

# **Experimental Safety Assessment Document for 2006 BCAL Test 6-Sep-2006**

## **1. Introduction**

The Hall D BCAL (Barrel Calorimeter) test in the Hall B alcove is scheduled to take data between 22-Sep-2006 and 1-Oct-2006. The BCAL detector module will be located in the Hall B downstream alcove or on a platform upstream of the alcove. The test will not use the CLAS detector itself but will use the Hall B tagging system. The CLAS TPE target will be installed but will be empty, and the CLAS torus magnet will not be energized. He bags will be installed as usual along the CLAS beamline and no additional ODH hazards will be created by the BCAL equipment.

The BCAL detector is composed of a lead/scintillating fiber matrix roughly 13 cm x 23 cm x 4 m. The test will use a low energy, low intensity bremsstrahlung beam produced by a standard  $10^{-4}$  radiator collimated down to 2.6 mm by the standard CLAS collimation system. The photon beam will traverse the hall and impinge on the BCAL module itself. The electron beam energy will be 0.687 GeV with a maximum current of 5 nA.

The BCAL detector weighs approximately 2000 pounds and will be mounted on a heavy-duty movable cart that supports manual lateral motion of the BCAL module as well as remotely-controlled horizontal rotation of the module around the cart axis. The cart will be located on a heavy steel plate bridging the elevated platform upstream of the alcove and the alcove itself. During the run the cart will be moved to various locations on the plate (i.e. on the platform and in the alcove), the module will be moved to various lateral positions with respect to the cart, and the module will be rotated on the cart to various angles with respect to the photon beam.

## **2. Hazard Analysis**

The important new components used in the BCAL test are the refurbished platform

upstream of the Hall B downstream alcove, the BCAL support cart, and the BCAL detector module itself. Electronics, HV power supplies, etc. are covered in the final section.

## 2.1 Platform

The platform is a reworked version of an older platform that stood in the same place. The original platform had two legs and the opposite end was connected to the edge of the alcove. For this test the platform needed to be rotated 90 degrees so two additional support legs were added, making the platform free-standing, and the platform was repositioned and connected to the alcove. A ¾" steel plate was attached to the platform and alcove in order to create a smooth surface for the cart to roll on from the upstream platform edge into the middle of the alcove. The platform sits about 16' in the air.

A new catwalk with railings was installed that bridges the gap between the upstream edge of the platform and the downstream edge of the CLAS forward carriage. The ladder that used to attach to the old catwalk now attaches to the new catwalk/platform assembly.

All design, engineering and installation of the platform and associated structures was performed by the Hall B engineering staff. Platform loading design was independently reviewed by Suresh Chandra (Plant Engineering).

Hazard:

Fall from the platform.

Mitigation:

Railings and chains are installed along the exposed edges of the platform at the standard height.

Hazard:

Fall hazard when working on ladders on the platform.

Mitigation:

Standard Hall B operating procedures will be enforced. If a ladder is closer than five feet to any railing and a person's waist will be higher than 42 inches above the platform, fall protection will be used. Slings, harnesses and tie-off points are provided in the hall and on the platform.

Hazard:

Operation of the support cart on the platform involves motion of large, heavy objects which can possibly fall off the platform.

Mitigation:

A keep-out zone on the floor under and around the platform will be marked and enforced while the cart is in use.

Hazard:

Need emergency egress from alcove/platform in case of fire.

Mitigation:

Two means of egress from the alcove/platform are provided. One is the ladder from the floor to the platform area. The other is the catwalk that leads to the forward carriage, which has stairs leading down to the floor.

Hazard:

Electrocution from currents flowing in platform structure due to lightning strikes or electrical faults.

Mitigation:

The platform is connected to the hall grounding system via a suitably sized grounding

connection.

## 2.2 Support Cart

The BCAL module support cart was designed and constructed at Indiana University, then shipped to JLab in pieces and reassembled on the refurbished platform. There are a large number of safety concerns and critical procedures involved with use of the cart, and a separate TOSP was created and reviewed by an outside committee (chaired by Bert Manzlak) under standard JLab review procedures. This TOSP, number PHY-06-009-TOSP, is signed and attached to this document. It covers installation procedures and requirements, training requirements, operating procedures, etc. All concerns and requirements of the review committee have been addressed in the TOSP.

All operation of the cart will be performed according to the TOSP requirements by suitably trained personnel. Note that steel-toed boots will be required for all personnel moving the cart on the platform, and that a flashing red light will be installed on the cart indicating the cart is powered and potentially able to move (rotate) under remote control. Crash switches will be installed on the platform and near the cart that kill power to the cart drive mechanism.

## 2.3 BCAL Detector Module

The BCAL detector module was constructed at the University of Regina and was installed on the cart in the alcove as part of the cart installation procedure. Motion of the module on the cart is covered by the TOSP mentioned in the previous section.

RadCon has prepared a RSAD (attached) concerning monitoring of possible activation of the module by the incident photon beam. This is expected to be negligible due to the extremely low power beam used in the BCAL test.

Hazard:

Lead contamination.

Mitigation:

All exposed lead surfaces are both painted and wrapped in Tedlar.

## 2.4 Electronics and HV Power Supplies

Except as noted below all electronics and HV power supplies used in the BCAL test are either commercial products or were produced by the JLab Fast Electronics group. Identical devices are in common use at JLab and operation of this equipment falls under standard JLab operating procedures. We note that these are all low-power devices.

The bases connected to readout PMT's were built by collaborators and are of the standard resistor/divider type. No hazards are expected from use of the bases with commercial low-power HV supplies and photo-tubes.

Hazard:

Electrocution.

Mitigation:

All JLab standard wiring and grounding procedures have been followed.

## 3. Additional Documents

1. BCAL Cart TOSP mentioned in section 2.2.
2. RSAD mentioned in section 2.3
3. Hall B COO with minor modifications for the BCAL test.