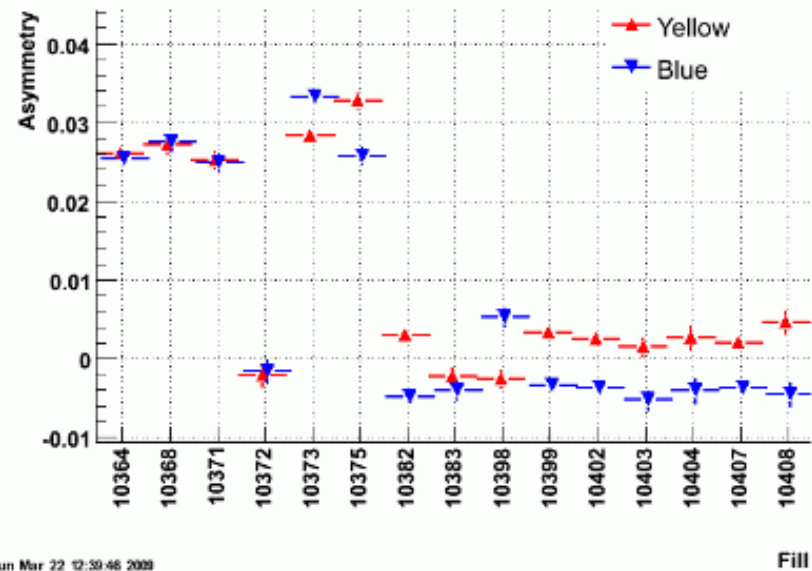


History of the ZDC

- ZDC commissioned during transverse running
 - 2 analyses see analyzing powers of $\sim 7.5\%$
 - Relatively insensitive to different trigger conditions
- See drop in asymmetry with switch to longitudinal running



$$\epsilon_{phys} = \frac{\sqrt{N_L^\uparrow N_R^\downarrow} - \sqrt{N_L^\downarrow N_R^\uparrow}}{\sqrt{N_L^\uparrow N_R^\downarrow} + \sqrt{N_L^\downarrow N_R^\uparrow}}$$

From B. Surrow

250 GeV

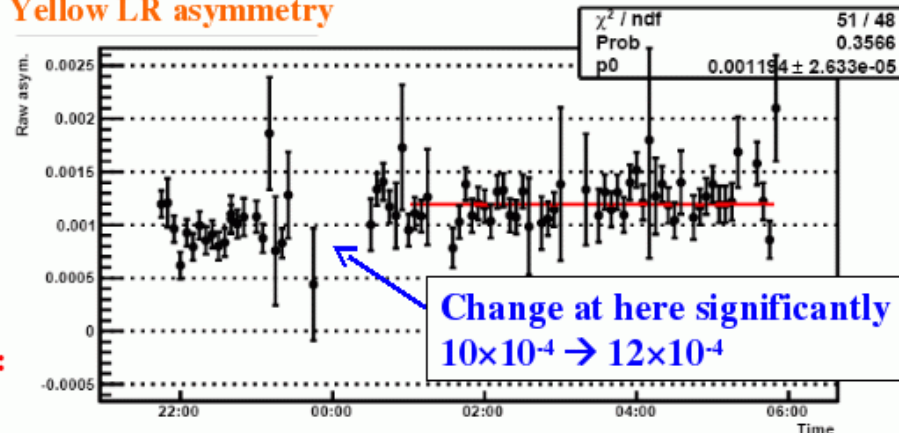
Shift of Pol in Yellow during Fill 10450

Fill#10450 (3/28 21:40 – 3/29 5:50)

Residual transverse components are significantly changed during this fill.

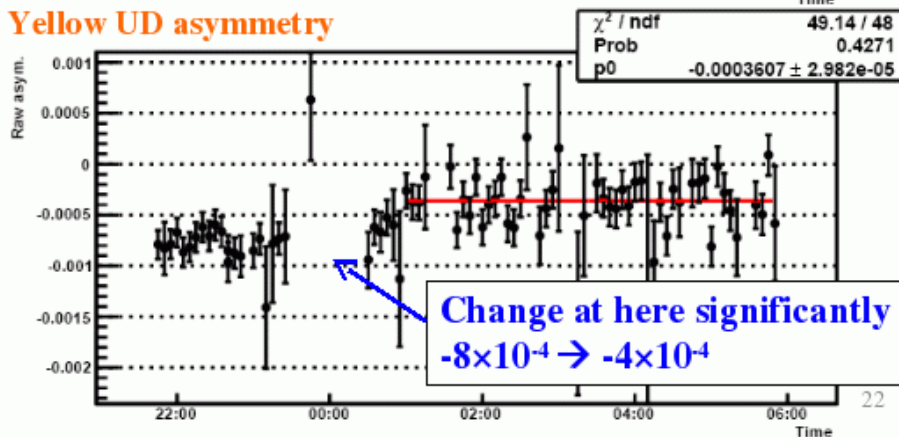
CNI measurements were :
 3/28 20:53 37.4±3.0 %
 3/29 00:01 37.6±1.9 %
 3/29 03:00 36.4±3.0 %

Yellow LR asymmetry



$$\text{Vert Spin: } \frac{L-R}{L+R}$$

Yellow UD asymmetry



$$\text{Horiz Spin: } \frac{U-D}{U+D}$$

From M. Tagawa

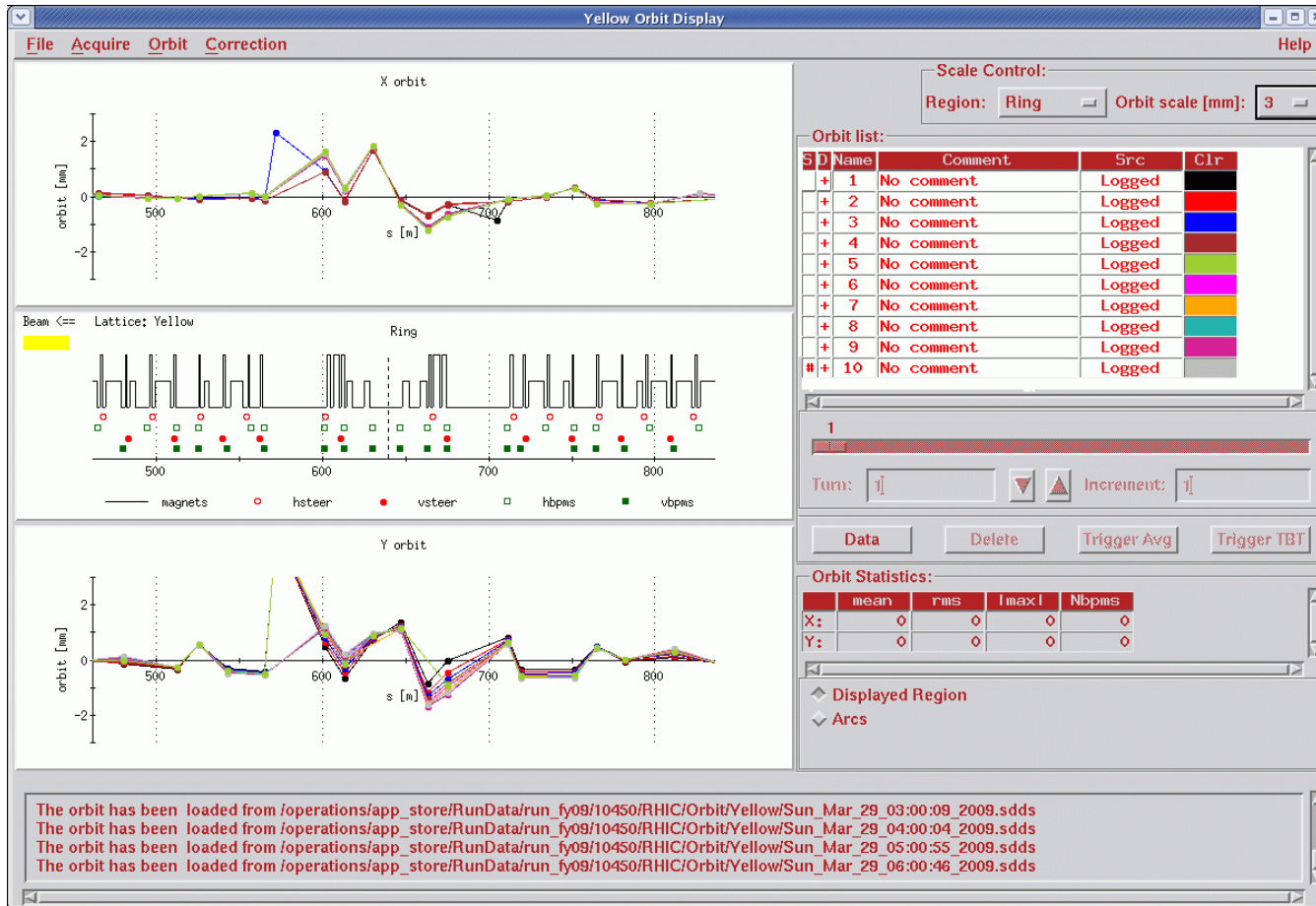
Estimation of angular shift

- Fills 10372 and 10375 (no rotators) had CNIPols: Y1~ 40%, Y2~ 50%
 - average to 45% with $A_0 \sim 0.031$
- Fill 10450 (with rotators): Y1~ 38%, Y2~ 47%
 - average to 42.5%.
- For 10450 scale $A_0 \sim 0.031 \times \frac{42.5}{45} \sim 0.029$

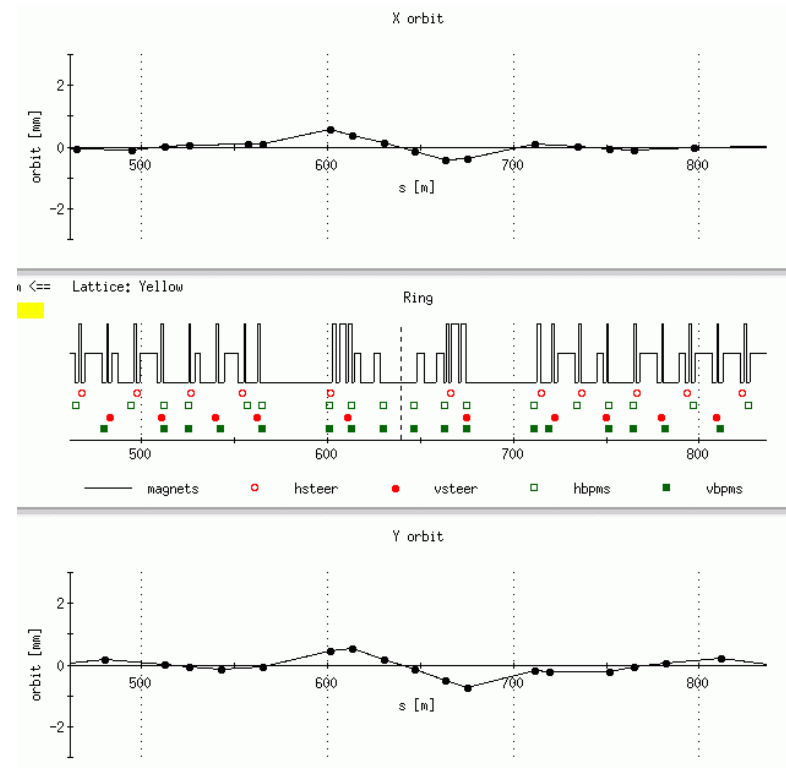
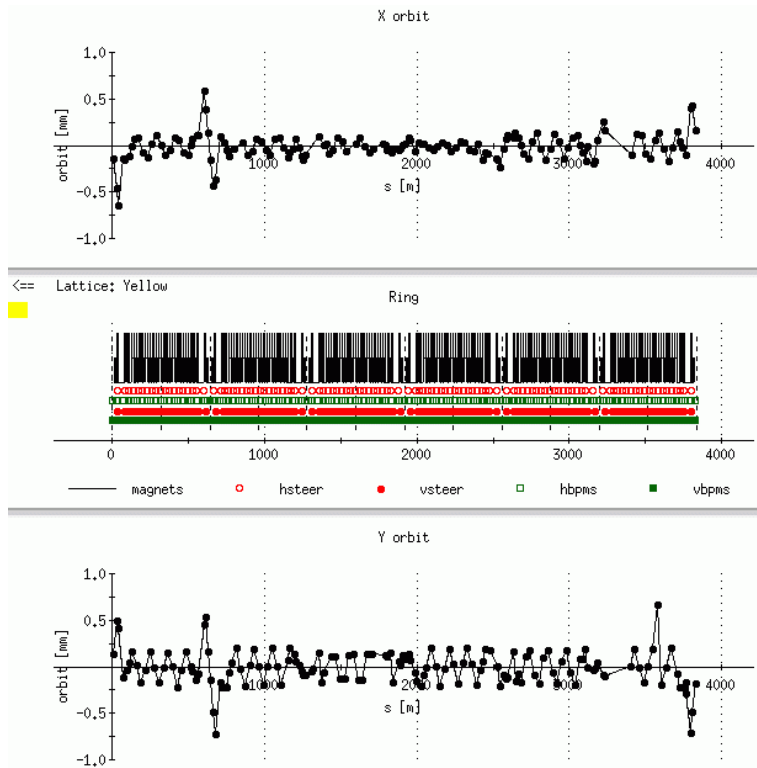
$$\frac{\Delta A_x}{A_0} \sim \frac{-0.0002}{0.029} = -6.7 \text{ mr}$$

$$\frac{\Delta A_y}{A_0} \sim \frac{0.0004}{0.029} = -13.4 \text{ mr}$$

Hourly yellow orbits during fill 10450

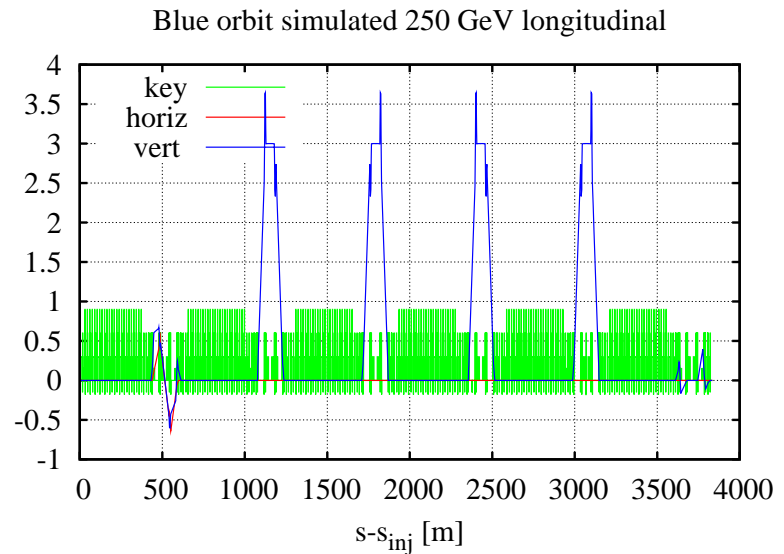
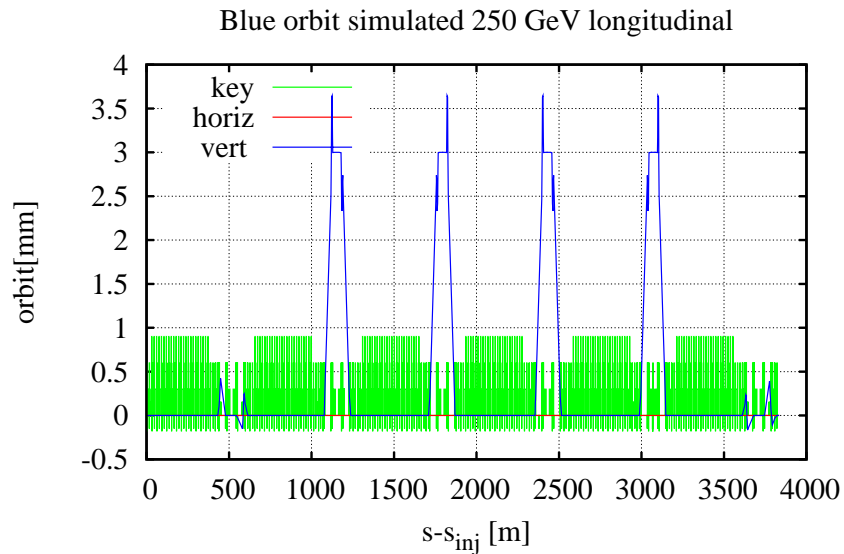


Orbit difference: 4 am minus 10 pm



$$\left. \begin{aligned}
 \Delta\theta_x &= -17.7 \mu\text{r} \\
 \Delta\theta_y &= -18.1 \mu\text{r} \\
 (1 + G\gamma)\Delta\theta_x &= -8.5 \text{ mr} \\
 (1 + G\gamma)\Delta\theta_y &= -8.7 \text{ mr}
 \end{aligned} \right\} \text{ (naive estimate)}$$

Simulation of IR8 angle bumps



Left: no angle bumps at IP8; Right: V and H angle bumps at IP8.

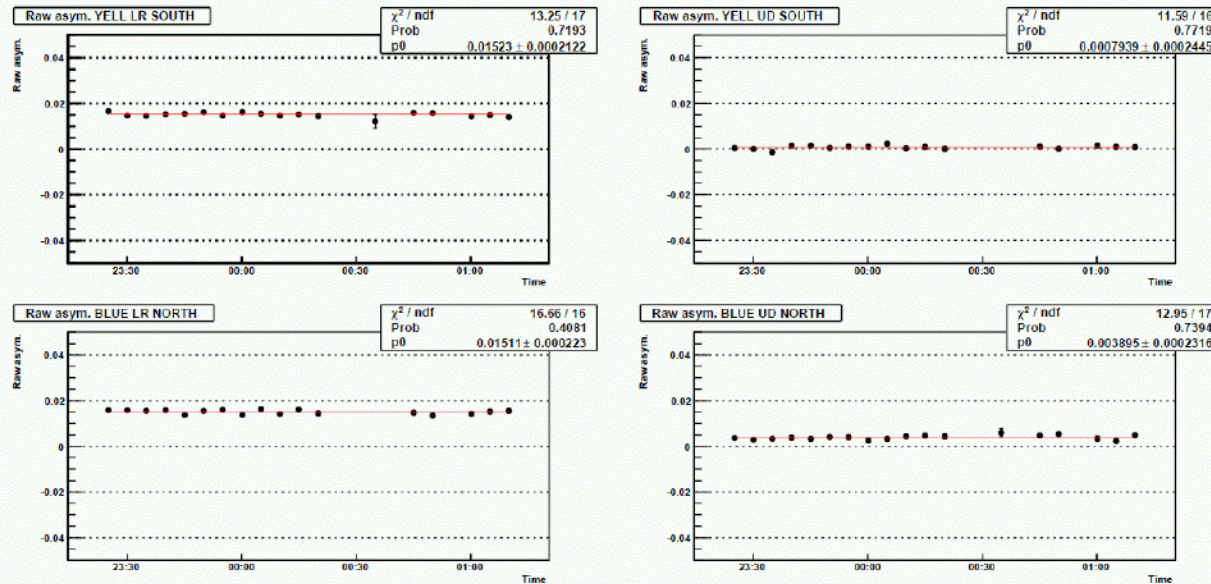
Fill 10450 comparison

	n_x	n_y
Sim. with bumps	-0.043256	-0.002936
Sim. without bumps	-0.023093	-0.005037
Sim. Δn_j	-0.020163	0.002101
Naive scaling Δn_j	-0.0085	-0.0087
PHENIX measurement	-0.0067	-0.0013

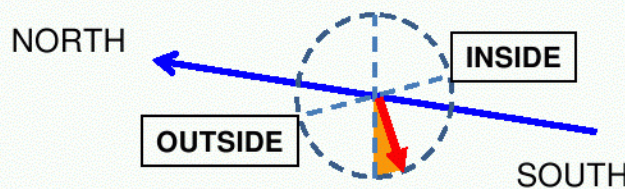
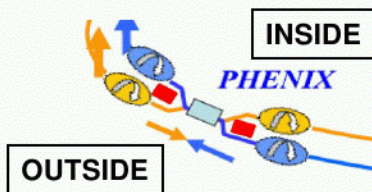
- Sim. with closed angle bumps: agreement not so good.
 - Overall magnitude of effect is in the ballpark.
 - Disagreement is probably due to the unclosed bumps.
- Automatic orbit correction was not working in fill 10450.
 - The horiz orb showed a two clear states, but vert drifted.

PHENIX Blue 100 GeV transverse

PHENIX Local Pol. 200GeV



Tilt angle of BLUE : 14 [deg]
(when CDEV is "+" .)



- Rotators off.

- yellow:

$$\tan^{-1} \frac{0.0008}{0.01523} = 3.0^\circ$$

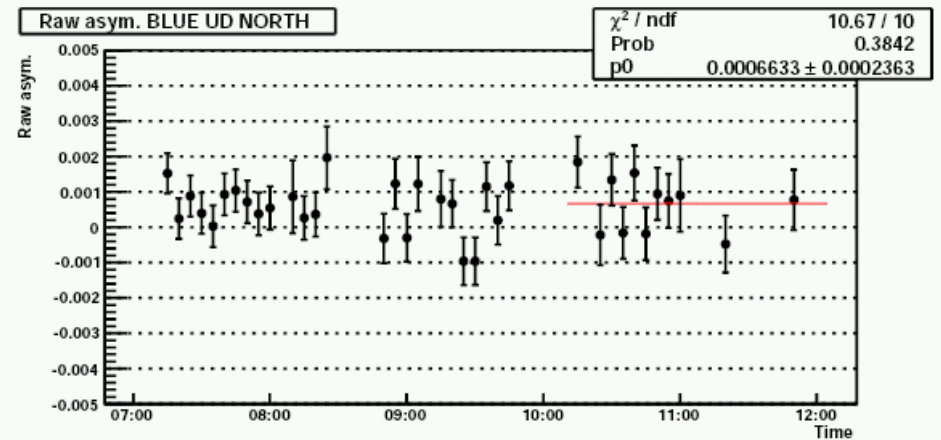
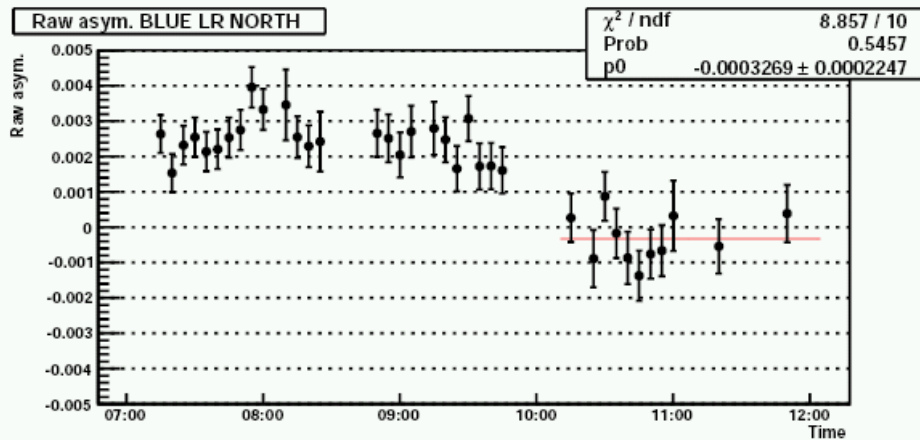
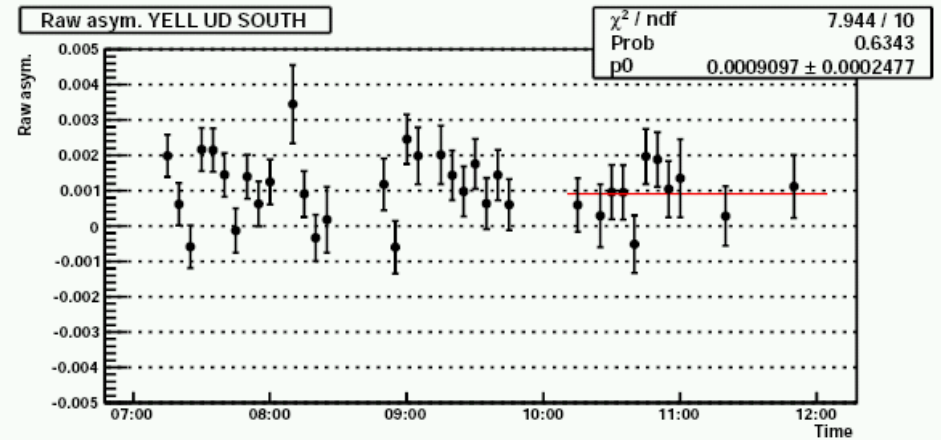
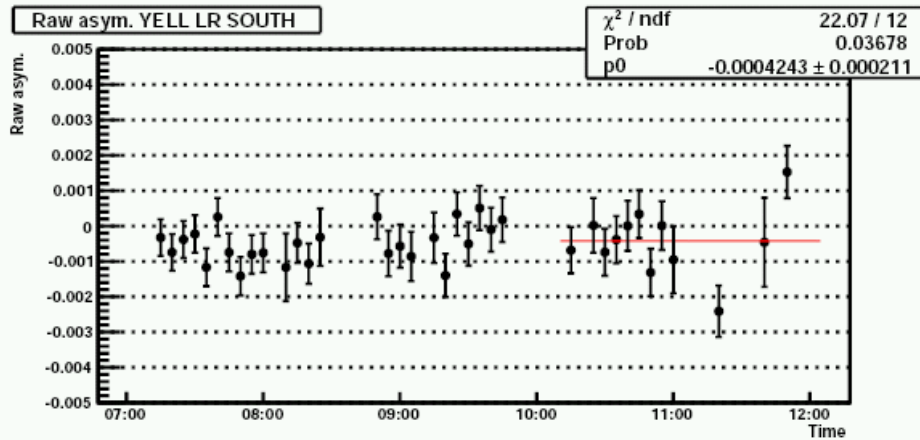
- blue:

$$\tan^{-1} \frac{0.0039}{0.0151} = 14.4^\circ$$

Plot from M. Tagawa

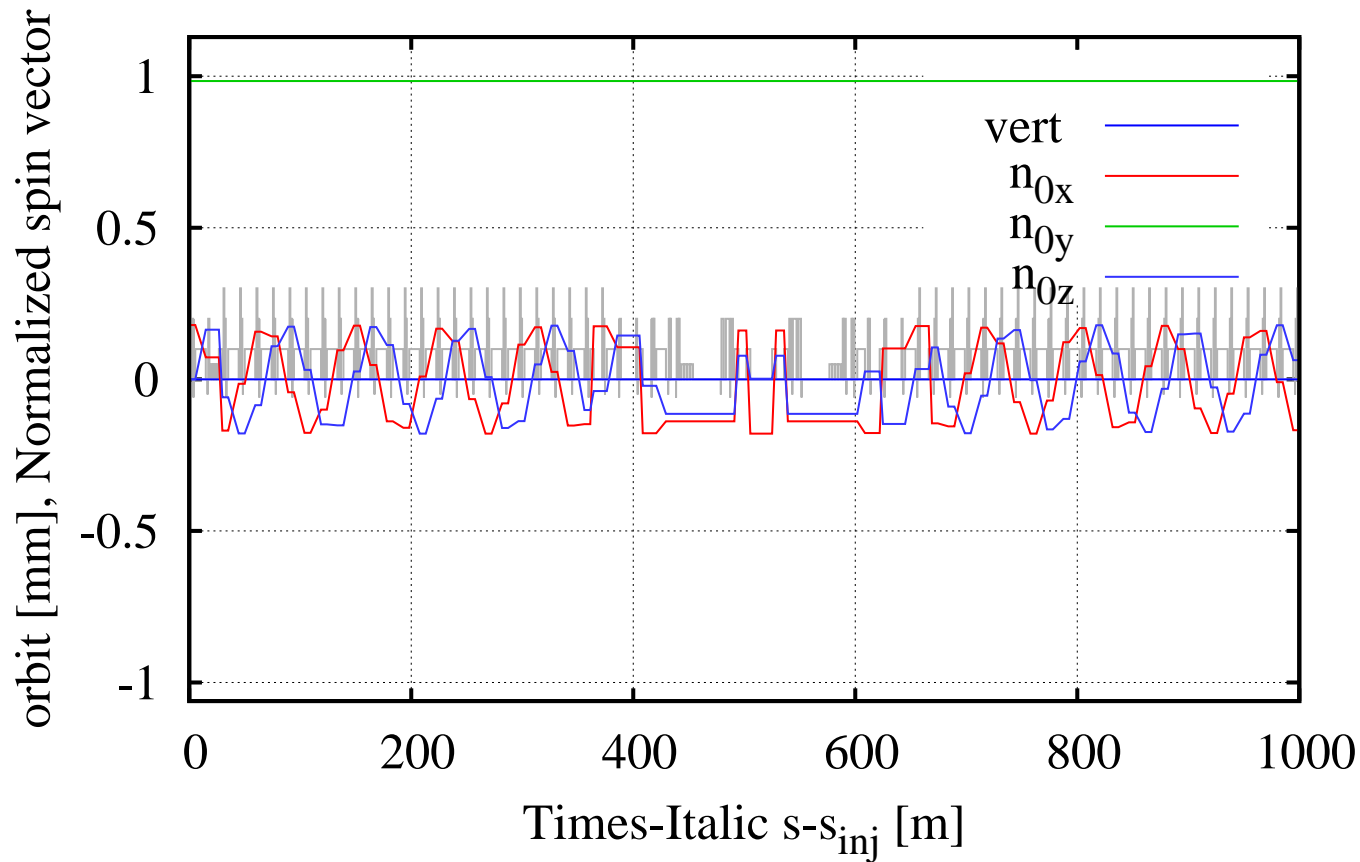
Polarization direction at PHENIX
Waldo MacKay 8 June, 2009

PHENIX Fill 10642 100 GeV B long



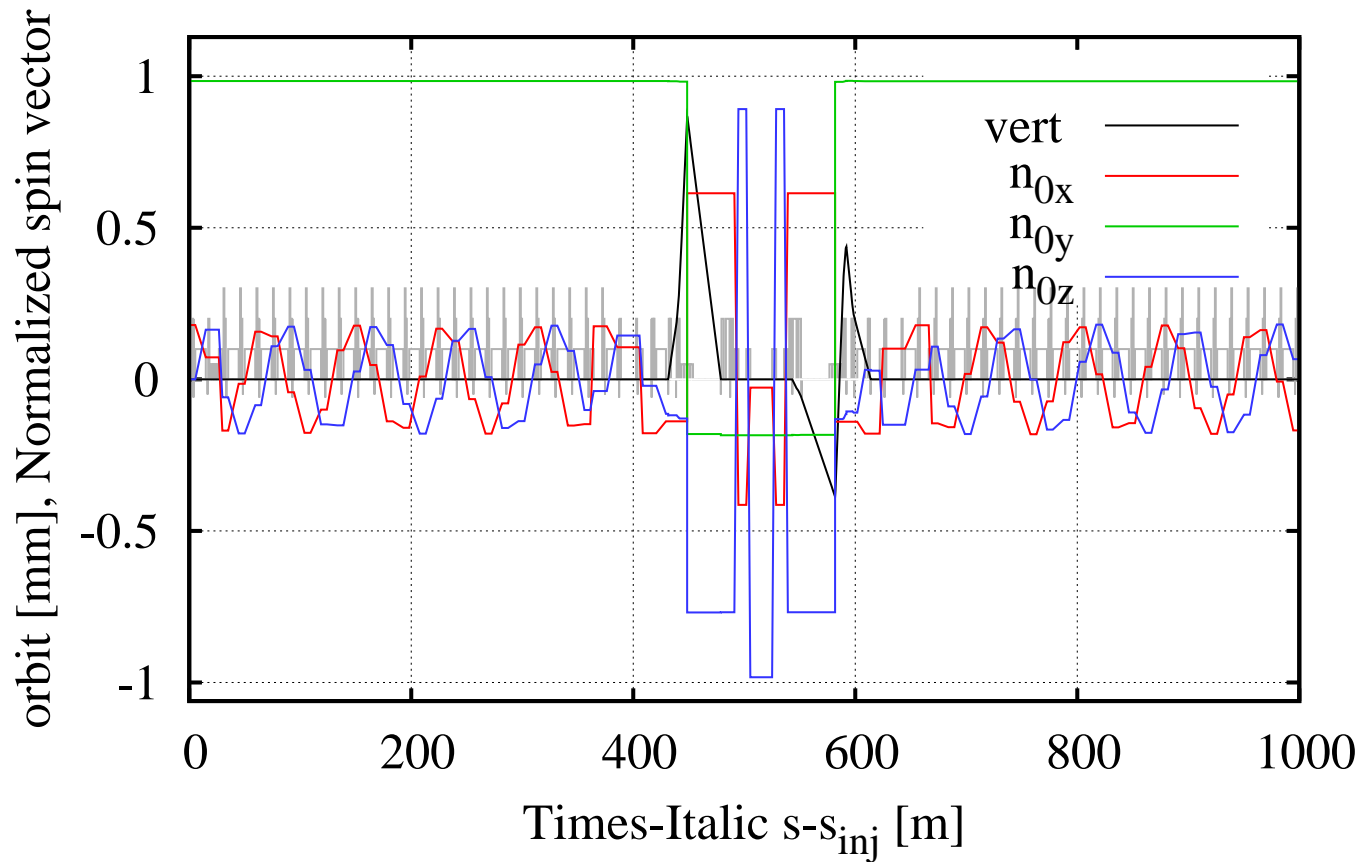
Adjust rotators to remove vertical component of 10° .

Simulation of IP8; rotators off



- Without IP8 rotators, initial spin set to have -10° radial component.

Simulation of IP8; rotators on



- With IP8 rotators, 10° radial component rotators to -10° vertical.

Summary

- At 250 GeV, PHENIX measures changes in spin direction with IR steering.
- At 100 GeV, the blue ring spin is tilted away from the vertical by 10 to 14° without rotators. ($n_x \sim -0.175$)
 - Rotates to vertical with rotators set for longitudinal. ($n_y \sim -0.175$)
 - I haven't identified the source. (Too large for snake errors.)