PHENIX Local Polarimeter Readiness for RUN03

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For

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RHIC Spin Meeting

02/21/03

Local Polarimeter for RHIC Experiments

- The stable direction of the proton spin vector in the RHIC ring is vertical.
- For all A_LL measurements in the PHENIX and STAR spin program the proton spin direction has to be longitudinal → **Use Spin Rotator Magnets (SRMs)**
- Calibration and monitoring of the SRMs is being discussed in the context of PHENIX and STAR "local polarimetry"

Principle of Local Polarimetry for PHENIX

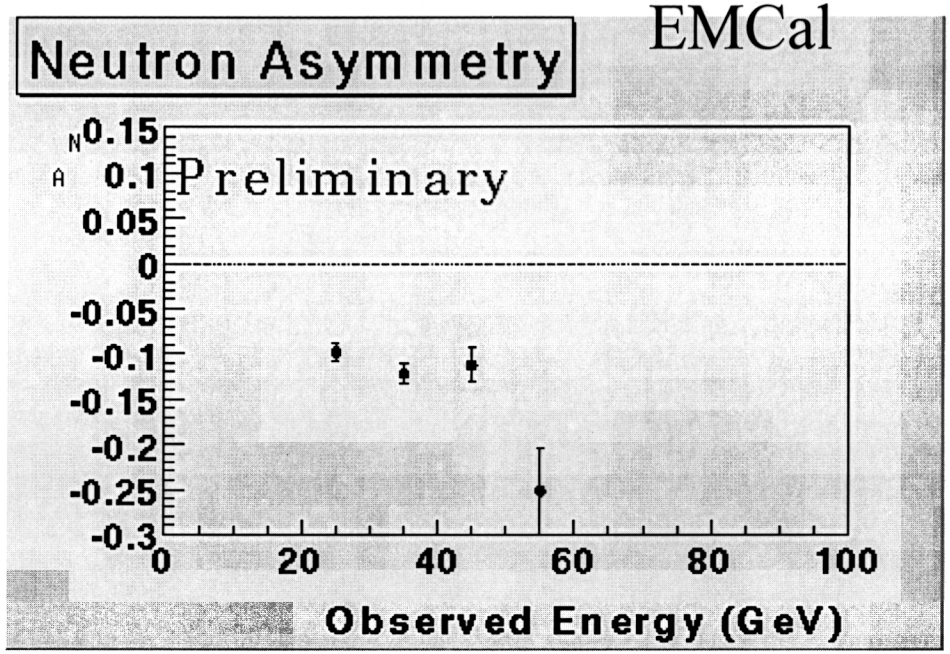
- **Recall:**

  RHIC Run 02, Experiment at IP12

  Search for analyzing power (A_N) in neutral pion and neutrons in transverse pp scattering

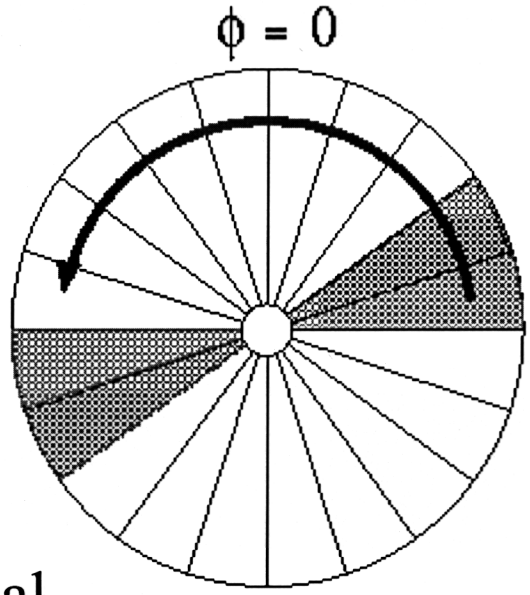
  → Observed large analyzing power in neutron production using a lead tungstate electromagnetic calorimeter, confirmed by an independent measurements using ZDC and a pre-shower detector.

EMCal



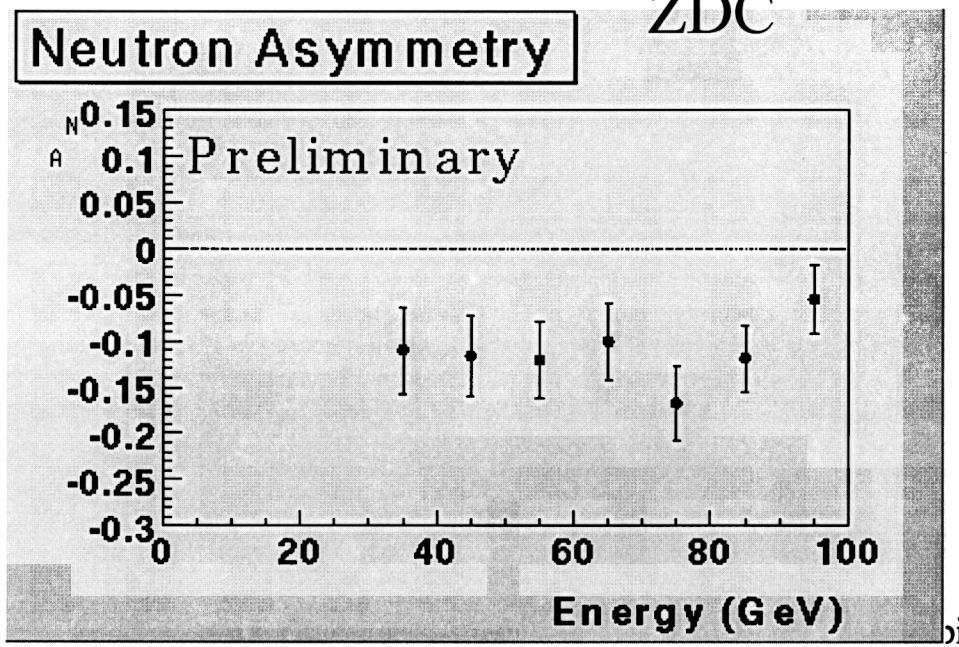
$\langle A_N \rangle = -0.109 \pm 0.0072$

Run 2 IP12
Results
Y. Fukao
Spin 2002

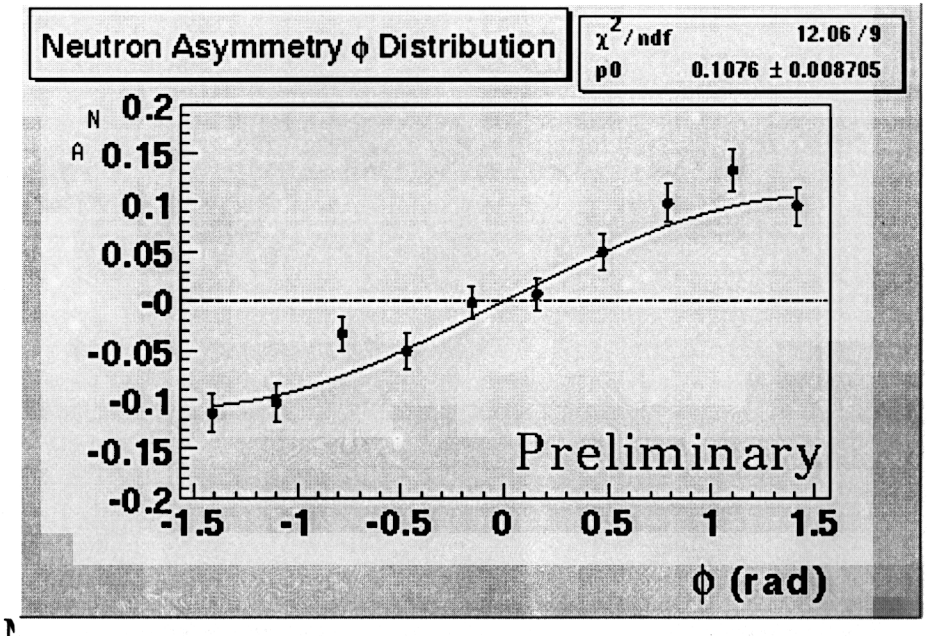


EMCal

ZDC



$\langle A_N \rangle = -0.110 \pm 0.015$



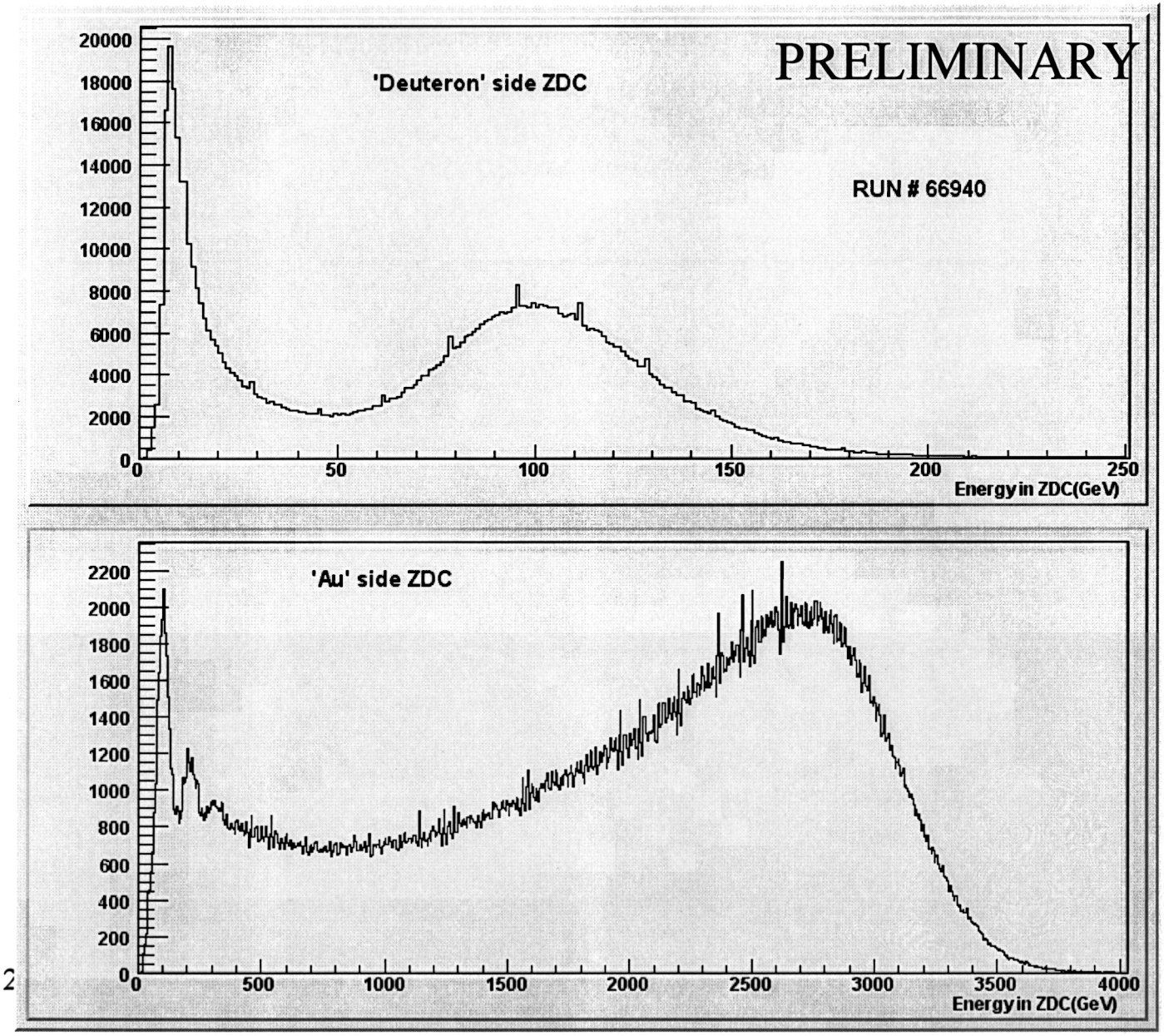
$\langle A_N \rangle = -0.108 \pm 0.0087$

Phenix Local Polarimeter
ZDC Shower Max Detector

- Construction & Design: A. Denisov, S. White
- Commissioning: A.Denisov, W. White, M. Chiu, + 2
- **Polarimetry Issues:** A. D., B. Fox, Y. Fukao, N. Saito, K. Tanida, M. Togawa

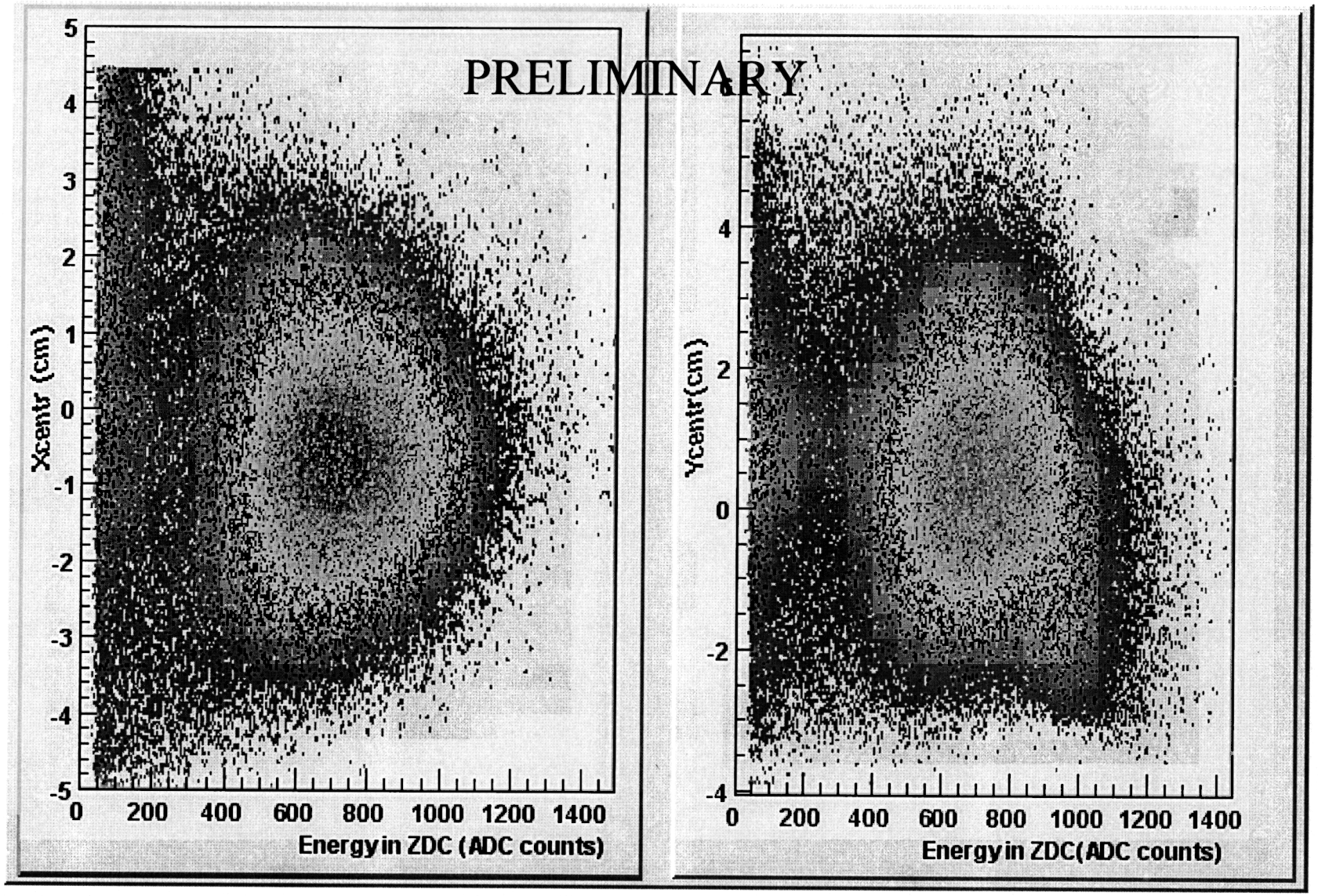
- ZDC Design known to all….
- Shower Max Detector (SMD):
  8 vertical & 7 horizontal scintillator strips cover the ZDC face
- SMD inserted between the first and the second ZDC unit
- Individually read out
- Sub-centimeter position resolution demonstrated

ZDC Operation in d-Au Run

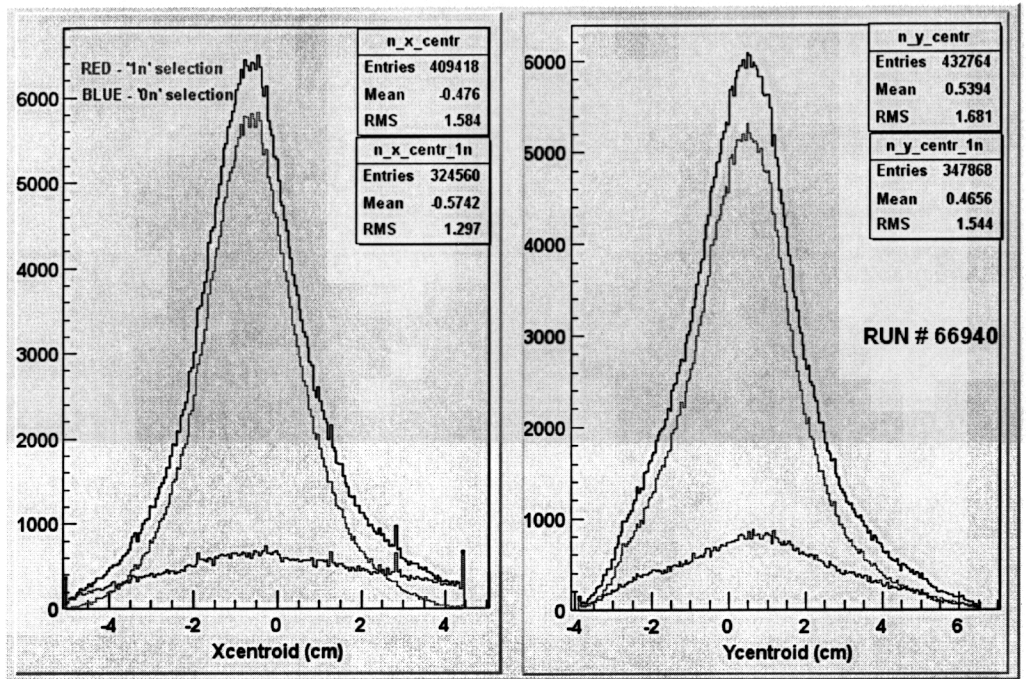


A. Denisov

ADC counts vs. x/y centroids (no cuts)

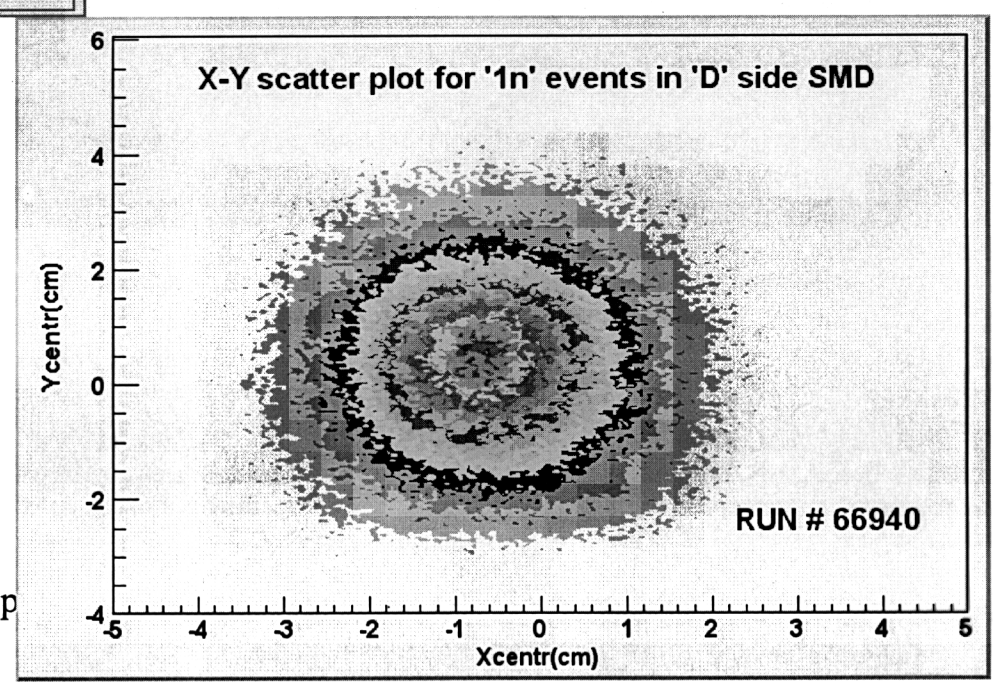


X centroids and Y centroids

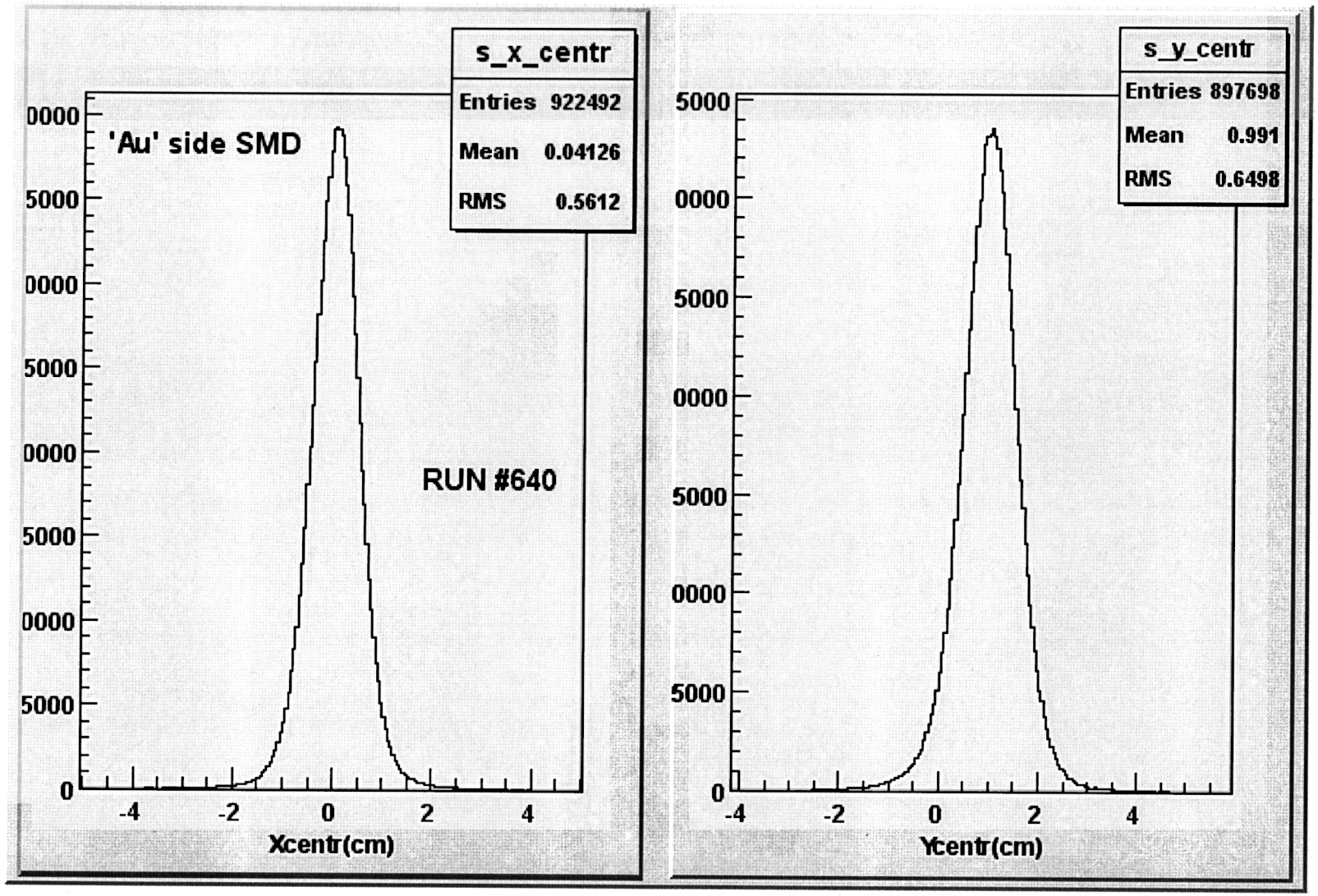


Select "1 neutron" events

PRELIMINARY



Position Resolution PRELIMINARY



Hardware in place

Detector Works

Basic software is ready

but

NOT

IN PHENIX

STANDARD CVS

DIRECTORY YET….

work in progress

Plan of action:

- Bring ZDC-SMDs back to the center (d-Au vs. p-p angles in experimental area)

- Trigger plan during commissioning of SRMs:
  BBC_NS (collision)+ZDC_N(neutron)
  BBC_NS (collision)+ZDC_S(neutron)

- Software setup: in progress
  → Basic BBC readout software ready & working in PHENIX
  → ZDC readout software ready & working in PHENIX
  Modifications to read SMD in PHENIX being implemented this week
- To be incorporated in to the PHENIX LVL2 Trigger Framework
  → After that it could also be incorporated in to the PHENIX On-Line-Monitoring (OnCal)

- Plan to test the entire chain during the d-A run and be ready at the beginning of the pp commissioning period.

Spin Rotator Magnet Calibration Day:

- Weekly Discussions with Waldo M., Les B., A. D. et al.
- Step 1
  - -- Get zero current reading for orientation of proton spin
  - -- Confirms our past results check for consistency as part of the full commissioning of the local polarimeter
- Step 2
  - -- turn on I_in & I_out and step through about 8-10 settings of SRM Currents
  - -- at each step confirm with CNI measurement that polarization is preserved
  - -- assuming 40% beam polarization and the analyzing power of IP12 time estimate for 3-4 sigma asymmetries is about 1-1.5 hrs
  - -- analyze data – online + in PHENIX LEVEL 2 trigger formalism
  - -- 10 minutes after end of run call up MCR and indicate the value of asymmetry seen at PHENIX
  - -- Change I_in and I_out and repeat the process (step 2)
- Estimate that there will be about 8 settings needed to arrive at the best guess of the zero angle point. ➔ 2hrs X 8 = 16hrs/beam
- Including contingency, this whole thing will take about 1 to 1.5 day for one ring.