PEPPo Commissioning Plan
January 19, 2012

1. Introduction

The purpose of this document is to identify the different steps required to bring the PEPPo apparatus to an operational status appropriate for physics data taking. It is not the goal here to list every measurement expected to be performed, but rather to define the tests and measurements necessary in order for the proper operation of PEPPo and the ability to carry out the program as described in the experiment proposal.

The following levels of commissioning are described in the subsequent text:

System Readiness
Electron Beam Transport Commissioning
Electron Beam Energy Commissioning
CW Electron Beam Commissioning
Annihilation Detector Commissioning
Fiber Array Detector Commissioning
Compton Transmission Polarimeter Commissioning
Detector Background Commissioning

2. System Readiness

These are system tests which must be performed prior to beam operation.

A. Vacuum System

Parameter	**Task**	**Status**
Integrity	Verify base pressure <1E-7 Torr Verify no leaks at flange or weld joints	
Isolation	Verify correct remote operation to open/close valve	
Protection	Verify beam line valve closes when hardware limit of interlocked ion pump supplies exceeds operational threshold (100uA or >1E-8 Torr) Verify thin vacuum window signs for hearing protection posted	
Monitoring	Verify ion pump power supply read back is accurate + archived	
Sum	Acceptance (VBV5D00, VIP5D00, VIP5D01, VIP5D03, VIP5D04)	

B. Beam Viewer System

Parameter	**Task**	**Status**
Operation	Verify correct insertion depth to beam line center Verify correct remote operation to insert/retract Verify video system correctly identifies component Verify adequate camera focus and illumination	
Protection	Verify software interlock to insert viewer non-viewer limited modes Verify anti-collision circuit between ITV5D04 and IFY5D04 (Faraday cup)	

Sum	Acceptance (ITV5D00, ITV5D03, ITV5D03A, ITV5D04)	

C. Beam Position Monitor System

Parameter	**Task**	**Status**
Operation	Verify hardware passes hot checkout Verify passes system calibration Verify passes hot checkout with beam (left/right/up/down,wiresum)	
Monitoring	Verify beam position monitor read back is accurate + archived Verify sample/hold fast (100kHz) output (DAC+V2F) read by DAQ	
Sum	Acceptance (IPM5D00, IPM5D01)	

D. Beam Cavity Current Monitor System- Two Methods

Parameter	**Task**	**Status**
Gigatronix Operation	Verify hot checkout successful Verify gain parameters and calibration	
Fast Receiver Operation	Verify cavity receiver (ioc powered) hot checkout successful Verify gain parameters and calibration Verify Fast Shutdown (FSD) signal works properly	
Monitoring	Verify Gigatronix read back is archived is accurate + archived Verify beam cavity receiver read back is accurate + archived Verify receiver fast (>20kHz) output (DAC+V2F) read by DAQ	
Sum	Acceptance (IBC0L02)	

E. Faraday Cup System

Parameter	**Task**	**Status**
Operation	Verify correct insertion depth Verify remote operation to insert/retract Verify Keithley 6485 picoammeter software checkout successful Verify picoammeter calibration successful	
Protection	Verify correct operation of LCW FSD interlock Verify electrical isolation overvoltage circuit installed Verify anti-collision circuit between IFY5D04 and ITV5D04 (viewer)	
Monitoring	Verify picoammeter read back is accurate + archived	
Sum	Acceptance (IFY5D04)	

F. Beam Scraping (Positron Collimation) System-(Left/Right Collimators)

Parameter	**Task**	**Status**
Operation	Verify injector scraping software hot checkout Verify correct remote operation to set, insert and retract Verify calibration of current to voltage monitoring channel	
Monitoring	Verify position and current read back is accurate + archived	
Sum	Acceptance (ISC5D03L, ISC5D03R)	

G. Steering Magnet Type BH (air core)

Parameter	**Task**	**Status**

Operation	Verify connection to 1 Amp bi-polar trim card Verify magnet wiring and polarity Verify control system field map (B vs. I) + no hysteresis Verify 1 Amp software limit	
Monitoring	Verify magnet read back is accurate + archived	
Sum	Acceptance (MBH5D00H, MBH5D00V, MBH5D00AH, MBH5D00AV)	

H. Steering Magnet Type CS (air core)

Parameter	Task	Status
Operation	Verify connection to 10 Amp bi-polar trim card Verify magnet wiring and polarity Verify control system field map (B vs. I) + no hysteresis Verify 3 Amp software limit	
Protection	Verify current limiting resistor to 3 Amp	
Monitoring	Verify magnet read back is accurate + archived	
Sum	Acceptance (MCS5D03H, MCS5D03V, MCS5D04H, MCS5D04V)	

I. Quadrupole Magnet Type QD (iron)

Parameter	Task	Status
Operation	Verify connection to 10 Amp bi-polar trim card Verify magnet wiring and polarity Verify control system field map (B vs. I) + yes hysteresis Verify 10 Amp software limit	
Protection	Verify LCW connect in tunnel (unmonitored)	
Monitoring	Verify magnet read back is accurate + archived	
Sum	Acceptance (MQD5D00, MQD5D01)	

J. Capture Solenoid Magnet MPC5D02 (iron)

Parameter	Task	Status
Operation	Verify connection to 300 A EMI uni-polar power supply Verify magnet wiring and polarity Verify control system field map (B vs. I) + yes hysteresis Verify 298 Amp software limit	
Protection	Verify LCW flow limit interlocked to power supply Verify thermal sensors interlocked to power supply Verify Class 1 enclosure surrounds magnet leads Verify Class 1 postings are visible	
Monitoring	Verify magnet controls accurately reported and archived	
Sum	Acceptance (MPC5D02)	

K. Spectrometer Dipole Magnet MPD5D03 (iron) + MPD5D03A (trim)

Parameter	Task	Status
Spectrometer Operation (MPD5D03)	Verify connection to 300 A EMI uni-polar power supply Verify magnet wiring and polarity Verify operation of current relay (supply off) Verify control system field map (B vs. I) + yes hysteresis	

	Verify 298 Amp software limit	
Spectrometer Protection (MPD5D03)	Verify LCW flow limit interlocked to power supply Verify thermal sensors interlocked to power supply Verify Class 1 enclosure surrounds magnet leads Verify Class 1 postings are visible	
Trim Operation (MPD5D03A)	Verify connection to 10 A bi-polar power supply Verify magnet wiring and polarity Verify control system field map (B vs. I) + no hysteresis Verify 3 Amp software limit	
Trim Protection (MPD5D03A)	Verify 3 Amp limiting resistor	
Monitoring	Verify magnet controls + read back accurate + archived	
Sum	Acceptance (MPD5D03, MPD5D03A)	

L. Solenoid Transport Magnet Type MPT5D04 (iron)

Parameter	Task	Status
Operation	Verify connection to 10 Amp bi-polar trim card Verify magnet wiring and polarity Verify control system field map (B vs. I) + yes hysteresis Verify 5 Amp software limit	
Protection	Verify current limiting resistor to 5 Amp	
Monitoring	Verify magnet read back accurate + archived	
Sum	Acceptance (MPT5D04)	

M. Compton Polarimeter Analyzing Magnet MPA5D05 (iron)

Parameter	Task	Status
Operation	Verify connection to 125 A Sorenson uni-polar power supply Verify magnet wiring and polarity Verify operation of current relay (supply off) Verify control system field map, hysteresis and 60 Amp software limit Verify embedded pick-up coils are connect to ISB patch panel Implement/verify measurement control of the iron core polarization	
Protection	Verify LCW flow limit interlocked to power supply Verify thermal sensors interlocked to power supply Verify Class 1 enclosure surrounds magnet leads Verify Class 1 postings are visible	
Monitoring	Verify magnet controls + read back accurate + archived	
Sum	Acceptance (MPA5D05)	

N. Production Target (T1) Ladder System – ITG5D01

Parameter	Task	Status
Operation	Verify correct remote operation to set, insert and retract target ladder Verify target video system correctly labeled Verify target video focus and illumination sufficient	
Monitoring	Verify target position is accurately reported and archived in control	

	system	
Sum	Acceptance (ITG5D01 = out, viewer, 3 targets)	

O. Compton Reconversion Target (T2) – ITG5D04

Parameter	Task	Status
Operation	Verify electrical isolation of target Verify connection to ISB patch panel Verify Keithley-6485 picoammeter hot checkout successful	
Protection	Verify overvoltage protection circuit connected	
Monitoring	Verify isolated read back is accurate + archived	
Sum	Acceptance (ITG5D04)	

P. Annihilation Detector System

Parameter	Task	Status
Operation	Verify detector physically installed in permanent location Verify detector HV and signal cables connected to ISB patch Verify readiness of remotely controlled HVPS in ISB	
Monitoring	Verify DAQ operation and data analysis	
Calibration	The detector system will be calibrated in the beam enclosure using Na-22 and Co-60 sources both to check the energy calibration and to verify detector timing; a stored spectrum from each source shall be available, along with the channel number where the 0.511 MeV photons are expected to appear	
Sum	Acceptance (IAC5D03-L, IAC5D03-R)	

Q. Fiber Array Detector System

Parameter	Task	Status
Operation	Verify detector physically installed to linear actuator Verify correct remote operation to insert/retract detector Verify detector HV and signal cables connected to tunnel DAQ Verify readiness of remotely controlled HVPS in ISB Verify with a source that each fiber generates a signal with an acceptable spectrum in the appropriate DAQ array. This will check the connections, electronics, and DAQ chain as well as the data analysis	
Monitoring	Verify DAQ operation and data analysis with source as described above	
Sum	Acceptance (IFA5D04)	

R. Compton Polarimeter Detector System

Parameter	Task	Status
Operation	Verify detector physically installed on detector fixture Verify correct manual operation to insert/retract detector Verify detector HV and signal cables connected to ISB patch Verify readiness of remotely controlled HVPS in ISB Energy calibration with Na-22, Co-60, and Cs-137 sources will be carried out and documented prior electron beam runs, together with cosmic ray measurements	

Protection	Verify procedure and operator training to manually insert/retract detector Verify sign to warn of pinch hazard during motion of detector fixture Verify GN2 flow to detector box (unmonitored)	
Monitoring	Verify DAQ operation and data analysis	
Sum	Acceptance (ICP5D05)	

S. Data Acquisition System

Parameter	Task	Status
Hardware	Development of the FADC250 firmware for integrated mode	
Trigger	Verify annihilation detector trigger mode Verify cosmic trigger mode Verify LED trigger mode Verify polarimeter trigger mode Verify trigger supervisor operation	
Operational Mode	Verify sample mode operation and limitations Verify semi-integrated mode and limitations Verify integrated mode and limitations	
Control Software	Verify CODA configuration files	
Sum	DAQ Acceptance	

T. Simulation Software

Parameter	Task	Status
ELEGANT	Verify configuration for element geometry Verify magnetic description for elements Verify process to benchmark measurement + model to T1 Verify process to benchmark measurement + model to T2	
G4Beamline	Verify configuration for element geometry Verify magnetic description for elements Verify process to benchmark measurement + model from T1 to T2	
G4PEPPo	Verify configuration for element geometry Verify magnetic description for elements Completed analyzing power simulation for electrons and positrons	
Sum	Simulation Software Acceptance	

U. Data Analysis

Parameter	Task	Status
Decoder	Verify data decoding for the 12-bit FADC250 Verify data decoding of the VME/TDC	
Analyzer	Verify sample data analysis Verify semi-integrated data analysis Verify integrated data analysis Verify analysis of the background mode Verify analysis of the radioactive source mode Verify analysis of the cosmic ray mode	

	Verify on-line asymmetry measurement	
Sum	Data Analysis Acceptance	

3. Electron Beam Transport Commissioning

The purpose of electron beam transport commissioning is to demonstrate sufficient understanding of the electron beam (momentum, Twiss parameters) and magnetic optical elements in order to deliver a well collimated and controlled spot size beam to either the positron production target T1 or the Compton polarimeter reconversion target T2.

This commissioning will be performed in two phases with viewer limited beam with average current of a few nanoamps at the nominal CEBAF injector beam energy, about 6.3 MeV. A total of 8 position sensing diagnostics (viewer, BPM, fiber array) over <3 meters are employed as the primary diagnostics. ***For the first phase of the tests a Faraday cup beam dump or viewer shall be inserted in the final vacuum cross to both detect and stop transported beam before reaching vacuum window.***

The following steps will be performed in sequence:

Step	Objective	Acceptance
1	Measure beam momentum and momentum spread	Successful procedure using the 2D injector spectrometer
2	Measure beam Twiss and emittance parameters	Successful procedure using injector harp analysis
3	Beam to first viewer	Successful dipole setting to deflect known beam momentum using measured MBV2D01 field map
4	Beam to target viewer	Successful steering magnets to deflect beam to target viewer
5	Quadrupole magnet centering	Successful centering procedure for each quadrupole to determine magnetic center and BPM offsets
6	Beam size and aspect control at target viewer	Successful demonstration to use injector and Region 1 quadrupole magnets to a) suppress magnetic dispersion and b) demonstrate round beam spot size from minimum to few millimeters
7	Beam size calibration at target viewer	Successful use of Region 1 steering magnets and video image of target viewer to calibrate beam size at target in X and Y
8	Beam to spectrometer exit	Successful use of measured beam momentum + spectrometer field map to transport beam to viewers located at the center and exit of spectrometer; explore use of spectrometer trim on second spectrometer dipole
9	Beam size and aspect control in spectrometer	Successful use of Region 1 quadrupole magnets and production target solenoid to control beam size at target, spectrometer center and spectrometer exit viewers in expected size and aspect ratios
10	Beam to final vacuum cross	Successful use of Region 3 steering magnets to transport beam to final vacuum cross and viewer
11	Beam centering in Region 3 solenoid	Successful use of Region 3 steering magnets to center in

Step	Objective	Acceptance
		Region 3 transport solenoid
12	Beam size and aspect control at exit viewer	Successful use of Region 3 solenoid magnet to control spot size on final viewer and confirm focal length
13	Beam current measurement at final vacuum cross	Successful use of Faraday cup to measure nanoamps of viewer limited beam transport to end of vacuum system
14	Beam line aperture test	Successful use of steering magnets and small variation in transport magnets to characterize the physical and magnetic acceptance of the apparatus using viewers and the Faraday cup

Once the first 14 steps outlined above have been completed successfully, the Faraday Cup / beam dump shall be retracted and the last three steps (listed below) shall be executed.

15	Beam to reconversion target T2 (in air)	Successful transport of viewer limited beam beyond the vacuum assembly reaching and measured at the electrically isolated reconversion target
16	Apparatus reproducibility	Successful application to change and cycle each element independently and verify reproducibility of beam transport using the viewers, Faraday cup and reconversion target T2
17	Collimator position calibration	Successful implementation of collimator to block beam to viewer at center of spectrometer; to then calibrate the collimator position vs. beam position as set by a steering corrector and measured on the viewer

4. Electron Beam Energy Commissioning

The purpose of electron beam energy commissioning is to explore the range of electron beam energy which can be achieved for the experiment. This parameter range is important because it determines the electron energy domain over which a) the magnetic transport system and b) the Compton transmission polarimeter may be carefully characterized with electrons.

This commissioning will be performed with viewer limited beam with average current of a few nanoamps. Measurements will be made to identify the maximum gradient and the lowest momentum beam.

Commissioning steps sequence:

Step	Objective	Acceptance
1	Measure maximum gradient for cryounit	Successful measurement of maximum cryounit gradient without vacuum or waveguide pressure faults (repeat test performed in 2009)
2	Measure minimum gradient for beam transport	Successful measurement to transport beam to 2D spectrometer as energy is reduced below pair

Step	Objective	Acceptance
		production threshold ($m_{e-} + m_{e+}$)
3	Quantify beam parameters versus cryounit gradient in 1 MeV steps	Successful procedure using 2D spectrometer and injector harp analysis to measure the beam momentum, momentum spread, emittance and Twiss parameters over cryounit gradient range from Steps 1 and 2
4	Transport beam to production target T1 and reconversion target T2 at the two extremes of the energy range in Step 3	Successful progress to repeat the Electron Beam Transport Commissioning for each of these two energies; evaluate if range should be modified and repeat this step

5. CW Electron Beam Commissioning

The purpose of CW electron beam commissioning is to demonstrate the capability to deliver and manage a CW beam to the PEPPo experiment within an acceptable envelope of conditions (intensity, energy, vacuum levels, radiation).

This commissioning will be performed with viewer mode (few nanoamps), tune mode (10's nanoamps) and CW mode (<5 uA). The beam energy will be varied between the minimum and maximum values determined in the electron beam energy commissioning. A Faraday cup beam dump may be inserted in the final vacuum cross to both detect and stop transported beam before reaching vacuum window. In the plan below "ELECTRON MODE" refers to magnetic elements downstream of the production target set for electrons; while "POSITRON MODE" refers to settings for positrons. Until beam is adequately commissioning to the PEPPo Faraday cup (final dump of vacuum system) a small lead brick wall will be used to protect Compton polarimeter detector from unnecessary irradiation.

CW ELECTRON MODE sequence:

Step	Objective	Acceptance
1	Calibration beam cavity monitor receiver	Successful calibration of receiver to optimize gain over up to 5uA against reference Faraday Cup #2
2	Complete + log PEPPo cw checklist	Successful cw checklist for PEPPo beam operations
3	Configure BCM FSD for 1 uA	Successful FSD fault with > 1 uA to Faraday Cup #2
4	Transport 6.3 MeV to Compton polarimeter in electron mode	Successful transport of viewer limited 6.3 MeV electron beam to reconversion target
5	Test cw 1 uA at PEPPo FC (PFC) in electron mode	Successful measurement of PFC current, vacuum load and radiation while ramping to 1 uA
6	Test cw 1 uA at reconversion target in electrode mode	Successful measurement of reconversion target current, vacuum load and radiation while ramping to 1 uA
7	Test cw 1 uA at collimators in electron mode	Successful measurement of PFC current, collimator current, vacuum load and radiation while ramping to 1 uA
8	Test cw 1 uA at spectrometer dump with spectrometer off	Successful measurement of vacuum load and radiation while ramping to 1 uA with no target; full beam

Step	Objective	Acceptance
9	Test cw 1 uA at production targets in electron mode	Successful measurement of PFC current, collimator current (vs. position), vacuum load and radiation while ramp to 1 uA; repeat for each target
10	Test cw 1 uA at production targets; transport lower momentum particles to PFC	Successful measurement of PFC current, collimator current (vs. position), vacuum load and radiation with 1 uA on production target and electron mode settings to collect lower momentum electrons
11	Test cw 1 uA at production targets; transport lower momentum particles to reconversion target T2	Successful measurement of reconversion target current, collimator current (vs. position), vacuum load and radiation with 1 uA on production target T1 and electron mode settings to collect lower momentum electrons to reconversion target T2
12	CW electron mode commissioning at lowest electron beam energy	Successful test of Steps 4-11 for lowest electron beam energy
13	CW electron mode commissioning at highest electron beam energy	Successful test of Steps 4-11 for highest electron beam energy

CW POSITRON MODE commissioning sequence:

Step	Objective	Acceptance
4	Configure BCM FSD for 5 uA	Successful FSD fault with > 5 uA to Faraday Cup #2
5	Transport 6.3 MeV to Compton polarimeter in electron mode	Successful transport of viewer limited 6.3 MeV electron beam to reconversion target
6	Test cw 5 uA at spectrometer dump with spectrometer off	Successful measurement of vacuum load and radiation while ramping to 5 uA with no target; full beam
7	Set polarimeter of spectrometer for positron mode	Successful polarity reversal using relay external to uni-polar power supply
8	Test cw 5 uA at spectrometer dump in positron mode	Successful measurement of vacuum load and radiation while ramping to 5 uA with no target at different spectrometer setting; full electron beam deflected across spectrometer dump
9	Test cw 5 uA at production targets in positron mode with collimator closed (PFC inserted)	Successful measurement of collimator current, vacuum load and radiation while ramping to 5 uA with collimators closed at different spectrometer setting; repeat for each target
10	Test cw 5 uA at production targets in positron mode with collimator open to PFC	Successful measurement of PFC current, collimator current, vacuum load and radiation while ramping to 5 uA vs. collimator position at different spectrometer setting; repeat for each target
11	Test cw 5 uA at production targets in positron mode with collimator open to reconversion target T2	Successful measurement of reconversion target T2 current, collimator current, vacuum load and radiation while ramping to 5 uA vs. collimator position at different spectrometer setting; repeat for each target
12	CW electron mode commissioning at lowest electron beam energy	Successful test of Steps 4-10 for lowest electron beam energy
13	CW electron mode commissioning at highest electron beam energy	Successful test of Steps 4-10 for highest electron beam energy

Once we have demonstrated the full range of beam transport and beam monitoring capabilities for both electrons and positrons, we are ready to begin the commissioning (as described below) of the three experimental devices along the beam line: the annihilation detector; the fiber array detector; and the Compton transmission polarimeter, and then to measure the detector background levels in operation before beginning physics measurements.

6. Annihilation Detector Commissioning

The main purpose of the annihilation counter detection system is to indirectly confirm the presence of positrons by detecting in coincidence the 511 keV photons produced when the positrons annihilate inside a target. The annihilation counters for PEPPo consist of a pair of Na detectors located perpedicular to the beam line and positioned to detect the back-to-back photons emitted either in coincidence or individually. The system can be configured to relax the back-to-back coincidence if desired. The detectors may also provide a relative measurement of the positron beam intensity

During initial operation with an electron beam:

- The annihilation counter will be tested with an electron beam. The signal-to-background ratio shall be measured and, if necessary, additional shielding added in the form of Pb blankets wrapped around the detector until the ratio is satisfactory. *(Note: not clear to me what this test was intending to accomplish and what will be the definition of "complete" – it would be worth expanding upon. I made a stab at guessing the purpose.)*

- Detector operation will be assessed by requiring a coincidence between the two Na(I) detectors in order to optimize the signal to noise ratio for detecting the back-to-back 511 keV photons from electron-induced positron annihilation inside the beam viewer. The detection of single electrons from the Møller scattering of the incident beam can also be used for this purpose. *(Note: this test assumes electron to positron conversion in the viewer, followed by positron annihilation. There should be a theoretical estimate of the rate for this process to be sure it is likely to be visible above the background levels in the detectors – singles rates of photons and scattered electrons incident on the detectors from an electron beam incident on the viewscreen and no positron production. This will be real (though non-coincident) background.)*

7. Fiber Array Detector Commissioning

The expected low currents involved in the PEPPo experiment allow to use a scintillating fiber array detector for the measurement of the positron beam profile. The device is a modified version of the beam profiler operating for the Hall B two-photon exchange experiments. It consists of sixteen 30 cm long square fibers 1x1 mm^2 along both axis of the plane perpendicular to the beam direction. The detector is located at the exit of the beam pipe just prior the reconversion target of the transmission polarimeter. Each fiber plane is connected to a 16 channels photomultiplier tube which signals are directed to a specific VME crate where the counting rate per fiber is recorded.

During initial operation with an electron beam:

- The operational assessment of the fiber array will be done by scanning the electron beam across the fiber array using the vertical and horizontal corrector magnets just after the second dipole. The beam spot under these conditions is expected to be of order a fiber diameter so this test will basically verify the working of the individual fibers and our understanding of the beam transport. *(Note: need to verify that the correctors have enough strength to move the electron beam across the fiber array; if so, add information on the change in corrector current expected to move the beam from one fiber to the next.)*

- Next, with the production target inserted one expects the beam size to increase dramatically, and be defined by the collimators and slits between the production target and the annihilation detector. Initially a test can be done with the beam line set for nominal transmission of the electron beam with no production target in place. The centroid of the beam at the beam profiler should remain at the same fiber position as in the "no production target in place" test above, but grow in width to **** fibers (FWHM).

- Next one can reverse the fields in the spectrometer and verify that the positron beam has a profile (and centering) similar to in the electron beam w/ conversion target in place situation.

8. Compton Transmission Polarimeter Commissioning

The operation of the PEPPo polarimeter relies on the Compton absorption of polarized photons inside a polarized target. Polarized photons are generated from the interaction of a polarized electron or positron beam inside a 2 mm tungsten target at the entrance of the analyzing magnet polarizing at 7% a 7.5 cm long iron target. Transmitted photons are measured in a 3 x 3 CsI crystal array located at the exit of the analyzing magnet. Each crystal, 6 cm x 6 cm square section and 28 cm long, is connected to a photomultiplier tube R6236-100 with custom bases designed to improve the tube life-time. The gain of each PMT is controlled via a LED monitoring system simultaneously to physics data taking. The output signals are recorded and processed by the PEPPo DAQ system based on the FADC-250 modules developed by the JLab electronics group.

During initial operation with an electron beam:

- Note: These measurements will be performed with the demonstrated lowest beam energy of the PEPPo program for a CW electron beam of 1nA whose polarization has been established using the Mott polarimeter before beginning these tests.

- The basic operation of the polarimeter will be established and any false asymmetries in the device determined by making measurements with a nanoampere level polarized electron beam of known polarization. Averaging the data over the two helicity states will determine the false asymmetry in the polarimeter. *(Note: should add here a limit on what you expect from things like the alignment of the polarimeter elements.)*

- The same data can then be used to determine the analyzing power of the polarimeter by taking sums and differences of the data from the two helicity states and knowing the beam polarization from measurements with the Mott. The analyzing power will be measured for centered and off-center beam. The use of the device for determining positron polarization will be contingent upon this result agreeing with expectations. *(Note: should add here just what those expectations are from the modeling.)*

- Finally, false asymmetries associated with beam motion correlated with helicity state can be determined by comparing the false asymmetry measurement with the Wien filter set for zero and for 180 degrees. These false asymmetries are expected to be negligible for this experiment.

- Once these measurements have been completed the polarimeter is ready to be used to characterize positron beams.

9. Detector Background Commissioning

Along with the beam line and the detectors operational assessments, measurements of the sensitivity of the detectors to ambient background should be evaluated. Several configurations should be studied as a function of the positron production target T1:

Production Target T1	**Transport Mode**	**Spectrometer**	**Collimators**
Out	n/a	Off	Closed
Out	Electron	Scan momentum	Closed
Out	Electron	Scan momentum	Open
Out	Electron	Beam momentum	Open
In	Electron	Beam momentum	Open
Out	Positron	Scan momentum	Open
In	Positron	Scan momentum	Open