

# BigBite Gas Cherenkov Detector Update

*Report by Todd Averett, College of William and Mary*

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**Summer 2011**—The GEANT 4 simulation of the full detector was completed at the level needed for a conceptual design. Geometry was optimized to transport light to the PMT array using 4 cylindrical mirrors. Once the simulation reached this point, we shifted our focus to the testing of the prototype detectors. W&M Research Scientist Bo Zhao worked full-time on these projects until October 2011.

**Fall 2011**—Prototype detector, version 1.0 had previously been completed at William and Mary. It consists of an 8x8 array of HERMES-type PMT's mounted inside of a light-tight box. This detector is located in Hall A. Aerogel was suspended above the PMT array to produce Cherenkov radiation from cosmic muons. A DAQ system based on 64 channels of VME ADCs and TDCs was constructed. Scintillator paddles were located above and below the prototype detector and served as a cosmic trigger. Trigger rate was about 0.3 Hz with a discriminator threshold of 40mV. The area of the trigger paddles was too large to constrain the geometry of the incident flux on the PMT array. However, the system was able to generate cosmic triggers that showed clean single-photoelectron ADC spectra when a timing cut was applied to the events.

**October 2011**—Research Scientist Bo Zhao left William and Mary for a different position. A new postdoc is expected to start in early January, 2012 and will focus on this project full-time at Jefferson Lab.

**Fall 2011**—T. Averett and student C. McLean focused on the design and construction of the second generation Prototype v.2. This new detector has a 9x9 array of the DIRC-style PMT's mounted in a steel box for magnetic shielding. This array is located inside a hermetically sealed aluminum box that includes a mirror and 70cm active length. The geometry of the detector was optimized match to the design used for the simulation above.

**November 21, 2011 Status**—Prototype v.2 has been constructed, mirror installed. PMT shielding box will undergo one more round of magnetic testing. In the last week of November, the PMT's will be mounted in the magnetic shielding and attached to the entire detector. The next step is to move the detector to Jefferson Lab for gain matching and commissioning with the DAQ system. The first draft of the OSP for this test is done and I hope to submit it by the end of November.

**December 2011—May 2012--**Plan to commission the detector using cosmics and eventually beam events. Albert's group is making 4 trigger paddles with optimized geometry. These paddles, along with several lead-glass blocks is expected to function as a simple detector package to characterize the prototype.

A mounting pedestal at beam height has been identified for the beam tests. A flat top plate needs to be fabricated to place the detector elements upon.

Tests of the prototype v.2 will continue in Hall A until beam arrives. We will continue to collect data until the beam shutdown in May. Data collected by this test run will be used to finalize the design of the entire final detector.

**To-Do List**—The items that need the most attention before the beam arrives are: identifying the correct delay cables and having them moved and sorted in the Hall, fabricate a mounting plate for the pedestal, finishing the magnetic shielding tests.