Experimental Safety Assessment Document (ESAD) for Hall A Experiment E04-007 March 17, 2008

The threshold pion production experiment is scheduled to run in Hall A from April 1 through Owl shift May 7, 2008. The experiment is compatible with the base equipment in Hall A, augmented by the BigBite spectrometer. The BigBite spectrometer has previously been used in two Hall A experiments, E01-015 with a hadron detector stack, and E02-013 with an electron detector stack. As of the writing of this document, the spectrometer is being installed with a hadron detector stack. Specifically, the experiment will use:

- the standard Hall A beamline with BigBite scattering chamber
- standard hydrogen cryotargets and solid targets
- the left High-Resolution Spectrometers (HRS) in the standard angle range, above 12.5 degrees, as described in the Hall A OSP
- the standard HRS detector package, as described in the Hall A OSP
- the BigBite spectrometer in the standard angle range, above 30 degrees, and
- the BigBite hadron detector package
- Helium Bag system

BigBite hazards are described below. More details about the BigBite gas system and magnet can be found in the Jefferson Lab operation safety procedures OSP-08-001-PHY and OSP-08-002-PHY respectively.

1 BigBite dipole magnet

The potential hazards associated with the BigBite dipole magnet include electrical (the power supply has a maximum output current of 1050 A at 250 V), magnetic (the central magnetic field is of the order of 1 Tesla), and fire (associated with high current power supply). These hazards are described

in detail in the BigBite OSP. The BigBite magnet should always be turned off when work is being done in the immediate area around the magnet or when the BigBite spectrometer angle is being changed by the technical staff. Further information about static magnet fields can be found in Chapter 6440 of the Jefferson Lab EH&S manual as well as in the BigBite operational safety procedure OSP-08-002-PHY.

2 BigBite Detector Package

The BigBite detector package contains following detectors:

- Two Drift Chambers for Particle Tracking
- dE/E Scintillator Planes for Triggering and Particle Identification
- BigBite Insertable Sieve Plate
- Helium Gas to Minimize the Energy Loss of Hadrons into BigBite

2.1 Wire chambers

The BigBite wire chamber package consists of two MWDCs, located immediately behind the BigBite dipole. The active area of the first chamber is 35 cm x 140 cm. The active area of the second and the third chambers is 50 cm x 200 cm. The chamber will operate with a pre-mixed gas mixture of 50% Argon and 50% Ethane, kept just above atmospheric pressure. The operation and safety of this system is documented in BigBite OSP-08-001-PHY. The operational voltages for these chambers are around 1650 V, supplied with a maximum current limit of less than 100 μA.

2.2 Scintillators

The BigBite Hadron package's 96 scilntillators are connected to signal and high voltage cables which run between the detector and the DAQ weldment. These cables pose a trip hazard and special walk-over points will be established in the Hall.

2.3 Helium Bag

The helium bag will be pre-installed in the BigBite magnet. No work should be done on this system unless the BigBite magnet is off. The bag may also end up with the radiation area around the target. If this is the case, Radcon must be contacted before entering the radiation area.

2.4 Sieve Plate

BigBite will have an insertable sieve plate. While the plate will likely be in the radiation area around the target, it will be movable via a pulley system which extends beyond the radiation area. If for any reason, one needs to locally access the sieve and the area has been a radiation area, one must contact Radcon before entering the area.