


# Conduct of Operations

for the

## Isotope Production R&D at Jefferson Lab's High-Power Electron Accelerators

December 2019

APPROVALS			
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## 1. Preface

As part of its mission, Jefferson Lab provides the resources necessary for international collaborations of scientists to carry out basic research in nuclear physics and related disciplines. This research must be conducted in a manner that ensures environmental, safety and health (ES&H) concerns receive the highest consideration. At the same time, the programmatic goals of the lab require that it produce the highest quality physics results efficiently.

Guidance on how to balance thoughtful, measured ES&H concerns with efficient operation has been taken from the Director's Office, the Director's Safety Council, and the JLab ES&H Manual. A graded approach is followed in which the measures taken are matched to the scale, cost, complexity, and hazards of the operation.

The Conduct of Operations (COO) for Accelerator experiments outlines how the experiment collaboration will operate in a safe and effective manner during the time period that the "Isotope Production R&D at Jefferson Lab's High-Power Electron Accelerators" experiment (hereinafter referred to as the "Isotope Production Experiment") is on the floor. Installation periods are not covered by the Accelerator Experiment COO. This document is directed to experiment users, physics staff, and must be read, understood, and followed by all members of the collaboration.

## 2. Documentation

This experiment uses the standard LERF accelerator setup with the addition of a small target beamline (labelled as the 1X beamline) in the 2F region. All procedures to be used during the course of the experiment are contained in the following documents:

- The Accelerator Experiment Conduct of Operations (COO) for the Isotope Production Experiment
- Experiment Safety Assessment Document (ESAD) for the Isotope Production Experiment (referring to the base equipment as well as any experiment-specific changes)
- Radiation Safety Assessment Document (RSAD)
- Jefferson Lab Emergency Response Guidelines (ERG)
- The Experimental equipment description.
- Run plans
- Any required OSPs or RWPs.

The present document shall hereafter be referred to as the **COO**. The Experiment Safety Assessment Document shall hereafter be referred to as the **ESAD**. The Radiation Safety Assessment Document shall hereafter be referred to as the **RSAD**. **ALL THREE DOCUMENTS ARE REQUIRED READING FOR SHIFT PERSONNEL**. Each shift taker will sign-off to acknowledge they have read the documents and participated in a walk-through. Reference copies of these documents are available in the LERF control room for the duration of the experiment. The COO, ESAD, and RSAD may also be available on the web at an experiment-specific website.

A full description of the physics motivation for the experiments, collaboration lists, and general plans for carrying out an experiment can be found on the same web site:

<https://jeffersonlab.sharepoint.com/sites/IsotopeProductionDocuments/Shared%20Documents/Forms/AllItems.aspx?sortField=LinkFilename&isAscending=true&viewid=a8a029b1%2D57bc%2D431f%2D9e9e%2D4bc548f5e11d>

### 3. Shift Personnel Training

#### 3.1. General Training Requirements

All personnel on shift are required to be current in the following JLab safety training:

- ES&H Orientation (SAF100)
- Radiation Worker I Training (SAF801)
- Oxygen Deficiency Hazard Training (SAF103)
- LERF Safety Awareness Walk-Through (SAF143kd)

All experiment personnel are required to have radiation badges in their possession **at all times** in the LERF vault. The LERF Safety Awareness Walk-through will emphasize hazards that are typical of normal LERF operations. Hazards which are unique to the experimental setup are addressed in the appendices of this document. All shift personnel will be trained in the safety procedures to be followed for access to the LERF complex. This training will include a brief discussion of the purpose and operation of the Personnel Safety System (PSS) for the LERF vault.

Individuals participating in the experiment collaboration may be required to have other equipment or procedure-specific training. Training needs shall be determined by the experiment spokesperson in consultation with the LERF Hall Leader and Accelerator Division Safety Officer (DSO).

#### 3.2. Additional Training Requirements

Experiment personnel must familiarize themselves with the sections of the JLab ES&H Manual relevant for their work in the LERF vault. A reference copy of this document is available in the LERF control room. It is also available via <http://www.jlab.org/ehs/ehsmanual/index.html>

##### 3.2.1. Ladder Safety

Prior to using a ladder at Jefferson Lab, you are required to take [Ladder Safety Awareness \(SAF307\)](#). If your task requires you to wear a safety harness to work from a position other than between the ladder rails, you may be required to take [Personal Fall Protection \(SAF202\)](#) and site specific [Fall Protection \(SAF202B\)](#). Please see you sponsor or supervisor.

##### 3.2.2. Lead Safety

Prior to handling lead bricks, sheets, pellets or solder, you are required to take [Lead Worker Safety Awareness \(SAF136\)](#).

##### 3.2.3. Electrical Safety

Prior to working on electrical equipment, beyond just plugging it into 120 Volts or below, you are required to take [Electrical Safety Awareness \(SAF603A\)](#). This training is required so that you can make a proper hazard assessment of the electrical equipment you are working on and know the requirements for locking out a piece of equipment prior to working on it.

If the staff/user will be switching a circuit breaker, switching a motor control center, switching a disconnect/safety switch, or switching a main disconnect on Class 2 or Class 3 equipment (contact equipment owner if unsure of equipment classification), you are required to take [Switching of Electrical Equipment \(SAF603S\)](#). This training applies only to electrical equipment in a closed cover scenario. [Arc Flash: Live to Tell \(SAF603N1\)](#) and [Electrical Safety: Beware the Bite \(SAF603N2\)](#) is required for any activity beyond simple switching of equipment.

If the staff/user will be performing maintenance on electrical or mechanical equipment which cannot be physically and verifiably isolated from an energy source, they are required to take Lock, Tag, and Try (SAF104).

### 3.3. High School and Undergraduate Students

In addition to the above guidelines, JLab has special policies for high school and undergraduate students working in the LERF Vault:

- No one under 18 (student or otherwise) may work in the LERF Vault or LERF Labs where tasks require medical qualifications (exposure to acids, lasers, hearing loss, radiation, etc.).
- No high school student may work outside regular working hours.
- Undergraduates working outside regular working hours must be pre-approved by the Division Safety Officer
- Graduate school students are considered users

During their first three months, working in conjunction with JLab or the JLab User community, undergraduate students 18 and over are permitted to work in the LERF Vault (following all other aforementioned rules) **ONLY** under the supervision of a LERF authorized person (i.e. a buddy); that person may not be another undergraduate. A fully trained JLab staff member or member of the JLab User community must be cognizant of the work to be done and must approve the LERF authorized person that is supervising the undergraduate student. At the end of the 3-month “trial period”, undergraduates demonstrating that they are responsible and safety conscious are permitted to work in the LERF Vault under the same guidelines that apply to other users.

## 4. Organization and Administration

### 4.1. Experiment Organization

The operation of the experiment is directed by the Experiment Lead Scientist(s) and the LERF Hall Leader. The Isotope Production Experiment leadership structure is shown here:

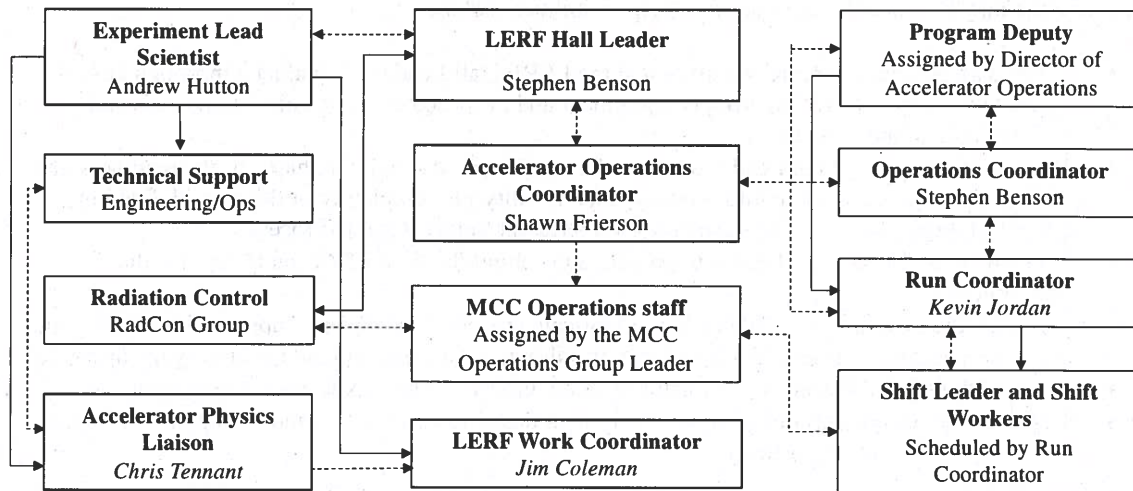


Figure 1: Functional Organization of the LERF Team. Dashed lines = information flow. Solid lines = responsibility. Personnel in italics are appointed by the Director of Accelerator Operations.

#### 4.2. LERF Program Manager/LERF Hall Leader

The LERF Program Manager/LERF Hall Leader coordinates with a variety of internal stakeholders and outside entities to ensure that the LERF facility best accommodates potential users and to ensure the operating program is well defined and supported with appropriate resources. Currently, the LERF Program Manager/Hall Leader is Steve Benson. Responsibilities include:

- Serve as the designated spokesman for the facility.
- Set high-level programmatic goals and priorities in consultation with JLab management and present those goals and priorities to the LERF Scheduling Committee.
- Work directly with the Lab Director to approve potential outside funded experiments.
- Meet with representatives of potential outside-funded experiments to determine if their requirements are in line with the capabilities of the facility and help move appropriate experiments through the approval and scheduling process. This includes working directly with the Experiment Lead Scientist to address all safety and technical requirements for the experiment.
- Contact the Radiation Control Group for special review of potential outside-funded experiments with requirements that fall outside the normal facility operating envelope. Examples of this type of experiment include fixed-target experiments that require energies above 20 MeV or isotope production.
- Verify all outside-funded experiments have completed the LERF Experiment Safety Review Process before scheduling beam time.
- Present the appropriate safety documents for potential experiments to the DSO before moving to the design phase of the Experiment Review Process.
- Maintain programmatic balance for the LERF by prioritizing activities and working with the various stakeholders.
- Maintain records for each experiment in an electronic database, including safety documentation such as the COO, ESAD, and LOSP as applicable.

#### 4.3. Experiment Lead Scientist

Each proposed LERF experiment is required to have an associated Experiment Lead Scientist, who supplies all experiment-specific information necessary for the design and safety review process. The Experiment Lead Scientist may be a non-JLab employee. Responsibilities include:

- Work with experiment representatives and the LERF Hall Leader to conduct a thorough design and safety analysis of all experiment equipment and proposed operating conditions, especially those unique to the experiment.
- Work with the LERF Hall Leader to guide the experiment through all phases of the readiness and safety review process; including primary responsibility for completion of the steps defined in [ES&H Manual Chapter 3130 Accelerator Experiment Safety Review Process](#).
- Work with the LERF Hall Leader to prepare and submit the final ESAD and COO for the experiment.
- Organize the experiment collaboration to fabricate any new experimental apparatus and develop the work control documents for reviewing, installing, commissioning, and operating the apparatus.
- Work with the LERF Work Coordinator to safely install any new experiment equipment.
- Organize the decommissioning of any equipment that is to be removed and arrange for removal at the conclusion of the experiment.

#### 4.4. CEBAF Program Deputy/LERF Run Coordinator

CEBAF Program Deputies (PD) and LERF Run Coordinators are staff appointed by the Director of Accelerator Operations to serve for a two-week period during beam operations within a facility. During his or her tenure, the PD/LERF Run Coordinator is responsible for all shifts of the operating facility program they are in charge of and is expected to communicate with each shift on a daily basis to direct the scheduled

program. The PD/LERF Run Coordinator keeps others informed of the program status by conducting/attending the CEBAF 0800 Daily Summary Meeting and commenting as appropriate; the LERF Run Coordinator also conducts the LERF 0830 Daily Summary Meeting. Detailed responsibilities are described in the respective Operation Directives for each accelerator facility ([AOD](#) or [LOD](#)). The Run Coordinator is also responsible for safe target retrieval in coordination with Radiation Control Group.

#### 4.5. LERF Operations Coordinator

The LERF Operations Coordinator organizes execution of the scheduled LERF program and addresses associated operational issues. This role requires a high level of familiarity with all aspects of the LERF program, including technical details of LERF accelerator operations and planned experiments. Detailed responsibilities are described in the LERF Operations Directives.

#### 4.6. Control Room Staff (Crew Chief and Operators)

LERF control room staff are trained as Crew Chiefs, LERF Operators, FEL Laser Operators, Assigned Radiation Monitors (ARMs), and Safety System Operators (SSOs). Control room staff also includes the physicists, engineers, experimenters, and others who operate the LERF controls to commission new hardware or software, diagnose problems, and perform specific experiments, test plans, or beam studies. All must comply with the directives specified herein, regardless of group or institutional affiliation.

LERF staffing requirements for normal operations are described in [LERF Operations Directives \(LOD\)](#). A listing of qualified staff is maintained on the MCC and LERF Information Bulletin Boards. The MCC Operations Group Leader posts this list of LERF-qualified Crew Chiefs, LERF Operators, ARMs, and SSOs. The LERF Laser System Supervisor posts a list of the qualified FEL Laser Operators on the LERF Information Bulletin Board. The LERF Hall Leader posts a list of those qualified as a LERF Scientist on Shift (LSOS) also on the LERF Information Bulletin Board.

In addition to the usual accelerator operations control room staff, an Accelerator Site Security Guard must also be present during beam operations. The Accelerator Site Security Guard is responsible for performing specific duties related to accelerator operations.

##### 4.6.1. Crew Chief

**NOTE:** Unless otherwise specified, the term Crew Chief is used throughout this document to refer to the on-duty Crew Chief. Under certain circumstances, staffing requirements may allow for the Crew Chief to be on-call, rather than on site.

The Crew Chief provides oversight responsibility for both the LERF and CEBAF accelerators. During LERF running, the Crew Chief determines which control room will be used for LERF operations (LERF or MCC) and assigns LERF Operator and LERF SSO responsibilities; The Crew Chief helps guide LERF program execution, even when the program is executed from the LERF Control Room. The chief is empowered to maximize utilization of available control room manpower, based on overall CEBAF and LERF program priorities. This includes redirecting the LERF Operator to perform duties that may be unrelated to LERF, but are in the best interest of the overall JLab program.

The Crew Chief On-Call role is described in the [Accelerator Operations Directives \(AOD\)](#). A summary of Crew Chief LERF-related responsibilities is listed in the [LOD](#); other Crew Chief responsibilities are listed in the [AOD](#).

##### 4.6.2. Crew Chief On-Call

A qualified Crew Chief is designated as the Crew Chief On-Call and is on duty 24 hours a day during the assigned period, when neither LERF nor CEBAF have a scheduled operations program (i.e., the

control rooms are not staffed). The Crew Chief On-Call can be contacted at all times via the Crew Chief cell phone (630-7050). An online schedule of on-call assignments is maintained at <http://opweb.acc.jlab.org/internal/OPS/batphonepss.html> and posted in the Guard House. Responsibilities are defined in the [AOD](#).

#### 4.6.3. LERF Operators

The LERF Operator controls and monitors LERF acceleration systems to deliver the beam required for scheduled and alternate LERF programs. The on-duty LERF Operator is supervised and directed by the Crew Chief. Based on overall JLab priorities or in case of emergency situations, the Crew Chief may redirect the LERF Operator to other non-related duties at any time; provided the LERF is first placed in a safe state of operation (Beam Off/Power Permit or lower).

LERF operations can be conducted from either the MCC Control Room or the LERF Control Room. When the Crew Chief is not available, the LERF Operator assumes a more prominent role for oversight of the program and control room staff. All LERF control system manipulations that could affect electron beam must take place in the presence of the LERF Operator (i.e., in the same control room), who can open channel access privileges to qualified staff as appropriate.

The LERF Operator cannot serve simultaneously as a CEBAF operator. When there is more than one LERF Operator on shift, the Crew Chief designates a lead operator. A summary of LERF Operator responsibilities is defined in the [LOD](#) while Accelerator Operator responsibilities are defined in the [AOD](#).

#### 4.6.4. LERF Hot-Standby Operator

The LERF Hot-Standby Operator is authorized to perform a limited subset of the regular duties of a LERF Operator during periods when the LERF PSS system state is Power Permit or lower. A LERF Hot-Standby Operator can simultaneously serve as a CEBAF Operator. Responsibilities are summarized in the [LOD](#) and in the [AOD](#).

### 4.7. Shift Leader

Each shift is led by a Shift Leader or by MCC Operations staff if the responsibility has been formally transferred to Operations staff. The selection of shift leaders is the responsibility of the Run Coordinator. The Shift Leader has the following responsibilities:

- to carry out the scientific program planned for the shift in a safe and efficient manner.
- to ensure that the logbook contains a complete and accurate description of the events and actions which occurred during the shift.
- to serve as primary contact with the machine control center (MCC) personnel.
- to see that experimental equipment is operated properly.
- to ensure that equipment malfunctions are properly labeled and locked out if necessary and to communicate this to shift personnel and subsystem experts.
- to ensure that in any emergency situation the Run Coordinator and Hall Leader are notified immediately.
- to notify the Run Coordinator and the Hall Leader, if the experiment is down due to equipment failure for more than four hours. The Shift Leader has the following authority:
  - to assign tasks to the shift members as needed.
  - to request that the state of the LERF vault be changed.
  - to limit the number of people in the LERF control room if required to effectively and safely carry out the experiment.



#### 4.7.1. Shift Member

The responsibilities of each shift member are to:

- carry out the scientific goals of the shift in a safe and efficient manner under direction of the shift leader.
- read the logbook to be aware of changes in goals, operating parameters, and new documentation.
- monitor the equipment for problems.
- maintain adequate records of the progress of the shift.
- be present before the start of each shift and coordinate current operating conditions with the previous shift.
- keep all training up-to-date.

#### 4.8. Technical Support

##### 4.8.1. LERF Work Coordinator

Responsibilities include:

- Act as the single point of contact for all work in the LERF.
- Determine if scheduled activities can be safely accomplished. Coordinate these activities with Physics and Accelerator Division Liaisons and the Run Coordinator. Upload tasks into the [work task lists](#).
- Ensure workers are properly trained, familiar with all significant hazards, and aware of all applicable work control documents associated with the project.
- Coordinate with Physics and Accelerator Division Liaisons to ensure the LERF apparatus is in safe mode (e.g., turn OFF unused magnets, install protective shields as needed, fulfill specific requirements in the ESAD, etc.) before authorizing transition to Restricted Access.

##### 4.8.2. LERF Geographic Integrator

The LERF Geographic Integrator helps coordinate system integration and readiness to meet the scheduled program. The Engineering Liaison serves as the primary communication point for the LERF Geographic Integrator. Detailed responsibilities are described in the [LOD](#).

##### 4.8.3. System Owners

System Owners oversee all aspects of a LERF system (e.g., SRF, RF, magnets, BPMs) to assure system performance in support of the scheduled program. Detailed responsibilities are described in the [LOD](#).

#### 4.9. LERF Accelerator-Physics Experiment Liaison (APEL)

The Accelerator Physicists Experiment Liaison serves as the primary contact on LERF beam physics issues for the Physics, Accelerator and Engineering Divisions. The LERF Accelerator-Physics Experiment Liaison (APEL) is an accelerator scientist appointed by the Director of Accelerator Operations to serve as a liaison for the LERF program. This liaison owns the process of establishing physics quality beam to the experiment including developing beam optics configurations capable of meeting the experiments requirements, identifying tools needed to diagnose, monitor and verify beam performance during the experiment as well as developing beam startup, setup and commissioning plans. Detailed responsibilities are described in the [LOD](#).

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#### 4.10. Accelerator Operations Liaison

The LERF has an Accelerator Operator assigned as a LERF to Operations Liaison. The Operations Liaison helps facilitate information exchange between experimenters and the MCC Operations Group, both in advance of and during the experiments. The Operations Liaison is responsible for ensuring experiment-specific information, procedures and requirements are available to all other operators and Crew Chiefs so that beam delivery can proceed efficiently.

An Accelerator Operator or Crew Chief is assigned as the Operations Liaison in order to serve as a link between experimenters and the Operations Group. Responsibilities include:

- Help facilitate information exchange between the LERF organization and the MCC Operations Group, both in advance of and during actual experiments.
- Remain engaged with the LERF organization, attend planning meetings, and proactively search for experiment-specific information to forward to the MCC Operations Group.
- Maintain and update LERF experiment-specific binders before the start of each experiment. Identical binders are located in the MCC (original documents) and the LERF control room (document copies).

#### 4.11. Engineering Liaison

Each experiment conducted at JLab will be evaluated to determine if its complexity requires facilitation with the Engineering Division to help ensure a successful outcome. Experiments that require facilitation will be assigned an individual from the Engineering Division to act as liaison between the Division and the associated Experimental and Physics Division staff. The liaison acts as a single point contact in order to facilitate information exchange between the experimenters and those in the Engineering Division responsible for systems requirements, design, scheduling, fabrication, installation, testing, documentation, and budgeting. The liaison is aware of all work conducted by Engineering for the experiment and ensures the appropriate resources are defined and allocated. Any issues and/or concerns are identified, documented, and tracked. For the current run period, the review found that no such liaison was required.

### 5. Operating Procedures

#### 5.1. Shift Routines

There are two types of shifts for active LERF experiments. **Operating Shifts** are the normal status when beam is being set up or being used to irradiate targets. **Standby Shifts** are periods when the target isotopes are decaying prior to retrieval, and require continuous monitoring. Standby status may result from normal operational planning (e.g. a target cooling period) or from abnormal conditions such as a major down time due to equipment failure. The staffing requirements are defined in the Accelerator Safety Envelope and the [LOD](#)

##### 5.1.1. Operating Shifts

Full-time occupation of the LERF or MCC Control Rooms and associated areas will be maintained by at least two authorized persons during each 8 hour shift as defined in the Accelerator Safety Envelope and the [LOD](#).

One person per shift is designated as the Shift Leader. The number of persons assigned to a shift will depend on the tasks assigned during the shift but at least one LERF Operator shall be in attendance. A shift schedule will be posted in the LERF Control Room listing the times and names of personnel on shift and identifying the Shift Leader and LERF Run Coordinator. The Shift Leader can be reached at the LERF Control Room at 269-6662. The shift schedule is available at <http://lerfboard.acc.jlab.org/>. The LERF Run Coordinator may also designate and supervise other teams for duties such as offline

analysis. The Run Coordinator's phone number will be posted in the LERF Control Room, MCC and the electronic logbook.

#### **5.1.2. Standby Shifts**

During Standby shifts, standby shift personnel are not required to be on site at JLab, but must be available through telephone contact to come in if needed.

When the LERF is in an operable state as defined in the ASE, minimum staffing is required. The LERF has a LERF Hot Standby Operator which can continuously monitor systems in the LERF from the MCC Control Room while the LERF is in Power Permit. This allows for systems such as RF or magnets, to be left in an ON state, but the machine is rendered incapable of delivering beam before the Hot Standby Operator takes over. Monitoring the target system can require the presence of a Target Operator on site at JLab during a standby shift. The Target Operator then also acts as Shift Leader.

The LERF Run Coordinator will ensure the shift checklist is executed at least once every 24 hours.

#### **5.1.3. Operations Turnover**

The electronic log book (LERFLOG) is a very effective means of remotely obtaining information about experimental operations. Experimenters can log in remotely and view all logbook entries prior to commencing their shift. Information which has been recorded in a paper logbook should be scanned, entered into the electronic logbook, and communicated between incoming and outgoing shift personnel.

Efficient and effective shift changeovers during experiment operation are enhanced by overlapping shifts. There are two standard shift-turnover (passdown) meetings for the Accelerator and LERF Operations crews: one for Crew Chiefs and one for operators. The shift-turnover meetings are held at the end of each shift so that the off-going control room crew can transfer information to the oncoming control room crew. Formal transfer of operator or Crew Chief responsibility takes place at the conclusion of the respective shift-turnover meeting, not when an operator or Crew Chief stamps in. The Operations shift-turnover meetings are held in the control room and usually last less than fifteen minutes. Attendance by anyone other than the members of the two affected shifts, the Program Deputy, and Operations Department leadership is discouraged.

Efficient and effective shift changeovers during experiment operation are enhanced by overlapping shifts. Whenever possible, shift leaders and workers are scheduled in shifts that are staggered by four hours, leading to an overlap of half a shift. If this is not the case, shift members must show up ten minutes prior to shift start and plan to stay ten minutes after for the purpose of information exchange to those taking over the same tasks. In all cases, incoming shift leaders must discuss the experiment and LERF status with the outgoing shift leaders.

The shift-turnover meeting shall not be interrupted by telephone calls, pages, or by anyone outside the experiment or operations staff, except when the safety of personnel or the integrity of the facility are in jeopardy.

#### **5.1.4. Timely Orders to Operators**

The initial run plan is the responsibility of the LERF Run Coordinator and shall be clearly recorded in the logbook. This plan specifies the tasks to be performed in the next 48 - 72 hours; including any special conditions or data runs, updated documentation and its location and/or alternate plans. Any changes to the run plan shall be recorded in the logbook and the white board in the LERF Break Room.

### 5.1.5. Operator Aid Postings

The day-to-day schedule, contact instructions for key personnel, and any other information relevant to current activities are located on the white board in the LERF Break Room. Shift personnel should consult the white board, especially at the beginning of their shift, to be aware of any updates to current running conditions.

Information pertaining to daily activities in the LERF must be posted on the bulletin board or written on the white board in the LERF break room.

## 5.2. Access to the Isotope Production Experiment within the LERF Vault

Work in designated radiation areas will be carried out in accordance with the [JLab RadCon Manual](#) as detailed in a Radiation Work Permit. No material may be removed from the LERF Vault after beam delivery without proper approval from the [Radiation Control Group](#). During target cool-down, no one is allowed in the LERF Vault without being accompanied or informing shift personnel and checking in on a regular basis. No-one may open the shielding around the target without a Radiation Control Group monitor present.

During a running experiment, the LERF vault will normally be in Beam Permit. When temporary access to the LERF Vault is needed, the Shift Leader can ask the MCC to bring the LERF Vault to Controlled Access. If long-term access to the LERF Vault is required, the Shift Leader may request the LERF vault be brought to Restricted Access.

Restricted Access is a state where delivery of beam and/or RF power is not permitted, and entry to and exit from the LERF vault is not controlled by the Personnel Safety System. This is the normal state of the LERF vault when the accelerator is off. Access is “restricted” only in the sense that the LERF vault is not open to the general public. Well-defined checklist procedures are to be followed whenever the vault is brought to and from Restricted Access.

Restricted Access is the period when all major work must be completed in the LERF Vault. All activities require advanced planning and must be scheduled for resources and safe operation. In order to streamline activities in the LERF vault and ensure everyone has ready access to the current status and requirements for work, there are two important resources:

- Single point of contact, which is the “LERF Work Coordinator”
- The ATLis system is used to plan and review the safety of all work in the LERF vault.

Approving ATLis tasks is the responsibility of the LERF Work Coordinator.

## 5.3. Collaboration Request for Laboratory Resources

Some requests may require that an OSP or TOSP be developed. Major, abnormal, or unanticipated configuration modifications such as stacking or movement of significant shielding, unanticipated vacuum work, unanticipated beam line modifications, the replacement target diagnostic, etc., require approval of the LERF Program Manager/LERF Hall Leader, Steve Benson, and the use of appropriate personnel. The LERF Hall Leader may require that an RWP, OSP or TOSP be prepared.

## 5.4. Scheduling of Work by Outside Groups

Work in the LERF vault that is to be performed by groups outside the collaboration such as survey and alignment, plant services, air conditioning, etc., must be scheduled so that it does not endanger personnel or equipment or interfere with the experiment. Non-emergency activities by these groups should be scheduled to coincide with planned accelerator maintenance periods. To maximize efficiency, the LERF Run

Coordinator (representing the collaboration) and the LERF Work Coordinator (representing the Isotope Production experiment) will concur on work scheduling. The LERF Work Coordinator's job is to coordinate activities in the LERF complex so that work can take place smoothly and safely and to ensure that multiple activities do not interfere. The LERF Work Coordinator and the LERF Run Coordinator will meet as needed to plan the work scheduled for the upcoming maintenance period. The product of this meeting will be a list of work in the LERF complex, the required access state of the hall (Controlled or Restricted), appropriate work control documents, and educational or other safety measures (such as escorts) that are needed. The ATLAS should be used for coordinating the cross-divisional work activities <http://www.jlab.org/listsites/>. Configuration changes as outlined above can affect site boundary dose and the production of airborne radioactivity. They require consulting with RadCon or ES&H personnel as appropriate.

### **5.5. Control of Equipment and System Status**

The isotope target assembly is described in the Jlab Isotope Production Target Manual. The manual described the loading of the gallium in the target crucible, the procedure for draining the possibly radioactive water from the cooling lines, and the flow and temperature signals that must be monitored during a run. There are 12 temperature signals and 4 flow signals that must be monitored in EPICs. The 4 flows are also interlocked so that loss of any of the four flows (the target, the radiator, the window, and the nitrogen flush) fails, the allowed beam mode must drop to tune more or less. Temperatures has alarm set-points. If the operator or shift member notices that an alarm has tripped, they must inform the Run Coordinator by phone. The Run Coordinator must determine, in consultation with any relevant SMEs, the best course of action in dealing with the alarm.

The only control in the target assembly is the rear wall retraction mechanism. This allows The Radiation Control group to access the target to retrieve the crucible and unload the gallium. After a run has started, only The Radiation Control group has the authority to move the rear wall. After the gallium is retrieved, the back wall should be locked close with a The Radiation Control group lock if a RadCon technician is not available to monitor it.

### **5.6. Equipment Labeling**

The experiment and Isotope Production experiment equipment shall be properly labeled so it can be quickly identified by both shift and maintenance personnel. Proper labeling helps prevent incorrect operation or modification of equipment by non-experts and facilitates proper and efficient operation by qualified personnel. Labeling also increases the likelihood that proper procedures will be followed in case of emergency. Improper labels should be corrected immediately if possible. Otherwise, the Shift Leader should be notified so that correct labeling can be requested from the qualified expert.

### **5.7. Independent Verification**

The LERF Run Coordinator will provide the shift crew with a set of measures for checking the quality of the experimental data. The up-to-date Isotope Production shift checklist (and instructions) shall be made available to shift personnel at LERF-specific sites on the data acquisition computers. The checklist will be completed at least once per shift during operating shifts and once per day during standby shifts. Additional items may be added to the list by the LERF Run Coordinator or subsystem experts. The LERF Work Coordinator provides more general checklists for closing the LERF vault.

### **5.8. Logkeeping**

Shift personnel will update the electronic logbook, which serves as the record of the experiment. The quality of the information recorded in the logbook determines the utility of the data. All data recorded electronically will be referenced in the computer logbook with the appropriate run number and run

information. All relevant activities are to be recorded, including all changes of experiment conditions and equipment failures.

Checklists performed using Isotope Production specific forms should also be scanned into the computer logbook when completed. The completed paper forms should be stored in a binder in the counting house. All deviations from normal operating parameters shall be recorded in the logbook.

The computer logbook will also serve as the primary reference for the determination of the operational efficiency of the experimental apparatus in the vault. As such, it is essential that it provide an accurate record of the capability of the equipment to carry out the intended research program. The computer logbook is the place of record for all safety issues and introductions of new or updated documentation and procedures.

**Appendix A – Special Procedures for LERF Experiment**

**The only special operating procedure is the RWP for target retrieval.**

## Appendix B – Special Procedures for Base Equipment Commissioning

Each shift requires a shift leader and a shift worker, which are assigned according to the Isotope Production shift policy. The safe operation of the “standard” LERF equipment is described in the LERF shift documentation and/or Operation Safety Procedures (OSPs). Additional experts may be required to operate or monitor the operation of the specialized equipment.



## Appendix C – Signature Sheet

After reading this document, as well as the ESAD, RSAD, and ERG for this experiment, workers need to sign the signature sheet located in the "yellow binder" of the experiment specific documents. This binder can be found in the LERF Control Room and in the MCC Control Room.

