

A1n/d2n Meeting



Stephen Wood – Hall C – Jefferson Lab

Hall C Publications + students

Measurements of Non-Singlet Moments of the Nucleon SF and Comparison ... for $Q^2=4 \text{ GeV}^2$

Accepted PRL – arXiv:1807.06061 (I. Albayrak et al.)

Revealing Color Forces with Transverse Polarized Electron Scattering (SANE)

Phys. Rev. Lett. 122, 022002 (2019) (W. Armstrong et al.)

Technical Supplement to “Polarization Transfer Observables ...” (GEP-III, GEP-2 γ)

Nucl Inst Meth A 910, 54 (2018) (A.J.R. Puckett et al.)

Experimental techniques and performance of Λ -hypernuclear spectroscopy (HKS)

Nucl Inst Meth A 900, 69 (2018) (T. Gogami et al.)

Determination of the Proton’s Weak Charge and its Constraints on the Standard Model

Annual Review of Nuclear and Particle Science – 2019 (Carlini, W. van Oers, M. Pitt, and G. Smith)

Graduated Students: Kurtis Bartlett, James Dowd, Sheren Alsalmi

Hall C Publication Drafts

Unique Access to u-Channel Physics: Exclusive Back.-Angle Omega Meson Electroprod. (FPI)

(W.B. Li et al.)

Exclusive π^+ electroproduction off the proton from low to high $-t$ (FPI)

(S. Basnet et al.)

Parity-Violating Inelastic Electron-Proton Scattering at Low Q^2 (Qweak 3 Pass ancillary measurements)

(Qweak collaboration) – Inclusive e^- and π^- asymmetries with longitudinal and transverse polarized beams

Testing the Standard Model at the Precision Frontier with the Qweak Experiment

To be submitted to *Nuclear Physics News International* (Carlini, W. van Oers, M. Pitt, and G. Smith)

First Determination of the ^{27}Al Neutron Distribution radius from PVES (AREX?)

(Qweak collaboration)

Beam normal spin asymmetries on ^{27}Al

(Qweak collaboration)

Beam normal spin asymmetries on the proton

(B. Waidyawansa, Qweak collaboration)

Hall C – 2019

Spring 2019

E12-16-007 LHCb charmed pentaquark via J/ψ production

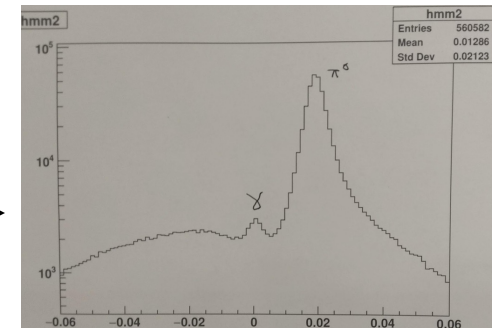
E12-09-002 Completed SIDIS-CSV

E12-09-011 (e,e'K) Completed data need for L/T separations

Now

E12-06-101/E12-07-105 Short low energy run for pion form factor + exclusive pi production scaling

E12-15-001 Generalized polarizabilities of the proton in VCS

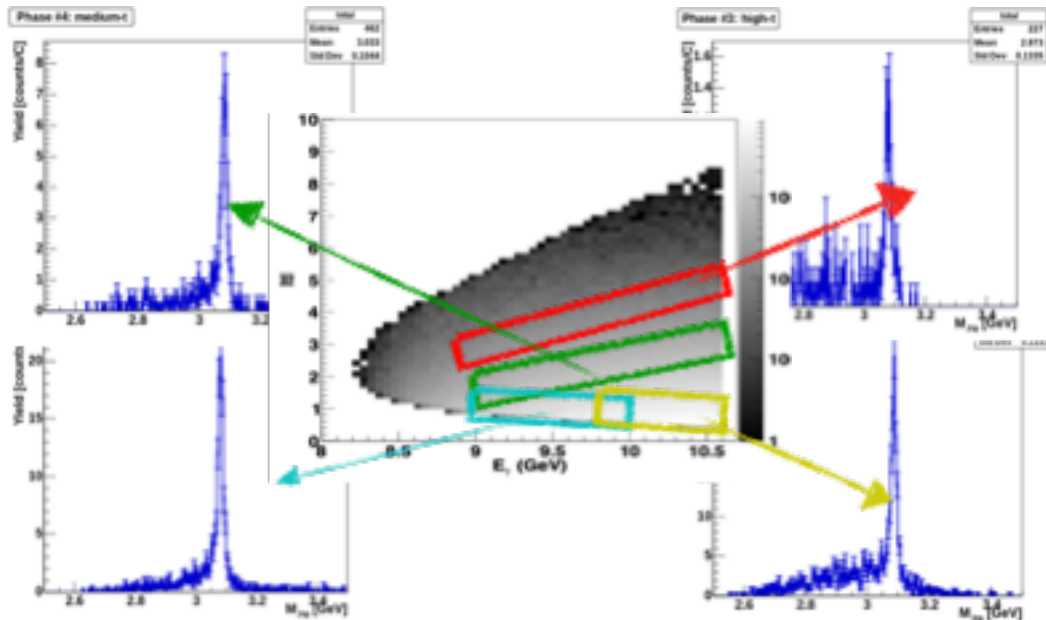


Late 2019-Early 2020

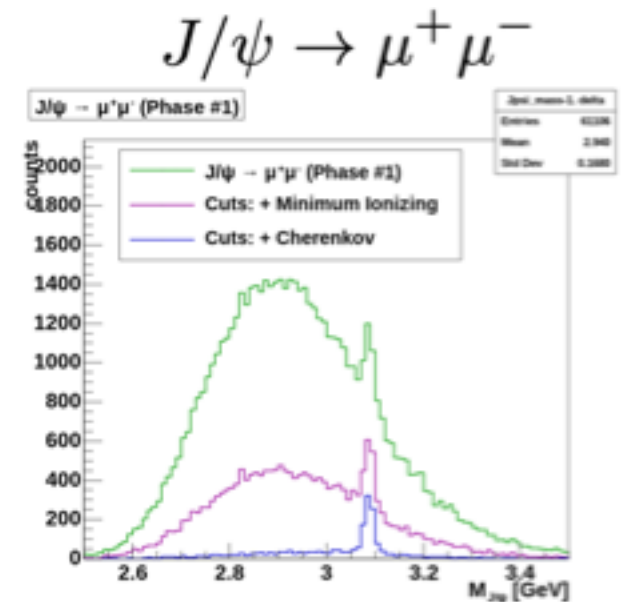
E12-06-110 A_{1n}

E12-06-121 g_{2n}/d_{2n}

Recent running – LHCb Pentaquark search



LHCb Pentaquark search.
Largest data set of
photoproduced J/ψ 's.
Preliminary results soon.

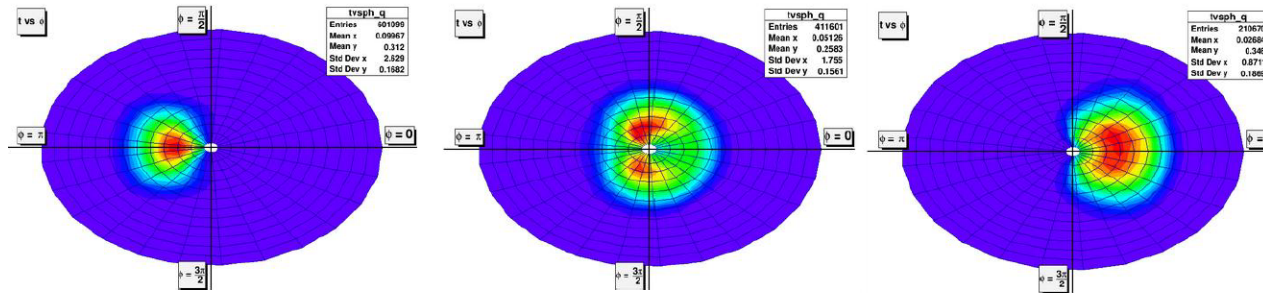


Double statistics with $\mu^+\mu^-$
channel?

Recent Running E12-09-011 (KaonLT)

Spokespersons: T. Horn (CUA), G. Huber (URegina), P. Markowitz (FIU)

Grad. Students: R. Ambrose (URegina, M.S. 2018), V. Kumar (URegina), M. Muhoza (CUA), R. Trotta (CUA)



Three SHMS angles

Two beam energies

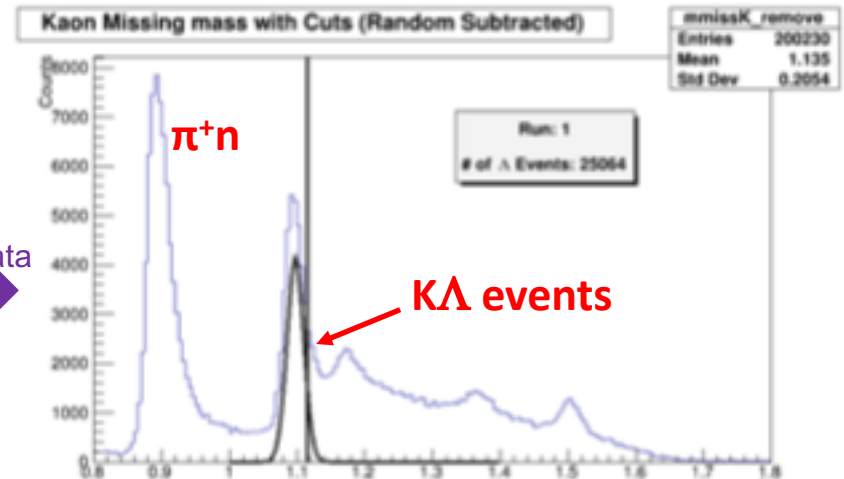
$$2\pi \frac{d^2\sigma}{dt d\phi} = \varepsilon \frac{d\sigma_L}{dt} + \frac{d\sigma_T}{dt} + \sqrt{2\varepsilon(\varepsilon+1)} \frac{d\sigma_{LT}}{dt} \cos\phi + \varepsilon \frac{d\sigma_{TT}}{dt} \cos 2\phi$$

Physics cross section

Polarized beam
FREE
 $+h \frac{d\sigma_{LT}}{dt} \sin\phi$

Setting	Low ε data	High ε data
$Q^2=0.50$ $W=2.40$	✓	✓
$Q^2=2.1$ $W=2.95$	✓	✓
$Q^2=3.0$ $W=2.32$	✓	✓
$Q^2=3.0$ $W=3.14$	✓	✓
$Q^2=4.4$ $W=2.74$	✓	✓
$Q^2=5.5$ $W=3.02$	✓	✓

Spring 2019



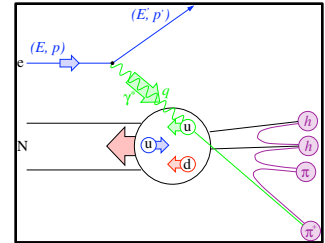
Online data

Thomas Jefferson National Accelerator See R. Trotta talk

Missing Mass (GeV) JSA

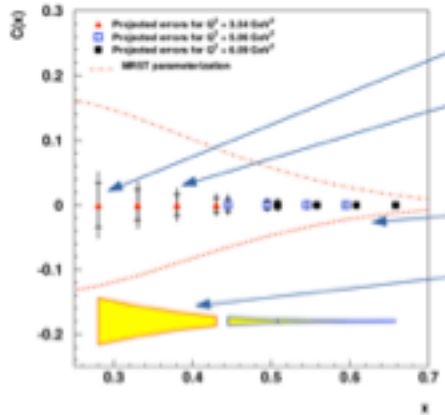
Charge Symmetry Violation - SIDIS

Measurement ratio of semi inclusive yields Y_{π^-} and Y_{π^+} of $d(e,e'\pi^-)$ and $d(e,e'\pi^+)$ to test charge symmetry

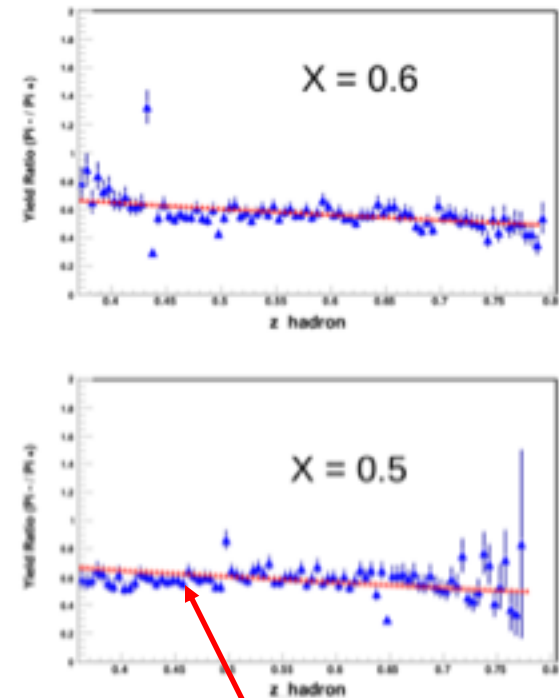
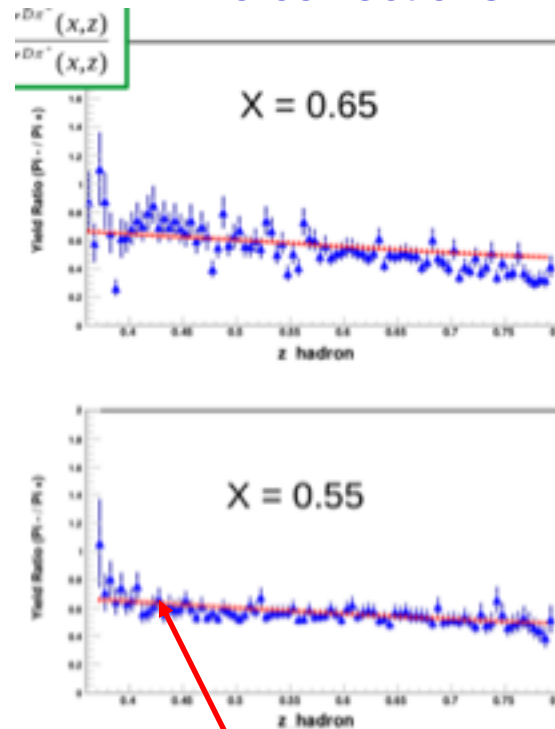


Yield ratios: Calibrations completed.
No corrections.

$$R_y(x, z) = \frac{Y_{\pi^+}(x, z)}{Y_{\pi^-}(x, z)}$$



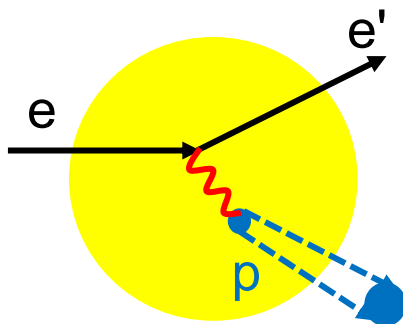
E12-09-002



Ratio predictions from HERMES data (no CSV)

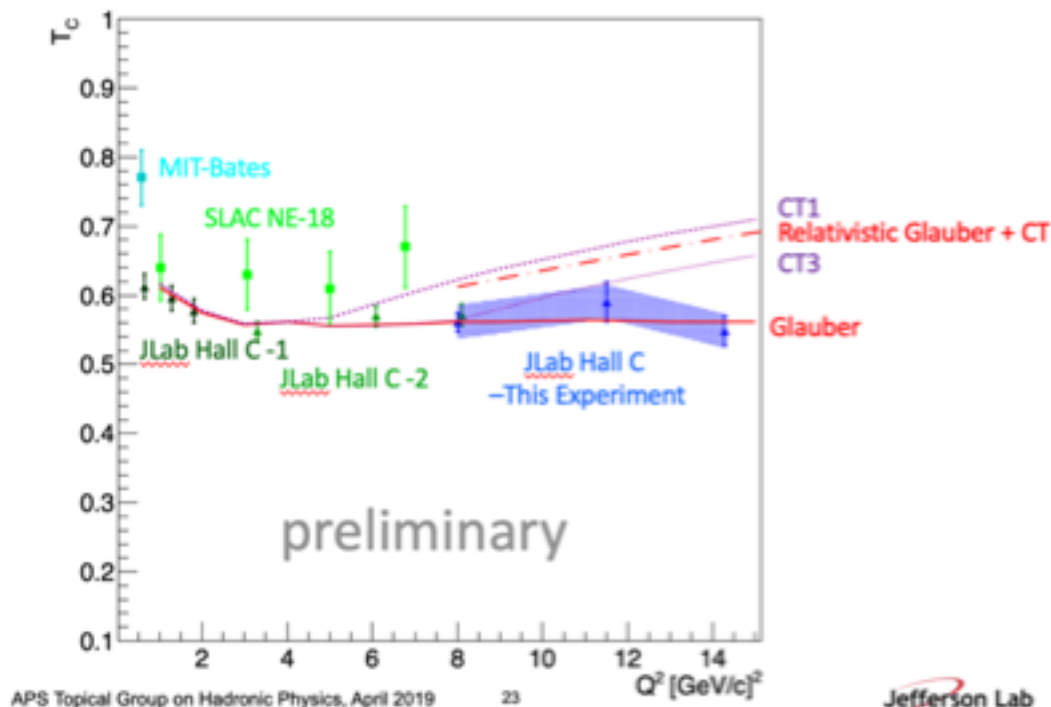
E12-06-107 Color Transparency

$$T_A = \frac{\sigma_{A(e,e'p)}}{Z \sigma_{p(e,e'p)}}$$

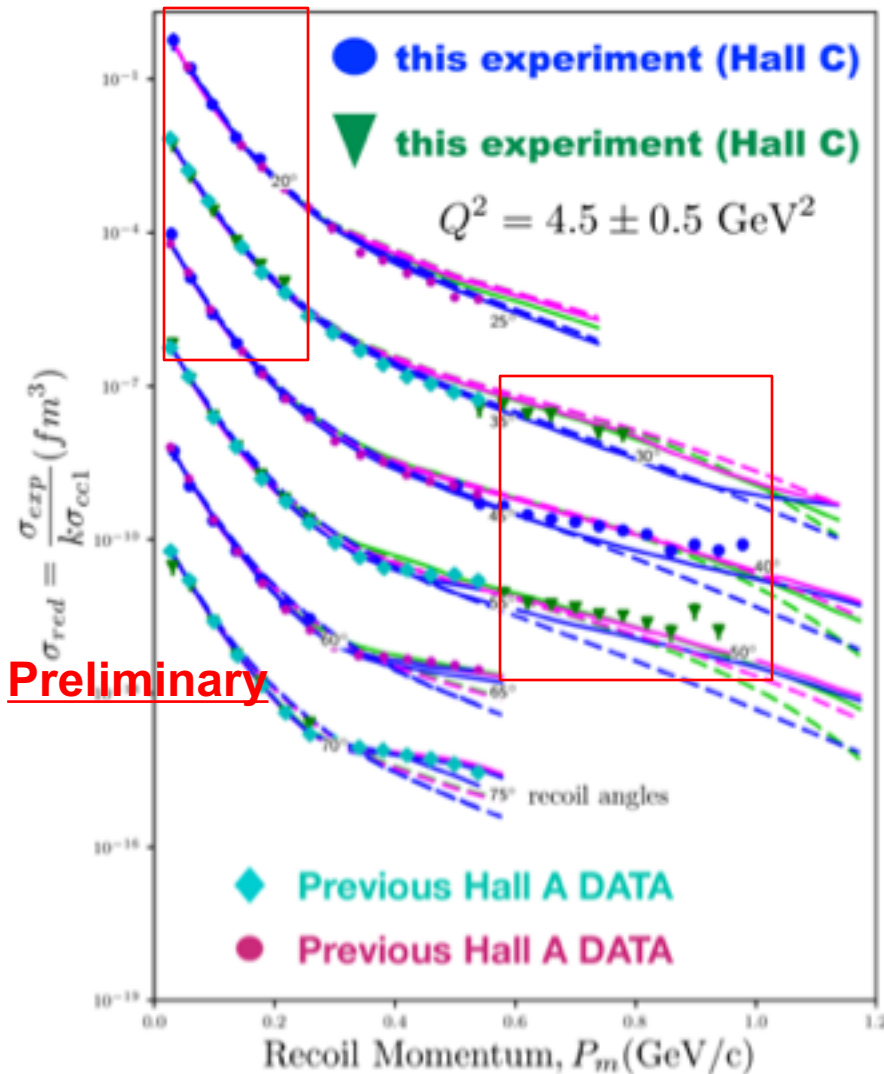


First commissioning experiment

Preliminary $^{12}\text{C}(e,e'p)$ Color Transparency results shown at APS meeting and User Group Meeting.



E12-10-003 d(e,e'p)



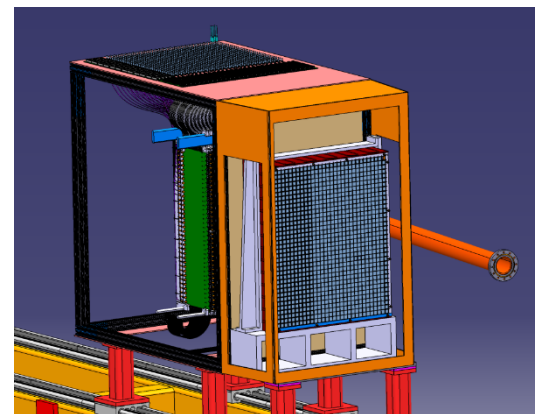
Commissioning experiment

Preliminary results matching to previous Hall A data.

Extends P_m to 1000 MeV/c.

NEUTRAL PARTICLE SPECTROMETER

- ❑ NPS passed ERR with recommendations
 - Experiments: E12-13-010/007, E12-14-003/005
- ❑ NPS 12x12 prototype test successfully completed
- ❑ NPS subsystem status
 - Magnet provided by CUA and ODU (NSF MRI) - ready for mapping



- Detector frame designed (IPN-Orsay)
- Crystal testing ongoing (CUA), final procurement underway
- PMTs on-site, HV base fabrication near completion (OU)
- Software development ongoing (IPN-Orsay, JMU, U. Glasgow, JLab)
- Trigger/Electronics/DAQ - (JLab)
- Mechanical – systems identified, e.g. SHMS platform extension designed, installation plan being developed and tuned (Jlab)

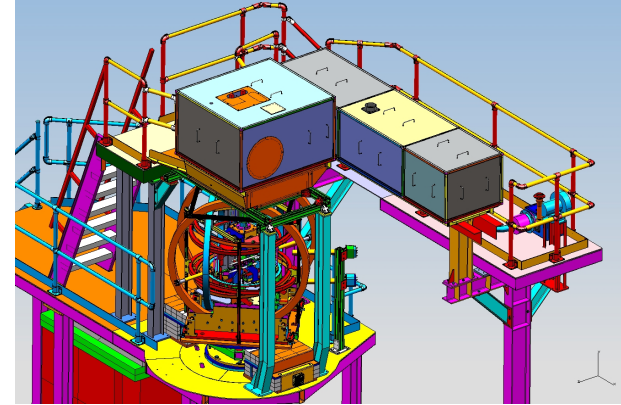


Polarized ^3He target

Preparing for A_1^n / d_2^n (E12-06-110, E12-06-121) in late 2019.

Design complete.

Fabrication of parts in progress.



Schedule update

Published Schedule: Installation start July 18, Run start November 1.

Due to accelerator problems, Hall C will open ~August 5. 2.5 week delay.

PREX2 also lost time and is requesting extension beyond August 18.

Scheduling meeting after PAC (Physics, ACC, Engineering, Facilities) to discuss run extension and later impacts.

Hall C delay puts pressure on target installation. Possible mitigations:

Shift start of A1n, using up 3.5 weeks of contingency (April 2020)

Delay accelerator startup (may be needed for planned ACC work, but has impacts on 2020 long-down schedule.)

Request for two 3 day periods at one pass is acknowledged.

Likely to be accommodated.

HMS Notes

HMS Q2 power supply reversing switch burned up in 2018.
Have been successfully running with a spare supply (with no remote polarity reverse.)
Remote polarity reversal disabled on Q1 and Q3 as a precaution.
Three quadrupole supplies ordered. Delivery in 2020.

Quadrupole polarity reversals done manually (swap cables)
Plan accordingly for any HMS positron running.

HMS and SHMS remote mostly working well.
Small angles require hall access and tech help.
A1n/d2n angles probably large enough to allow remote operation, but check.

Recently had trouble with rotation tripping with HMS near 33 degrees.
Suggest checking rotation to angles in run plan before run starts.

Other notes

Planning a test of the Moller polarimeter at end of current run.

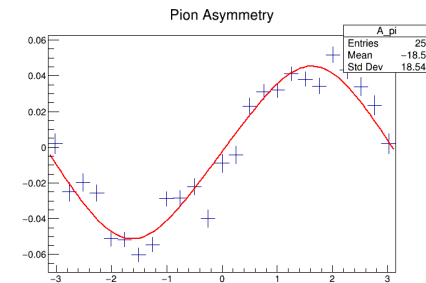
Capital equipment plan to upgrade and harmonize Hall A and C polarimeters.

New SC magnet for Hall C Moller(likely not in time for A1n/d2n)

New Moller target ladder

Hall C analyzer decodes delayed helicity reporting. Asymmetries observed in $p(e,e'\pi)$ data.

Helicity scalers (for beam charge asymmetry measurement) in DAQ.
M. Rehfuss developing analysis software for helicity scalers.



Safety

Several near miss incidents at lab recently.

Electrical shock

^3He target lab laser

Raise safety issues you see.

Encourage to have questioning attitude about safety.

Make sure documentation – OSPs, Hclists – exists and is up to date.