.1332
P3 0.5337
30
25
20
15
10
5
0
-5
-2
0
2

Window Event



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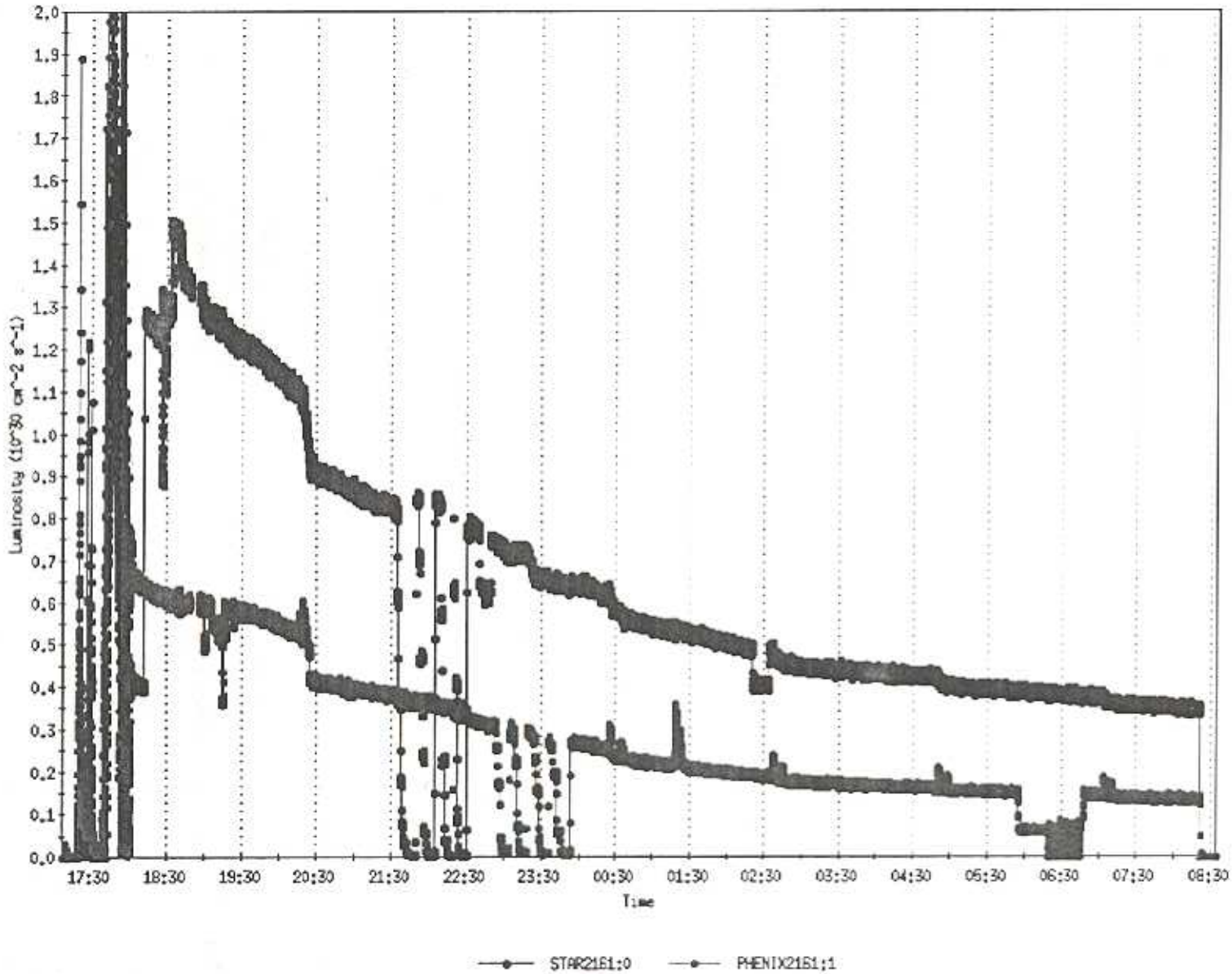
Window Event



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PHENIX successfully displayed
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