Spin Program Status

~~D. Fields, UNM and RBRC~~

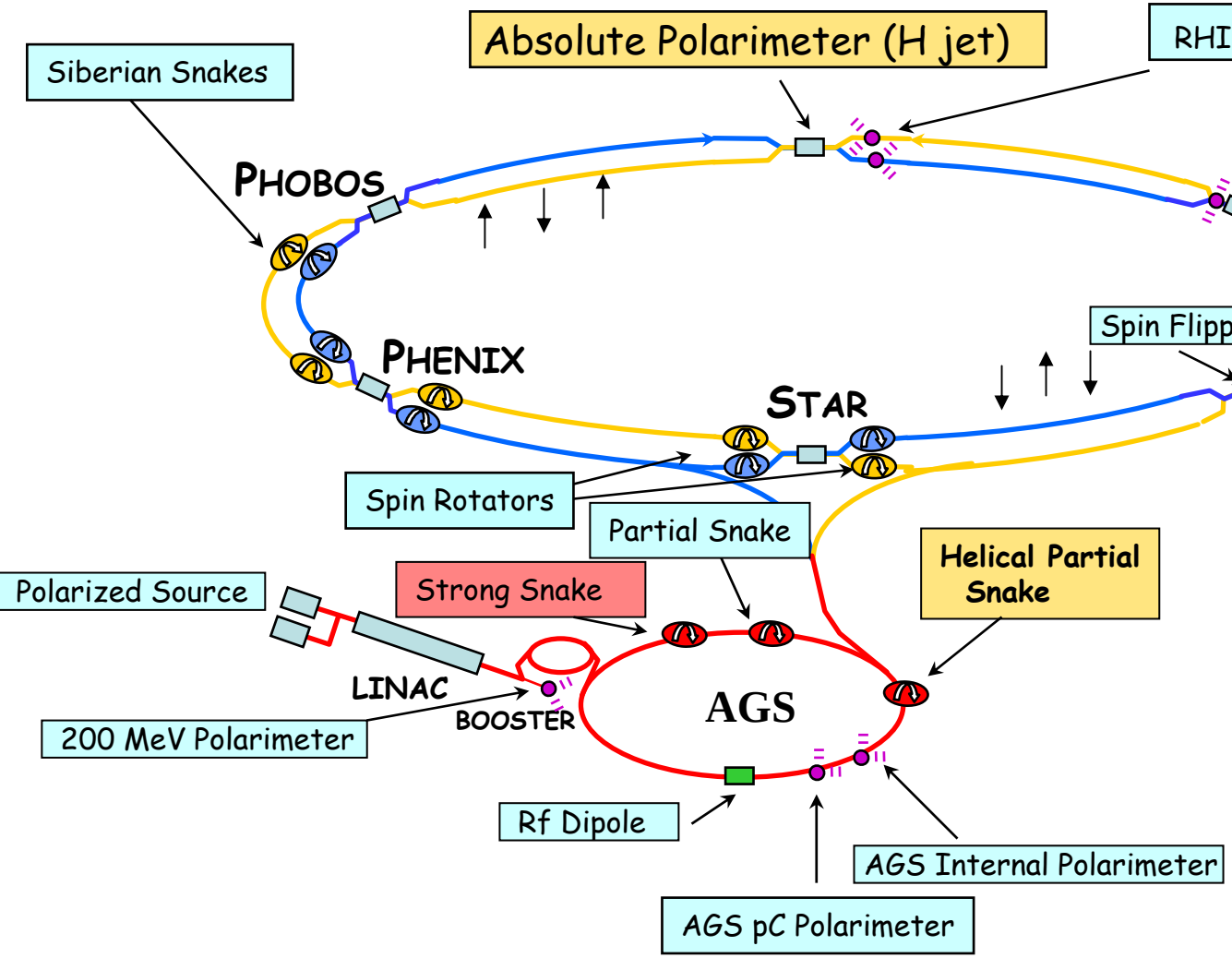
Matthias Grosse Perdekamp, UIUC and RBRC

(NSAC talk)

The successful Development of a novel Experimental Method:

Polarized Proton Collisions!

source: Thomas Roser, BNL



Run 04 achieved:

$\sqrt{s} = 200\text{GeV},\ L_{peak} \sim 6\times10^{30}\ \text{cm}^{-2}\,\text{s}^{-1}$

P_b~45% , 55 bunches
New working point with long beam and polarization lifetimes

Run 05 planned:

Time to tune accelerator complex
Measure: A_{LL}(jets), $A_{LL}(\pi^0)$
Commission strong supercon-ducting AGS snake (see M. Bai's talk)

Run 04: The Polarized Jet Target for RHIC

Courtesy Sandro Bravar, STAR and Yousef Makdisi, CAD

Polarized Hydrogen Gas Jet Target

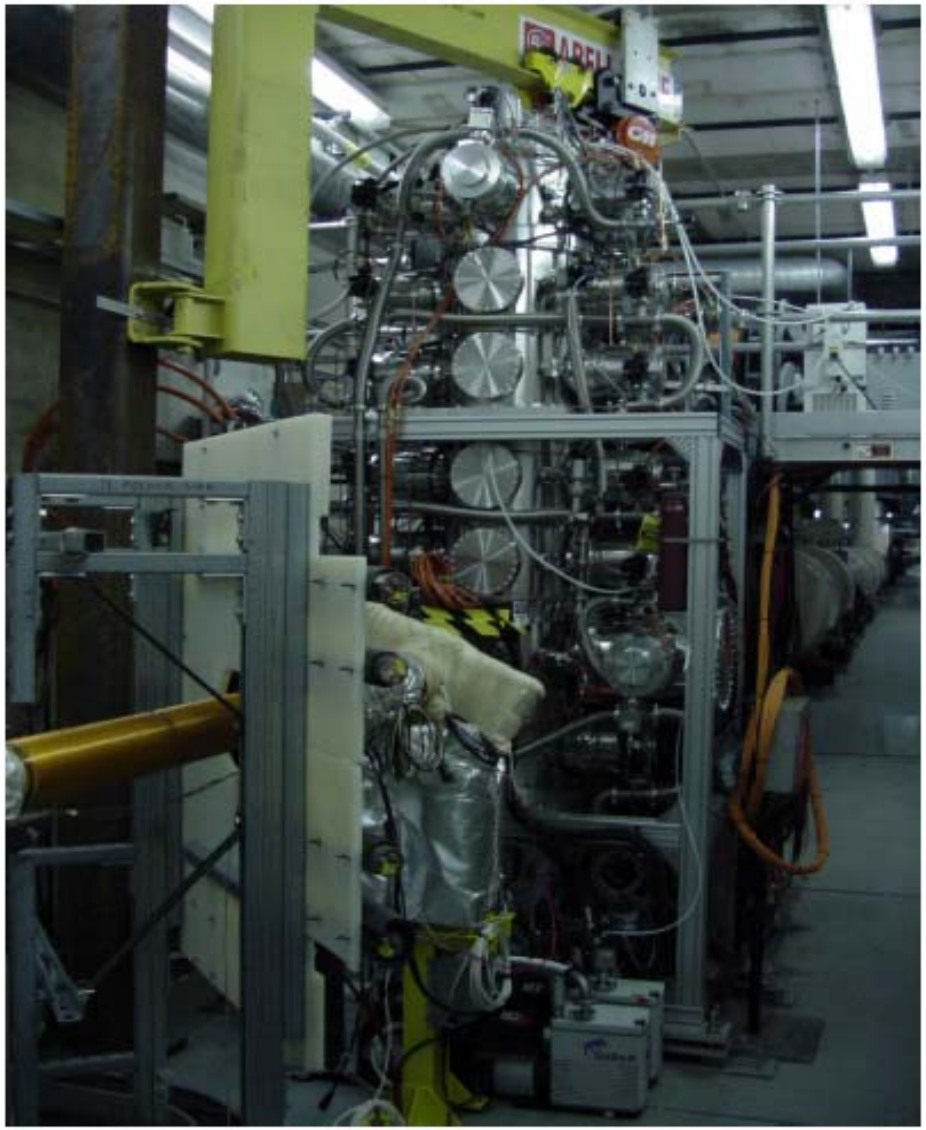
thickness of > 10^{12} p/cm^2

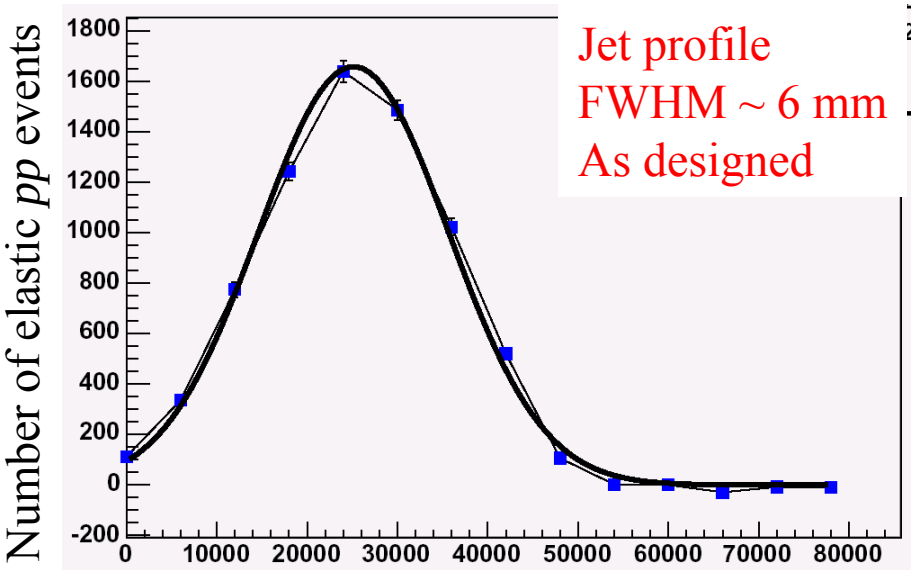
polarization > 93% (+1 −2)%!

no depolarization from beam wake fields

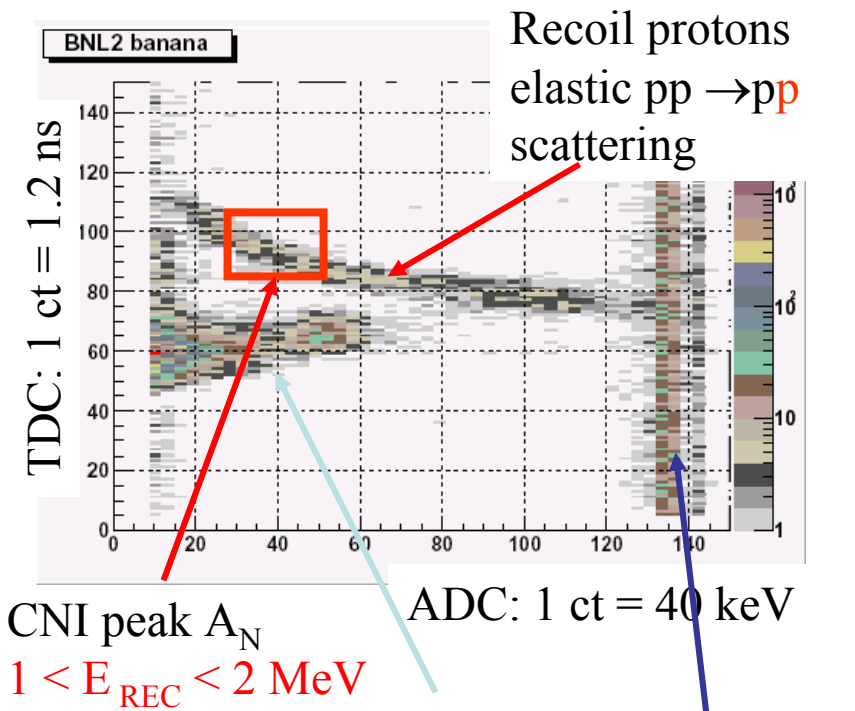
Silicon recoil spectrometer to measure

- The left-right asymmetry A_N in pp elastic scattering in the CNI region to $\Delta A_N < 10^{-3}$ accuracy.
- Transfer this to the beam polarization
- Calibrate the p-Carbon polarimeters
- In 2004 we expect to measure P_B to 10%





Hor. pos. of Jet 10000 cts. = 2.5 mm



Data collected so far in this run:

- 100 GeV ~ 700,000 events at the peak of the analyzing power (~ 3 x 10^6 total useful *pp* elastic events)
- 24 GeV ~ 120,000 events at the peak of the analyzing power (~ 5 x 10^5 total useful *pp* elastic events)

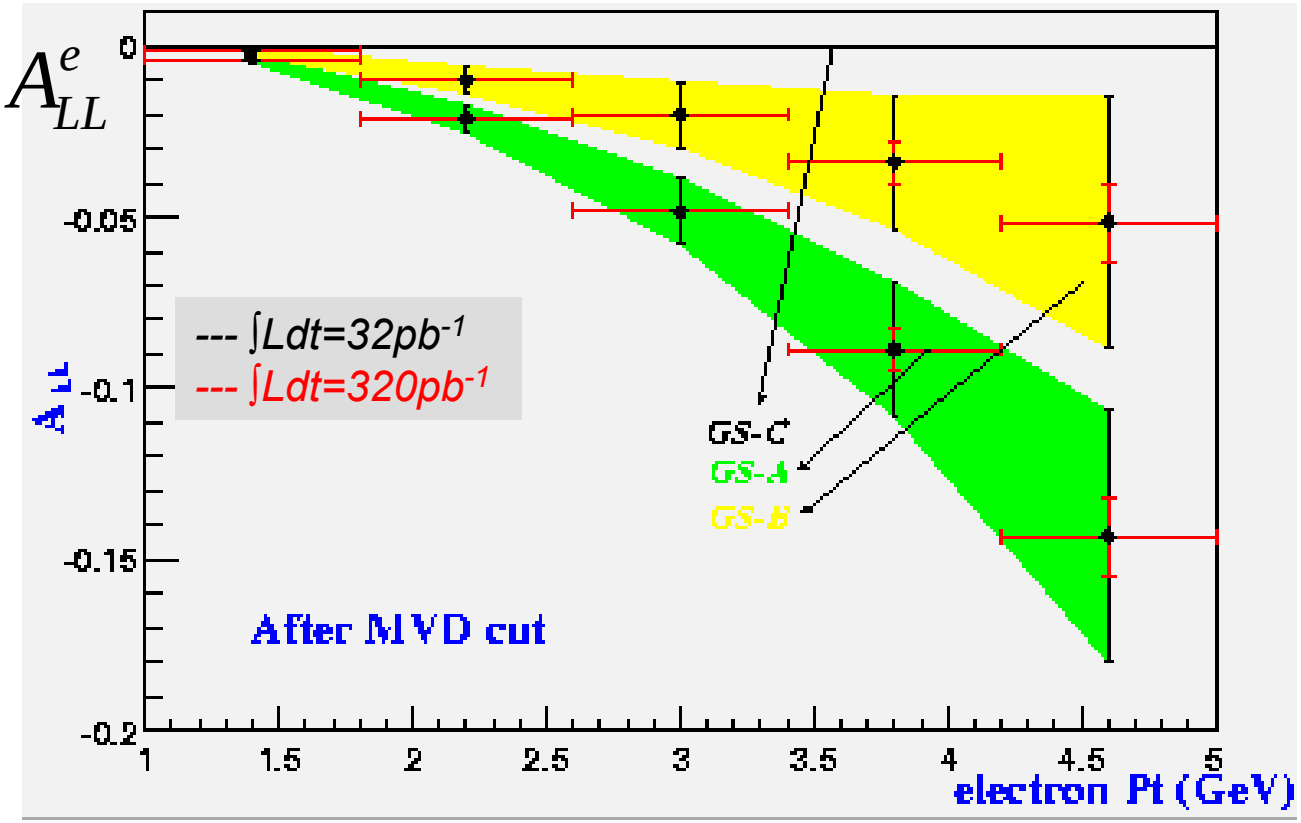
Spin Physics Overview

Physics – Signal	PHENIX can see
Single transverse-spin asymmetry	
– neutron	– neutrons in ZDC/SMD
– π^0	– $\gamma\gamma$ in EMCal
– charged hadron	– charged hadron (BBC / Central)
– single muon from π decay	– single muons in Muon Arms
– transversity	– A_T, A_{TT} Drell-Yan di-muons
Gluon polarization	
– jet production/direct photons	– leading high p_t in Central Arms
– open heavy flavor	– e, μ, eμ, $\mu\mu$, and $D\rightarrow\pi K$
– J/ψ	– ee, $\mu\mu$ in Central and Muon Arms
Flavor decomposed quark polarization	
– $W^{\pm}$	– high p_T $\mu^{\pm}$ in Muon Arms

Gluon Polarization at Moderate Luminosity: Charm Production: *(∫Ldt > 30pb^{-1}, P>0.6)*

from Wei Xie, PHENIX

A_{LL} for single electrons in PHENIX



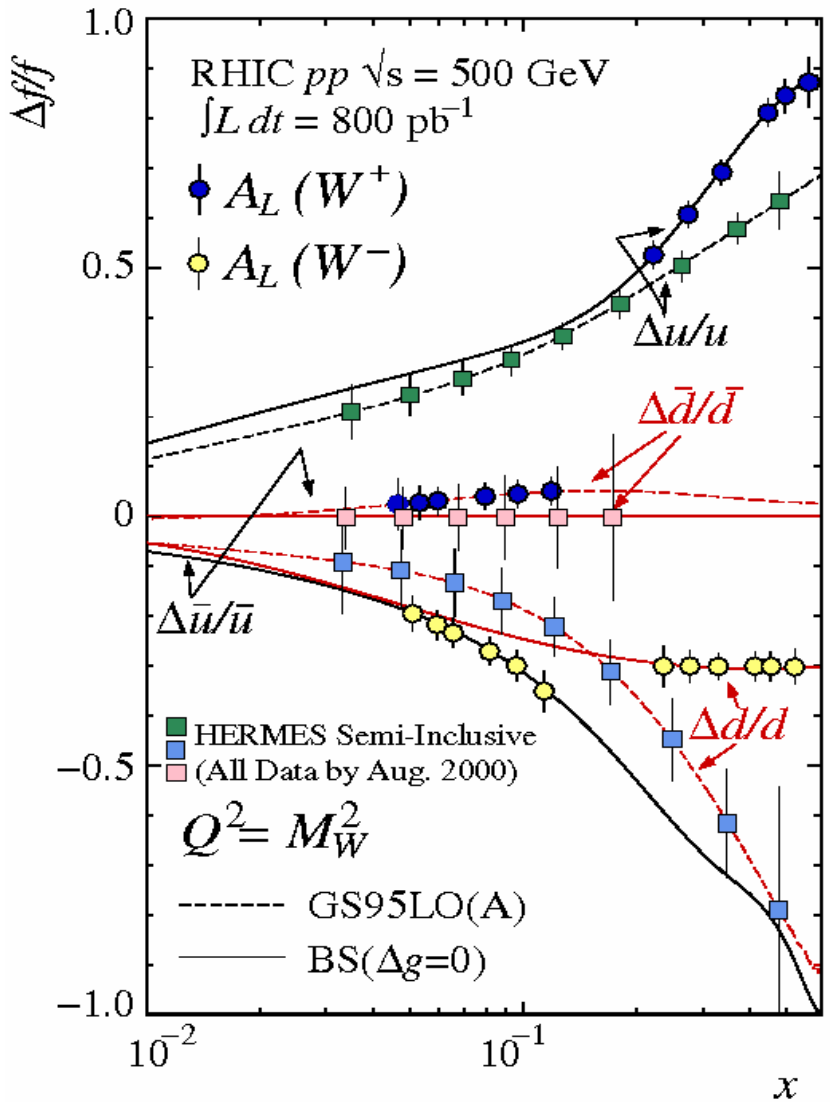
Silicon Vertex Detector Upgrade!

GS-A/B/C:

$\Delta G(x_g)$ parametrization from Gehrmann and Stirling Phys.Rev. D53 6100-6109,1996

$\int G_A(x)dx = 1.8$
$\int G_B(x)dx = 1.6$
$\int G_C(x)dx = 0.2$

Quark Polarization: RHIC vs HERMES

from Naohito Saito, PHENIX

- W-production at RHIC
  - No fragmentation ambiguity
  - *x*-range limited
- Semi-inclusive DIS
  - Wide *x*-range
  - Limited sensitivity to sea flavors
  - Fragmentation functions poorly known at low scales (HERMES)