Conduct of Operations for JLab Experiment, E12-11-105 (PEPPo)

May 8, 2012 (v12.0)

Authorized: _____
Injector Program Manager

Contents

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 E12-11-105 (PEPPo) is on the floor. Installation and commissioning periods are not covered by this document. Furthermore, this document is directed to physicists participating in the PEPPo experiment. It must be read, understood, and followed by all members of the collaboration.

This experiment uses a unique set of new equipment that has been installed on a beamline just downstream of the injector quarter cryomodule and on the opposite side of the beamline from the 5 MeV Mott polarimeter. For the purposes of organizing the responsibilities for the experiment in a manner analogous to a typical experiment in one of the halls, we have revised the standard hall COO for a typical user-driven CEBAF experiment for this accelerator physics experiment. We shall treat the polarized sources plus the quarter cryomodule in a manner analogous to the full accelerator in typical CEBAF experiments, and consider the PEPPo apparatus as analogous to the equipment in one of the experimental halls. The first vacuum valve on the PEPPo beamline (VBV5D00) will be treated as the moral equivalent of the "green wall" that separates each hall from the accelerator, with work upstream of the valve (and on Accelerator-managed, beam-related devices downstream of it) controlled by the Accelerator Division and work on the experimental equipment downstream of the valve controlled by the experiment collaboration. A table is supplied as Appendix A1 of this document to clarify this division of responsibilities. The head of the injector group, Matt Poelker, who is a member of the Accelerator Division, shall be serving for this experiment the function of the Hall Leader in one of the halls for a typical CEBAF experiment. Similarly, Steve Suhring, who oversees all work in the accelerator enclosure, shall serve the function of the hall work coordinator in a typical CEBAF experiment.

The primary physics goals of this experiment are discussed in the proposal[1].

[1] See http://www.jlab.org/exp_prog/proposals/11/PR12-11-105.pdf

2 Documentation

This experiment uses a unique set of new equipment that has been installed on a beamline just downstream of the injector quarter cryomodule. The broad division of responsibilities has been outlined above. All of the procedures to be used by the collaboration during the course of the experiment are contained in the following documents[2]:

- The Conduct of Operations for JLab Experiment E12-11-105, the document you are now reading.
- Experiment Safety Assessment Document (ESAD) for E12-11-105.
- Radiation Safety Assessment Document (RSAD) for E12-11-105.
- The PEPPo Shift Takers Online Documentation and Procedures (available at: https://positron.jlab.org/wiki/index.php/Shift_Takers_Online_Documentation_and_Procedures)
- Personnel Allowed to Operate PEPPo Equipment
- JLab Emergency Response Plan

Reference copies of these documents will be available at the PEPPo Control Desk in the MCC for the duration of the experiment in either hard copy or electronically accessible format. The present document shall hereafter be referred to as the COO, the Experiment Safety Assessment Document as the ESAD, and the Radiation Safety Assessment Document as the RSAD. All documents are also available online at: https://positron.jlab.org/wiki/index.php/General_PEPPO_documents

The COO, the ESAD and the RSAD are required reading for all shift personnel.

Because there is not yet any part of the PEPPo experiment beamline that can be considered a permanent, "base equipment" installation, there is no formal, reviewed operations manual for the equipment. Hence operation of any of the sub-systems of the experiment requires training and certification for the use of that sub-system by a designated expert. Those who have been trained and certified by the expert(s) will be listed in the document "Personnel Allowed to Operate PEPPo Equipment", a copy of which shall be posted at the PEPPo Control Desk in the MCC. A list of the sub-systems and experts and a template for the authorization document are provided in Appendix A.2

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)

[2] The process is documented at http://www.jlab.org/user resources/PFX/.

- Oxygen Deficiency Hazard Training (SAF 103)
- Tunnel Awareness Training - Online & Walkthrough (SAF132/SAF132A)
- Lead Worker Training (SAF136) – required only for those shift members who will be involved in handling bricks
- Tunnel Radiation Work Permit (SAF801kd)

All experiment personnel are required to have radiation badges in their possession during their shifts. The Safety Awareness Walk-Through will emphasize hazards that are typical of injector region operations. Hazards peculiar to the current experimental setup are addressed in the ESAD and in appendices of this document. In addition, all shift personnel will be trained in the safety procedures to be followed for access to the Accelerator Tunnel. This training will include a brief discussion of the purpose and operation of the Personnel Safety System (PSS) for the Accelerator Tunnel, and specifically identify the PSS Run/Safe box "kill buttons" locations in the injector/north linac. 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 Matt Poelker and Accelerator Division EH&S personnel.

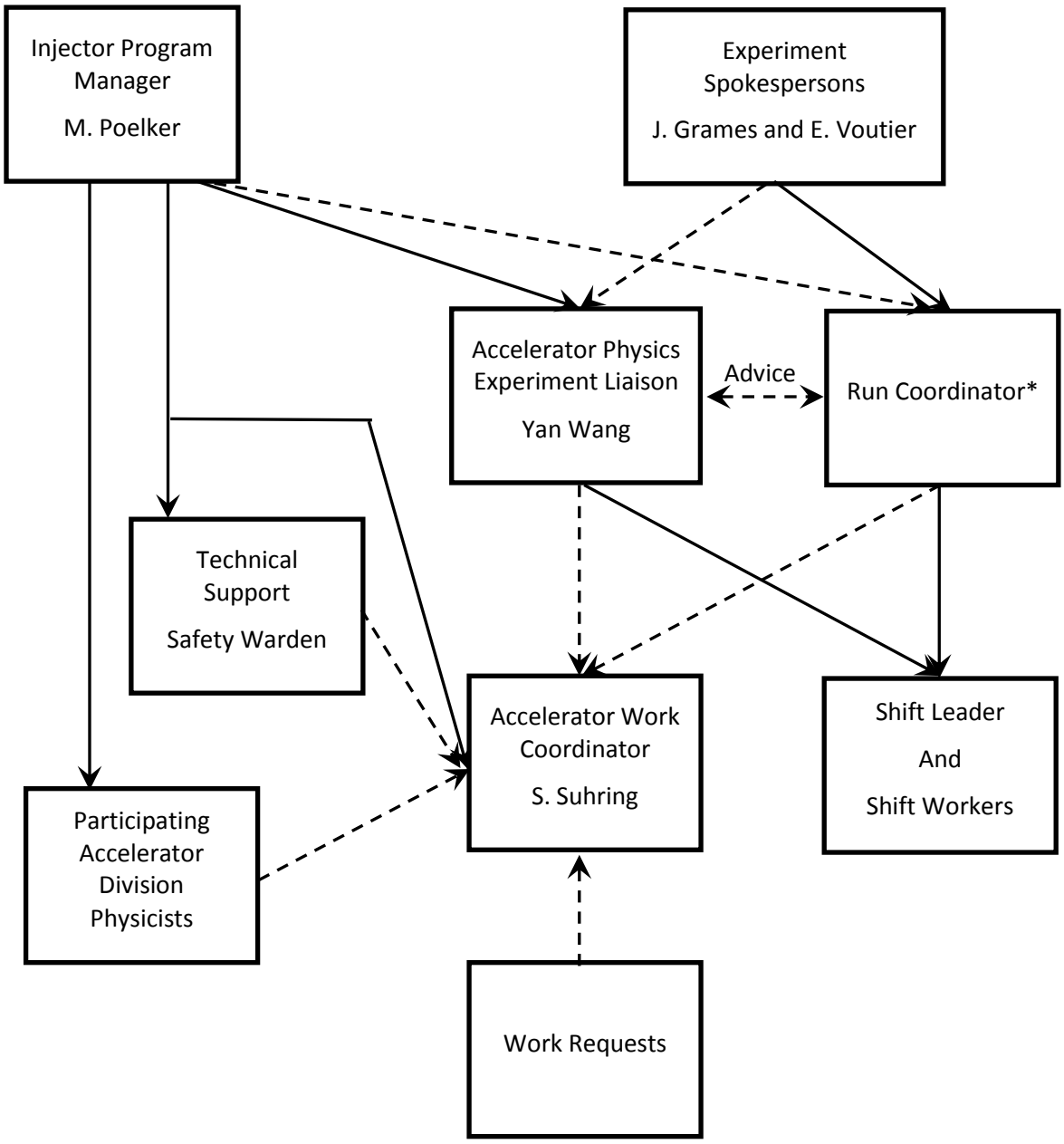
In addition, experiment personnel must familiarize themselves with the sections of the JLab EH&S Manual relevant for their work in the Accelerator enclosure. The formal reference copy of this document is available on the web at http://www.jlab.org/ehs/manual/EHSbook.html .

Finally, JLab Lock and Tag[3] 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.

4 Organization and Administration

The operation of the experiment is directed by Joe Grames and Eric Voutier, the Experiment Spokespersons, in coordination with Matt Poelker. An organization chart for the experiment is found in Figure 1.

[3] The EH&S Manual provides Lockout/Tagout information in Chapter 6110



* Run Coordinators will include: Joe Grames, Eric Voutier, Erica Fanchinni, Riad Suleiman, and Arne Freyberger.

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

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 Matt Poelker. The Run Coordinator shall ensure that Matt Poelker, Joe Grames and also Arne Freyberger are aware of all pertinent issues. The Run Coordinator shall promote an environment in which the highest safety standards are maintained.

All Run Coordinators must ensure that all of the JLab training necessary to perform their duties is up to date before their shift as Run Coordinator commences.

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., PEPPo area accesses) in order to optimize productivity.
- to ensure that an experiment checklist is completed every 24 hrs during standby shifts.
- to ensure, together with the experiment spokespersons, that the PEPPo Control Desk is manned appropriately: i.e., sufficient personnel are present to safely carry out the experimental program or monitor the apparatus as needed.
- hold a daily meeting of the collaboration during running periods to review plans for the continuation of the experiment.

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

- ensuring that the Matt Poelker, Joe Grames and Arne Freyberger are aware of all necessary issues.
- coordinating with the various system leaders (beam line vacuum components, beam line magnets, annihilation detector, fiber array detector, Compton transmission detector, data acquisition hardware, data acquisition analysis, and Compton Polarimeter) and schedule activities such as Mott polarimeter runs, injector beam characterization runs, and PEPPo area accesses to optimize productivity.
- 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 preceding week.

- 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 Accelerator Work Coordinator (S. Suhring), scheduling work by groups outside the collaboration.
- interacting with the Accelerator Program Deputy to plan and conduct un- scheduled activities.
- maintaining the "Access Authorization List" (a list of individuals who are to be allowed entry to the PEPPo area the Accelerator is in Controlled Access or during maintenance) and ensure that MCC has an up to date list.
- in conjunction with the Accelerator Work Coordinator, scheduling work by groups outside the collaboration. This work will normally coincide with the scheduled machine maintenance days. This coordination requires a weekly meeting of these two individuals. The product of this meeting will include any necessary updates to the "Access Authorization List".
- acting as the single point of contact for Unlisted Workers (workers not on the "Access Authorization List") who need access to the PEPPo area and to determine if the area is in a state such that the work can be done safely. The Run Coordinator shall inform the shift leader on duty.
- being responsible for safe transition of the PEPPo area to Restricted Access, and, in particular, documenting that transition through overseeing the execution of the "End of Run Procedures" as described in subsection 5.1.6 below .
- providing an oral report at the weekly collaboration meeting updating the experimental progress to the collaboration.

III. To submit a written report to Joe Grames, with a copy to Matt Poelker, that includes run time statistics and a description of any significant problems with the PEPPo instrumentation.

4.2 Accelerator Physics Experiment Liaison

Broadly speaking, the Accelerator Physics Experiment Liaison to the experiment is a Division staff member appointed by Arne Freyberger to oversee the Division's interests with respect to personnel and equipment protection.[4] The role of the Accelerator 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 PEPPo area status change to Restricted Access in coordination with the Accelerator Work Coordinator during and after the PEPPo run.
- Training verification of shift workers.

[4] 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

- Together with the Run Coordinator, ensure that the PEPPo Control Desk is manned appropriately: i.e., sufficient personnel are present to safely carry out the experimental program or monitor the apparatus as needed.

4.3 PEPPo Area Work Coordinator

The role of the PEPPo Work Coordinator shall be served by the Accelerator Work Coordinator, Steve Suhring to eliminate confusion in responsibility for such efforts inside the accelerator enclosure. This portion of Steve's responsibilities shall include:

- to act as the single point of contact for all work on PEPPo.
- to determine if the scheduled PEPPo activities can be done safely. These activities shall be coordinated with the Accelerator Division Liaison and the Run Coordinator.
- 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 Accelerator Division Liaison, ensure that the PEPPo 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 Accelerator 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 that occurred during the shift.
- to serve as primary contact between the machine control center (MCC) and experiment personnel.
- to oversee that PEPPo 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 machine control center (MCC) before entering the PEPPo area when in Controlled Access. Furthermore, to confirm that these workers have communicated with the Run Coordinator and the Accelerator 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 Accelerator Division Liaison, Run Coordinator, and Injector Group Leader are notified immediately.
- to notify the Run Coordinator and the Injector Group Leader, if PEPPo 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 injector/north linac be changed (Request for a change to Restricted Access must be approved by the Accelerator Division Liaison.)
- to limit the number of people in the PEPPo Counting Desk area or injector/north linac if required to effectively and safely carry out the experiment.
- to limit access to injector/north linac 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 PEPPo 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 injector/north linac and none of the equipment 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 PEPPo Control Desk area will be maintained by crews of at least two persons 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 near the PEPPo Control Desk 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. 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.

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 machine control center (MCC).

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 near the PEPPo Control Desk. 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 PEPPo must be posted on the MCC Control Room white board.

5.1.6 End of Run Procedures

At the end of a PEPPo run the equipment associated with the PEPPo experiment shall be shut down and secured in an orderly manner to assure that this equipment does not interact with routine operation of the accelerator for other purposes. The Run Coordinator shall oversee this process, and "sign off" on its completion using the "End of Run Checklist" provided in Appendix A.3.

5.2 Injector Segment Access

Access to the injector segment will be governed by the JLab Beam Containment Policy[5] , and work in designated radiation areas will be carried out in accordance with the JLab RadCon Manual. Normally the injector segment is not a posted Radioactive Materials Area. The run coordinator and/or accelerator liaison will contact RadCon once CW beam greater than 7.2MeV has been established in the injector segment. RadCon will post the injector segment appropriately in the event radioactive materials are produced at the target. During operations, no one is allowed in the injector segment without either being accompanied, or informing shift personnel and checking in on a regular basis.

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

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

Restricted Access is the period when all major work must be completed in the injector segment. Consequently, all activities require advanced planning and must be scheduled for resources and safe operation. In order to streamline the activities in the injector segment 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 "Accelerator Work Coordinator"
- The information board at the entrance to the injector segment

All work must be scheduled through the Accelerator Work Coordinator. The content on the information board is the responsibility of the Accelerator safety wardens and the Accelerator Work Coordinator. The information board will contain all critical information required for safe entry into the area. This information will include a succinct, one page safety summary covering the injector segment's current safety hazards and mitigating measures (to be read by all persons working in the injector segment), active Operational Safety Procedures (OSPs) and Temporary Operational Safety Procedures (TOSPs), required temporary work permits (e.g., Radiation Work Permits),

[5] EH&S Manual, Appendix 6310-T2

current activities in the injector segment, 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, Yan Wang. 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 detector, etc., require approval of the Injector Group Leader, Matt Poelker [6], and the use of appropriate personnel. The Injector Group Leader may require that a SOP, OSP, or TOSP be prepared.

5.4 Scheduling of Work by Outside Groups

Work in the injector/north linac 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 Accelerator Division Work Coordinator will concur on work scheduling. The Accelerator Work Coordinator's job is to coordinate activities in the accelerator 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 injector/north linac, the required access state of the injector/north linac (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

Because PEPPo is an apparatus under development, there is no formal Operations manual. Summary information (The PEPPo Shift Takers Online Documentation and Procedures) is available online at: https://positron.jlab.org/wiki/index.php/Shift_Takers_Online_Documentation_and_Procedures . This online document also includes information on the "Response to Alarms and Equipment Malfunctions". A hard copy of that information shall be available at the PEPPo Control Desk. Supplementary information specific to experiment E12-11-105 may be found in the ESAD.

[6] 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.

The document "Personnel Allowed to Operate PEPPo Equipment" lists the individuals authorized by the subsystem experts to operate the various sub-systems of the experiment. A list of the subsystem experts (whose authorization is required) is attached as Appendix A2. This "Personnel Allowed to Operate PEPPo Equipment" list 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 document and kept at the PEPPo Control Desk in the MCC.

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 PEPPo and Accelerator 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 PEPPo shift checklist (and instructions) shall be made available to shift personnel at experiment- 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 "PEPPo End of Run Checklist", available online at https://positron.jlab.org/wiki/index.php/Shift_Takers_Online_Documentation_and_Procedures provides more general check lists for closing the experiment down after a run has been completed and the injector/north linac is to be used for normal CEBAF operations.

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 PEPPo-specific forms should also be scanned into the

computer logbook when completed. The completed paper forms should be stored in a binder in the machine control center (MCC). 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 PEPPo experimental 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 computer logbook is the place of record for all safety issues and introductions of new or updated documentation and procedures.

A Special Procedures for the PEPPo Experiment

A.1 Equipment Responsibilities

There is a substantial amount of equipment downstream of the valve (VBV5D00) and a very mixed responsibility for it. The table below identifies the principle items along the beamline and the control and maintenance responsibilities. The beamline layout is shown in Section A.2 below

PEPPo Element Table Positron SELECT

EPICS	Human Name	Who Controls	Non-OPS Maintained Devices
2I→ 1I → 0L00	From Gun → 1/4 cryomodule	OPS/Gun/Inj	
R027GSET, R028GSET	1/4 CryoModule gradient	OPS/Gun/Inj	
R027PSET, R028PSET	1/4 CryoModule Phase	OPS/Gun/Inj	
ITV0L01	First viewer after 1/4	OPS/Gun/Inj	
MBH0L01H&V	Corrector Magnets	OPS/Gun/Inj	
MQJ0L01	Quad	OPS/Gun/Inj	
VBV0L01A	Valve	OPS	
VBV0L01B	Valve	OPS	
MQS0L01A	Skew Quad	OPS	
MHB0L01AH&V	Corrector	OPS/Gun/Inj	
MQJ0L02	Quad	OPS/Gun/Inj	
MQS0L02	Skew Quad	OPS	
MBH0L02H&V	Corrector	OPS/Gun/Inj	
IBC0L02XXXX.YYYY 0L02	BCM gains	OPS/Gun/PSS	
MBV2D01 (aka MBV0L021)	5MeV Dipole	OPS/Gun/Inj	
3DXXXX	Mott Line	Ops/Gun/Inj	
MBH5D00AH&V	Correctors	OPS/Gun/Inj	
VBV5D00	Valve	OPS	
ITV5D00	Viewer	OPS/Gun/Inj	
MQD5D00	Quad	OPS/Gun/Inj	
MBH5D00AH&V	Correctors	OPS/Gun/Inj	
MQD501	Quad	OPS/Gun/Inj	
ITG5D01	Primary Target	OPS/Gun	Peppo
ITV5D01	Viewer	OPS/Gun/Inj	
MPC5D02	Collection Solenoid	OPS/Gun/Inj	

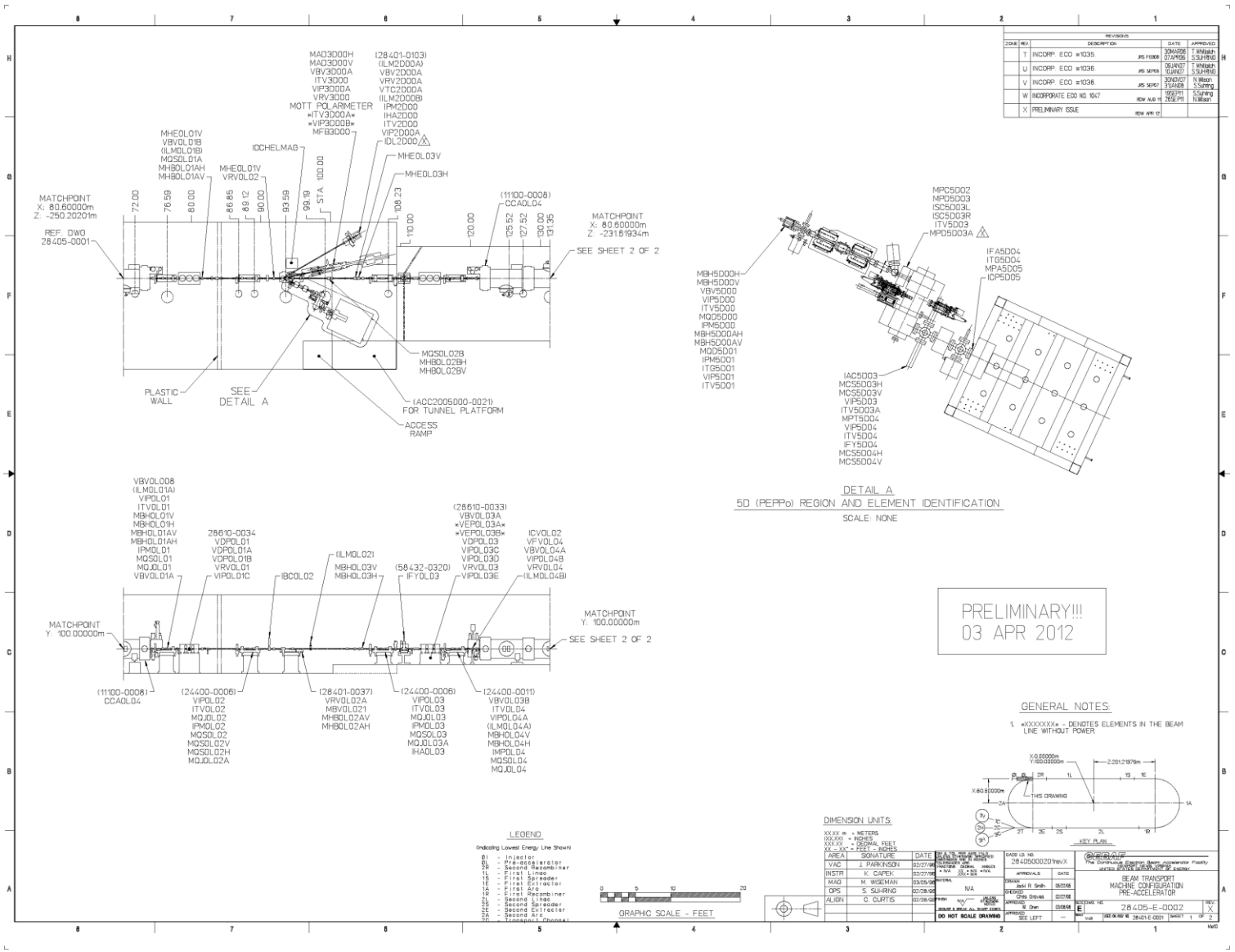
EPICS	Human Name	Who Controls	Non-OPS Maintained Devices
MPD5D03	Spectrometer Dipoles (or first dipole only if MPD5D03A is implemented)	OPS/Gun/Inj	
ISC5D03L	Collimator/Scraper	OPS/Gun/Inj/Peppo	
ISC5D03R	Collimator/Scraper	OPS/Gun/Inj/Peppo	
ITV5D03	Viewer	OPS/Gun/Inj	
MPD5D03A	Second Spectrometer Dipole (if implemented – if not MPD503 runs both in series)	OPS/Gun/Inj	
IAC5D03(XXX)	Annihilation Counter	Peppo	Peppo
MCS5D03H&V	Corrector	OPS/Gun/Inj	
ITV5D03A	Viewer OPS/Gun/Inj	OPS/Gun/Inj	
IFY5D04	F-cup, insertion and gains	OPS/Gun/Inj	
MCS5D04H&V	Corrector	OPS/Gun	
IFA5D04(XXX)	Fiber Array, HV, thresholds, location	Peppo	Peppo
ITG5D04	Conversion Target	OPS/Gun/Inj/Peppo	Peppo
MPA5D05	Compton Solenoid	OPS/Gun/Peppo	
ICP5D05	Compton Transmission Polarimeter	Peppo	Peppo

Location of the Compton Transmission polarimeter is to be performed manually (when in controlled or restricted access) by the PEPPo collaboration. HV, threshold and all aspects of the data acquisition are controlled and maintained by PEPPo collaboration.

Group Definitions for the Element Table above:

- OPS Qualified Crew Chiefs, Operators and Arne
- Gun Poelker, Grames, Suleiman
- INJ Kazimi, Wang, Hofler
- Peppo Trained PEPPo collaborator
- PSS Member of the safety systems group

A.2 PEPPo Beamline Layout



A.3 Equipment Subsystem Experts and Approved Operators

In situations where there is not a fully developed and approved operations manual for the relevant equipment, its use shall be under the guidance and control of an identified subsystem expert. The PEPPo subsystems and experts are identified in the table below. Each expert may identify individuals trained sufficiently in the use of the subsystem to operate it during the experiment.

Subsystem	**Subsystem Experts**
Beam line vacuum components	Joe Grames
Beam line magnets	Joe Grames
Annihilation Detector	Tony Forest
Fiber Array Detector	Paul Gueye
Compton Transmission Detector	Eric Voutier, Erica Fanchini
Data Acquisition Hardware	Alexandre Camsonne, Erica Fanchini
Data Acquisition Analysis	Erica Fanchini, Riad Suleiman

The format of the "Approved Subsystem Operators" document is provided on the following page for reference. The completed original shall be posted at the PEPPo Control Desk in the MCC, and a copy maintained by the experiment spokespersons.

PEPPo Subsystem Approved Operators

Subsystem	Authorized Sub-System Operator	Subsystem Expert Certification: Signature/Date	Restrictions (none if blank)
Beam line vacuum components			
Beam line magnets			
Annihilation Detector			
Fiber Array Detector			
Compton Transmission Detector			
Data Acquisition Hardware			
Data Acquisition Analysis			

Document here is for format reference; the guiding document shall be posted at the PEPPo Control desk and scanned into the experiment electronic logbook.

A.4. PEPPo Experiment Shutdown Checklist

At the end of a run the PEPPo Run coordinator shall oversee the execution of the shutdown of the PEPPo apparatus and document its completion using the checklist here.

PEPPo Experiment Shutdown Checklist
(Complete and scan into electronic logbooks)

Sequence #	Action	Completion Certified (Initials/Date)
1	EPICS – close vacuum valve VBV5D00	
2	EPICS – zero all trim magnets (MBH-, MCS-, MQD-, MPD5D03A)	
3	EPICS – zero high current magnets (MPC5D02, MPD5D03, MPT5D04, MPA5D05)	
4	EPICS – retract target ladder (ITG5D01) to home limit switch	
5	EPICS – retract fiber array detector (IFA5D04) to out limit switch	
6	EPICS – retract collimators (ISC5D03L, ISC5D03R) to home limit switch	
7	EPICS – zero annihilation detector (IAC5D03) high voltage	
8	EPICS – zero fiber array detector (IFA5D04) high voltage	
9	EPICS – zero Compton detector (ICP5D05) high voltage	
10	EPICS – set detector high voltage power supplies off	
11	INJECTOR SERVICE BUILDING – power off and LOTO high current power supplies	
12	INJECTOR – apply end cap to exit vacuum window	
13	INJECTOR – RadCon perform and log detailed radiation survey of apparatus	

Note – LCW flow to magnets and GN2 flow to polarimeter detector can remain on without impact to injector operations; these would be disconnected when uninstalled.

Completed By _____ on _____

B Authorized Targets and Beam Currents for E12-11-105

The set of targets and maximum beam currents listed below have been identified by the Experiment Review process as appropriate and safe for experiment E12-11-105.

Target	**Material = Thickness**	**Maximum Beam Current [μA]**			**Comments**
		KE=2MeV	KE=5MeV	KE=8MeV	
Viewscreen ITV5D00	CrO2 = 0.1mm	0.01			CW inhibit
Viewscreen ITV5D01	CrO2 = 0.1mm	0.01			CW safe
Viewscreen ITV5D03	CrO2 = 0.1mm				CW safe
Viewscreen ITV5D03A	CrO2 = 0.1mm				CW safe
Viewscreen ITV5D04	CrO2 = 0.1mm	0.01			CW safe
Production Target ITG5D01	W = 0.1mm	3.50	6.07	6.62	None
Production Target ITG5D01	W = 0.5mm	1.09	0.65	0.81	None
Production Target ITG5D01	W = 1.0mm	1.08	0.43	0.36	None
Production Target ITG5D01	W = 2.0mm	1.07	0.41	0.26	None
Reconversion Target ITG5D05	W = 1.8mm	0.10			Typ. <10nA

C Outline of the Shift Takers Online Documentation and Procedures

An outline of PEPPo experiment documentation and procedures as of the publication date of this document is provided below to be informative, however ***shift takers should always refer to the current documentation and procedures available on the PEPPo experiment wiki:***
https://positron.jlab.org/wiki/index.php/Shift_Takers_Online_Documentation_and_Procedures

C.1 On Line Procedures

1. Shift Sign up Page
   https://misportal.jlab.org/mis/apps/physics/shiftSchedule/index.cfm?experimentRunId=PEPPo
2. Shift takers how-to procedures
   https://positron.jlab.org/wiki/index.php/Shift_takers_how-to_procedures

C.2 Subsystem Documentation

1. Beam line vacuum components (Joe Grames)
   - Songsheet (Rev X, April 4, 2012) Media:songsheet_revX.pdf
2. Beam line magnets (Joe Grames)
   - Power Supply Summary Table media:magnet_ps_summary.pptx
3. Annihilation Detector (Tony Forest)
   - Link to Annihilation Counter Operation PePPOAnnihCounterOperationPePPOAnnihCounterOperation
4. Fiber Array Detector (Paul Gueye)
   - Description and How to operate the PEPPo fiber array detector Media:PEPPo_FiberArray_Doc-12Apr12.pdf
5. Compton Transmission Detector (Eric Voutier)
   - Description and technical designs [[1]]
6. Data Acquisition Hardware (Alexandre Camsonne)
   - EPICS/CODA Dictionary media:epics_list.txt
7. Data Acquisition Analysis (Erica Fanchini)
   - Useful Runs media:RUNS.xlsx
   - Documents
     - FADC Mode 1&2 [[2]] and Programming it [[3]]
     - FADC Mode 3 Media:FADC_Mode3.pdf
     - Scalers Media:Scaler_38001.pdf
     - TDC CAEN V775 Media:TDC_Caenv775.pdf
     - VME Discriminator CAEN V895 Media:Discriminator_Caenv895.pdf
     - Helicity Board Media:HelicityBoard.pdf

8. PEPPo End of Run Checklist (Joe Grames)
   - See Appendix A.4 above
9. Response to Alarms and Equipment Malfunctions (Joe Grames)
   - Included under the "Shift-takers how to procedures" in section C.1 above

C.3 Files and directories

1. Accelerator machine
   Instruction to find files and directories used to run CODA, the DAQ in genaral, data files, macroes etc... are here: [[4]]
2. Silo & Farm
   There is a storage space on the silo. All information and instructions are here: [[5]]
3. E166 Documentation (included for reference)
   - E166 NIM Paper media:E166-NIM.pdf
   - Compton Polarimeter Analyzing Magnet and T2 Reconversion Target (E166 communication from P. Schuler) media:DESY_Magnet.pdf
   - CsI Crystals (E166 communication from P. Schuler) media:E166-CsI.pdf