

Hall-B Status Report

- Comments for Visitors and Users
- Introduction to Hall-B Group
- Preparations for the PRad-II / X17 Run
- Related Detector Research & Developments
- Related Hall B Experiments & Proposals
- Run Schedule

Patrick Achenbach

Nov. 11, 2024



Comments to Visitors and Users

- **Single point-of-contact** for Hall B visitors is admin support Chris Ross (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** to be signed before work commences (the Electronic Permit Administration System ePAS manages work permits, isolations, risk assessments, job hazard analyses, etc.)

Hall B User Visit Initiation Form

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

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:

Requested Support from JLab:

- 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

Comments to Visitors and Users

- **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, other operations tasks)
- 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. 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))

Comments to Visitors and Users

- 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 Oder 142.3 regarding Foreign National Visits has changed, waiting for consequences
- Potential shift in visitor travel processes possible
- Nonetheless, JLab cold be a nice place to travel



Hall B



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

Joint Appointments

Hedde, David (CNU)

Phelps, William (CNU)

Administrative

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

Expertise for PRad-II / X17 Operations in Hall B

Electrical, Pressure and Vacuum Systems, Gas, Hot Work, etc.

Denny Insley
Morgan Cook
Steve Docherty
Calvin Mealer
Dontre Tucker
Donald Williams

Engineering

Bob Miller

Design

Chris Guthrie
Phillip Dobrenz

Power Supplies

Krister Bruhwel

Beamline

Eugene Pasyuk
Stepan Stepanyan

Target

Xiangdong Wei
Phillip Dobrenz

Work Coordination

Denny Insley
Morgan Cook

PRad/X17 Detectors

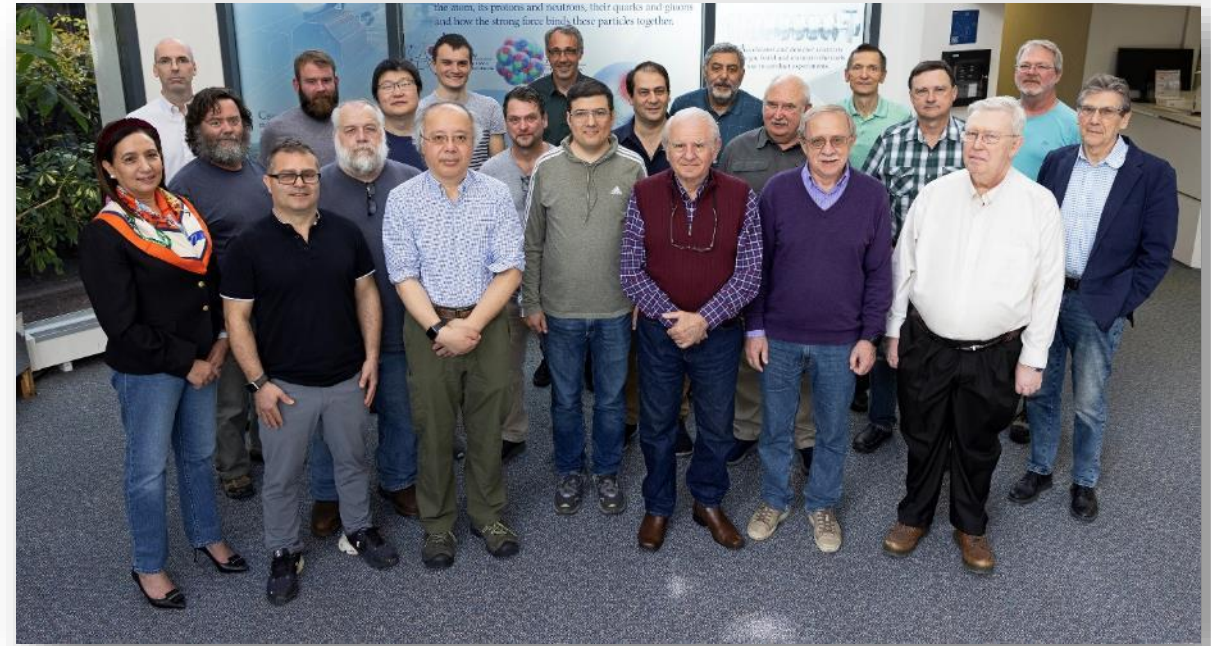
Eugene Pasyuk
Yuri Sharabian

Trigger

Valery Kubarovsky
Gagik Gavalian
Richard Tyson

PDL/Safety

Eugene Pasyuk
Rafayel Paremuzyan



Software/Data Processing

Nathan Baltzell

Data Monitoring

Gagik Gavalian
Raffaella De Vita

Slow Control

Nathan Baltzell

Data Acquisition

Sergey Boyarinov

Beamline DAQ

Rafayel Paremuzyan

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 working on the PRad target
- **Spin-Polarized Fusion & Hall-B Systems Engineer Phillip Dobrenz** started May 1
 - Design and commission **cryogenic equipment** and **Hall B systems**
- **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



Preparations for PRad-II / X17 Run



Experiment Readiness Review in Jan. 2025

The review includes an **experiment installation plan, timeline and resource requirements.**

Things that must be presented or available for this ERR include:

- **Experiment**

- Who is assigned as Physics Division Liaison for the experiment
- Installation schedule
- Preliminary commissioning and run plans
- System ownership and responsibility
- Preliminary data analysis plan

- **Equipment**

- Existing equipment requirements finalized
- New equipment design and requirements including cost finalized (if applicable)
- Timeline for equipment fabrication & installation (if applicable)
- Manuals for new equipment available
- Certification for new equipment available

- **Manpower**

- Manpower and resource requirements for equipment fabrication (if applicable) and installation

- **Documentation**

- Preliminary OSPs for new systems (official forms with Subject Matter Experts indicated)
- Flammable gas analysis if applicable
- Preliminary: RSAD, ESAD, COO, ERG, Operations Manual
- Equipment Installation

Typical ERR Questions

- **Data taking**
 - What is the trigger configuration?
 - What is the expected data volume?
- **Simulations**
 - Which event generators are used? Do they adequately generate events of interest and background?
 - Is the experimental setup fully simulated?
- **How are the detectors calibrated?**
 - Energy of the calorimeter
 - Timing calibration
 - How are the detectors aligned?
 - How is the PID performed?
 - Is the reconstruction software adapted to the new configuration?
- **Data analysis**
 - What is the status of the analysis chain?
- **Collaboration resources**
 - Are the person-power and skill set assigned adequate?
 - Provide a detailed and realistic evaluation of the available FTE with names if possible

Work Planning, Control and Authorization

- **Location** – Requirements such as power requirements, water, gas, cryogenics, safety boundaries
- **Dimensions, weight** – How will it be held? If a support structure is used, who did the design/fabrication? How will it be positioned and moved?
- **Special hazards associated to build/operate the setup** – Flammable materials, oxygen deficiency hazard, high pressure, radioactivity, toxic or noxious fumes, repetitive handling/operation, special equipment
- **Electronic equipment** – Developed in-house, another lab or university? Was the equipment borrowed or bought? Was it modified? JLab is required to check equipment which has no seal of approval from a Recognized Testing Laboratory
- **Personnel to work on setup** – JLab staff, professors, students? Do they have previous experience working on same or similar setups? Does any of the work they will perform require specialized training? Do the personnel involved understand the risks involved?

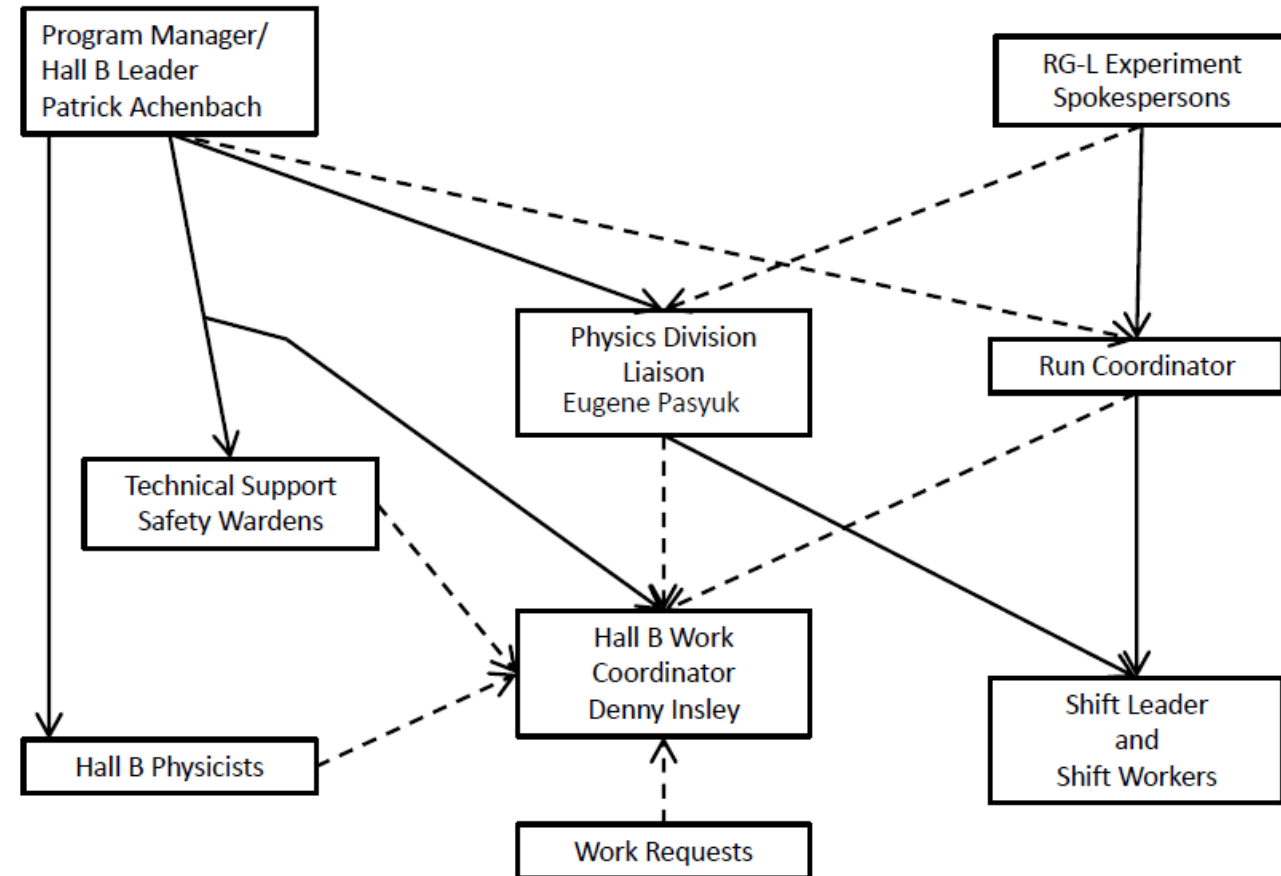
Organizational Structure During the Run

■ PDL

- Oversees that proper rules of safety are carefully followed in the conduct of the experiment
- Verifies training of shift workers
- Ensures that Counting House is staffed appropriately to safely carry out the experimental program or monitor the apparatus as needed

– With great responsibility comes great power

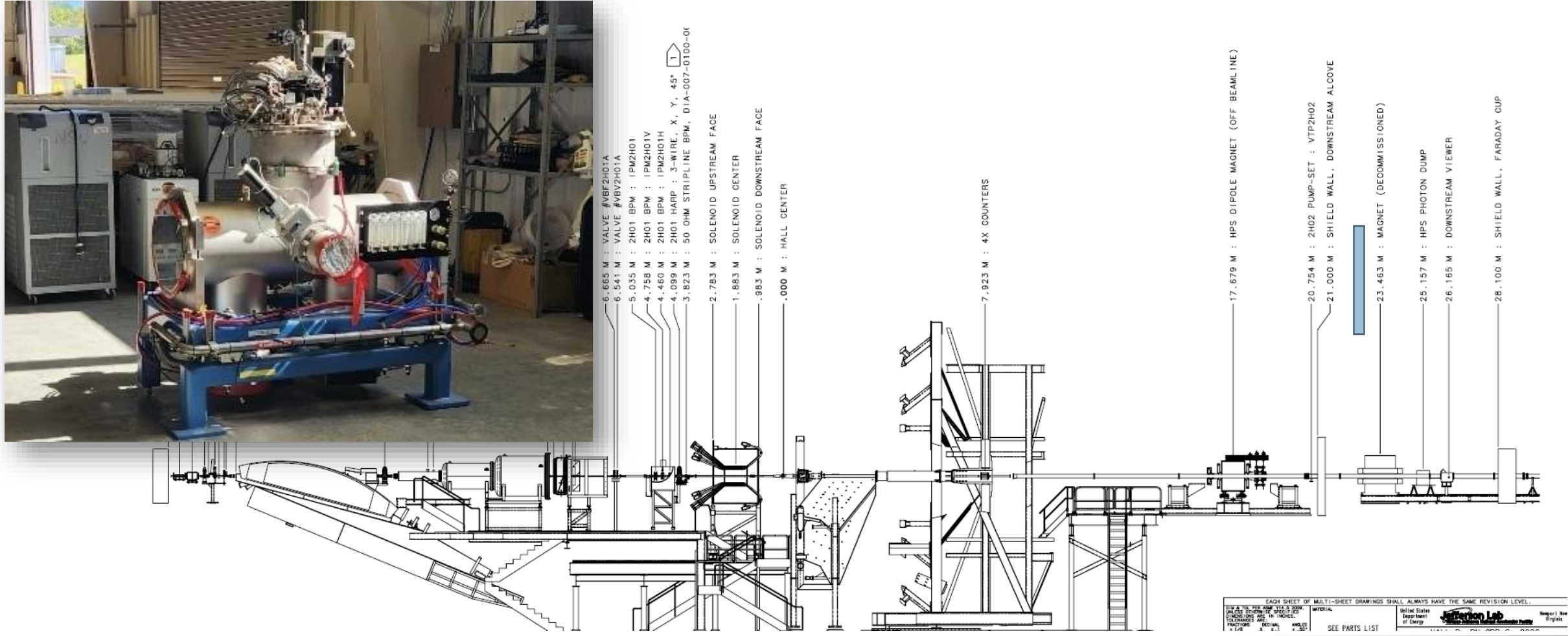
- Eugene Pasyuk's deputy is Rafayel Paremuzyan
- Denny Insley's deputy is Morgan Cook



- Katheryne Price is Accel. Operations Liaison
- Michael Tiefenback is Accel. Physicist Liaison

Activities for PRad Collaboration in Hall B

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



Related Detector Research & Developments



Tracking Detector Characterization

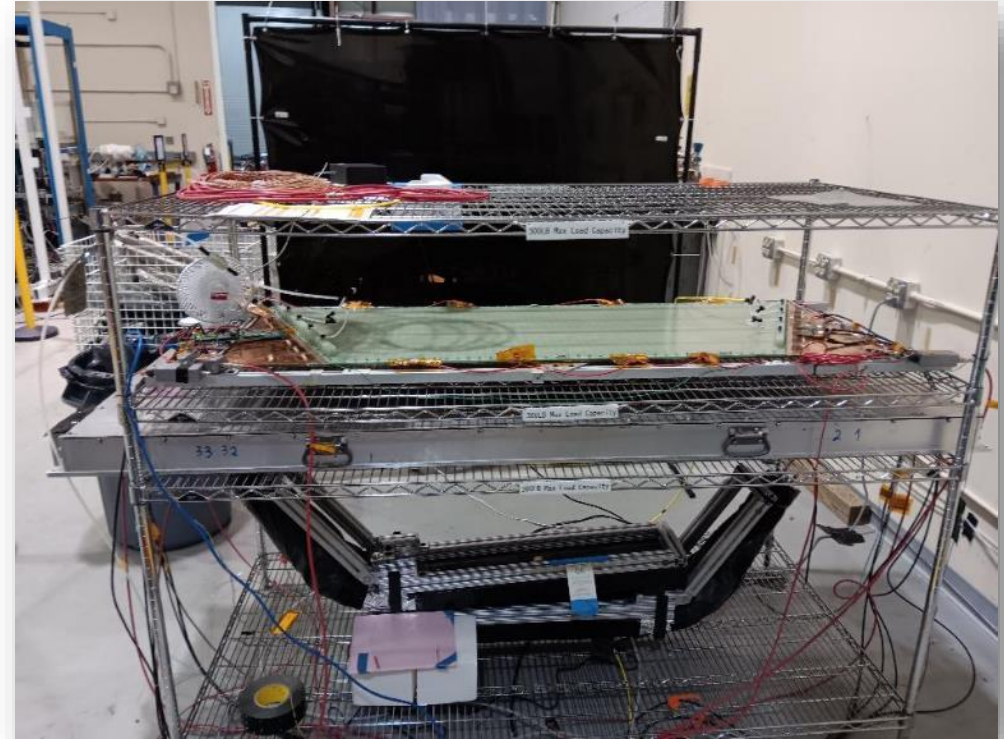
- **Test stand for new μ RWELL versions**

LDRD project by Florian Hauenstein and Sara Liyanaarachchi



- **Test stand for CLAS12 μ RWELL prototype**

Luminosity upgrade project by Stepan Stepanyan

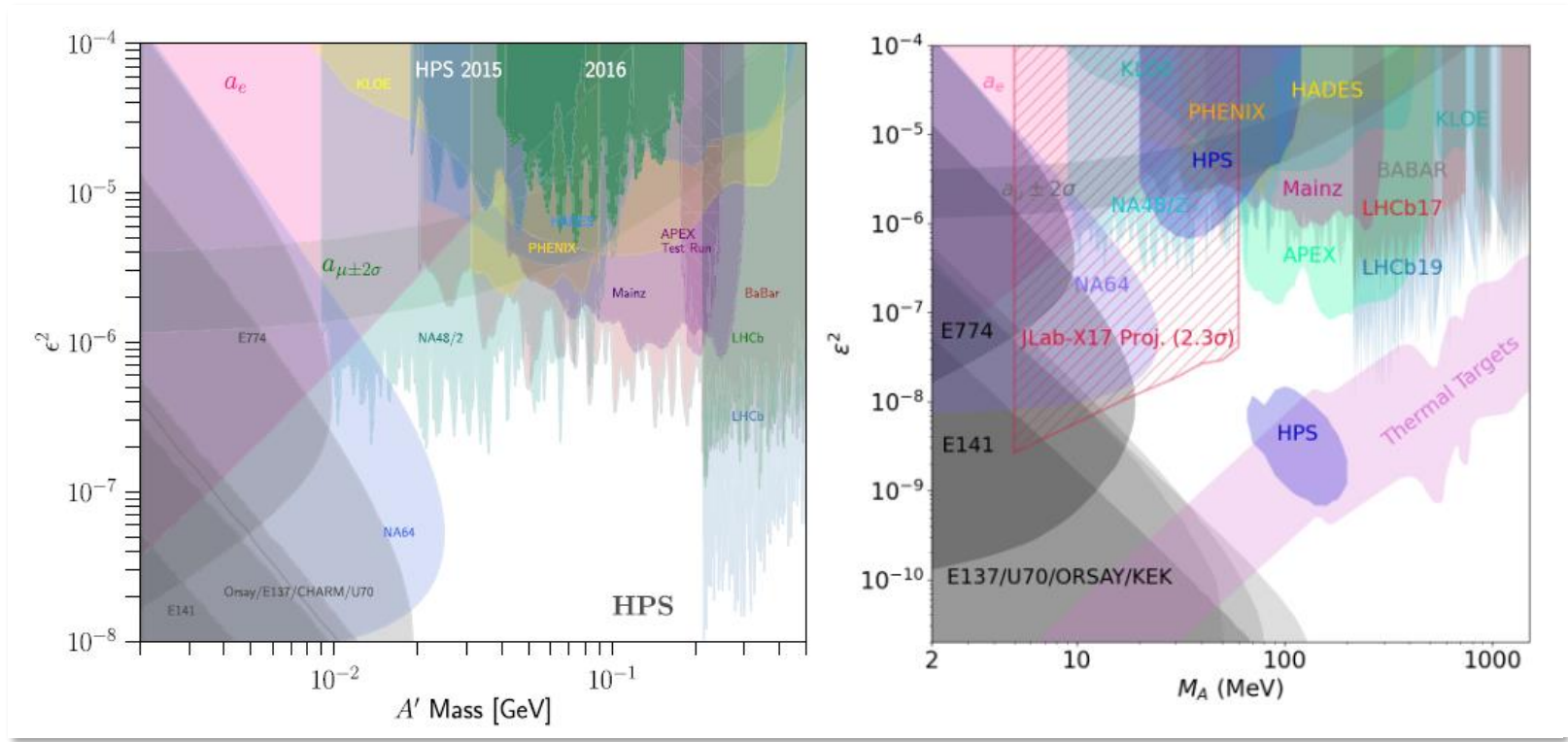
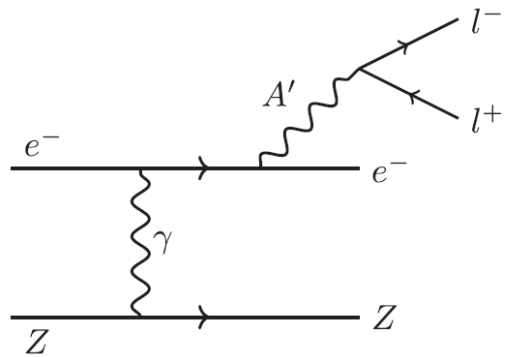
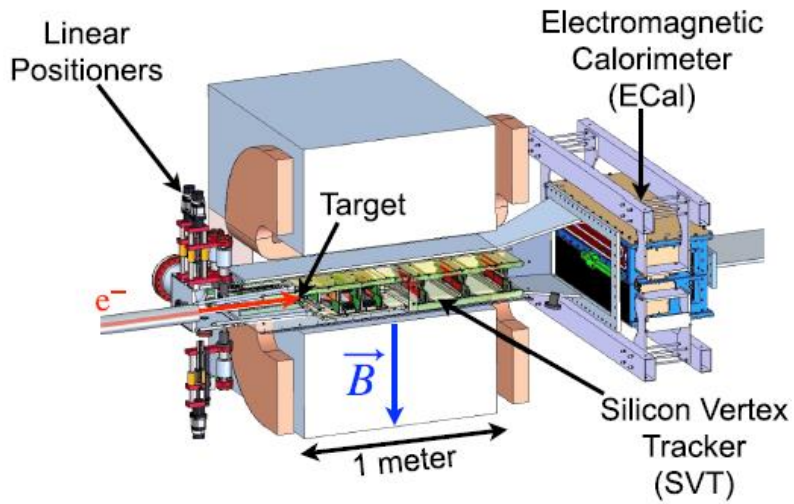


- **GEM Working Group** by Drew Weisenberger
- **GEM Cooperation** with Holly Szumila Vance (FIU) and Michael Kohl (Hampton)

Related Hall B Experiments & Proposals



First Displaced Vertex Analysis in Heavy Photon Search



- Including both, bump hunt and displaced vertex search
- Results from 2.3 GeV 2016 engineering run
- Excludes A' production over mass range 40 – 180 MeV down to $\epsilon^2 = 10^{-5}$

[P. H. Adrian et al. (HPS Collab.), Phys. Rev. D 108, 012015, 21 July 2023]

- **HPS Collaboration Meeting 3–5 June**

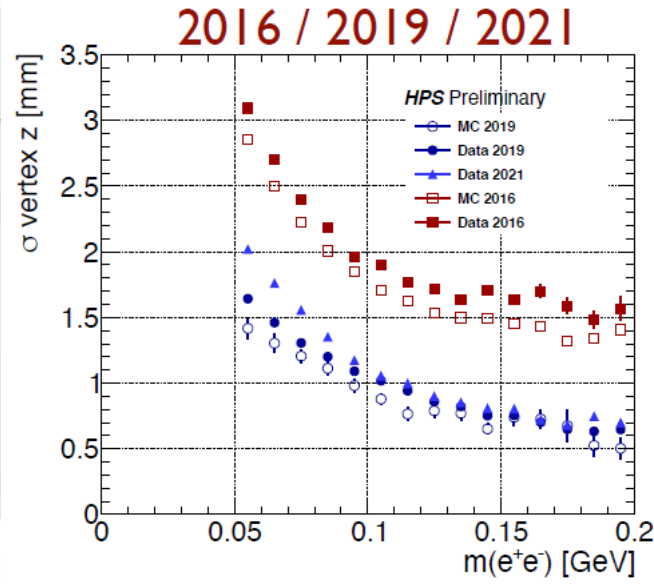
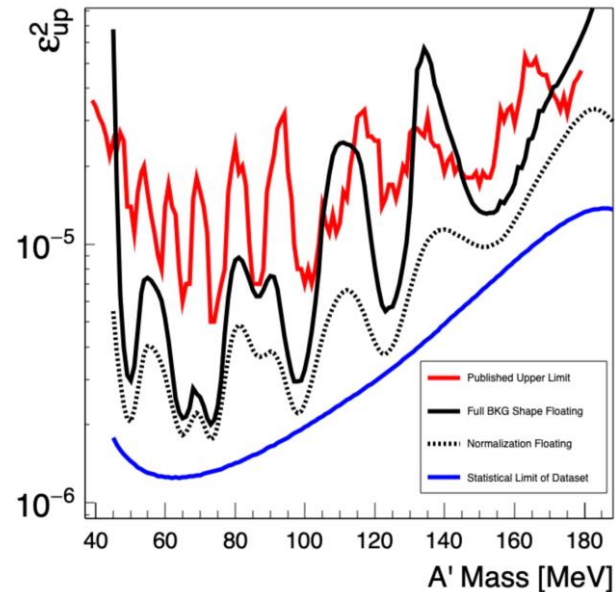
- 24 registered participants
- 7 current graduate students

- **Alec Spellman** (UC Santa Cruz) graduated “*Searching for Strongly-Interacting Dark Matter with the HPS Experiment*”



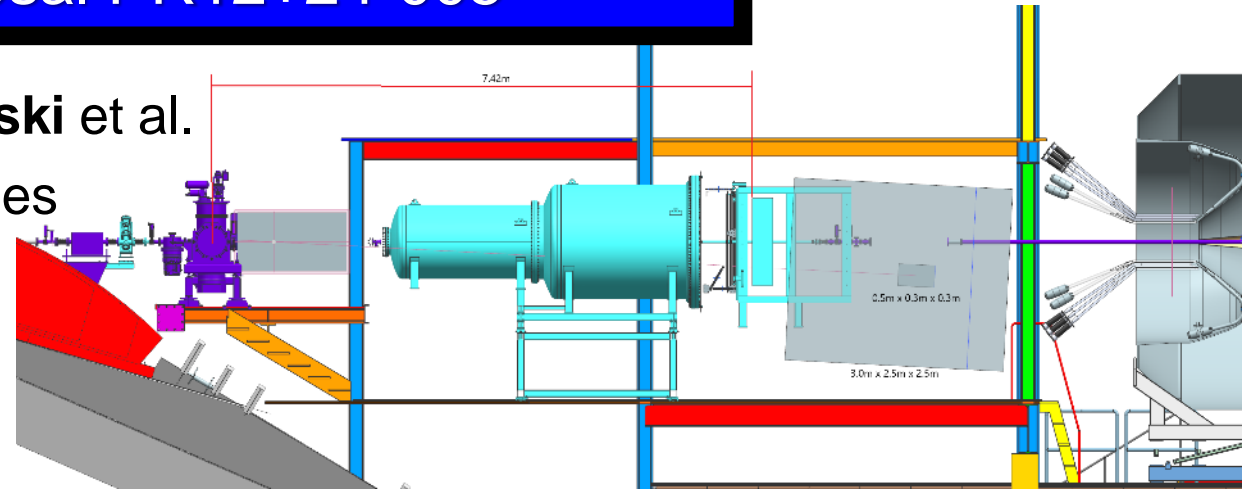
- **Analysis progress on:**

- A' displaced vertex search in 2021 data
- Resonance search in 2019/2021 data (with improved background modeling)
- Calibration and reconstruction progress



JLab PAC Proposal PR12+24-005

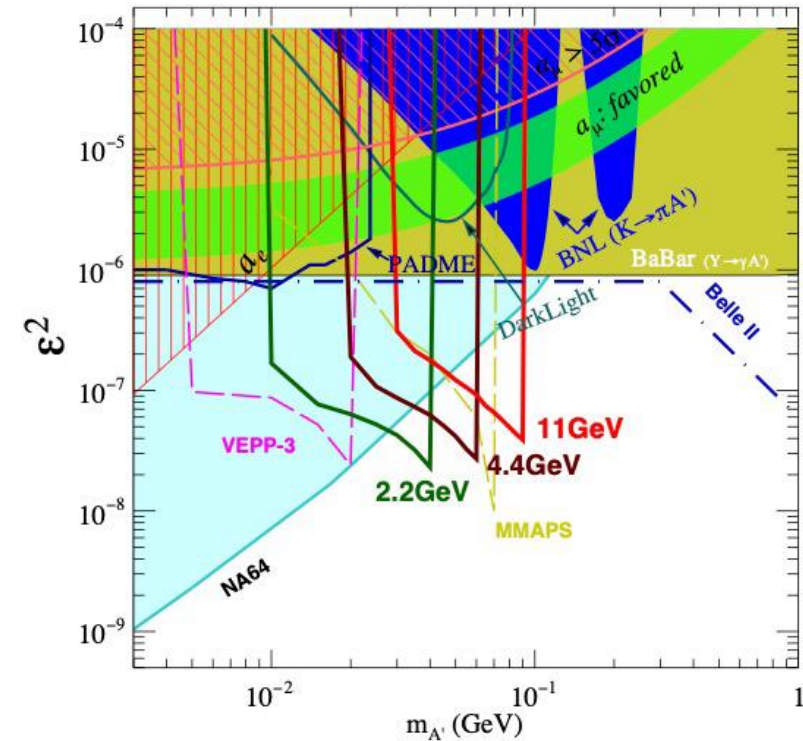
- Successful proposal by **Bogdan Wojtsekhowski et al.**
 - Positron beam** with multiple beam energies
 - PRad apparatus** with small beam dump
 - Utilize resonant positron annihilation
 - Detect single gammas
 - Missing mass search:**



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

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”

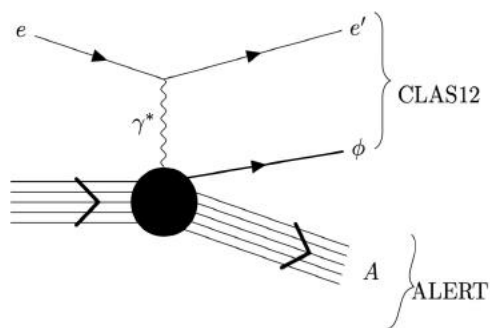


Run Schedule



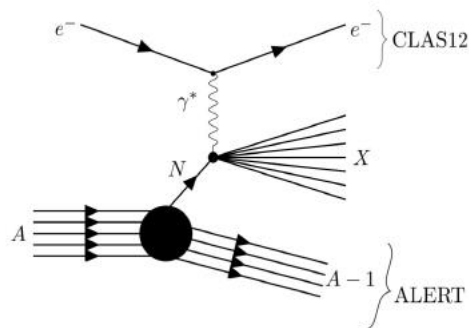
ALERT Run Group

Proposal	Physics	Exp. Contact	Rating	PAC	Group Days	Equipment	Energy	Group Contact	Target
E12-17-012	Partonic structure of light nuclei	Z. Meziani	A-	45	55	CLAS12 ALERT	11	L R. Dupre	High pressure gaseous H, D, ^4He
E12-17-012A	Tagged EMC measurements on light nuclei	R. Dupre		45					
E12-17-012B	Spectator-tagged DVCS on light nuclei	W. Armstrong		45					
E12-17-012C	Other physics opportunities with ALERT	M. Defurne		45					
E12-23-013	Measuring short-range correlations with ALERT	F. Hauenstein	A	51	17	6.6	F. Hauenstein		



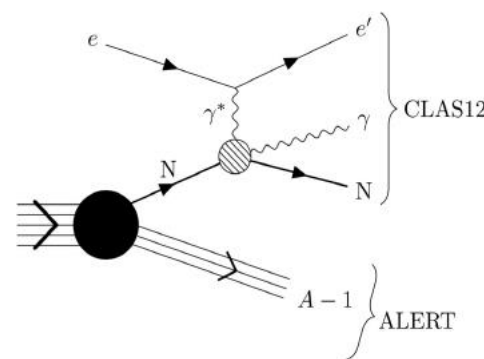
Coherent Processes on ^4He

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



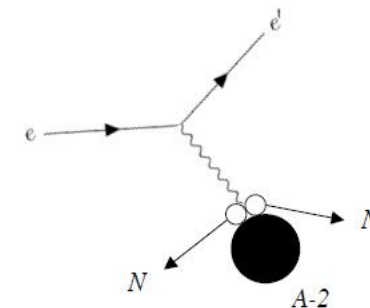
DIS on ^4He and ^2H :
Tagged EMC Effect

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



Incoherent Processes
on ^4He and ^2H

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



Short Range Correlations
on ^4He

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

Near-Term Run Schedule FY 2025

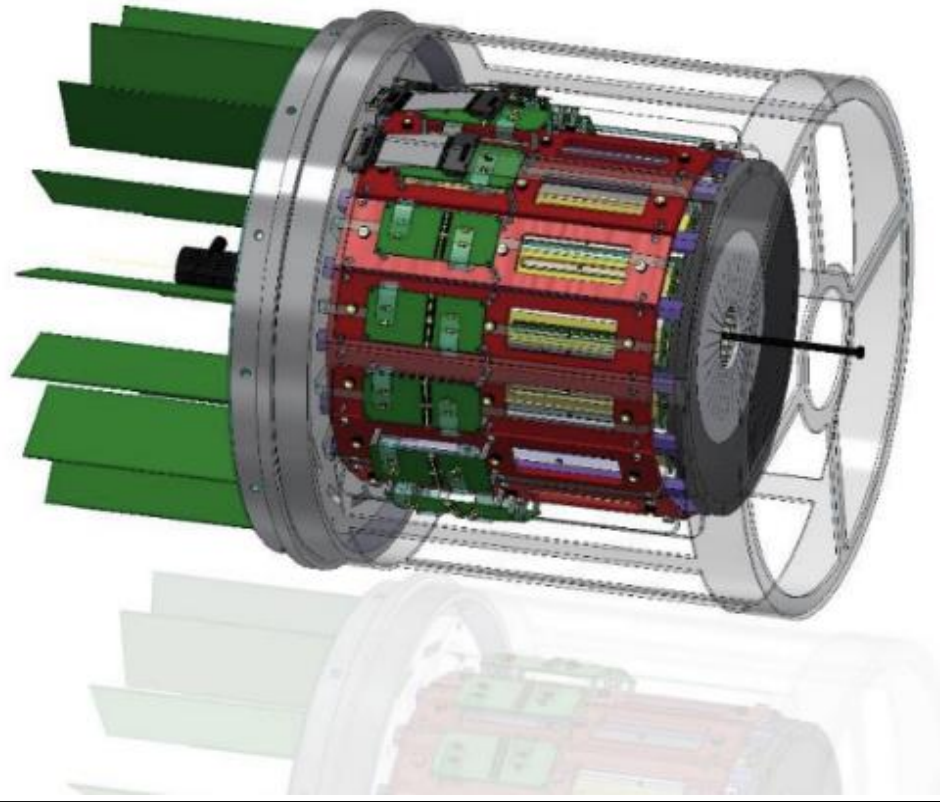
SAD or scheduled Run Group	Setup / Status	Target	Beam Energy	Start Date	End Date	Scheduled Calendar Days	Remaining PAC Days Before Run	Scheduled PAC Days = Cal.Days/2	Actual PAC Days from ABUs	Remaining PAC Days After Run
SAD 2024				2024-05-19	2025-01-02	228				
RG-L	ALERT	high pressure gas	11	2025-01-27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

ALERT Detector

A Low Energy Recoil Tracker (ALERT)

- Hyperbolic **drift chamber**
- **Time-of-Flight** array
- **Target straw** for H₂, D₂, and ⁴He
30 cm active length, 6 mm Ø

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



Conditional Schedule FY 2026

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
X17 search	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					
X17 search	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				
PRad-II	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				
PRad-II	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		
PRad-II	HyCal/GEMs	gas jet	0,7	2026-06-16	2026-07-06	20	9	10		-2
SAD 2026							sum:	103		

Closing Remarks

- **The Collaboration need to request support from Hall B where appropriate**
- **The Collaboration need to request support from external groups where appropriate**
- **The Collaboration should not be shy to give responsibility and accountability to collaborators or groups not on the initial PRad-II / X17 proposals**

I am trying to convey a message here. Thank you.