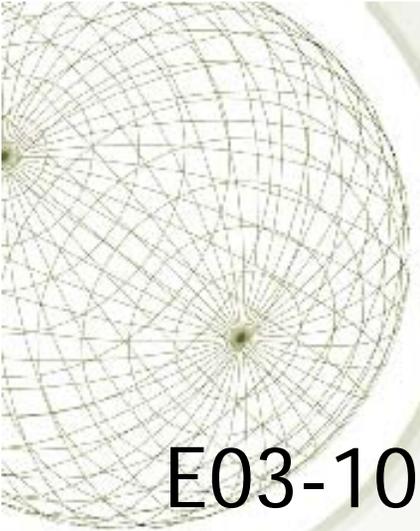


E03-104 Update

Michael Paolone
University of South Carolina
Hall-A Collaboration Meeting
Jan 3rd, 2007

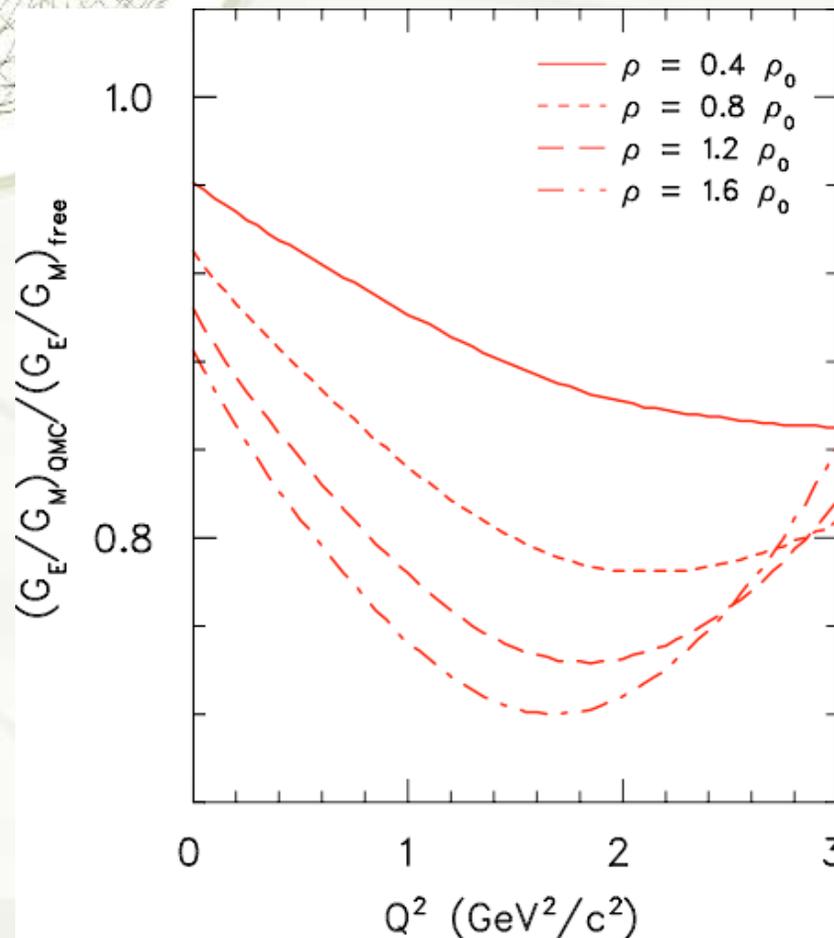
A decorative wireframe sphere is located in the top-left corner of the slide. It consists of a grid of lines forming a sphere, with a central point and lines radiating outwards to form the surface.

Outline

E03-104 is an update of E93-049

- ★ Motivation and results for E93-049
- ★ E03-104 and expectations
- ★ Preliminary results

Medium Modifications



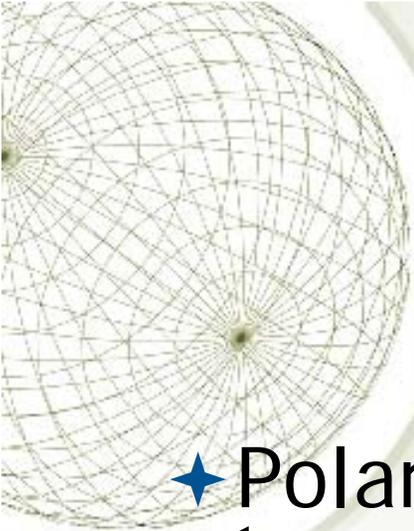
★ Quark Meson Coupling model predicts medium modified form factors.



Polarization Transfer

- ★ For a free proton, the polarization transfer ratio is used to directly compute form factor ratio.

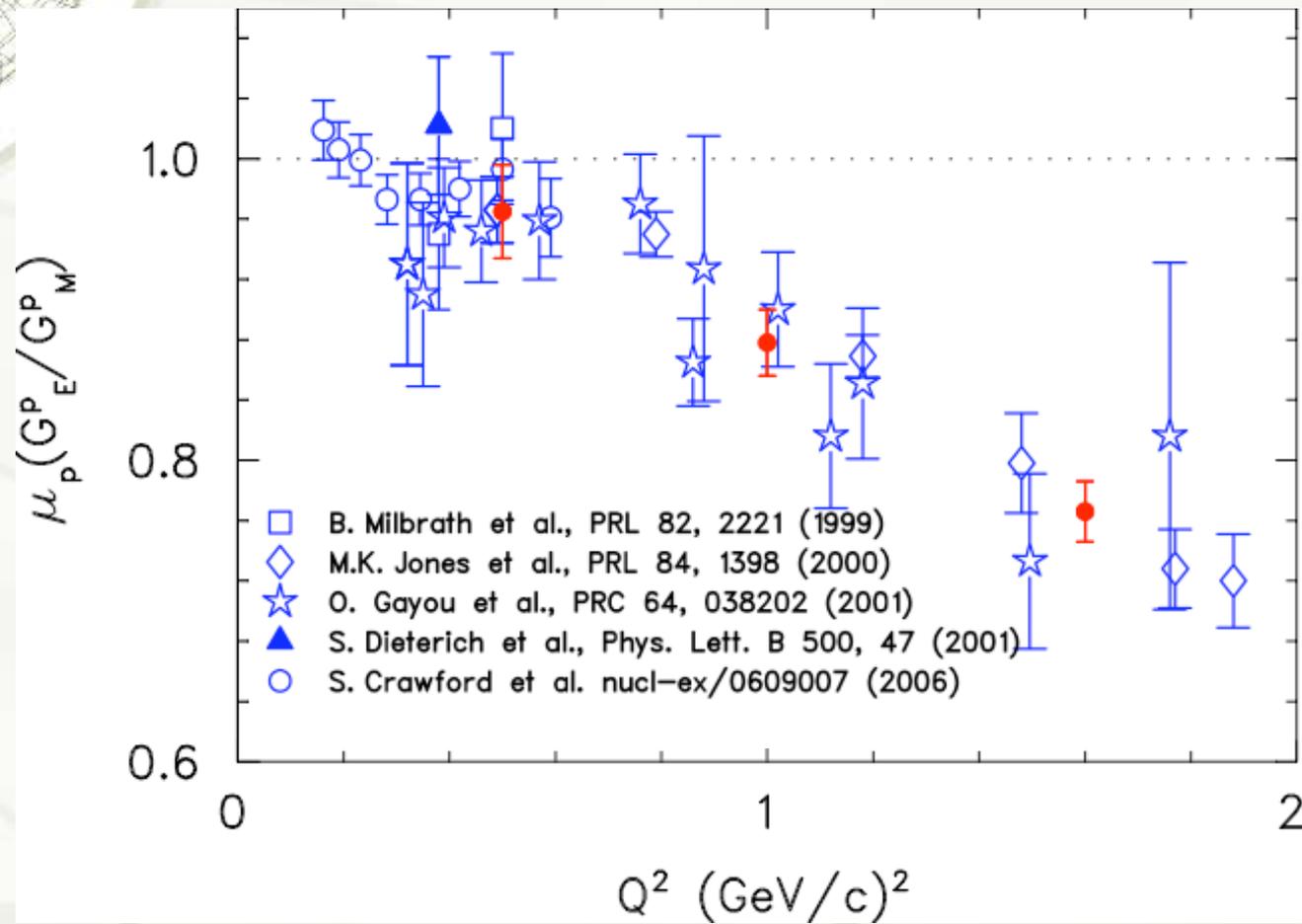
$$\frac{G_E}{G_M} = -\frac{P'_x}{P'_z} \cdot \frac{(E_i + E_f)}{2m} \tan\left(\frac{\theta_e}{2}\right)$$



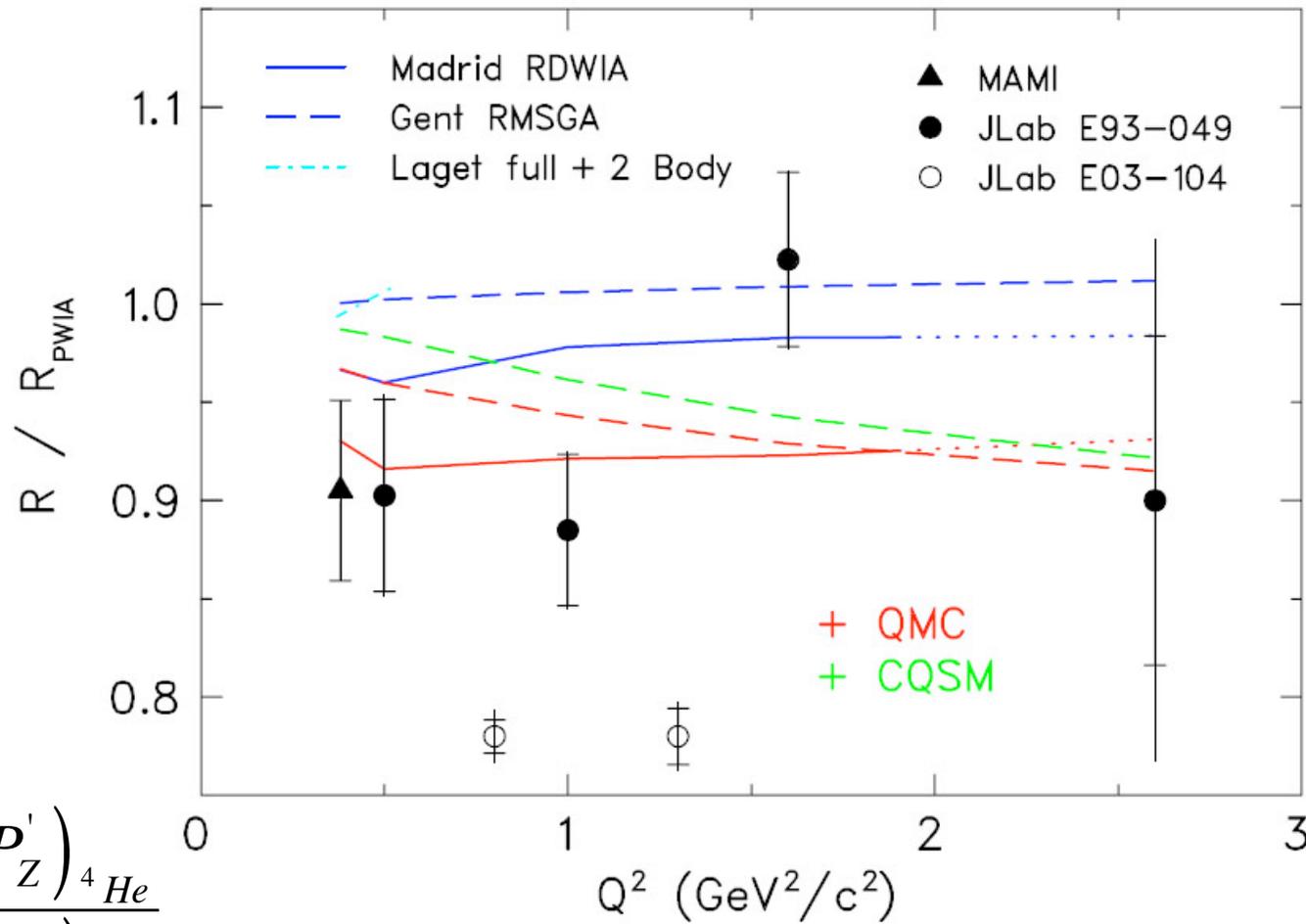
E93-049

- ★ Polarization transfer measured for ${}^1\text{H}(\vec{e}, e' \vec{p})$ and ${}^4\text{He}(\vec{e}, e' \vec{p}){}^1\text{H}$.
- ★ Quasielastic scattering and low missing momentum.
- ★ Q^2 of 0.5, 1.0, 1.6 and 2.6 $(\text{GeV}/c)^2$.

Proton Electromagnetic Form Factor Ratio

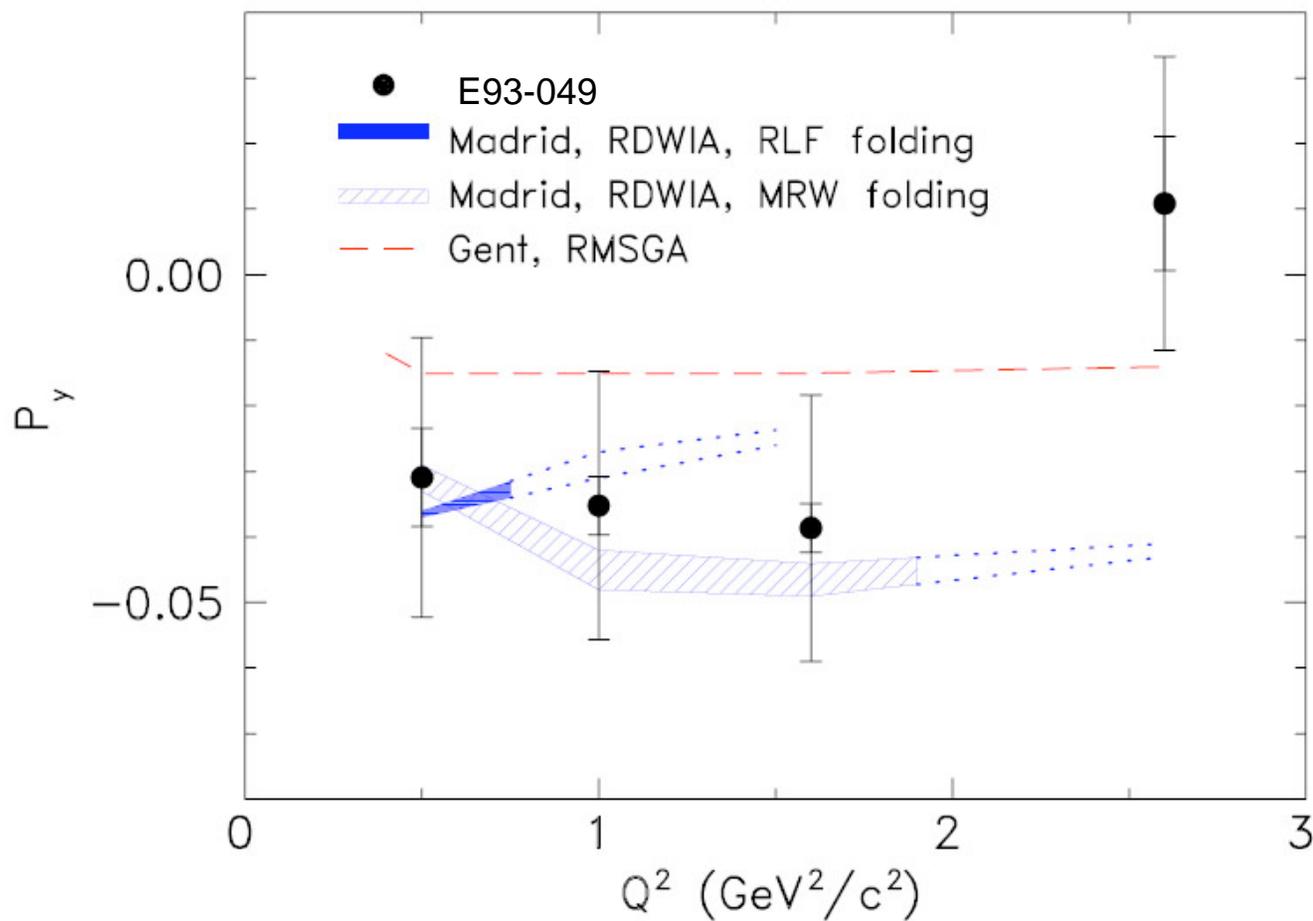


$^4\text{He}/^1\text{H}$ Super-Ratio



$$R = \frac{\left(P'_X / P'_Z\right)_{^4\text{He}}}{\left(P'_X / P'_Z\right)_{^1\text{H}}}$$

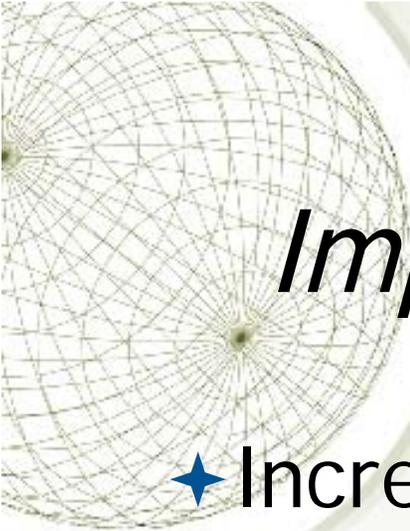
Induced Polarization





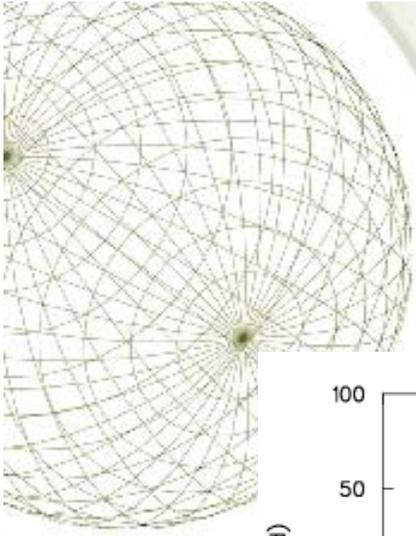
E03-104

- ★ ${}^4\text{He}(\vec{e}, e' \vec{p}){}^1\text{H}$ and ${}^1\text{H}(\vec{e}, e' \vec{p})$ at $Q^2 = 0.8$ and 1.3 (GeV/c)^2
- ★ Measure Transferred Polarization (P_x' and P_z') and Induced Polarization (P_y)
- ★ Low missing momentum / Quasielastic

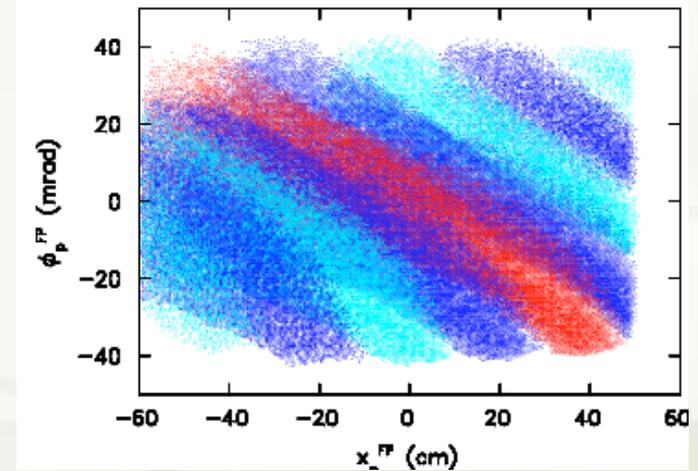
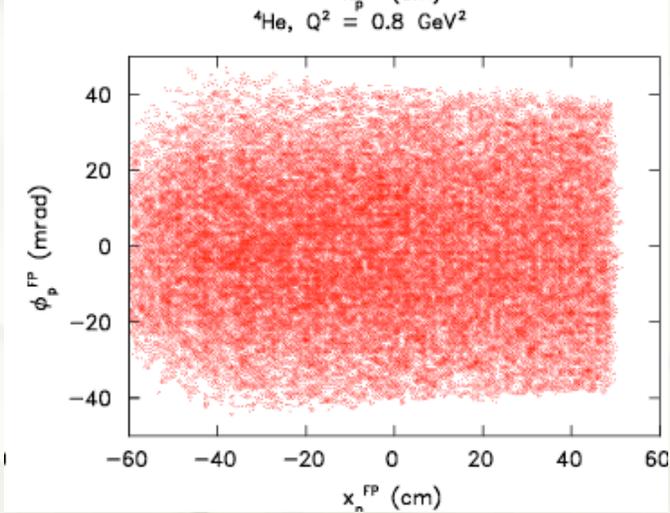
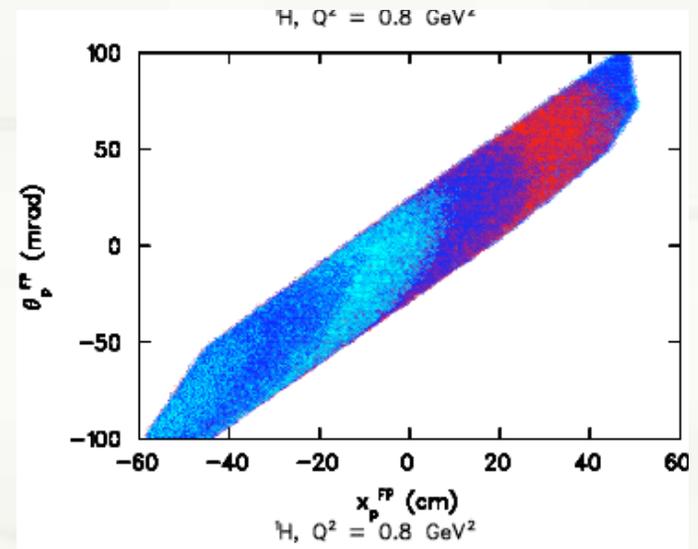
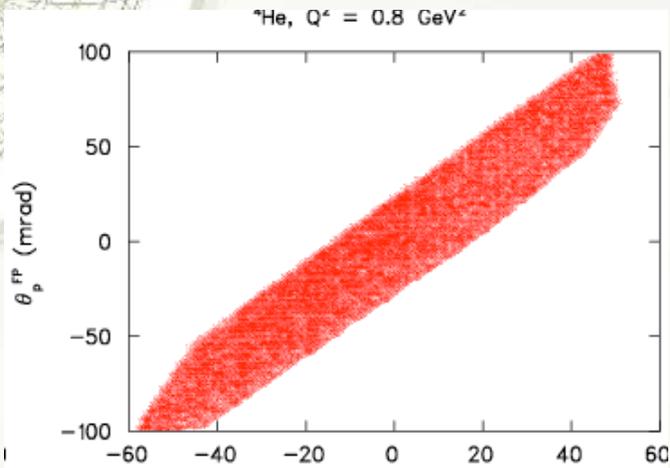


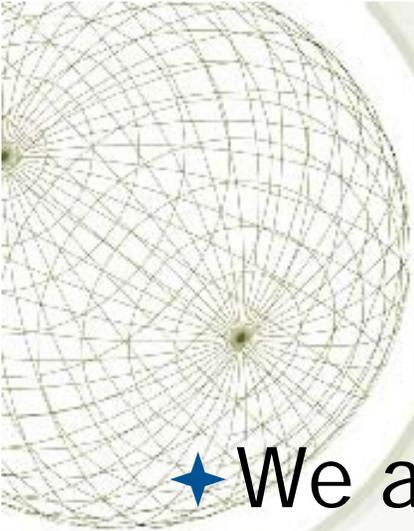
Improvements from E93-049

- ★ Increased beam time
- ★ Optimized beam energies
- ★ Higher beam polarization
 - ★ ~86%
- ★ ^1H focal plane coverage similar to ^4He
 - ★ Nine ^1H momentum settings for both Q^2 points.



Focal Plane Coverage



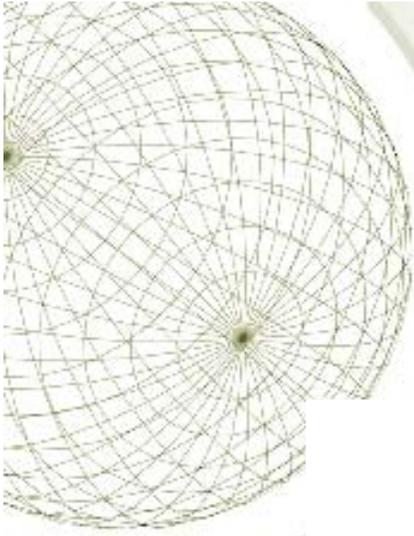


High Statistics

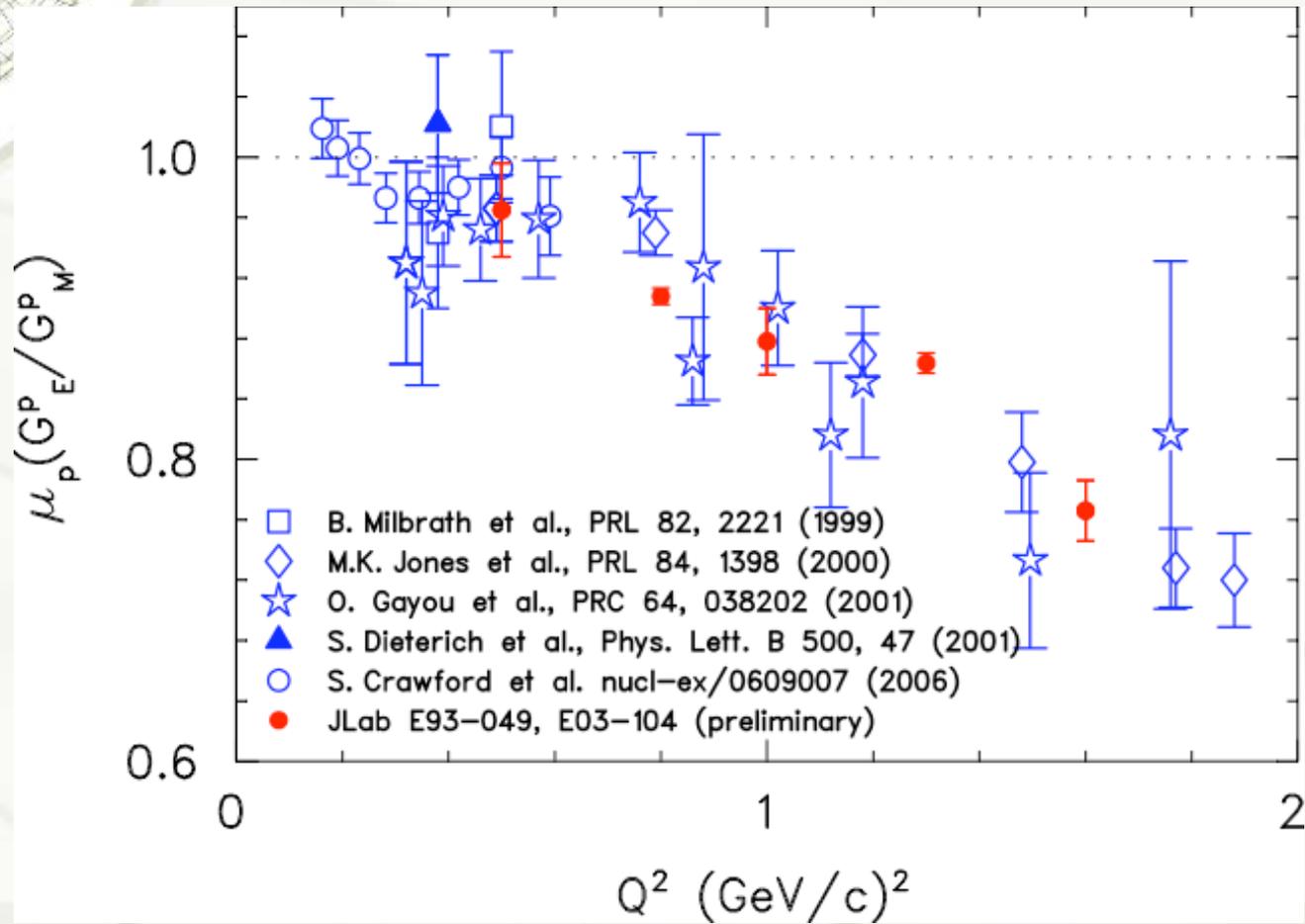
- ★ We achieved our proposed statistical target:

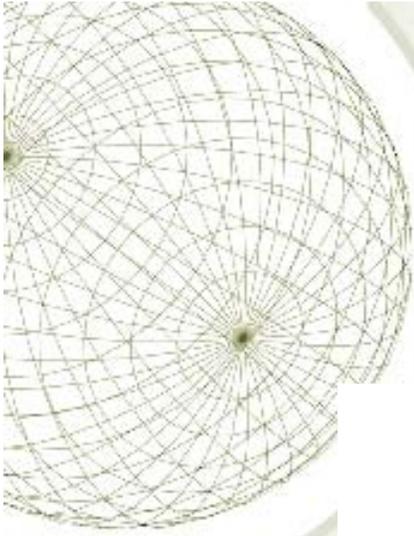
| | ^1H | ^4He |
|----------------------|--------------|---------------|
| 0.8 GeV ² | 300 M | 190 M |
| 1.3 GeV ² | 500 M | 200 M |

- ★ Preliminary results begin with ^1H .

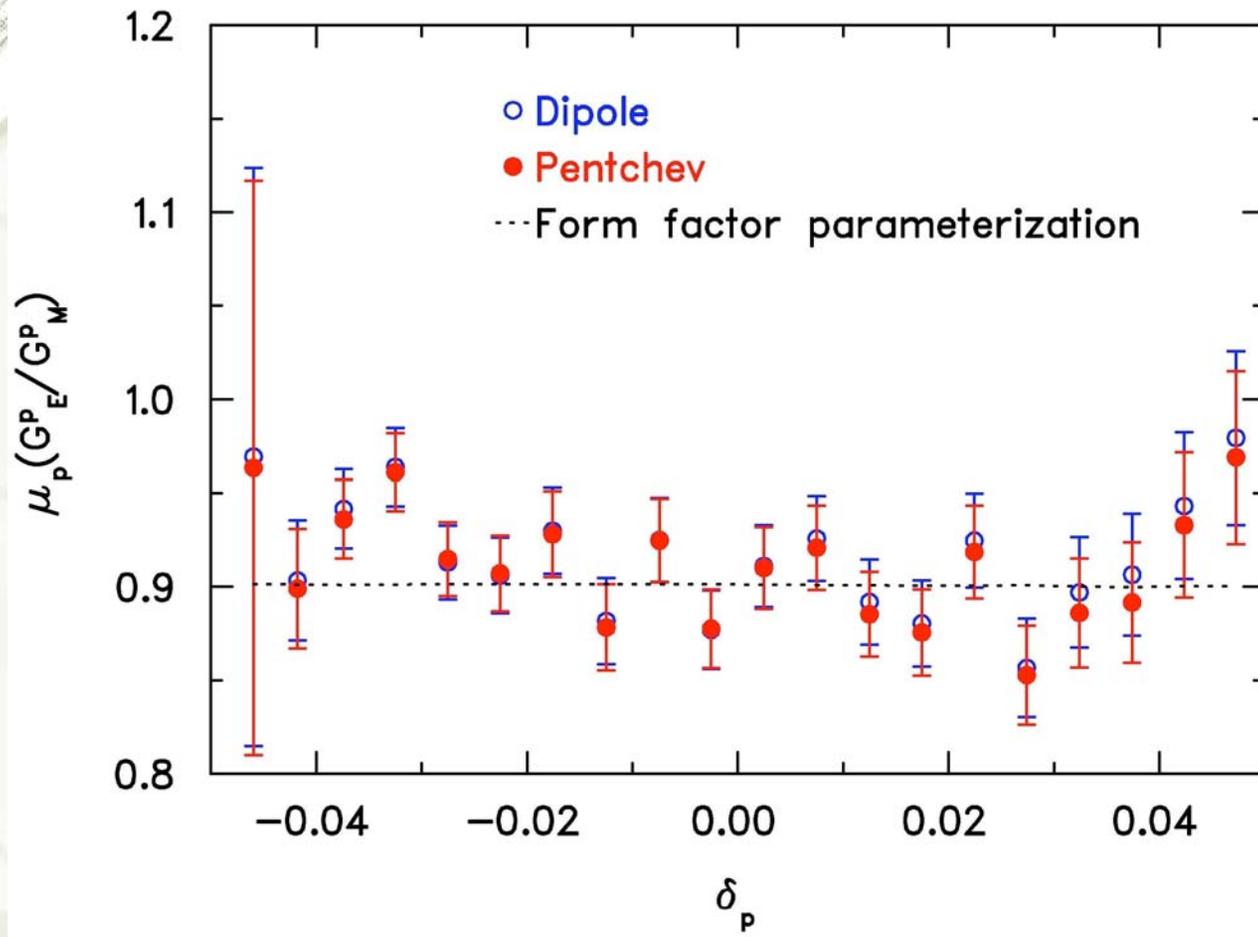


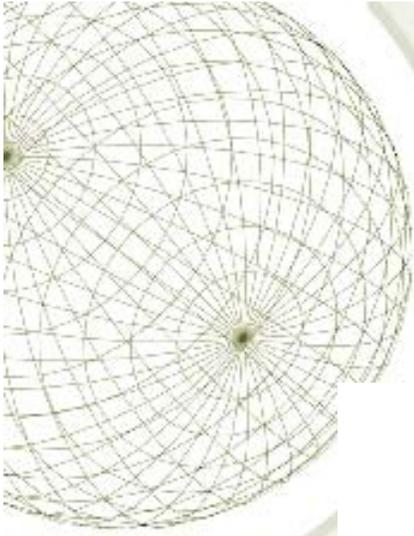
$$G_E/G_M$$



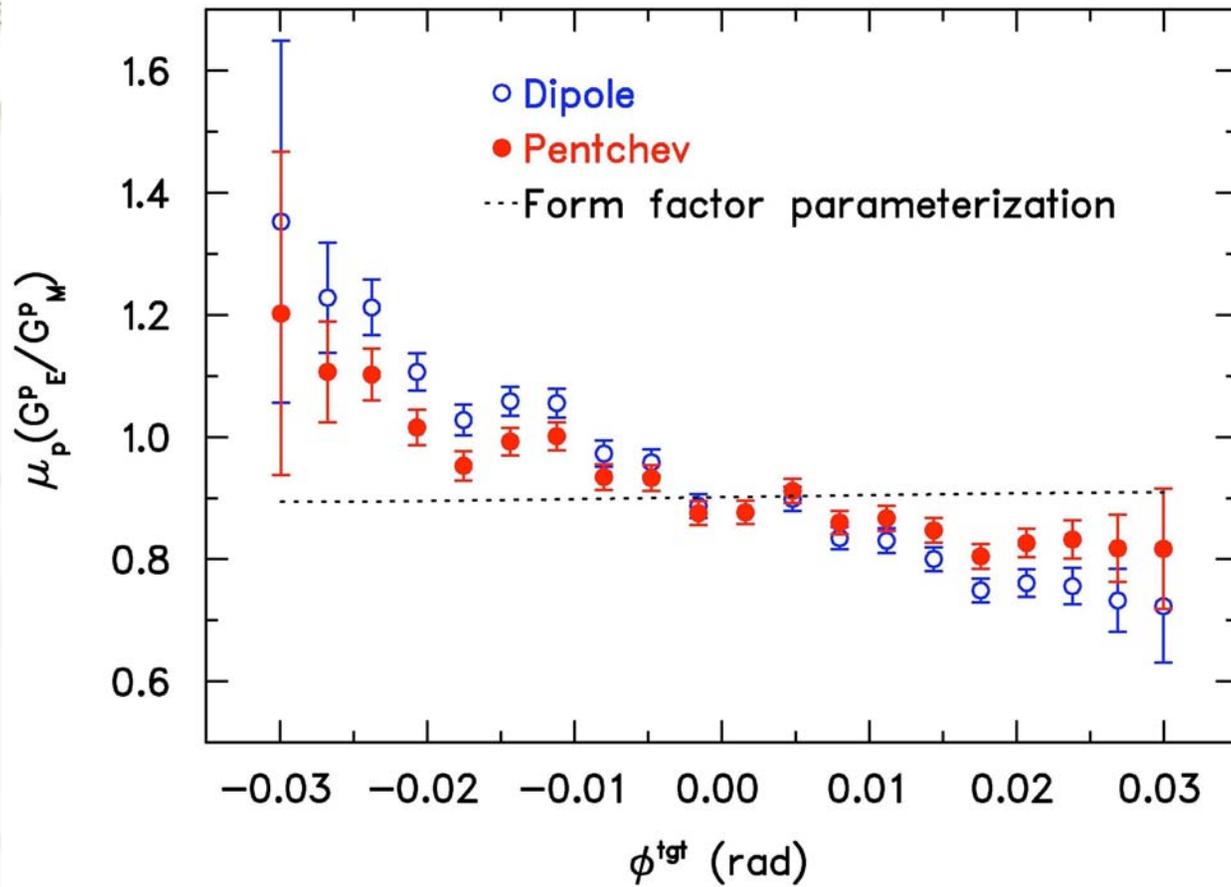


$$G_E/G_M$$

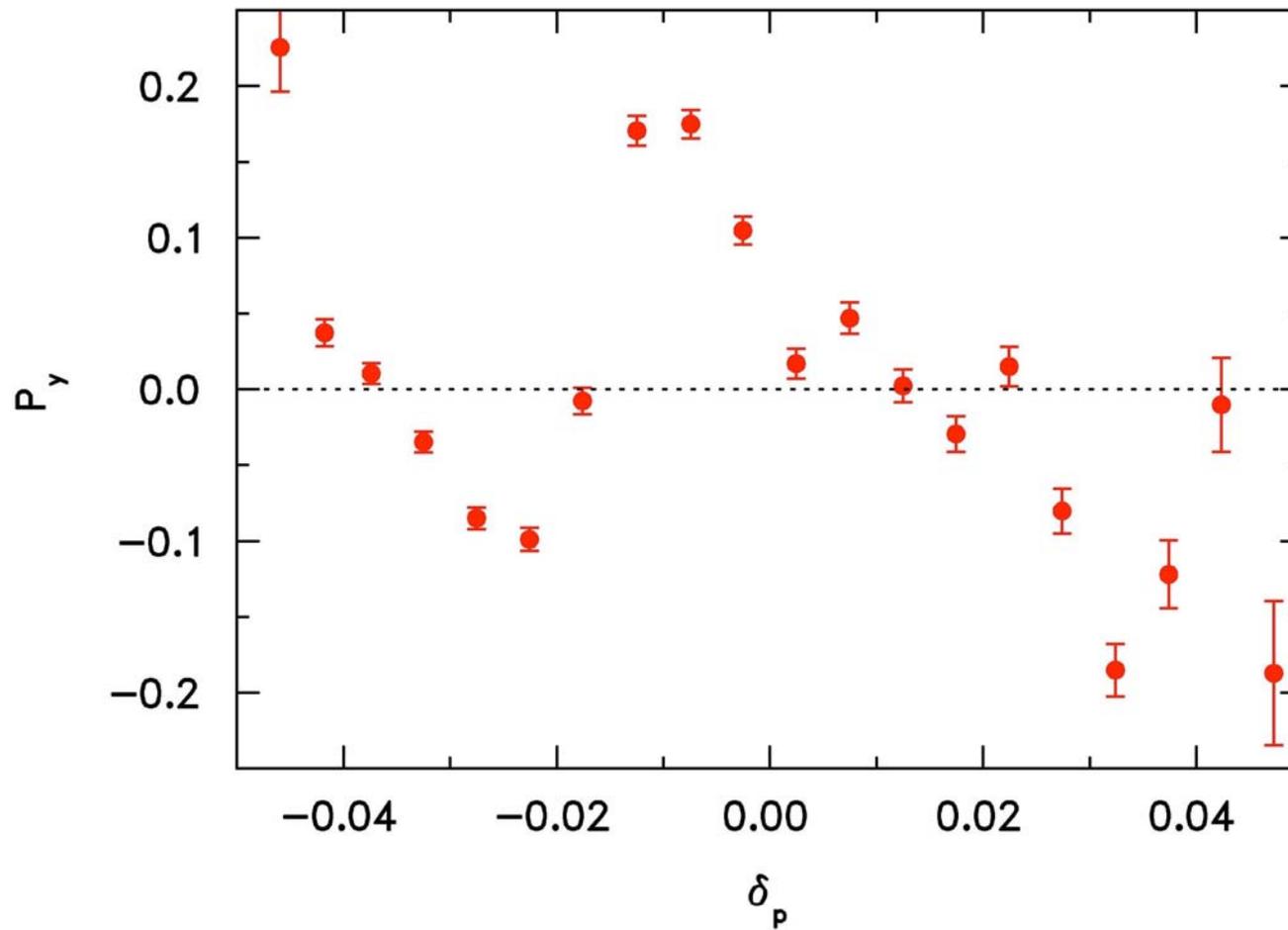




$$G_E/G_M$$

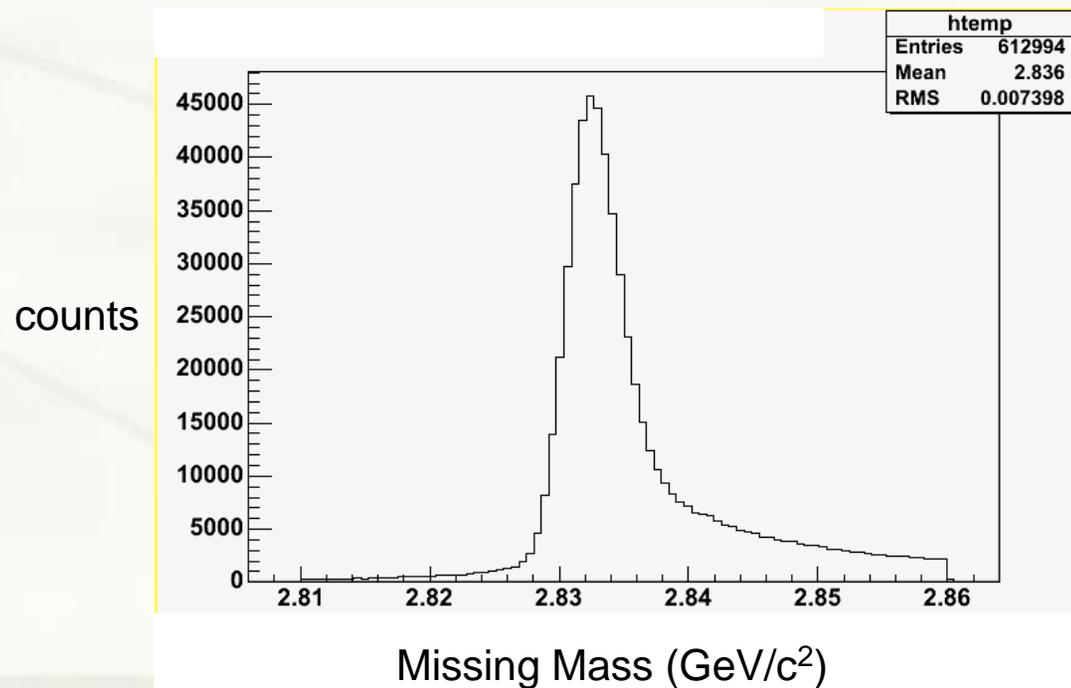


False Asymmetries



Helium

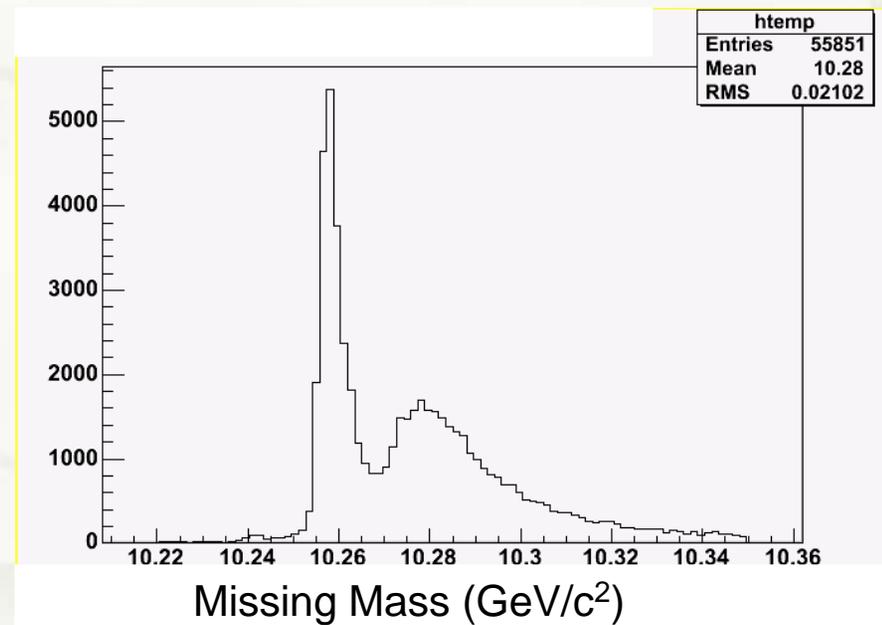
- ★ Missing mass is used to confirm tritium in the final state:

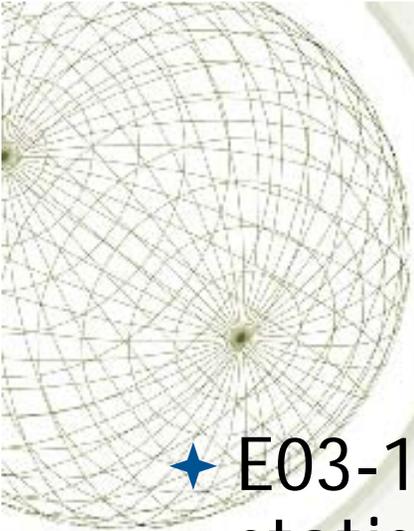


$^{12}\text{C}(e, e'p)$

- ★ Data collected when Hall-C could not allow us to have polarized beam.
- ★ Induced polarization calculated from the $p_{3/2}$ -shell knockout.

counts





Conclusion

- ★ E03-104 was successfully run with great statistics.
- ★ E03-104 will provide:
 - ★ High precision polarization transfer data
 - ★ Induced polarization with reduced systematic uncertainties.
 - ★ A stringent test of calculations