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Operational Safety Procedure Review and Approval Form # 80619
 (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		
Serial Number:	ACC-18-80619-OSP		
Issue Date:	12/10/2018		
Expiration Date:	11/10/2021		
Title:	LERF Gun High Voltage Conditioning		
Location: (where work is being performed) Building Floor Plans	18 - Low Energy Recirculator Facility (LERF)	Location Detail: (specifics about where in the selected location(s) the work is being performed)	LERF Vault
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 : Determined to have an unmitigated Risk code of 3 or 4		
Owning Organization:	ACCCIS		
Document Owner(s):	Hernandez-Garcia, Carlos (chgarci@jlab.org) Primary		

Supplemental Technical Validations

Lock, Tag, Try (Paul Powers, Todd Kujawa)
ODH 0 and 1 (Imani Burton, Jennifer Williams)
Radiological Controlled Area (David Hamlette, Keith Welch)

Document History

Revision <input type="checkbox"/>	Reason for revision or update <input type="checkbox"/>	Serial number of superseded document <input type="checkbox"/>
1	This revised version addressed T. Kujawa's point about a missing step in the procedure, that being TRYING OUT cycling the valve upon applying lock	80619

Lessons Learned [Lessons Learned](#) relating to the hazard issues noted above have been reviewed.

Comments for reviewers/approvers:

Attachments

Procedure: *LERF Gun HV Conditioning OSP Dec 2018 Rev03.pdf*

THA: *THA LERF Gun HV conditioning.pdf*

Additional Files:

Review Signatures

Subject Matter Expert : Lock-> Tag-> Try	Signed on 12/5/2018 2:30:13 PM by Todd Kujawa (kujawa@jlab.org)
Subject Matter Expert : Oxygen Deficiency Hazards (ODH)->ODH 0 and 1	Signed on 12/6/2018 9:36:05 AM by Jennifer Williams (jennifer@jlab.org)
Subject Matter Expert : Radiation - Ionizing->Radiological Controlled Area	Signed on 12/7/2018 10:30:04 AM by David Hamlette (hamlette@jlab.org)

Approval Signatures

Division Safety Officer : ACCCIS	Signed on 12/10/2018 7:09:46 AM by Harry Fanning (fanning@jlab.org)
Org Manager : ACCCIS	Signed on 12/7/2018 3:44:36 PM by Matthew Poelker (poelker@jlab.org)
Safety Warden : Low Energy Recirculator Facility (LERF)	Signed on 12/7/2018 10:51:07 AM by Lee Johnson (ljohnson@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:	LERF Gun High Voltage Conditioning		
Location:	LERF building	Type:	<input checked="" type="checkbox"/> OSP <input type="checkbox"/> TOSP
Risk Classification (per Task Hazard Analysis attached) (See ESH&Q 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:	Accelerator	Date:	12/05/2018
Document Owner(s):	Carlos Hernandez-Garcia		

DEFINE THE SCOPE OF WORK

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

To define LERF operations configuration controls for providing safe operating conditions that allow hot checkout and high voltage conditioning of the LERF electron gun without generating unintentional electron beam.

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

The objective of the task is to ensure there is no production of unintentional electron beam while the gun is energized. There are two sources of light that could potentially illuminate the photocathode during the task: a) the drive laser for generating electron beam during nominal operations, and b) the quantum efficiency (QE) laser for making a QE map during photocathode maintenance. Both lasers reach the photocathode through mirrors inside the electron beamline downstream of the gun. There is a beamline valve between the mirrors and the gun, VBV0F01. Locking close the gun valve VBV0F01 (see Figure 1 below) prevents any potential light from the drive laser and/or from the QE laser from reaching the photocathode.

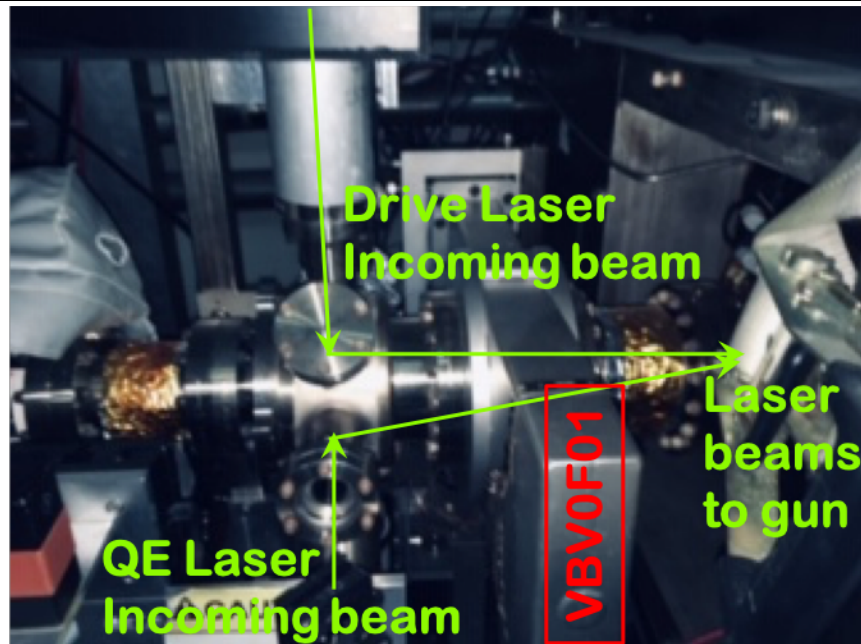


Figure 1

Prerequisites:

1. Approved ATLI for gun high voltage conditioning. The ATLI makes reference to this OSP.
2. RadCon Checklist complete.
3. Crew chief and LERF run coordinator cognizant of the approved ATLI.
4. Operations configuration lock applied by the Crew Chief to the LERF injector instrument air manifold that actuates the gun valve VBV0F01.
5. LERF vault is required by the PSS to be in Beam Permit for energizing the gun HVPS.

NOTE: Gun high voltage conditioning usually requires 1-5 shifts.

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

The LERF vault is the foundation of Building 18. Access to the vault is required to lock the manifold instrument air valve that prevents actuating the gun valve VBV0F01. The manifold instrument air is located in the injector pit north wall as indicated by the pictures in LRF-PR-15-001 LERF Gun Lockout Procedure which is referenced within this document
http://opsntrsrv.acc.jlab.org/ops_docs/online_document_files/LERF_online_files/LERF_gun_lockout_proc.pdf
 Access to the LERF vault is controlled by the status of the PSS.

ANALYZE THE HAZARDS and IMPLEMENT CONTROLS

4. Hazards identified on written Task Hazard Analysis

Exposure to ionizing radiation during high voltage conditioning due to field emission and unintentional production of electron beam.

5. Authority and Responsibility:

5.1 Who has authority to implement/terminate

The Director of Operations.

5.2 Who is responsible for key tasks

Electron Gun Group designee to perform the gun high voltage conditioning.
 Radiation Control Group designee to do the LERF RadCon Checklist
 Crew Chief being cognizant of the task to be performed described in this OSP
 Crew Chief designee to apply lock per LRF-PR-15-001 LERF Gun Lockout Procedure

1. The Electron Gun Group designee submits an ATLI for the task indicating the following steps.
2. The Radiation Control Group completes the LERF RadCon Checklist and turns it in to MCC operations.
3. The Crew Chief or his/her designee proceeds to the LERF vault and places an operations configuration lock to the compressed air valve handle that actuates the gun valve VBV0F01 (Follow LRF-PR-15-001 LERF Gun Lockout Procedure).
4. Electron Gun Group designee coordinates with MCC operations the time to sweep the LERF vault. MCC operations staff in coordination with the SSO performs the sweep of the LERF vault.
5. Upon request from the Electron Gun Group designee as LERF Scientist on Shift for gun high voltage conditioning, the SSO places the state of the LERF PSS into Beam Permit.
6. The gun high voltage conditioning is performed by the Electron Gun Group designee staff once the LERF PSS is in Beam Permit. The PSS is presently configured in such a way that this state is required to energize the gun HVPS.
7. Once the Electron Gun Group designee as LERF Scientist on Shift performing the gun high voltage conditioning deems the procedure is done for the shift, he or she contacts MCC SSO to change the state of the LERF PSS to the previously agreed state by MCC operations and by LERF Run Coordinator.
8. When the gun high voltage conditioning is deemed complete by the Electron Gun Group designee, he or she informs MCC operations and the LERF Run Coordinator that the task described in this OSP and in the approved ATLI is complete and the operations configuration lock may be removed from the compressed air valve handle that actuates the gun valve.

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](#))

Radiation Control group.

6. Personal and Environmental Hazard Controls Including:

6.1 Shielding

The gun is installed in the LERF vault constructed with high density concrete shielding. Concrete blocks shield the exterior of the ramp roll-up door. The ramp roll-up door is part of the PSS. The drive laser beam is enclosed a transport evacuated starting at the optical table in the clean room 214A.

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

Access to the vault is controlled by the LERF PSS

6.3 Interlocks

Controlled Access Interlocks are controlled by the LERF PSS

6.4 Monitoring systems

The LERF vault has its own Radiation and ODH monitoring systems.

6.5 Ventilation

The LERF vault has its own ventilation and ODH monitoring system.

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

Magenta Beacons, RadCon and ODH signage are placed at each LERF vault entry point

7. List of Safety Equipment:

7.1 List of Safety Equipment:

No specialized safety equipment beyond standard clothing requirements to access the LERF vault .

7.2 Special Tools:

A specialized compressed-Air locking valve capture mechanism for the compressed air valve handle that actuates the gun valve. See LRF-PR-15-001 LERF Gun Lockout Procedure

http://opsntrsrv.acc.jlab.org/ops_docs/online_document_files/LERF_online_files/LERF_gun_lockout_proc.pdf

8. Associated Administrative Controls

1. ATLis each time the task described in this OSP is to be performed.
2. Task Hazard Analysis Worksheet
3. RadCon check list
4. LRF-PR-15-001 LERF Gun Lockout Procedure:
http://opsntrsrv.acc.jlab.org/ops_docs/online_document_files/LERF_online_files/LERF_gun_lockout_proc.pdf
5. JLab Final Safety Assessment Document

9. Training

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

SAF801 Radiation Worker I
 SAF103 Oxygen Deficiency Hazard
 SAF143kd LERF Safety Awareness

DEVELOP THE PROCEDURE

10. Operating Guidelines

1. The Electron Gun Group designee submits an ATLis for the gun high voltage conditioning task attaching this OSP for reference. Usually gun high voltage conditioning requires between 1 and 5 shifts. This will be specified in the ATLis.
2. A RadCon checklist must be completed before the LERF vault can be swept and placed in Beam Permit. The LERF vault must be in Beam Permit to energize the electron gun high voltage power supply (HVPS). This is determined by the present PSS configuration.
3. An operations configuration lock must be applied by the Crew Chief or his/her designee to the manifold valve that provides instrument air to the gun valve VBV0F1 following LRF-PR-15-001 LERF Gun Lockout Procedure. This effectively prevents VBV0F01 from being actuated. A LERFLOG/ELOG entry by Crew Chief or designee documents this action.

4. Once ATLI is approved and a time has been agreed upon to execute the task, Operations Staff in coordination with MCC SSO sweeps and places the state of the LERF PSS in Beam Permit.
5. Once in Beam Permit, the designated person from the Electron Gun Group signs in as LERF Scientist on Shift and contacts MCC SSO to inform that the gun hot checkout and high voltage conditioning will take place.

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

Electron Gun Group designee submits ATLI for this task and contacts Radiation Control Group to perform RadCon Checklist. Upon completion, RadCon turns in the checklist to MCC operations.

Electron Gun Group designee coordinates with MCC operations the execution of the ATLI.

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

1. The Radiation Control Group completes the LERF RadCon Checklist and turns it in to MCC operations.
2. The Electron Gun Group designee to perform the gun high voltage conditioning submits an ATLI referencing this OSP.
3. Once ATLI is approved, the Crew Chief or designee may proceed to a) Verify that the gun valve cycles properly, b) LOCK OUT the compressed air valve that actuates gun valve VBVF01, and c) TRY OUT cycling the gun valve verifying that it cannot be done because the air supply line has been shut off and locked out. This is done by executing LRF-PR-15-001 LERF Gun Lockout Procedure:
http://opsntsrv.acc.jlab.org/ops_docs/online_document_files/LERF_online_files/LERF_gun_lockout_proc.pdf
4. Once lock is applied, Crew Chief or designee makes a LERFLOG/ELOG entry documenting the state of the gun valve VBVF01.
5. Electron Gun Group designee coordinates with MCC operations staff and the LERF Run Coordinator the date and time to execute the gun high voltage conditioning. Upon an agreed time, MCC operations staff in coordination with the SSO performs the sweep of the LERF vault.
6. Upon request from the Electron Gun Group designee as LERF Scientist on Shift for gun high voltage conditioning, the SSO places the state of the LERF PSS into Beam Permit.
7. The gun high voltage conditioning is performed by the Electron Gun Group designee staff once the LERF PSS is in Beam Permit. The PSS is presently configured in such a way that this state is required to energize the gun HVPS.
8. Once the Electron Gun Group designee as LERF Scientist on Shift performing the gun high voltage conditioning deems the procedure is done for the shift, he or she contacts MCC SSO to change the state of the LERF PSS to the previously agreed state by MCC operations and by LERF Run Coordinator.
9. **The operations configuration lock applied to the compressed air valve handle that actuates the gun valve VBVF01 must remain in place until the gun high voltage conditioning is complete.**
10. When the gun high voltage conditioning is deemed complete by the Electron Gun Group designee informs MCC operations and the LERF Run Coordinator that this task is complete

and coordinates with MCC SSS changing the status of the LERF PSS to the previously agreed state. Only then the operations configuration lock may be removed from compressed air valve handle that actuates the gun valve VBV0F01. The completion of the task will be documented by the Electron Gun Group designee in the ATLI. Usually gun high voltage conditioning requires between 1 and 5 shifts.

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

1. The Electron Gun Group designee for gun high voltage conditioning turns off the gun high voltage power supply using EPICS controls.
2. The Electron Gun Group designee for gun high voltage conditioning calls MCC SSO and requests LERF PSS to be placed in Restricted Access. There is no need for RadCon survey since electron beam was not generated.
3. Lock removed from the compressed air valve handle driving the gun valve per LRF-PR-15-001 LERF Gun Lockout Procedure
http://opsntrsrv.acc.jlab.org/ops_docs/online_document_files/LERF_online_files/LERF_gun_lockout_proc.pdf
4. Crew Chief or designee makes a LERFLOG/ELOG entry stating that the gun valve Lock has been removed.
5. Backout procedure complete.

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, fire, etc.)

Responses to fire and ODH alarms require shutting off the gun HVPS by hitting the LERF Crash Button located in the LERF control room (see Figure 2), evacuating the building and notifying the Crew Chief from the phone located by the LERF building main entrance muster point.



Figure 2. LERF Crash Button to be hit in case of emergency to shut off the equipment.

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

N/A

17. Inspection Schedules

LERF PSS certification.

18. References/Associated/Relevant Documentation

N/A

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

N/A

[Click](#)
 To Submit OSP
 for Electronic Signatures

Distribution: Copies to Affected Area, Authors, Division Safety Officer

Expiration: Forward to ESH&Q Document Control

Form Revision Summary

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.
ESH&Q Division	Harry Fanning	04/11/18	04/11/21	1.5

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Task Hazard Analysis (THA) Worksheet

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

**Click
For Word**

Author:	Carlos Hernandez-Garcia	Date:	11/29/2018	Task #: If applicable	
Complete all information. Use as many sheets as necessary					
Task Title:	LERF Gun hot checkout and high voltage conditioning	Task Location:	LERF building 18		
Division:	Accelerator	Department:	Center for Injectors and Sources	Frequency of use:	As needed prior to LERF beam operations
Lead Worker:	Carlos Hernandez-Garcia				
Mitigation already in place: Standard Protecting Measures Work Control Documents	LERF shielded vault enclosure has a functional and certified PSS with Radiation and ODH Interlocks. Magenta beacons, RadCon and ODH signage are posted at each entry point. PSS state and access to the vault are controlled by MCC SSO. To energize the gun HVPS for high voltage conditioning described in the OSP associated with this THA, requires the PSS to be in Beam Permit. This THA analyzes the risks involved in performing gun high voltage conditioning with the LERF vault in Beam Permit to prevent generating unintentional electron beam.				

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)
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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	Consequence Level	Probability Level	Risk Code (before mitigation)	Proposed Mitigation (Required for Risk Code >2)	Safety Procedures/ Practices/Controls/Training	Risk Code (after mitigation)
	<p>During Gun HV conditioning, unintentional generation of field emission may lead to exposure to ionizing radiation.</p> <p>In addition, potential sources of light illuminating the photocathode may lead to unintentional electron beam generation.</p>	M	M	3	In addition to the mitigation already in place described above, a RadCon check list and an ATLis are required.	<p>The primary objective of the task is to ensure no personnel is present in the LERF beam enclosure during the execution of this task. Access to the LERF vault is controlled by the PSS. During the execution of the task, there is no access of personnel to the vault since the PSS will be in Beam Permit. To energize the gun, the LERF PSS is configured in such a way that requires to be placed in Beam Permit.</p> <p>The second objective of the task is to ensure there is no production of unintentional electron beam while the gun is energized. There are two sources of light that could potentially illuminate the photocathode during the task: a) the drive laser for generating electron beam during nominal operations, and b) the quantum efficiency (QE) laser for making a QE map during photocathode maintenance. Both lasers reach the photocathode through mirrors in the electron beamline downstream of the gun. There is a valve between the mirrors and the gun, VBVOF1. Locking close the gun valve VBVOF01 prevents any potential light from the drive laser and/or from the QE laser from reaching the photocathode</p>	1

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

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	Consequence Level	Probability Level	Risk Code (before mitigation)	Proposed Mitigation (Required for Risk Code >2)	Safety Procedures/ Practices/Controls/Training	Risk Code (after mitigation)

Highest Risk Code before Mitigation:

3

Highest Risk Code after Mitigation:

1

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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