Experiment Safety Assessment Document for
Experiment E99-114 - December 13, 2001

1 Introduction

The Experiment E99-114 Real Compton Scattering (RCS), is scheduled to run in Hall A for 33 days during the January-February, 2002 period. The experiment is partially compatible with the base equipment in Hall A. The standard Hall A equipment for this experiment is as follows:

- Standard Hall A beam line
- Hall A Scattering Chamber and Cryogenic Target System
- The Left High Resolution Spectrometer (HRS-L) and its standard detector package for angles in the range $12.5° - 45°$ and for central momenta in the range 1.5-4.3 GeV/c. The Right High Resolution Specrometer (HRS-R) is not used in this experiment and is permanently parked at a large angle.

There are two pieces of new equipment for Experiment E99-114: the RCS Photon Spectrometer and the RCS Deflection Magnet. The remainder of this document describes the safety considerations for this equipment.

2 RCS Deflection Magnet

The RCS experiment (E99-114) will use a specially designed dipole magnet as a charged particle sweeping magnet. It will be located immediately adjacent to the target chamber on the right side of the beam. Once installed, it will not be moved for the duration of the experiment. The Bigbite power supply will be used to energize this magnet. It is also located in Hall A, under the cryogenic target control system.

The TOSP for the magnet describes the Hazard Analysis and Hazard Mitigation for this device, and the reader is referred to that document for the details. Also described in the TOSP are the operating guidelines for the magnet during the running of the experiment. That discussion is repeated here for convenience.

2.1 Operating Guidelines during the Running of Experiment E99-114

2.1.1 Preparing to Close the Hall

The Hall A technical staff will be responsible for doing the following things during their sweep of the hall:

1. Rope off the area around the magnet.

2. Sweep the area inside the ropes for magnetic material. Make sure that the area is clean, and that no foreign objects are in or near the aperture of the magnet or the inside of the stay-clear zone. All such material must be removed and placed outside of the ropes.

3. Make sure all protective barricades, signs, *etc.* are in place to warn of possible exposure to magnetic and electrical hazards.

4. Verify all covers on energized conductors on the magnet are securely in place.

5. Verify all power supply doors and cabinets are closed and locked.

6. Check that the cooling water is turned on. Valves on the magnet and on individual cooling paths must all be open.

7. Verify that water flow is present—feel the hoses.

8. Turn on the flashing beacons.

9. Remove the administrative lock on the power supply disconnect switch. Make sure that Jefferson Lab's Lock and Tag procedures, as described in Chapter 6110 of the Jefferson Lab EH&S Manual, are followed throughout the following procedures:

   (a) Up-to-date Lock and Tag training.

   (b) Training on the operation of the power supply and magnet.

   (c) Authorization by B. Wojtsekowski

10. Enable main power on the power supply and ramp output current according to standard procedures.

2.1.2 While the Hall is Closed

Under normal running conditions, the shift leader has sole authority to energize or de-energize the magnet, according to the run plan.

2.1.3 Controlled Access

For controlled access during the experiment, it is the responsibility of the shift leader to ramp the current to zero prior to personnel entering the hall.

2.1.4 Returning to Restricted Access

If the hall returns to restricted access, the shift leader is responsible for ramping the current to zero. Upon accomplishing this, the shift leader informs the Hall A technical staff, who is then responsible for turning off the main power at the power supply, applying the administrative lock to the power supply, and turning off the flashing beacons. All this needs to be done before the hall is open for restricted access.

3 RCS Photon Spectrometer

The RCS Photon Spectrometer consists of the detector platform, the electronics platform, and the cables interconnecting the two platforms.

The detector platform is on the right side of the beam (same as the RCS Deflection Magnet). Depending on the kinematic configuration, it can be placed at scattering angles in the range $20° - 80°$ and at a radial distance from the Hall A center in the range 5.0-25.0 m. Sitting on the detector platform are the RCS detectors, which consist of a 704-block matrix of lead-glass calorimeter blocks and an array of 216 Lucite Cerenkov detectors, all with associated photomultiplier tubes (PMT). Also sitting on the platform are some of the data acquisition electronics.

The electronics platform is located on the left side of the beam behind a concrete shielding wall at an angle of approximately 63° with respect to the beam direction and approximately 15 m from the Hall A center.

The high voltage and signal cables connect the detector and electronics platform via a series of cable carts. Starting from the detector, the cables run along a series of carts, which facilitate movement of the detector, to the periphery of the hall, behind HRS-R, to the electronics platform.

3.1 Hazard Analysis and Mitigation

3.1.1 Electrical Hazard

Each PMT base requires approximately 1.5 kV at 1 mA. However, the bases are in enclosed boxes that are not accessible to personnel. Moreover, the high voltage power supply is interlocked so that it will turn off if a high voltage cable is removed.

3.1.2 Fire Hazard

The total power dissipated in the PMT bases for the calorimeter is about 1050 kW. Since the bases are in an enclosed box, this represents a potential fire hazard. To mitigate against this, room-temperature air is circulated through the box. During running in the Test Lab over the past two months, this has been shown to be an effective way to keep the enclosure at an acceptable temperature. An interlock system will automatically turn off the high voltage power supply if the temperature, pressure, or air flow falls outside of preset bounds. The total power dissipated in the veto detector PMT bases, which are also in an enclosed box, was determined during running in the Test Lab to not require any air flow.

3.1.3 Mechanical Hazard

During configuration changes of the detector, the entire platform needs to be lifted with a mechanical crane. Only a trained crane operator is authorized to perform this task.

3.1.4 Fall Hazard

There is a potential fall hazard for persons atop the detector platform. This is partially mitigated by the rails on the sides of the platform. Nevertheless, it is required that all personnel atop the detector platform utilize a harness-type fall protection.