GlueX Budget Justification for CDC Research

1 Introduction

The purpose of the proposed R& D activities is to complete tests of the GlueX Straw-tube chamber and to finalize the design for the actual detector. The R& D activities include initial tests at CMU followed by proposed beam tests at TRIUMF and eventual tests in a magnetic field at IUCF. These activities are expected to take place in the time period of 2006 through 2008.

2 Description

The initial R& D activities at CMU will involve studying the performance of the CDC prototype that is currently at CMU. In order to carry out this work, it will be necessary to obtain **two 200-MHz Flash-ADC modules** to install in our already exiting data acquisition system. These modules will allow us to read out up to 32 channels of the chamber. With this, we should be able to obtain chamber resolution by fitting straight-line tracks that pass through multiple layers of the chamber. Carrying out this work at CMU is anticipated to take much of 2006. In order to get started on this, it will be crucial to have the Flash-ADC ordered as soon as possible.

In order to prepare for future beam tests, we anticipate needing to install an additional 100 channels in the chamber. To be able to do this, we will need to go out to a vendor to produce appropriate quantities of feed-through parts. This contract work for this will need to start to late 2006 to have these parts available in early 2007 for installation. It will also be necessary to produce additional High-Voltage boards and preamplifier boards for the chamber. Getting all of this built and tested will take about 6 months in 2007, at which point the chamber will be ready for testing in beams at TRIUMF.

The beam tests at TRIUMF would use the M11 beam which can be time separated to identify electrons, muons and pions. This would allow us to not only check resolutions of the chamber, but also to study the performance of dE/dx in the chamber as a function of track angle. In order to carry out such tests, the number of read out channels will need to be increased to

about 100 from the 32 in the earlier tests. This could be accomplished by either purchasing 68 additional channels of Flash-ADC, or using prototypes of preamps and Flash ADCs that have been produced by the electronics groups. The latter is the preferred solution, and delaying beam tests until these are available is likely to be a more viable solution.

Finally, we would like to be able to test the chamber (with cosmics) in the energized solenoid at IUCF. The purpose of these tests would be to verify that that our GARFIELD predictions for the behavior of the chamber in magnetic field are correct and to verify that the desired gas mixture is adequate. In a well-defined electric field in a straw tube, the effect of a strong magnetic field in the time-to-distance relation ship can be easily predicted. As such, there should be no surprises in the field, but such tests will give us hard data on a couple of calibration points. This work will require no additional expenditures.

3 Outcomes

At the end of this R& D effort, we will understand the performance of the straw-tube chamber including position and dE/dx resolution. We will have vetted the electronics for use on the final chamber and have verified that the magnetic field behavior of the chamber can be predicted by calculation. The information learned in this process will then feed into the small details in the design and construction of the final chamber.