

Other Measurements with the Solenoid

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- Unpolarized SIDIS, T-odd distribution function (Boer-Mulders)
- SIDIS double spin asymmetries: helicity distributions
- Inclusive longitudinal double spin asymmetries: quarks helicity distributions and their moments.
- Inclusive transverse double spin asymmetries: d_{2n} matrix element and color polarizabilities

Boer-Mulders distribution function

$$\begin{aligned}
 d\sigma_{\{\lambda, \Lambda\}}^{\ell N \rightarrow \ell \pi X} &\propto f_1 \otimes d\hat{\sigma}^{\ell q \rightarrow \ell q} \otimes D_1 + \frac{k_{\perp}}{Q} f_1 \otimes d\hat{\sigma}^{\ell q \rightarrow \ell q} \otimes D_1 \cdot \cos \phi \\
 &+ \left[\frac{k_{\perp}^2}{Q^2} f_1 \otimes d\hat{\sigma}^{\ell q \rightarrow \ell q} \otimes D_1 + h_1^{\perp} \otimes d\hat{\sigma}^{\ell q \rightarrow \ell q} \otimes H_1^{\perp} \right] \cdot \cos 2\phi \\
 &+ |S_T| \cdot h_1 \otimes d\hat{\sigma}^{\ell q \rightarrow \ell q} \otimes H_1^{\perp} \cdot \sin(\phi + \phi_S) \quad \text{Collins} \\
 &+ |S_T| \cdot f_{1T}^{\perp} \otimes d\hat{\sigma}^{\ell q \rightarrow \ell q} \otimes D_1 \cdot \sin(\phi - \phi_S) \quad \text{Sivers} \\
 &+ \dots
 \end{aligned}$$

- Can be measured in Drell-Yan and SIDIS
- Allows the test of **universality**
- Provides some indication on the role of angular momentum

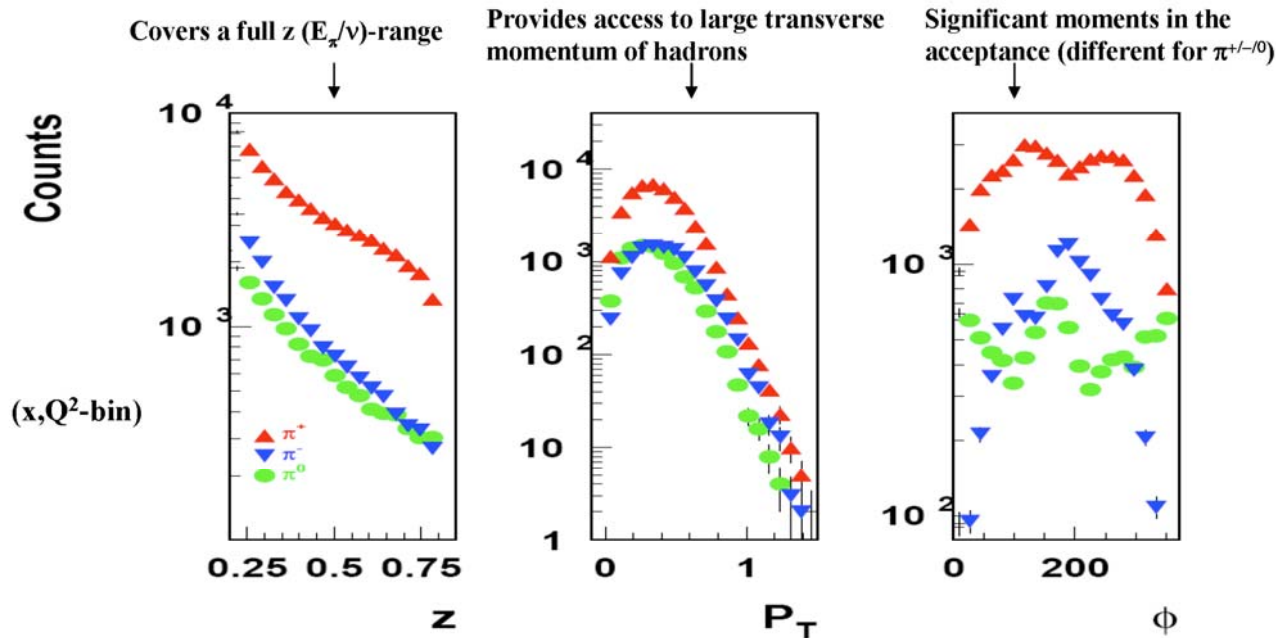
Comprehensive extraction of

$$h_1^\perp$$

Need a study of “backgrounds”
with high statistics measurements

- Higher twists (kinematical, dynamical)
 - Different dependences on z, x, P_+ and Q^2
- Radiative corrections
- Understanding the systematic errors in the acceptance
- Comparisons between $\cos \phi$ and $\cos 2\phi$ in the same experiment are important
- Checking $\pi^+ + \pi^-$ versus π^0 need to be consistent
- Checking $\pi^+ - \pi^-$

CLAS12: kinematic distributions using LUND-MC



Wide kinematical coverage of CLAS12 allows fine binning in all relevant kinematical variables for all 3 pions.

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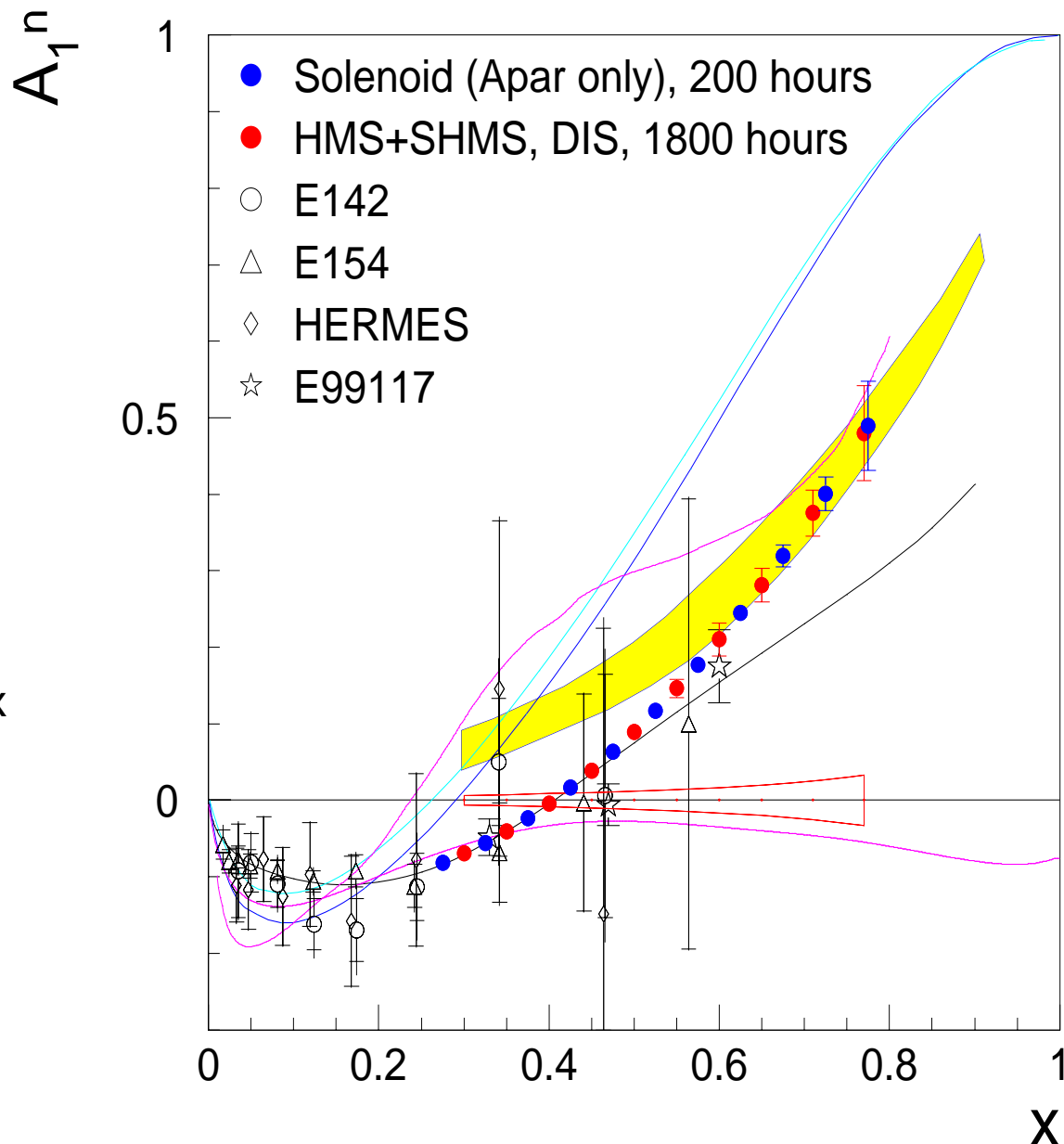
For the Solenoid the luminosity in the unpolarized case is 1000 larger
three dimensional plots with at least the same precision in each bin is possible

- Solenoid, 200 hours

- HMS+SHMS, 1800 hours

(X. Zheng)

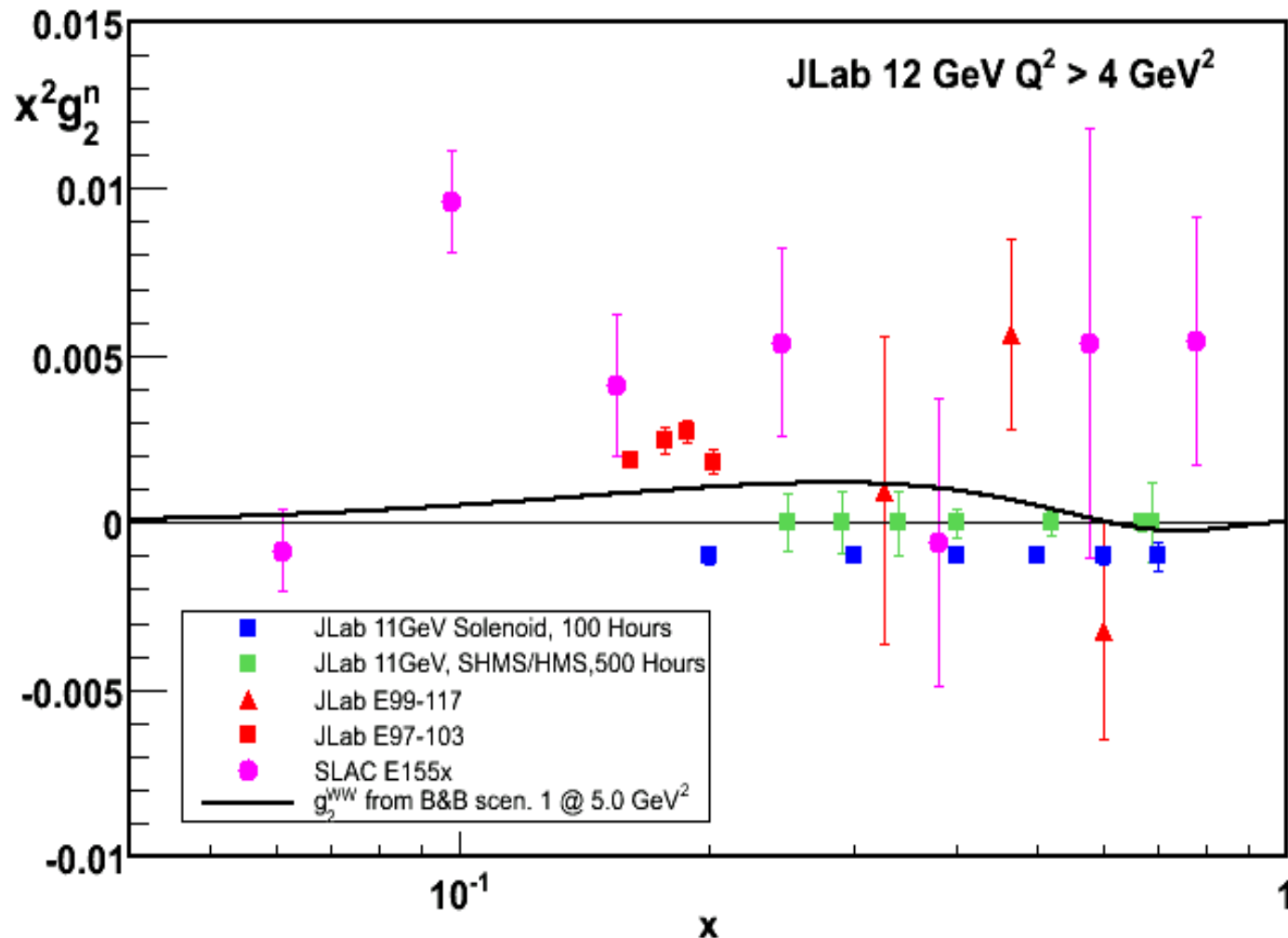
A_1^n at 11 GeV



Impact on down quark helicity distribution determination at large x

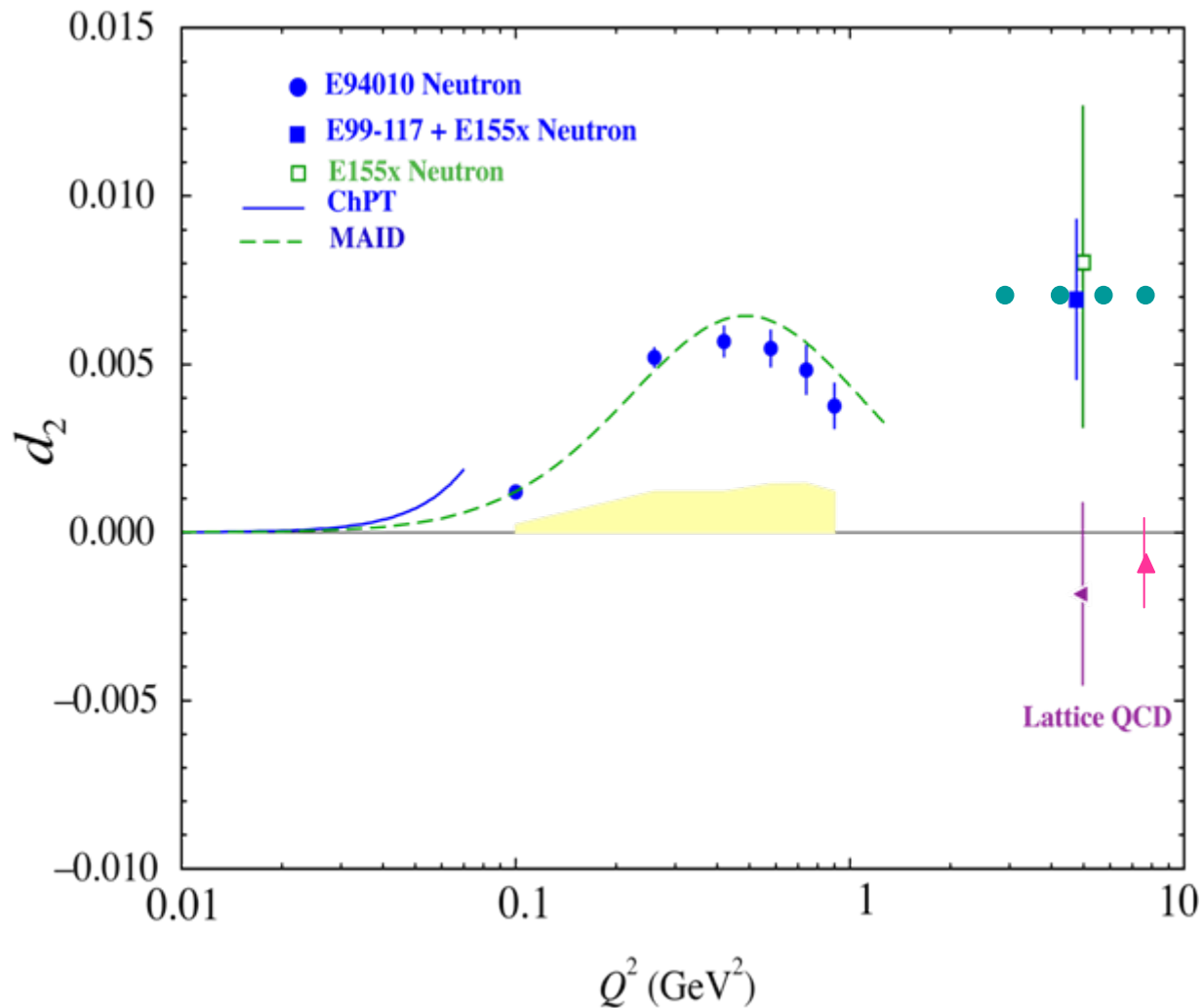
JLab 12 GeV projections of the neutron x^2g_2

- Solenoid (100 hours)
- SHMS+HMS (500 hours) (W. Korsch)



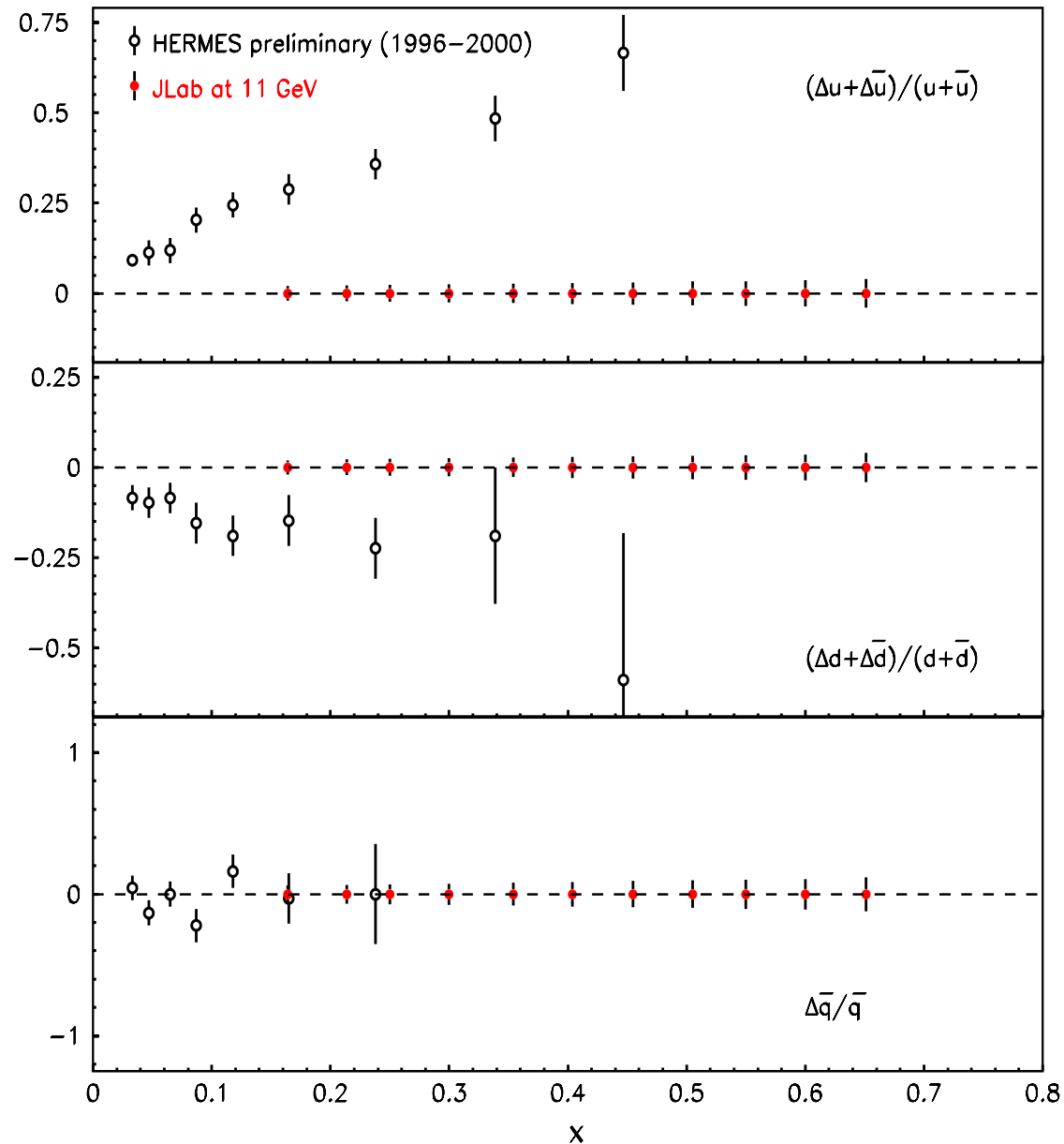
d_2^n with JLab 12 GeV

- Projection with Solenoid, Statistical only, will be systematics limited?
- Improved Lattice calculation (QCDSF, hep-lat/0506017)



Flavor Decomposition with SIDIS

Projection with MAD 2000 hours
(X. Jiang)
compared with HERMES



- Solenoid would improve by 2 orders of magnitude the statistical uncertainty.

12 GeV + Solenoid

- A powerful tool to probe **PV** physics and **Nucleon Structure** physics
- With the projected luminosity the experimental investigation of small observables is possible
- Systematics effects can be studied and minimized