

Operational Safety Procedure Form

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

Click
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Title:	GEM detector set up for the SBS experiments		
Location:	TEDF with the BigBite assembly	Type:	<input checked="" type="checkbox"/> OSP <input type="checkbox"/> TOSP
Risk Classification (per Task Hazard Analysis attached) (See ESH&O Manual Chapter 3210 Appendix T3 Risk Code Assignment.)		Highest Risk Code Before Mitigation	3
		Highest Risk Code after Mitigation (N, 1, or 2):	1
Owning Organization:	Hall A	Date:	8 March 2021
Document Owner(s):	Holly Szumila-Vance		

DEFINE THE SCOPE OF WORK

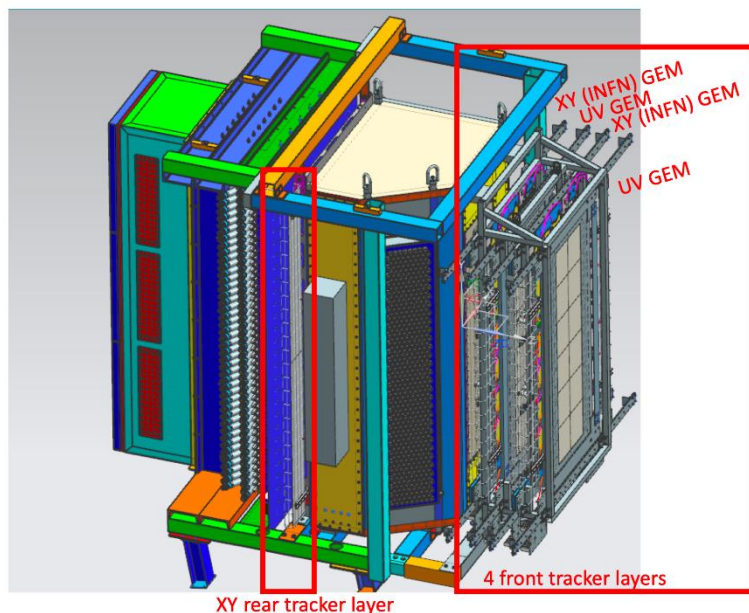
1. Purpose of the Procedure – Describe in detail the reason for the procedure (what is being done and why).

This document describes the BigBite GEM detectors that are being setup and tested in the TEDF prior to movement to Hall A. These GEMs will be installed in the GEM frames attached to the BigBite detector stack and are produced from both UVa and INFN.

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

Operation of the GEMs in the TEDF in preparation for Hall A SBS experiments. The scope of this OSP encompasses electrical issues associated with the GEM detector, the use of Ar/CO₂ gas flowing in the detectors, work conducted under Covid-19 elevated MEDCON levels, and access to the detector by use of a ladder.

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



The GEM detectors for the SBS experiments will be installed on both the BigBite detector stack. The BigBite assembly will have 4 front tracker layers with a UVa-produced UV layer (60 deg stereo angle) in the front, followed by an INFN-produced XY layer and this pattern repeated. The front tracker INFN layers are composed of 3 modules that in total produce an active area of 40 cm in the horizontal direction by 150 cm in the vertical direction. These INFN layers readout via 54 APVs per chamber. The front tracker UV layers are composed of a singular larger module with the same active area. Downstream of the GRINCH detector, a larger UVa-produced XY layer is installed as the rear tracker. This rear tracker is composed of 4 GEM modules tacked in a layer so that the total active layer is 60 cm in the

horizontal direction by 200 cm in the vertical direction and is readout by 88 APVs in total.

The GEMs are readout by APV25s that are connected to backplanes supplied with low voltage on the sides of the GEM plane. The APV25 readout is connected by HDMI cables to MPDs for readout. The MPDs are housed in crates to the front of the BigBite stack. The output signals from the MPDs in the forward electronics will be carried by optical fibers to the DAQ (weldment staging area) for trigger processing. The HV supplies for the GEMs are located in the MPD crates. Also the LV supply is located to the rear of the MPD and HV crates.

The GEMs are supplied with an Ar/CO₂ bottle with a pressure regulator located near the MPD electronics crates to the front of the BigBite detector assembly. The gas system is able to be remotely monitored from a web browser. The flow is <1 ft³/hour. A relief valve between the regulator and detector is implemented as a backup in the event of regulator failure. The gas system is developed by the Detector Support Group and Jack Segal.

ANALYZE THE HAZARDS and IMPLEMENT CONTROLS

4. Hazards identified on written Task Hazard Analysis

Electrical shock, pressurized gas containers, potential for ladder work, and work under Covid-19 elevated MEDCON

5. Authority and Responsibility:

5.1 Who has authority to implement/terminate

Hall A/C Leader, Hall A Work Coordinator

5.2 Who is responsible for key tasks

Holly Szumila-Vance, Kondo Gnanvo, Evaristo Cisbani, Roberto Perrino, Jessie Butler

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.)

GEMs may need to be accessed by ladder. Safety training will be adhered and work in pairs will be advisable to assist.

6.3 Interlocks

N/A

6.4 Monitoring systems

Remote monitoring of gas flow system.

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 shielded HV cables and connectors. Exposed high voltage wrapped with high voltage electrical tape (none in design).

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 be coordinated through Kondo Gnanvo, Evaristo Cisbani, Roberto Perrino, Bogdan Wojtsekhowski, Holly Szumila-Vance, Chuck Mahon, members of the Work Coordinator's staff, members of Hall A/C staff, and others designated by Kondo, Evaristo, Roberto, or Holly. Signs and labels will be posted at the gas assembly, HV, and LV junctions.

9. Training

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

ODH training, Ladder safety training if requiring access by ladder, Pressure system training SAF130A, SAF 130C, addition of current electrical training with subject to change as the new training is taking hold at the lab, equipment specific training

DEVELOP THE PROCEDURE

10. Operating Guidelines

See Operations manual for the INFN and UVa GEMs. Do not operate the system unless authorized by an individual in Section 5 and with training as noted above.

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

Contact Hall Work Coordinate 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 experiments on the GEM holders of the BB and SBS detector stacks.
2. GEM forward electronics will be placed approximately 10m to the outside of the BB and SBS detectors at pre-designated Hall clock positions and will be shielded. This electronics will be connected to the DAQ by fiber optics.
3. Connect the gas system to the GEMs.
4. Install GEM HV units and PC in the weldment, far electronics locale.
5. Connect the electronics, data acquisition, high voltage, and gas.

For detailed operation of detector operation, refer to INFN/UVa GEM manual.

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
3. Reassess the job before turning power and gas back on

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

Operator manual for INFN/UVa GEMs and THA

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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