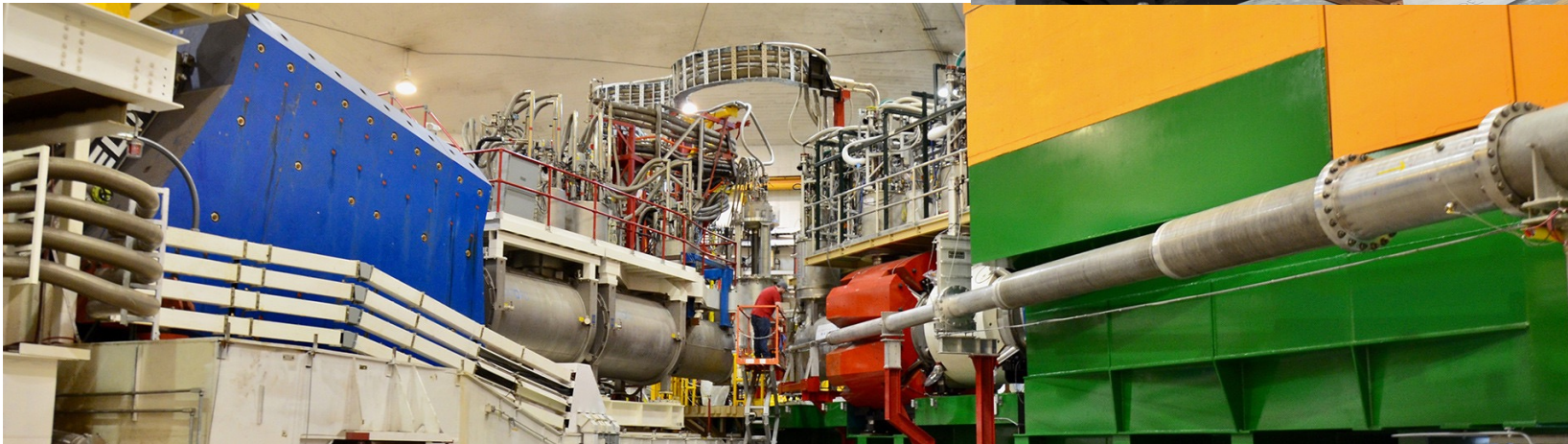
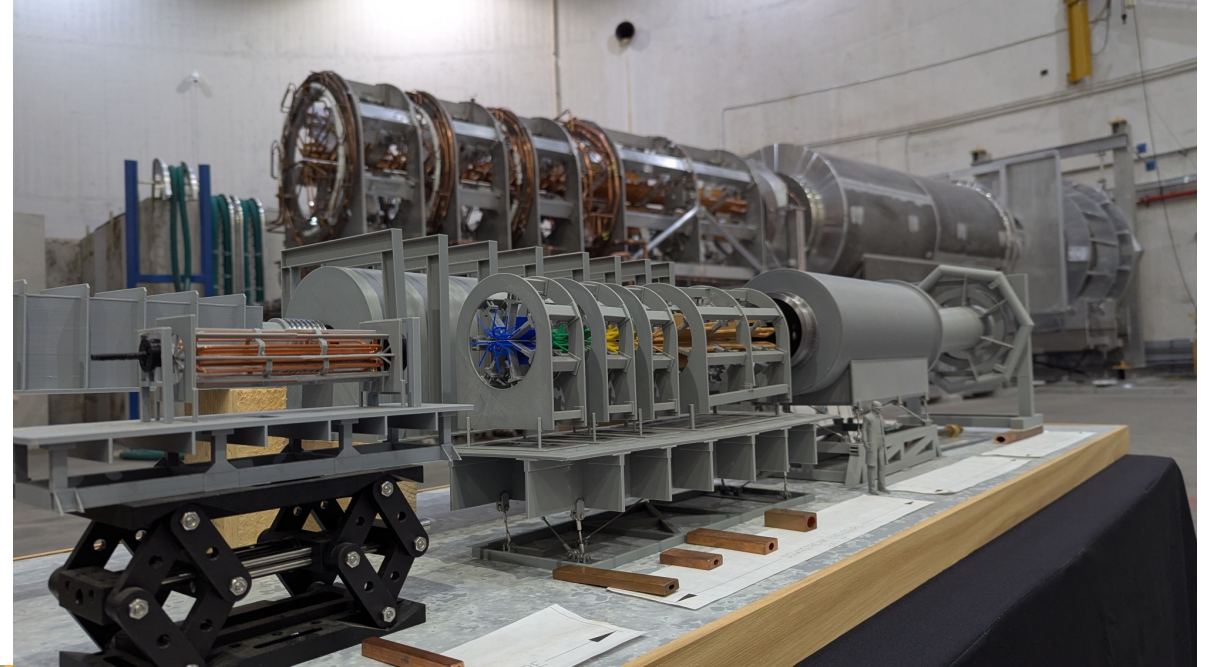


Hall A and C Update

Dave Gaskell
JLUO Satellite Meeting at APS/DNP
October 12, 2026

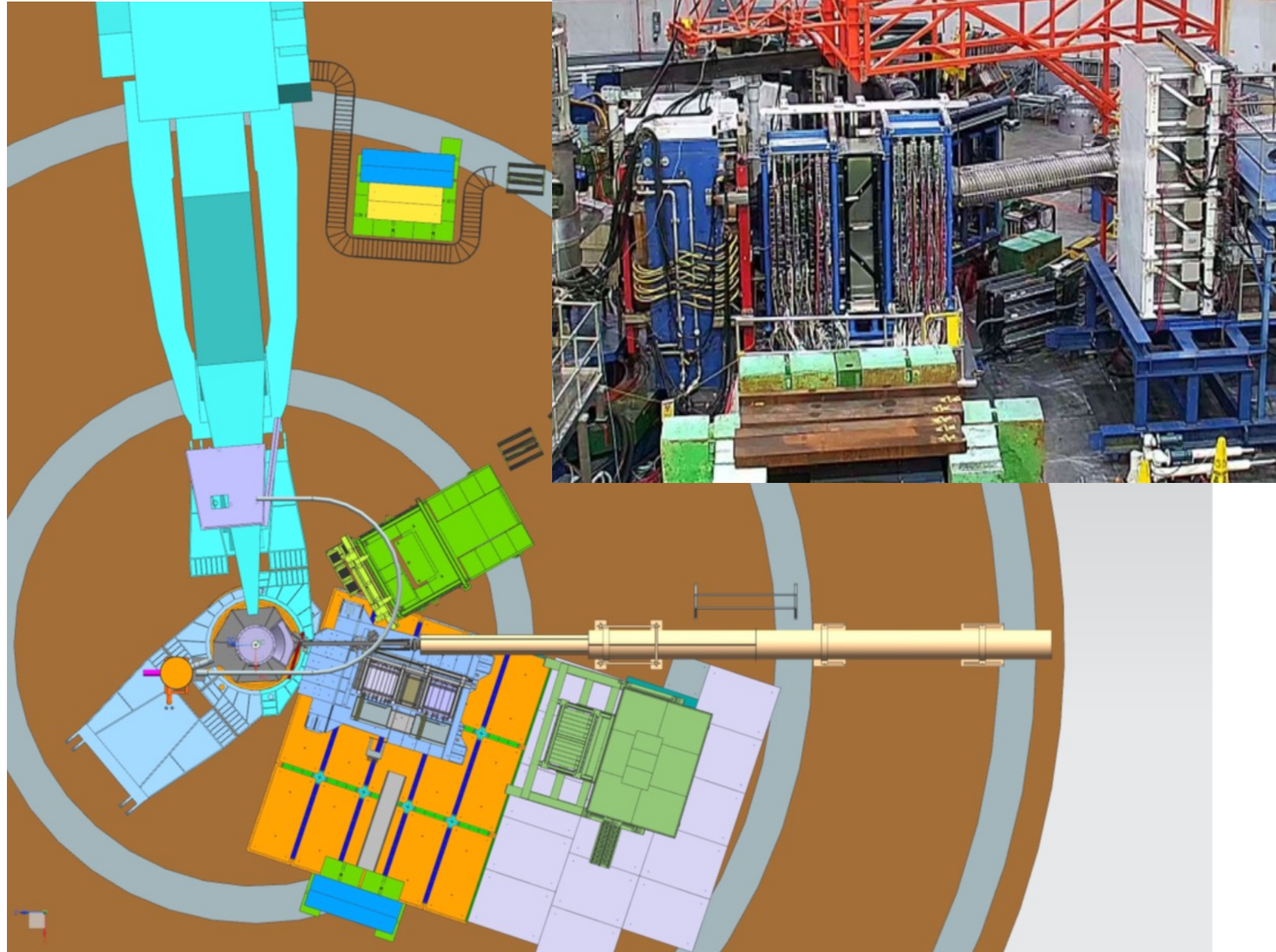


Hall A: SBS

SBS Form factor program in Hall A completed in late **August 2025**

Completed extensive program of nucleon form factor measurements

- E12-09-019: GMn using ratio method
- E12-09-106: GEn with polarized ^3He
- E12-20-010: Two-photon effects in elastic neutron scattering
- E12-07-109: (GEP-V) proton elastic form factor ratio



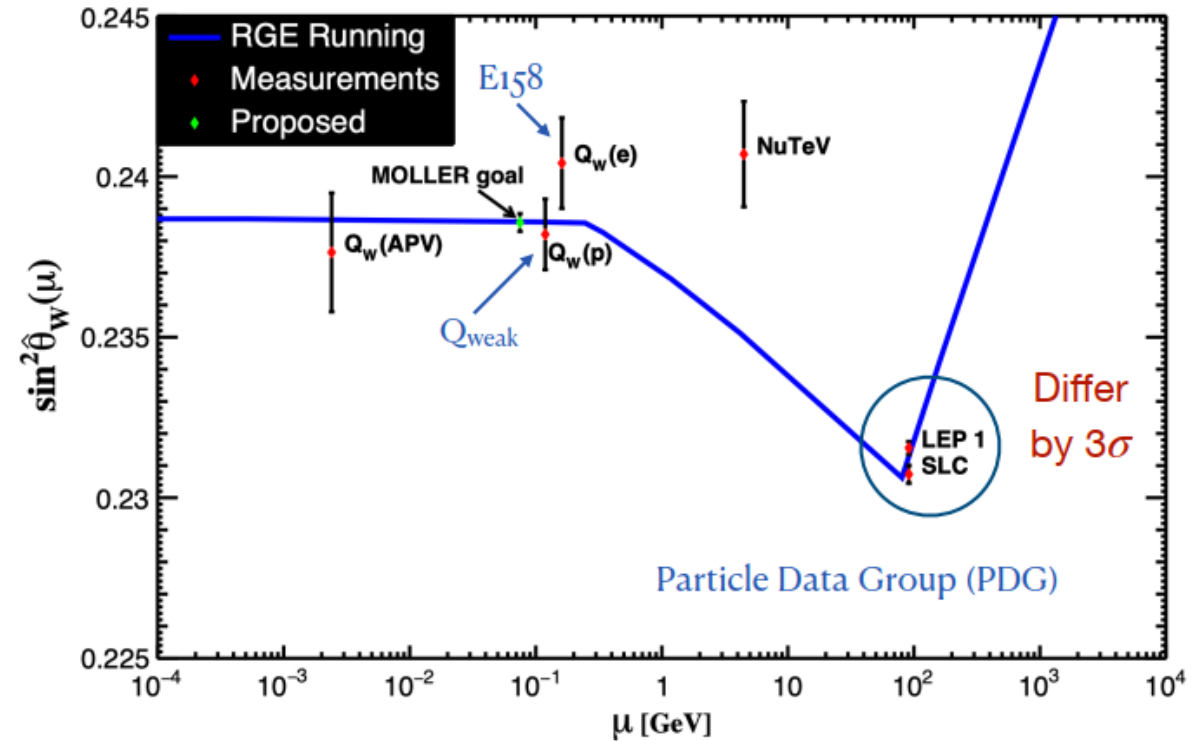
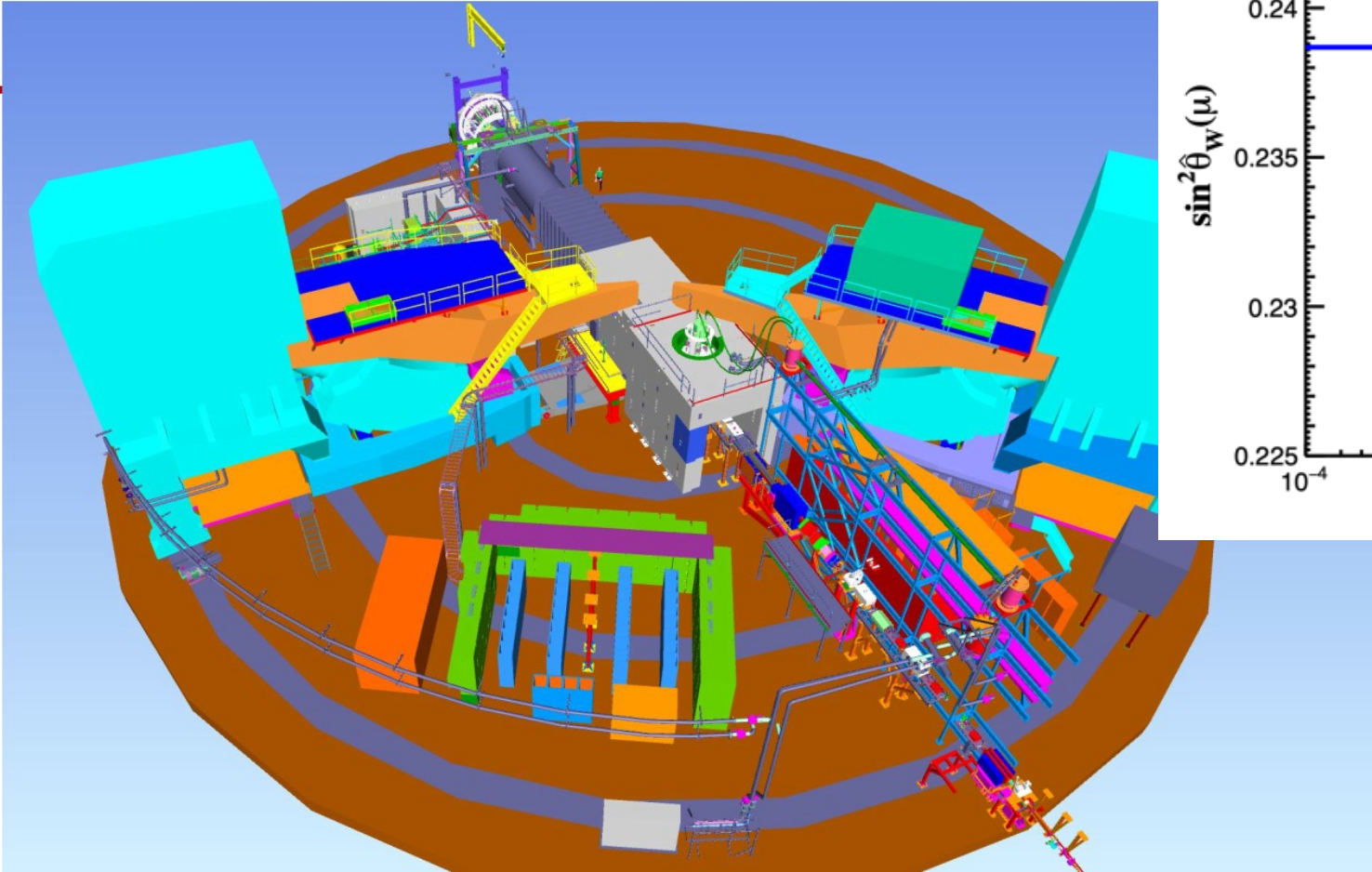
Hall A: SBS to MOLLER

- After GEP-V, removed SBS equipment in preparation for MOLLER installation
- SBS deinstallation completed by end of 2025
- Tasks completed
 - SBS counterweight and floor plates removed from hall
 - Removed bellows that attach shielded beam pipe and shielded exit Beam Pipe
 - Disassembled Exit Beamline Tower and removed from Hall
 - Disassembled (Corrugated) Exit Beam Pipe
 - Removed Concrete Footing and Mounting Hardware for Tower and Exit Beam Pipe Support
 - Moved the LHRS from 95 to 90 degrees
 - Removed the scattering chamber



MOLLER Experiment

Precision measurement of the weak mixing angle
→ Dedicated spectrometer, new detectors

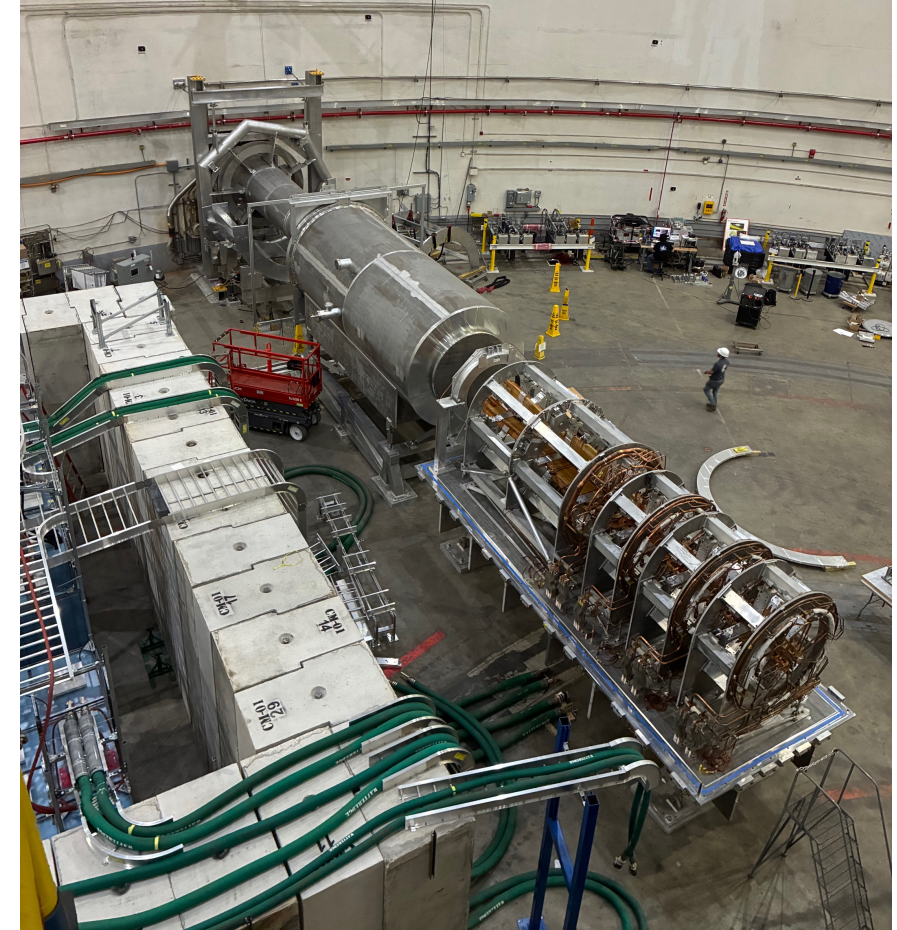
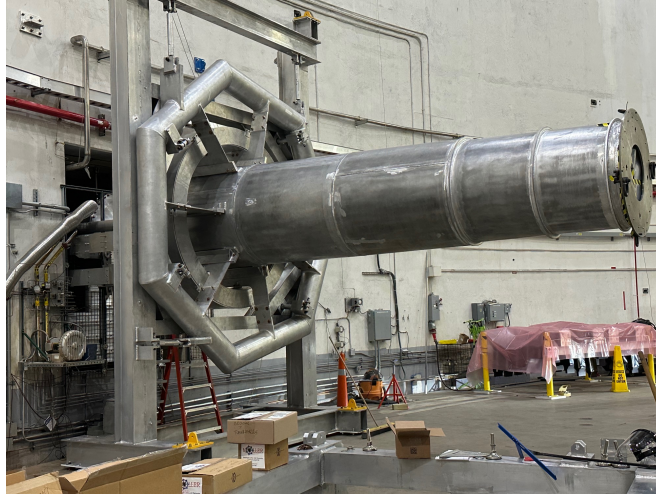


MOLLER has been/is being built and installed as an official DOE managed project
→ Initial running planned for summer 2027

Hall A: MOLLER Installation



Pion Donut and Detector pipe on beam line

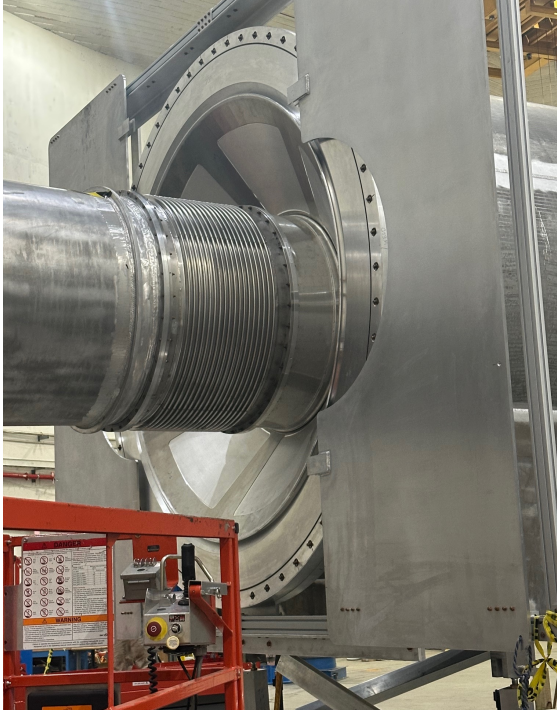


Lots of grout poured and pads made for the installation of the drift pipe and downstream magnets stand.



MOLLER toroidal magnets on beam line

Hall A: MOLLER Installation



Large Detector side window of Drift Pipe. Pump system was connected and successfully pumped down. Alignment test of the Drift pipe, bellows and the Detector pipe completed



All 5 MOLLER Power supplies connected to power and LCW.

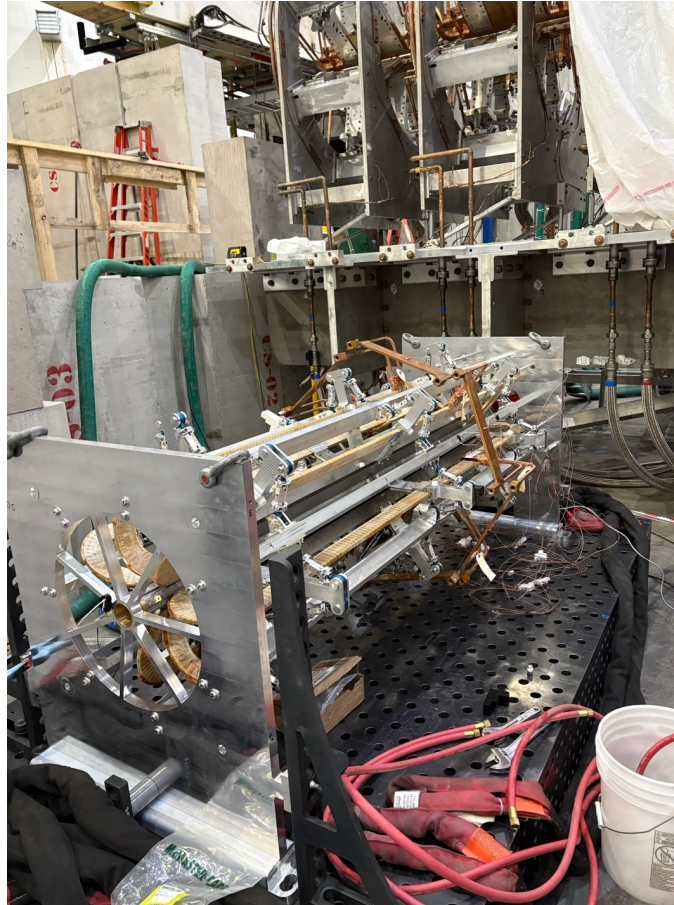


Blue Utility platform and all the cables removed. Multi-month effort from many groups.

Hall A: MOLLER Installation



Target region shielding – partially installed



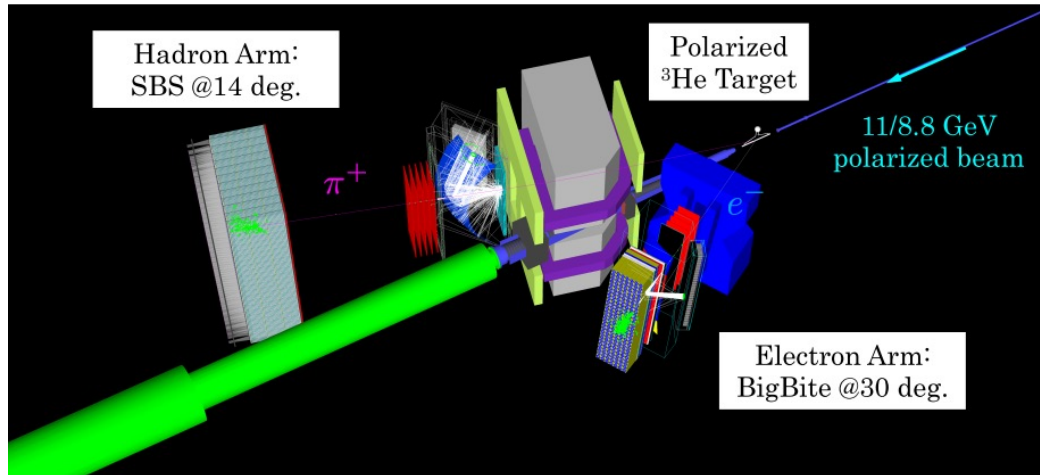
TM0 – first toroidal magnet
Getting prepared for testing
and installation



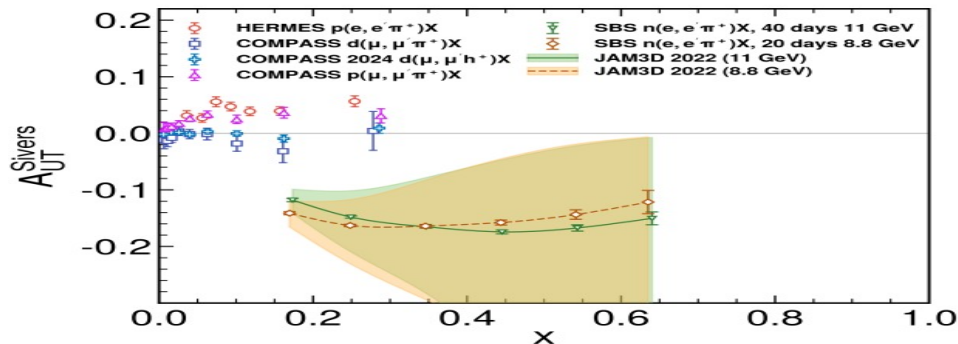
MOLLER Main detector segments
were all installed in June.
Shower Max detectors were all
installed at end of September.

Future Hall A Program

The SBS SIDIS Experiment (E12-09-018), PAC A rated



Example of projected results (1D): A_{UT}^{Sivers} for $\vec{n}(e, e' \pi^+)X$

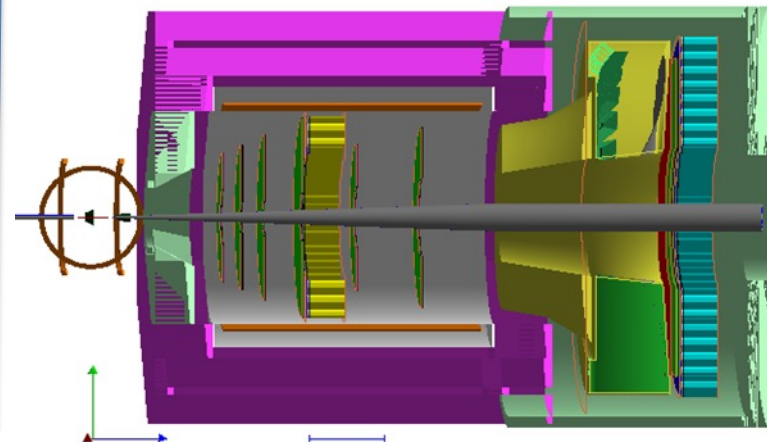


Example comparison of E12-09-018 projected neutron Sivers asymmetry to HERMES and COMPASS published data (including COMPASS 2022 deuteron data for unidentified charged hadrons)

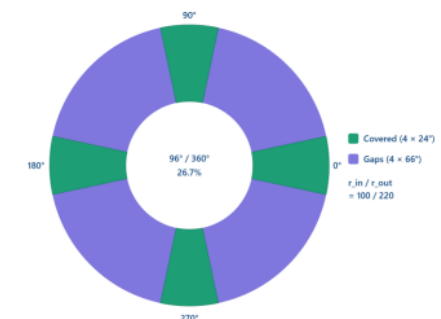
Plot and Figure from Andrew Puckett's talk at [Workshop on the Physics Program with High Luminosity Facilities](#)

Future Large acceptance spectrometer using the CLEO magnet

- Given present DOE budget realities, a SoLID CD0 is not possible at this time.
- Need to focus on modifications to the CLEO magnet with detectors which can be funded through CEBAF operations and capital.
- SoLID collaboration has been doing simulations and planning to prepare proposals for next PAC.
- See the agenda for [Workshop on the Physics Program with High Luminosity Facilities](#) for presentations on high luminosity and large acceptance experiments from Hall A, Hall B (CLAS12 upgrades and μ CLAS12 and Hall D.
- Initial idea to have GEMs, Large Angle ECAL, only one Cherenkov and Forward Angle ECAL covering 96 of 360 deg.
- Investigating reusing detectors from sPHENIX and STAR



Forward angle cover 4 sections of 24deg



Hall A Theses and Publications

Thesis

- [Vimukthi Haththotuwa Gamage, University Of Virginia, June 2026](#)
 - “Measurement of the Neutron Elastic Electromagnetic Form Factor Ratio at Large Momentum Transfer”
 - E12-09-016 (SBS GEN-II), ran in 2022-3

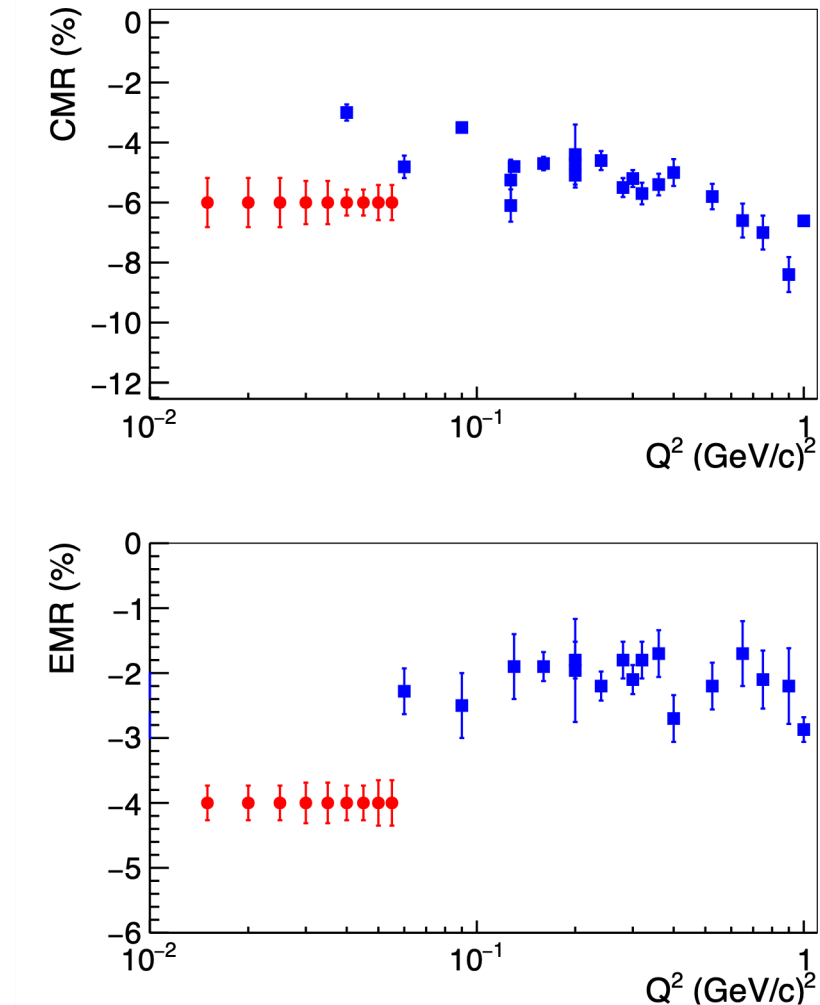
Papers

- P. Datta, K. Evans, et al., “The BigBite Calorimeter for the Super Bigbite Spectrometer Program at Jefferson Lab”, NIM A, Vol 1090, 2026
- Y.P. Zhang, et al., “Measuring short-range correlations and quasi-elastic cross sections in $A(e,e')$ at $x > 1$ and modest Q^2 ”, Physics Letters B, Vol 872, 2026
- I. A. Qattan, et al., “High precision measurements of the proton elastic electromagnetic form factors and their ratio at $Q^2 = 0.50, 2.64, 3.20$, and 4.10 GeV^2 ”, Phys. Rev. C 112, 2025
- S. Li, et al., “Inclusive studies of two- and three-nucleon short-range correlations in ^3H and ^3He ”, Physics Letters B, Vol 868, 2025
- D. Abrams, et al., “EMC Effect of Tritium and Helium-3 from the JLab MARATHON Experiment”, Phys. Rev. Lett. 135, 2025

Hall C 2026 Low Energy Running

2 Hall C experiments made use of CEBAF low energy run period

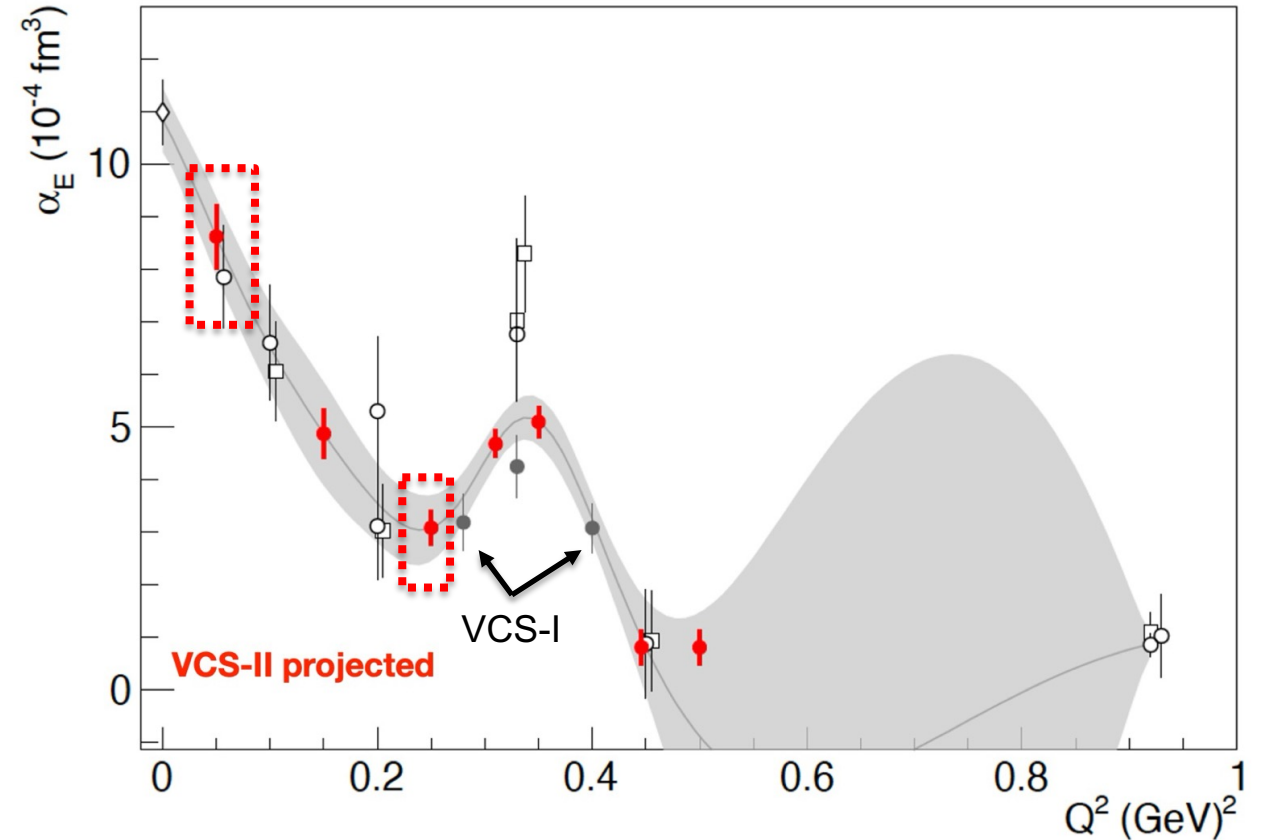
- [E12-22-001](#) Measurement of N- Δ form factor at low Q^2
- Extend existing measurements of electric and coulomb quadrupole amplitudes to low Q^2
- Test whether amplitudes converge as $Q^2 \rightarrow 0$
- Provide benchmark data for chiral effective field theory and lattice calculations
- Measured $p(e,e'p)\pi^0$ using HMS and SHMS at $E_{\text{beam}}=1.4$ GeV



Hall C 2026 Low Energy Running

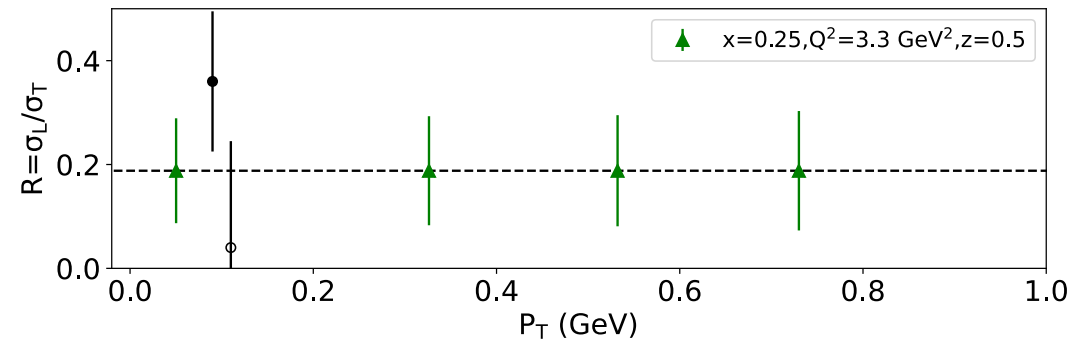
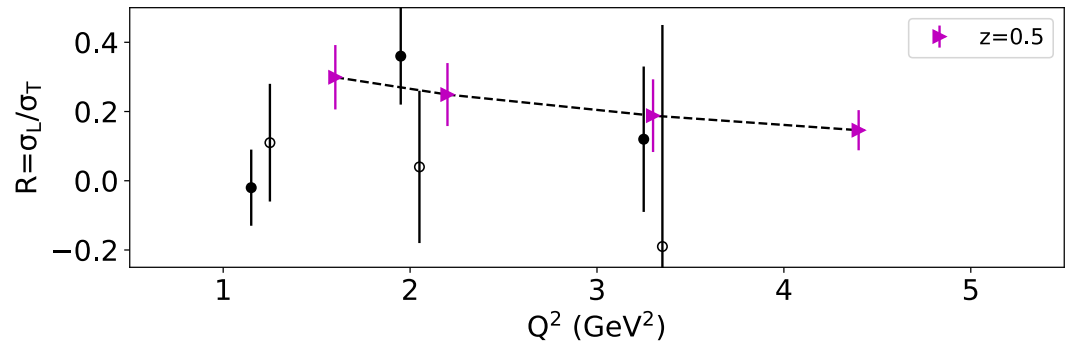
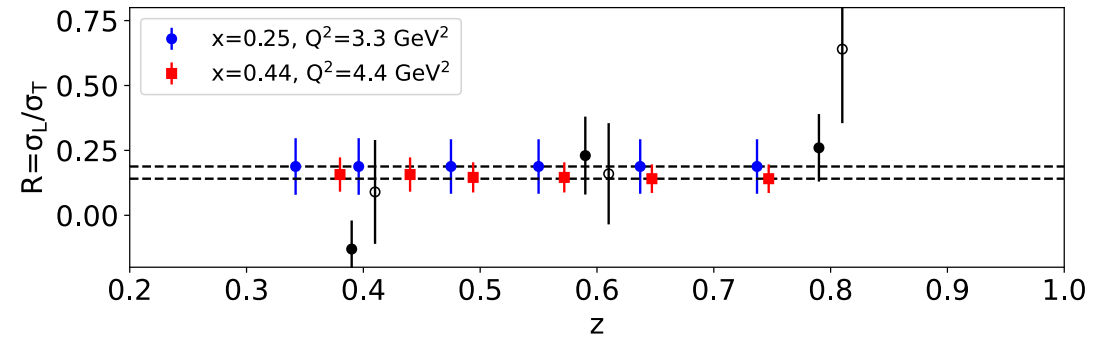
2 Hall C experiments made use of CEBAF low energy run period

- [E12-23-001](#) Proton Generalized Polarizabilities (VCS-II)
- Builds on results from VCS-I experiment that ran in 2019
- Extends Q^2 range, improves precision in region of interest
- Measured $p(e,e'p)\gamma$ reaction at $E_{\text{beam}}=1.4$ and 2.1 GeV
- Measured $Q^2=0.05$ and 0.25 GeV^2
- Remaining kinematics planned for future running



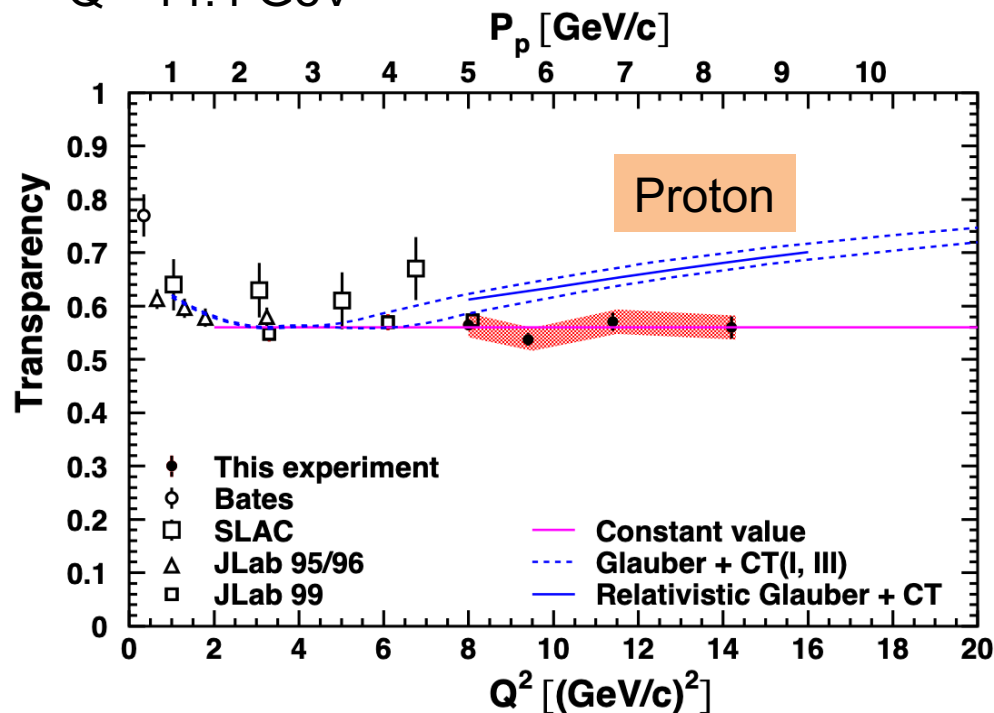
Hall C 2026: R-SIDIS (E12-06-104, E12-24-001)

- [E12-06-104](#) $R=\sigma_L/\sigma_T$ in charged pion SIDIS on ^1H and ^2H
- [E12-24-001](#) Nuclear Dependence of R in SIDIS (C and Cu)
- First half of R-SIDIS experiments completed in **2025**
 - $x=0.25$, $Q^2=3.3 \text{ GeV}^2$, included scan in z and P_t
- Second half of R-SIDIS completed in **2026**
 - x/Q^2 scan at fixed $z=0.5$, additional z scan at $x=0.44$
- Experiment goals:
 - Map R_H for $x=0.16$ to 0.44
 - Map R_H , R_D , R_A as a function of P_t for $x=0.25$
 - Map R_H , R_D , R_A as a function of z at $x=0.25$
 - Map R_H as a function of z at $x=0.44$
 - Compare R_{SIDIS} to R_{DIS} for all settings

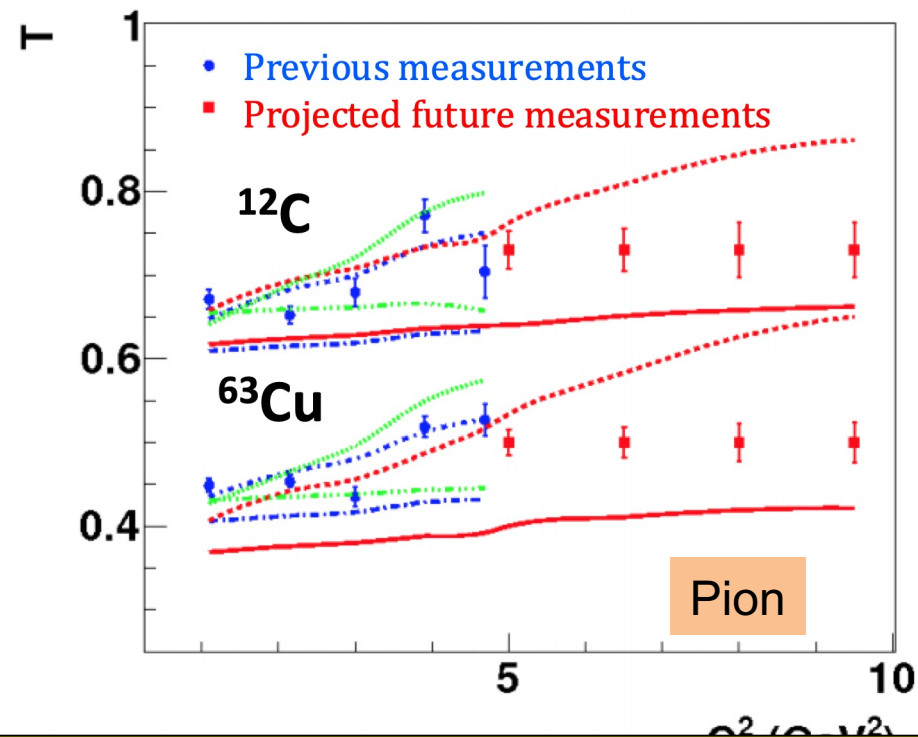


Hall C 2026: pionCT (E12-06-107)

- [E12-06-107](#) Search for Color Transparency at 12 GeV
- First part ran in 2018 as 12 GeV Hall C Commissioning Experiment
- Color transparency in (e,e'p) ruled out up to $Q^2=14.4 \text{ GeV}^2$
- 2026-27 will search for Color transparency up to $Q^2=9 \text{ GeV}^2$ using pion electroproduction
- Compare exclusive π^+ cross section from ^1H to C and Cu
- Color Transparency for mesons expected to set in at lower Q^2 than for proton



Bhetuwal et al, PRL 126 (2021) 8, 082301

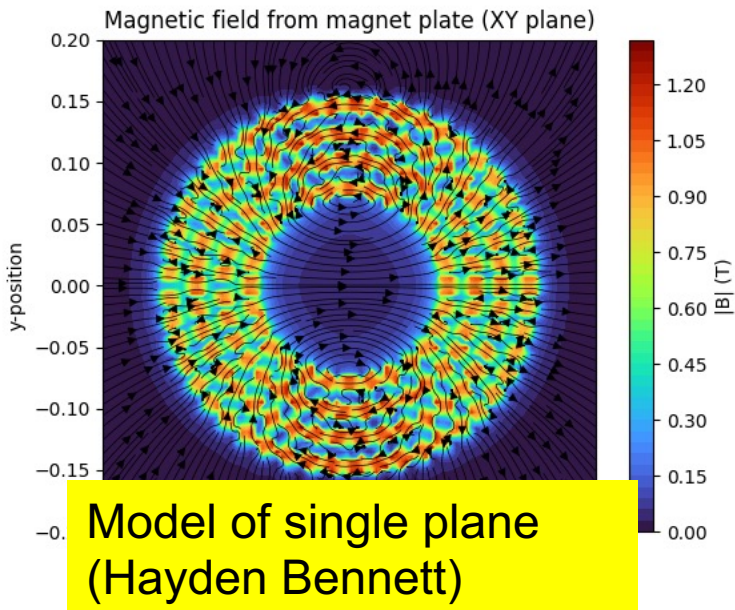


Partially completed in 2026 – remainder will run in 2027

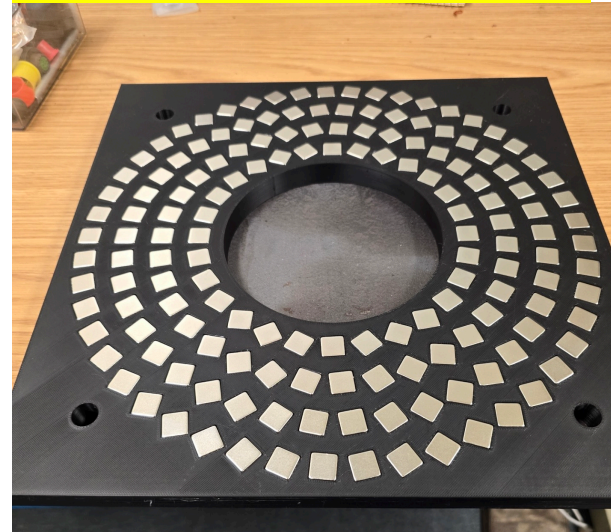
High-rate tracking test and deflection magnet

Test stand installed in Hall C during 2026 high energy running
→ Testing 3 kinds of tracking detectors: GEM, μ RWell, μ RGroove

Took data at large angles (90 degrees) during 2026 run, but will move to small angle during 2027
→ Will use ~ 0.06 Tm dipole made from array of permanent magnets to deflect low energy charged particles



3D-printed magnet plane
(Phillip Uhlmann)



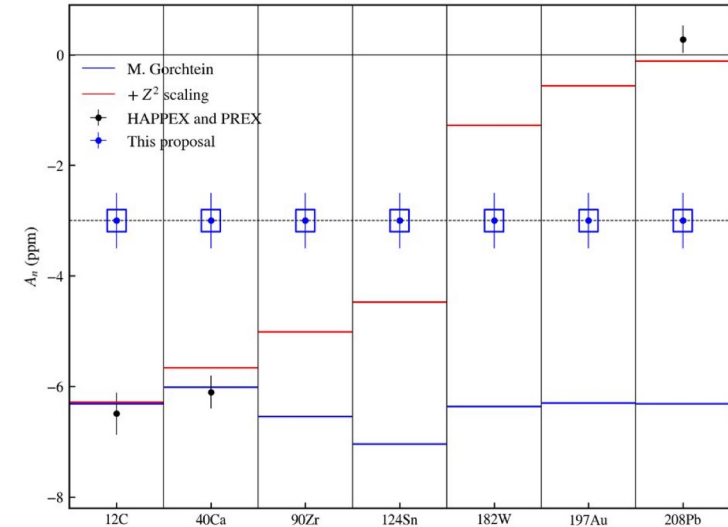
12 planes stacked
together in enclosure

Hall C Experiments for 2027

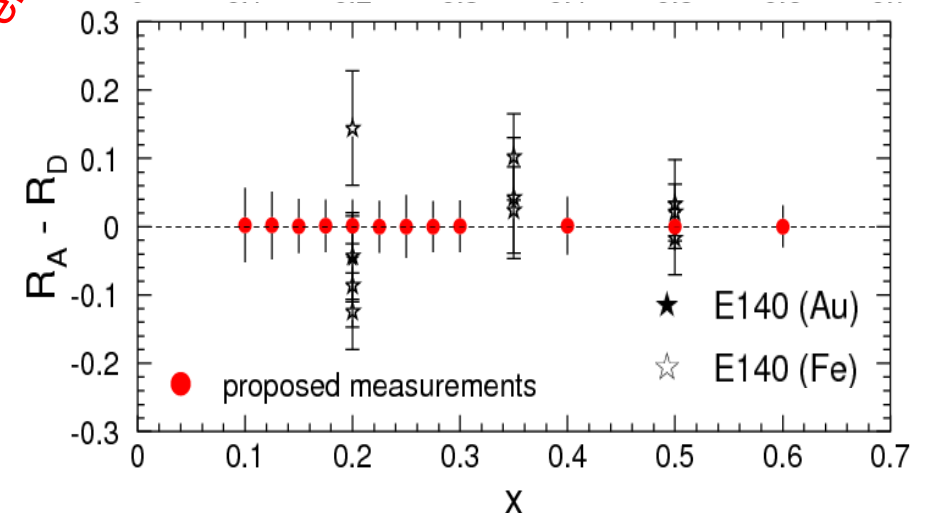
2027 will also have low energy (~ 1 GeV) run period, then transition to high energy

- [E12-24-007](#) Elastic A_T on Nuclei $\rightarrow$ parity-like experiment, new integrating mode setup
- L-T separations
 - [E12-14-002](#) R-DIS on Nucleons and Nuclei
 - [E12-09-011](#) Kaon-LT experiment (complete 8 PAC days)
- [E12-23-001](#) VCS-II – complete 1-4 remaining Q^2 settings
- [E12-20-007](#) u-channel π^0 experiment (1.5 days for Q^2 scaling test)
- [E12-25-007](#) ϕ electroproduction – few days for rate and background verification
- [E12-06-107](#) Complete pionCT running

Low energy

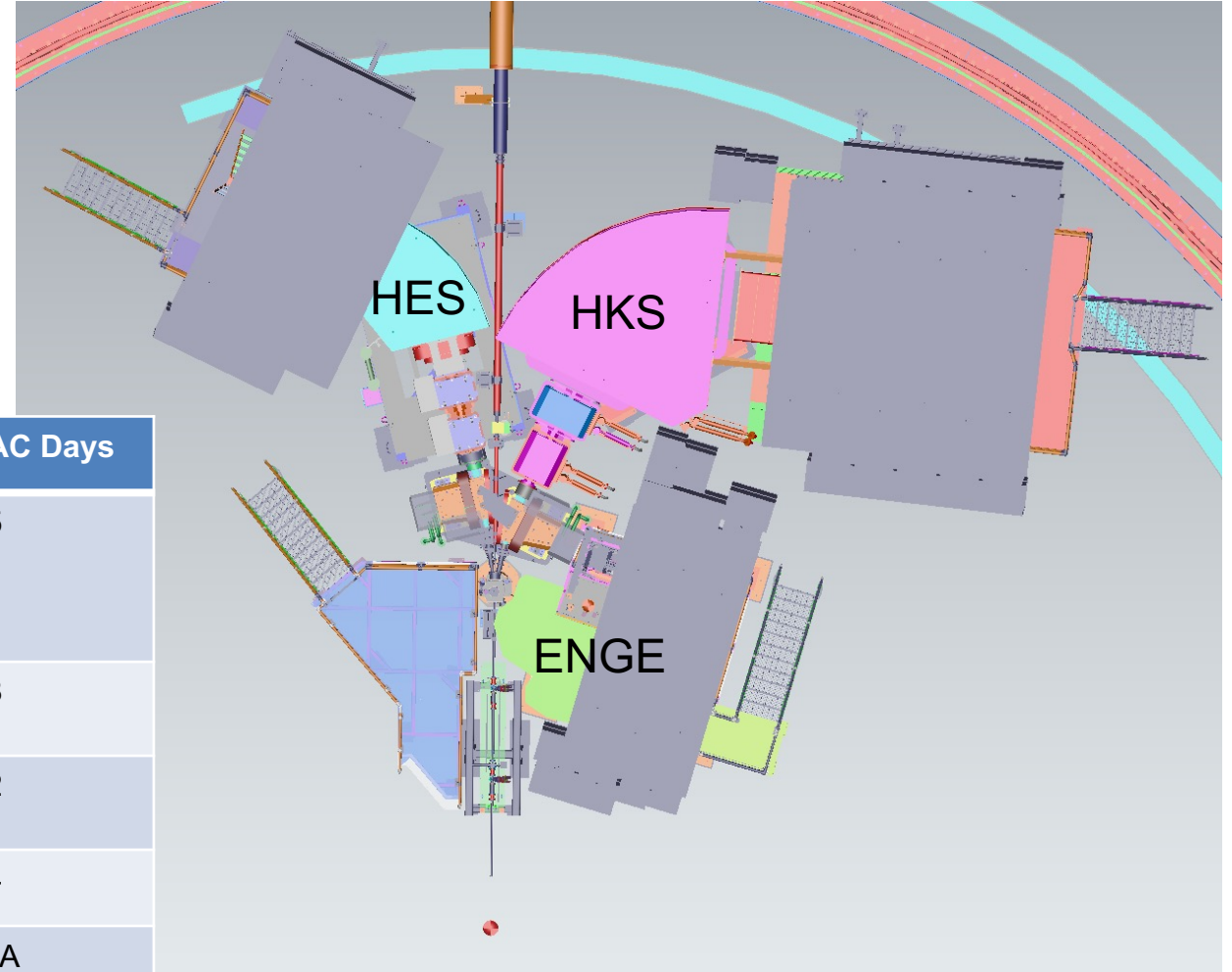


High energy



Hypernuclear Experiments

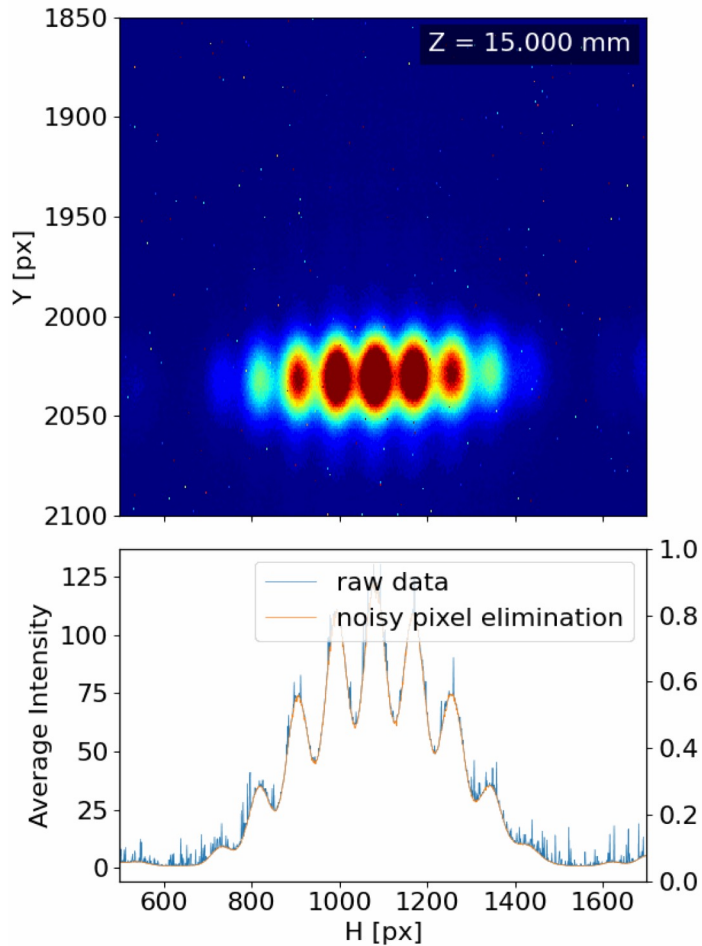
- Fall 2027 – plan to begin installation for hypernuclear experiments
- **Successful ERR in June 2026**
- Installation through 2028 – start running in early 2029
 - No cryogenic magnets or cryotargets
 - Compatible with MOLLER in Hall A



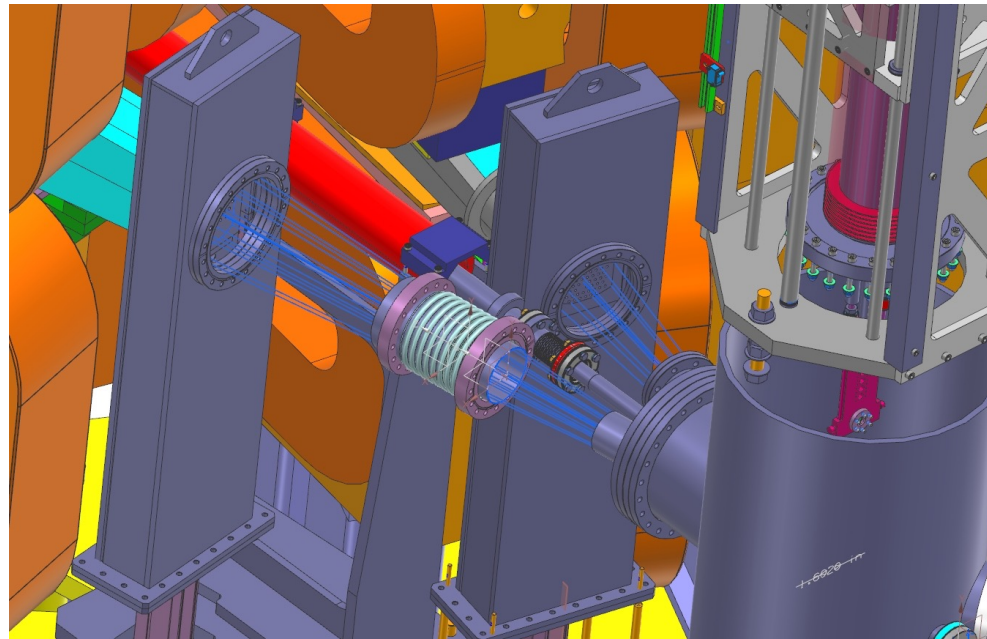
Experiment	Title	PAC Days
E12-23-013	An isospin dependence study of the Lambda-N interaction through the high precision spectroscopy of Lambda hypernuclei	55
E12-24-011	Study of a triaxially deformed nucleus using a Lambda particle as a probe	28
E12-24-003	Studying Lambda interactions in nuclear matter with the $208\text{Pb}(e,e'K^+)(208_{\Lambda}\text{Pb})\text{TI}$ reaction	42
E12-24-004	Study of charge symmetry breaking in p-shell hypernuclei	24
Run Group	High-resolution spectroscopy of light hypernuclei with the decay-pion spectroscopy (ENGE magnet)	N/A

Hypernuclear Preparations

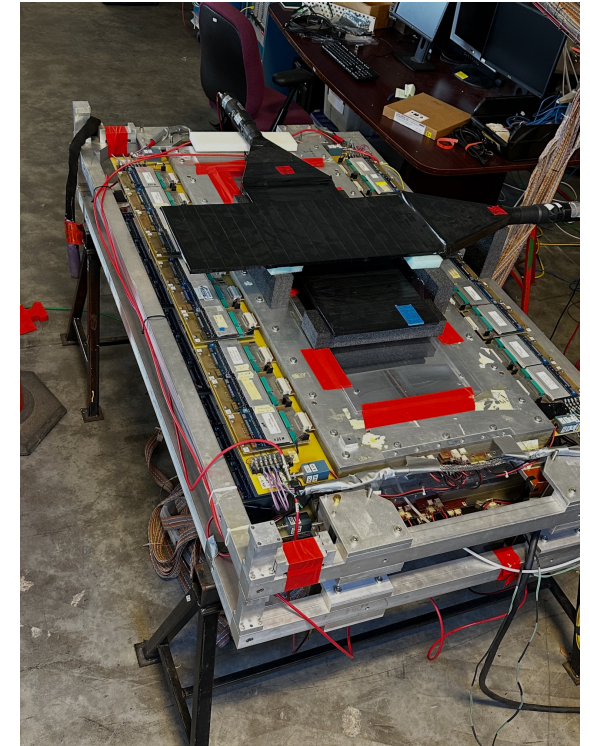
Beam tests of new Synchrotron
Light Interferometer to measure
energy spread



Design of new beamline and spectrometer
collimator systems



Drift chamber cosmic tests



Hall C Theses (FY26)

- Noah Swan, Old Dominion University, May 2026
 - “A Study of Short-Range Correlated Pair Formation Mechanisms”
 - E12-17-005 (CaFe), ran in 2022
- Abhyuday Sharda, University of Tennessee, Knoxville, May 2026
 - “Study of Nuclear Structure Functions at Jefferson Lab”
 - E12-10-008 (EMC Effect), ran in 2022-23
- Wassim Hamdi, Monastir University, June 2026
 - “Analysis of Electromagnetic Calorimeters and Application to the Deeply Virtual Compton Scattering Experiment at Hall C of Jefferson Lab”
 - E12-22-006 (DVCS from Neutron), ran in 2023-24
- Mitchell Kerver, Old Dominion University, May 2026
 - “Exclusive Neutral Pion Electroproduction Cross Section Measurement with a Neutral Particle Spectrometer”
 - E12-13-010 (DVCS and exclusive π^0 from proton), ran in 2023-24

Hall C Publications (FY26)

- D. Nguyen *et al*, *Nature* 654, 619-621 (2026) , “Nuclear shell structure governs short-range nucleon pairing”
 - <https://www.jlab.org/news/releases/nuclear-physicists-discover-new-rule-peppy-partner-picking>
- W. Hamdi *et al*, *NIM A* 1086 (2026) 171323, “Intrinsic energy and time resolution of the Jefferson Lab Hall C Neutral Particle Spectrometer”
- A. C. Postuma *et al*, *PLB* 872 (2026) 140094 , “Probing hard/soft factorization via beam-spin asymmetry in exclusive pion electroproduction from the proton”
 - <https://www.jlab.org/news/releases/beam-spin-asymmetry-study-puts-proton-models-test>
- P. Bosted *et al*, *PRC* 113 (2026) 3, 035205, “Flavor, transverse momentum, and azimuthal dependence of charged pion multiplicities in semi-inclusive deep-inelastic scattering with 10.6 GeV electrons”
- S. Ali *et al*, *NIM A* 1083 (2026) 171070, “The SHMS 11 GeV/c spectrometer in Hall C at Jefferson Lab”
- M. Nycz *et al*, *PLB* 880 (2026) 140742, “Quasielastic ^3He $(\vec{e}, e')$ asymmetry in the threshold region with a longitudinally polarized target”
- D. Biswas *et al*, *PRL* 135 (2025) 15, 151902, “New Measurements of the Deuteron-to-Proton F_2 Structure-Function Ratio”

Hall A and C Organization

- As part of Jefferson Lab organizational changes, Hall A and C are now (again) two distinct organizational groups
 - Hall A leader = Mark Jones
 - Hall C leader = Dave Gaskell
- Both Hall A and C have benefited greatly from the participation of the scientific staff in both halls
 - Leverage expertise for both halls (DAQ, targets, detectors, polarimetry, etc.)
 - Ability to divert efforts to area with the greatest need
- The plan is to continue this way of working and doing experiments. The combined Hall A and C staff expertise greatly expands the scope of experiments we can perform!

APS GHP 2027 Workshop

April 9-11, 2027, Atlanta Georgia
→ Just before APS Global Summit

<https://indico.jlab.org/event/1078/>



APS GHP 2027 Workshop

12th Workshop of the
APS Topical Group on
Hadronic Physics

Atlanta, GA
April 9-11, 2027



The GHP workshop is
an excellent
opportunity for nuclear
and particle physicists
to share their research
and explore common
interests in hadronic
physics. We warmly
welcome your
attendance and
participation and
encourage you to
invite your students
and postdocs to take
part.

The workshop will take
place immediately
before the APS 2027
Global Physics
Summit at the same
venue.

WORKSHOP TOPICS INCLUDE:

- Artificial intelligence and machine learning for hadron physics
- Beyond-Standard Model physics and hadrons
- Electron-Ion Collider, high-luminosity and other future initiatives
- Electroweak physics and hadrons
- Extreme matter and neutron star collisions
- Hadron spectroscopy
- Hadron structure and tomography
- Hadronization
- Heavy flavor and jet production
- Instrumentation for hadron physics
- Neutrino-hadron interactions
- QCD in Nuclei
- Origin of hadron properties
- Physics of the quark-gluon plasma
- Quantum information for hadron physics
- Spin physics
- Ultraperipheral Collisions

CONTACT:

gHPworkshops@gmail.com

<https://indico.jlab.org/e/GHP2027>



ORGANIZING COMMITTEE:

- Anna Stasto (Pennsylvania State University) (workshop co-chair)
- Xiaochao Zheng (University of Virginia) (workshop co-chair)
- Provakar Datta (Lawrence Berkeley National Laboratory)
- Dave Gaskell (Jefferson Lab)
- Michael Kohl (Hampton University)
- Shujie Li (Lawrence Berkeley National Laboratory)
- Peter Petreczky (Brookhaven National Laboratory)
- Alexei Prokudin (Pennsylvania State University Berks)
- Susan Schadmand (GSI Darmstadt)
- Bjoern Schenke (Brookhaven National Laboratory)
- Bernd Surrow (Temple University)
- Zhoudunming (Kong) Tu (Brookhaven National Laboratory)
- Ramona Vogt (Lawrence Livermore National Laboratory & UC Davis)
- Christian Weiss (Jefferson Lab)
- Maria Zurek (Argonne National Lab)



APS GHP 2027