GlueX Reconstruction Software

GlueX-doc-662

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This note is meant to summarize the discussions on reconstruction software that were held after the Lehman review at Jefferson Lab. They are in response to the request to develop reconstruction software the experiment.

The GlueX Geant Simulation

The staring point of this discussion was with HDGeant. In particular, we need to make sure that the material and geometry information that is in HDGeant is up to date. At this point in time, the material that is in the drift chambers, particularly that through which charged tracks travel needs to be checked. However, getting the cables and support structures correct will be important as we move onto looking at calorimetry

Charged Tracking

The CDC

One of the recommendations of the GlueX detector review in October of 2004 was to make sure that the arrangement of layers in the CDC was optimal for vertex resolution. A study was carried out shortly after the review which has been written up as a GlueX note: *A Study of Vertex Resolution in GlueX* by Curtis Meyer, `GlueX-doc-388`, November 2004. Two results of this study were that we can safely shorten the CDC from 200 cm to 175 cm, and that adding additional layers inside the current minimum radius, and then rearranging stereo layers would significantly improve resolutions. Both of these

changes are very easy to implement to the CDC. However, a presentation at the May 2005 collaboration meeting indicated that the background rates in the innermost layers of the current implementation of the CDC would be about as high as we could tolerate. This essentially precluded adding additional CDC-layers closer to the target.

During the discussion, Richard raised the point that the study that showed the high rates did not have the magnetic fields properly implemented and that this study needs to be redone.

Performing a new background estimate as a function of radius in the CDC would allow us to finalize the inner dimension of the CDC. If we are able to move closer to the beam line, we have worked out designs that will allow us to improve vertex resolution by moving stereo layers around.

The FDC

There are several open questions on the FDC system. The exact location of the FDC packages does need to be optimized, but it is also a degree of freedom that we have even after the experiment starts taking data. More relevant are the effects of the current choice of materials in the FDC on the overall resolution of the GlueX detector. There is also some question of the exact number of layers in the chambers, particularly if the 150 micron resolution can be achieved with the cathodes. There are also questions of how the central part of the chambers are deadened/

A possible beam line detector

There has been some suggestion of a GEM detector that sits in front of the GlueX target and is used to provide a high-resolution point that could be connected to the TFDC hits.

Event Reconstruction

In order to verify the tracking resolution numbers that were found using the MCFast code, it will be necessary to be able to reconstruct tracks in the non-uniform magnetic field of GlueX.

Track Reconstruction that starts with space points in the detectors and reconstructs particle momenta in the non-uniform mag-

netic field of GlueX will be needed to determine what the resolution for charged tracks will be in GlueX. It will also allow us to understand the impact of material in the chambers will be on this resolution. Such code could also be used to study the connecting of tracks with hits in both the down stream TOF wall as well as with the BCAL hits.

Calorimetry

What is the optimal segmentation of readout in the barrel calorimeter? What are the effects of drift chamber frames on reconstruction in the barrel? What are the effects of the drift chamber material on the minimum threshold and uniformity of threshold response? What are the effects of drift chamber materials on the upstream of TOF and LGD (e.g. Cerenkov counter) detectors?