SANE

Hovhannes Baghdasaryan
University of Virginia
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Outline

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- Motivation
- Experiment
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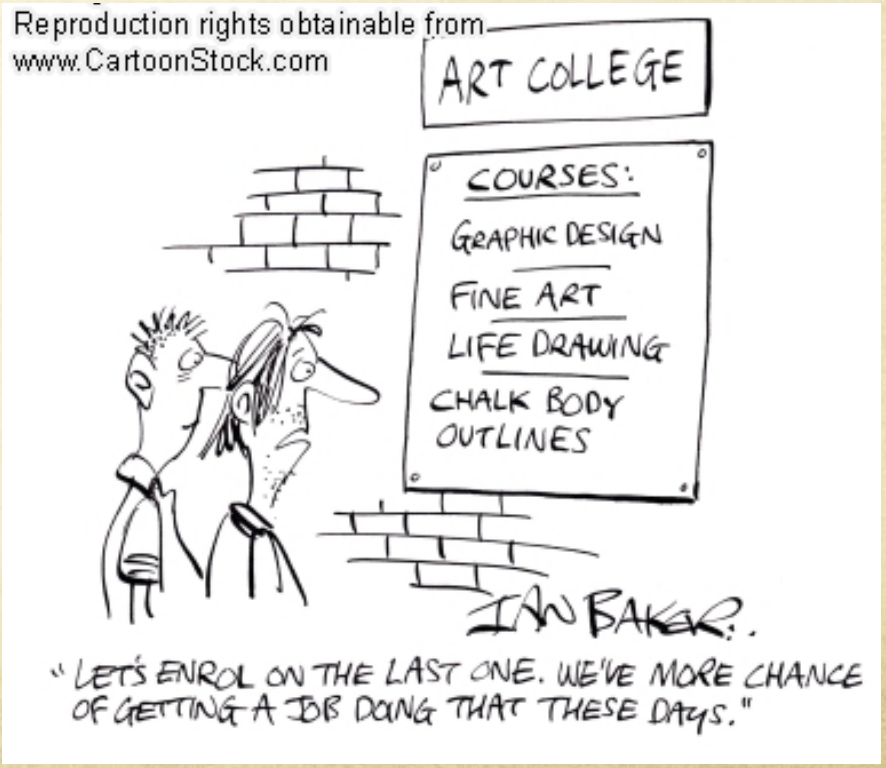
- What still needs to be done
- Summary



Goal of the experiment

- Measure A_{80} and $A_{||}$
- Extract A_{1p} and A_{2p}
- Extract g_{1p} and g_{2p} (Spin Structure Functions)
- Calculate Twist 3 matrix element $d_2 = \int_0^1 x^2(2g_1 + 3g_2)\,\mathrm{d}x$

(Quantifying quark – gluon interactions)

- Probe the Approach of A_1 to x=1 at constant Q^2 to test quark models and pQCD

Extraction

$$A_{80} = \frac{D \cdot E'}{W_1}(2 \cdot G_2 \cdot E \cdot (cos(\theta)cos(80) - cos(80) + sin(80) \cdot cos(\phi) \cdot sin(\theta)) + G_1 \cdot M_p \cdot (cos(80) + cos(\theta) \cdot cos(80) + sin(80) \cdot cos(\phi) \cdot sin(\theta)))$$

$$A_{180} = \frac{D}{W_1}((E + E' \cdot cos(\theta)) \cdot M_p \cdot G_1 - Q^2 \cdot G_2)$$

Solve for $\frac{M_p \cdot G_1}{W_1}, \frac{G_2}{W_1}$ which can be used to extract A_1 and A_2

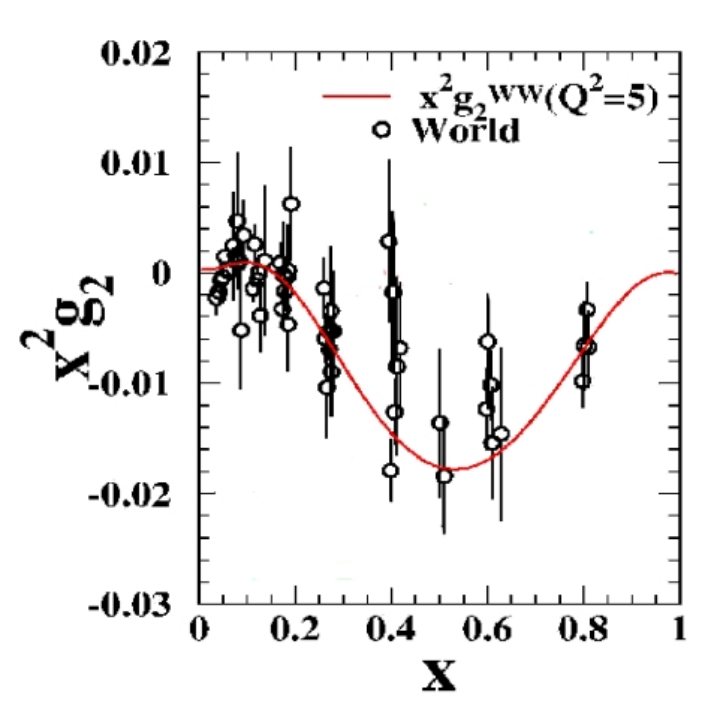
$$A_1 = \nu \cdot \frac{M_p \cdot G_1}{W_1} - Q^2 \cdot \frac{G_2}{W_1}$$

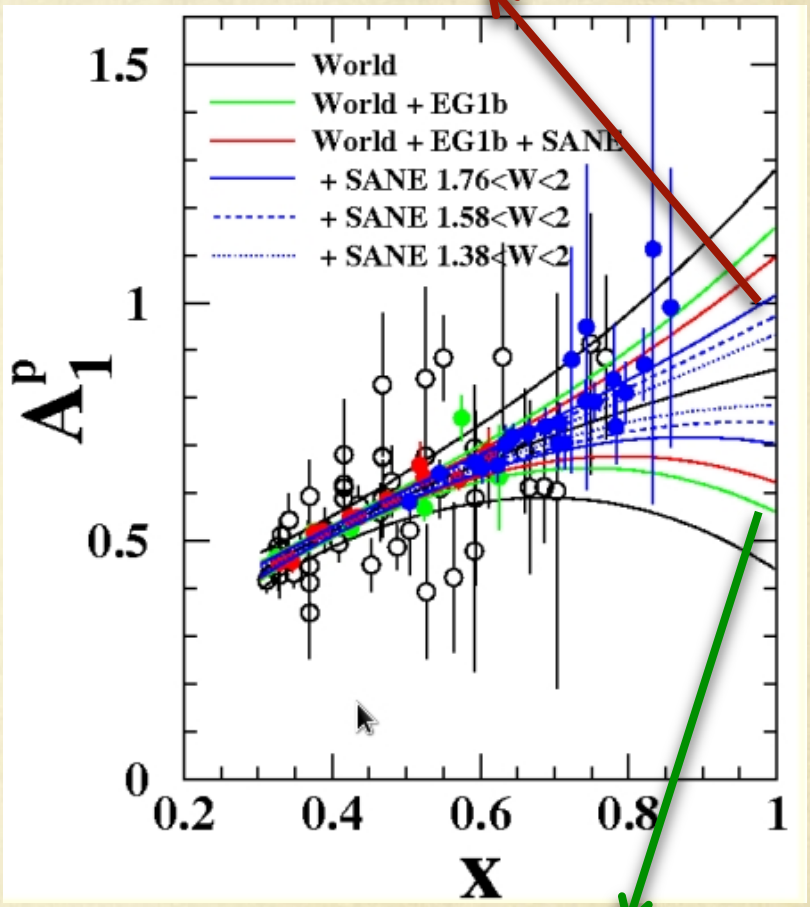
$$A_2 = \sqrt{Q^2}(\frac{M_p \cdot G_1}{W_1} + \nu \cdot \frac{G_2}{W_1})$$

A_1 and A_2 are obtained in model independent way using experimental asymmetries only

Motivation

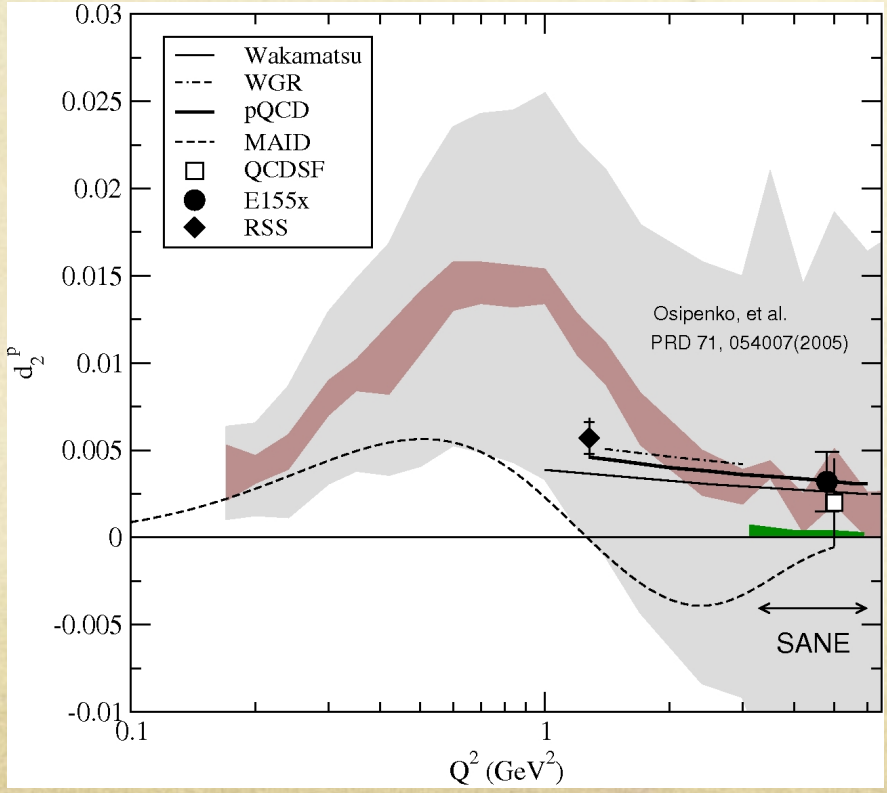
- World Data (or lack of it)
  - Little data on A_{2p}
  - A_{1p} data (assumption)
  - Low precision data for g_{2p}

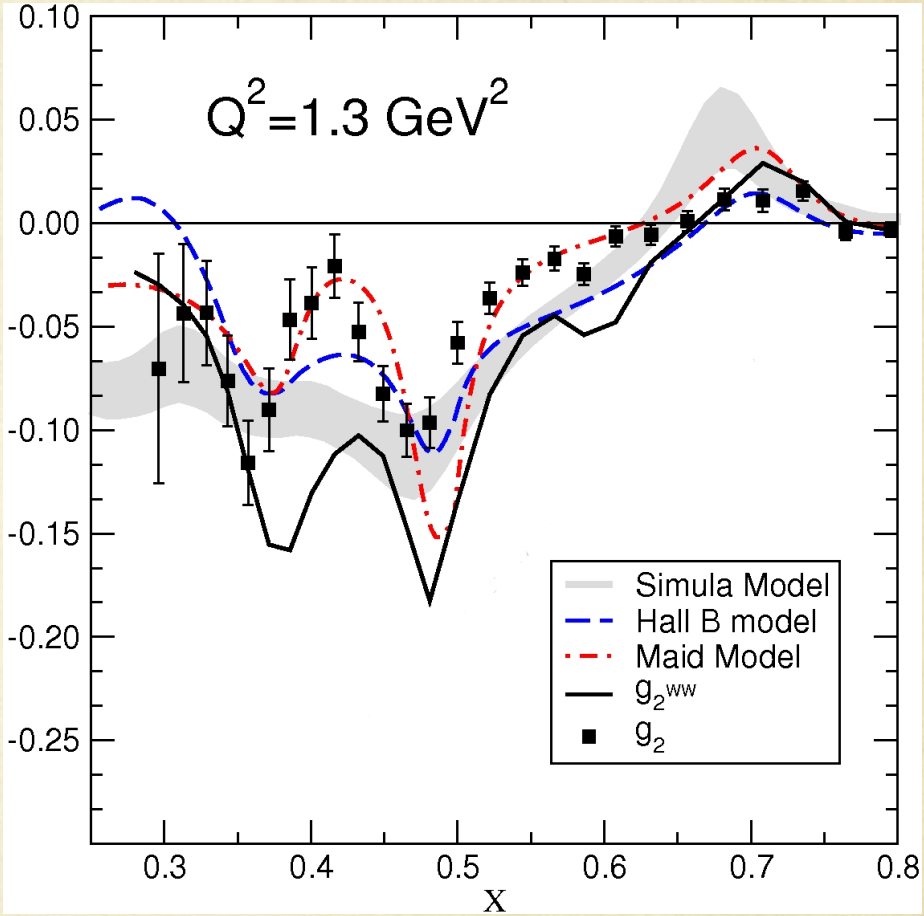




Motivation

- Recent Data from RSS
- Little info on d_2





EXPERIMENT

Hall-C –TJNAF

UVA NH_3 Polarized target

80 and 180 degree

Electron arm BETA detector

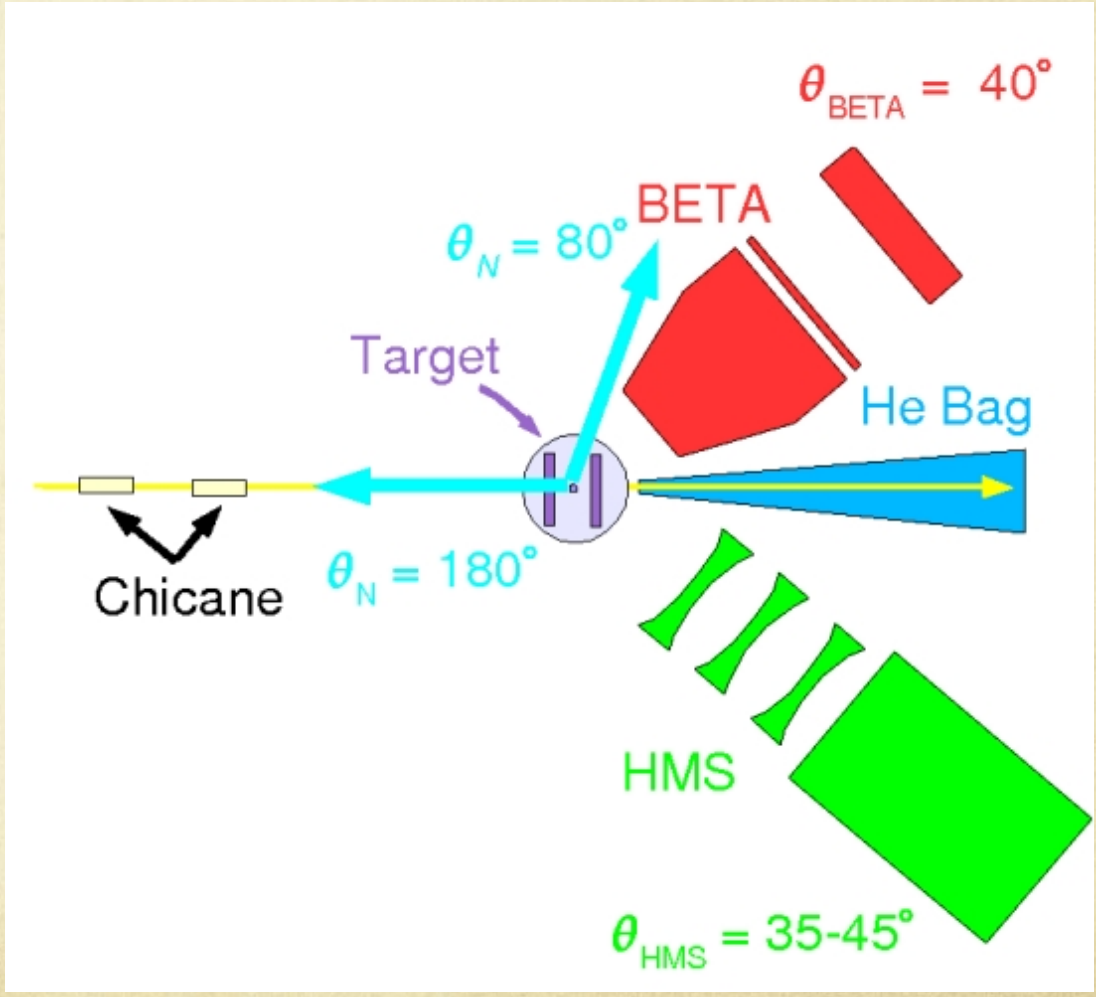
Tracker (Regina, NSU)
Cerenkov (TEMPLE)
Lucite (NC A&T)
BigCal

HMS arm

15-45°

BEAM

80-100nA current
Chicane
He bag



Run Info

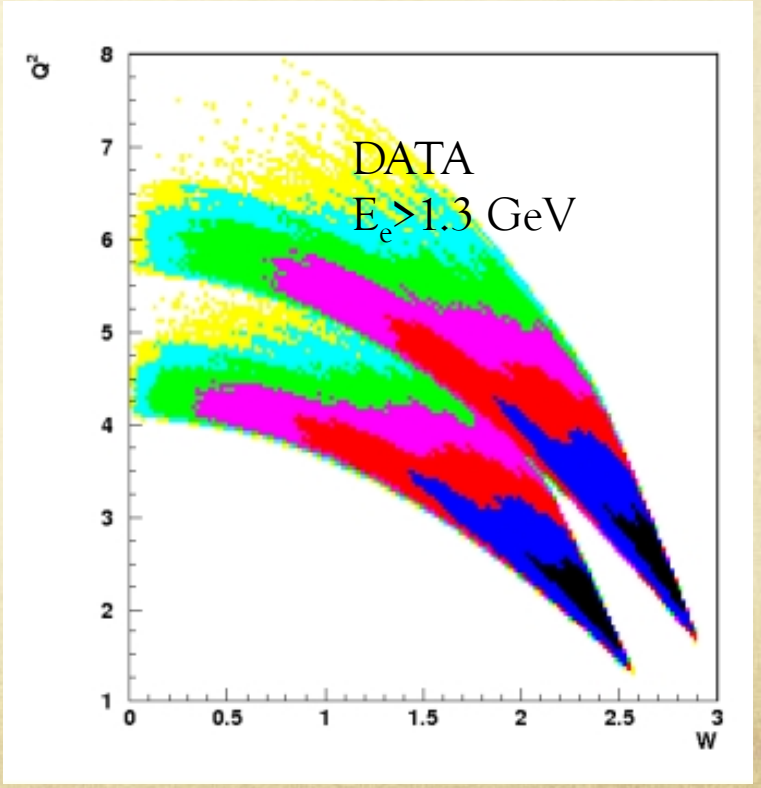
- **Experiment run Feb – Mar 2009**
- **Energy/field Beam Pol* Proposed /FOM****

4.7 GeV Parallel	66%	39%
5.9 GeV Parallel	88%	35%
4.7 GeV Perp	85%	58%
5.9 GeV Perp	71%	62%

Target Pol 69%

(*) Measured by Moller polarimeter

(**) FOM=$(P_{targ}*P_{Beam})^2*I_{Beam}$



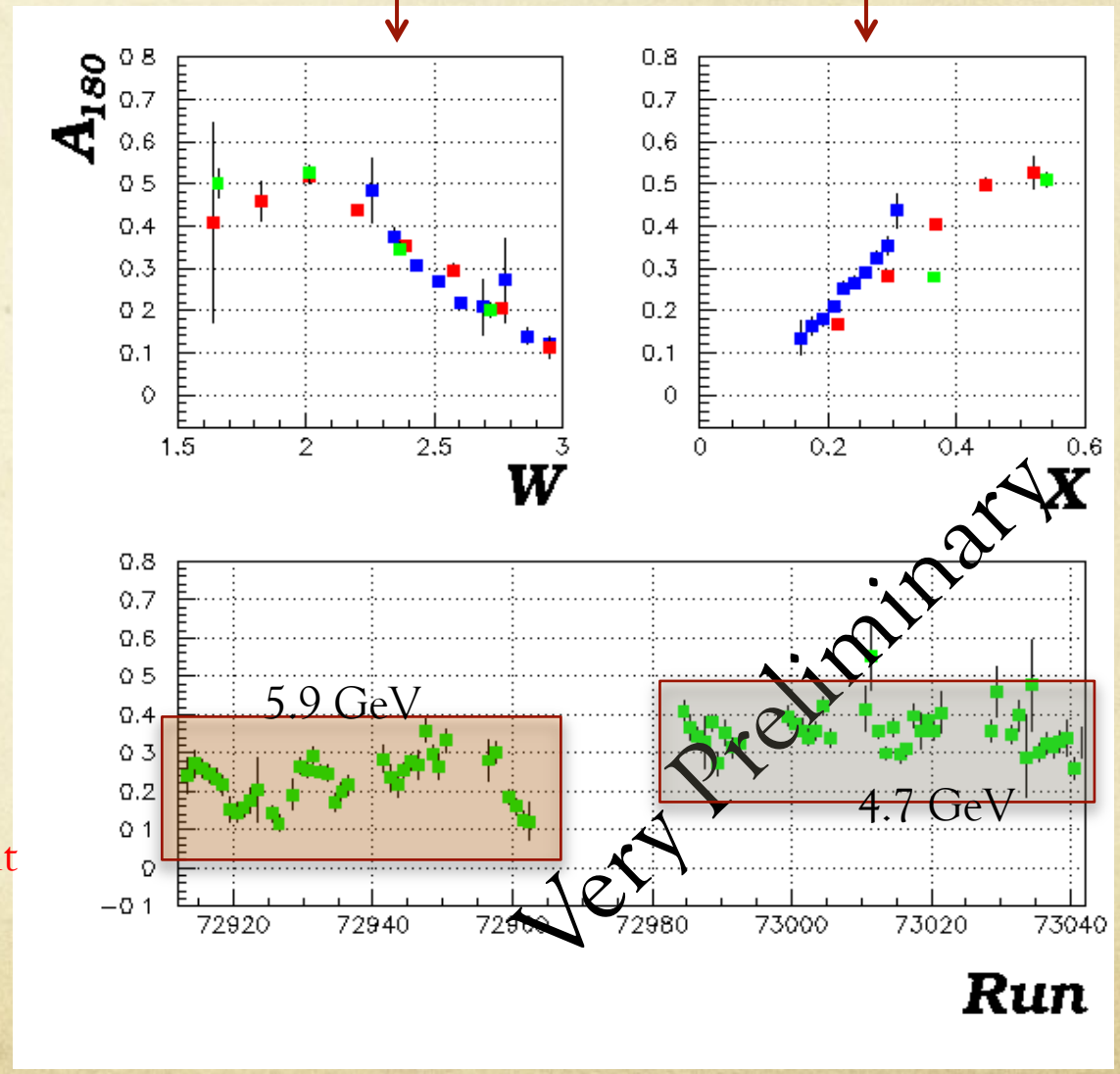
Parallel

- Q^2 1.7 GeV^2
- Q^2 2.5 GeV^2
- Q^2 3.5 GeV^2

- Low X or High W shows small asymmetry
- Small Q^2 dependence
- Statistical errors only

What else needs to be done

- Kinematics dependent dilution factors
- RAD corrections
- Try to understand run dependent behavior for sum of the runs
- Match kinematic binning with 80^o data



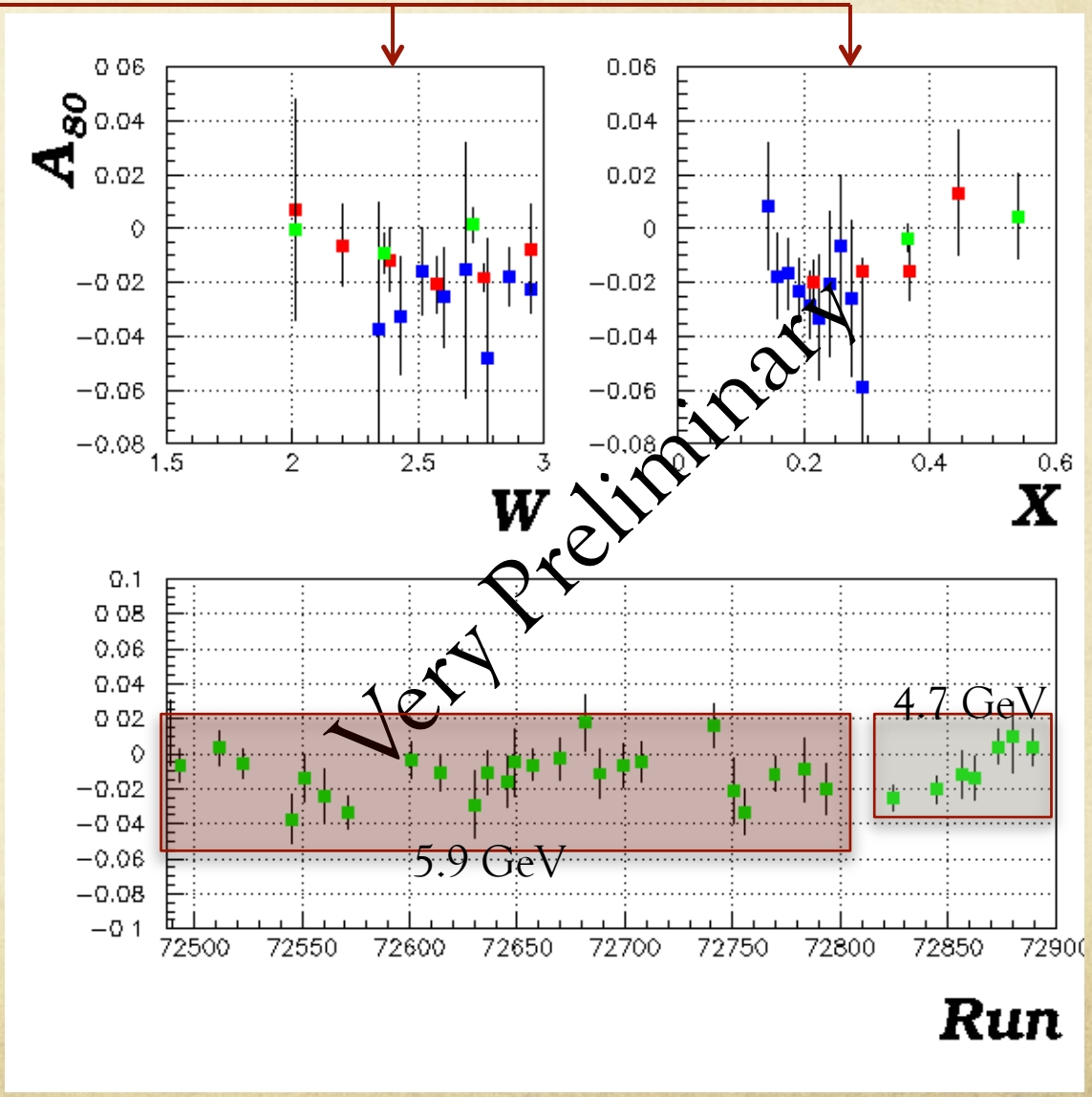
Perpendicular data

- Q^2 1.7 GeV^2
- Q^2 2.5 GeV^2
- Q^2 3.5 GeV^2

- Non-zero Asymmetry (2%)
- In some kinematics ranges A_{80} is about 20% of A_{180}

What else needs to be done

- Only shows about 50% of data taken
- Kinematics dependent dilution factors
- RAD corrections
- Better binning



Summary

- SANE collaboration collected data to extract in model independent way A_1 and A_2
- Although A_{80} is small but for some kinematics it's about 20% of A_{180}
- A_{80} is about 2% for Q^2 1.7 GeV^2
- Preliminary A_{80} from only part of the data set with tight event selection cut
- Calculate Nachtmann moments

SANE Collaboration (E-07-003)

E. Brash, **P. Carter, M. Veilleux**
Christopher Newport University, Newport News, VA

W. Boeglin, P. Markowitz, J. Reinhold
Florida International University, Miami, FL

I. Albayrak, O. Ates, C. Chen, E. Christy, C. Keppel,
M. Kohl, **Y. Li**, **A. Liyanage**, P. Monaghan, **X. Qiu**,
L. **Tang, T. Walton, Z. Ye, L. Zhu**
Hampton University, Hampton, VA

P. Bosted, J.-P. Chen, S. Covrig, W. Deconink, A. Deur,
C. Ellis, R. Ent, D. Gaskell, J. Gomez, D. Higinbotham,
T. Horn, M. Jones, D. Mack, G. Smith, P. Solvignon, S. Wood
Thomas Jefferson National Accelerator Facility, Newport News, VA

A. Puckett
LANL, Los Alamos, NM

W. Luo
Lanzhou University, China

J. Dunne, D. Dutta, **A. Narayan, L.Ndukum, Nuruzzaman**
Mississippi State University, Jackson. MI

A. Ahmidouch, S. Danagoulian, **J. German, Martin Jones**
North Carolina A&T State University, Greensboro, NC

M. Khandaker
Norfolk State University, Norfolk, VA

A. Daniel, P.M. King, J. Roche
Ohio University, Athens, OH

A.M. Davidenko, Y.M. Goncharenko, V.I. Kravtsov,
Y.M. Melnik, V.V. Mochalov, L. Soloviev, A. Vasiliev
Institute for High Energy Physics, Protvino, Moscow Region, Russia

C. Butuceanu, G. Huber
University of Regina, Regina, SK

V. Kubarovsky
Rensselaer Polytechnic Institute, Troy, NY

L. El Fassi, R. Gilman
Rutgers University, New Brunswick, NJ

S. Choi, H-K. Kang, **H. Kang, Y. Kim**
Seoul National University, Seoul, Korea

M. Elaasar
State University at New Orleans, LA

W. Armstrong, **D. Flay**, Z.-E. Meziani, **M. Posik**,
B. Sawatzky, H. Yao
Temple University, Philadelphia, PA

O. Hashimoto, D. Kawama, **T. Maruta,**
S. Nue Nakamura, **G. Toshiyuki**
Tohoku U., Tohoku, Japan

K. Slifer
University of New Hampshire

H. Baghdasaryan, M. Bychkov, D. Crabb, D. Day, E. Frlez,
O. Geagla, N. Kalantarians, **K. Kovacs**, N. Liyanage,
V. Mamyan, J. Maxwell, J. Mulholland, D. Pocanic,
S. Riordan, O. Rondon, M. Shabestari
University of Virginia, Charlottesville, VA

L. Pentchev
College of William and Mary, Williamsburg, VA

F. Wesselmann
Xavier Unniversity, New Orleans, LA

Asaturyan, H. Mkrtchyan, V. Tadevosyan
Yerevan Physics Institute, Yerevan, Armenia

Ph.D. student, M.S. Student, Student