

# Hall-B Status Report

- Information for Collaborators
- News from Hall-B Group and the Collaborations
- Related Detector Research & Development
- Run Preparations and Run Schedule

Patrick Achenbach

*Nov. 12, 2024*



# Information for Collaborators

- **Single point-of-contact** for Hall B visitors is admin support Chris Ross ([cross@jlab.org](mailto:cross@jlab.org))
- **New User Visit Initiation Form** from Hall B staff to help, but not required by JLab
- All documentation needs to be submitted **7 days in advance** of the visit, also for meetings
- Every visitor must **check in and check out** with their hosts upon arrival and ending the visit
- New regulations require **pre-job briefings** for every work task that is performed
- New regulations require **ePAS permits** before work commences (*Electronic Permit Administration System* for work permits, risk assessments, job hazard analyses, etc.)

Hall B User Visit Initiation Form

- Name (First, Last):
- Email:
- Institution:
- Position:
- Planned dates on-site at JLab:

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Visit details: List primary work tasks and required JLab training:

Active JLab training:

Applicable ePAS permits associated with each task:

ePAS permits that need to be prepared to support the work tasks:

Required site access:

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Requested Support from JLab:

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- Visitor must register for Site Access using the following link:  
<https://misportal.jlab.org/jlabAccess/>
- Visitor must check-in with host before work begins and check-out with host upon ending visit
- All work tasks require pre-job briefing before starting
- Applicable ePAS permits must be signed by visitor before work begins

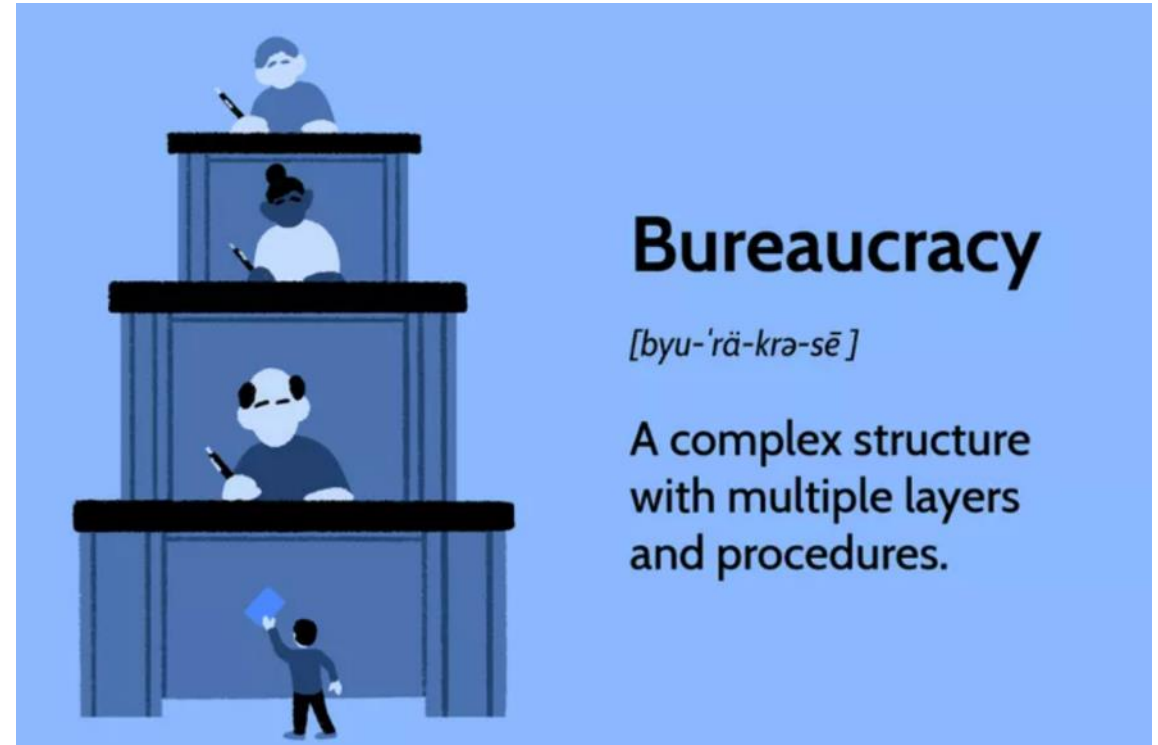
## Information for Collaborators

- **For preparing and performing the run**, there is **operation support** available for visitors at the discretion of the Hall leader  
*e.g. for building, testing, installing, operating, or calibrating experimental equipment, readout electronics development and maintenance, DAQ software development and maintenance, sitting shifts, serving as Run Coordinator, preparing requisite safety documentation, ...*
- In **FY2025**, actual Hall B budget for supporting visitors is **smaller than it should**
- **For research tasks**, there is almost **no research support available** for visitors at the discretion of the Hall leader  
*e.g. for serving as spokesperson of a running experiment, mentoring or supervising students or postdocs, attending or speaking at conferences, workshops, or seminars, performing physics simulations for proposals or analyses, preparing scientific proposals, notes, or publications, scientific data analysis post experiment, ...*

## Information for Collaborators

- If you were issued a **Tourist (WT) visa** and not a **Business (WB) visa** at the US port of entry, the lab is not allowed to pay any expenses for you and hands on research is not allowed and is against immigration regulations – it is a USCIS U.S. Department of State visa regulation. You will not be allowed to get a JLab badge
- You may begin to receive support or do hands on research when your visa type is changed
- We recently experienced **several instances** and **changing the visa type could take as long as 10 days**

- DOE Order 142.3 regarding Foreign National Visits has changed, waiting for consequences



- ORCID personal identifier is required for all authors supported by government funds

# News from Hall B Group



# Hall B Staff

## ***Group Leader***

Achenbach, Patrick

## ***Scientific Staff***

Avagyan, Harut

Baltzell, Nathan

Boyarinov, Sergey

Burkert, Volker

Cao, Tongtong

Carman, Daniel

De Vita, Raffaella

Dilks, Christopher

Elouadrhiri, Latifa

Gavalian, Gagik

Gotra, Yuri

Hauenstein, Florian

Kubarovsky, Valery

Mokeep, Viktor

Paremuzyan, Rafayel

Pasyuk, Eugene

Sharabian, Youri

Stepanyan, Stepan

Ungaro, Maurizio

Wei, Xiangdong

Ziegler, Veronique

## ***Post Docs***

Liyanaarachchi, Sara

Tyson, Richard

*One open position*

*+ one more to come*

## ***Joint Appointments***

Hedde, David (CNU)

Phelps, William (CNU)

## ***Admin. Support***

Ross, Christopher

## ***Engineering Staff***

Dobrenz, Phillip

Miller, Robert

## ***Designer Staff***

Chris Guthrie

## ***Technical Staff***

Bruhweil, Krister

Cook, Morgan

Docherty, Steve

Insley, Denny

Mealer, Calvin

Tucker, Dontre

Williams, Donald

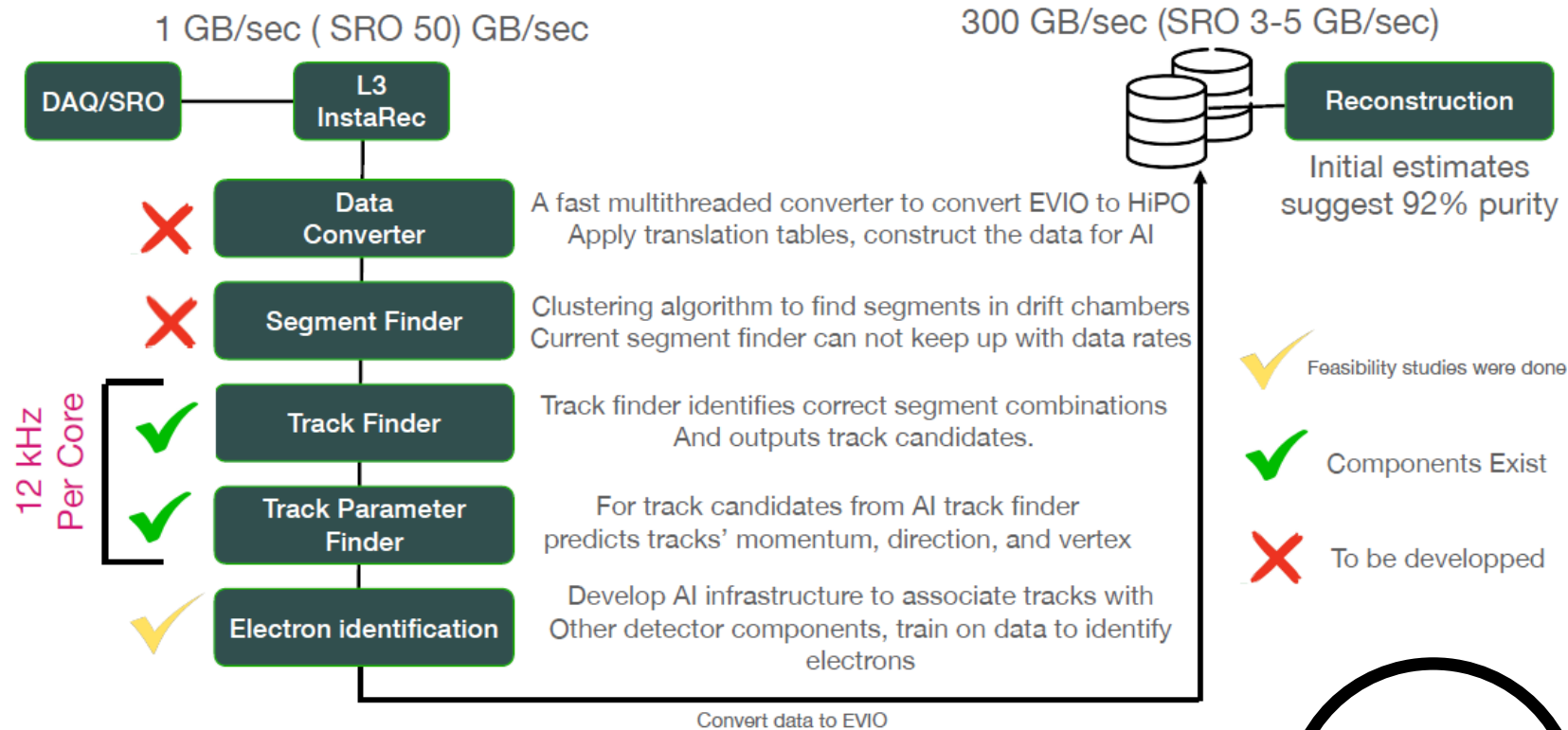
## New Hires in Hall-B Group

- **Spin-Polarized Fusion & Hall-B Technician Donald Williams** started August 16
  - Machine and install **cryogenic equipment** and **Hall B systems**
  - He has been welding and fabricating for over 40 years
  - He is currently working on the PRad target installation
- **Spin-Polarized Fusion & Hall-B Systems Engineer Phillip Dobrenz** started May 1
  - Design and commission **cryogenic equipment** and **Hall B systems**
  - He is currently working on the PRad target installation
- **Hall-B Postdoc Pierre Chatagnon** left for a permanent position at CEA in Paris-Saclay
- **Hall-B Postdoc Bhawani Singh** (TUM, Munich) will start February 2025



# New LDRD Project

## ▪ Gagik Gavalian: Tracking using Artificial Intelligence

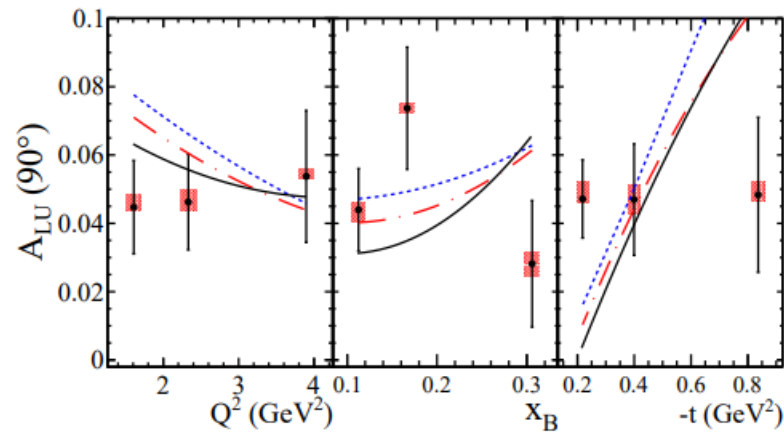


## ▪ LDRD Postdoc position job opening for 2025

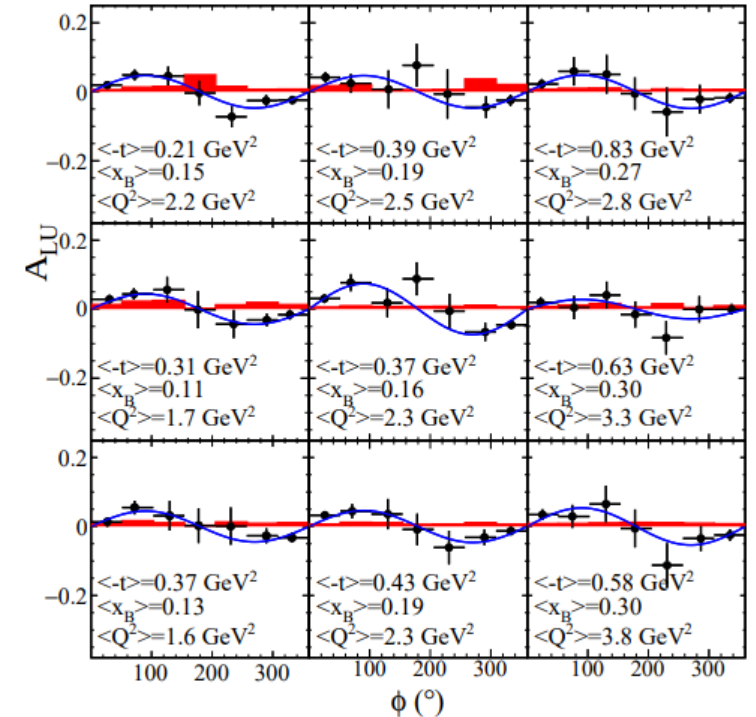


- **Valerii Klimenko** defended his PhD at UConn on 20 Sep. with *first results on differential cross sections for inclusive electron scattering from CLAS12 RG-A data* in his thesis
- **Viktor Mokeev** co-authored A.V. Golda et al., "Cross Section Evaluation for Exclusive Channels of  $K^+\Lambda$  and  $K^+\Sigma^0$  Electroproduction off Protons Using CLAS Detector Data", *Physics of Nuclei and Elementary Particles* 79, 450 (2024), doi: 10.3103/S0027134924700577
- **Adam Hobert** et al. published "First Measurement of Deeply Virtual Compton Scattering on the Neutron with Detection of the Active Neutron" from **RG-B data**:

- **Noémie Pilleux** defended her PhD at IJCLab U Paris Saclay on *nDVCS on a longitudinally polarized target with CLAS12 from RG-C data*

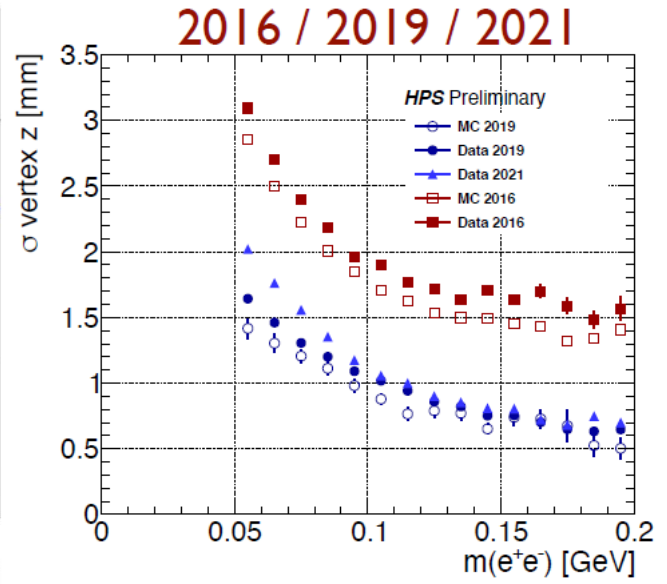
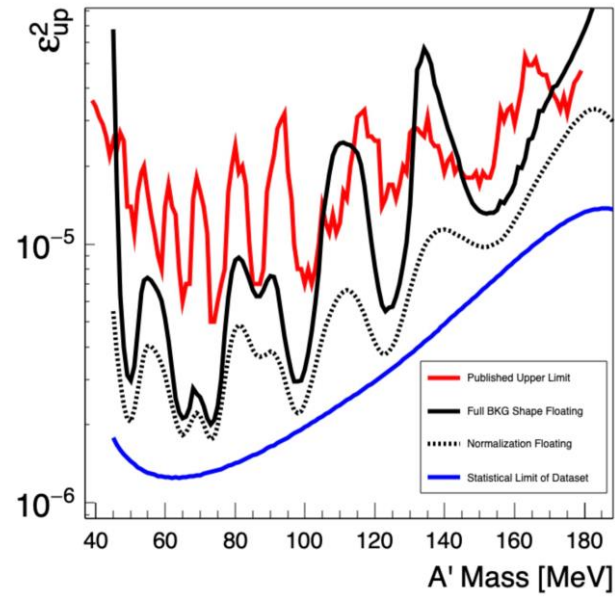


e-Print: [2406.15539](https://arxiv.org/abs/2406.15539) accepted for PRL  
**JLab News Release is prepared**



# HPS Collaboration News

- Collaborators from SLAC doing **detector work** in JLab's clean room
- **HPS Collaboration Meeting 3–5 June**
  - 24 registered participants
  - 7 current graduate students
- **Alec Spellman** (UC Santa Cruz) graduated “*Searching for Strongly-Interacting Dark Matter with the HPS Experiment*”
- **Analysis progress on:**
  - **Displaced vertex search** in 2021 data
  - **Resonance search** in 2019/2021 data (with improved background modeling)
  - Calibration and reconstruction progress





# PRad Collaboration News

- **New scintillator system** designed and constructed at JLab
- **Beam-lines** for PRad2/X17 designed; **vacuum tank** inspected
- **HyCal** is being refurbished by students
- **PRad target** is being set up in ESB

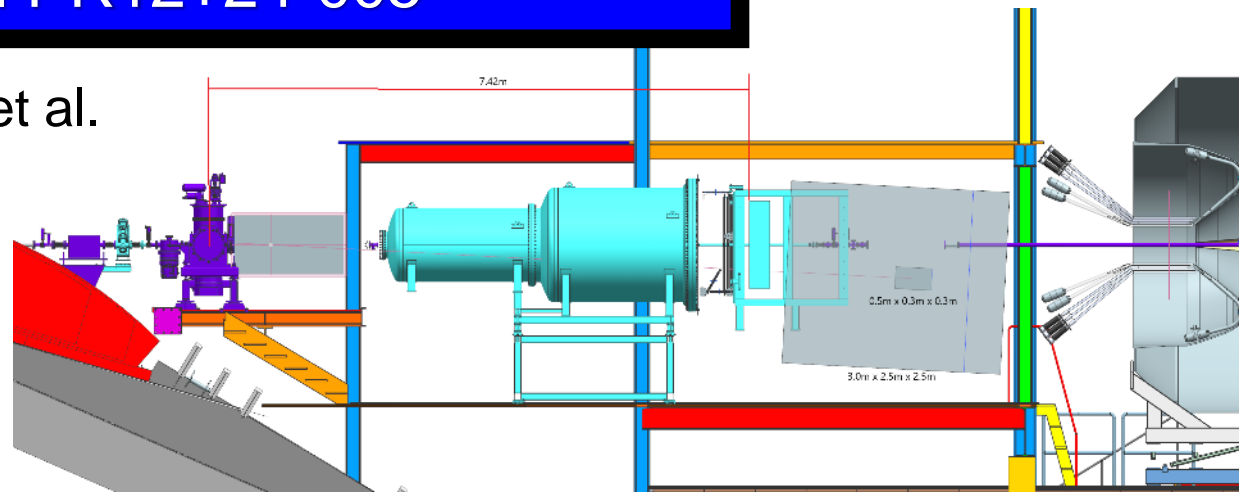


60 Members and growing ...

- Yesterday, **PRad Collaboration Meeting**, preparing for the Experiment Readiness Review
- PRad Collaboration Charter has been adopted, and Working Groups established

# PAC Proposal PR12+24-005

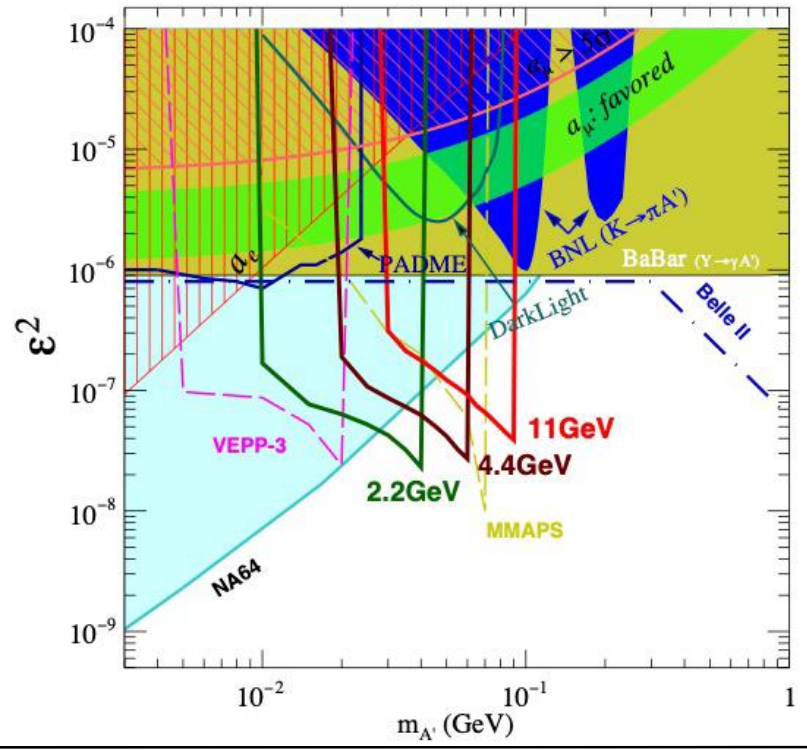
- Approved proposal by **Bogdan Wojtsekhowski et al.**
  - Positron beam** with multiple beam energies
  - PRad apparatus** with small beam dump
  - Utilize resonant positron annihilation
  - Detect single gammas
  - Search in Missing mass:**



$$M_{A'}^2 = 2m_e^2 - 2m_e * (E_+ - E_\gamma) - 4E_+ * E_\gamma * \sin^2\left(\frac{\theta_\gamma}{2}\right)$$

## PAC Summary:

“This proposed experiment provides an **important search for dark photons** that **does not rely on specific decay modes of the A'**, with a reach beyond existing invisible decay limits from NA64, PADME, and Belle-II”



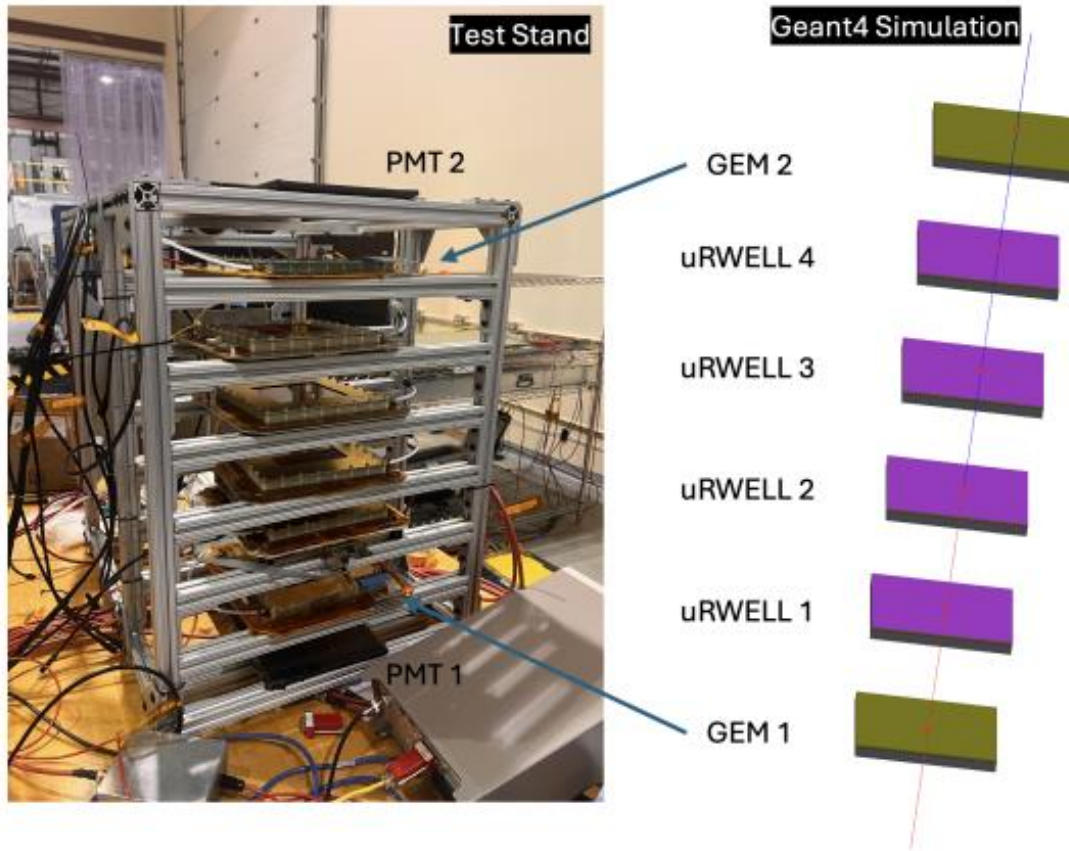
# Detector Research & Developments



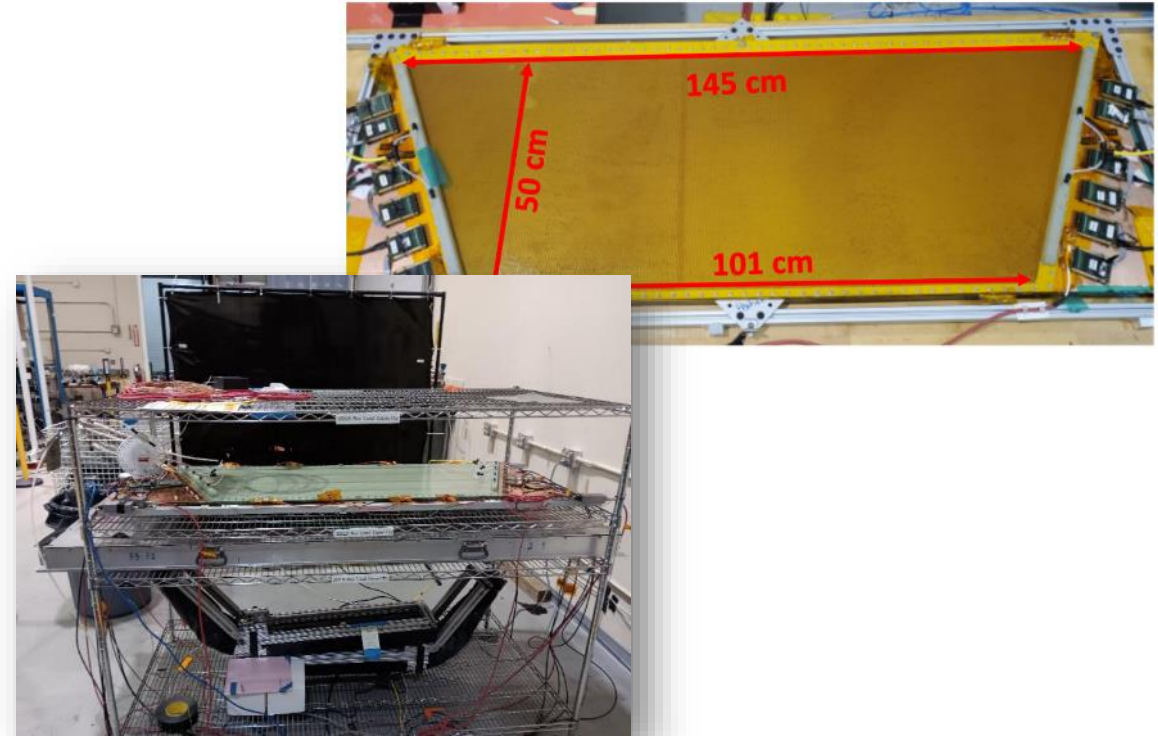


# Tracking Detector Characterization

- **Test stand for new  $\mu$ RWELL versions**  
LDRD project by Florian Hauenstein and Sara Liyanaarachchi **extended for a 2<sup>nd</sup> year**



- **Test stand for CLAS12  $\mu$ RWELL prototype**  
Luminosity upgrade project by Stepan Stepanyan



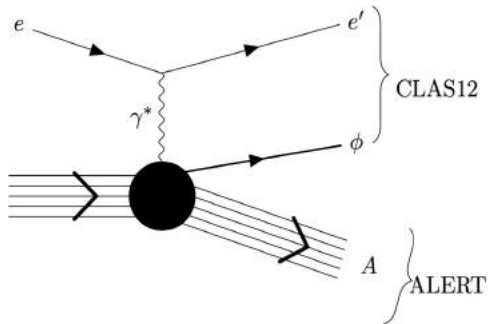
- **GEM Working Group** by Drew Weisenberger
- **GEM Cooperation** with several Universities

# Run Preparations and Run Schedule



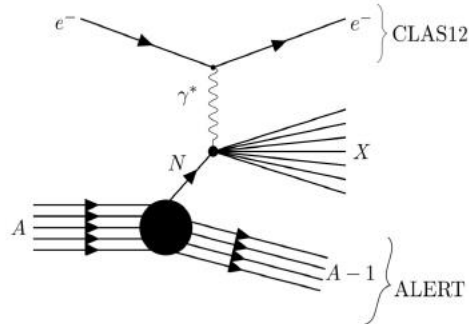
# ALERT Run Group

| Proposal    | Physics   | Exp. Contact  | Rating | PAC | Group Days | Equip-ment      | Energy        | Group Contact | Target  |
|-------------|---|---------------|--------|-----|------------|-----------------|---------------|---------------|---|
| E12-17-012  | <a href="#">Partonic structure of light nuclei</a>            | Z. Meziani    | A-     | 45  | <b>55</b>  | CLAS12<br>ALERT | 11            | L<br>R. Dupré | High<br>pressure<br>gaseous<br>H, D,<br><sup>4</sup> He |
| E12-17-012A | <a href="#">Tagged EMC measurements on light nuclei</a>       | R. Dupré      |        | 45  |            |                 |               |               |   |
| E12-17-012B | <a href="#">Spectator-tagged DVCS on light nuclei</a>         | W. Armstrong  |        | 45  |            |                 |               |               |   |
| E12-17-012C | <a href="#">Other physics opportunities with ALERT</a>        | R. Dupré      |        | 45  |            |                 |               |               |   |
| E12-23-013  | <a href="#">Measuring short-range correlations with ALERT</a> | F. Hauenstein | A      | 51  | <b>17</b>  | 6.6             | F. Hauenstein |               |   |



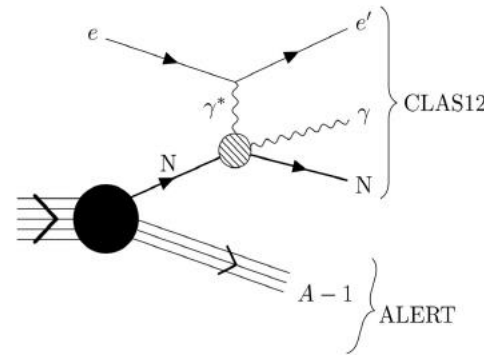
Coherent Processes on <sup>4</sup>He

- $^4\text{He}(e, e'\gamma)^4\text{He}$
- $^4\text{He}(e, e'\phi)^4\text{He}$



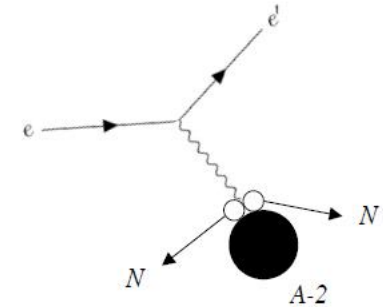
DIS on <sup>4</sup>He and <sup>2</sup>H:  
Tagged EMC Effect

- $^4\text{He}(e, e'^3\text{H})X$
- $^4\text{He}(e, e'^3\text{He})X$
- $^2\text{H}(e, e'p)X$



Incoherent Processes  
on <sup>4</sup>He and <sup>2</sup>H

- $^4\text{He}(e, e'\gamma p^3\text{H})$
- $^4\text{He}(e, e'\gamma^3\text{He})n$
- $^2\text{H}(e, e'\gamma p)n$



Short Range Correlations  
on <sup>4</sup>He

- $^4\text{He}(e, e'pd)n$
- $^4\text{He}(e, e't)p$
- $^4\text{He}(e, e'p)$



# Near-Term Run Schedule 2025

| SAD or<br>scheduled Run<br>Group | Setup / Status | Target            | Beam<br>Energy | Start Date | End Date    | Scheduled<br>Calendar<br>Days | Remaining<br>PAC Days<br>Before Run | Scheduled<br>PAC Days =<br>Cal.Days/2 | Actual PAC<br>Days from<br>ABUs | Remaining<br>PAC Days<br>After Run |
|----------------------------------|----------------|-------------------|----------------|------------|-------------|-------------------------------|-------------------------------------|---------------------------------------|---------------------------------|------------------------------------|
| <b>SAD 2024</b>                  |                |                   |                | 2024-05-19 | 2025-01-02  | 228                           |                                     |                                       |                                 |                                    |
| <b>RG-L</b>                      | ALERT          | high pressure gas | 11             | 2025-01-27 | 2025-05-17  | 110                           | 55                                  | 55                                    |                                 | 0                                  |
|                                  | ALERT          | high pressure gas | 6,6            | 2025-05-28 | 2025-07-01  | 34                            | 17                                  | 17                                    |                                 | 0                                  |
| <b>SAD 2025</b>                  |                |                   |                |            | <b>sum:</b> | 144                           | <b>sum:</b>                         | 72                                    |                                 |                                    |

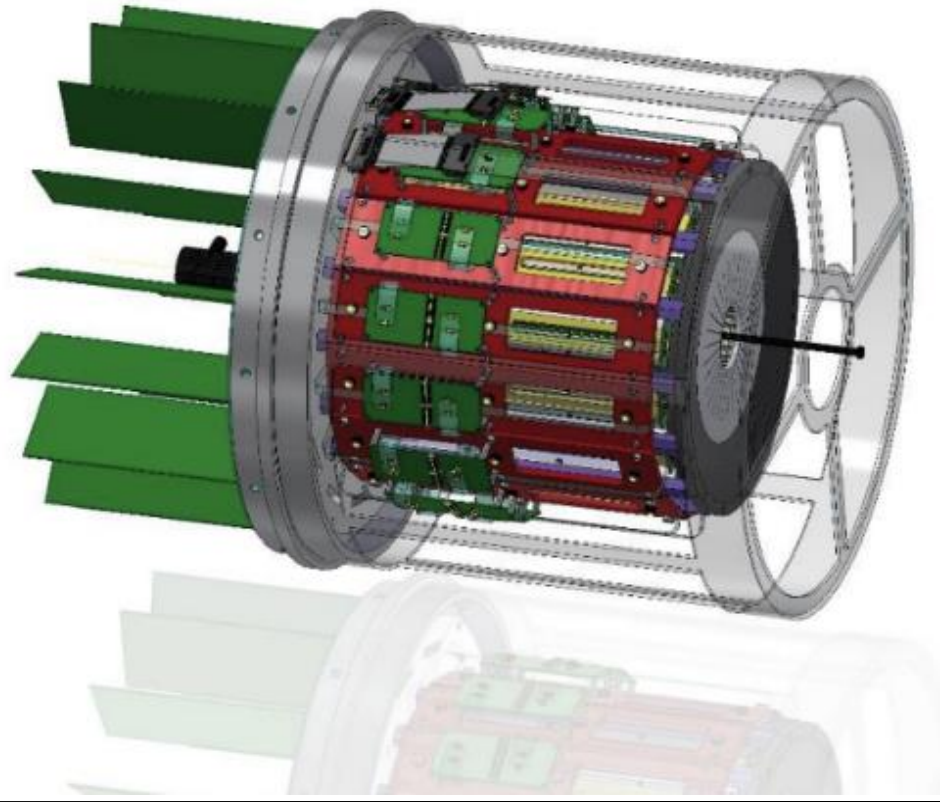
- **SRC proposal for ALERT** was awarded 17 PAC days by last year's PAC51
- Begin of run scheduled for end of **January 2025**
- **ALERT Internal Readiness Review at JLab Thursday Oct. 10, 2024**  
– Hardware, Software, Organization
- **ALERT Meeting planned at JLab in first week of December 2024**
- **Accelerator restore and physics run schedule still holding**

# ALERT Detector

## A Low Energy Recoil Tracker (ALERT)

- Hyperbolic **drift chamber**
- **Time-of-Flight** array
- **Target straw** for H<sub>2</sub>, D<sub>2</sub>, and <sup>4</sup>He  
30 cm active length, 6 mm Ø

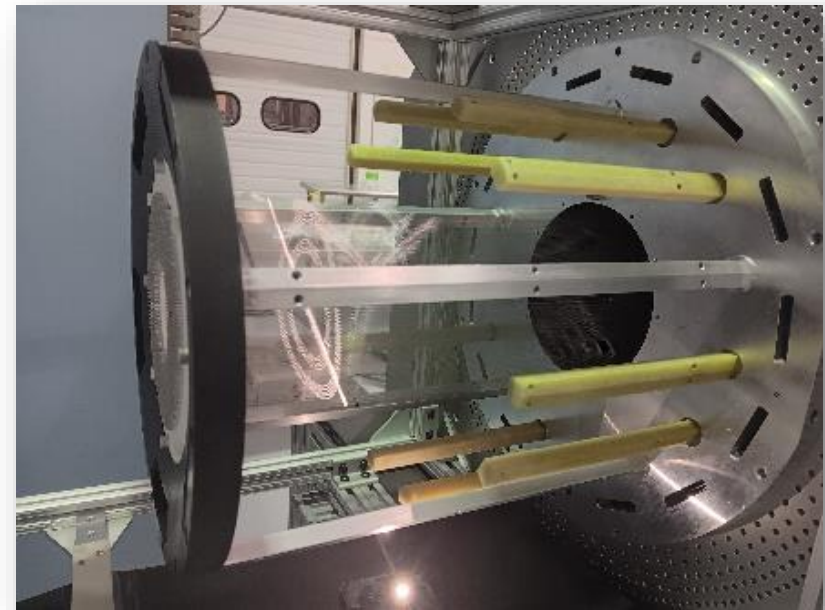
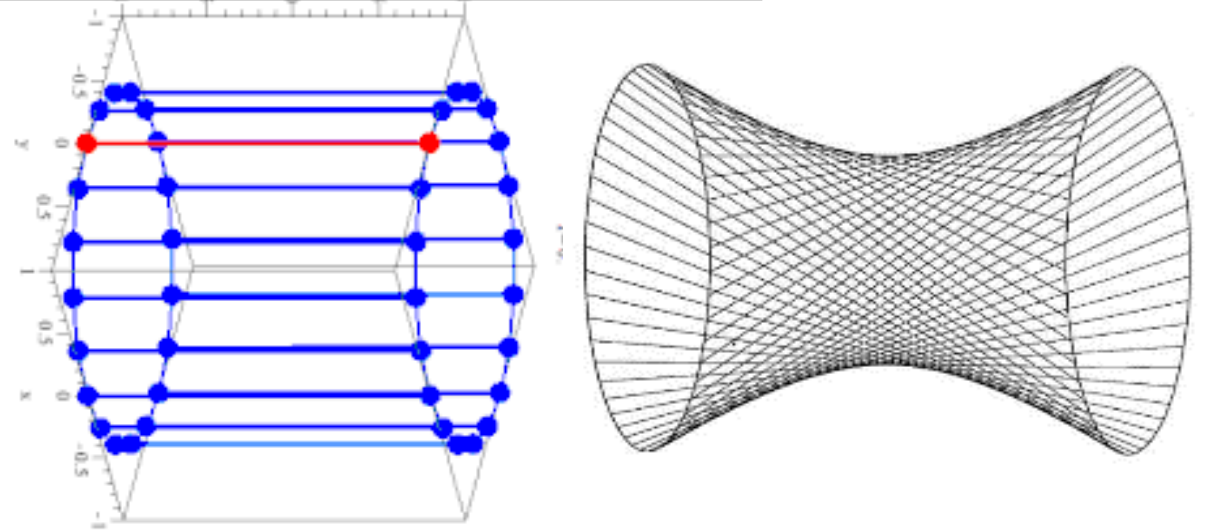
| Measurement  | Particles detected                 | $p$ range                     | $\theta$ range                |
|--------------|------------------------------------|-------------------------------|-------------------------------|
| Nuclear GPDs | <sup>4</sup> He                    | $230 < p < 400 \text{ MeV}/c$ | $\pi/4 < \theta < \pi/2$ rad  |
| Tagged EMC   | p, <sup>3</sup> H, <sup>3</sup> He | $70 < p < 250 \text{ MeV}/c$  | As close to $\pi$ as possible |
| Tagged DVCS  | p, <sup>3</sup> H, <sup>3</sup> He | $70 < p < 250 \text{ MeV}/c$  | As close to $\pi$ as possible |



# ALERT Drift Chamber (AHDC)

## ■ AHDC:

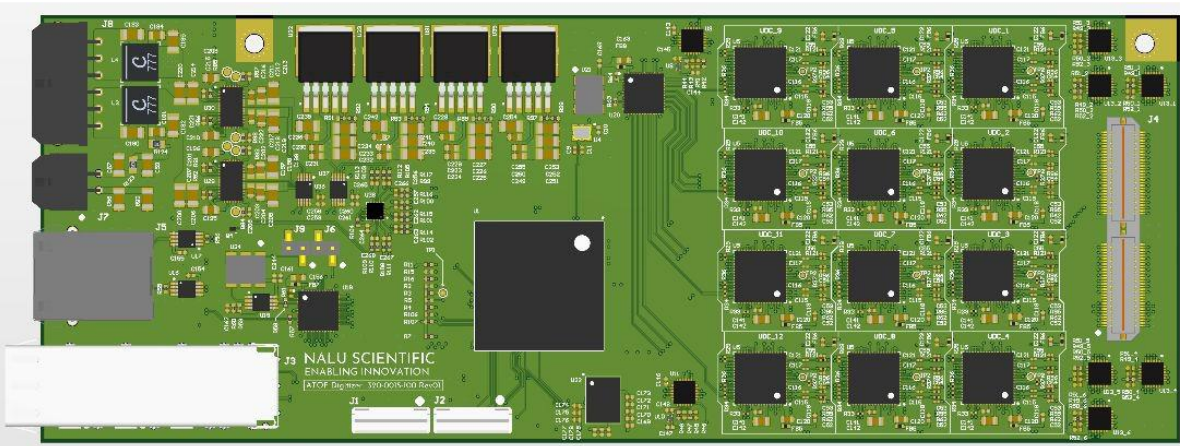
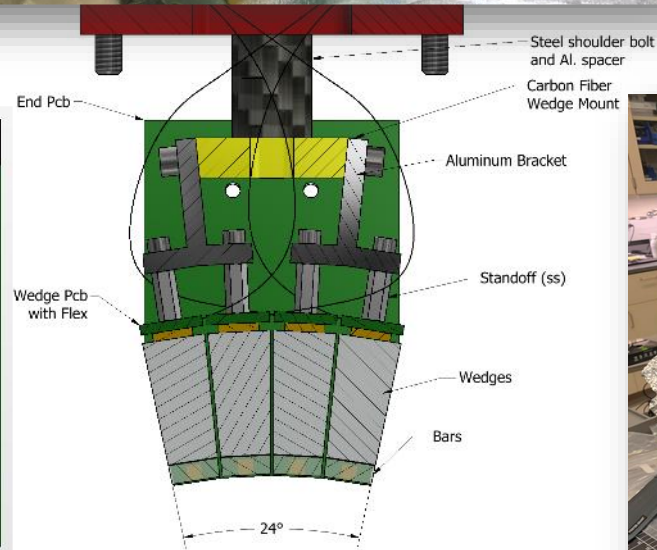
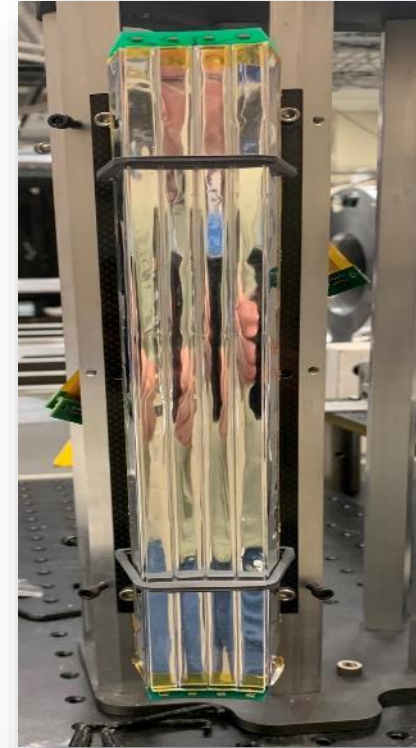
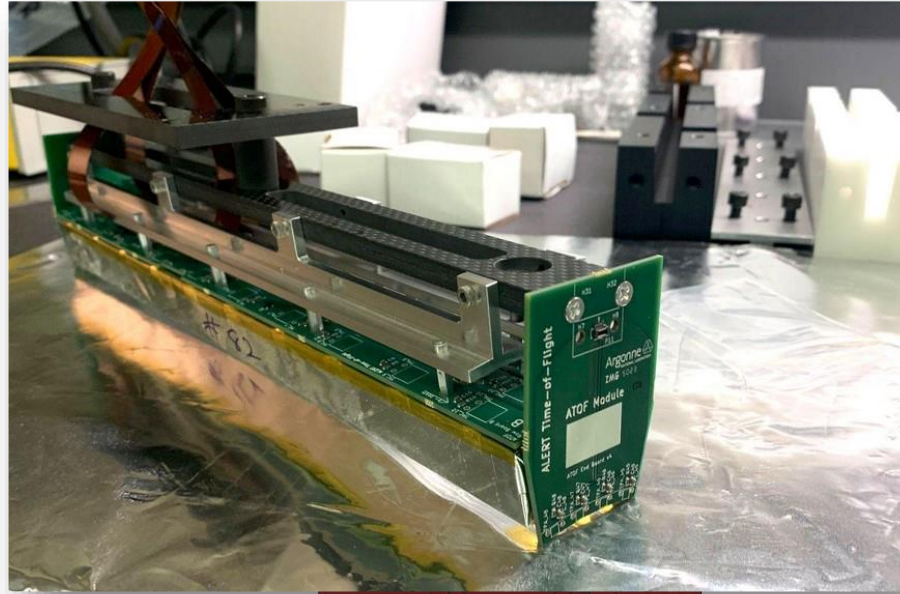
- 30 cm active length, hyperboloid shape
- 576 signal + 2450 guard wires = 3026 wires
- Al 30  $\mu\text{m}$  diameter, 20° stereo angle
- Operating gas He<sub>4</sub> - CO<sub>2</sub>





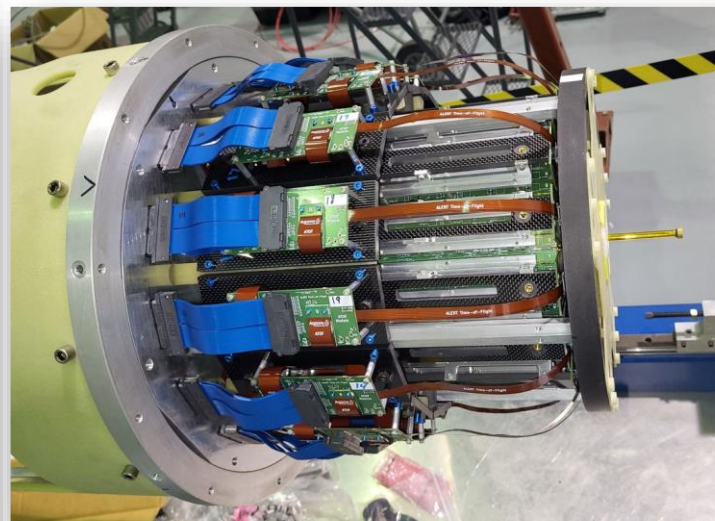
# ALERT Time-Of-Flight (ATOF)

- **TOF:** Two layers of scintillators with SiPM readout, 28 cm length, 15 sub-assemblies: 600 wedges, 60 bars
- **Electronics**
  - 19 PETIROC boards from JLab
  - One NALU board from ANL





# ALERT Installation Progress



- **Target straw:** ALERT experienced a failure during testing in EEL

- **Detector dance:** ALERT moved from EEL building to Hall B and swapped positions with Central Vertex Tracker



# Closing Remarks

- Welcome to Jefferson Lab
- It can be a great place to go in November



# Conditional Schedule 2025-26

- Requires green light from the Experiment Readiness Review planned for February 2025

| 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 |
|----------------------------|----------------|---------|-------------|------------|------------|-------------------------|-------------------------------|---------------------------------|---------------------------|------------------------------|
| <b>X17 search</b>          | HyCal/GEMs     | Ta foil | 2,2         | 2025-11-05 | 2025-12-20 | 45                      | 60                            | 22,5                            |                           | 37,5                         |
|                            | winter break   | change  |             | 2025-12-20 | 2026-01-12 |                         |                               |                                 |                           |                              |
| <b>X17 search</b>          | HyCal/GEMs     | Ta foil | 4,4         | 2026-01-12 | 2026-03-30 | 77                      | 37,5                          | 39                              |                           | -1                           |
|                            | reconfigure    | change  |             | 2026-03-30 | 2026-04-06 | 7                       |                               |                                 |                           |                              |
| <b>PRad-II</b>             | HyCal/GEMs     | gas jet | 2,2         | 2026-04-06 | 2026-04-27 | 21                      | 40                            | 11                              |                           | 30                           |
|                            | pass change    |         |             | 2026-04-27 | 2026-05-04 | 7                       |                               |                                 |                           |                              |
| <b>PRad-II</b>             | HyCal/GEMs     | gas jet | 3,6         | 2026-05-04 | 2026-06-15 | 42                      | 30                            | 21                              |                           | 9                            |
|                            | pass change    |         |             | 2026-06-15 | 2026-06-16 | 1                       |                               | 1                               |                           |                              |
| <b>PRad-II</b>             | HyCal/GEMs     | gas jet | 0,7         | 2026-06-16 | 2026-07-06 | 20                      | 9                             | 10                              |                           | -2                           |
| <b>SAD 2026</b>            |                |         |             |            |            |                         | <b>sum:</b>                   | <b>103</b>                      |                           |                              |

- Optimistically assuming 30 weeks of physics running while the lab currently plans with 25 weeks

# Conditional Schedule

- Requires green light from the Experiment Readiness Review for RG-G

| SAD or<br>scheduled<br>Run Group | Setup / Status | Target                     | Beam<br>Energy | Start Date | End Date | Scheduled<br>Calendar<br>Days | Remaining<br>PAC Days<br>Before Run | Scheduled<br>PAC Days =<br>Cal.Days/2 | Actual PAC<br>Days from<br>ABUs | Remaining<br>PAC Days<br>After Run |
|----------------------------------|----------------|----------------------------|----------------|------------|----------|-------------------------------|-------------------------------------|---------------------------------------|---------------------------------|------------------------------------|
| <b>RG-C</b>                      |                | long. polarized<br>NH3/ND3 | 11             |            |          | 80                            | 40                                  | 40                                    |                                 | 0                                  |
| <b>E12-14-001</b>                |                | long. polarized<br>7LiD    | 11             |            |          | 110                           | 55                                  | 55                                    |                                 | 0                                  |
| <b>SAD 2027</b>                  |                |                            |                |            |          |                               | <b>sum:</b>                         | <b>95</b>                             |                                 |                                    |



# Backup 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 |
|----------------------------|----------------|-------------------------|-------------|------------|----------|-------------------------|-------------------------------|---------------------------------|---------------------------|------------------------------|
| <b>RG-E</b>                |                | liq. D2 & nucl. doublet | 11          |            |          | 66                      | 33                            | 33                              |                           | 0                            |
|                            | reconfigure    | change                  |             |            |          | 7                       |                               | 4                               |                           |                              |
| <b>HPS</b>                 | HPS setup      | nuclear                 | 4,4         |            |          | 120                     | 105                           | 60                              |                           | 45                           |
|                            |                |                         |             |            |          |                         |                               | <b>sum:</b>                     | <b>97</b>                 |                              |

| 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 |
|----------------------------|----------------|-------------------------|-------------|------------|----------|-------------------------|-------------------------------|---------------------------------|---------------------------|------------------------------|
| <b>RG-E</b>                |                | liq. D2 & nucl. doublet | 11          |            |          | 66                      | 33                            | 33                              |                           | 0                            |
|                            | reconfigure    | change                  |             |            |          | 7                       |                               | 4                               |                           |                              |
| <b>RG-K</b>                |                | liq. H2                 | 8,4         |            |          | 120                     | 52                            | 60                              |                           | 0                            |
|                            |                |                         |             |            |          |                         |                               | <b>sum:</b>                     | <b>97</b>                 |                              |