

Conduct of Operations for Hall C  
Experiment E01-011 (HKS) & E02-017 (LIFETIME) -  
May 20, 2005

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# 1 Preface

As part of its mission, JLab 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 that environmental, health and safety (EH&S) concerns receive the highest consideration. At the same time the programmatic goals of the laboratory require that it produce the highest quality physics results efficiently.

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

**This document outlines how approved experiment collaborations will conduct operations in a safe and effective manner during the time period that experiment E01-011 (HKS) & E02-017 (LIFETIME) is on the floor. Installation and commissioning periods are not covered by this document. Furthermore, this document is directed to physics users and physics staff rather than the Hall C technical staff. It must be read, understood, and followed by all members of the collaboration.**

# 2 Documentation

This experiment uses part of the standard Hall C equipment and the specially installed equipment required by the experiment. All of the procedures to be used during the course of the experiment are contained in the following documents:<sup>1</sup>

- The Conduct of Operations for JLab Experiments (COO), the document you are now reading.
- Experiment Safety Assessment Document (ESAD) for E01-011 (HKS) & E02-017 (LIFETIME) (referring to the base equipment as well as any experiment-specific changes)
- Radiation Safety Assessment Document (RSAD)
- Hall C Experimental Equipment Operations Manual (EEOM)
- E01-011 (HKS) Special Equipment Operations Manual (HKS SEOM)
- E02-017 (LIFETIME) Special Equipment Operations Manual (LIFETIME SEOM)
- Personnel Allowed to Operate Hall C Equipment

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<sup>1</sup>The process is documented at [http://www.jlab.org/user\\_resources/PFX/](http://www.jlab.org/user_resources/PFX/).

- JLab Emergency Response Plan

Reference copies of these documents will be available in the Counting House for the duration of the experiment. The present document shall hereafter be referred to as the COO. The Experiment Safety Assessment Document shall hereafter be referred to as the ESAD, and the Radiation Safety Assessment Document shall be referred to as the RSAD. The ESAD and COO may also be available on the WWW at an experiment-specific web site. **The COO, the ESAD and the RSAD are required reading for shift personnel.**

A full description of the physics motivation for the experiment, collaboration list, and the general plan for carrying out the experiment can be found in the proposal(s) to the JLab Program Advisory Committee (PAC).

### 3 Shift Personnel Training

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

- EH&S Orientation (SAF 100)
- Radiation Worker Training (SAF 801)
- Oxygen Deficiency Hazard Training (SAF 103)
- Hall C Safety Awareness Walk-Through ( SAF111 )
- Conduct of Operations ( SAF122 )

All experiment personnel are required to have radiation badges in their possession during their shifts. The Safety Awareness Walk-Through will emphasize any hazards that are peculiar to the current experimental setup. In addition, all shift personnel will be trained in the safety procedures to be followed for access to the Hall. This training will include a brief discussion of the purpose and operation of the Personnel Safety System (PSS) for the Hall. Individuals within the collaboration may be required to have other, equipment or procedure-specific training. The need for such training shall be determined by the experiment spokesperson in consultation with the Hall Leader and Physics Division EH&S personnel.

In addition, experiment personnel must familiarize themselves with the sections of the JLab EH&S Manual relevant for their work in the Hall. A reference copy of this document is available in the main hallway of the Counting House. It is also available via <http://www.jlab.org/ehs/manual/EHSbook.html>

Finally, JLab Lock and Tag<sup>2</sup> training is required for all staff/users who will be performing maintenance on electrical and mechanical equipment which cannot be physically and verifiably isolated from an energy source.

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<sup>2</sup>The EH&S Manual provides Lockout/Tagout information in Chapter 6110.

## 4 Organization and Administration

The operation of the experiment is directed by the Spokespersons and the Hall Leader, Rolf Ent. An organization chart for the experiment is found in Figure 1.

### 4.1 Run Coordinator

The Run Coordinator is the immediate on-site manager of the experiment and is responsible for ensuring that the physics goals of the experiment are met. This individual is designated by the experiment spokespersons and approved by the Hall Leader. The Run Coordinator shall ensure that the Hall Group Leader, Physics Division Liaison, and at least one Spokesperson are aware of all pertinent issues. The Run Coordinator shall promote an environment in which the highest safety standards are maintained. The functions of the Run Coordinator are:

I. To manage daily operation of the experiment:

- to ensure that the run plan is clear to the shift workers.
- to define the data quality appropriate for the goals of each shift.
- to track the progress of the experiment.
- to coordinate and schedule activities (e.g., Hall accesses) in order to optimize productivity.
- to ensure that an experiment checklist is completed every 24 hrs during standby shifts.
- together with the Physics Division Liaison, to ensure that the counting house is manned appropriately: i.e., sufficient personnel are present to safely carry out the experimental program or monitor the apparatus as needed.

II. To coordinate interactions between Jlab and the experiment. This entails:

- informing the Program Deputy of the experiment's status and plans at a 7:45 AM meeting in the MCC during the working week, and at an agreed upon time on weekends or holidays.
- representing the collaboration at the 8:00 AM meetings in the MCC during the work week.
- attending the 1:30 PM Wednesday scheduling meeting in the MCC conference room to represent the collaboration and to present a report on the proceeding week.

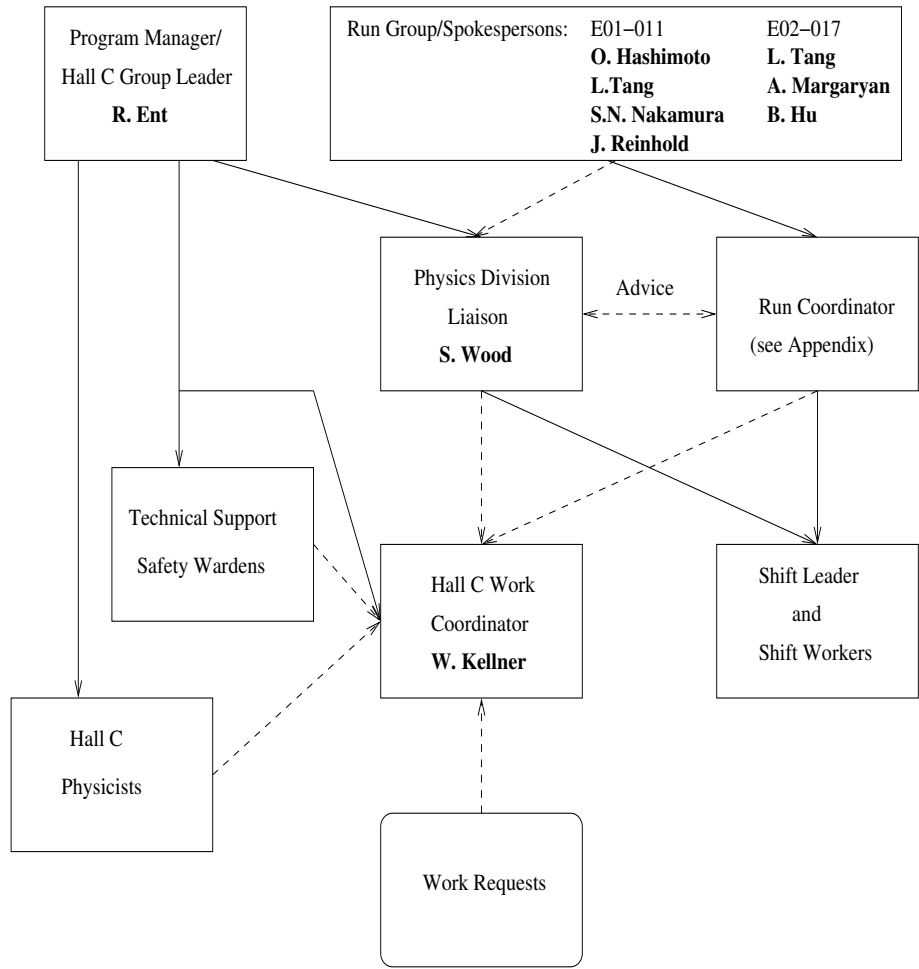


Figure 1: Functional Organization of the Hall C Team. Dashed lines indicate information flow, solid lines indicate responsibility.

- remaining in the local area and being available by cell-phone/pager at all times. (If temporarily unavailable the Run Coordinator must designate another qualified collaborator as a replacement.)
- in conjunction with the Hall Work Coordinator, scheduling work by groups outside the collaboration.
- interact with the Accelerator Program Deputy to plan and conduct unscheduled activities.

III. To submit a written report to the Hall Leader which includes run time statistics and a description of any significant problems with the Hall instrumentation.

## 4.2 Physics Division Liaison

Broadly speaking, the Physics Division Liaison to the experiment is a Hall C staff member selected by Rolf Ent to oversee the hall's interests with respect to personnel and equipment protection.<sup>3</sup> This is true for all three halls. However, the role of the Physics Division Liaison may include other responsibilities depending upon the experiment and other factors. His/her responsibilities include:

- Oversee that proper rules of safety are carefully followed in the conduct of the experiment.
- Approve a Hall status change to Restricted Access in coordination with the Hall Work Coordinator.
- Training verification of shift workers.
- Together with the Run Coordinator, ensure that the counting house is manned appropriately: i.e., sufficient personnel are present to safely carry out the experimental program or babysit the apparatus as needed.

## 4.3 Hall Work Coordinator

The Hall Work Coordinator's responsibilities are:

- to act as the **single point of contact for all work in the hall.**
- to determine if the scheduled activities in the hall can be done safely. These activities shall be coordinated with the Physics Division Liaison and the Run Coordinator.

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<sup>3</sup>The responsibilities described here correspond to those of the Physics Division Liaison during the operating phase of the experiment as outlined in the EH&S Manual Chapter 3120/Glossary.

- to ensure that workers are properly trained, are familiar with all significant hazards, and are aware of all applicable work control documents associated with the project.
- in coordination with the Physics Division Liaison, ensure that the hall apparatus is made safe before giving permission to make a transition to Restricted Access (e.g., turn off unused magnets, install protective shields as needed, fulfill specific requirements in the ESAD, etc.).

#### 4.4 Shift Leader

Each shift is led by a Shift Leader. The selection of shift leaders is the responsibility of the Run Coordinator and Physics Division Liaison. 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 between the machine control center (MCC) and experiment personnel.
- to oversee that hall equipment is operated properly.
- to ensure the shift checklist is performed every eight hours on operating shifts.
- to ensure that equipment malfunctions are properly labeled and locked-out if necessary and to communicate this to shift personnel and subsystem experts.
- to note in the logbook when workers from outside groups (such as survey and alignment) stop by the counting house before entering the hall when in Controlled Access. Furthermore, to confirm that these workers have communicated with the Run Coordinator and the Hall Work Coordinator.
- to coordinate the response of the shift crew to any emergency situation, including the notification of appropriate individuals as outlined in the JLab Emergency Response Plan.
- to ensure that in any emergency situation the experiment Physics Division Liaison, Run Coordinator, and Hall Leader are notified immediately.
- to notify the Run Coordinator and the Hall Leader, if the hall 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 hall be changed (Request for a change to Restricted Access must be approved by the Physics Division Liaison.)
- to limit the number of people in the Counting House or hall if required to effectively and safely carry out the experiment.
- to limit access to hall on-line computers if required to effectively and safely carry out the experiment.
- to authorize qualified personnel to make modifications in the experiment configuration within the allowed parameters, as specified in the EEOM.
- to authorize time accounting for the shift.

## 4.5 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.

# 5 Operating Procedures

## 5.1 Shift Routines

There are two types of shifts for active hall experiments: Operating and Standby. Operating shifts are the normal status when beam is available for the experiment. Standby shifts are periods designated by the Run Coordinator when beam is not available or not in use in the hall and none of the equipment, except for the target, requires continuous monitoring. Standby status may result from normal operational planning or from abnormal conditions such as a major down time due to equipment failure.



### **5.1.1 Operating Shifts**

During operating shifts, 24 hour occupation of the counting house area will be maintained by crews of at least two persons <sup>4</sup> in 8 hour shifts. 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. A shift schedule will be posted in the Counting House listing the times and names of personnel on shift and identifying the Shift Leader and Run Coordinator. The shift schedule may be available at an experiment-specific website. The Run Coordinator may also designate and supervise other teams for duties such as offline analysis.

### **5.1.2 Standby Shifts**

During Standby shifts, shift personnel are not required to be on site at JLab but must be available through telephone contact to come in if they are needed. Monitoring the target system can require the presence of a Target Operator during a standby shift. The Target Operator then also acts as Shift Leader. The Run Coordinator will ensure that the shift checklist is executed at least once every 24 hours.

### **5.1.3 Operations Turnover**

The electronic log book, accessible from the web, is a very effective means of remotely obtaining information about experimental operations. This allows experimenters to log in remotely and view all log book entries prior to commencing their shift. Information which can only be recorded in the paper log book, should be noted accordingly and communicated between incoming and outgoing shift personnel directly.

Efficient and effective shift changeovers during experiment operation are enhanced by overlapping shifts. Therefore, whenever possible, shift leaders and workers are scheduled in shifts that are staggered by four hours, leading to an overlap of half a shift.

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

The initial run plan is the responsibility of the Run Coordinator and shall be clearly recorded in the log book. 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 log book and the white board in the counting house.

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<sup>4</sup>The readiness review committee may require more personnel depending on the complexity of the experiment. Two people are the minimum required for safe operations.

### 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 Counting House. 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 activities in Hall C must be posted on the bulletin board or written on the white board at the entrance to the hall.

## 5.2 Hall Access

Access to the hall will be governed by the JLab Beam Containment Policy<sup>5</sup>, and work in designated radiation areas will be carried out in accordance with the JLab RadCon Manual. In particular, no material may be removed from the hall after beam delivery without proper approval from the RadCon Group.<sup>6</sup> During operations, no one is allowed in the hall without either being accompanied, or informing shift personnel and checking in on a regular basis.

During a running experiment the hall will normally be in Beam Permit. When temporary access to the hall is needed the Shift Leader can ask the MCC to bring the hall to Controlled Access. If long term access to the hall is required, the Shift Leader may request the hall be brought to Restricted Access. Such a request requires prior approval from the Physics Division Liaison, while the actual transition will be supervised by the Hall Work Coordinator.

Restricted Access is a state where delivery of beam and/or RF power is not permitted, and entry to and exit from the hall is not controlled by the Personnel Safety System. This is the normal state of the hall when the accelerator is off and no experiments are running. Access is “restricted” only in the sense that the hall is not open to the general public. Well-defined check-list procedures are to be followed whenever the hall is brought to and from Restricted Access.

Restricted Access is the period when all major work must be completed in the hall. Consequently, all activities require advanced planning and must be scheduled for resources and safe operation. In order to streamline the activities in the hall 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 “Hall Work Coordinator”
- Information board at the entrance to the hall

All work must be scheduled through the Hall Work Coordinator. The content on the information board is the responsibility of the hall safety wardens and the Hall Work Coordinator. The information board will contain all critical information required for safe entry into the hall. This information will include

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<sup>5</sup>EH&S Manual, Appendix 6310-T2.

<sup>6</sup>For Hall B, approval is only required for equipment along the beamline. For Hall A, approval is not required for equipment inside the detector shielding huts.

a succinct, one page safety summary covering the hall's current safety hazards and mitigating measures (to be read by all persons working in the hall), active Operational Safety Procedures (OSPs) and Temporary Operational Safety Procedures (TOSPs), required temporary work permits (e.g., Radiation Work Permits), current activities in the hall, points of contact, and required training and safety equipment.

### 5.3 Collaboration Request for Laboratory Resources

The collaboration may request additional services from Accelerator Division through the Accelerator Division Liaison, Hari Areti. Alternatively, the collaboration may also request additional services from hall personnel through the Physics Division Liaison, Steve Wood. These requests should be noted in the logbook. Some requests may require that an SOP, 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 of a wire chamber, etc., require approval of the Hall C Leader, Rolf Ent <sup>7</sup>, and the use of appropriate personnel. The Hall Leader may require that a SOP, OSP, or TOSP be prepared.

### 5.4 Scheduling of Work by Outside Groups

Work in the hall 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 the planned accelerator maintenance periods. To maximize efficiency, the Run Coordinator (representing the collaboration) and the Hall Work Coordinator (representing Hall C) will concur on work scheduling. The Hall Work Coordinator's job is to coordinate activities in the hall so that work can take place smoothly and safely and to insure that multiple activities do not interfere.

The Work Coordinator and the 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 hall, 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.

### 5.5 Control of Equipment and System Status

The operation of the experimental equipment is documented in the Hall C Experimental Equipment Operations Manual and HKS & LIFETIME Special Equipment Operations Manuals. These documents include information on the

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<sup>7</sup>Configuration changes as outlined above can affect site boundary dose and the production of airborne radioactivity. They require consulting with RadCon or EH&S personnel, as appropriate.

normal response to alarms and equipment malfunctions. Supplementary information specific to experiment E01-011 (HKS) & E02-017 (LIFETIME) may be found in the ESAD.

The document “Personnel Allowed to Operate Hall C Equipment” lists the authorized subsystem experts. A similar list will be available for the non-standard equipment. These lists may be amended as necessary to reflect personnel and training changes with the signed authorization of the subsystem expert. A copy of these amendments will be attached to the main documents and kept in the Counting House.

All general equipment installation, maintenance, and testing activities are to be carried out in accordance with the JLab EH&S Manual.

### **5.5.1 Equipment and Piping Labeling**

The experiment and hall 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.

## **5.6 Independent Verification**

The Run Coordinator will provide the shift crew with a set of measures for checking the quality of the experimental data. The up-to-date Hall C shift checklist (and instructions) shall be made available to shift personnel at hall-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 Run Coordinator or subsystem experts.

The Hall C Experimental Equipment Operations Manual provides more general check lists for closing the experimental Hall and conditions when the Hall is used as an accelerator dump.

## **5.7 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 Hall C-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 Hall. As such it is essential that it provide an accurate record of the capability of the equipment to carry out the intended research program. Finally, the computer logbook is the place of record for all safety issues and introductions of new or updated documentation and procedures.

## A Special Procedures for Hall C

### A.1 Badge Reader Physical Access Control

General physical access to Hall C is restricted by a full time badge reader system. The badge reader limits non-emergency hall access to those individuals on the approved access lists. The Hall Leader maintains the data base, with input from the Physics Division Liaison, the experiment run coordinator, the Hall C work coordinator, the Hall C safety warden, and physics division safety personnel. As a part of the general access control the Physics Division Liaison working with the collaboration management will collect names of those who state by signature that they have read and understood the COO and ESAD.

The badge reader based security system is in addition to the engineering and administrative controls discussed previously. Specifically, to gain physical access to the hall requires the logical .AND. of all engineering based access control systems. If the hall is in a "Restricted Access" or lesser state the maglock will release after a valid badge is scanned by the badge reader. Each individual must scan his/her badge separately and all entries and exits are logged. Badges and access privileges are assigned to individuals. Letting individual(s) into the hall via a badge not assigned to them will be treated as the circumvention of a laboratory safety system. Arrangements will be made to have one guest badge available which can be used to escort one fully-trained Hall C Staff member or experimental collaborator into Hall C, who has lost or not yet received his/her badge. Exceptions include formal prearranged and approved guided tours or escorting of a visitor who has a RADCON issued dosimeter.

If the hall is in "Controlled Access" those seeking entry must also request access with MCC (generally by the phone near the door) simultaneously with the badge scanning to unlock the outer Hall C personnel door. The MCC cannot override the badge reader's data base and a valid badge does not guarantee that the MCC will allow entry into Hall C. The badge reader's data base of authorized individuals is not static and may be modified as appropriate for the activities underway in the hall at that time.

### A.2 Pivot Area Access

The pivot area and access to it is restricted to those individuals on the pivot area work Operating Safety Procedures (OSP) authorized list. This applies at all times including during controlled access entries. The list will be kept to those with critical skills with a real need to access the pivot area. The access name list "gate keeper" is Paul Brindza (Hall C Engineer). All access to and work on the pivot area must be performed in accordance with the pivot area work OSP.

## B Special Procedures for E01-011 (HKS) & E02-017 (LIFETIME)

The experiments E01-011 (HKS) & E02-017 (LIFETIME) are major installation experiments which will install and operate a pair of specialized non-standard spectrometer systems. In addition, experiment E02-017 (LIFETIME) will employ another target/detector device just in front of the HKS target chamber. A detailed list of the involved equipment and safety issues are given in the experiment specific ESAD. All the E01-011 and E02-017 collaborators who will take part of these experiments must read this document before working on or operate the HKS and LIFETIME devices. Spokespersons and Run Coordinator are responsible to ensure this procedure.

The HKS Special Equipment Operations Manual (HNSS SEOM) and LIFETIME Special Equipment Operations Manual (LIFETIME SEOM) are documents providing the detailed operational procedures and responsible persons for the specialized HKS and LIFETIME devices and monitoring systems. One responsible person for each device must stay in the area and be reachable by phone or pager throughout the experiment. The name and phone number of such person must be provided on the white board in the Counting House. Changes to operational procedures or device configurations must be made through the responsible person and communicated to and approved by the Run Coordinator and Spokespersons. Configuration changes requiring hall access during the experiment must follow the procedures outlined in the previous sections to ensure that it will be carried out safely, efficiently, and timely.

The HKS target chamber is more than 2 meters downstream of the regular Hall C target pivot area mentioned in the previous chapter and has its own access platform. The HKS experiment will change targets on the ladder at least one time during the experiment. The procedure is outlined in the HKS SEOM. This work will take place on the HKS target access area and involve handling activated or contaminated target materials after a period of beam on target operation. **This work has to be performed in consultation with RadCon and may require a special RWP.** Only designated persons are authorized to perform this work on the access area. Radworker II training may be required for these persons. The names of the designated person will be added to the the list maintained by Paul Brindza.

For LIFETIME experiment, the HKS target ladder will be pulled out and the port vacuum sealed with a blank flange. The front entrance window will be replaced with larger window size. The last section of removable beam pipe will be removed in order to install and setup the Fission Fragment target/detector chamber. **This work has to be performed in consultation with RadCon and may require a special RWP.** Only designated persons will be allowed to carry out the task. The LIFETIME experiment will run with two targets, empty and Bi foil, which can be simply switched with a mechanical push-in/pull-out handle. Access to the Fission Fragment Detector area for target position and other configuration changes must follow standard radiation safety procedures.

The name of the designated persons will be listed on the white board in Counting House and in the list maintained by Paul Brindza.

## **C Approved Runcoordinators for Experiments E01-011 (HKS) & E02-017 (LIFETIME)**

S.N. Nakamura	Tohoku University
M. Sumihama	Tohoku University
L. Tang	Hampton University
K. Baker	Hampton University
L. Yuan	Hampton University
J. Reinhold	Florida International University
P. Markowitz	Florida International University
W. Boeglin	Florida International University
L. Gan	University of North Carolina
I. Niculescu	James Madison University
G. Niculescu	James Madison University