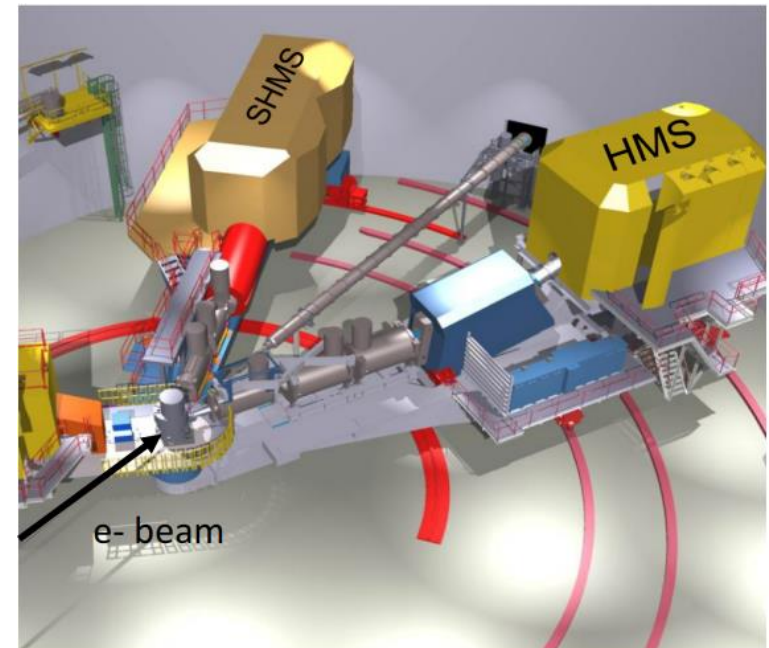
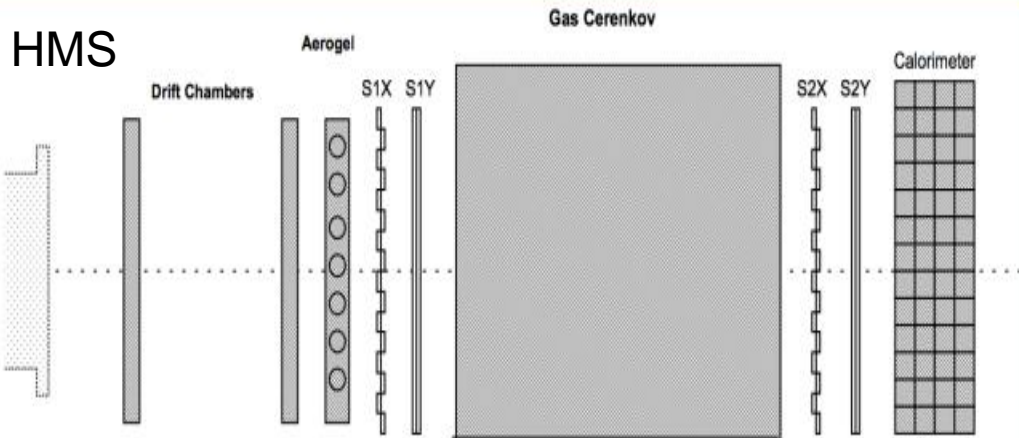


Hall C Introduction

Mark Jones , Hall C Staff

- ❑ Hall C has two small acceptance spectrometers:
 - High Momentum Spectrometer (HMS) from 6 GeV era
 - $P_{\max} = 7.3 \text{ GeV}/c$, $\Omega = 6.5 \text{ msr}$, $-10 < \delta < 10\%$, $10.5 < \Theta < 85^\circ$
 - Super High Momentum Spectrometer (SHMS) , new for 12 GeV era
 - $P_{\max} = 11 \text{ GeV}/c$, $\Omega = 4 \text{ msr}$, $-15 < \delta < 25\%$, $5.5 < \Theta < 40^\circ$

- ❑ The detector packages in HMS and SHMS
 - Drift Chambers, Scintillator Hodoscopes, Aerogel, Gas Cerenkov, Calorimeter



Hall C Software Overview

- The standalone C++ library is called HCANA which utilizes the existing Hall A PODD library.
- Git for version control and Github as repository server. [HCANA repo](#)
 - Steve Wood, manages main git repository. Use Travis to check commits.
 - Users fork from main repo and make pull requests to main git repo.
 - Activity monitored by Hall A experts: Ole Hansen and Bob Michaels
- JLab developed SWIF workflow used for farm submissions.
- Nightly builds on multiple machine types. [Build status](#)
- SCONS for building code. CMAKE now available.
- [Doxygen for documenting code.](#)
- Annual joint Hall A/C software meetings
- Simulation code for coincidence experiments is [SIMC](#).
- Simulation code for single arm experiments uses [MC SHMS SINGLE](#). Separate radiative correction code, [rc externals](#).

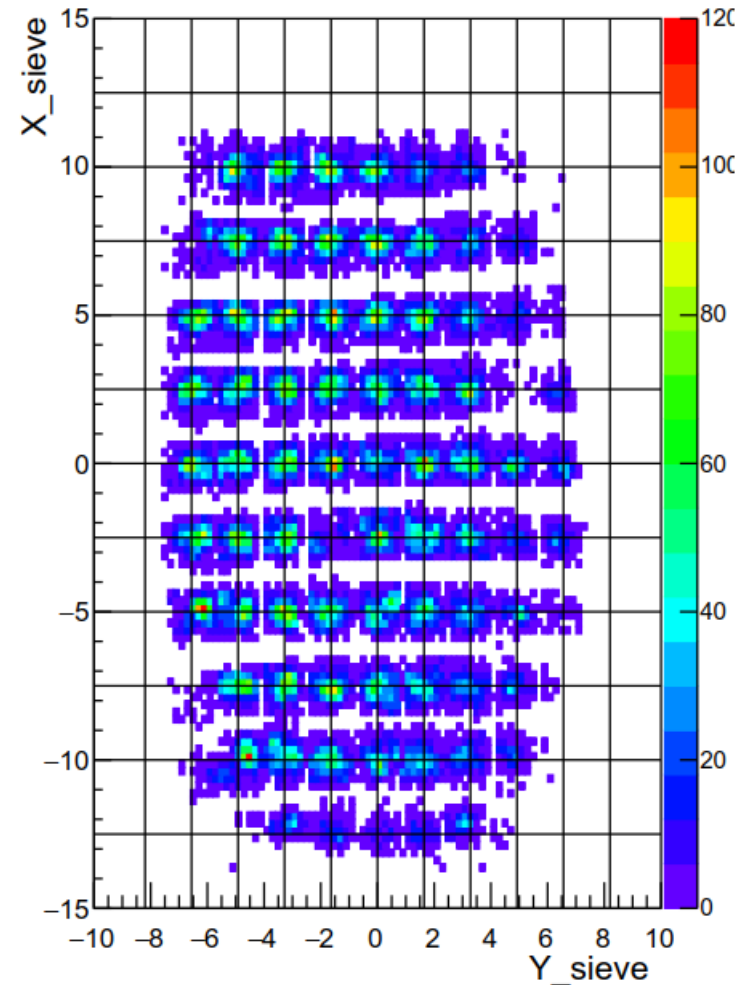
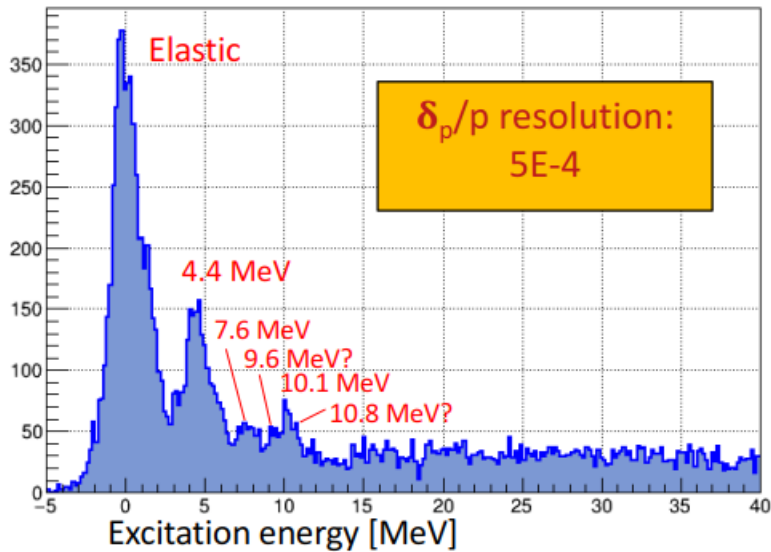
Commissioning Experiments

- Commissioned SHMS/HMS detectors and optics with 1-pass and 3-pass beam from Dec 2017-Jan 2018
- Set of commissioning experiments from Jan 2018 - April 2018
 - [E12-06-107](#) The Search for Color Transparency at 12 GeV
 - [E12-10-002](#) Precision measurements of the F2 structure function at large x in the resonance region and beyond
 - [E12-10-003](#) Deuteron Electro-Disintegration at Very High Missing Momentum
 - [E12-10-008](#) Detailed studies of the nuclear dependence of F2 in light nuclei.

- Opportunity to involve lots of graduate students and post-docs in commissioning detectors.
- Single arm and coincidence experiments for testing knowledge of HMS/SHMS acceptance and optics.

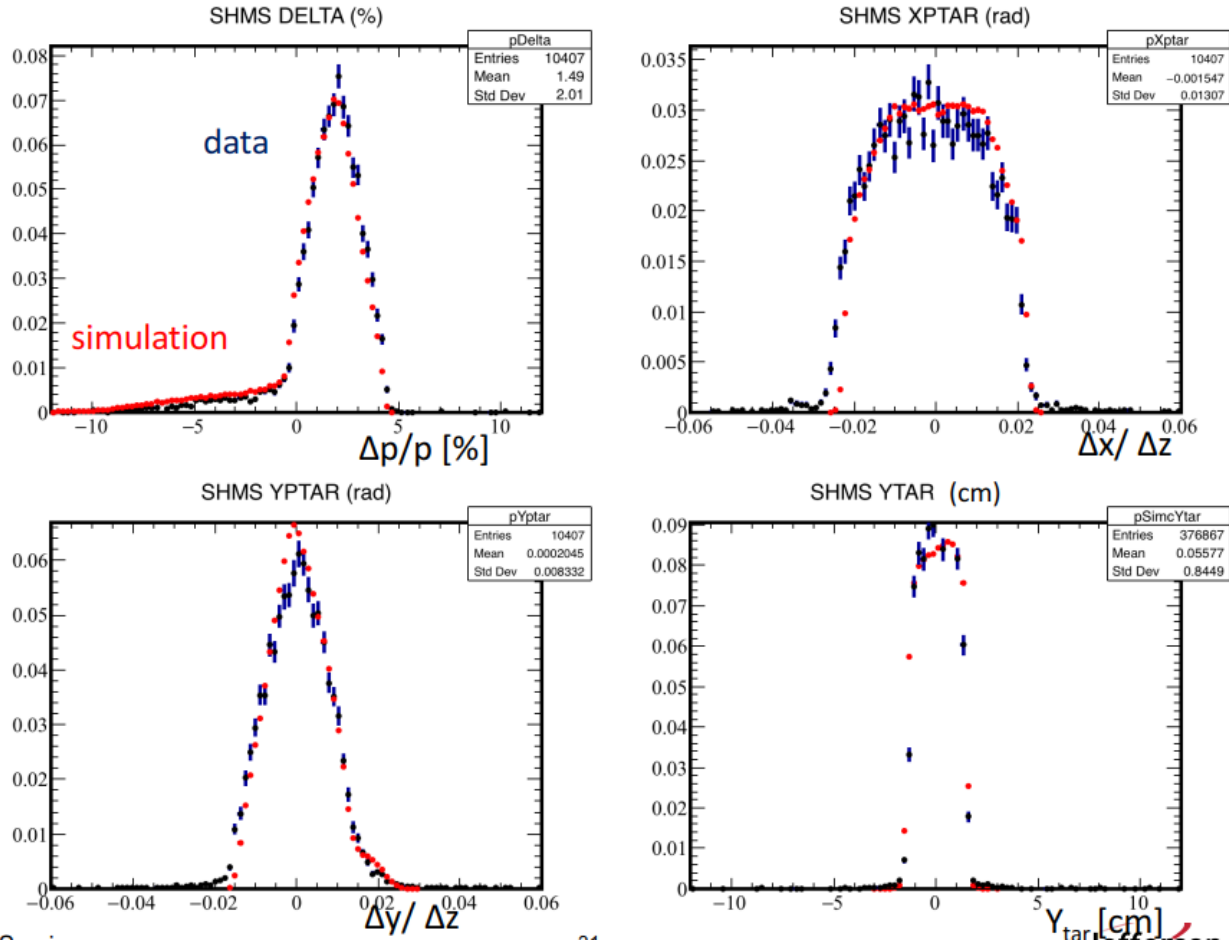
SHMS Optics calibration

- Used carbon elastic scattering with 2.2 GeV beam for delta calibration.



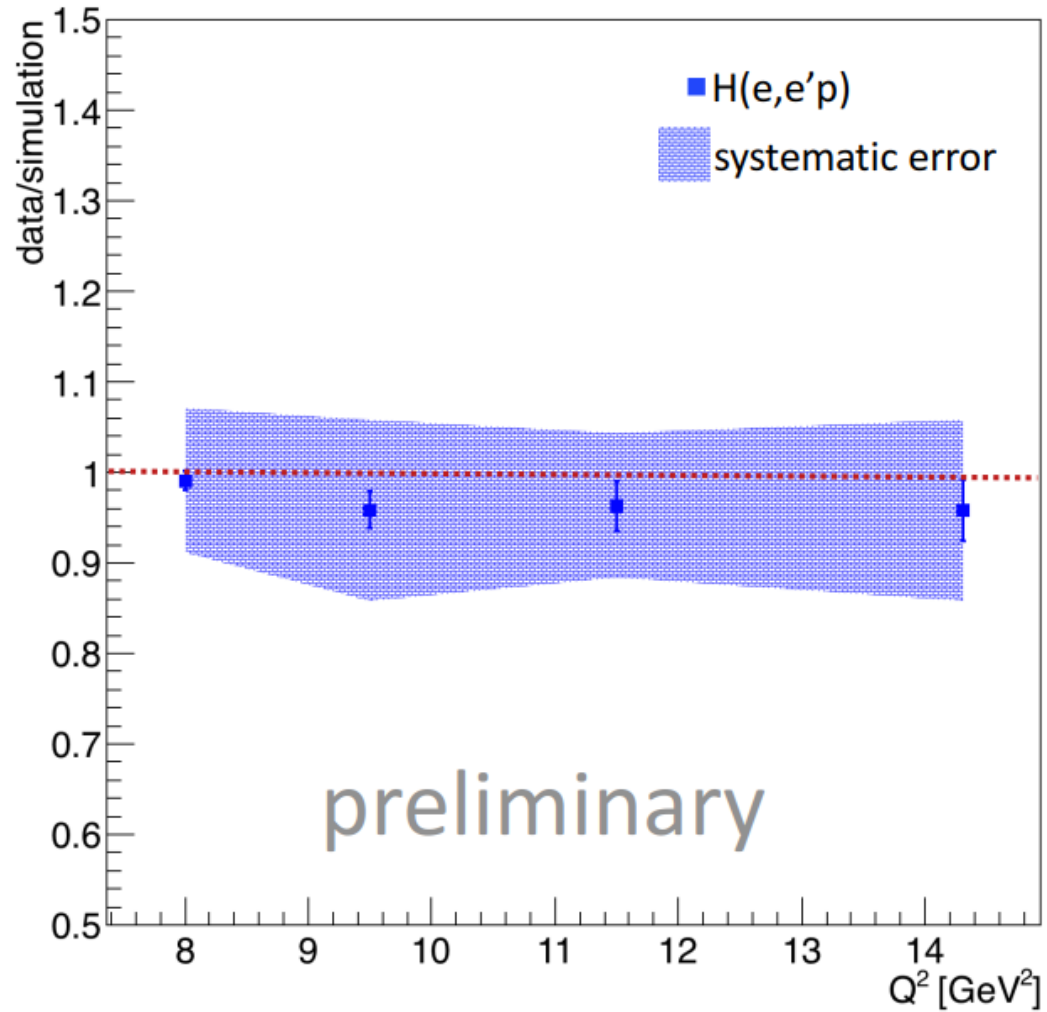
1H(e,ep) elastic DATA/SIMC comparison

SHMS target quantities for elastic ep coincidence at $Q^2 = 8 \text{ GeV}^2$



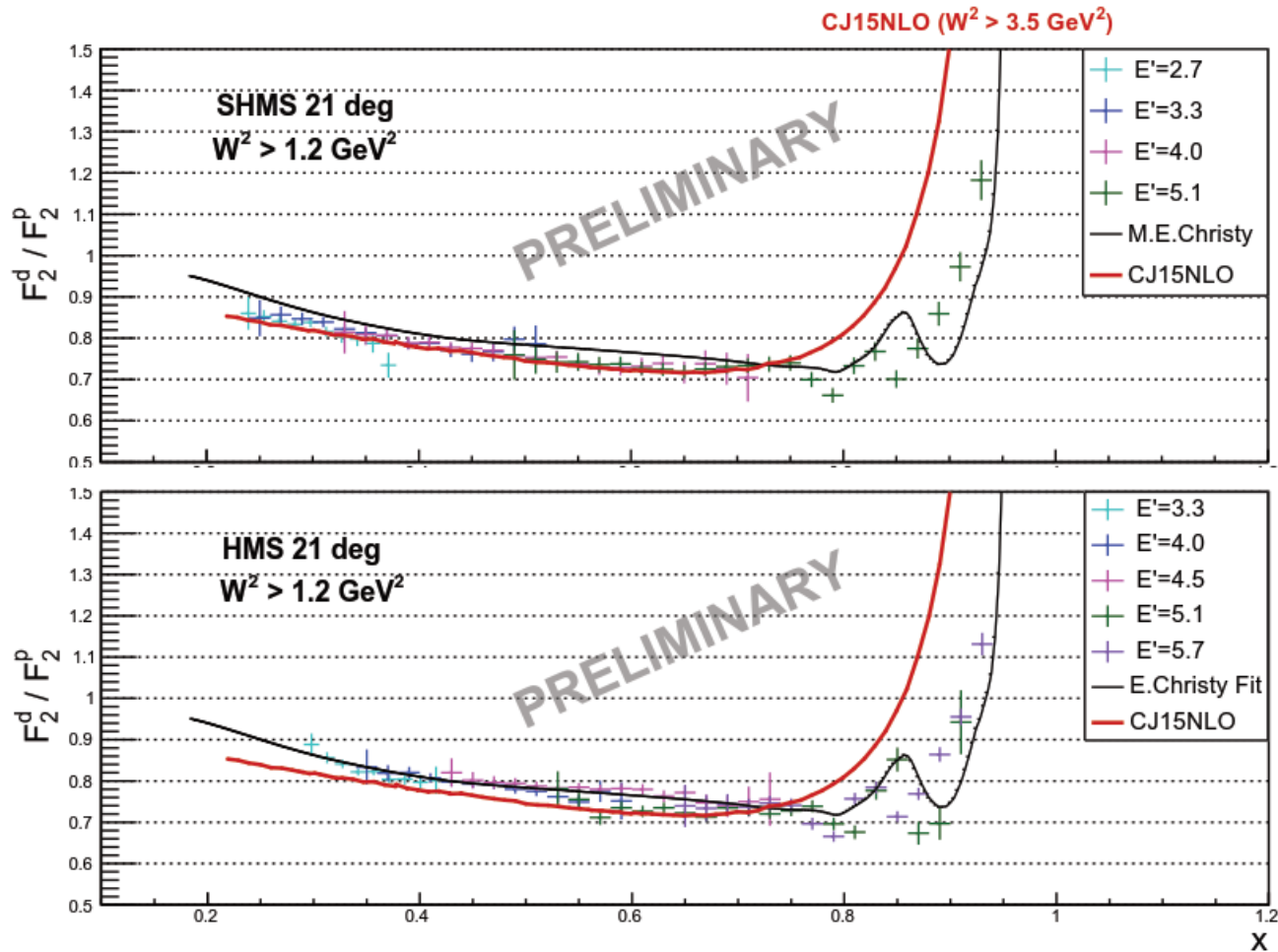
Plots from Holly Szumila-Vance for CT experiment

1H(e,ep) elastic results



Plots from Holly Szumila-Vance for CT experiment

F₂ deuteron/proton ratio

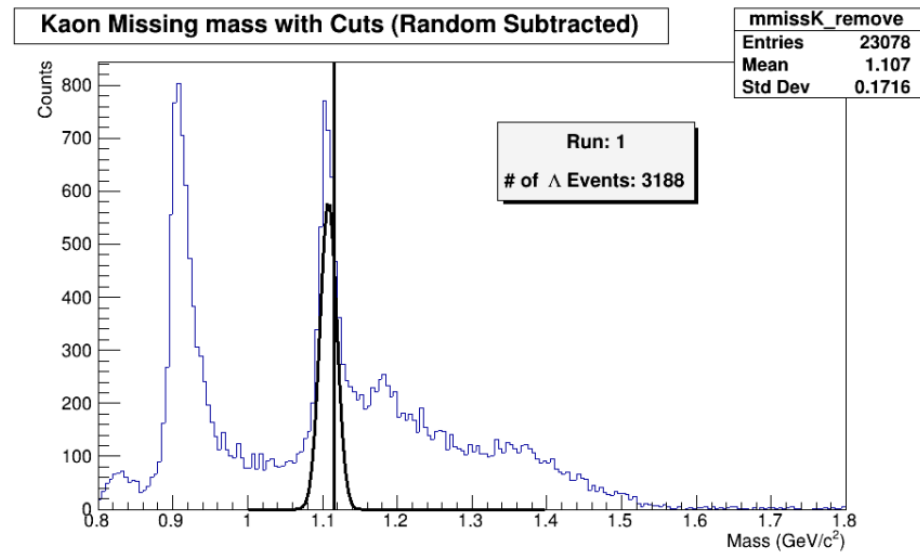


Plots from Sanghwa Park for F₂ experiment

Late Spring 18/Fall 18/ Spring 19 Experiments

- [E12-09-017](#) Transverse Momentum Dependence of Semi-Inclusive Pion Production
- [E12-09-011](#) Studies of the L-T Separated Kaon Electroproduction Cross Section from 5-11 GeV
- [E12-09-002](#) Precise Measurement of π^+/π^- Ratios in Semi-inclusive Deep Inelastic Scattering Part I: Charge Symmetry Violating Quark Distributions
- [E12-16-007](#) A Search for the LHCb Charmed “Pentaquark” using photoproduction of J/Psi at Threshold in Hall C at Jefferson Lab

- Online results from E12-09-011
- Lambda mass not reconstructed at the correct mass. Work to do in determining the central HMS/SHMS spectrometer momentum to 0.1% level



Future Experiments

- Summer 2019 (Low energy running)
 - [E12-06-101](#) Measurement of the Charged Pion Form Factor to High Q^2
 - [E12-07-105](#) Scaling Study of the L-T Separated Pion Electroproduction Cross Section at 11 GeV
 - [E12-15-001](#) Measurement of the Generalized Polarizabilities of the Proton in Virtual Compton Scattering
- Winter 2019/Spring 2020
 - [E12-06-110](#) Measurement of Neutron Spin Asymmetry A_{1n} in the Valence Quark Region Using an 11 GeV Beam and a Polarized ^3He Target in Hall C
 - [E12-06-121](#) A Path to 'Color Polarizabilities' in the Neutron: A Precision Measurement of the Neutron g_2 and d_2 at High Q^2 in Hall C
- Experiments from Fall 2020 onwards will use standard SHMS/HMS.

Computing requirements (part 1)

- Background load in cores (nominal): 300 cores
- Background tape consumption (nominal): 0.5 TB/week
 - Background usage rates based on ~2.5M core-hour/yr usage from 2015–2018
- Weeks Running (estimated):
 - 23 [FY18, FY19]
 - 12 [FY20] (Planned Accelerator down)
 - 28 [FY21, FY22]

Computing requirements (part 2)

- Resource use per week of Running
 - Simulation load in core-weeks: N/A *
 - Non-simulation load in core-weeks: N/A *
 - Simulation data to tape: N/A *
 - * Simulation and offline analysis captured in above background estimates for Hall C.
 - Online analysis typically carried out on Hall compute cluster.
 - Non-simulation data to tape: 1 TB/week
 - Based on (nominal) 5 MB/sec data rate to disk and 40% Accel*Hall uptime

Conclusion

- Recommendation of last review: *Continue to aggressively enlist the user community to commission the upcoming experimental program.*
 - Wide range of commissioning experiments
 - Joint Hall A/C software workshops coordinated with user meetings.
- Data analysis and Monte Carlo software working well. Benefit from combining with Hall A software.
- Preliminary results have been presented at conferences. Publications within the next year.
- Computing requirements are modest with no major changes anticipated in next 5 years.