

Person: Segal, Jack (segal@jlab.org)
Org: PHALLA

Status: PROCESSED
Saved: 8/16/2021 8:14:54 AM
Submitted: 8/16/2021 8:14:54 AM



Operational Safety Procedure Review and Approval Form # 119583
(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 LOTO-COMPLEX Information Click for LOTO-GROUP Information		
Serial Number:	ENP-21-119583-OSP		
Issue Date:	8/18/2021		
Expiration Date:	7/18/2024		
Title:	BigBite GRINCH for the SBS experiments		
Location: (where work is being performed) Building Floor Plans	101 - Experimental Hall A - A100	Location Detail: (specifies about where in the selected location(s) the work is being performed)	BigBite Spectrometer
Risk Classification: (See ES&H Manual Chapter 3210 Appendix T3 Risk Code Assignment)	Without mitigation measures (3 or 4):		3
	With mitigation measures in place (N, 1, or 2):		1
Reason:	This document is written to mitigate hazard issues that are : <i>New/previously unrecognized Hazard Issue</i> <i>Determined to have an unmitigated Risk code of 3 or 4</i>		
Owning Organization:	PHALLA		
Document Owner(s):	Segal, Jack (segal@jlab.org) Primary		
Supplemental Technical Validations <input checked="" type="checkbox"/>			
Mode 2: Class 1 Equipment (Phillip Stanley, Tim Fitzgerald) Gas Cylinders (Robert Myles, Tim Minga) ODH 0 and 1 (Imani Burton, Jennifer Williams) Ladders (Bert Manzlak, George Perry) ESH&Q Liasion (Bert Manzlak)			
Other Hazards: New equipment (Jack Segal)			
Document History <input checked="" type="checkbox"/>			
Revision <input checked="" type="checkbox"/>	Reason for revision or update <input checked="" type="checkbox"/>	Serial number of superseded document <input checked="" type="checkbox"/>	

Lessons Learned	Lessons Learned relating to the hazard issues noted above have been reviewed.
Comments for reviewers/approvers: <input type="checkbox"/>	08/16/2021: Addressed comments from Phillip Stanley and Jennifer Williams.
Attachments <input type="checkbox"/>	
Procedure: <i>sbs_grinch_OSP_rev_1.pdf</i> THA: <i>sbs_grinch_THA_rev_1.pdf</i> Additional Files:	
Review Signatures	
Additional Authorization : Associate Director - ESH&Q	Signed on 8/16/2021 8:21:02 AM by Steven Hoey (hoey@jlab.org)
Person : Subject Matter Expert : New equipment	Signed on 8/16/2021 8:14:54 AM by Jack Segal (segal@jlab.org)
Subject Matter Expert : Electricity->Mode 2: Class 1 Equipment	Signed on 8/16/2021 8:22:50 AM by Phillip Stanley (pstanley@jlab.org)
Subject Matter Expert : Gas Cylinders	Signed on 8/16/2021 9:05:04 AM by Tim Minga (minga@jlab.org)
Subject Matter Expert : Oxygen Deficiency Hazards (ODH)->ODH 0 and 1	Signed on 8/16/2021 9:42:14 AM by Jennifer Williams (jennifer@jlab.org)
Subject Matter Expert : Working at Elevations->Ladders	Signed on 8/16/2021 8:34:52 AM by Bert Manzlak (manzlak@jlab.org)
Approval Signatures	
Division Safety Officer : PHALLA	Signed on 8/16/2021 9:42:39 AM by Ed Folts (folts@jlab.org)
ESH&Q Division Liasion : PHALLA	Signed on 8/16/2021 11:02:27 AM by Bert Manzlak (manzlak@jlab.org)
Org Manager : PHALLA	Signed on 8/18/2021 2:11:10 PM by Cynthia (Thia) Keppel (keppel@jlab.org)
Safety Warden : Experimental Hall A - A100	Signed on 8/16/2021 1:12:22 PM by Jessie Butler (jbutler@jlab.org)

Operational Safety Procedure Form

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

Title:	BigBite GRINCH for the SBS experiments		
Location:	Hall A, on the BigBite detector stack	Type:	<input checked="" type="radio"/> OSP <input type="radio"/> TOSP
Risk Classification (per Task Hazard Analysis attached) (See ES&H 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:	08/11/21
Document Owner(s):	Jack Segal, Bradley Yale, Eric Fuchey		

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 GRINCH detector which will be used in the BigBite spectrometer for the SBS experiments. This detector will be sitting in the BigBite detector stack in Hall A and is produced by the College of William and Mary.

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

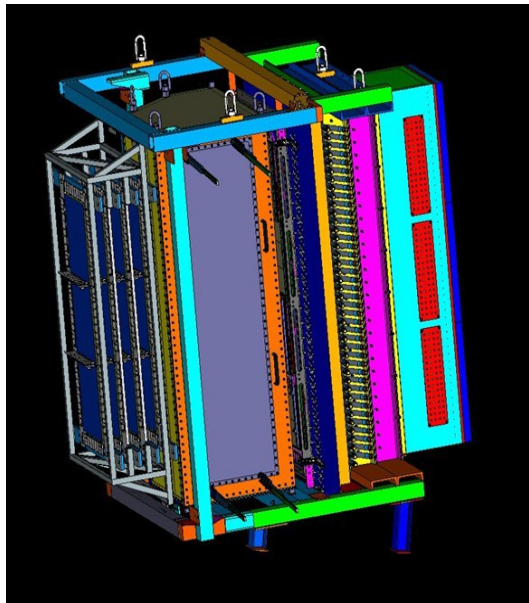
Operation of the GRINCH in the Hall A SBS experiments. The scope of this OSP encompasses electrical issues associated with the GRINCH, work conducted under Covid-19 elevated MEDCON levels, access to the detector by use of a ladder, and opening the detector for maintenance or repair..

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

For questions or comments regarding this form contact the Technical Point-of-Contact [Harry Fanning](#)

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Operational Safety Procedure Form



The GRINCH will be installed in the Bigbite detector stack, sitting between the two stacks of GEM planes (see illustration on the left). This detector stack is located in Hall A, on the BigBite platform. GRINCH is composed of a tank filled with C4F8 gas for Cherenkov radiator. The light radiated by the charged particles is reflected by mirrors and collected by a matrix of 510 photomultiplier tubes. The signal from the PMTs are processed by NINO front-end cards, and are conveyed to the GRINCH DAQ located in the DAQ bunker in Hall A through 17-pair flat cables. In order to mitigate the signal attenuation along the 100 ft cables, an LVDS to ECL converter is also required in the hall between the detector package and the DAQ bunker. At the DAQ bunker there is a corresponding ECL to LVDS converter to convert the signals back to the correct format. The high voltage power supplies for the PMTs are also sitting in the DAQ bunker, and also requires cables running from the DAQ bunker to the detector stack. The low voltage for the NINO cards is located in the DAQ electronics bunker connected via 4 AWG welding cables to the low voltage distribution on the BigBite

frame.

ANALYZE THE HAZARDS and IMPLEMENT CONTROLS

4. Hazards identified on written Task Hazard Analysis

Electrical shock, pressurized gas containers, oxygen displacement, 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, Todd Averett, Bradley Yale, Jack Segal

5.2 Who is responsible for key tasks

Todd Averett, Bradley Yale

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

Jessie Butler (Hall A Work Coordinator), Jack Segal (Halls A and C Spectrometer Support Manager)

6. Personal and Environmental Hazard Controls Including:

6.1 Shielding

N/A

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

GRINCH may need to be accessed by ladder. Safety training will be adhered and working in

Operational Safety Procedure Form

	pairs will be advisable.
6.3 Interlocks	
	N/A
6.4 Monitoring systems	
	The high voltage will be monitored with the high voltage GUI. The gas will be monitored using a pressure gauge. Low voltage will be monitored with the low voltage GUI.
6.5 Ventilation	
	Standard Hall A ventilation. Local forced ventilation inside the detector if it is opened after filling. A buddy rule is instituted when opening the detector after it has been filled, minimum of two people required.
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 2kV. Use of shielded HV cables and connectors. Use of current limited low voltage supply (12.5V, 120A). Gas supplied through a pressure regulator attached to the gas bottle with flow limited by a flow meter, restriction, and pressure relief valve.
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 BigBite timing hodoscope setup may be coordinated through Todd Averett, Bradley Yale
9. Training	
9.1 What are the Training Requirements (See List of Training Skills)	
	Hall A walk through. Radiation Worker I. ODH training. Ladder safety training, if requiring access by ladder. Pressure system training. ESC001, ESC003, ESC004, ESC007, and ESC008, current electrical training, subject to change as the new training is taking hold at the lab. Equipment specific training
DEVELOP THE PROCEDURE	
10. Operating Guidelines	
	Normal operation of the system high voltage is documented in the HV “how-to”. Any other non-routine operation on the system shall not be made unless authorized by an individual in Section 5 and with training as noted above.

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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	
12. List the Steps Required to Execute the Procedure: from start to finish.	
<ol style="list-style-type: none"> 1. GRINCH installation prior to start of experiments in the BigBite detector stack. 2. Install GRINCH HV and data acquisition in the SBS DAQ bunker 3. Connect the electronics, data acquisition and high voltage. 4. Connect the gas system to the GRINCH 5. Gain match the PMTs, which requires access to the front end NINO cards (ladder / lift required) 	
13. Back Out Procedure(s) i.e. steps necessary to restore the equipment/area to a safe level.	
<ol style="list-style-type: none"> 1. Turn off high voltage and low voltage 2. Stop gas flow 3. Reassess the job before turning power 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.)	
<p>In the event of injury, or an immediate emergency exists, call 911 and also notify:</p> <ul style="list-style-type: none"> • Guards (x5822) • Occupational Medicine (x7539) • Crew Chief (x7045) (if inside the fence) <p>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.</p>	
16. Instrument Calibration Requirements (e.g., safety system/device recertification, RF probe calibration)	

Operational Safety Procedure Form

<ol style="list-style-type: none"> 1. Access to front end NINO cards for gain matching PMTs, including the top ones via ladder / lift 2. Gas leak rate check, via access to the gas panel
17. Inspection Schedules
N/A
18. References/Associated/Relevant Documentation
Documentation for high voltage and low voltage operation
19. List of Records Generated (Include Location / Review and Approved procedure)
N/A

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://jlabdoc.jlab.org/docushare/dsweb/Get/Document-24048/3310T1Form.doc>
- 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 1.7 – 02/25/2021** – Corrected link to Word doc; updated ‘ESH&Q’ to ‘ES&H’; other minor edits. No approval required.
- 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	02/25/24	1.6

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Task Hazard Analysis (THA) Worksheet
 (See [ES&H Manual Chapter 3210 Appendix T1](#)
[Work Planning, Control, and Authorization Procedure](#))

Author:	Jack Segal	Date:	08/11/21	Task #: If applicable	
Complete all information. Use as many sheets as necessary					
Task Title:	BigBite GRINCH for the SBS experiments	Task Location:	Hall A, downstream of the target and on the beam left side		
Division:	Physics	Department:	Hall A	Frequency of use:	Daily from September 2021 onwards
Lead Worker:	Bradley Yale				
Mitigation already in place: Standard Protecting Measures Work Control Documents	Use of voltage appropriate shielded HV cables and connectors. Restricting orifice and relief valve between regulator and detectors				

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Task Hazard Analysis (THA) Worksheet

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

Sequence of Task Steps	Task Steps/Potential Hazards	<u>Consequence Level</u>	<u>Probability Level</u>	<u>Risk Code</u> (before mitigation)	Proposed Mitigation (Required for <u>Risk Code</u> >2)	<u>Safety Procedures/Practices/Controls/Training</u>	<u>Risk Code</u> (after mitigation)
1	Electrical shock from 2kV high voltage supplying GRINCH photomultiplier tubes, or from 6V low voltage power supply for GRINCH front end NINO cards	M	L	2	Use of current limited high voltage supply at 2kV. Use of shielded cables and connectors for HV. Use of 4 AWG welding cables and connectors for LV	High voltage cables are only connected or disconnected to/from the detectors, power supplies, and patch panels when power supply is not energized. ESH Manual Chapter 6200 Electrical Safety Program: https://www.jlab.org/ehs/ehsmanual/6200.htm / Training: ESC001, ESC003, ESC004, ESC007, and ESC008 Electrical Safety Awareness Class, Modes, etc. Electrical safety training for QEW is currently being modified.	1

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Task Hazard Analysis (THA) Worksheet

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

Sequence of Task Steps	Task Steps/Potential Hazards	<u>Consequence Level</u>	<u>Probability Level</u>	<u>Risk Code</u> (before mitigation)	Proposed Mitigation (Required for <u>Risk Code</u> >2)	<u>Safety Procedures/Practices/Controls/Training</u>	<u>Risk Code</u> (after mitigation)
2	Use of compressed C4F8 gas: hazards associated with handling of pressurized containers and oxygen displacement in the event of a catastrophic leak.	M	L	2	Gas supplied through a pressure regulator attached to the gas bottle with flow limited by a flow meter, an aperture restriction and a pressure relief valve. Location of the gas bottle in a non confined place to limit the effect of oxygen displacement. Each cylinder has 110 pounds of liquid at 25 PSIA. This is 200 cubic feet of gas at STP. The volume of the GRINCH is 82 cubic feet. The area of Hall A is about 21,124 square feet. One cylinder will cover the hall with 0.114 inches of gas. Thus the concern is one of a local ashyxiant. Anytime the detector is opened for repair or maintenance adequate forced ventilation should be used to ensure no stagnant volume of simple asphyxiant remains in the detector. A buddy rule will be instituted for opening the detector after filling.	Setup, connection, or disconnection of the gas shall only be done by individuals authorized by this OSP. ESH Manual Chapter 6150 Gas Cylinder Safety - Storage, Movement, and Labeling https://www.jlab.org/ehs/ehsmanual/manual/6150.html , Training for individuals: SAF130A, SAF130C Relief valve and restriction between the regulator and detector is implemented as a backup in the event of regulator failure. Oxygen deficiency hazard SAF103	1

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Task Hazard Analysis (THA) Worksheet

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

Sequence of Task Steps	Task Steps/Potential Hazards	<u>Consequence Level</u>	<u>Probability Level</u>	<u>Risk Code</u> (before mitigation)	Proposed Mitigation (Required for <u>Risk Code</u> >2)	Safety Procedures/ Practices/Controls/Training	<u>Risk Code</u> (after mitigation)
3	Covid-19 contamination (if at an elevated MEDCON level)	M	M	3	Face covering required. Maintain Social Distancing of 6' or use appropriate PPE if 6' distancing cannot be maintained.	OSP: ESH-21-116798-OSP. Follow required guidelines	1
4	Use of portable ladder for access to the GRINCH detector	M	M	3	Use of ladder training and having an observer/assistant.	SAF307 Ladder Safety	1

Highest <u>Risk Code</u> before Mitigation:	3	Highest <u>Risk Code</u> after Mitigation:	1
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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](#).)

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Task Hazard Analysis (THA) Worksheet

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

Form Revision Summary

Revision 0.2 – 07/26/21 – Periodic Review; updated header and footer

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.
ES&H Division	Harry Fanning	08/29/18	07/26/24	0.2

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