Proposal For Beamtest of Hall D Forward Calorimeter Prototype Underneath Hall B Tagger

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This document is a summary of the proposal to test a prototype of the Forward Calorimeter (FCAL) underneath the Hall B tagger, within the tagger alcove. The FCAL of the GlueX detector will be an array of 2800 lead glass blocks that are of dimensions 4 cm × 4 cm × 45 cm each. The entire beamtest will be done parasitically, and data acquisition will be done completely independent of CLAS, *i.e.*, no live datastream from CLAS will be required on our end. The purpose of this beamtest will be to gain experience working with the final setup of the hardware under realistic experimental conditions, measure the energy and time resolution of the setup, and compare this with simulations. By positioning the prototype in different places beneath the Hall B tagger, we aim to calibrate the prototype for energies near and above the detector threshold. The duration of the beamtest will depend on how often we are able to access the hall and realign our setup, and how frequently the beam pass changes for Hall B. Currently we expect to be able to take enough data at a single beam pass over a period of several days to a week. Full details of this beamtest proposal are available as GlueX-doc-#1798, available at the GlueX Document Database (http://argus.phys.uregina.ca/cgi-bin/public/DocDB/DocumentDatabase).

Our current plan is to place a 5 × 5 array of lead glass blocks underneath the Hall B tagger within the tagger alcove, at a tilted angle using a custom support structure to accept the electrons that pass through the tagger. Our support structure will have dimensions of approximately 1.85 m along the beamline, 0.76 m across the direction of the beamline, and a height of 1 m when tilted at 45°. Movement along and transverse to the beamline, and also adjustment of the tilt angle can be done manually, so as to center the electrons on different blocks at different energies. By moving the blocks along the beam direction, we will be able to take data at various energies, which allows us to calibrate the energy resolution. The fADCs we would like to test, and all other electronics, including triggers and DAQ, will be prepared by ourselves.

We plan to conduct our proposed beamtest during the fall 2011 run of CLAS, during HDICE. The run will utilize the 3-, 4-, and 5-pass electrons, which will allow us to take measurements at different energies, separately from alignment of our structure along the beam. Based on our studies of the tagger geometry and electron energy distribution, we expect to be able to accumulate enough statistics in a very short time. Once the detector has been properly placed, we should be able to accumulate sufficient statistics at a single electron energy and angle within a few running hours at most. Depending on the run conditions of Hall B and how frequently we will be able to have access to the Hall, we should be able to collect data at a single beam pass within a period of a week, and we hope to do measurements at different beam passes.

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