Hall A/C Status

Hall A:
Neutron $G_E/G_M$ by Beam-target Asymmetry

Hall C:
Neutral Particle Spectrometer

Mark Jones, Hall A/C Group Leader, PAC meeting, July 2023
Bob Michaels, Hall A/C Deputy Group Leader
Hall A: Past Year’s Experiments (July 2022- March 2023)

Neutron $G_E/G_M$ by Beam-target Asymmetry on polarized 3He

- Started in Oct 2022
  - Completed $Q^2 = 2.9$ and $6.6 \text{ GeV}^2$
  - $Q^2 = 9.9 \text{ GeV}^2$ is partially done.
  - Complete final 6 weeks running from Sept 2023-Nov 2023

- Polarized 3He target
  - First time running with 60cm long 3He cell
  - 50-55% polarization in beam!
Hall A: Plan for coming years (Jan 2024 – July 2025)

**Neutron $G_E/G_M$ by recoil polarization**
- Switch from 3He to LH2/LD2
- Plan to start in Spring 2024, $Q^2 = 4.5$

**Pion photo-production on neutron**
- Beam-target asymmetry, $A_{LL}$
- Recoil polarization, $K_{LL}$

**Proton $G_E/G_M$ by recoil polarization**
- ECAL platform is in Hall A and plan to start stacking in August.
- After Neutron Recoil Polarization is completed
  - Need about 6 months for installation
  - Experiment will run in late 2024 to spring 2025.
Hall A : Plans beyond July 2025

**MOLLER**
- Inflation Reduction Act provided full funding.
- In Jan 2023, passed CD-3A review and spending CD-3A funds.
- CD2 /CD3 review in October 2023.
- Aggressive installation schedule of 18 months after GEp run ends
- 3 years of running. Starting in Fall 2026
- Reuben Fair is new PM, Klaus Dehmelt is new DPM (Sept 1).

**SoLID**
- CLEO magnet cold test at 120A completed.
- High rate test of SoLID detector. Set at $8^0$ and $17^0$ in Hall C.
- SoLID mentioned in Recommendation 1 in the Hot/Cold QCD and the recommendations of FSNN LRP town meetings

- Coil production underway

- Magnet test

- High rate test

- Ramp to 120A

- Coil temps constant

- LASPD photon rej ~ (6-7):1
### E12-19-006
Ran from June to mid Sept to complete high $\varepsilon$ points to match low $\varepsilon$ points taken the previous run cycle.

- **Pion form factor to $Q^2 = 8.5$**
- **Proposed error bars**
- **Test of factorization by measuring $Q^2$ dependence of $\sigma_L$**

### E12-17-005
*Ran at the end of Sept 2022 for two weeks*

#### Mean-field setting
- $^{40}$Ca: 527 counts/sec
- $^{48}$Ca: 521 counts/sec
- $^{54}$Fe: 224 counts/sec

#### SRC setting

### E12-10-008
Study EMC effect over range of nuclei
- 6Li and 7Li added to light nuclei already measured
- Flavor dependence with $^{40}$Ca and $^{48}$Ca

### E12-06-105
Inclusive Scattering from Nuclei at $x > 1$
- Precision measurement of 2N SRC
  - A-dependence in light nuclei
  - Variation with neutron excess
  - Connect EMC effect and SRC
- First observations of 3N SRC
- Nuclear PDFs at $x > 1$ and look for superfa

### E12-10-003
Deuteron Electro-Disintegration at Very High Missing Momentum

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**Hall C:** Past Year’s Running (July 2022-March 2023)
Hall C : Plan for next year (July 2023- July 2024)

Neutral Particle Spectrometer
• Sweeping Magnet with calorimeter.
  • Magnet and power supply have been tested.
• NPS attached to SHMS carriage to allow easy angle change.
  • The calorimeter is on rails, cabled and taking cosmics.
• 1080 Lead-Tungstate blocks in calorimeter to detect $\gamma$ and $\pi^0$

Two experiments using the NPS
• E12-13-010 is two concurrent experiments
  • Exclusive Deeply Virtual Compton on proton
  • SIDIS ($e,e',\pi^0$) cross section.
    • Map the transverse momentum dependence.
• E12-22-006
  • Exclusive Deeply Virtual Compton on deuteron
  • Subtract the proton data from deuteron data to get neutron.
  • Proposal PR12-23-014 would be a new run group that measures $R=\sigma_L/\sigma_T$ in SIDIS ($e,e',\pi^0$) cross section.

Students putting fiducial marks on Calo

Cabling crew with Simona Malace who has led the installation of NPS Calo

NPS Calo craned onto the NPS platform
Hall C: Plans beyond July 2024

**Experiments to run in Fall 2024- Spring 2025**

- Standard SHMS/HMS
  - E12-06-104 \( R = \sigma_L / \sigma_T \) in SIDIS on 1H and 2H
  - E12-06-107 Complete CT experiment
  - E12-11-107 Spectator tagged DIS \( d(e,e'p_s) \)
    - Install Large Angle Detector
    - HMS/SHMS detect electron

**Fall 2025 and beyond**

- Depends on PAC recommendations
- Starting in Fall 2025
  - Standard SHMS/HMS experiments.
  - Experiments with non-standard beam energies
  - New proposals
- Running during MOLLER and after:
  - During MOLLER, limits on total target power and beam current in the two halls
    - Hypernuclear experiments in 2026
    - Polarized deuteron experiments
    - WACS and other experiments using the NPS
    - Experiments using the Compact Photon Source
      - Capital project is ongoing
      - SBS/BB experiments that did not run in Hall A
      - Exciting new letters of intent
- Future plans will incorporate needs of the other halls and target group resources.