Conduct of Operations
for
Jefferson Laboratory Hall A Experiment E93-027

July 13, 1998

All experiment personnel must acknowledge their familiarity with this document as well as their intention to comply with all the conditions defined within by sending an email message to Mark Jones (shift/personpower coordinator of E93-027: jones@jlab.org) before performing any shiftwork.

1 Preface

The Thomas Jefferson National Accelerator Facility (JLAB, also Jefferson Lab) operates the Continuous Electron Beam Accelerator Facility (CEBAF). The scientific mission of JLAB is to explore the underlying structure of hadrons and nuclei using the electromagnetic probe. CEBAF is a superconducting electron accelerator with a nominal maximum energy of 4 GeV and 100% duty cycle. The electron beam, with a maximum current of 200 μA, can be used simultaneously for electron scattering experiments in three experimental areas, Halls A, B and C.

As part of its mission, JLAB provides the resources necessary for international collaborations of scientists to carry out basic research at the frontiers of the field of 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 program goals of the laboratory require that it produces the highest quality physics results efficiently.

Guidance on how to balance thoughtful, measured EH&S concerns with efficient operation has been taken from the Department of Energy (DOE) Order 5480.10, "Conduct of Operations," 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, the cost, the complexity and hazards of the operation.

2 Introduction

2.1 General Hall A Considerations

This experiment uses the experimental equipment in Hall A at JLAB, including the beam transport system, beam dump, the two High Resolution Spectrometers (HRS), the Hall A electronics and data acquisition system, and the scattering chamber and cryogenic hydrogen/deuterium target system. The electron and hadron arm HRS's will be in standard configuration. The Hall A Möller polarimeter will be used to measure the polarization of the beam. The experiment also requires use of the polarized electron source.

The procedures appropriate for the operation of the standard equipment that will be used during the course of the experiment are contained in the following documents:

- *Conduct of Operations for Jefferson Lab Hall A Experiment E93-027* (this document);
- *Hall A Experimental Equipment Operations Manual* (a basic operations manual for the Hall which includes discussions of the following subjects and provides cross references to other appropriate documentation):

  1. *Procedures for Experiments*;
  2. *Experimental Equipment Operation*;
  3. *Safety Assessment Document for Hall A Equipment*;
  4. *Personnel Allowed to Operate Hall A Equipment.*

Reference copies of these documents are available at all times in the Hall A Counting House for the duration of the experiment.

2.2 Description of E93-027

The physics goal of this experiment is to measure the ratio of the proton's electric form factor to magnetic form factor between $Q^2 = 0.5$ to $3.0\ GeV^2$ and calibrate the polarimeter. A description of the physics motivation of the experiment can be found in the 1993 proposal to the JLAB program advisory committee (PAC). The detailed plan for carrying out the experiment is contained in the E93-027 Run Plan, available in Counting House A, and on the E93-027 Web Page.

`http://www.jlab.gov/~jones/e93027/e93027.html`

This experiment is a Hall A Collaboration Experiment and is part of the Hall A EXPINT "commissioning" program. A list of the Hall-A collaboration is provided at the end of this document as an Appendix.

3 Operations, Organization, and Administration

The functional organization of the experiment is shown in Figure 1. The operational organization of the experiment is directed by the *Spokespersons* and the *Hall A group leader*. The immediate on-site management of the experiment will be the responsibility of the experiment *Run Coordinator*. The Run Coordinator will be in residence in the local JLAB area at all times during a running period. The Run Coordinator is thus the overall manager of the shift workers, including the shift leader. On-call Experts or their designates provide backup support to the shift workers with responsibility for oversight in their area of expertise.

The functions of the Run Coordinator are:

- to oversee the execution of the run plan;
- to manage the daily operation of the experiment, including its safe operation;
- to coordinate interactions between JLAB and the experiment;
- to represent the experiment at the weekly accelerator scheduling meetings (Wednesdays at 13:30 in the MCC Conference Room) one week before the run period, one week after the run period, and during the run period itself;
- to represent the experiment at the daily operations meeting at 7:30 am and 8:00 am in the MCC Conference Room or arrange for a representative of the experiment to be present at this meeting;
- to set and post goals for each shift and evaluate the progress of the experiment and the quality of the data;
- to ensure that the Hall A Group Leader, the accelerator Crew Chief, the Program Deputy, and the Spokesperson are aware of all necessary issues;
- to oversee and verify that the equipment is operated properly in accordance with the *Hall A Experimental Equipment Operations Manual*;
- to define the data quality measures appropriate for the goals of each shift;
- to insure sufficient overlap and transfer of information between Shift Leaders;
- to discuss in advance significant changes to the run plan with the Hall A Group Leader and to notify the Program Deputy;
- to provide the Hall A Group Leader with a weekly overview of the accelerator and Hall A equipment performance.

4 Shift Routines and Operating Procedures

There are two types of shifts for the time when the experiment is designated as occupying Hall A: *standby* and *operating*. 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 in the Hall and none of the equipment that is operating requires continuous monitoring. Standby status may result from normal operational planning or from abnormal conditions such as a major down time for the accelerator due to equipment failure.

4.1 Standby Shifts

During standby shifts, the shift personnel are not required to be on site at JLAB, **with the exception of the designated target expert**, but must be available via telephone contact to arrive at the Hall in an expeditious manner in the event of a problem with equipment that is their responsibility. The Run Coordinator will ensure that the shift checklist (see Table 1) is executed at least once every 24 hours.

4.2 Operating Shifts

During operating shifts, 24-hour occupation of the Hall A area will be maintained by crews of at least three people, in 8 hour shifts. One person per shift is designated as the Shift Leader. This individual has the following authority and responsibilities:

- primary responsibility for carrying out the scientific program planned for the shift by the Run Coordinator;
- primary responsibility for monitoring the quality of the data being taken;
- overall responsibility for the proper operation of the Hall A equipment during the shift;
- primary responsibility for coordinating the response of the shift crew to emergency situations, including the notification of appropriate individuals as outlined in the *Jefferson Lab Emergency Response Plan* and the *Hall A Emergency Checklist*;
- notifying the Run Coordinator of any circumstances that might have a significant impact on the planned activities for that shift; this includes discussing requests for any unplanned (but non-emergency) access into the Hall with the Run Coordinator before starting to arrange for such an access;
- primary responsibility for monitoring the operation of the Hall A equipment and for the coordination of the response to and the reporting of all abnormal/unusual occurrences. Reporting shall include entering the relevant information in the Log Book, notifying the Hall A responsible staff member for the relevant equipment, and notifying the Program Deputy as appropriate for the system that had the occurrence;
- acting as primary experiment contact between the Machine Control Center (MCC) and experiment personnel. This includes authority to request entries into the Hall;
- primary responsibility for keeping accurate records of the operation of the accelerator, experimental equipment, the simultaneous availability of beam (standard electronic log), and for the reconciliation of the Hall A records on beam availability with those kept by the Accelerator Crew Chief at the end of the shift;
- can authorize qualified personnel to make modifications in the experiment configuration within the allowed parameters;

- primary responsibility for the actions of shift crews under their leadership;
- primary responsibility for orderly transition of crews at shift change and writing the *End-of-Shift Summary*. This summary shall include pointing out the existence of any new issues pertaining to the experiment;
- primary responsibility for the Log Book containing a complete and accurate description of the events and actions of the shift;
- primary responsibility for ensuring that the shift check list is performed and that the equipment is operating within expected normal operating parameters;
- authority to limit the number of people in the Hall A Counting House or the Hall itself as necessary to effectively and safely carry out the experiment;
- authority to limit access to the Hall A aquisition computers if required to effectively and safely carry out the experiment;
- primary responsibility to ensure that malfunctioning equipment is properly labeled, that the existence of the malfunction is reported both to shift personnel and the individual(s) responsible for the operation and maintenance of the equipment, and whenever necessary, to ensure the equipment is locked-out by a trained responsible individual;

The number of persons assigned to a shift will normally be three or four. The Shift Leader and several other shift workers will have training in specific areas (spectrometers, detectors, beamline, and replay) and will have oversight responsibility in those areas during their shifts. Shift workers with oversight responsibility will have a designated leader who will arrange their training. The shift schedule for each run period will be clearly posted in the Hall A Counting House, listing the times of each shift, the names of the personnel on shift, the target operator and the Shift Leader for each shift. The shift schedule for each run period will also be available on the E93-027 website:

`http://www.jlab.org/~jones/e93027/e93027.html`

Also posted will be the name of the Run Coordinator, as well as phone numbers for support staff. The responsibilities of each shift member are to:

- carry out the scientific goals of the shift in a safe and efficient manner under the direction of the Shift Leader;
- read the Log Book to be aware of changes in goals, operating parameters and new documentation;
- monitor the quality of the data being taken;

- monitor the operation of all equipment for departures from normal operations and report problems to the Shift Leader;
- maintain adequate records of the progress of the shift;
- be present in a timely fashion before the start of each shift so that a smooth, coordinated transition between shifts may be accomplished;

In addition, each shift member is responsible for carrying out their work in a safe and efficient manner, according to the rules and procedures documented in the *Jefferson Lab EH&S Manual* and in the documents listed in Section 2.1.

4.3 Shift Personnel Training

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

- EH&S Orientation;
- Radiation Worker Training;
- Oxygen Deficiency Hazard Training.

In addition, all shift personnel will be trained in the safety procedures to be followed for access to the Hall and its close-up prior to beam delivery. This training will include a brief discussion of the purpose and operation of the Personnel Safety System (PSS) for the Hall, a trained escort for individuals the first time they enter Hall A on a controlled access, and an escorted General Hazard Awareness Walk-Through of Hall A. At least one person on each controlled access to the Hall must have been trained by designated Hall A personnel in the proper procedures for such an access into the Hall.

Individuals within the Hall A Collaboration may be required to have other equipment or procedure-specific training as their responsibilities demand. The need for such training shall be determined by the Spokesperson or the Run Coordinator in consultation with the Hall A Group Leader and Physics Division EH&S personnel.

All experiment personnel are required to have radiation badges in their possession during an access to any radiological area. The *two-person rule* is in strict enforcement for all entries into the Hall. It is strongly recommended that hard hats are worn during an access. Ear protestion must be worn when working near the scattering chamber.

Access to the Hall will be governed as described in the *Jefferson Lab Beam Containment Policy and Implementation* document and by the *General Access Radiation Work Permit (RWP) for Hall A*. This RWP is kept in the Hall A Counting House. All personnel must read the RWP and sign the log indicating that they have done so before entering the Hall. A sign-up log is also kept at the PSS gate in Hall A for convenience. Work in designated radiation areas will be governed by the *Jefferson Lab RadCon Manual*. In particular, no material may be removed from the Hall after beam delivery to the Hall without proper approval from an Assigned Radiation Monitor responsible for the Hall or from the RadCon Group, as appropriate.

5 Control of Equipment and System Status

The operation of the Hall A experimental equipment should be carried out in accordance with the *Hall A Experimental Equipment Operations Manual.* This document includes information on the normal response to alarms and equipment malfunctions; however, in general, the basic emergency response is to bring the situation to the attention of the *Expert* (see Figure 1) for the system in question after taking immediate response measures that common sense and Jefferson Lab policies and procedures dictate.

The only individuals authorized to make **significant** modifications, repairs and/or changes to the operating status of equipment are the Experts or persons under their direct supervision. Significant changes to the operating status of equipment include *any* changes within the stated safe parameters of operation in the operating procedures that are beyond those described in the *Hall A Experimental Equipment Operations Manual* as routine. Shift personnel will make routine changes in operating conditions as specified in the operating procedures. Authorized subsystem experts are also listed. This list may be amended as necessary to reflect personnel and training changes with the signed and written authorization of **both** an expert for that subsystem **and** the Hall A Leader or his/her authorized designate. A copy of these amendments will be maintained in the Hall A Counting House attached to the reference copy of the *Hall A Experimental Equipment Operations Manual.*

All general equipment installation, maintenance and testing activities shall be carried out in accordance with the *Jefferson Lab EH&S Manual.*

6 Independent Verification

The basic check list given in Table 1 will be performed once per shift during operating shifts and once per day during standby shifts. Additional items may be added to the list at the discretion of the Run Coordinator.

The Run Coordinator will define a set of quality measures for the data and communicate these to the shift crews. These measures may change over the course of the experiment. The *Hall A Experimental Equipment Operations Manual* provides a more general checklist for closing the Hall, and for situations where the Hall A beam dump is used for accelerator development.

7 Logkeeping

A single series of hard bound Log Books will serve as the record of the experiment. All relevant activities are to be recorded in these books, including all changes of experiment conditions and equipment failures. The quality of the information recorded in the Log Book is critical to the ability of the Collaboration to "make sense" of the data, through careful correlation of events in the written history of the experiment with the apparent changes in the experimental conditions inferred from changes in the data stream.

The Log Book will also serve as the primary reference for the determination of the operational efficiency of the Hall A apparatus. 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 Log Book is the place of record for all safety issues and for providing notification of all new or updated documentation and procedures.

All data recorded electronically will be referenced in the Log Book with the location of the appropriate files and media. The only exception to the Log Book as the place of record is the experiment checklist mentioned in Section 6, which will be stored in binders in the Hall A Counting House. However, all deviations from normal operating parameters observed during the checklist evaluation procedure will be recorded in the Log Book. All Log Books will remain in the Hall A Counting House for the duration of the experiment (unless they are being copied.). After the experiment has been completed, the Log Books will be archived at Jefferson Lab for future reference.

All entries in the log book should be in ink (preferably black for photocopying). All entries and corrections should contain a time, a date, and the name of the person making the notation. Initials may be used if the initials are recorded in the master initial table at the beginning of the logbook.

Bookkeeping	DATE and TIME Shift Checklist Recorder
HRS_e	Magnet Currents Dipole Field Angle Collimator Cryogenic Fill Levels Drift Chamber Gas (gas shed) Drift Chamber HV/Current Pb-Glass HV Cerenkov Gas/Pressure Cerenkov HV Hodoscope HV
HRS_h	Magnet Currents DipoleField Angle Collimator Cryogenic Fill Levels Drift Chamber Gas (gas shed) Drift Chamber HV/Current Hodoscope HV
Vacuum	Scattering Chamber HRS_e HRS_h
Electronics	Status Visual Survey of CH
CODA	Status
Target	Position Temperature Pressure
Beam and Beamline	Energy Current Rastering Duty Factor Special Conditions Switchyard Magnet Currents

Table 1: Items to be included in the shift checklist as appropriate for the JLAB E93-027 apparatus configuration.

Appendix

The Hall-A E93-027 Collaboration

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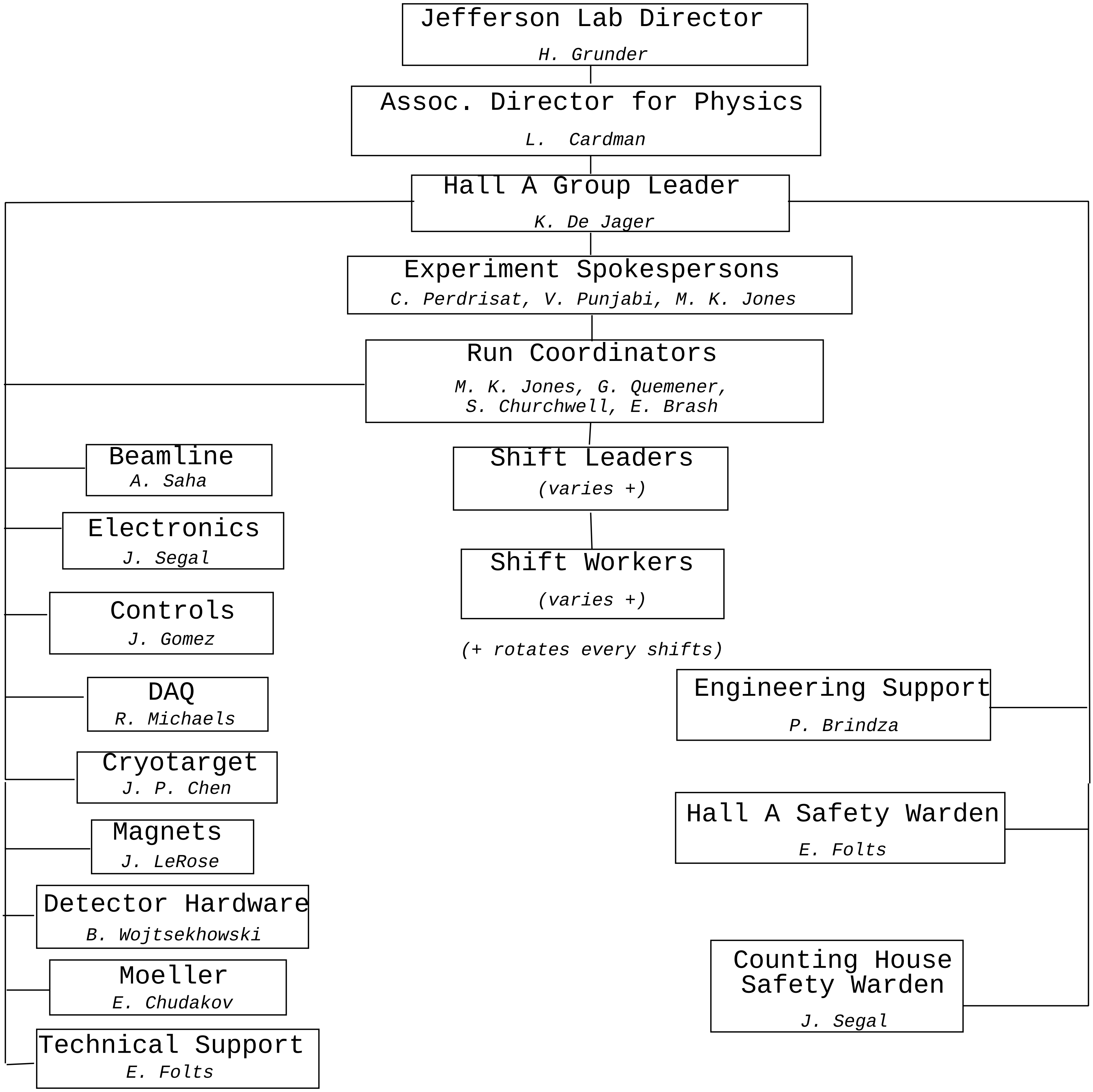

Figure 1: Functional Organization of E93-027