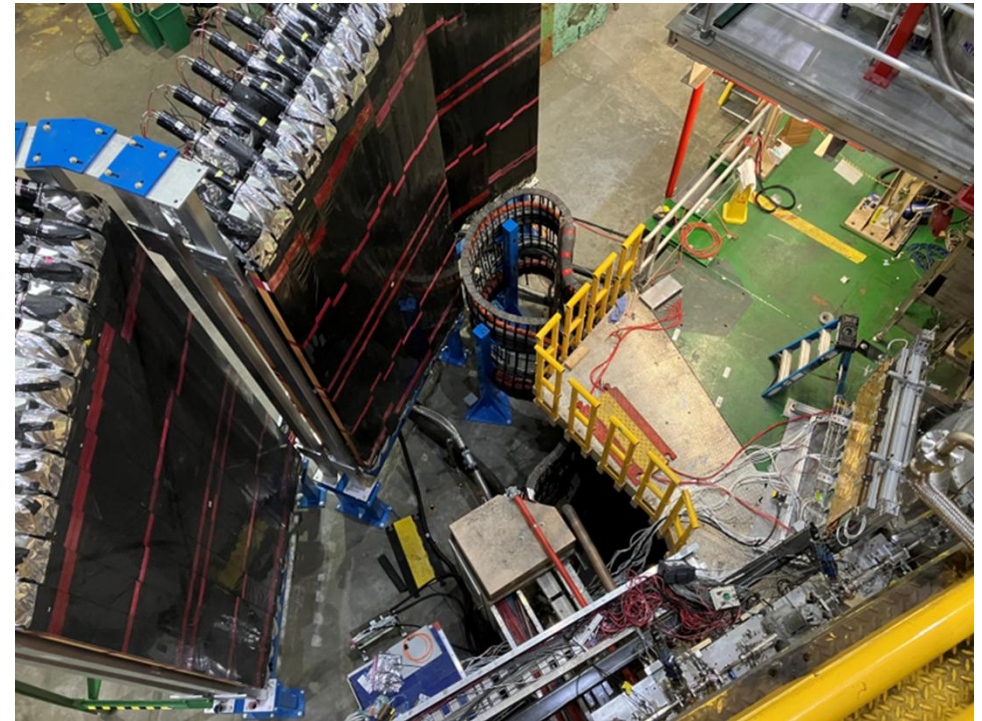
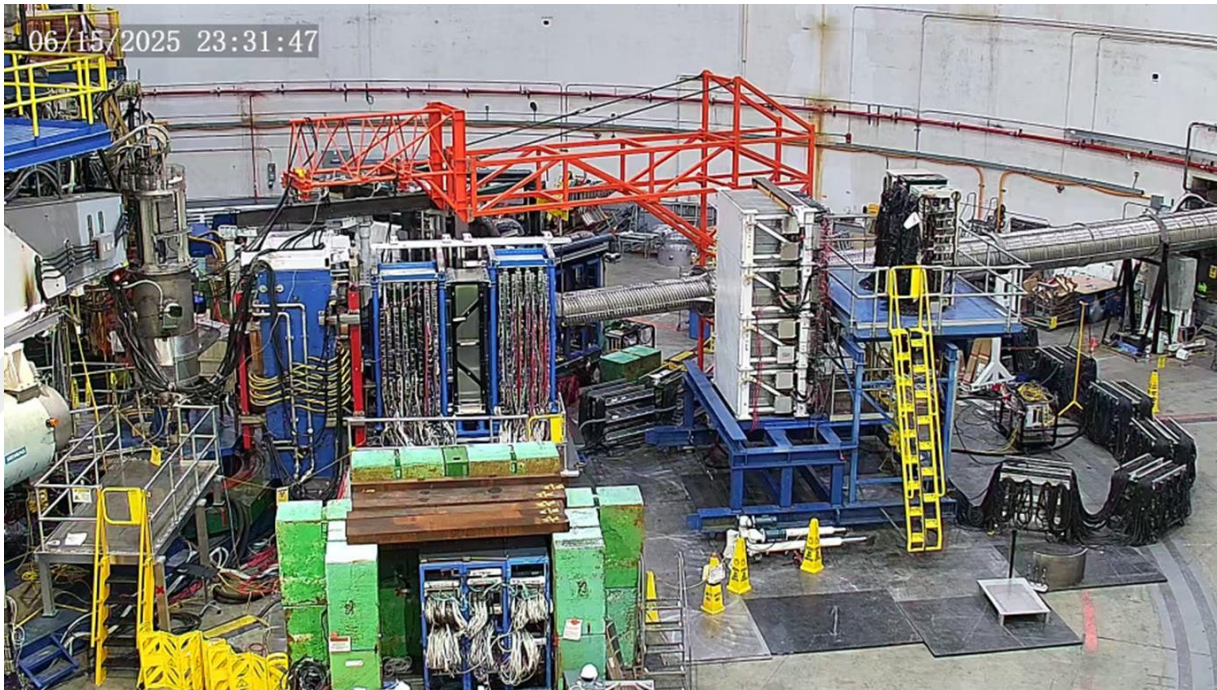


# Hall A/C Status

Hall A is presently measuring the ratio of the proton  $G_E/G_M$

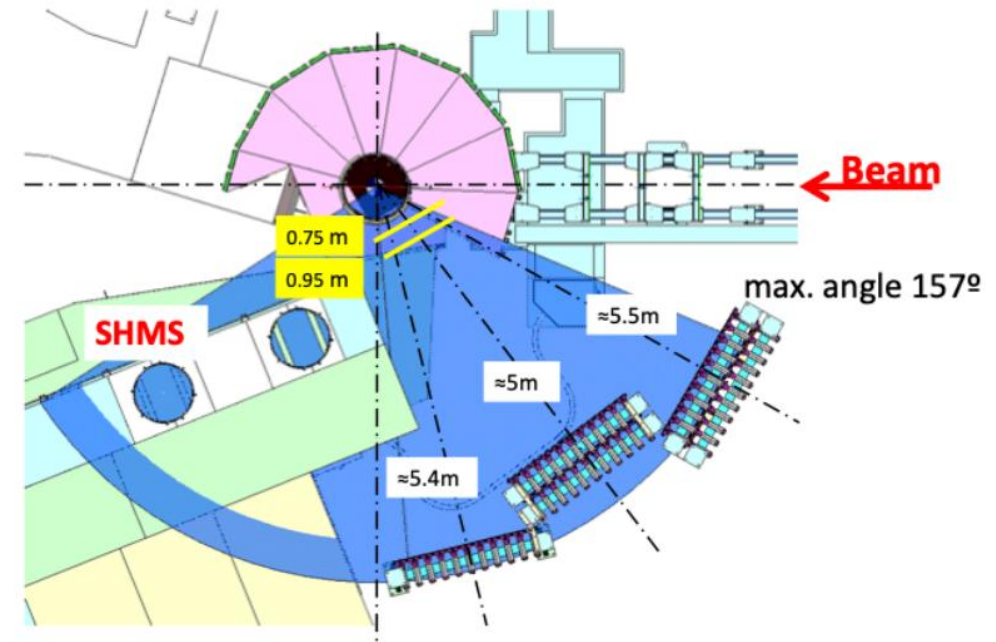
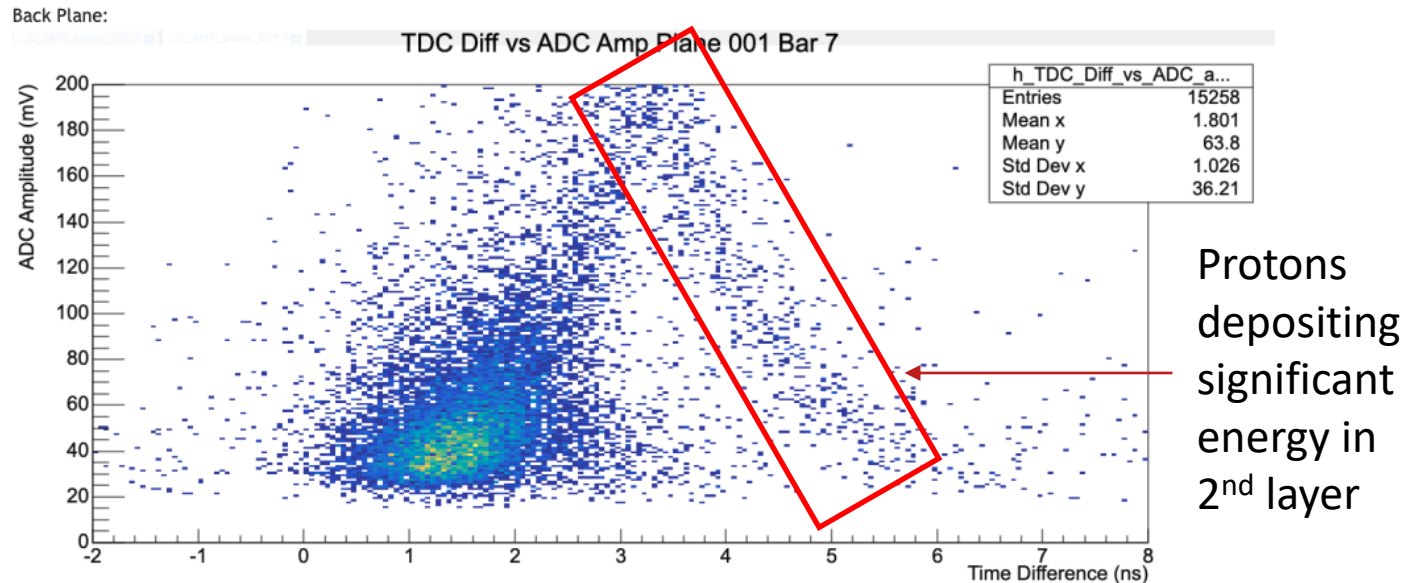
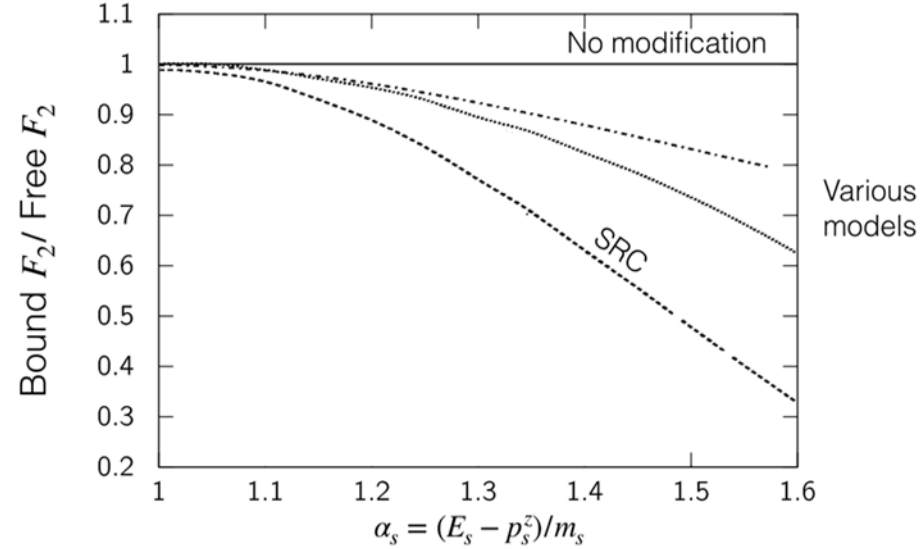
Setup of the Large Angle Detector to measure the spectator proton in DIS  $d(e,e'p_s)$   
Experiment has just completed running.



Mark Jones, Hall A/C Group Leader, PAC53 meeting , July 2025  
Dave Gaskell, Hall A/C Deputy Group Leader

# Hall C LAD (E12-11-107) experiment: Spectator tagged DIS $d(e,e'p_s)$

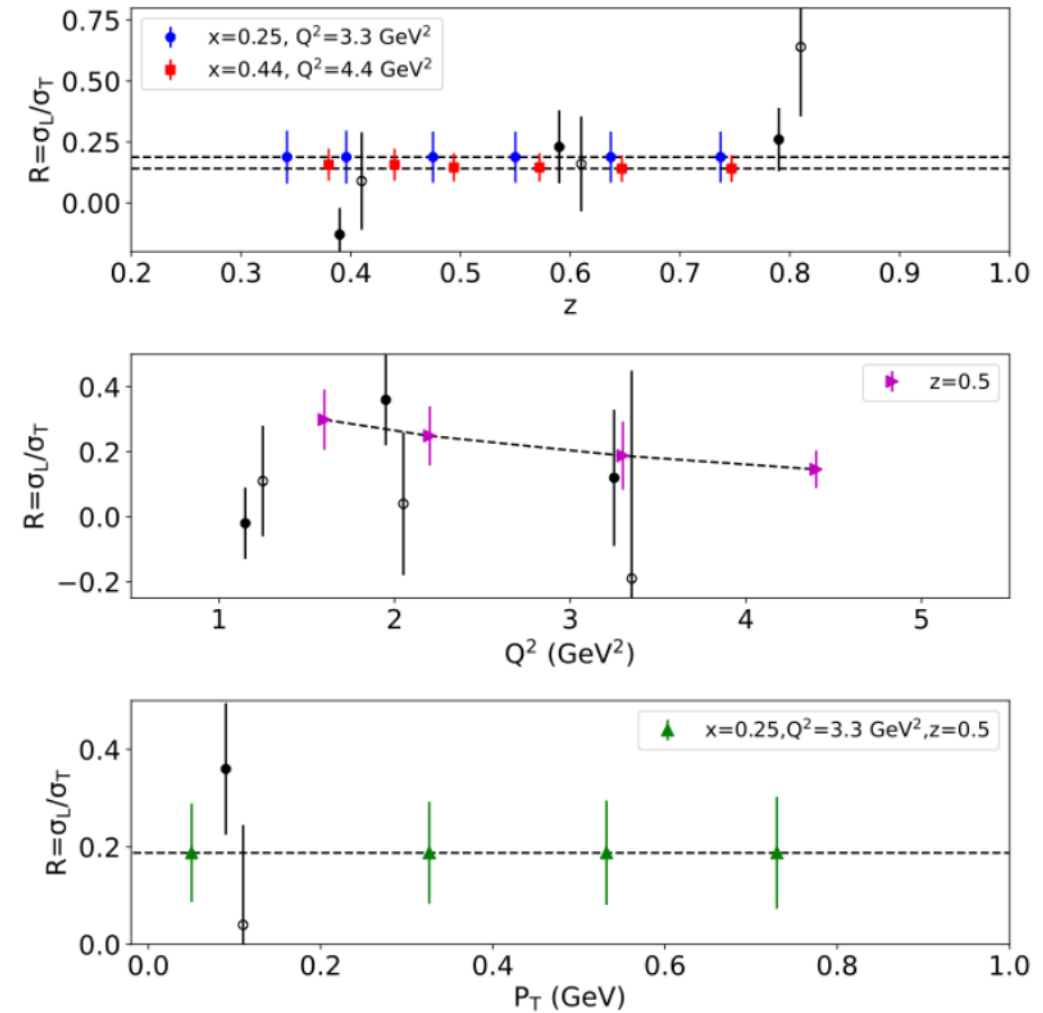
- Ran from April- July 14 2025
- Coincidence HMS+LAD and SHMS+LAD
- Dedicated detectors installed to tag high momentum, spectator protons in backward direction
- Measure modification of  $F_2^n$  in deuteron at large virtuality (missing momentum)





## Hall C R-SIDIS (E12-06-104, E12-24-001) is currently running

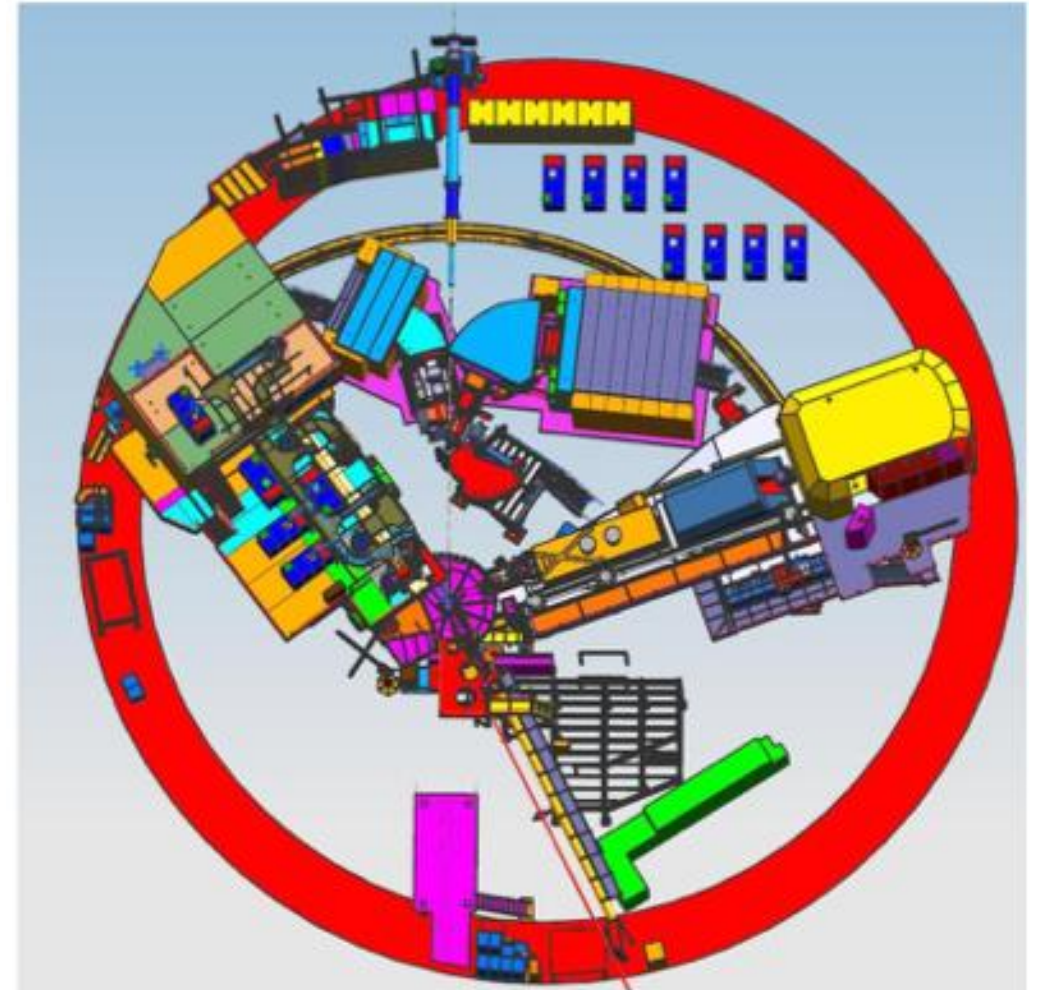
- E12-06-104  $R=\sigma_L/\sigma_T$  in  $\pi^+/\pi^-$  SIDIS on 1H and 2H
- E12-24-001 Nuclear Dependence (C,Cu) of R in SIDIS
- Part of broad program of SIDIS experiments
  - Ran two charged pion SIDIS experiments in 2018 and 2019
  - Completed  $\pi^0$  SIDIS with NPS in 2023.
- During this run period will complete 40% of the experiment
- Complete remainder of experiment in FY26 run period
- Goals of experiment:
  - Map  $R_H$  SIDIS and  $R_D$  SIDIS as a function of  $z$  at same  $x$  and  $Q^2$  setting.
  - Map  $R_H$ ,  $R_D$  SIDIS as a function of  $z$  at two  $x$  and  $Q^2$  settings
  - Map  $R_H$  SIDIS as a function of  $p_T$  at one  $x$  and  $Q^2$  setting.
  - Map  $R_H$  SIDIS for  $Q_2 = 1.6 - 4.4$   $\text{GeV}^2$



## Hall C Future running

- Next run period in FY26
  - E12-22-001 N-Delta at low  $Q^2$ , Special beam energy to match Hall B.
  - E12-23-001 VCS at low  $Q^2$ , Special beam energy to match Hall B. (only 15 of 61 PAC days)
  - Complete E12-06-104/ E12-24-001 R-SIDIS
  - E12-06-107 Pion Color Transparency
- Run schedule in FY27 is still being determined.
  - Run standard HMS/SHMS experiments.
  - Possibilities:
    - Complete VCS experiment
    - NucR and complete KaonLT
      - Need non-standard beam energies
    - E12-23-010 Color Transparency in Maximal Rescattering Kinematics
    - E12-20-007 Backward-angle Exclusive  $\pi^0$  Production above the Resonance Region
- Hypernuclear installation in 2027
  - Did not pass ERR in Nov 2024.
  - Lots of work by collaboration to prepare for next ERR in March 2026.

Hypernuclear experiment layout in Hall C



# Hall A SBS: Neutron magnetic form factor experiment has near-final results

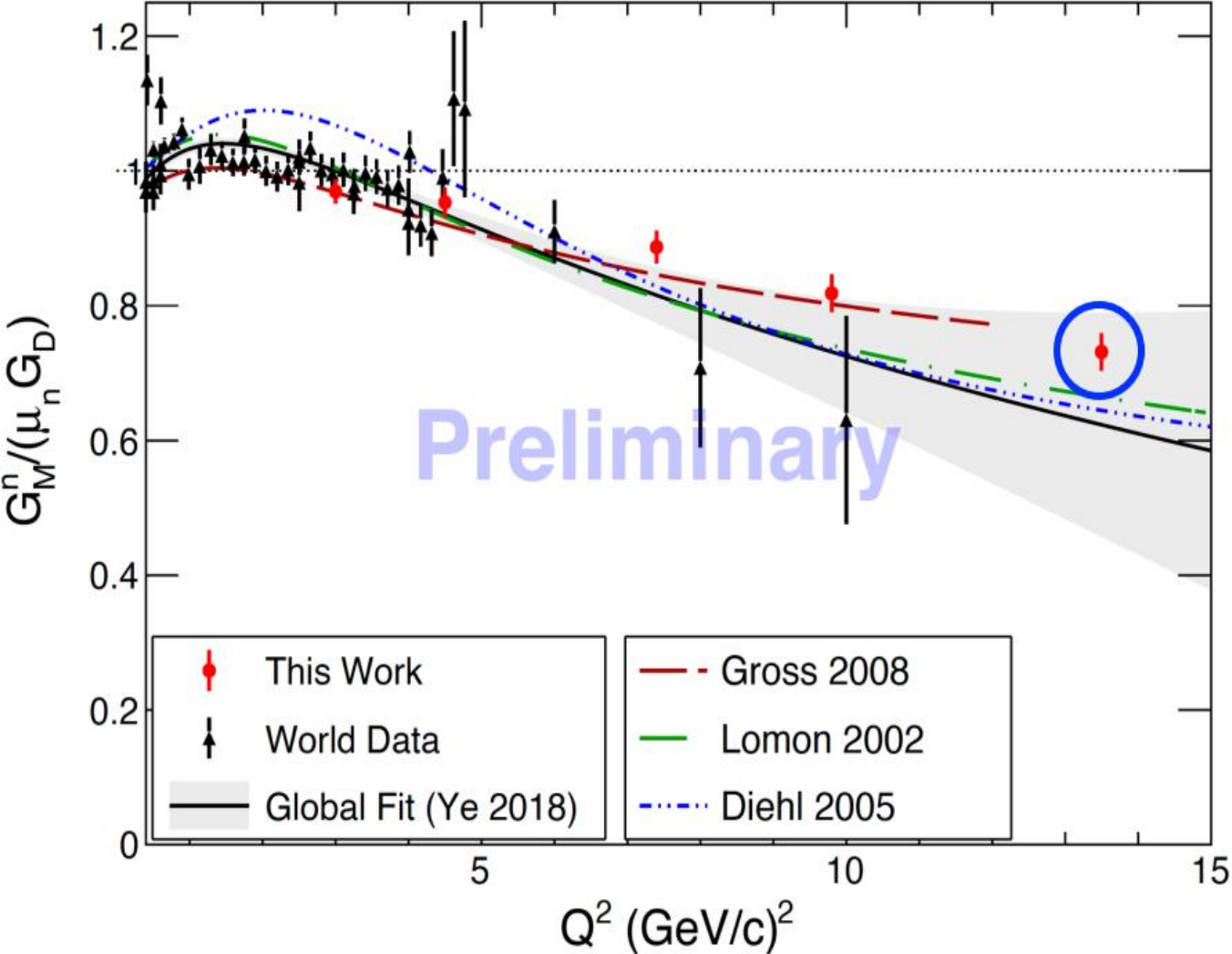
Figures and Text from JSA Thesis Winner Provakar Datta's talk

Statistical and Systematic errors have been added in quadrature.

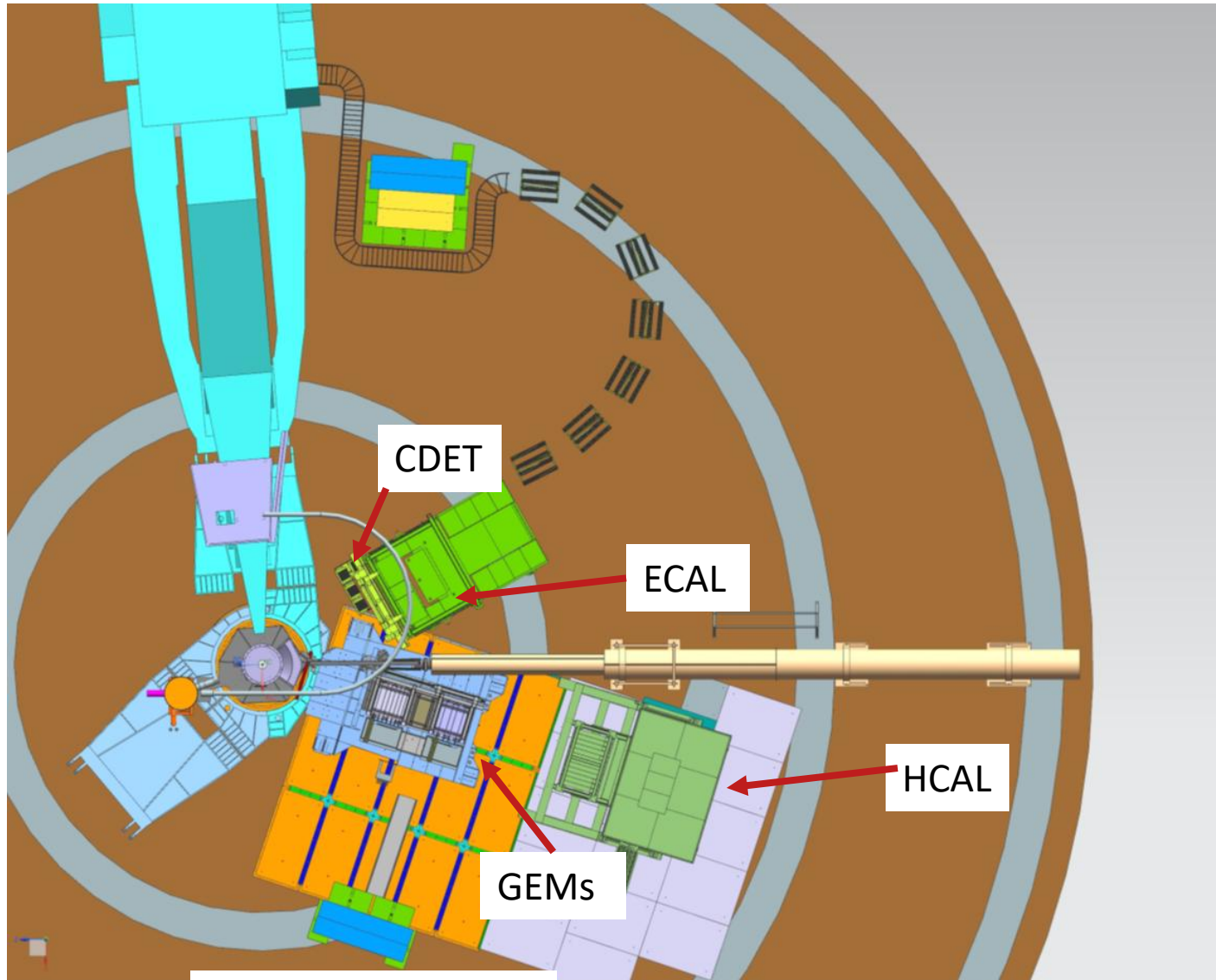
Determine neutron  $G_M$  from ratio of quasi-free deuteron neutron to proton knockout cross sections.

$$R = \frac{\frac{d\sigma}{d\Omega} |n(e,e')}{\frac{d\sigma}{d\Omega} |p(e,e')} = \frac{\frac{\sigma_{\text{Mott}} \epsilon_n}{1 + \tau_n} (\epsilon_n G_E^n^2 + \tau_n G_M^n^2)}{\frac{\sigma_{\text{Mott}} \epsilon_p}{1 + \tau_p} \sigma_{\text{Red}}^p}$$

Error Sources	$Q^2$ ( $\epsilon$ )				
	3 (0.72)	4.5 (0.51)	7.4 (0.46)	9.9 (0.50)	13.5 (0.41)
$\Delta(R)_{\text{sys}}$					
Inelastic Cont.	0.33	0.75	0.84	0.75	2.67
Nucleon Det. Effi.	2.00	2.01	2.01	2.02	2.02
Radiative Corr.	2.31	3.32	3.77	3.87	5.47
Cut Stability	0.16	0.15	0.40	0.67	0.60
FSI	0.04	0.01	0.02	0.02	0.03
Total	3.08	3.95	4.37	4.48	6.44



# Hall A: Presently running the highest $Q^2$ kinematics for proton $G_E/G_M$



GEM DAQ bunker

## Electron Detection

- Electron Calorimeter (ECAL)
  - 1656 Lead glass blocks
  - Trigger formed in FADC from clusters
  - Need good energy calibration at FADC
  - Tight cut on elastic to reduce accidentals
  - Measure angle and energy
- Coordinate Detector (CDET)
  - 2352 scintillator bars, 2 layers
  - Measures vertical angle
  - Aids track finding in front GEMs
  - Reduce the photon background

## Proton Detection

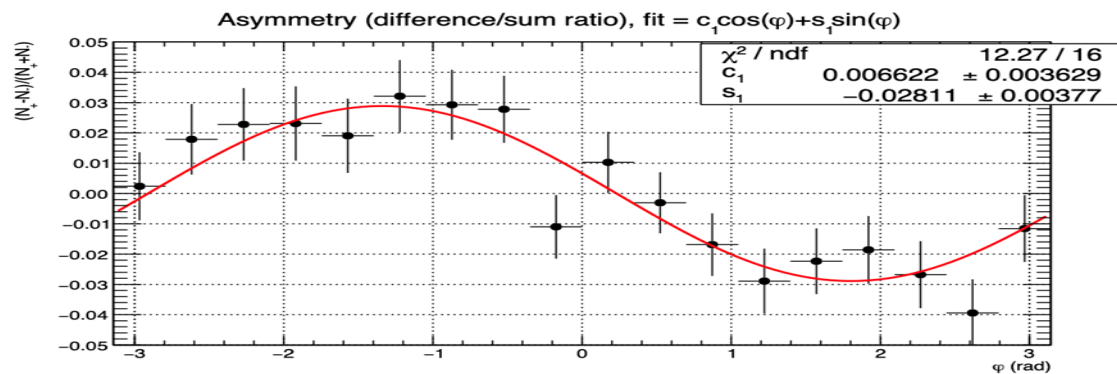
- GEMS Front and rear tracker
  - Each 8 layers of GEMs
  - Measure momentum, z-target, angles
  - Plastic analyzer for rescattering protons
  - Measure the recoil polarization of protons
- Hadron Calorimeter (HCAL)
  - 288 iron/scintillator blocks
  - Trigger formed in FADC from clusters
  - Aids track finding in rear trackers



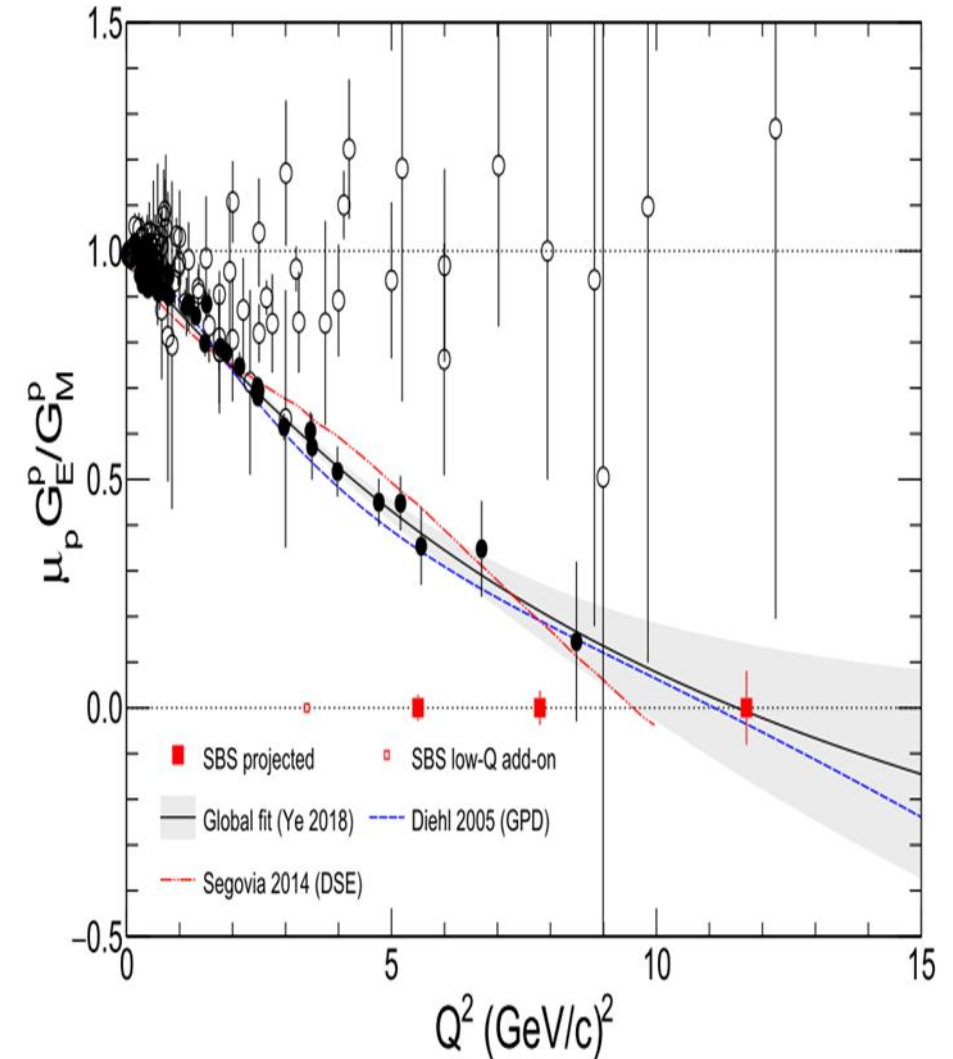
## Hall A Status

- Commissioning with 3 pass from April 11-17.
- Production with 3 pass from April 17-28.
- Changeover to 5 pass configuration from April 28 – May 5<sup>th</sup>
- Production at 5 pass started May 5<sup>th</sup>.
  - Decided to run at lower  $Q^2$  of 11.1  $\text{GeV}^2$  from the original  $Q^2 = 12 \text{ GeV}^2$ .
    - This increases rate by factor of 4.
  - High occupancy of 43-50% at 25uA and 37-42% at 20uA.
  - Not able to run the  $Q^2 = 8 \text{ GeV}^2$  setting and E12-24-010 which was high precision  $G_E/G_M$  to complement future positron data.

Online results for small subset of  $Q^2 = 5.6 \text{ GeV}^2$  data

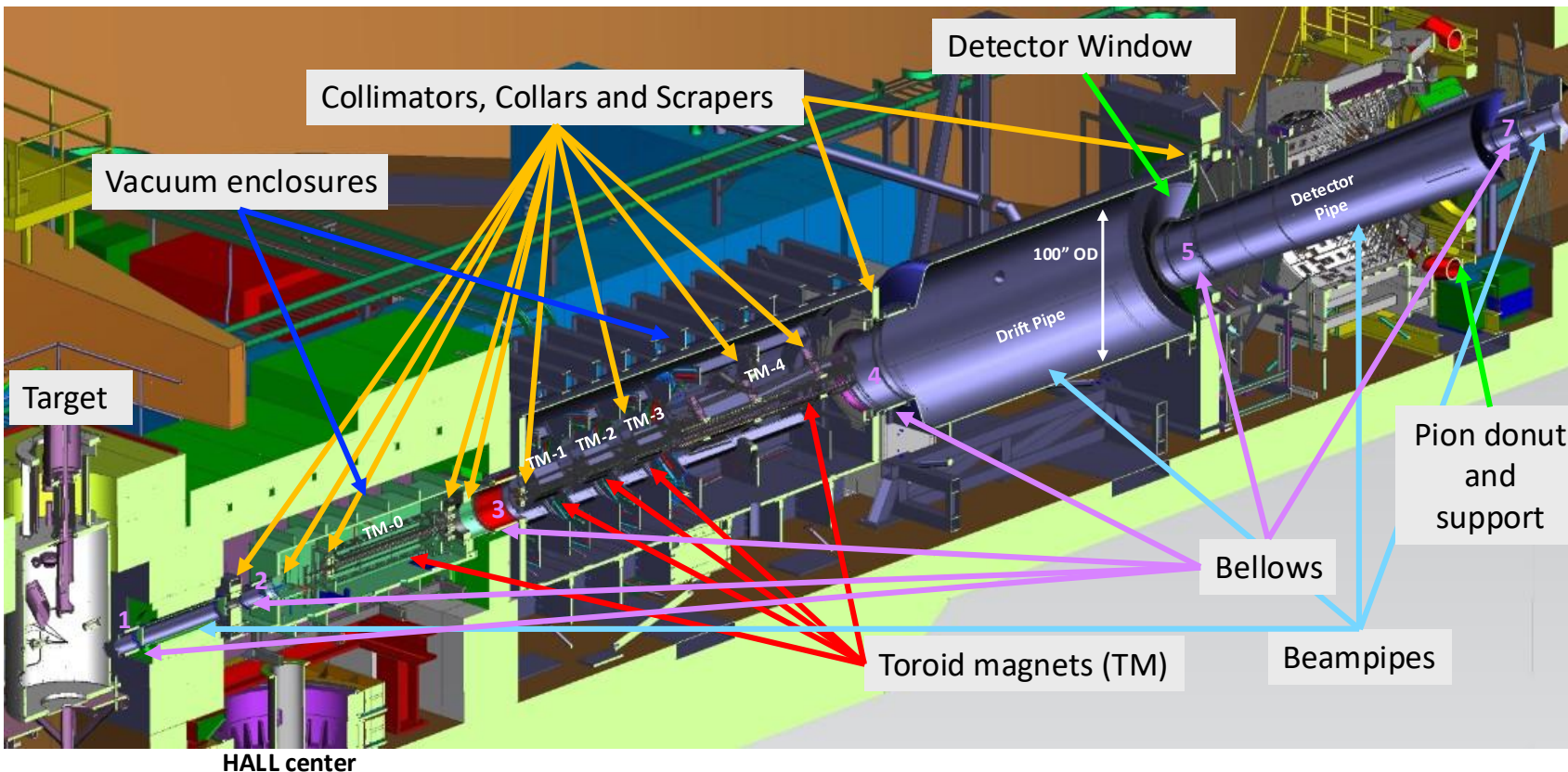
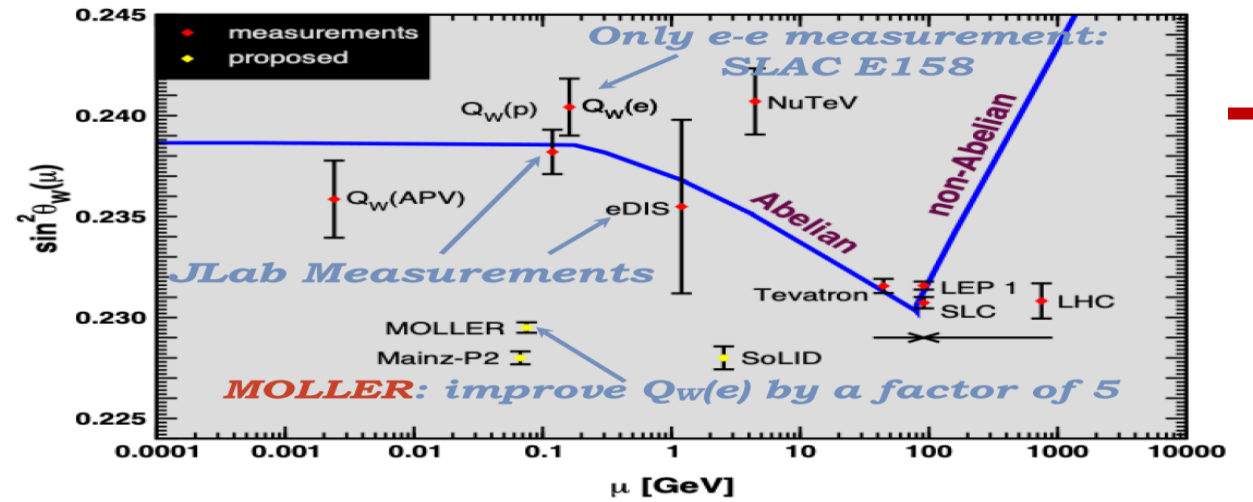


## Original Proposal Error Projections



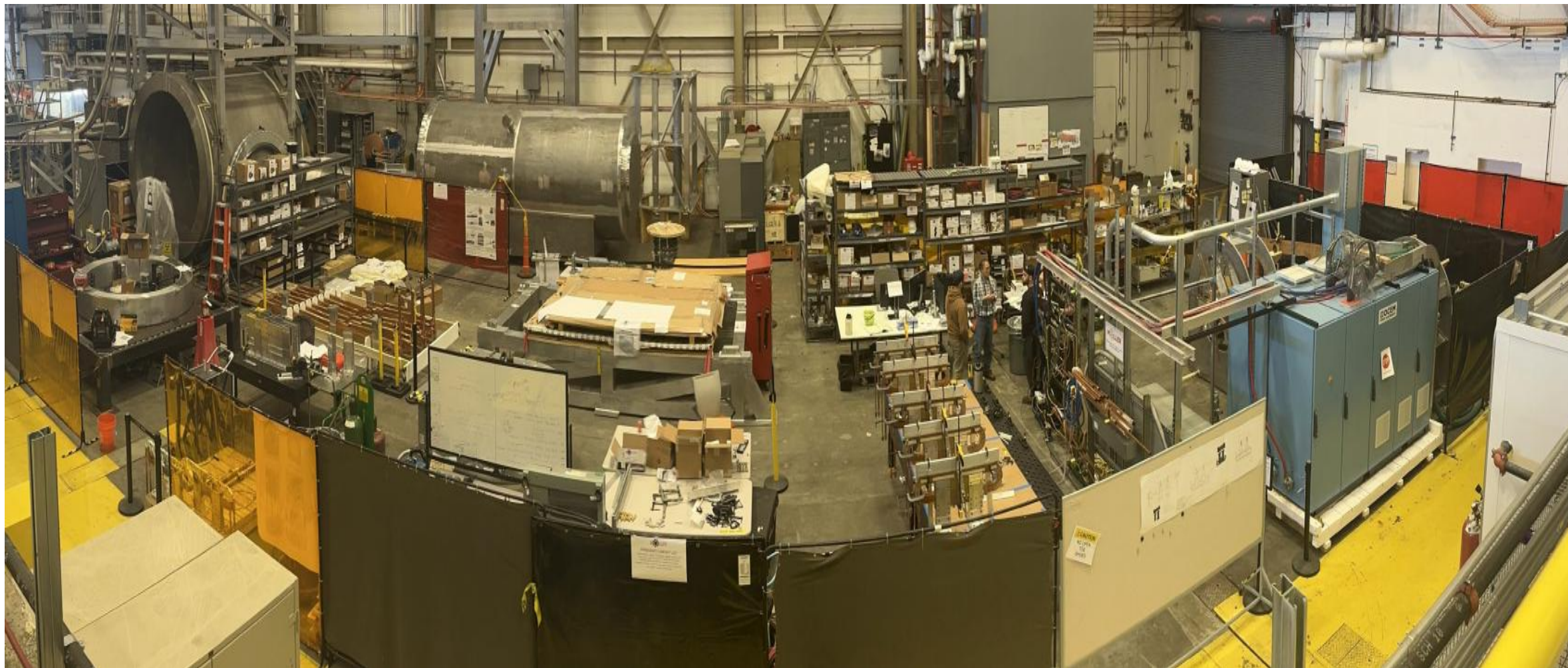
# MOLLER experiment and Project

- MOLLER install starts Aug 25<sup>th</sup>
- MOLLER ERR2 July 28 – Aug 1<sup>st</sup>
- MOLLER collaboration meeting June 3-5
- Lots of progress with detectors, spectrometers and infrastructure.





# MOLLER equipment in the TestLab





# MOLLER updates

## Loading Six TM1 Coils and Three TM2 Coils into their Frames





# SoLID update

- SoLID collaboration meeting July 7-8<sup>th</sup> .
  - Strong collaboration with new proposals and run groups
- Long Range Plan: Strong Endorsement in Recommendation 4
- DOE Facility Review: Readiness: A – Ready to be launched
  - Waiting for across field evaluation and report (no new project approval before the Facility Review Report)
  - Need to get CDO approval.
- Nearly final report on the productive pre R&D test at high luminosity that was done in Hall C parasitically in 2022-3
- Planning for new pre R&D test in Hall C during FY26.

