Analysis Update on E06-010

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Physics Goals of E06-010 (SIDIS)

- Measure Collins, Sivers and Pretzelosity
 asymmetries in valence region: x = 0.1 ~ 0.4
- Parasitic measurements on g_{1T} (double-spin asymmetry) and A_y (single electron SSA in DIS)



$$\sigma_{UT} \propto S_T (1-y) \frac{P_{h\perp}}{zM_h} \sin(\phi_h^l + \phi_S^l) \cdot \sum e_q^2 h_1^q(x) \otimes H_{1q}^{\perp h}(z, P_{h\perp}^2)$$
 Transversity

$$+S_{T}(1-y+\frac{y^{2}}{2})\frac{P_{h\perp}}{zM_{N}}\sin(\phi_{h}^{l}-\phi_{S}^{l})\cdot\sum e_{q}^{2}f_{1T}^{\perp q}(x)\otimes D_{1q}^{h}(z_{h},P_{h\perp}^{2})$$
 Sivers

$$+S_{T}(1-y)\frac{P_{h\perp}^{3}}{6z^{2}M_{N}^{2}M_{h}}\sin(3\phi_{h}^{l}-\phi_{S}^{l})\cdot\sum e_{q}^{2}h_{1T}^{\perp q}(x)\otimes H_{1q}^{\perp h}(z_{h},P_{h\perp}^{2})$$
 Pretzelosity

E06-010 Setup



- Electron beam: *E* = 5.9 GeV
- 40 cm transversely polarized ³He target (effective polarized neutron)
- BigBite at 30° as **electron** arm: $P_e = 0.7 \sim 1.8 \text{ GeV}/c$
- HRSL at 16° as hadron arm: $P_h = 2.35 \text{ GeV}/c$
- Average beam current 12 uA (max: 14 uA, 15 uA in proposal)
- Preliminary ³He polarization is 65%. (42% in proposal)
- Final statistics may be slightly better than the one in proposal.

BigBite Detector Performance





BigBite Sieve Slit

BB Optics & PID

- Good optics in wide p and ΔΩ acceptance.
- Well separated electron and pion.



60000

40000

20000

8000

6000

4000

2000

() 81

0.8

0.6

0.4

(GeV)

1.5

0.4

0.65

∆ (1232)

N (1700)

∆ (1700)

1.3 1.4

W (GeV)

1.2

N (1520

1.1

△ (1232)

Left High Resolution Spectrometer

- Clean *e*/π separation with Gas Cherenkov and Pion
 Rejector
- Vertex and TOF coincidence with BigBite will suppress background
- Kaon detection:

6/11/2009

- □ A1: Pion rejection > 90 %
- RICH: K/ π separation ~ 4 σ
- \square TOF: K/ π separation ~4 σ



eπ Coincidence Time



Progress in Target Analysis

- EPR Analysis (preliminary)
- NMR Water Calibration: (preliminary)

 Target density, wall thickness, water cell flux work in progress.





Parasitic measurements Status

Lumi analysis

- Preliminary studies show negligible effects from luminosity.
- Follow-up studies are under-way.
- Beam Polarimetry:
 - Moller polarimetry (absolute)
 - Compton polarimetry (relative)
 - Average 79%



Analysis Status

- Major calibrations are finished.
 - BigBite wire chamber, shower counter, scintillator (done)
 - BigBite optics, TOF (done)
 - HRS Gas Cerenkov, A1, TOF (done)
 - HRS RICH, Optics and pion rejector (partly done, room to improve)

- Focusing on data quality check:
 - 2nd round farm production.
 - Forming mysql run database.
 - Detector stability check.
 - Scalar check.
 - Understand the effect of beam on various detectors.
 - Developing MC etc...
 - Target analysis

Detector Stability Check



Summary

- Major calibrations are finished.
- In the progress of data quality check.
 - Large scale farm production
 - Identify and study possible sources of false asymmetries.
- Preliminary results will come out soon.
 - Developing MC to understand various backgrounds etc.
 - Checking asymmetries from witness channel.
 - Neutron Collins, Sivers and Pretzlosity asymmetries.
 - Neutron g_{1T} and SSA DIS A_y measurement.

Backup Slides

