Person: Szumila-Vance, Holly (hszumila@jlab.org)
Org: PHALLA

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Jefferson Lab
Thomas Jefferson National Accelerator Facility

Operational Safety Procedure Review and Approval Form # 107889
(See ES&H Manual Chapter 3310 Appendix T1 Operational Safety Procedure (OSP) and Temporary OSP Procedure for Instructions)

Type:	***OSP*** Click for OSP/TOSP Procedure Form Click for LOSP Procedure Form Click for LTT-Individual Information Click for LTT-Group Information		
Serial Number:	(Assigned after final approval)		
Issue Date:	(Assigned after final approval)		
Expiration Date:	***< Approximately 10/22/2023 >***		
Title:	***GEM detector for LAD experiment***		
Location: (where work is being performed) Building Floor Plans	***96 - Experimental Hall C***	Location Detail: (specifics about where in the selected location(s) the work is being performed)	***On the target platform, beam left, approx 127 deg off beamline. GEMs in line with target and 0.75m from target center.***
Risk Classification: (See ES&H Manual Chapter 3210 Appendix T3 Risk Code Assignment)	Without mitigation measures (3 or 4):		***2***
	With mitigation measures in place (N, 1, or 2):		***0***
Reason:	This document is written to mitigate hazard issues that are : ***Not Applicable***		
Owning Organization:	***PHALLC***		
Document Owner(s):	***Szumila-Vance, Holly (hszumila@jlab.org)*** Primary		

Supplemental Technical Validations

- ☐ Air Contaminants - Hazardous (*Imani Burton, Jennifer Williams*)
- Area Temperature (*Imani Burton, Jennifer Williams*)
- ☐ Asbestos (*Jennifer Williams, Scott Conley*)
- ☐ Bloodorne Pathogens (*Bob May, Smitty Chandler*)
- Chemicals (*Imani Burton, Jennifer Williams*)
- ☐ Confined Space (*Imani Burton, Jennifer Williams*)
- ☐ Cryogenic Material - Gas or Liquid (*Jonathan Creel, Kelly Dixon*)
- Electricity (*Phillip Stanley, Tim Fitzgerald*)

- Environmental (*Bill Rainey*)
- ☐ Ergonomics - Lifting, Carrying, Repetitive Motion (*Bob May, Smitty Chandler*)
- ☑ Gas Cylinders (*Robert Myles, Tim Minga*)
- ☐ Hazardous Material Transport - On or Off Site (*Christian Whalen, Jennifer Williams*)
- Hazardous Metals (*Imani Burton, Jennifer Williams*)
- ☐ High Noise (*Imani Burton, Jennifer Williams*)
- Hot Work (*Jenord Alston, Steve Smith*)
- ☐ Lasers Class 3B or 4 (Ultraviolet, Infrared, and Visible Light) (*Jennifer Williams, Paul Collins*)
- ☐ Lock, Tag, Try (*Phillip Stanley, Tim Fitzgerald*)
- ☐ Machine Tools (*Bert Manzlak, Paul Collins*)
- Material Handling Equipment (*Bob Sperlazza, Mark Loewus*)
- ☐ Nanotechnology - Engineered (*Bob May, Jennifer Williams*)
- Oxygen Deficiency Hazards (ODH) (*Imani Burton, Jennifer Williams*)
- ☐ Pinch Points (*Bert Manzlak, Paul Collins*)
- ☐ Portable Hand Tools (*Bert Manzlak, Paul Collins*)
- Pressure Systems (*Will Oren*)
- Radiation - Ionizing (*Adam Hartberger, David Hamlette, Keith Welch*)
- ☐ Radio Frequency (*Imani Burton, Jennifer Williams*)
- ☐ Sharp Edges (*Bert Manzlak, Paul Collins*)
- ☐ Silica (*Imani Burton, Jennifer Williams*)
- ☐ Static Magnetic Fields >5G: Fringe, High, & Quench Effect (*Imani Burton, Jennifer Williams*)
- ☐ Stored Energy: Mechanical, Hydraulic, Pneumatic (*Bert Manzlak, Paul Collins*)
- Subcontracts (*Bob Sperlazza, Rusty Sprouse*)
- Waste Generation (*Jennifer Williams, Scott Conley*)
- Working at Elevations (*George Perry*)

Other Issues:

- ☐ Emergency Preparedness (*Tina Menefee*)
- ☐ Fire Protection (*Tim Minga*)
- ☑ ESH&Q Liasion (*Bert Manzlak*)

Document History

Revision	Reason for revision or update	Serial number of superseded document

Lessons Learned	Lessons Learned relating to the hazard issues noted above have been reviewed.	Submit
Comments for reviewers/approvers:		

Attachments

Procedure: ***GEM-OSP.pdf***

THA: ***GEM-THA.pdf***

Additional Files:

Review Signatures

Subject Matter Expert : Electricity->50V or Greater: De-energized Work	Authorized Signers • Tim Fitzgerald (tfitzger@jlab.org) • Phillip Stanley (pstanley@jlab.org)
Subject Matter Expert : Electricity->Mode 1: Class 1-> 2-> and 3 Electrical Equipment	Authorized Signers • Tim Fitzgerald (tfitzger@jlab.org) • Phillip Stanley (pstanley@jlab.org)
Subject Matter Expert : Gas Cylinders	Authorized Signers • Robert Myles (myles@jlab.org) • Tim Minga (minga@jlab.org)

Approval Signatures

fa

Jefferson Lab
Thomas Jefferson National Accelerator Facility

Operational Safety Procedure Form

(See ES&H Manual Chapter 3310 Appendix T1 Operational Safety Procedure (OSP) and Temporary OSP Procedure for instructions.)

Click

Title:	GEM detector for the LAD experiment		
Location:	Hall C – target platform	**Type:**	☒ OSP ☐ TOSP
Risk Classification (per Task Hazard Analysis attached) (See *ESH&Q Manual Chapter 3210 Appendix T3 Risk Code Assignment*.)		**Highest Risk Code Before Mitigation**	2
		Highest Risk Code after Mitigation (N, 1, or 2):	0
Owning Organization:	Hall C	**Date:**	Oct. 16, 2020
Document Owner(s):	Holly Szumila-Vance		

DEFINE THE SCOPE OF WORK

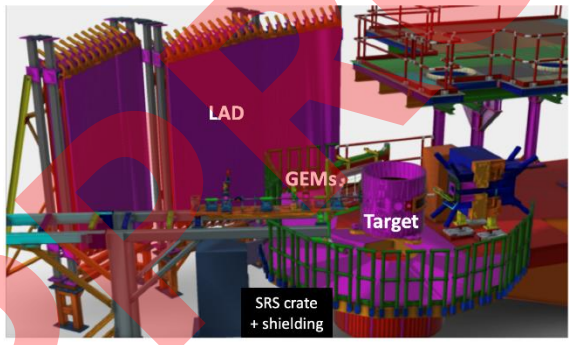
1. Purpose of the Procedure – Describe in detail the reason for the procedure (what is being done and why).

This document describes the GEM assembly detector that will be used in the LAD experiment in Hall C. These GEMs were previously installed in Hall B for the PRAD experiment.

2. Scope – include all operations, people, and/or areas that the procedure will affect.

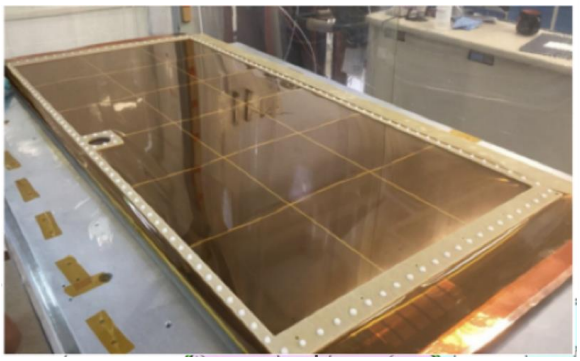
Operation of the PRAD GEMs in the Hall C LAD experiment. The scope of this OSP encompasses electrical issues associated with the GEM detector and the use of Ar/CO2 gas flowing through the detector.

3. Description of the Facility – include building, floor plans and layout of the experiment or operation.

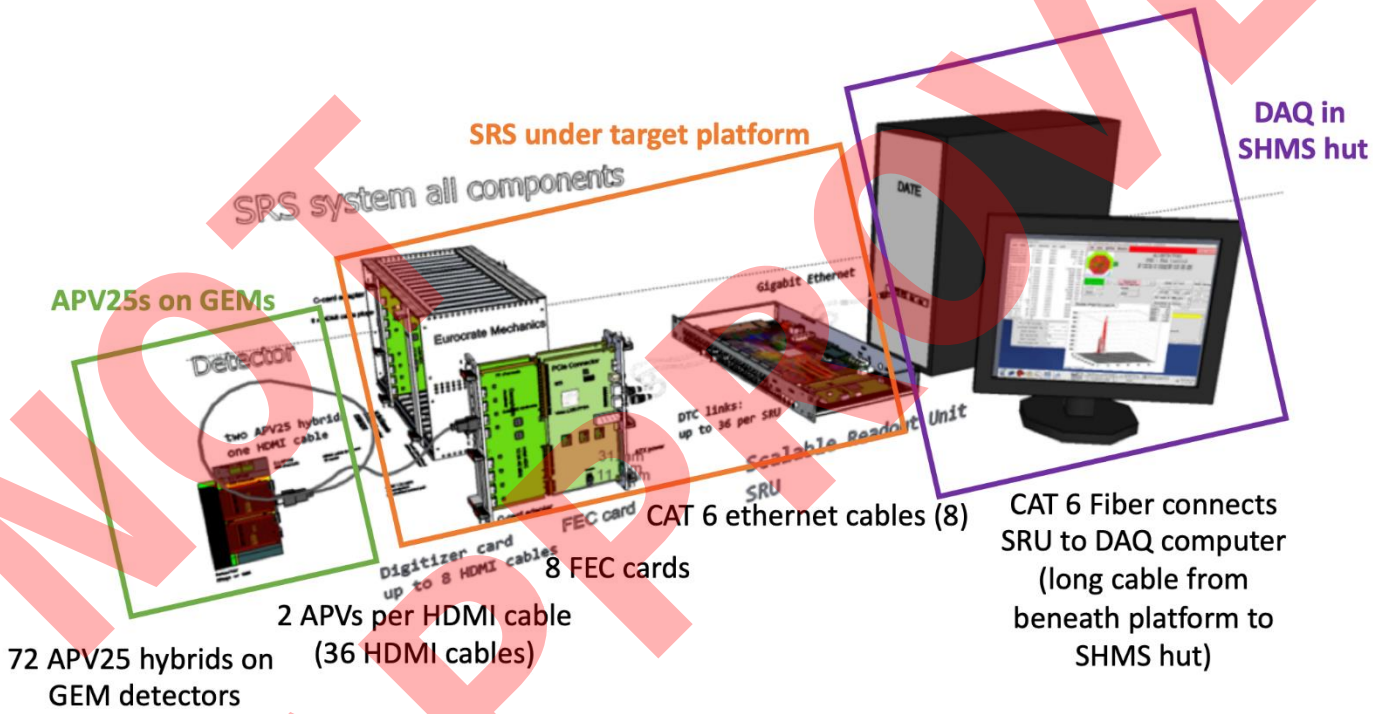


The components of the GEM detector assembly are in 4 locations.

1. The detector, GEMs with an active area of 120cm by 55cm are mounted on stands on the target platform, beam left, 127 deg off the beamline and level with the target. The first GEM layer is at 75 cm from the target center, and the second GEM layer is at 95 cm from the target center. The APV25s (72 in total) for readout are attached to the GEMs.



2. An Ar/CO2 bottle with pressure regulator is securely fastened at the bottom of the target platform. A tube connects the bottle to a flow meter near the GEM detector. The flow is <1 ft^3/hour.
3. The Scalable Readout System (SRS) is composed of 8 FEC cards+SRU and is located beneath the target platform and is shielded with lead. The FEC cards are attached to the APV25s through 36 HDMI cables (2 APVs per cable). The FEC cards are connected through 8 CAT-6 ethernet cables to the Scalable Readout Unit (SRU).



4. The DAQ is located in the SHMS electronics hut. A CAT-6 fiber connects the SRU to the DAQ computer and runs from beneath the target platform to the SHMS hut. THE GEM high voltage supply (4kV) is also located in the SHMS electronics hut.

ANALYZE THE HAZARDS and IMPLEMENT CONTROLS

4. Hazards identified on written Task Hazard Analysis

Electrical shock. Pressurized gas bottle.

5. Authority and Responsibility:

5.1 Who has authority to implement/terminate

Hall A/C Leader, Hall C Work Coordinator, Holly Szumila-Vance, Steve Wood, Xinzhan Bai, Florian Hauenstein

5.2 Who is responsible for key tasks

Holly Szumila-Vance, Xinzhan Bai

5.3 Who analyzes the special or unusual hazards including elevated work, chemicals, gases, fire or sparks (See ES&H Manual Chapter 3210 Appendix T1 Work Planning, Control, and Authorization Procedure)

Work Coordinator or designee

6. Personal and Environmental Hazard Controls Including:

6.1 Shielding

N/A

6.2 Barriers (magnetic, hearing, elevated or crane work, etc.)

N/A

6.3 Interlocks

N/A

6.4 Monitoring systems

N/A

6.5 Ventilation

N/A

6.6 Other (Electrical, ODH, Trip, Ladder) (Attach related Temporary Work Permits or Safety Reviews as appropriate.)

Use of current limited high voltage supply at 4kV. Use of HV cables and connectors. Exposed high voltage wrapped with electrical tape.

Gas supplied through a pressure regulator attached to the gas bottle with flow limited by a flow meter.

7. List of Safety Equipment:

7.1 List of Safety Equipment:

N/A

7.2 Special Tools:

N/A

8. Associated Administrative Controls

Setup, removal or changes to the GEM setup may only be done by Holly Szumila-Vance, Xinzhan Bai, Florian Hauenstein, Chuck Mahon, members of the Work Coordinators staff, members of Hall

A/C staff, and others designated by Holly Szumila-Vance or Steve Wood. Users may operate the high voltage under the direction of Holly Szumila-Vance, Steve Wood, or Florian Hauenstein.

9. Training

9.1 What are the Training Requirements (See List of Training Skills)

Hall C walk through, Radiation Worker I

DEVELOP THE PROCEDURE

10. Operating Guidelines

11. Notification of Affected Personnel (who, how, and when include building manager, safety warden, and area coordinator)

Contact hall work coordinator prior to start of work, daily.

12. List the Steps Required to Execute the Procedure: from start to finish.

1. GEM installation prior to start of experiment on GEM stands on target platform.
2. GEM electronics installed beneath target platform.
3. Connect gas system to GEM.
4. Install GEM HV unit and PC in the SHMS electronics hut.
5. Connect electronics, data acquisition, high voltage and gas.

13. Back Out Procedure(s) i.e. steps necessary to restore the equipment/area to a safe level.

1. Turn off high voltage.
2. Stop gas flow.

14. Special environmental control requirements:

14.1 List materials, chemicals, gasses that could impact the environment (ensure these are considered when choosing Subject Mater Experts) and explore EMP-04 Project/Activity/Experiment Environmental Review below

N/A

14.2 Environmental impacts (See EMP-04 Project/Activity/Experiment Environmental Review)

N/A

14.3 Abatement steps (secondary containment or special packaging requirements)

N/A

15. Unusual/Emergency Procedures (e.g., loss of power, spills, injury, fire, etc.)

In the event of injury, or an immediate emergency exists, call **911** and also notify:

- Guards (**x5822**)
- Occupational Medicine (**x7539**)
- Crew Chief (**x7045**) (if inside the fence)

In case of an injury follow standard JLAB procedures. Initial response cards are located with each phone for appropriate emergency phone numbers. Additional information can be found at https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-24400/*.pdf.

16. Instrument Calibration Requirements (e.g., safety system/device recertification, RF probe calibration)

None

17. Inspection Schedules

None

18. References/Associated/Relevant Documentation

19. List of Records Generated (Include Location / Review and Approved procedure)

Submit Procedure for Review and Approval (See ES&H Manual Chapter 3310 Appendix T1 OSP & TOSP Instructions – Section 4.2 Submit Draft Procedure for Initial Review):

- Convert this document to .pdf
- Open electronic cover sheet: https://mis.jlab.org/mis/apps/mis_forms/operational_safety_procedure_form.cfm
- Complete the form
- Upload the pdf document and associated Task Hazard Analysis (also in .pdf format)

Distribution: Copies to Affected Area, Authors, Division Safety Officer
Expiration: Forward to ES&H Document Control

Form Revision Summary

Revision 1.6 – 06/23/2020 – Update section 15 to reflect guard number, what to do in an emergency, crew chief numbers, etc. approved by H. Fanning
Revision 1.5 – 04/11/18 – Training section moved from section 5 Authority and Responsibility to section 9 Training
Revision 1.4 – 06/20/16 – Repositioned "Scope of Work" to clarify processes
Qualifying Periodic Review – 02/19/14 – No substantive changes required
Revision 1.3 – 11/27/13 – Added "Owning Organization" to more accurately reflect laboratory operations.
Revision 1.2 – 09/15/12 – Update form to conform to electronic review.
Revision 1.1 – 04/03/12 – Risk Code 0 switched to N to be consistent with 3210 T3 Risk Code Assignment.
Revision 1.0 – 12/01/11 – Added reasoning for OSP to aid in appropriate review determination.
Revision 0.0 – 10/05/09 – Updated to reflect current laboratory operations

ISSUING AUTHORITY	FORM TECHNICAL POINT-OF-CONTACT	APPROVAL DATE	REVIEW DATE	REV.
ES&H Division	Harry Fanning	04/11/18	04/11/21	1.6

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Jefferson Lab
Thomas Jefferson National Accelerator Facility

Task Hazard Analysis (THA) Worksheet

(See ES&H Manual Chapter 3210 Appendix T1
Work Planning, Control, and Authorization Procedure)

Click For Word

Author:	Holly Szumila-Vance	**Date:**	October 20, 2020	**Task #:** If applicable	

Complete all information. Use as many sheets as necessary

Task Title:	GEM detector for LAD experiment			**Task Location:**	Hall C target platform on the SHMS side, level with target
Division:	Physics	**Department:**	Hall C	**Frequency of use:**	Daily
Lead Worker:	Florian Hauenstein				
Mitigation already in place: Standard Protecting Measures Work Control Documents					

Sequence of Task Steps	Task Steps/Potential Hazards	Consequence Level	Probability Level	Risk Code (before mitigation)	Proposed Mitigation (Required for Risk Code >2)	Safety Procedures/ Practices/Controls/Training	Risk Code (after mitigation
	Electrical shock from 4kV high voltage supplying GEM detector	M	L	2	Use of current limited high voltage supply at 4kV. Use of SHV cables and connectors. Exposed high voltage wrapped with electrical tape.	High voltage cables are only connected or disconnected to/from detectors, power supplies, and patch panels when power supply is not energized.	0
	Use of compressed Ar/CO2 gas	M	L	2	Gas supplied through a pressure regulator attached to the gas bottle with flow limited by a flow meter.	Setup, connection, or disconnection of the gas shall only be done by individuals authorized by this OSP.	0

Highest Risk Code before Mitigation:	2	**Highest Risk Code after Mitigation:**	0

Task Hazard Analysis (THA) Worksheet

(See ES&H Manual Chapter 3210 Appendix T1 Work Planning, Control, and Authorization Procedure)

When completed, if the analysis indicates that the Risk Code before mitigation for any steps is "medium" or higher (RC≥3), then a formal Work Control Document (WCD) is developed for the task. Attach this completed Task Hazard Analysis Worksheet. Have the package reviewed and approved prior to beginning work. (See ES&H Manual Chapter 3310 Operational Safety Procedure Program.)

Task Hazard Analysis (THA) Worksheet

(See ES&H Manual Chapter 3210 Appendix T1
Work Planning, Control, and Authorization Procedure)

Form Revision Summary

Periodic Review – 08/29/18 – No changes per TPOC
Periodic Review – 08/13/15 – No changes per TPOC
Revision 0.1 – 06/19/12 - Triennial Review. Update to format.
Revision 0.0 – 10/05/09 – Written to document current laboratory operational procedure.

ISSUING AUTHORITY	TECHNICAL POINT-OF-CONTACT	APPROVAL DATE	REVIEW DATE	REV.
ESH&Q Division	Harry Fanning	08/29/18	08/29/21	0.1

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