SANE experiment update

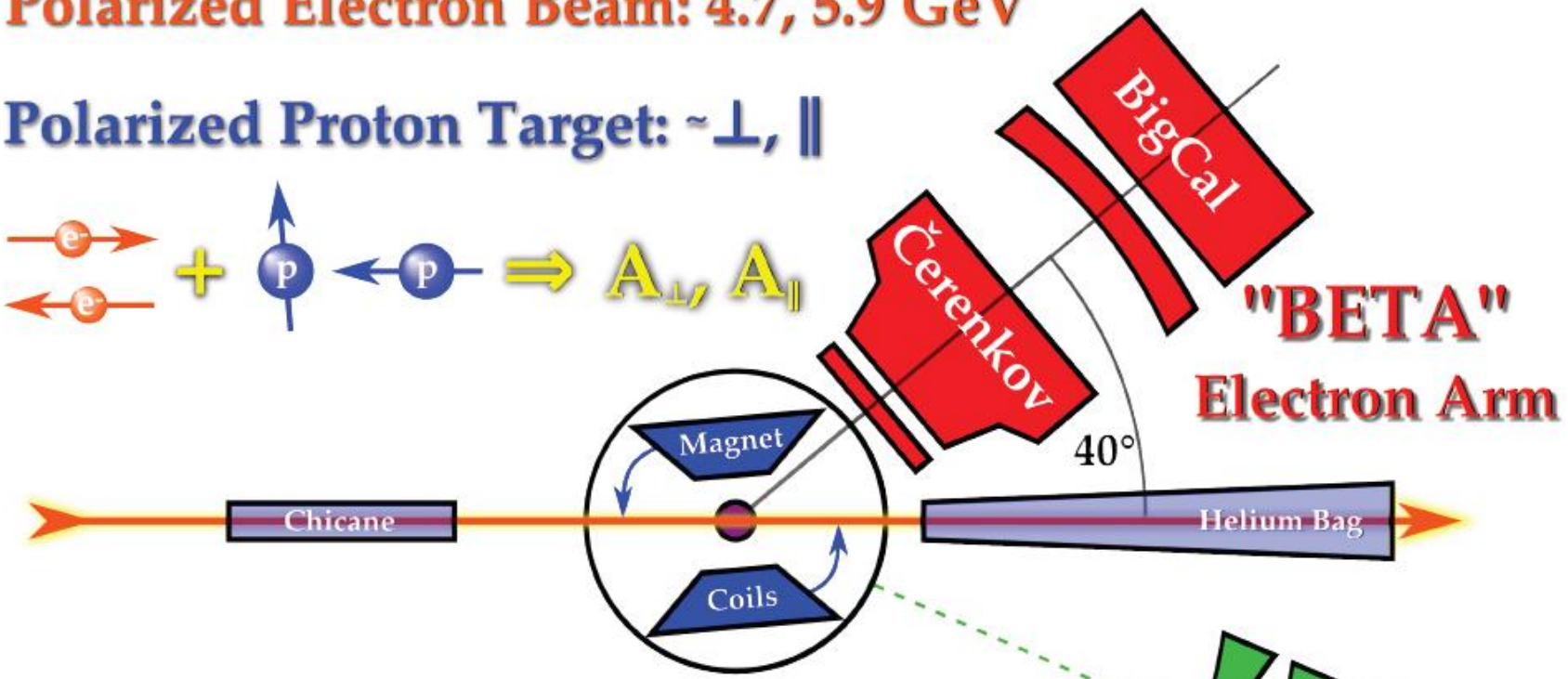
Mark Jones

Slides from talks by Whit Armstrong and Oscar Rondon

SANE

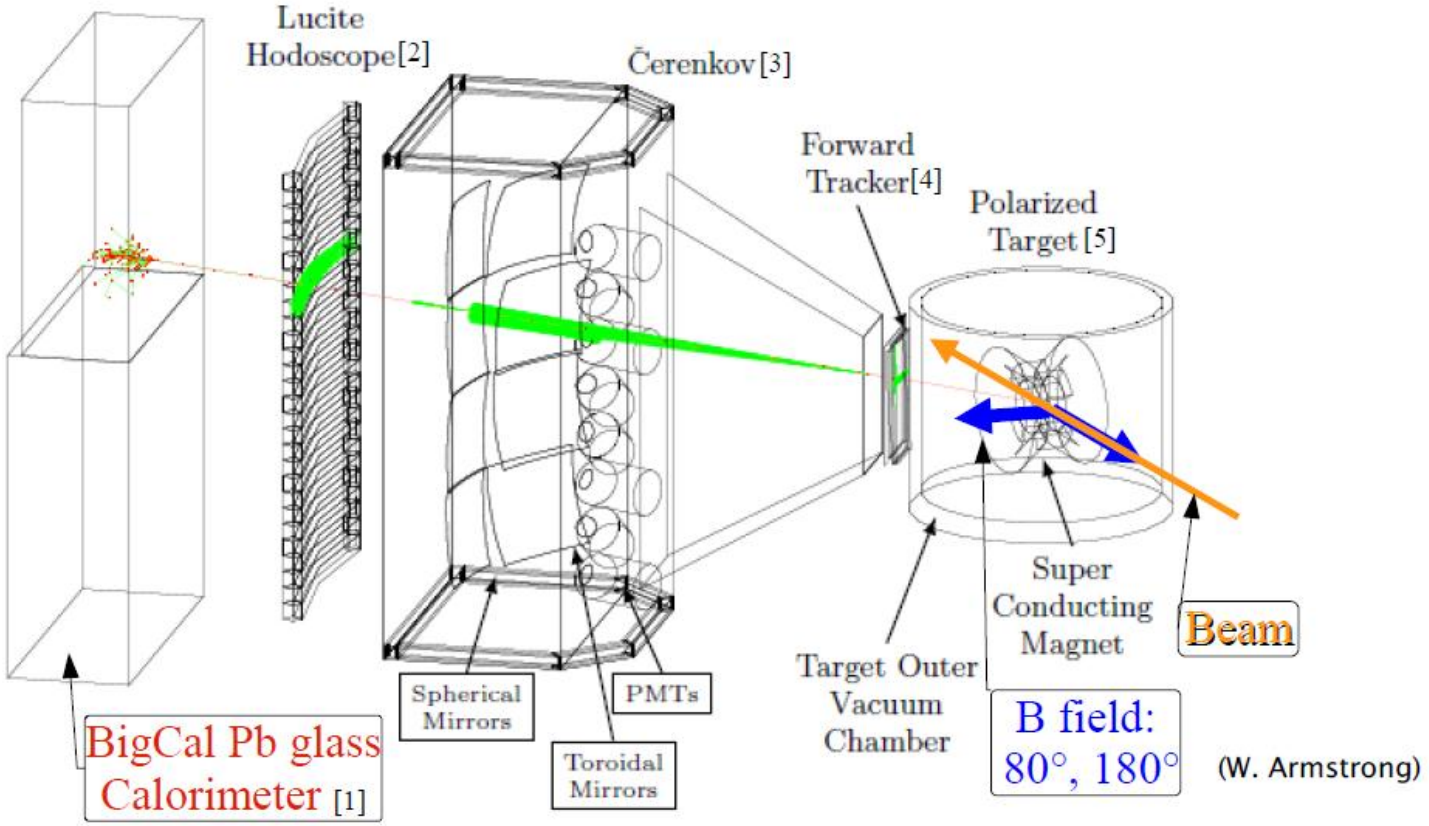
Polarized Electron Beam: 4.7, 5.9 GeV

Polarized Proton Target: ~⊥, ∥



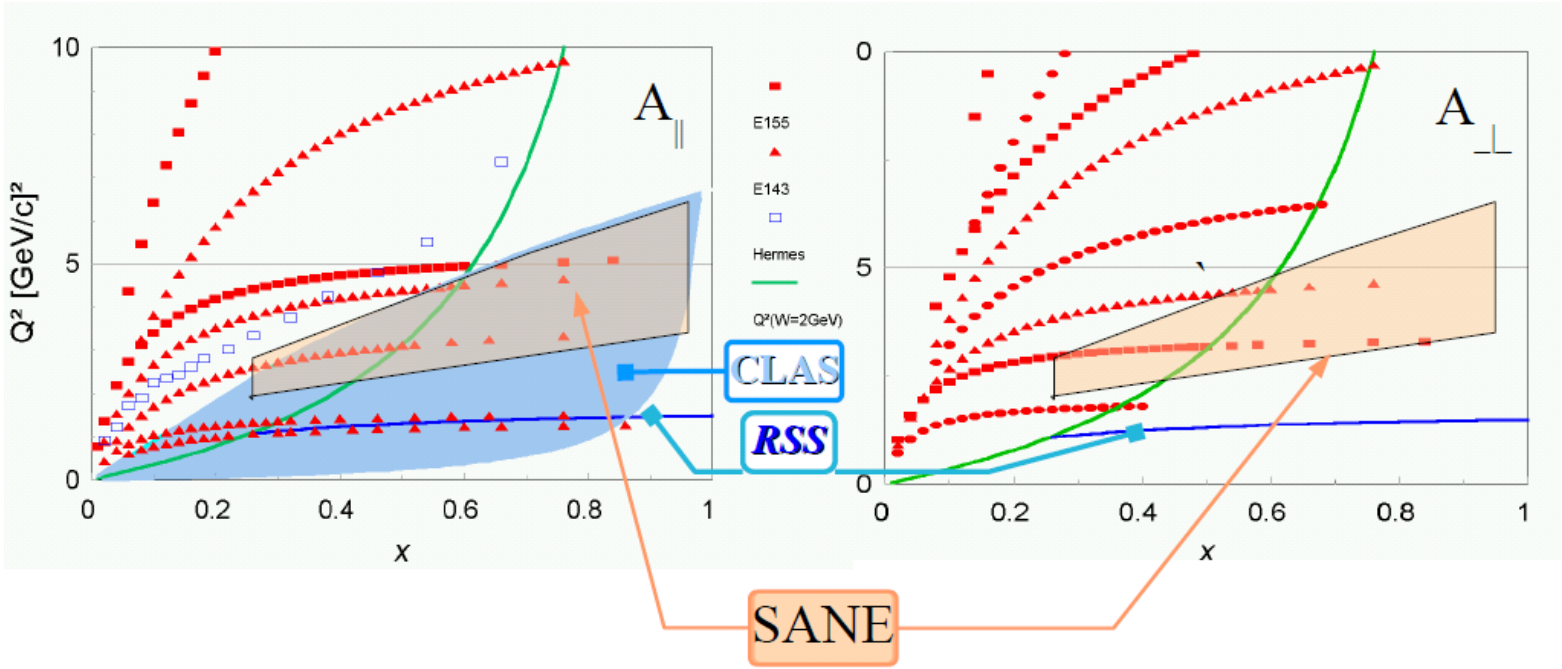
Ammonia (NH_3) Polarized via DNP in 5T Magnetic Field

BETA with DIS electron simulation



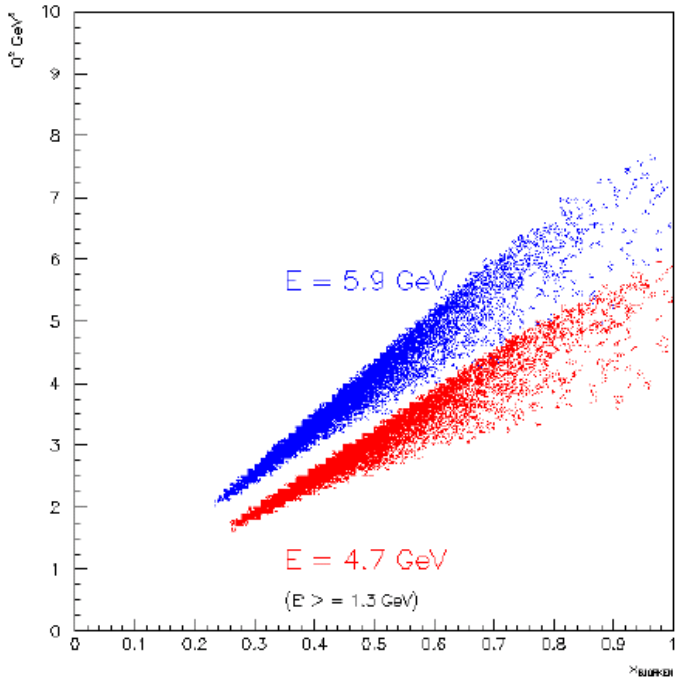
[1] BigCal Collaboration
[2] North Carolina A&T U.
[3] Temple U
[4] Norfolk State U. and U. of Regina
[5] UVA- JLab

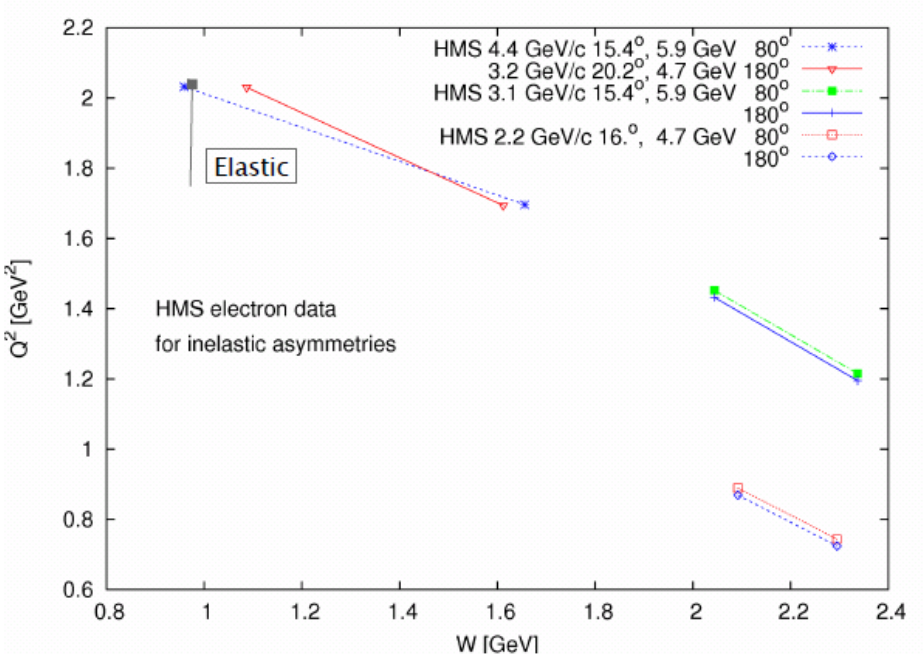
Proton world $A_{\parallel}$, $A_{\perp}$ data before SANE



- Two beam energies: 5.9 GeV, 4.7 GeV
- Very good high ***x*** coverage with detector at 40°

BETA and HMS data



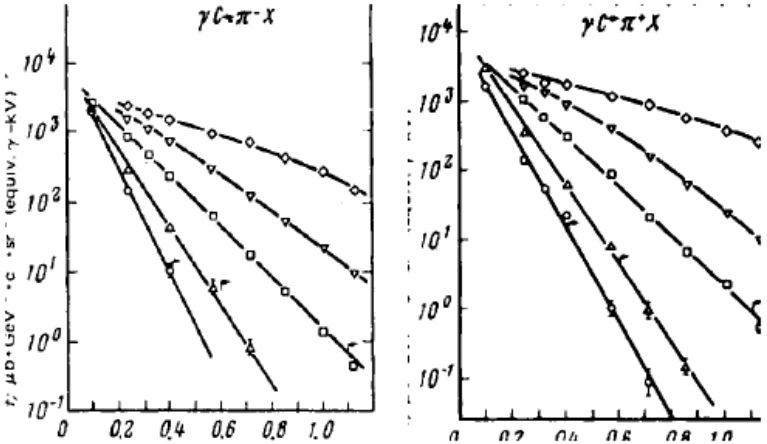


- $Q^2 - x$ phase space of BETA's 80° data
  - cut on E' ≥ 1.3 GeV
- Central kinematics of HMS inclusive asymmetry data

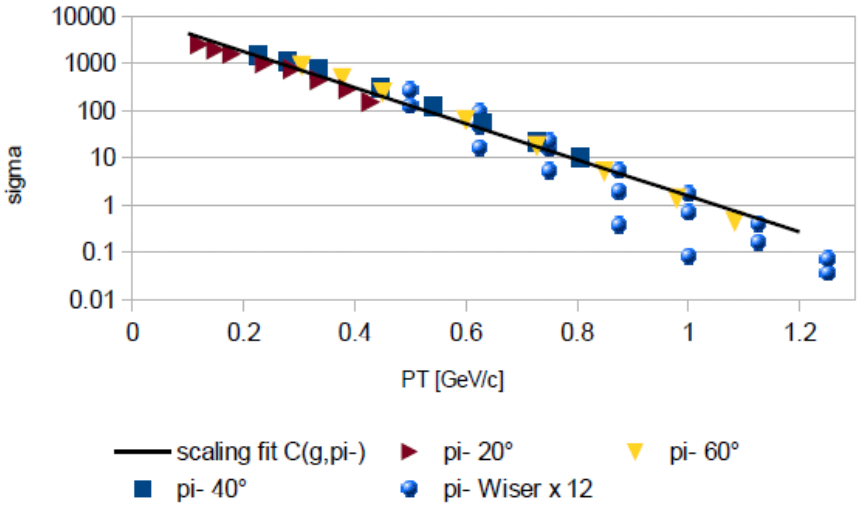
Pair-symmetric background - I

- BigCal detects both charge signs
  - Significant background from e^+e^- from π^0 decays
  - Partial control with cut on $E' \geq 1.3$ GeV; worst dilution $< \sim 0.2$
  - Estimate with GEANT simulation of π^0 production
  - Need inclusive pion photo- and electro-production cross sections
  - Existing D. Wiser parametrization only for H, D targets
  - Parameterized Yerevan pion photoproduction data on C at 4.5 GeV
    - Cross section scales with pion P_T: use simple exponential scaling fit
    - Included fit in J. O'Connell EPC code for single arm hadron photo and electroproduction
    - Compared with DESY electroproduction on C at 5 GeV

Pair-symmetric background - II



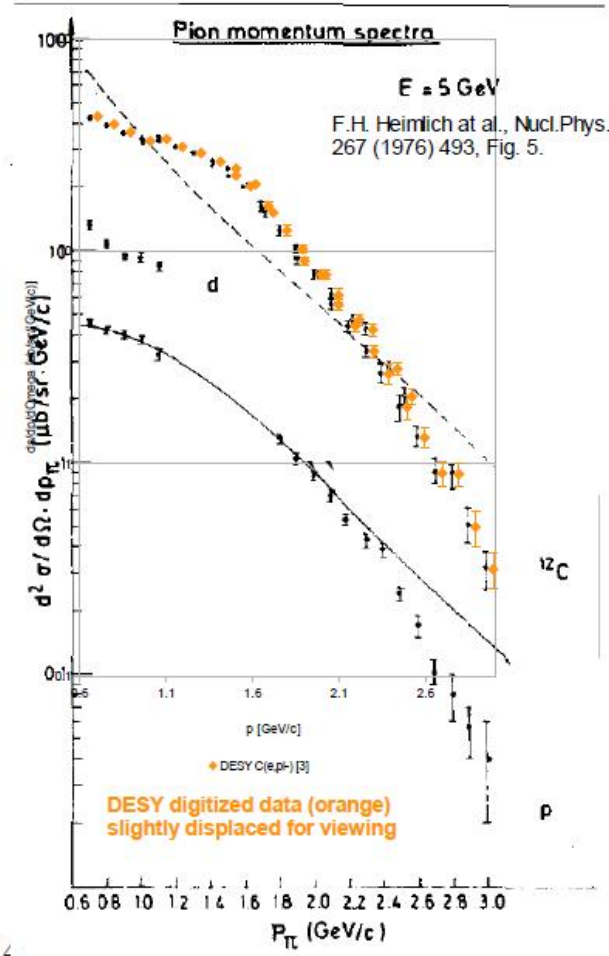
K. Alanakian et al., JETP Lett. 32 (1980) 652

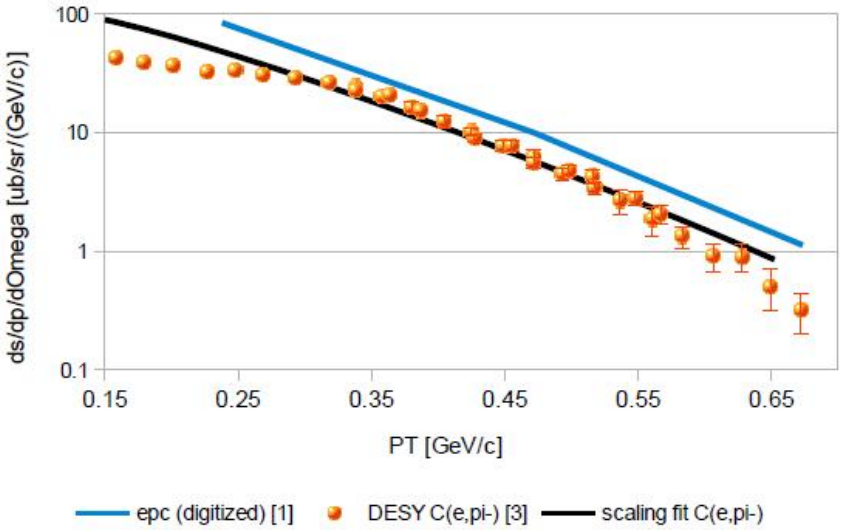


- Fitted π^+, π^- data at 20º, 40º, 60º to $\boldsymbol{\sigma(P_T) = a\, e^{-bP_T}}$
- π^0 fit from average of π^+ and π^-

- Wiser π^- data on H scaled times12, along with data on C and scaling fit (only to C)

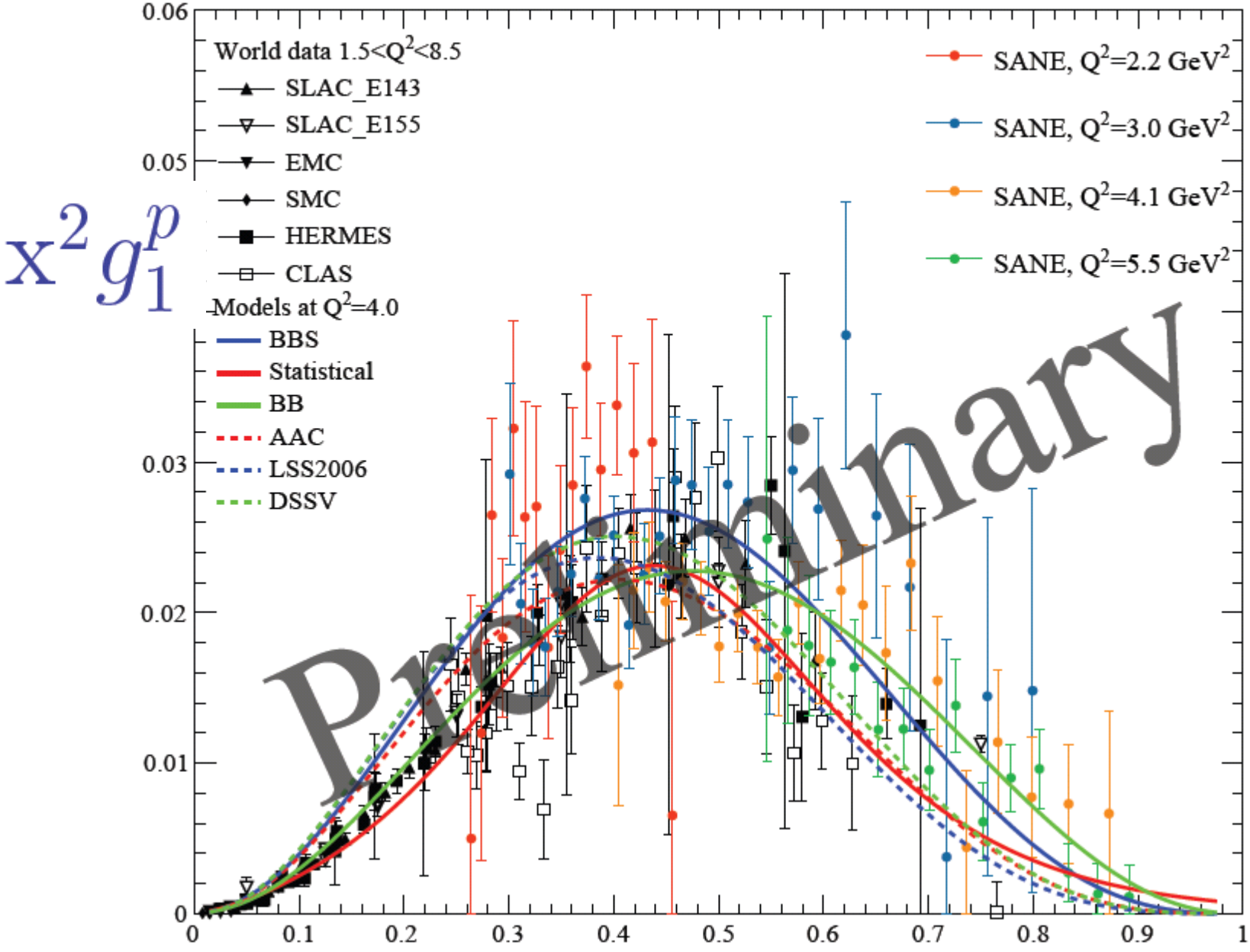
Pair-symmetric background - III



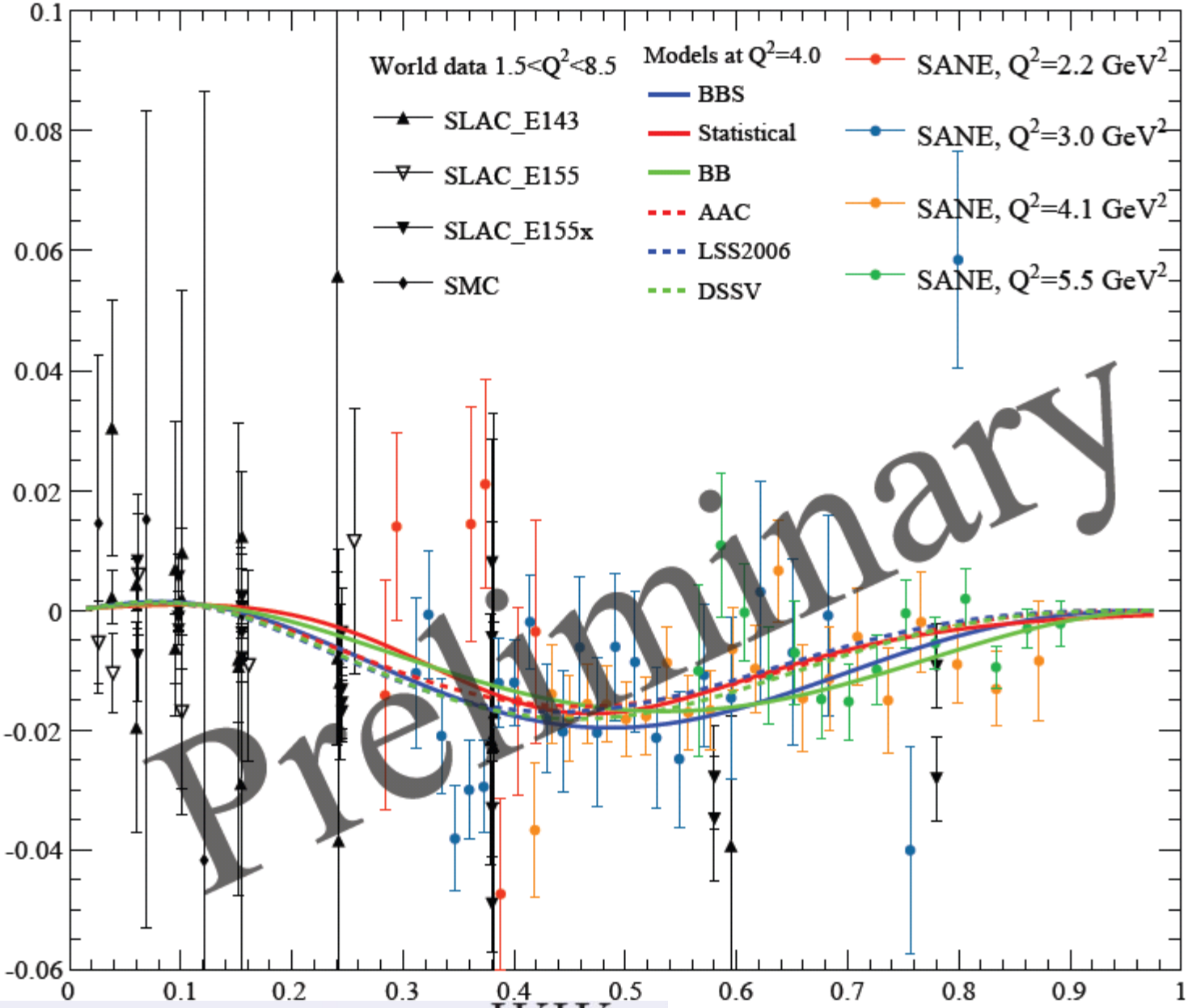


- Test of scaling fit with DESY C(e,π^-) data at 5 GeV, 13°

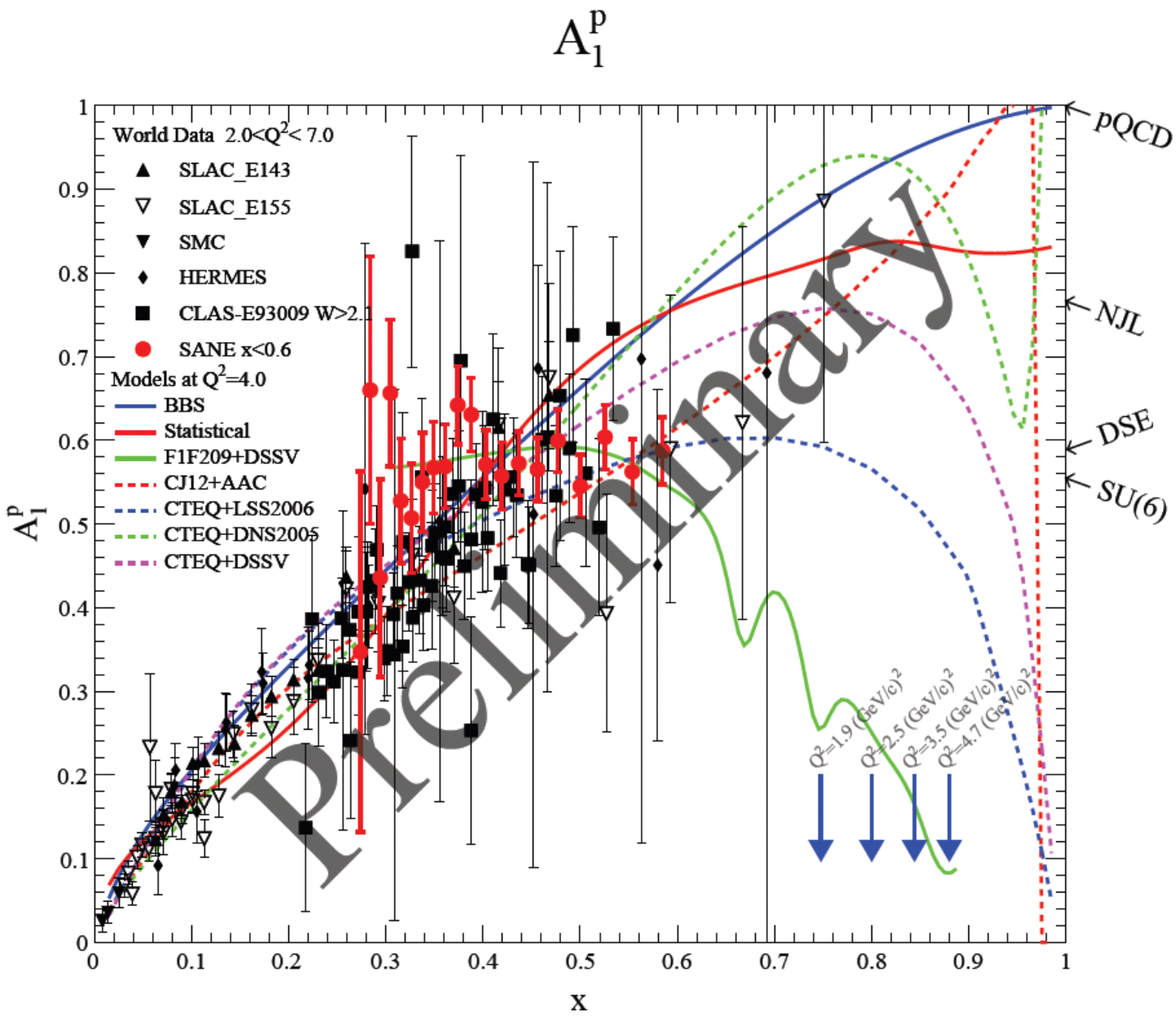
[1] J. O'Connell CEBAF Summer Workshop, F. Gross and J. Lightbody, News, 1988, p. 345


$x^2 g_1^p$
World data 1.5<Q²<8.5
SLAC_E143
SLAC_E155
EMC
SMC
HERMES
CLAS
Models at Q²=4.0
BBS
Statistical
BB
AAC
LSS2006
DSSV
SANE, Q²=2.2 GeV²
SANE, Q²=3.0 GeV²
SANE, Q²=4.1 GeV²
SANE, Q²=5.5 GeV²
Preliminary
0.06
0.05
0.03
0.02
0.01
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

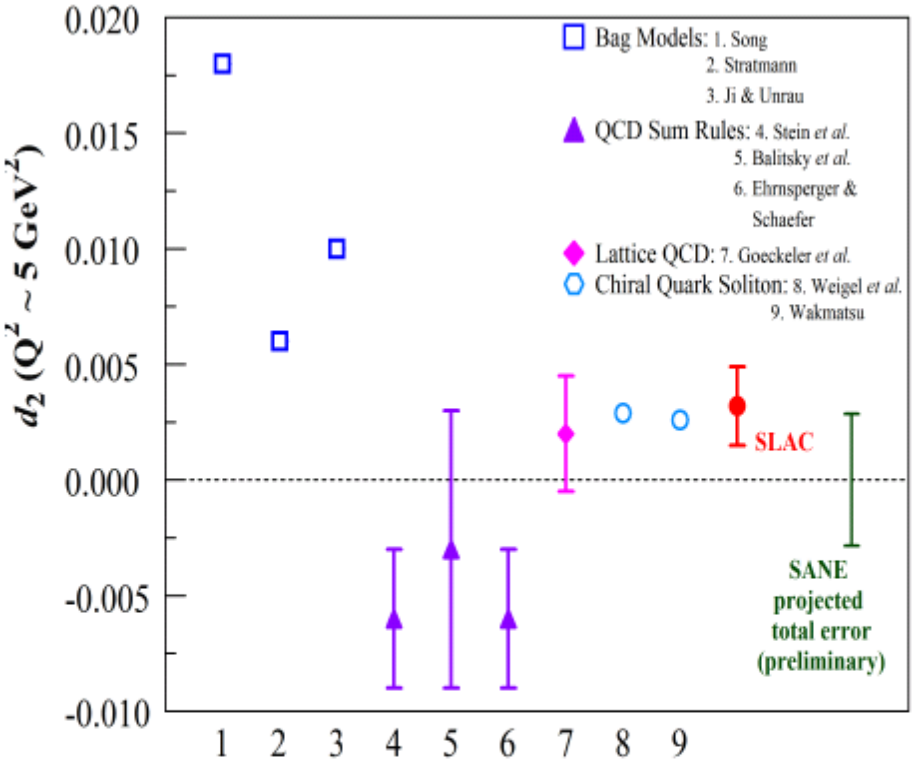
$x^2 g_2^p$



Models are showing g_2^{WW}.


A_1^p
World Data 2.0<Q^2< 7.0
SLAC_E143
SLAC_E155
SMC
HERMES
CLAS-E93009 W>2.1
SANE x<0.6
Models at Q^2=4.0
BBS
Statistical
F1F209+DSSV
CJ12+AAC
CTEQ+LSS2006
CTEQ+DNS2005
CTEQ+DSSV
pQCD
NJL
DSE
SU(6)
Q^2=1.9 (GeV/c)^2
Q^2=2.5 (GeV/c)^2
Q^2=3.5 (GeV/c)^2
Q^2=4.7 (GeV/c)^2
A_1^p
x
Preliminary

Projected error bar on d_2



SANE's measured C-N d_2

(all data $E' > 1.3$ GeV, $W > 2$ GeV.
Only projected error shown.)

Future work

- Finalize pi0 background estimate
- Finish recalibration of BigCal energy calibration using both pi0 and eta decays.
- Expect to be finished by end of 2014.