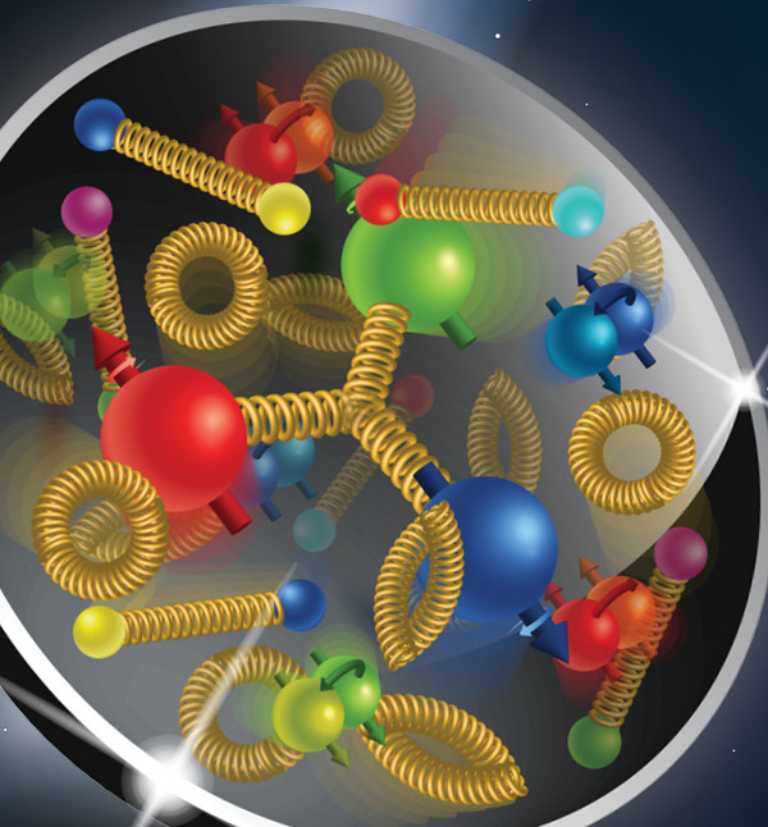


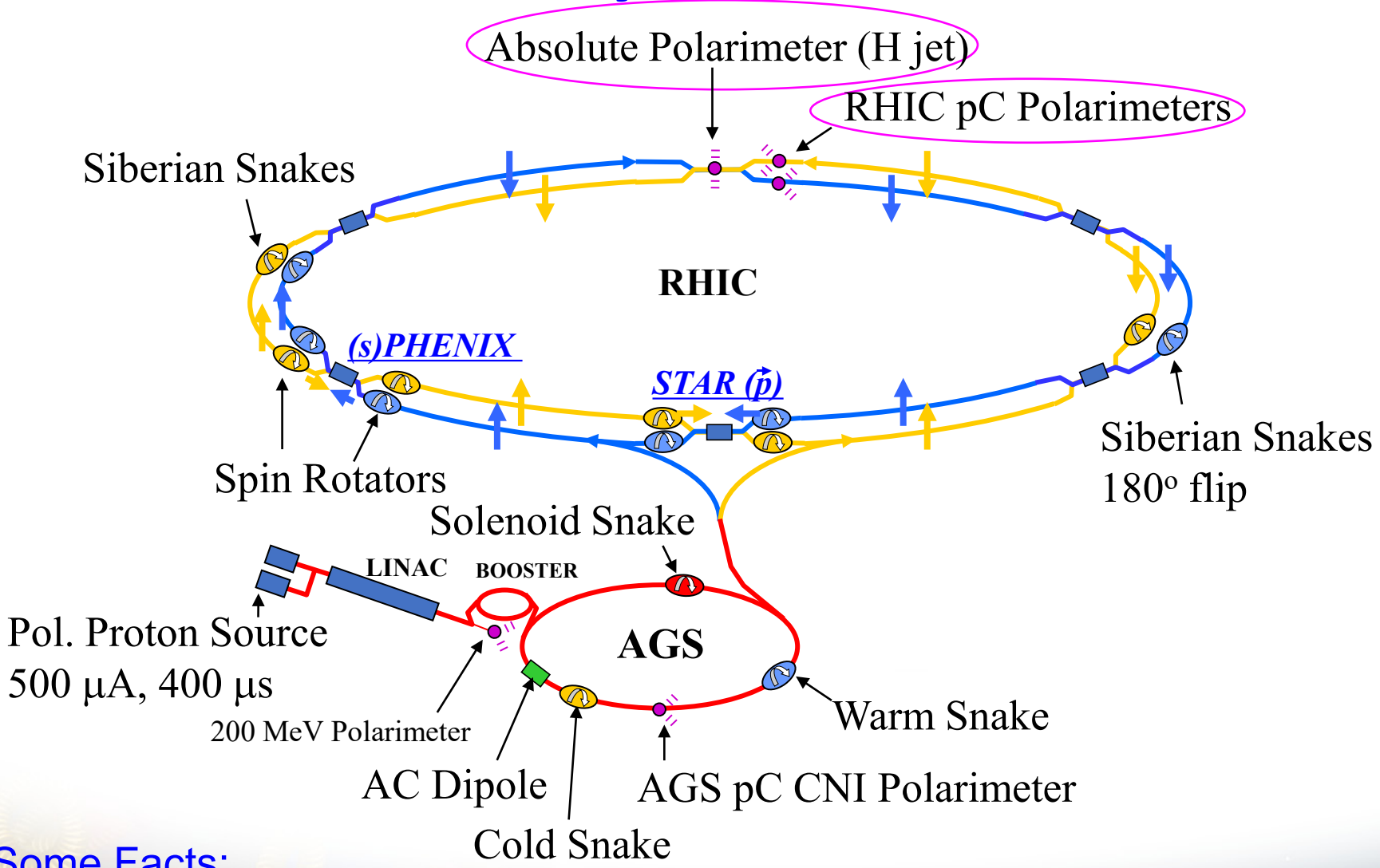
# Do we understand the spin direction in Blue

E.C. Aschenauer



Electron-Ion Collider

# RHIC and Polarimetry

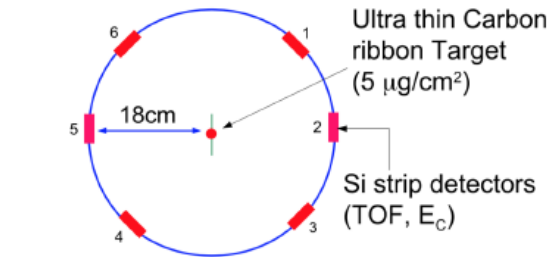
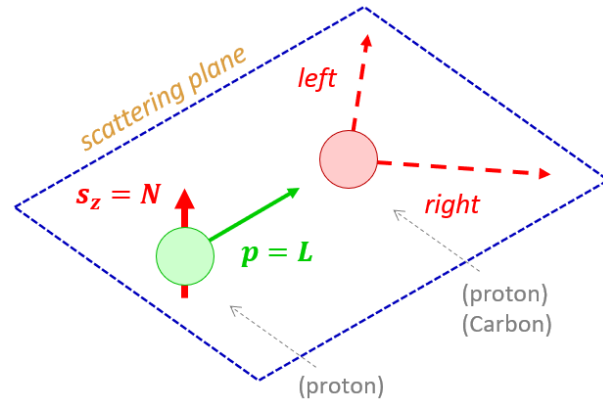
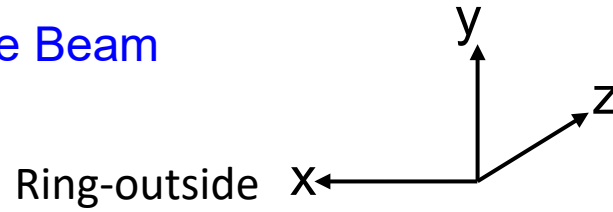


## Some Facts:

CDEV spin direction the one at the source, id even spin flips source to RHIC  
 IP-12 spin direction and source are the same  $\rightarrow$  IP-6 spin direction == **-IP-12**

# pC Polarimetry

Coordinate System: → Blue Beam



**Note:**

$$\Phi = 0 = +y$$

For yellow beam x-axis is flipped  
+x points ring-inside

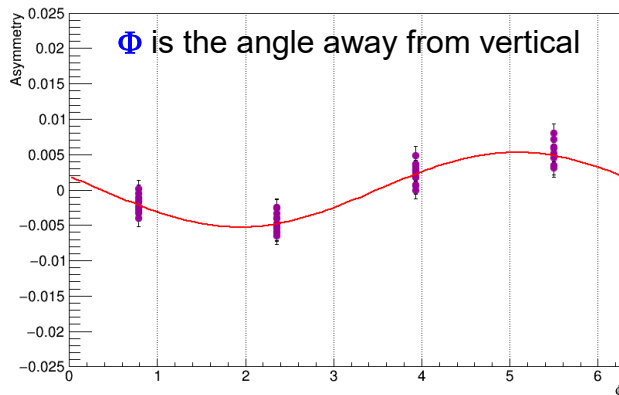
## spin tilts @ store

| $\phi_{pC} (^{\circ})$ | Blu | Yel |
|------------------------|-----|-----|
| Run9-100               | 6   | 5   |
| Run11-250              | 3   | 1   |
| Run12-100              | 3   | 3   |
| Run12-255              | 11  | 7   |
| Run13-255              | 16  | 9   |
| Run15-100 pp           | 3   | 2   |
| Run15-104 pAu          | 0   | -   |
| Run15-104 pAl          | 1   | -   |
| Run17-255              | 12  | 8   |

**Blue:**

+ $\phi_{pC}$ : spin tilted  
towards ring - inside

32877.202: Recorded Mon Dec 20 20:27:03 2021, Analyzed Mon Dec 20 21:17:50 2021, Version v2.2.10M, zchang



$\chi^2 / \text{ndf}$  57.37 / 45  
Prob 0.1021  
Asym  $0.005293 \pm 0.0002589$   
 $\phi$   $0.365 \pm 0.04764$

**B2D**

Polarimeter-Info: <https://www.cnipol.bnl.gov/rundb/>

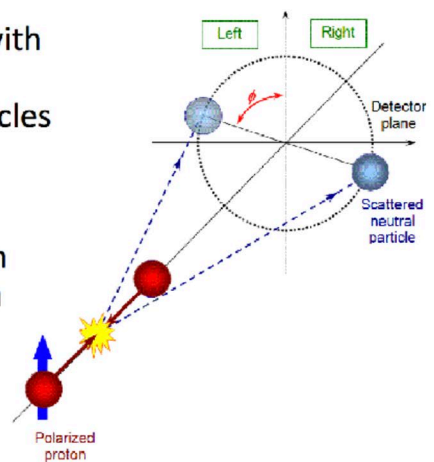
# STAR Local Polarimetry

## Single-spin asymmetry at zero angle

Hadronic calorimeter equipped with Shower Maximum Detector detects very forward neutral particles

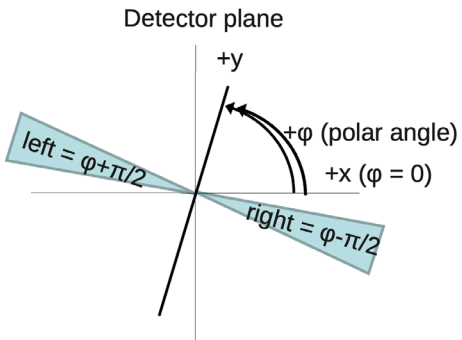
$$p^\uparrow + p \rightarrow n + X$$

Large asymmetry  $A_N$  of neutron production enables its use as a local polarimeter

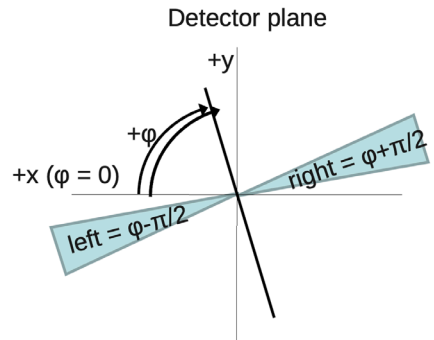


Local polarimeter normally used to ensure beam is longitudinal if spin rotators are used  
 →  $A_N$  disappears if spin is longitudinal

## Geometry definition

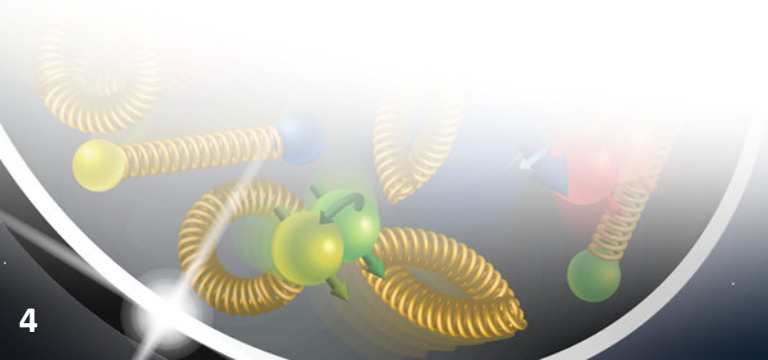


Looking along yellow beam



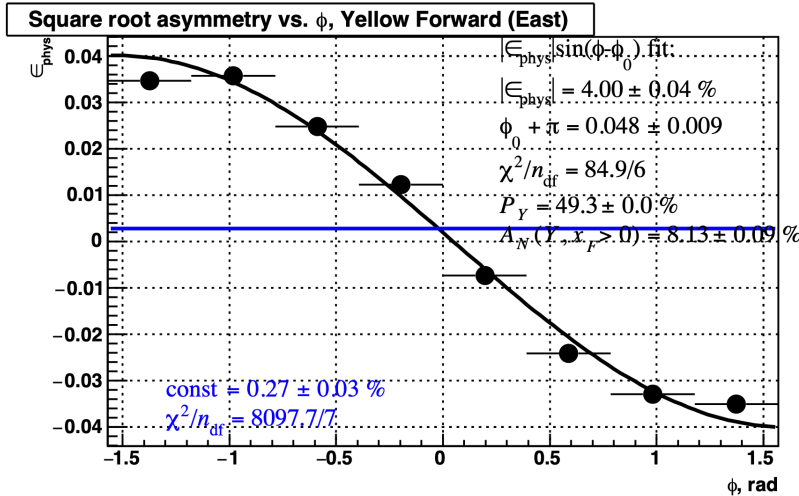
Looking along blue beam

$\epsilon_{phys}$  is a left-right asymmetry with respect to  $\phi = \text{const}$  plane, looking along the incident beam



# STAR Local Polarimetry

## Run-17

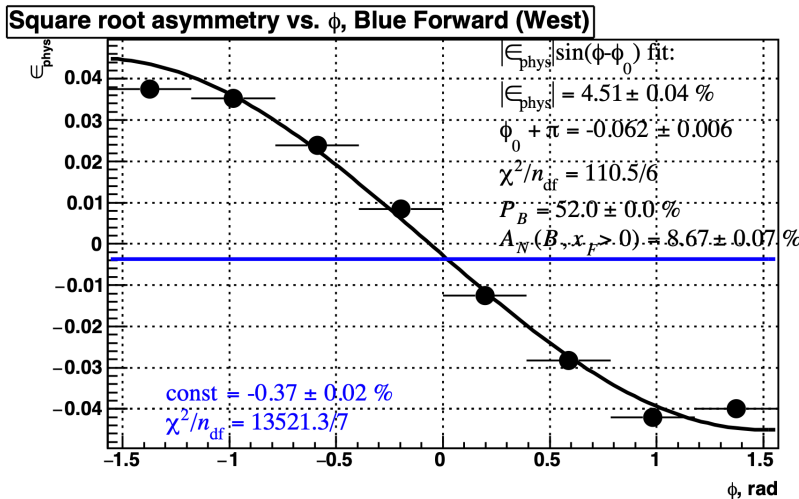


**Note:**

$$1/P \times \epsilon_{\text{phys}} = A_N$$

$$A_N \text{ Yellow} = A_N \text{ Blue}$$

$$\frac{e_{\text{Phys}}^{\text{Blue}}}{e_{\text{Phys}}^{\text{Yellow}}} = \frac{P_B}{P_Y}$$



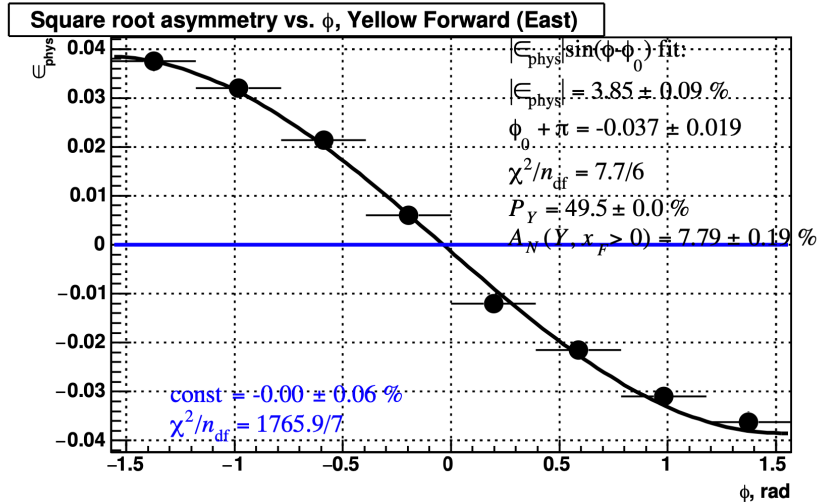
**All worked out in Run-17**

ZDC Single Spin Asymmetry (run 18074020)

Wed Mar 15 09:34:01 2017

# STAR Local Polarimetry

## Run-22



Yellow:

$A_N$  &  $\epsilon_{\text{phys}}$

Run-22 consistent with Run-17

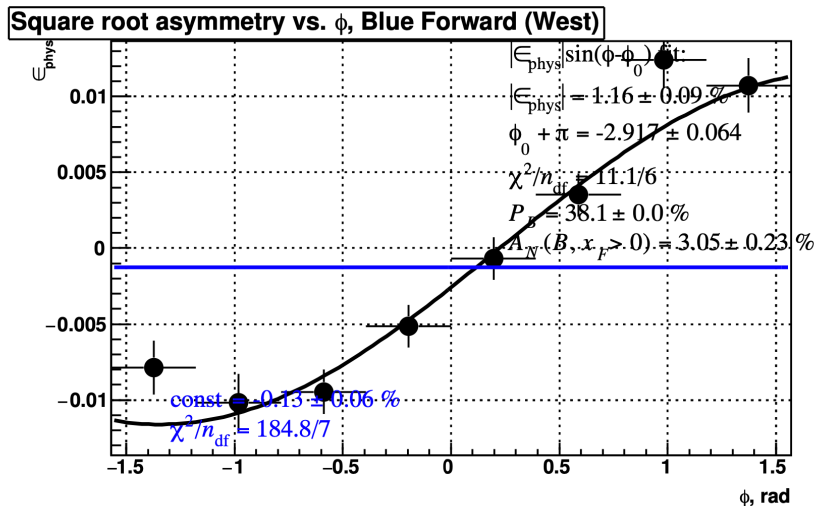
Note:

$\epsilon_{\text{phys}}$  – blue 1/3 of  $\epsilon_{\text{phys}}$  – yellow

$A_N$  Yellow and  $A_N$  Blue do not agree still different by 2.55

this would need  $P_{\text{Blue}}$  to be significantly higher

→ only explanation significant longitudinal component at STAR



ZDC Single Spin Asymmetry (run 22355037)

Tue Dec 21 12:52:37 2021