

# Summary of GlueX Beam Test Discussions

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## **Abstract**

This document contains notes collected during the November 2005 collaboration meeting on beam tests as well as notes from the follow-up discussion that took place on November 29, 2005.

## **1 Beam Tests in 2006**

In 2006, we hope to be able to test BCAL modules in the Hall B alcove at Jefferson Lab. Sometime soon after mid-2006 we will do beam tests of the existing 4-m BCAL module in the Hall B alcove using photons. This will be during G0 running when CLAS is not running. The estimate is that the tests would take about 1 week of beam time and probably at least a week of set up time. The optimum time to perform them would be after the 2nd module is completed. Probably this is concurrent with the G0 running.

Richard Jones also plans to test the active collimator as part of the CLAS g8 run period in 2006. He has the detector and one half of the electronics. The other half of the needed electronics is part of his 2006 R& D request.

## **2 Beam Tests in 2007**

Tests in 2007 focused on runs at TRIUMF that would involve the LGD, FDC and BCAL. These tests would be performed in the M11 beam line. If these tests took place late enough in the year, it might also be possible to test the CDC, although additional tubes need to be added before this can be done.

### **3 Beam Tests in 2008**

These tests would likely take place in the Hall B alcove and would involve the 64 -block LGD with new light coupling schemes. One might also want to perform tagger microscope tests in Hall B during this year.

### **4 Other Discussion**

The IU group felt that additional TOF tests are not necessary. They should be able to get the information that they need from cosmics.

There was also discussion of if it is possible to test the CDC in a magnetic field before the GlueX Solenoid is ready. This is difficult with the existing prototype because the B-field needs to be intense and along the length of the tubes.

The following has been added after the discussion. Assuming that the straw tubes are well positioned, the effects of a B-field on the drift and pulse characteristics of the chamber can be calculated quite well using a program such as Garfield. The real question comes down to one of gas mixture. In fact, this could probably be tested with only a small number of short tubes placed in some smaller and more manageable field. However, the exact gas mixture does not need to be settled until the experiment is ready to run. As such, tackling this problem in the GlueX solenoid at IUCF in 2008 or 2009 is not an unreasonable time to do it.

### **5 Notes collected by Alex Dzierba**

Sometime soon after mid-2006 we will do beam tests of the existing 4-m BCAL module in the Hall B alcove using photons. This will be during G0 running when CLAS is not running. The tests will concentrate on measurements of energy and time resolution and linearity as a function of incident angle - at several positions along the module. Zisis will be the overall coordinator for this test. Eric (IU) will design a remote controlled transport system and will also work with the UR group on producing light guides. We still need to decide whether to use FEU-84-3 or XP2020 PM's

The 64-channel FCAL will be tested in mid-2007 - with with improved light coupling. Energy resolution and spatial resolution and linearity will be measured using photons. TOF tests will not be made in this run. FCAL will

use the JLab FADC's. We also want to instrument the tagger with F1 TDC's to correlate timing info from tagger and FCAL (using FADC information).

The FCAL and TOF will be tested further at TRIUMF using electrons. The FDC will also be used. FCAL/TOF timing correlation will be made.  $dE/dx$  measurements from FDC will also be made. Low energy electrons will determine how low in energy we can detect electromagnetic showers.

## 6 Notes collected by Elton Smith

**BCAL** Goals:

1. Scan in incident photon angles at center of calorimeter
2. Scan in incident photon angles at edge of calorimeter to understand response at shallow angles, e.g. 10 degrees.
3. Scan in incident photon energies, e.g. measure resolution vs. energy

Discussion:

1. Consider segmentation in readout. IU could produce light guides that couple to FEU pmts. These have poor timing resolution. Regina and IU groups will consider use of tubes with better timing resolution and propose a setup that allows segmentation in the readout. (Note: the guides for the LGD coupling to FEU pmts are 4x4cm<sup>2</sup> x 5cm long)
2. Zisis has volunteered to coordinate these beam tests.

Location and Schedule: (Hall B)

1. Goal to be ready by late summer 2006
2. Opportunities for measurements are Sep or Dec 2006 based on present schedule.

**FCAL** Goals:

1. Position and angle scan of photon beam on LGD array.
2. Test linearity of signal vs input photon energy. (This requires relatively high energies available in Hall B).
3. Determine response of system to low photon energies between 50 and 150 MeV.
4. Test energy sums in 250MHz FADC.
5. Timing correlations with tagger.

#### Discussion.

1. Low energy measurements are perhaps best suited for TRIUMF.
2. Position resolution measurements can benefit from incident electrons.
3. Linearity measurements need higher energies such as in Hall B

#### Location

1. TRIUMF is most likely for position resolution studies and response to low energy photons, especially if channel is modified to be able to produce a small momentum bite
2. Other alternative is the beam at Duke TUNNEL.

#### Schedule

1. Tests to be conducted after the matching guides between pmts and LGD. This is likely to be in late 2007.

#### **TOF** Goals:

1. Repeat tests of TRIUMF runs last summer with smaller momentum bite in channel and thicker scintillators to improve resolution.
2. Look at timing correlation with LGD.

## Location and Schedule

1. Work in parallel with TRIUMF tests for Fcal.

### **Active Collimator Goals:**

1. Test prototype for accuracy in determining centroid of photon beam.  
Location (Hall B)
2. Need relatively high photon rate.

### Schedule:

1. Likely coupled with running experiment in Hall B, such as g9 which is run with polarized beam and target in fall of 2006

### **FDCs Goals:**

1.  $dE/dx$  tests with small prototype and various particle types.
2. Tracking and response of full-scale package to beam particles

## Location and Schedule (TRIUMF)

1. for  $dE/dx$  measurements
2. Small prototype is available now
3. Large-scale prototype would not be ready till approx 2008

### **CDC Goals:**

1.  $dE/dx$  tests
2. Tracking of response to segments

## Discussion

1. Test along with FDC prototype.
2. Useful test will require adding more tubes to the present prototype.
3. Will also need 100 MHz FADC

#### Location and Schedule (TRIUMF)

1. Late 2007 or 2008 after more tubes are installed

#### **Electronics Goals:**

1. Support detector tests as needed
2. Look at tagger data instrumented with F1 TDCs
3. Clock distribution to electronics

#### Discussion

1. Need to budget cost of more F1 TDC boards

#### Location and Schedule (Hall B)

1. Would like to run as parasitic with a running Hall B experiment.
2. Likely g9 running period would be a good match.