Hall-B Status Report

- News from Hall-B Group and Collaborations
- Run Schedule and Run Preparation for Hall B
- Update on Hall-B Theses and Publications

There will be a Hall-B Business Meeting this Friday 12:00 pm with information on projects, subcontracts and research tracking

Patrick Achenbach

July 8, 2025

News from Hall-B Group and Collaborations

News from Hall-B Group

JOINT APPOINTMENTS

- **New Joint Appointment with Lamar University**
  - 5-year assistant professor position with Hall B
  - Candidates have been interviewed
- **Joint Appointment of Anselm Vossen with Duke U**
  - JLab support discontinued after two 3-year terms
  - Continuation of Hall B projects at Duke U with more specialized support from JLab/Hall-B in future

POSTDOCS

- **New LDRD Postdoc position** on AI/ML
  - Selected candidate rejected position
  - Position not re-approved by leadership
- **Richard Tyson** will leave in mid October
  - Regular completion of his 2-year term
  - Regular succession is planned

TRANSITIONS

- **Donald Williams** left Spin-Polarized Fusion Team
  - Transitioned to a permanent Technician position in Physics Division Target Group
  - Continues to work on Hall B projects
- **Gagik Gavalian** left Hall B Offline Software Group
  - Continues to work on Hall B projects

PROMOTIONS

- **Florian Hauenstein** to Staff Scientist II
- **Rafayel Paremuzyan** to Staff Scientist II

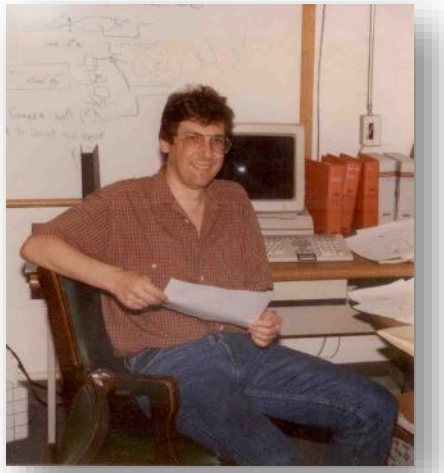
Congratulations, well deserved!

Awards to Hall-B Staff

Tom W. Bonner Prize in Nuclear Physics

- **Volker Burkert**

– "*For exemplary leadership in the development of high-performance instrumentation for large acceptance spectrometers that have enabled breakthroughs in fundamental nuclear physics through electroproduction measurements of exclusive processes*"



11/20/1985: Volker's 1st day at CEBAF

Service Award

- **Calvin Mealer**

– For 25 years of dedication to JLab

Employee Excellence Awards

- **Calvin Mealer, Dontre Tucker, Steve Docherty**

– For their outstanding service to JLab

Feodor Lynen Research Fellowship

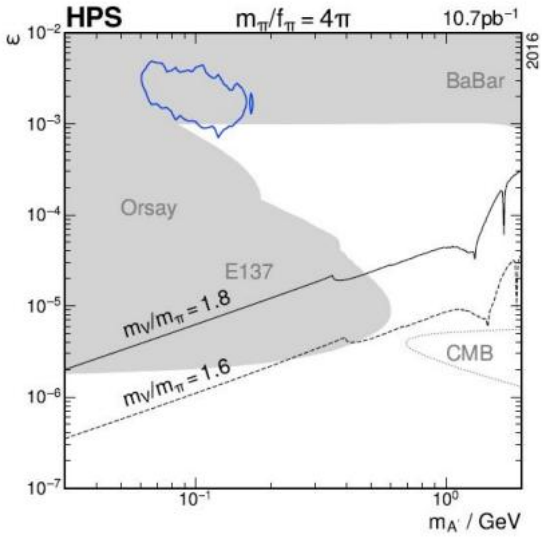
- **Bhawani Singh**

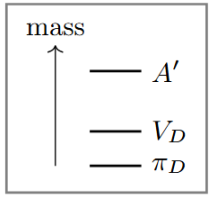
– Declined due to incompatibility of JLab as host institution

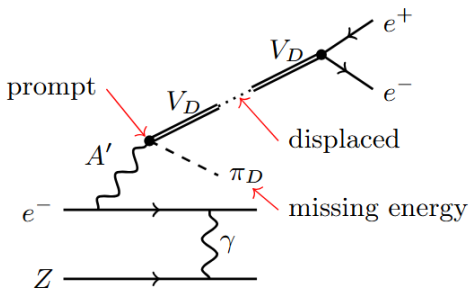
News from Hall-B Collaborations

HPS COLLABORATION

- Semi-annual **HPS Collaboration Meeting** at JLab from June 3–5, 2025 with 23 registered participants
- SIMPs paper draft "*Displaced Vertex Searches for Electroproduced Strongly Interactive Massive Particles with the 2016 HPS Dataset*" based on two analysis notes from **Alec Spellmann** and **Tom Eichlersmith** using full unblinded 2016 statistics:



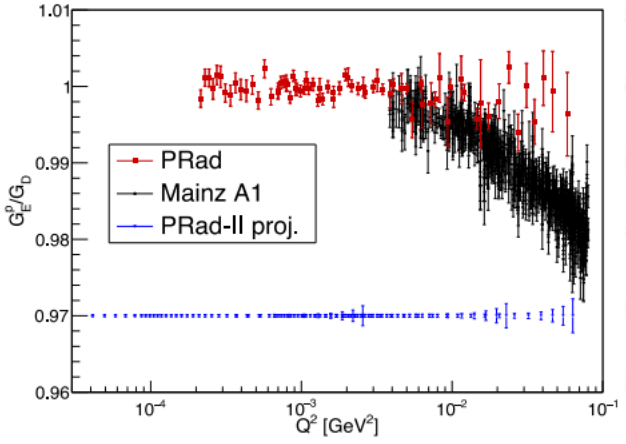


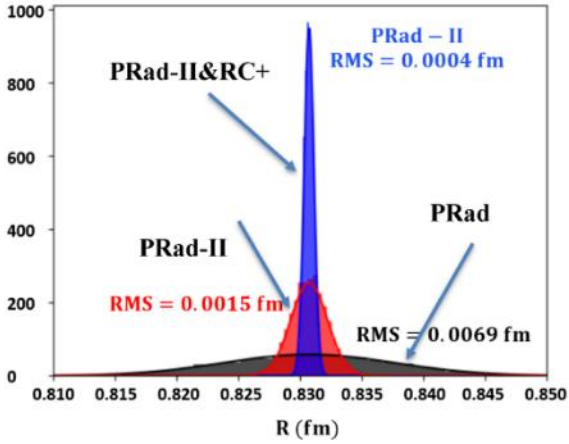


- Improvements in calibration, alignment, processing

PRAD COLLABORATION

- **PRad-II/X17 passed the Experimental Readiness Review on May 8–9, 2025**
  - Review committee provided constructive comments and few recommendations
  - Preparations for PRad-II/X17 run in FY26 continuing with close monitoring of procurements and installation schedule
- **McMule Group joined PRad Collaboration** as collaborators on radiative corrections:





Run Schedule

FY25 Run Status

SAD or scheduled Run Group	Setup / Status	Target	Beam Energy	Start Date	End Date	Scheduled Calendar Days	Remaining PAC Days Before Run	Scheduled PAC Days = Cal Days/2	Actual PAC Days from ABUs	Remaining PAC Days After Run
SAD 2024				2024-05-19	2025-03-19	304				
RG-L	ALERT	high pressure gas	2,1	2025-04-05	2025-04-12	7	55,0	3,5	1,0	54,0
	pass change			2025-04-12						
RG-L	ALERT	high pressure gas	11	2025-04-12	2025-07-01	80	54,0	40,0	36,0	18,0
RG-L	ALERT	high pressure gas	11	2025-07-01	2025-08-04	34	18,0	17,0		1,0
	pass change			2025-08-04						
RG-L	ALERT	high pressure gas	2,1	2025-08-04	2025-08-07	3	1,0	1,5		-0,5
	pass change			2025-08-07						
RG-L	ALERT	high pressure gas	6,6	2025-08-07	2025-09-03	27	17,0	13,5		3,5
SAM 2025	reconfigure					151	**sum:**	**75,5**		

pass change →

last week ←

end of run in Sept. ←

- We are at about 60% of the run time with about 50% of ABUs collected [with 1 significant digit]
- 2 additionally approved weeks compensating for 2 lost weeks because of accelerator issues

Change-over from ALERT DIS to SRC Run

- Two consecutive pass changes in one week should be scheduled on **Monday & Thursday**
  - **Option 1: week starting July 28, 2025**
  - **Option 2: week starting August 4, 2025**

- **ALERT DIS (high-energy) run**
  - Still recovering from particularly low accelerator availability in early May (about 1 week behind)
  - Running **median current** (325 nA) while originally low- and high current parts were planned; scheduled run time is expected to provide sufficient statistics for all approved analyses
  - Assuming high run efficiency in July, **Option 1** would complete the experiment

- **ALERT SRC (low-energy) run**
  - Benefits from commissioning/debugging/repairs
  - Assuming high run efficiency in August, **Option 2** would complete the experiment

Note: assuming high run efficiencies both in July and August, we are fine either way

Update on Run Schedule Planning

- **PRad-II/X17 passed Experiment Readiness Review on 8-9 May, 2025**
  - Hall C plans a program that requires reducing energy gain to around **700 MeV/pass**
  - This fits well with the low beam energies required for PRad-II
  - Such beam energies will not be available during the coming years of MOLLER running

- **ERR for RG-G will not happen in FY26:** Irradiation infrastructure and LiD samples will not be ready in January 2026 to produce highly-polarized target material

  Chris Keith: "*It is looking more and more like we'll get one chance per year at the injector and that is the month or so before beam is delivered to the halls.*"

- **RG-A / RG-B / RG-E / RG-K will be ready:** small modifications to the Hall-B cryotarget planned

- **HPS could be ready for FY27**

Many scheduling aspects were discussed during the last Hall-B Business Meeting in March 2025

FY26 Run Schedule

Scheduled Experiment	Setup / Status	Target	Beam Energy	Start Date	End Date	Scheduled Calendar Days	Remaining PAC Days Before Run	Scheduled PAC Days = Cal Days/2	Remaining PAC Days After Run
PRad-II/X17	HyCal/GEMs	Radiator	3,5	2026-01-26	2026-02-02	7	40,0	3,5	36,5
PRad-II	HyCal/GEMs	H2 gas	3,5	2026-02-02	2026-03-02	28	36,5	14,0	22,5
	pass change			2026-03-02					
PRad-II	HyCal/GEMs	H2 gas	0,7	2026-03-02	2026-03-23	21	22,5	10,5	12,0
	CEBAF rescale			2026-03-23	2026-04-04	12			
PRad-II	HyCal/GEMs	H2 gas	2,2	2026-04-04	2026-05-04	30	12,0	15,0	-3,0
	reconfigure			2026-05-04	2026-05-09	5			
X17 Search	HyCal/GEMs	Ta foil	2,2	2026-05-09	2026-06-29	51	60,0	25,5	34,5
					sum:	**154**	**sum:**	**68,5**	

CEBAF rescale →

← **setup change**

- **PRad-II** scheduled **for completion of the experiment** including non-standard beam energies
- **X17 Search** scheduled for **~50% of the experiment** with one of two planned beam energies

Possible FY27 Run Schedules

SAD or scheduled Run Group	Setup / Status	Target	Beam Energy	Start Date	End Date	Scheduled Calendar Days	Remaining PAC Days Before Run	Scheduled PAC Days = Cal.Days/2	Actual PAC Days from ABUs	Remaining PAC Days After Run
RG-E		liq. D2 & nucl. doublet	11			66	33	33		0
	reconfigure	change				7		4		
RG-K		liq. H2	8.8			120	52	60		0
							sum:	**97**		

Or:

SAD or scheduled Run Group	Setup / Status	Target	Beam Energy	Start Date	End Date	Scheduled Calendar Days	Remaining PAC Days Before Run	Scheduled PAC Days = Cal.Days/2	Actual PAC Days from ABUs	Remaining PAC Days After Run
RG-E		liq. D2 & nucl. doublet	11			66	33	33		0
	reconfigure	change				7		4		
HPS	HPS setup	nuclear	4.4			120	105	60		45
							sum:	**97**		

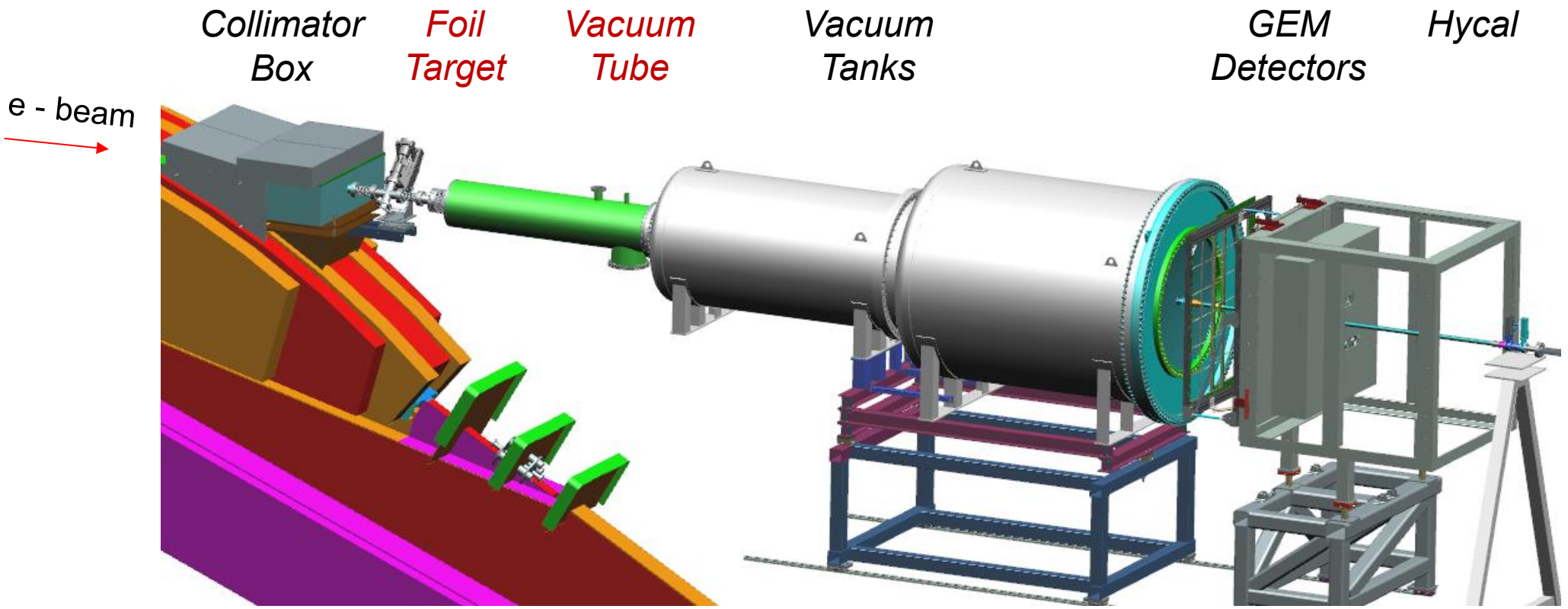
Combinations with RG-A and RG-B are also possible, some months with Hall-B cryotarget are a must!

PRad Run Preparations

PRad-II/X17 Setup in Hall B

Experimental setup based on existing PRad equipment

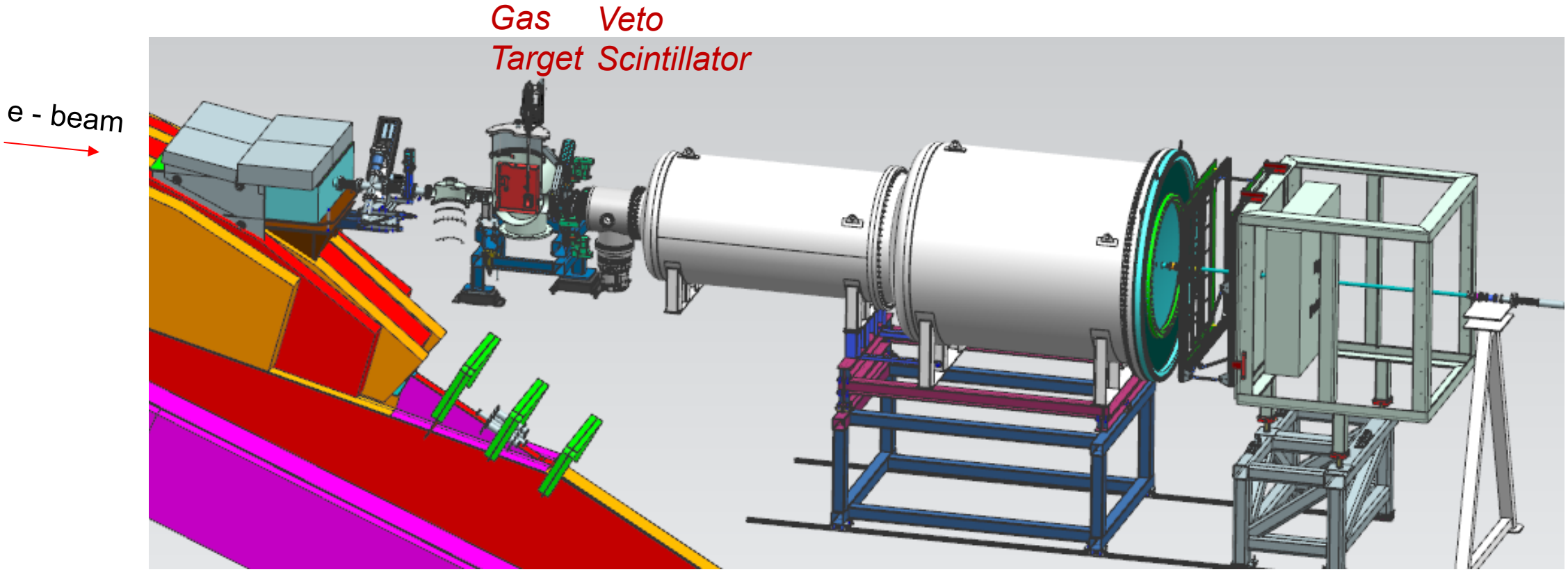
- For X17 specific: foil targets (1 μm Ta) and new vacuum tube
- Large vacuum tanks to minimize scattering
- Two planes of GEM detectors for tracking
- HyCal Calorimeter for electron/positron detection



PRad-II/X17 Setup in Hall B

Experimental setup based on existing PRad equipment

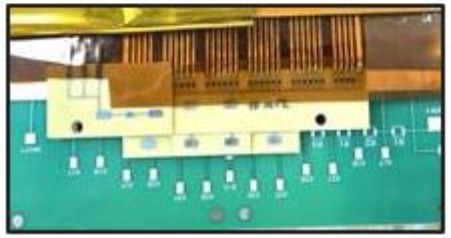
- For PRad specific: gas flow target and scintillator assembly
- Large vacuum tanks to minimize scattering
- Two planes of GEM detectors for tracking
- HyCal Calorimeter for electron/positron detection



GEM Detector Status

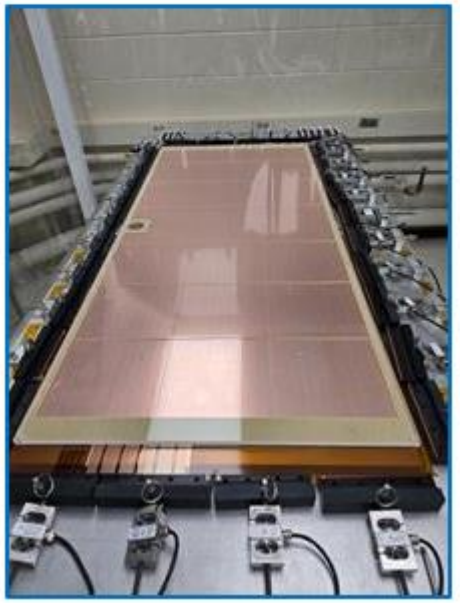
- Two planes (4 layers) of **newly constructed and characterized GEMs**

Procurement

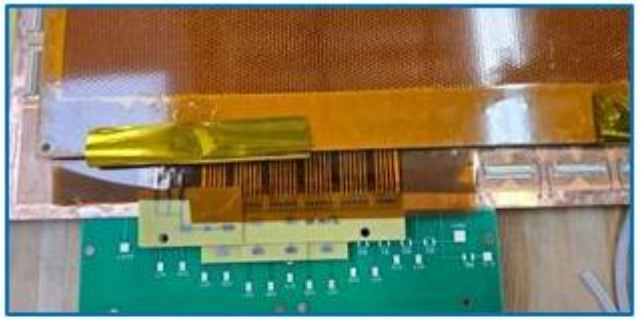


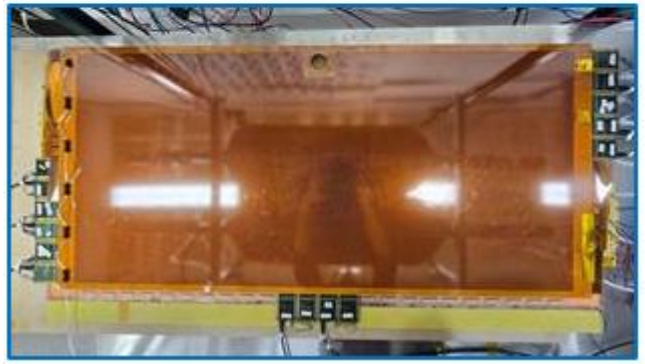
Pre-cleanroom activities

Cleanroom activities



Post-cleanroom activities



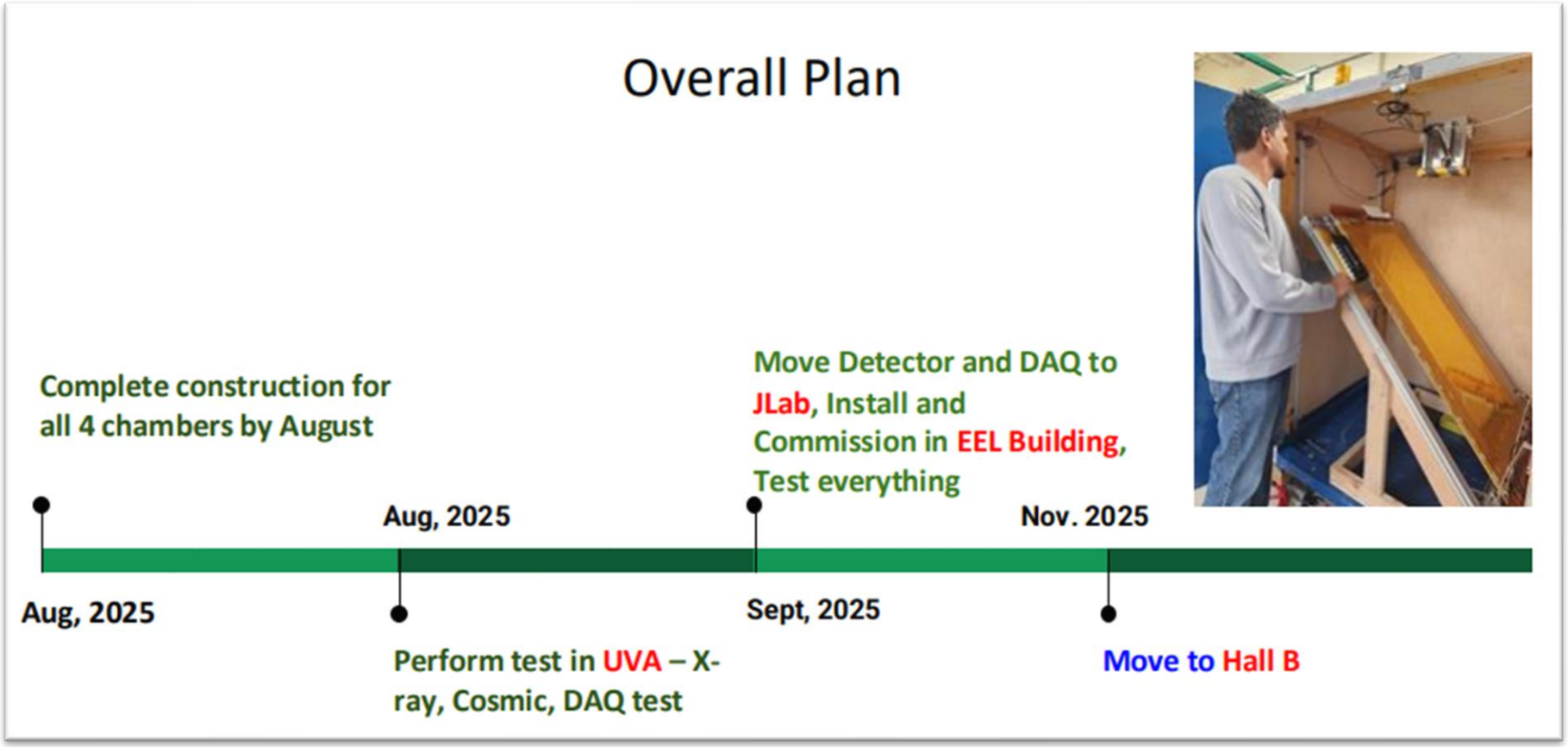


- Frames
- Foils
- Honeycomb plates

UVa is subcontracted for procurement, fabrication, and tests

Readiness of GEM Detector Integration

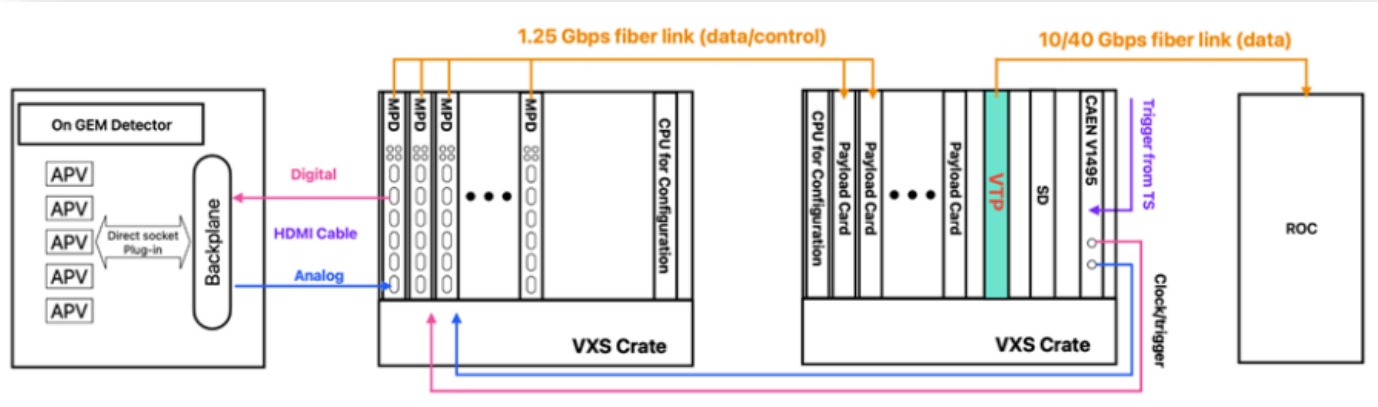
- First module assembly completed and with on-going characterization
- Timeline presented by Nilanga Liyanage during the ERR in May:



Collaboration is on track to provide the equipment this summer

Readiness of GEM Detector DAQ

- Based on VTP-MPD system currently used in SBS program
- Status presented by Nilanga Liyanage during the ERR in May:



DAQ Component Readiness

-II/X17 GEM DAQ

Module Name	Required Quantity
VXS crate	3
Payload Cards	12
MPD modules	48
backplanes	52 (1-, 2-, 3-slot combined)
APV	144
SD	3
TI Card	3
CAEN V1495	1
CPU	3
VTP	3
fan-in-fan-out NIM modules	as needed (depends on module)
HDMI Cables (10 m)	104
1-to-4 fibers	12
Wiener MPOD ompv 8008	13 (ready in Hall B)

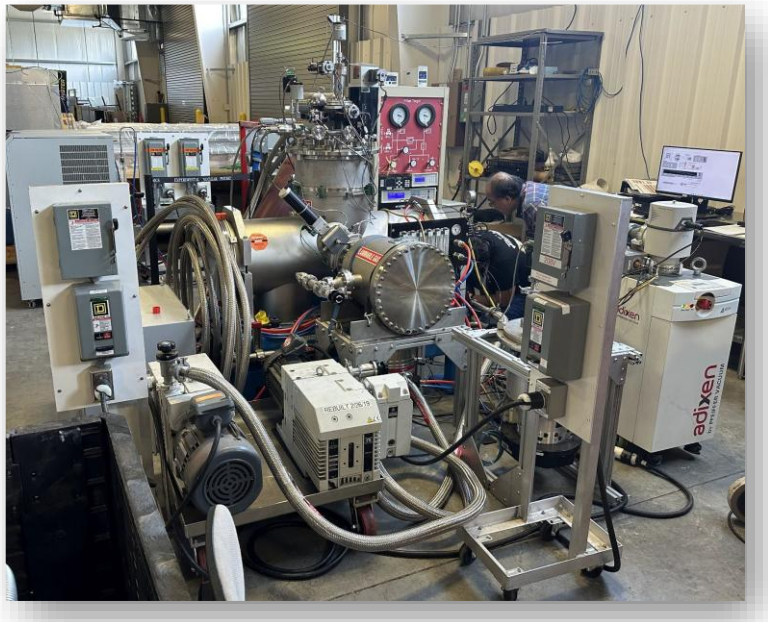
Table 1: List of Modules

- Ready in Hall B ✓
  - VXS crate, TI cards, CPU
  - Wiener MPOD ompv 8008
- From SBS program ✓
  - MPD, VTP, SD, Payload Cards
  - CAEN V1495
  - Fan-in-Fan-out modules
  - HDMI cables, 1-to-4 fibers
- Already purchased for PRad-II/X17 ✓
  - APV hybrid cards
- Manufacturing in Progress (expected June 2025)
  - backplanes

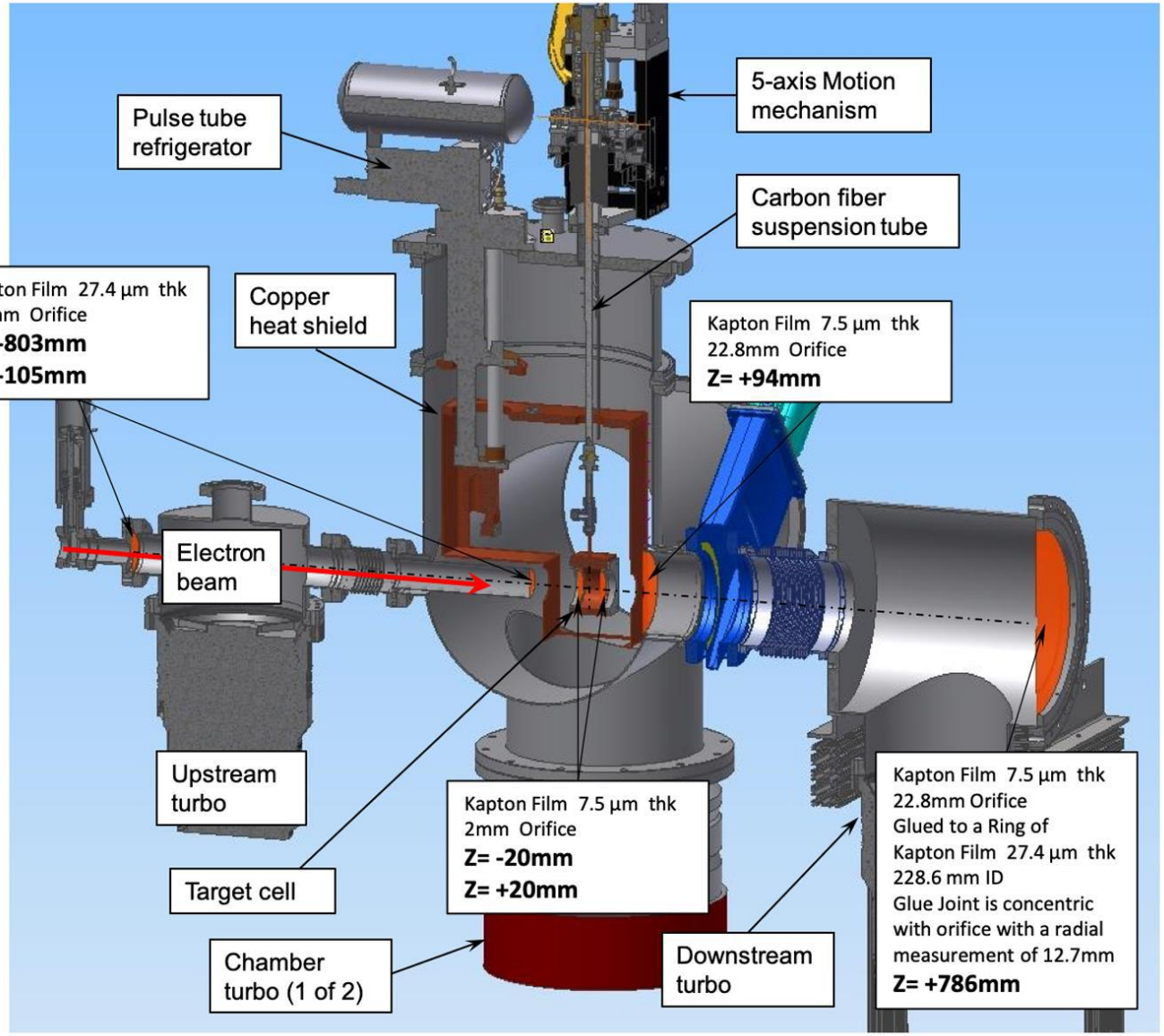
DAQ was tested at UVa with
25 kHz event rate

Windowless Hydrogen Gas Flow Target

- Target cell: 75 x 75 x 40 mm^3
- Windowless: beam enters and exits via 2 mm orifices in 7.5 µm thin polyimide foils
- 40 mm target thickness at 0.63 mbar pressure and 19.5 K temperature

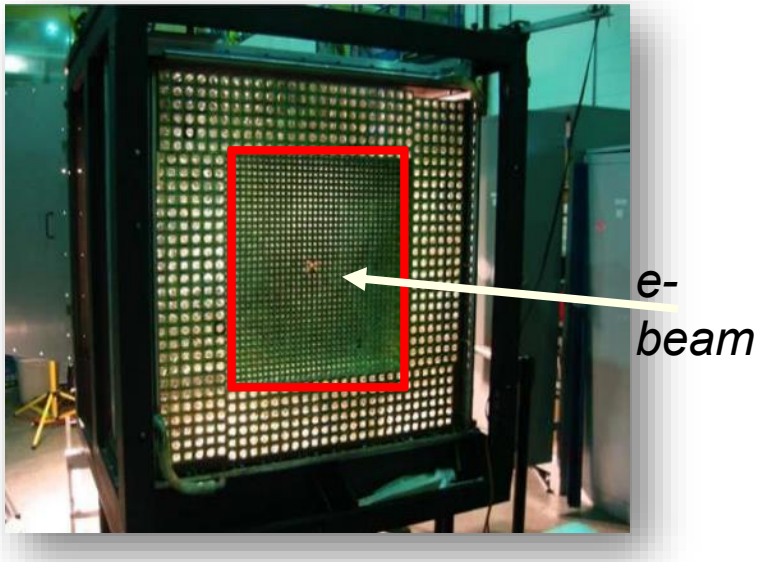


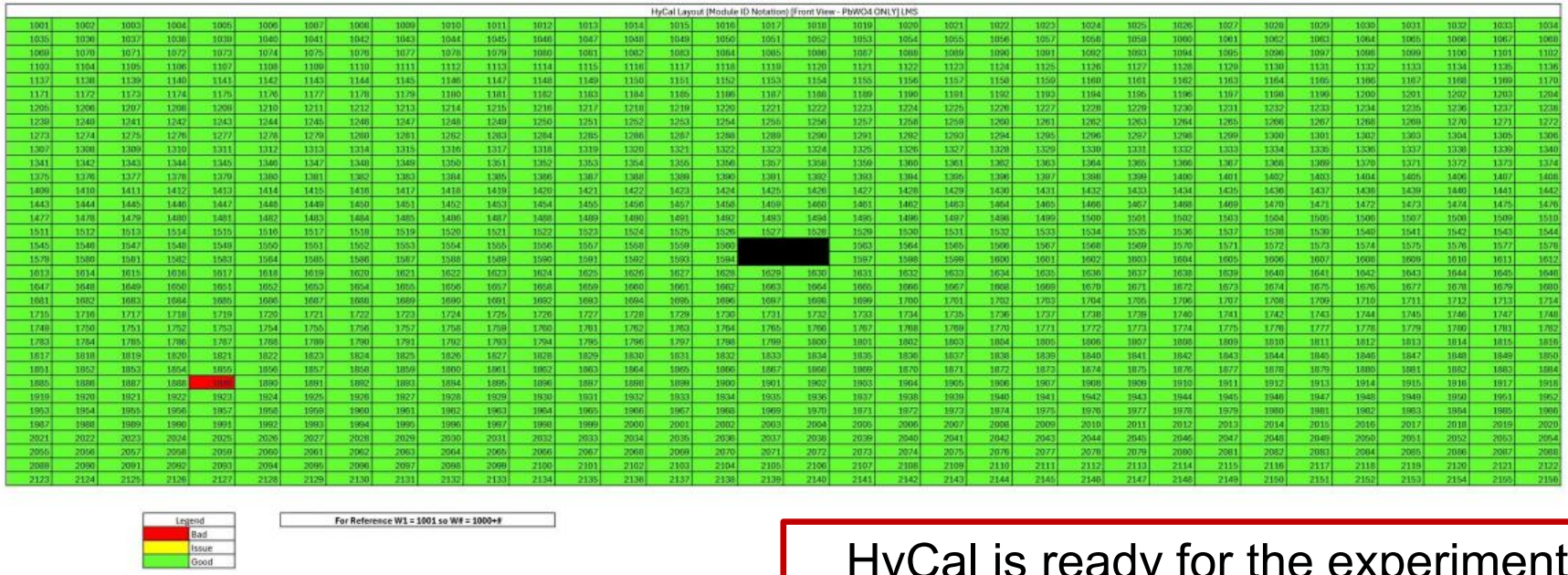
Target was tested with helium in ESB



HyCal Electromagnetic Calorimeter

- 34 x 34 =1156 $PbWO_4$ modules, each 2 x 2 x 18 cm^3
- 68 x 68 cm^2 total detection area
- 2 x 2 crystals removed from center for beam passage





HyCal is ready for the experiments

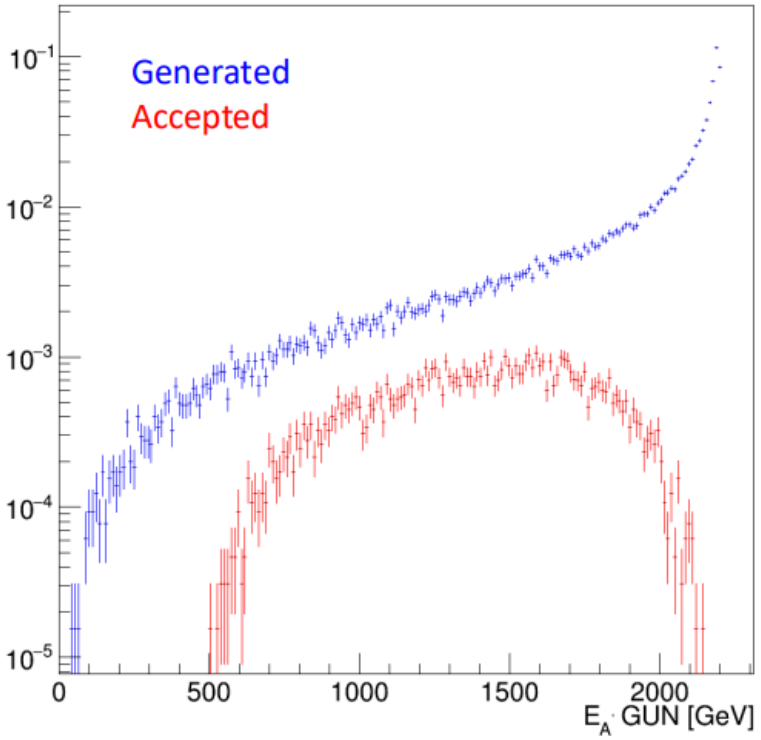
Signal cable conversion and testing – DONE; fADC testing – DONE; HV CAEN crate testing; – DONE; LMS test – DONE; LMS fiber repairs – DONE; HyCal module testing – repair of one remaining channel

Updated X17 Signal Simulations

MadGraph5 A' production → GEANT4 → Reconstruction → Analysis

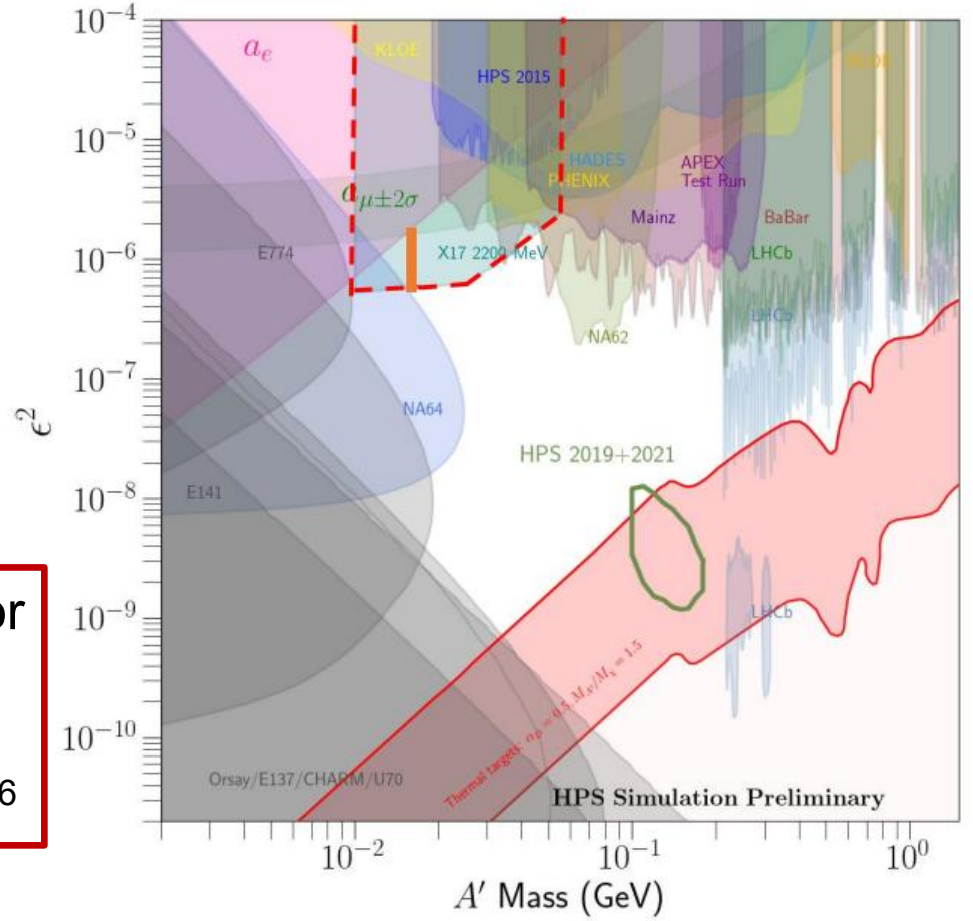
$$e + Ta \rightarrow Ta\, e^- e^+ e^-$$

M = 17 MeV



Experiment can exclude or validate the X17 for masses 3 − 60 MeV and couplings $\varepsilon^2 \approx 5\times10^{-7}$–$10^{-6}$

E_b = 2.2 GeV; I = 50 nA; 40 PAC days

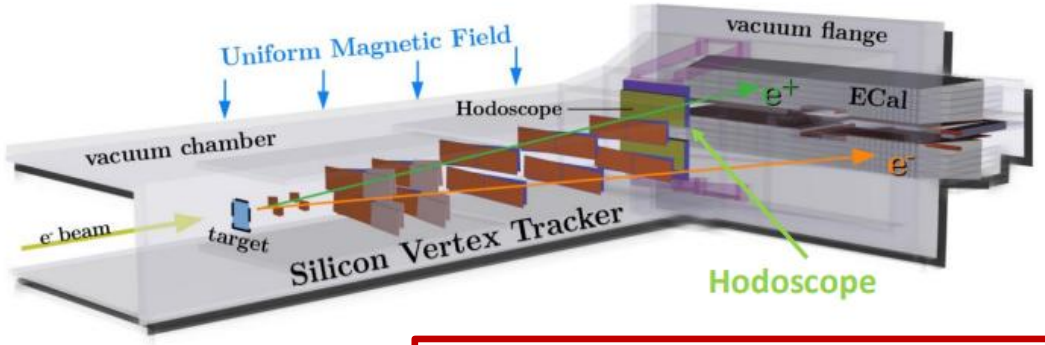


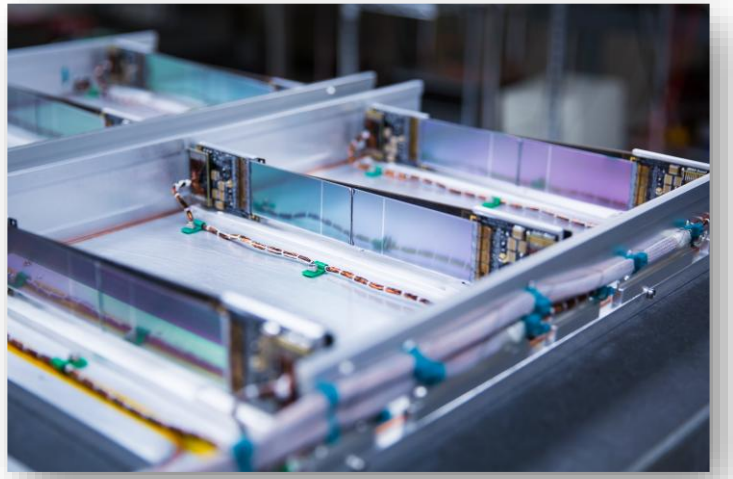
HPS Run Preparations

Expected Improvements Compared to 2021 Run

- **Operations**
  - SVT alignment, field-off runs with acceptance in all layers, fully surveyed detector
- **Hardware**
  - SVT modules, ECal chiller, DAQ update, servicing of Frascati magnet system
- **Optimized run periods**
  - Optimum is ~7 weeks at 4 GeV and ~6 weeks at 2 GeV beam energy
  - HPS has requested **60 PAC days of two-pass running**, to be followed by a final one-pass run

[Timothy Nelson, “HPS Overview”, HPS Collaboration Meeting (June 2025)]





Readiness of **sensors** seems to be most relevant component

HPS Sensitivity in Minimal A' Scenario

HPS 2019+2021 Run

"Existing data (75 days) opens up significant region of sensitivity"

[Timothy Nelson, "HPS Overview", HPS Collaboration Meeting (June 2025)]

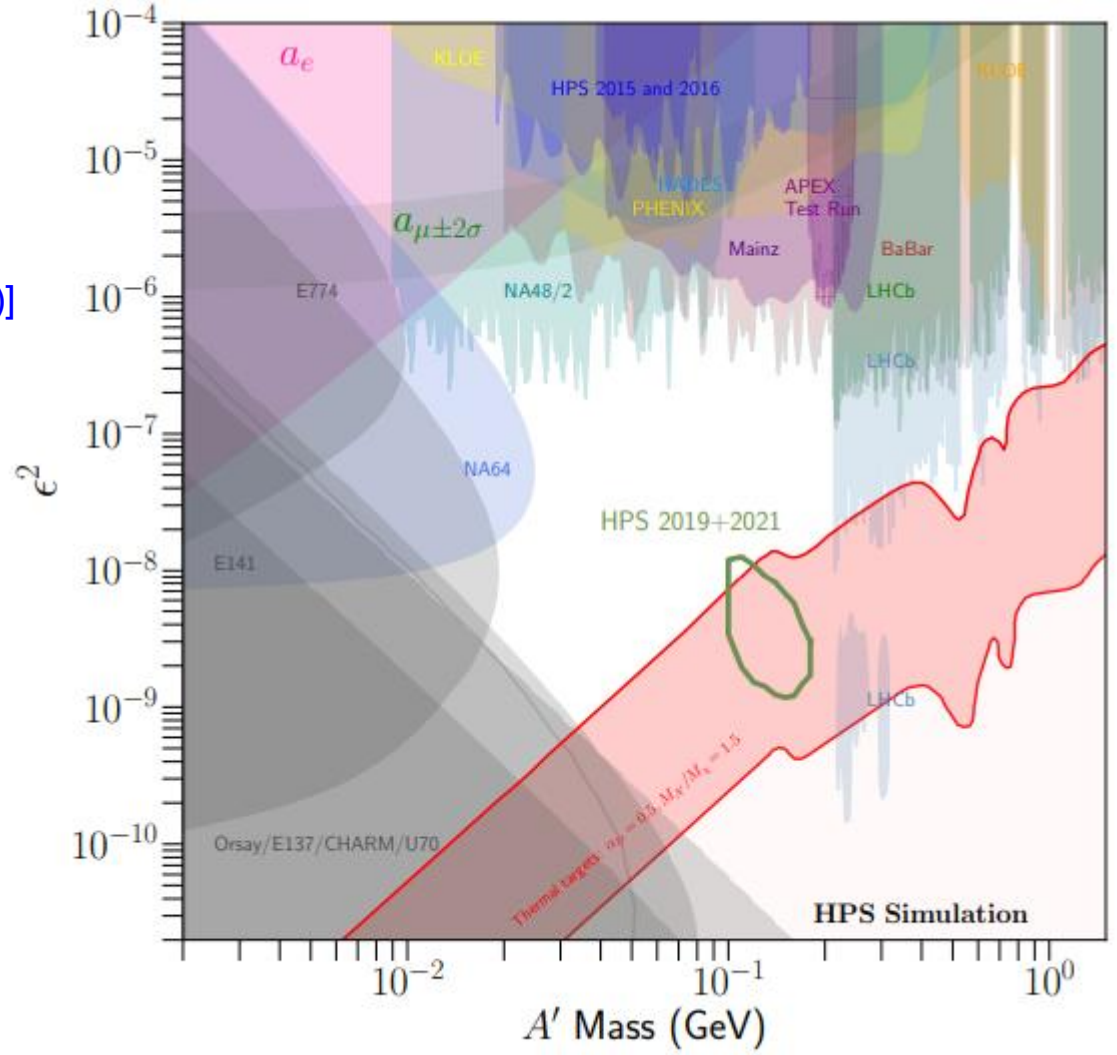
Two physics runs completed with upgraded detector

2019 run:

- E_b = 4.55 GeV
- Lumi = 128 pb^{-1}
- Target 8μm and 20 μm W foils

2021 run:

- E_b = 3.74 GeV
- Lumi = 168 pb^{-1}
- Target: 20 μm W foil



HPS Sensitivity in Minimal A' Scenario

HPS Full Luminosity

"Future run plan (105 days) more than doubles this region"

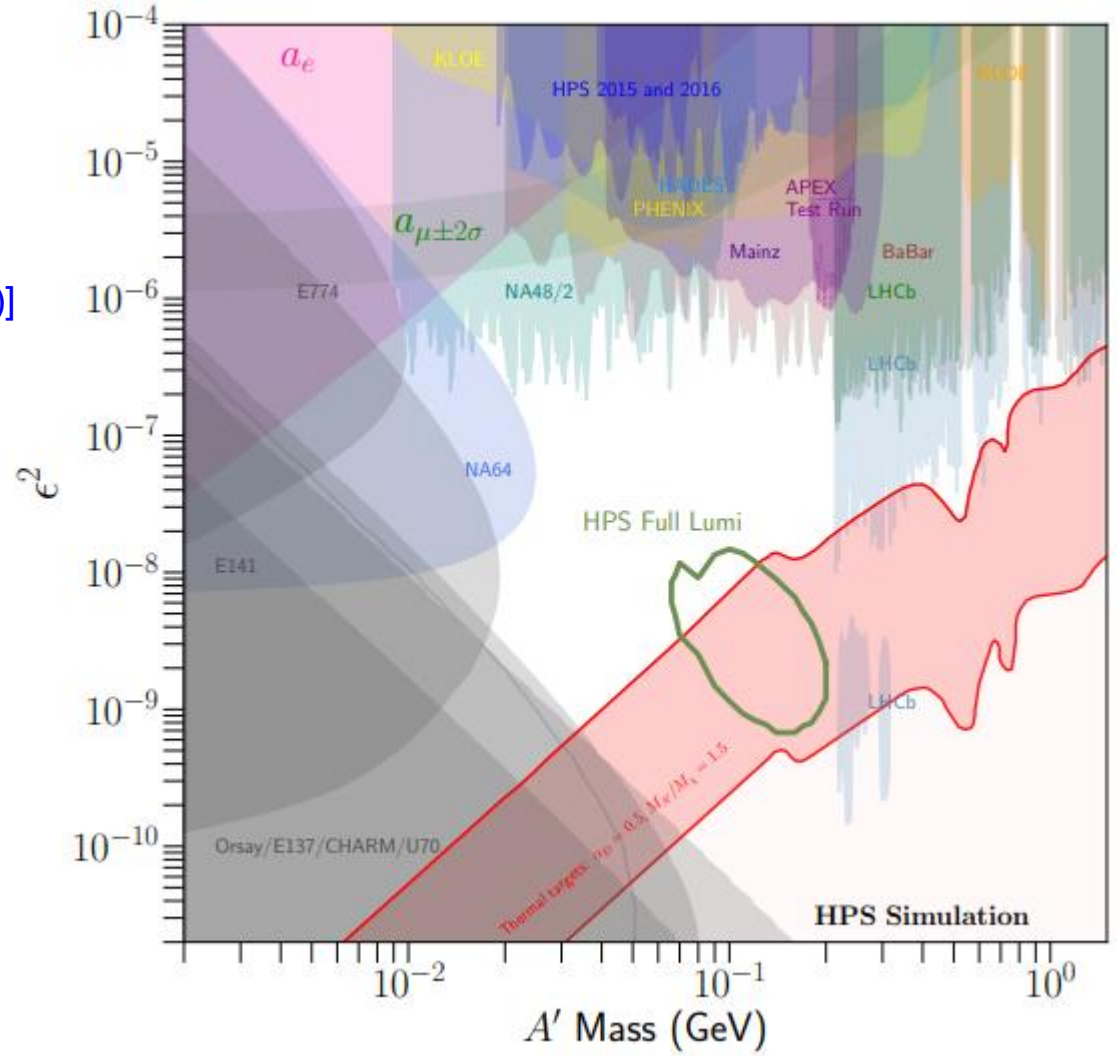
[Timothy Nelson, "HPS Overview", HPS Collaboration Meeting (June 2025)]

Progress in dark photon searches has been incremental.

What happened?

a) *These are hard experiments*

b) *These are difficult searches*



Updates on Theses and Publications

Two New Completed PhD Theses in CLAS

THE STRUCTURE FUNCTION OF THE FREE NEUTRON AT HIGH X-BJORKEN

by

Madhusudhan Pokhrel
B. Sc. December 2013, Tribhuvan University, Nepal
M. Sc. December 2016, Tribhuvan University, Nepal
M. S. May 2019, Old Dominion University, USA

A Dissertation Submitted to the Faculty of
Old Dominion University in Partial Fulfillment of the
Requirements for the Degree of

DOCTOR OF PHILOSOPHY

PHYSICS

OLD DOMINION UNIVERSITY
May 2025

Approved by:

Stephen Bueltmann (Director)

Sebastian Kuhn (Member)

Raul Briceno (Member)

Yuan Zhang (Member)

Sylvain Marsillac (Member)

In 2025:
- Madhusudhan Pokhrel
- Krishna Neupane

FIRST CLAS12 DOUBLE-PION ($N\pi\pi$) ELECTROPRODUCTION ANALYSIS

by

Krishna Chandra Neupane

Bachelor of Science
Tribhuvan University, 2011

Master's Degree in Physics
Tribhuvan University, 2014

Submitted in Partial Fulfillment of the Requirements

for the Degree of Doctor of Philosophy in

Physics

College of Arts and Sciences

University of South Carolina

2025

Accepted by:

Ralf Gothe, Major Professor

Fred Myhrer, Committee Member

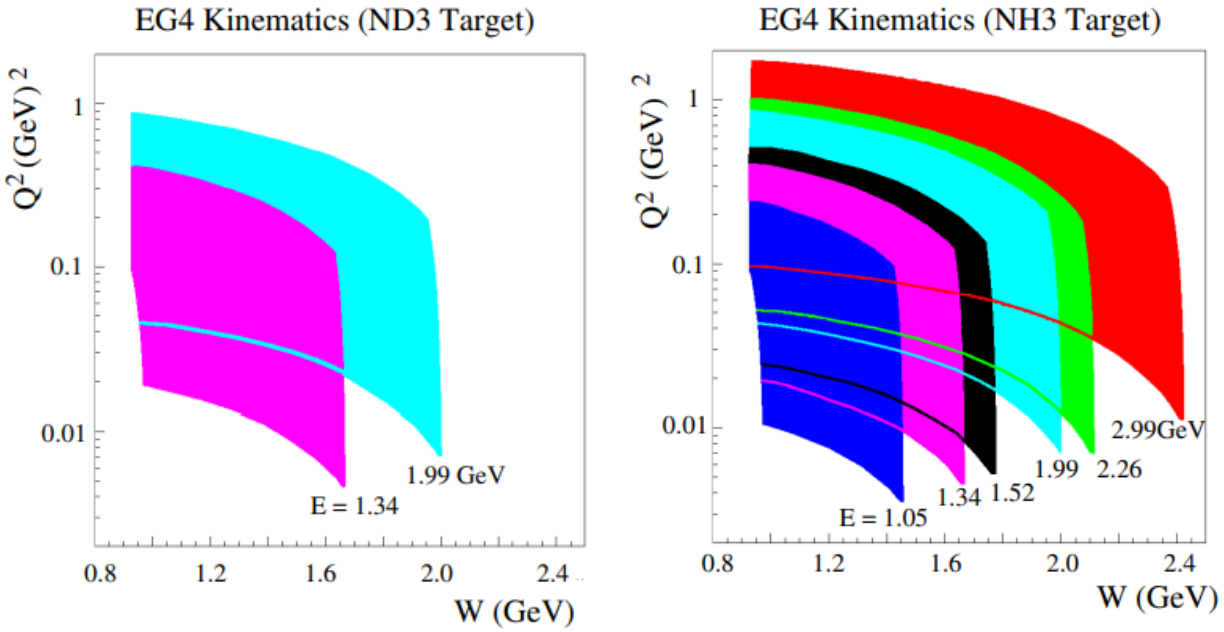
Steffen Strauch, Committee Member

Viktor Mokeev, Committee Member

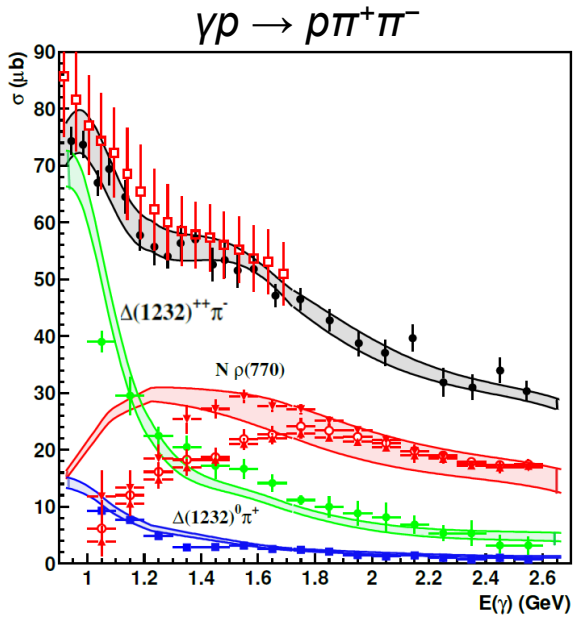
Ann Vail, Dean of the Graduate School

Update on Publications Using CLAS Data

A. Deur *et al.* (CLAS Collaboration), "*Measurement of the nucleon spin structure functions for 0.01 < Q^2 < 1 GeV^2 using CLAS*", **Phys. Rev. C 111, 035202 (Mar. 2025)**

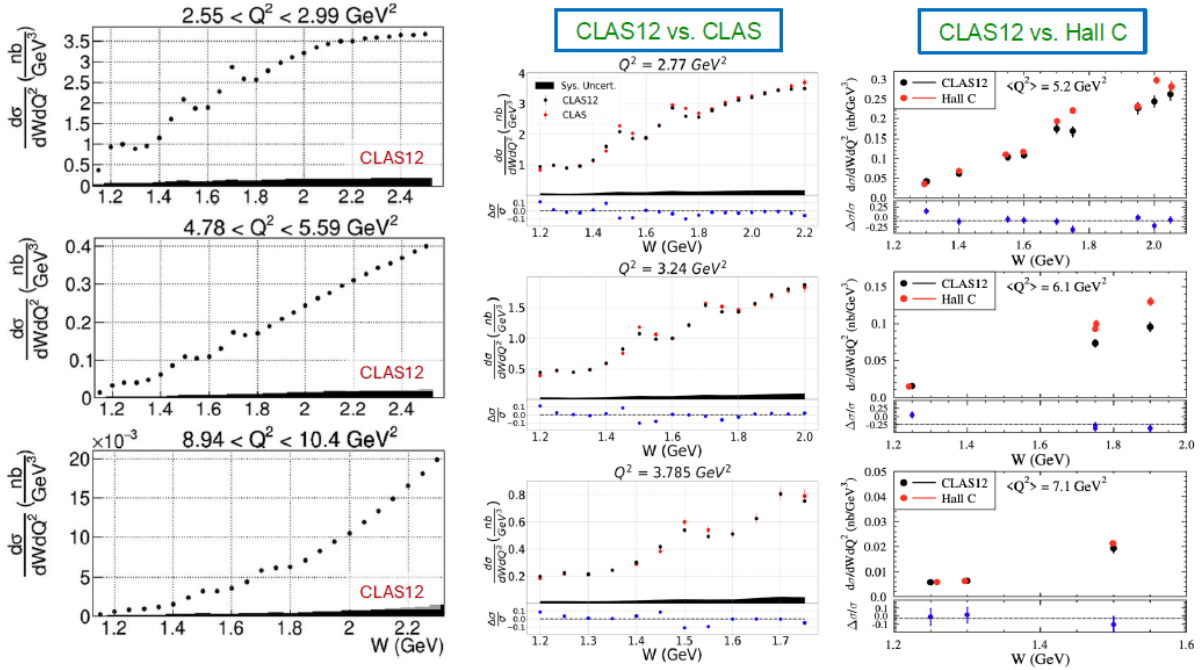


A.V. Sarantsev, *et al.* (CLAS Collaboration), "*Photoproduction of two charged pions off protons in the resonance region*", **Phys. Rev. C 111, 035203 (Mar. 2025)**



Update on Publication Using CLAS12 RG-A Data

V. Klimenko *et al*. (CLAS Collaboration), "*Inclusive Electron Scattering in the Resonance Region off a Hydrogen Target with CLAS12*", **accepted in Phys. Rev. C (June 2025)**



- First inclusive electron scattering cross sections
- **JLab press release is prepared**

CLAS12 Provides a New View of the Proton Spectrum

New data bring physicists closer to a full understanding of the proton's structure

NEWPORT NEWS, VA – The small but mighty proton serves as a foundation for our universe. It abides at the very heart of matter, giving rise to everything we see around us as it anchors the nucleus of the atom. Yet, its own structure is unbelievably complex, and the quest to understand the details of that structure has occupied theorists and experimenters alike since its discovery over a century ago.

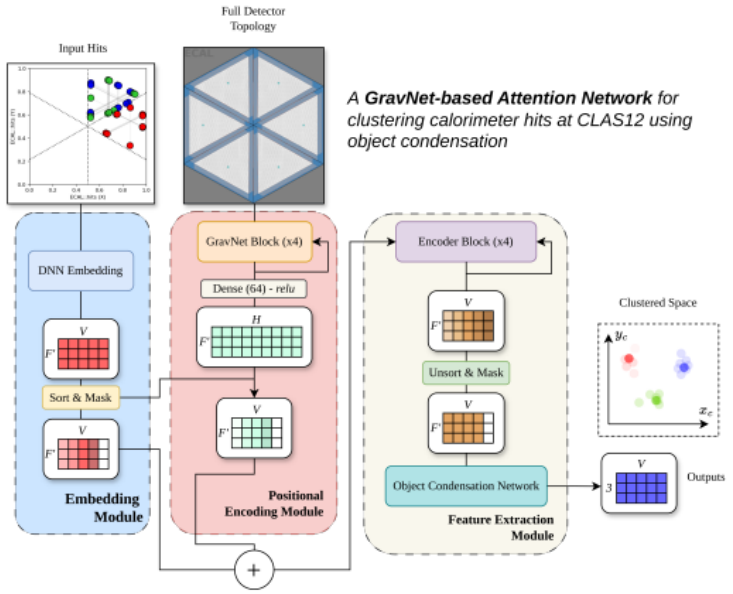
"The visible universe is made of protons," said Kyungseon Joo, a physics professor at the University of Connecticut. "And so, if you want to understand the universe, it's important to understand how the proton is structured. We think we understand it quite well, but a lot of things are still missing."

In 2018, an international team of researchers began taking new measurements of the proton in experiments conducted at the U.S. Department of Energy's Thomas Jefferson National Accelerator Facility with a new apparatus called CLAS12. Now, the first results

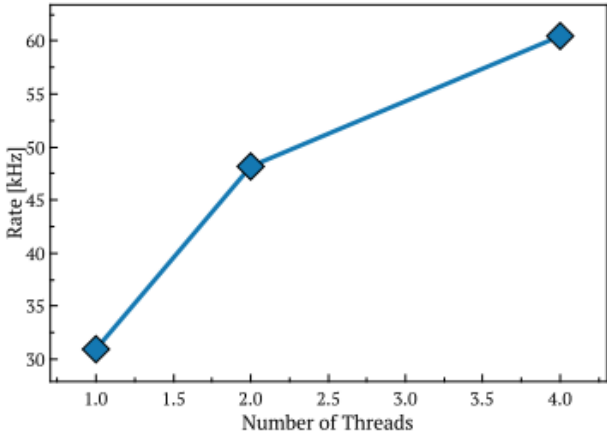
New Publications on Analysis Methods

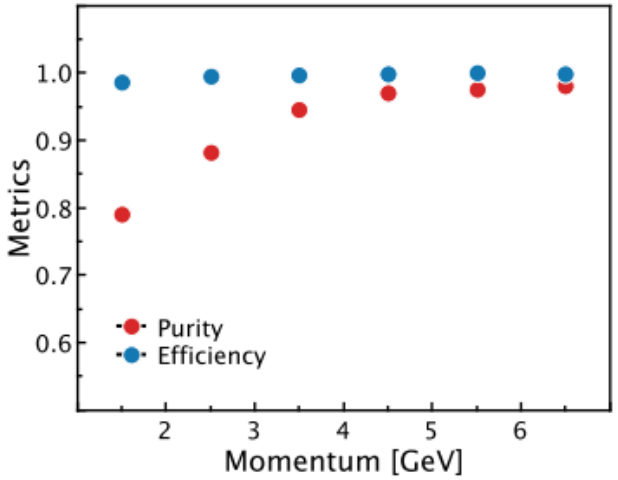
Gregory Matousek and Anselm Vossen, "*AI-Assisted Object Condensation Clustering for Calorimeter Shower Reconstruction at CLAS12*", arXiv: 2503.11277 [physics.ins-det], DOI: https://doi.org/10.48550/arXiv.2503.11277

- **AI-based clustering method** for calorimeter
- Networks for hit representations
- Object condensation for hit clustering



Gagik Gavalian and Richard Tyson, "*Online Electron Reconstruction at CLAS12*", submitted to Comput. Phys. Commun. (2025)





- **AI-based electron reconstruction**
- Electron identification purity above 75% retaining an efficiency close to 100% within fiducial region

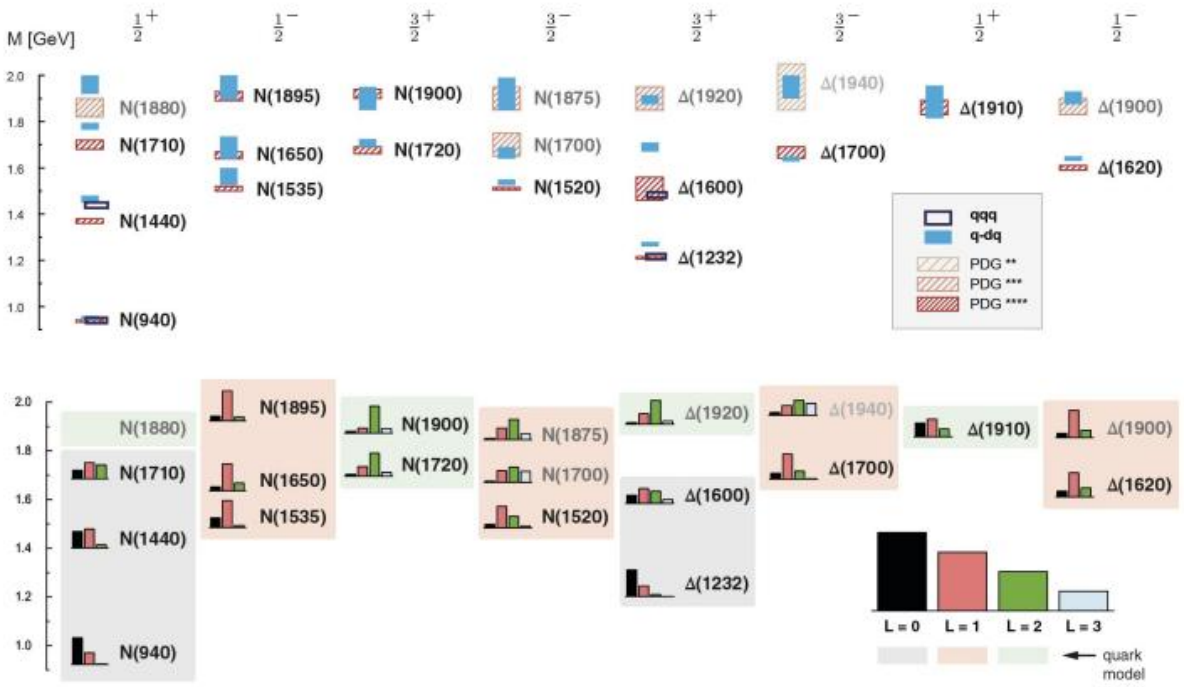
New Publication on Data Presentation

V.D. Burkert, A. Camsonne, P. Chatagnon, K. Cichy, M. Constantinou, H. Dutrieux, I. M. Higuera-Angulo, C. Mezrag, D. Richards, P. Sznajder, "*Open database for GPD analyses*", arXiv: 2503.18152 [hep-ph], DOI: https://doi.org/10.48550/arXiv.2503.18152, submitted to Eur. Phys. J. C (?)

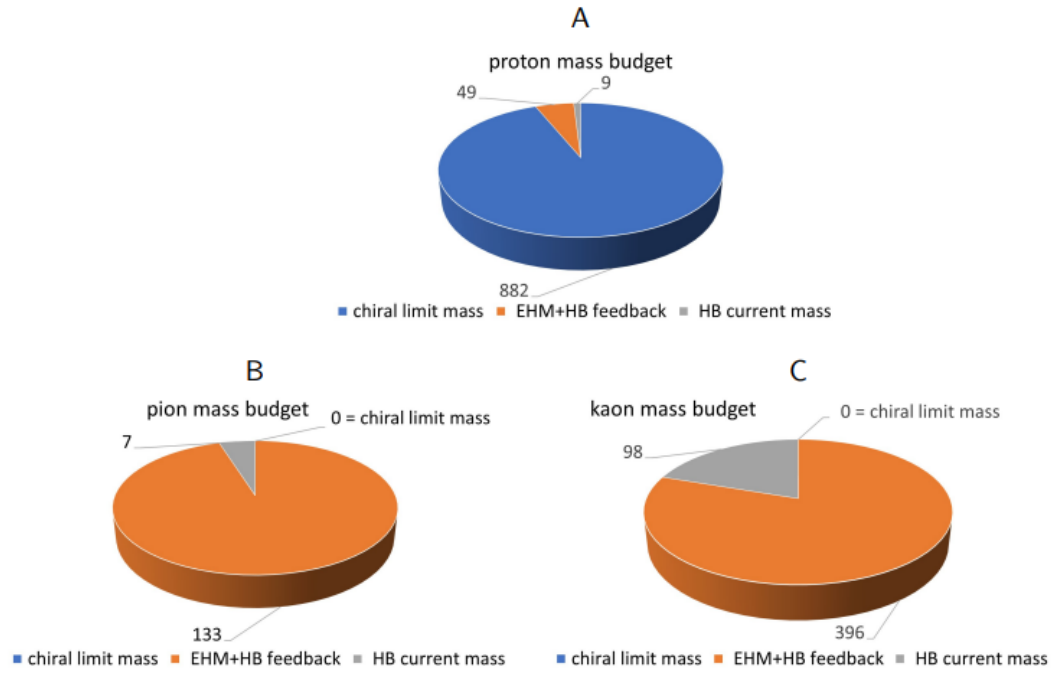
- **Open database** for use in exploration of GPDs
- Designed to store experimental and lattice-QCD data
- Can aid in benchmarking GPD models
- Utilizes a new data format based on YAML

New Reviews

Volker Burkert, Gernot Eichmann, Eberhard Klempt, "*The impact of γN and γ*N interactions on our understanding of nucleon excitations*", arXiv: 2506.16482 [hep-ph], DOI: https://doi.org/10.48550/arXiv.2506.16482, submitted to Prog. Part. Nucl. Phys.

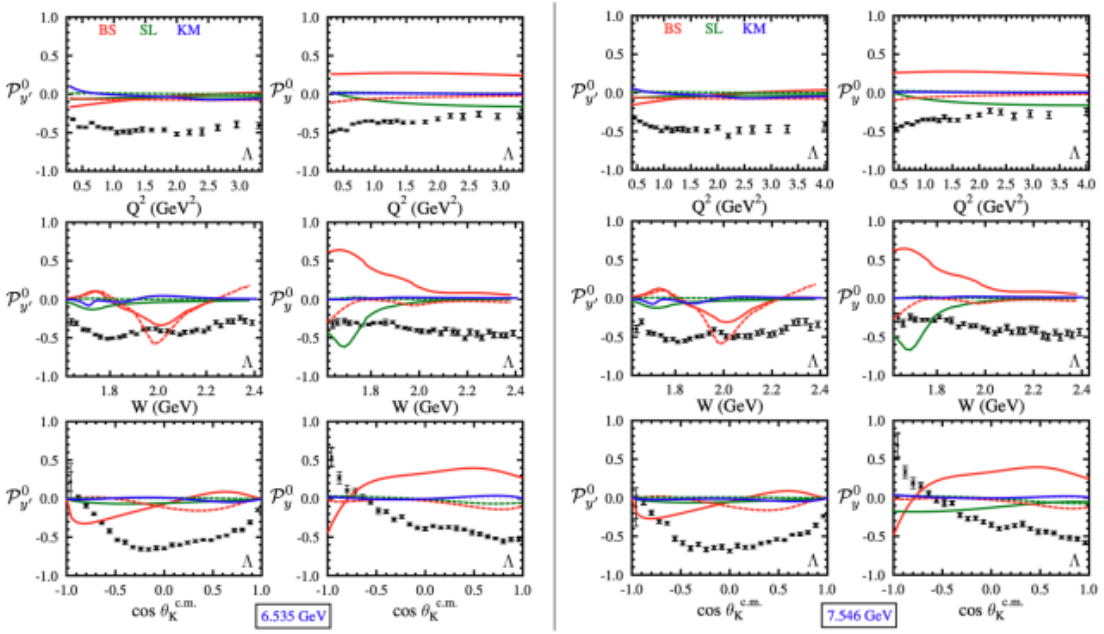


Patrick Achenbach, Daniel S. Carman, Ralf W. Gothe, Kyungseon Joo, Victor I. Mokeev, Craig D. Roberts, "*Electroexcitation of Nucleon Resonances and the Emergence of Hadron Mass*", arXiv: 2505.23550 [hep-ph], DOI: https://doi.org/10.48550/arXiv.2505.23550, accepted in Symmetry (July 2025)



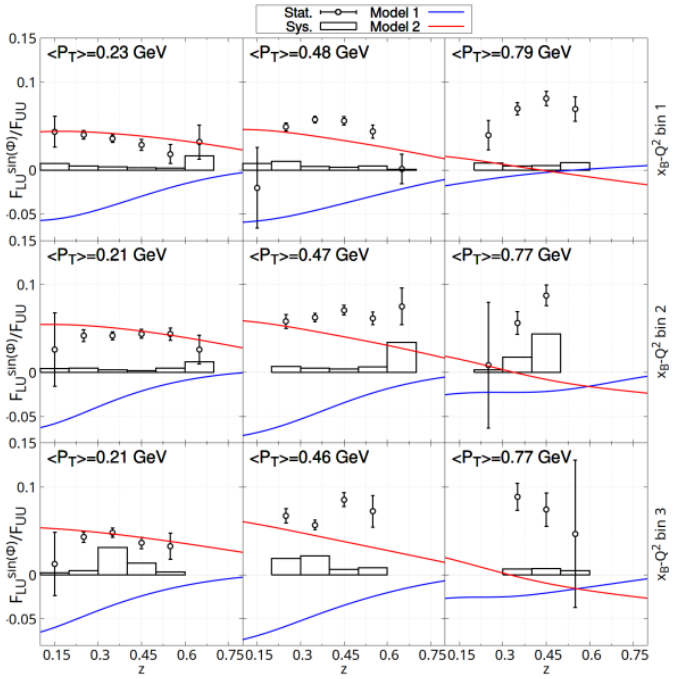
New Publications Using CLAS12 Data

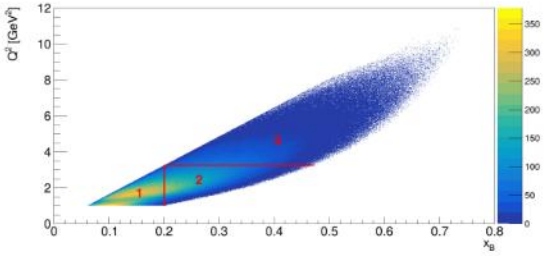
D.S. Carman *et al.* (CLAS Collaboration), "*Recoil Polarization in K^+Y Electroproduction in the Nucleon Resonance Region with CLAS12*", arXiv: 2505.12030 [nucl-ex], DOI: https://doi.org/10.48550/arXiv.2505.12030, submitted to Phys. Rev. C



- Polarization observables extend existing data on Λ and first electroproduction measurements for Σ^0

A. Kripko *et al.* (CLAS Collaboration), "*Multi-dimensional Measurements of Beam Single Spin Asymmetries in Semi-Inclusive Deep-Inelastic Charged Kaon Electroproduction off Protons in the Valence Region*", arXiv:2504.0858 [hep-ex], DOI: https://doi.org/10.48550/arXiv.2504.08580, submitted to Phys. Rev. Lett.



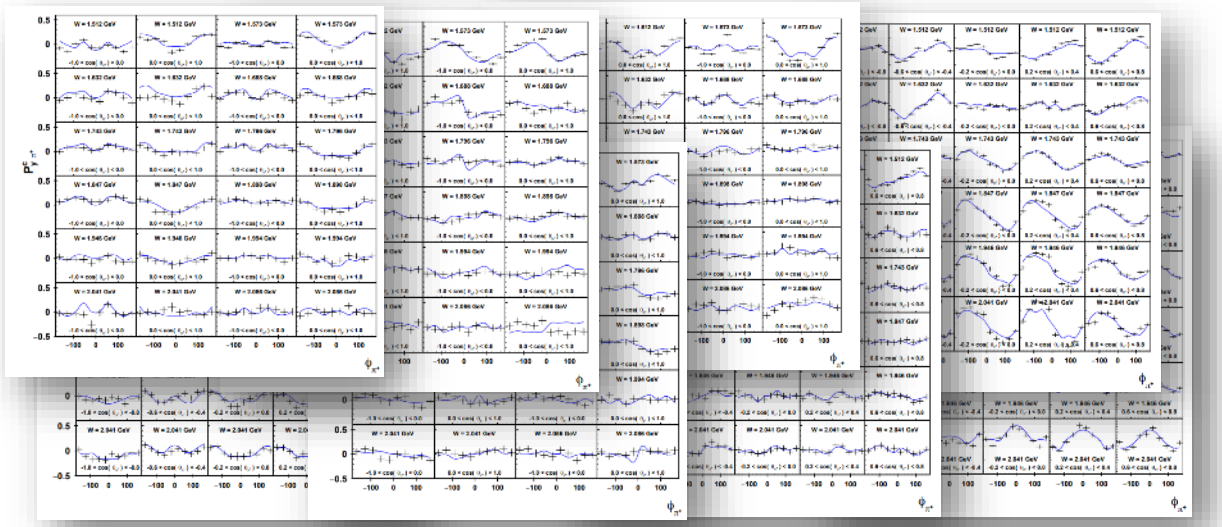


- Large kinematic range of z, x_B, p_T and Q^2
- Constrains on twist-3 PDFs

New Publications Using CLAS Data

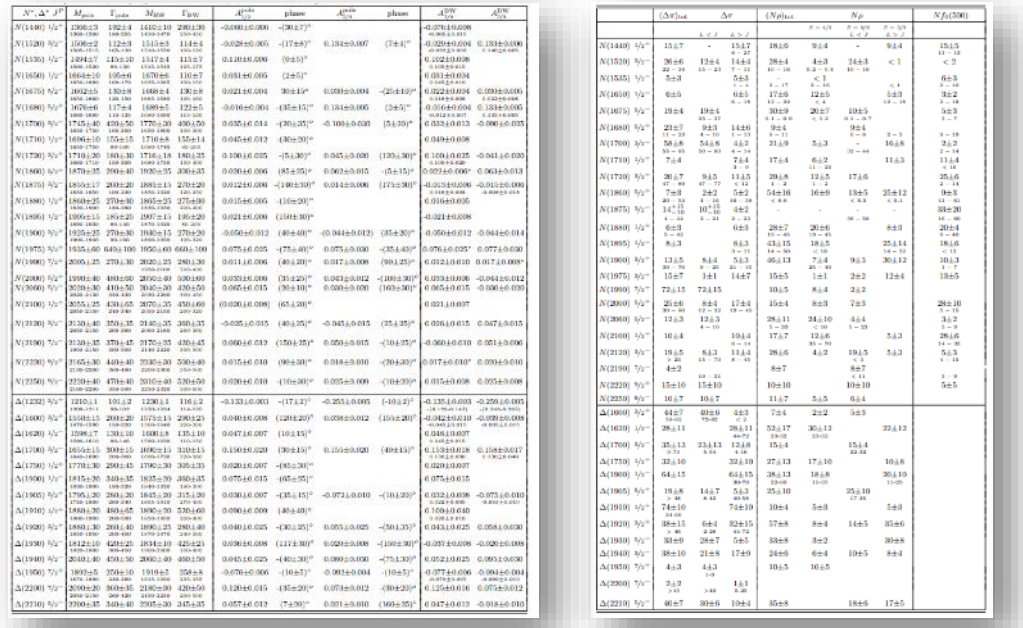
P. Roy *et al.* (CLAS Collaboration), "*Measurement of Single- and Double-Polarization Observables in the Photoproduction of $\pi^+\pi^-$ Pairs off the Proton Using CLAS at Jefferson Laboratory*", arXiv: 2504.21119 [nucl-ex], DOI: https://doi.org/10.48550/arXiv.2504.21119, submitted to Phys. Rev. C

- Beam and target asymmetries, and beam-target double-polarization observables measured using a transversely polarized target (FROST)



A.V. Sarantsev, E. Klempt, K.V. Nikonov, T. Seifen, U. Thoma, Y. Wunderlich, P. Achenbach, V.D. Burkert, V. Mokeev, V. Crede, "*Decays of N* and Δ* Resonances into Nρ, Δπ, and $Nf_0(500)$*", arXiv: 2503.16636 [nucl-th], DOI: https://doi.org/10.1103/qfpf-tcs3 Phys. Rev. C 112, 015202 (2 July, 2025)

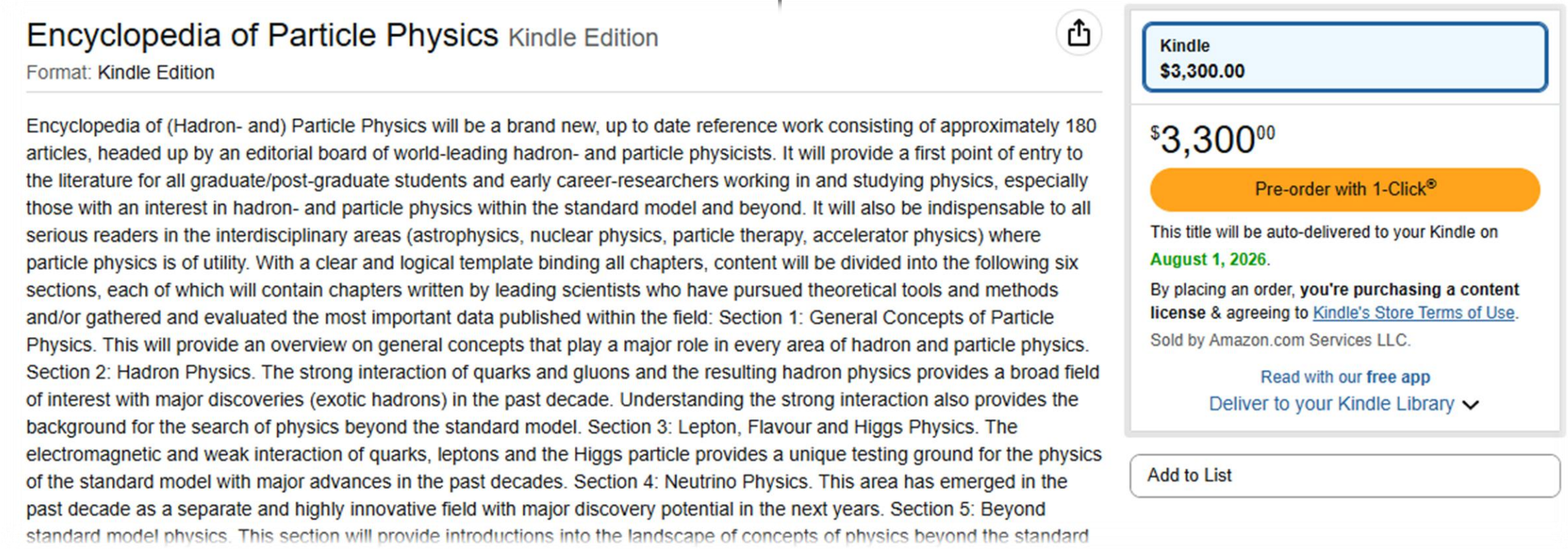
- Masses, widths and branching ratios of N* and Δ*



New Outreach Publication

Raffaella De Vita, "*The CLAS12 Experiment at Jefferson Lab*", to appear in the Encyclopedia of Particle Physics (2026)

Patrick Achenbach, "*Experiments at Jefferson Lab*", to appear in the Encyclopedia of Particle Physics (2026)



Encyclopedia of Particle Physics Kindle Edition

Format: Kindle Edition

Encyclopedia of (Hadron- and) Particle Physics will be a brand new, up to date reference work consisting of approximately 180 articles, headed up by an editorial board of world-leading hadron- and particle physicists. It will provide a first point of entry to the literature for all graduate/post-graduate students and early career-researchers working in and studying physics, especially those with an interest in hadron- and particle physics within the standard model and beyond. It will also be indispensable to all serious readers in the interdisciplinary areas (astrophysics, nuclear physics, particle therapy, accelerator physics) where particle physics is of utility. With a clear and logical template binding all chapters, content will be divided into the following six sections, each of which will contain chapters written by leading scientists who have pursued theoretical tools and methods and/or gathered and evaluated the most important data published within the field: Section 1: General Concepts of Particle Physics. This will provide an overview on general concepts that play a major role in every area of hadron and particle physics. Section 2: Hadron Physics. The strong interaction of quarks and gluons and the resulting hadron physics provides a broad field of interest with major discoveries (exotic hadrons) in the past decade. Understanding the strong interaction also provides the background for the search of physics beyond the standard model. Section 3: Lepton, Flavour and Higgs Physics. The electromagnetic and weak interaction of quarks, leptons and the Higgs particle provides a unique testing ground for the physics of the standard model with major advances in the past decades. Section 4: Neutrino Physics. This area has emerged in the past decade as a separate and highly innovative field with major discovery potential in the next years. Section 5: Beyond standard model physics. This section will provide introductions into the landscape of concepts of physics beyond the standard

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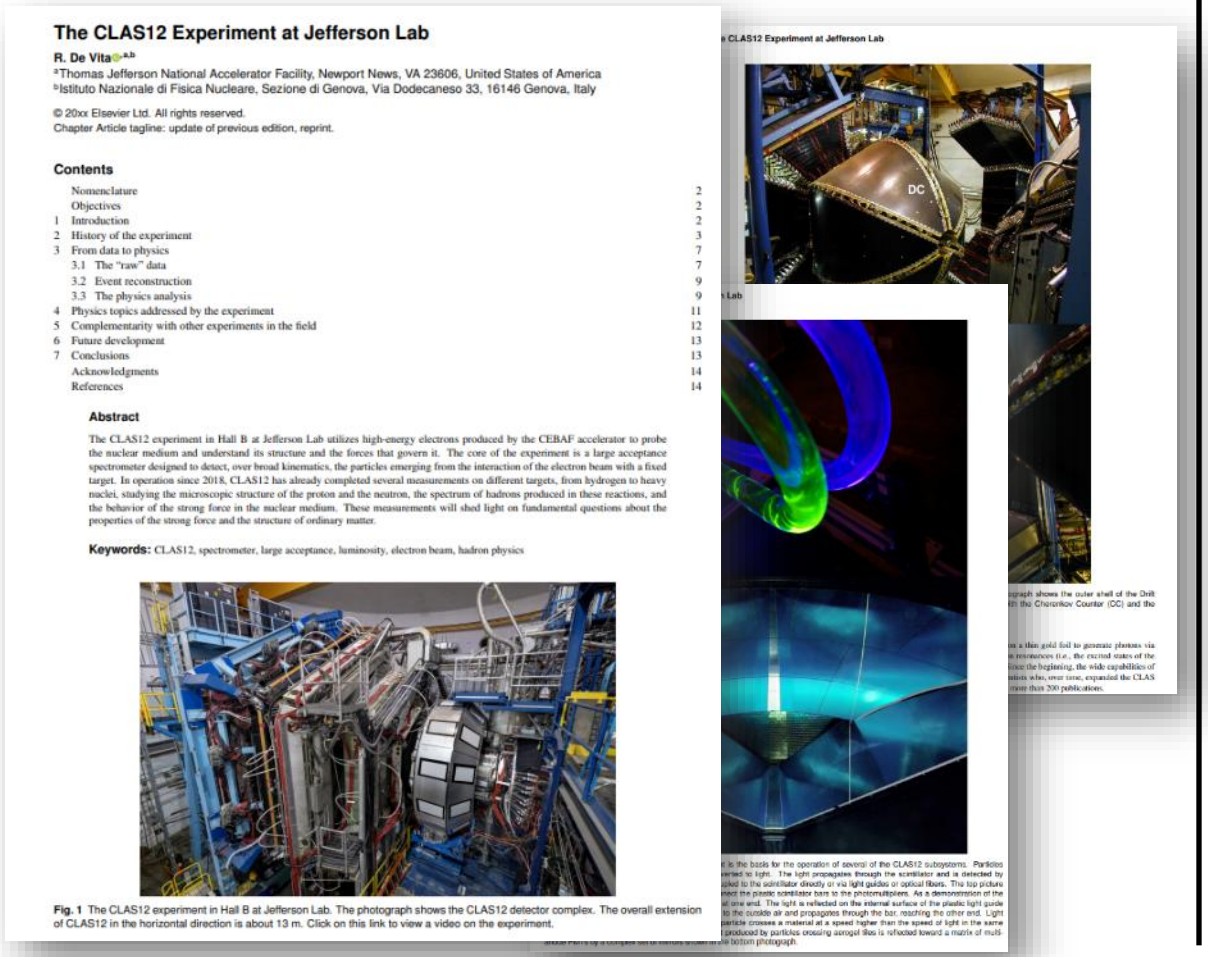

The CLAS12 Experiment at Jefferson Lab

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Chapter Article tagline: update of previous edition, reprint.

Contents

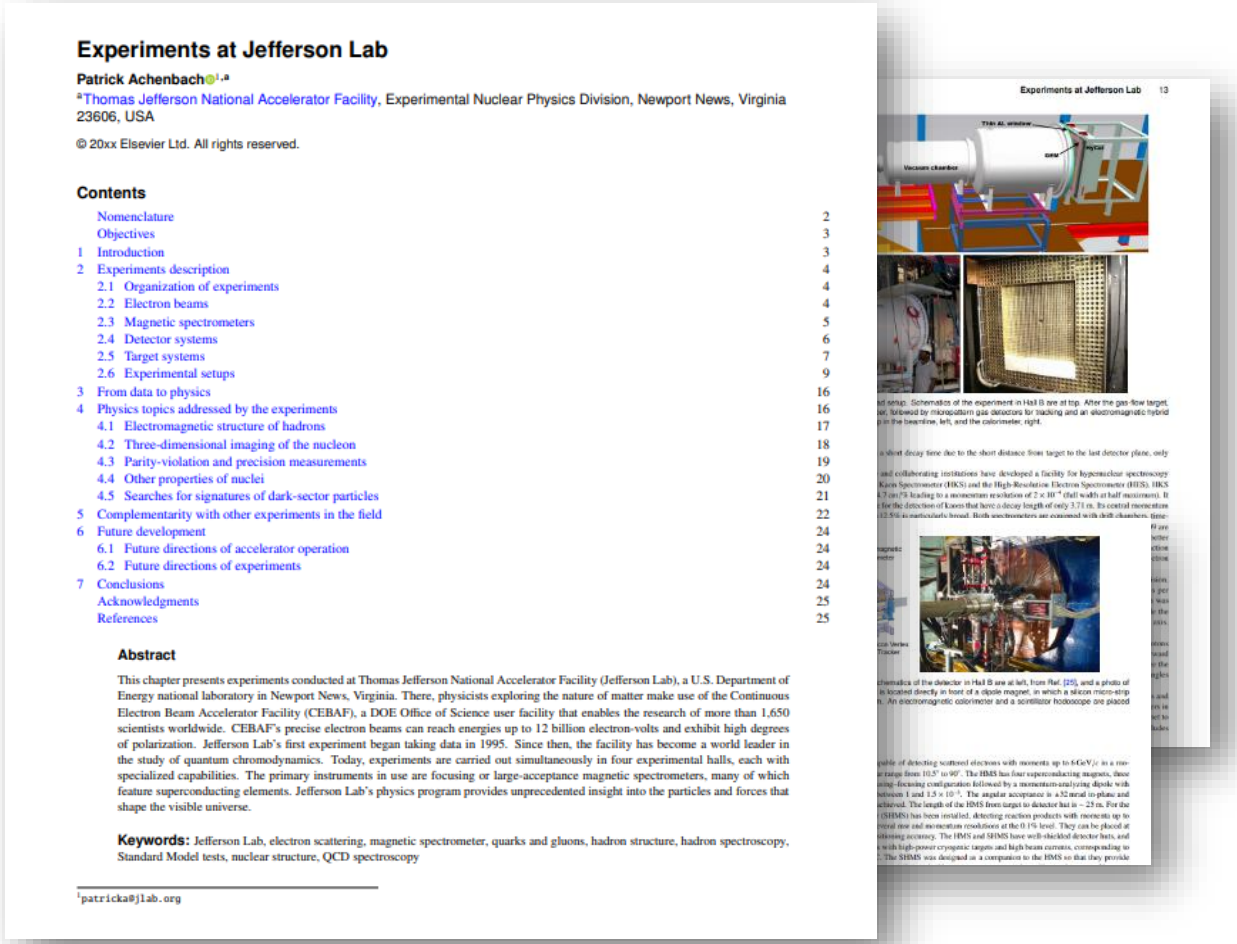
Abstract

The CLAS12 experiment in Hall B at Jefferson Lab utilizes high-energy electrons produced by the CEBAF accelerator to probe the nuclear medium and understand its structure and the forces that govern it. The core of the experiment is a large acceptance spectrometer designed to detect, over broad kinematics, the particles emerging from the interaction of the electron beam with a fixed target. In operation since 2018, CLAS12 has already completed several measurements on different targets, from hydrogen to heavy nuclei, studying the microscopic structure of the proton and the neutron, the spectrum of hadrons produced in these reactions, and the behavior of the strong force in the nuclear medium. These measurements will shed light on fundamental questions about the properties of the strong force and the structure of ordinary matter.

Keywords: CLAS12, spectrometer, large acceptance, luminosity, electron beam, hadron physics

Fig. 1 The CLAS12 experiment in Hall B at Jefferson Lab. The photograph shows the CLAS12 detector complex. The overall extension of CLAS12 in the horizontal direction is about 13 m. Click on this link to view a video on the experiment.

Patrick Achenbach, "*Experiments at Jefferson Lab*", to appear in the Encyclopedia of Particle Physics (2026)



Experiments at Jefferson Lab

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Contents

Abstract

This chapter presents experiments conducted at Thomas Jefferson National Accelerator Facility (Jefferson Lab), a U.S. Department of Energy national laboratory in Newport News, Virginia. There, physicists exploring the nature of matter make use of the Continuous Electron Beam Accelerator Facility (CEBAF), a DOE Office of Science user facility that enables the research of more than 1,650 scientists worldwide. CEBAF's precise electron beams can reach energies up to 12 billion electron-volts and exhibit high degrees of polarization. Jefferson Lab's first experiment began taking data in 1995. Since then, the facility has become a world leader in the study of quantum chromodynamics. Today, experiments are carried out simultaneously in four experimental halls, each with specialized capabilities. The primary instruments in use are focusing or large-acceptance magnetic spectrometers, many of which feature superconducting elements. Jefferson Lab's physics program provides unprecedented insight into the particles and forces that shape the visible universe.

Keywords: Jefferson Lab, electron scattering, magnetic spectrometer, quarks and gluons, hadron structure, hadron spectroscopy, Standard Model tests, nuclear structure, QCD spectroscopy

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Concluding Remarks

- Hall B had an **initially difficult but so far successful run** in Hall B
- It is scheduled to **complete all ALERT experiments** in this run period
- The SAM until January 2026 will be used for **installation of PRad-II/X17 setup**
- These experiments are scheduled to run in 2026 to
  - Validate existence or set an experimental upper limit on the X17
  - Search for hidden sector particles in the 3–60 MeV mass range
  - Validate existence or resolve discrepancy in proton form factor data
  - Improve the precision on the proton charge radius
- **CLAS Collaboration in Hall B** continues to **deliver high-level physics results**

Thanks to all collaborators for their valuable contributions!