Minutes of CAL s/w telecon
J. Eric Grove
9 August 2000

Why these goals for paper? Grove

I raised the question of which results for the CAL to report in the beamtest paper. It's clear to me that there's currently a lot of interest in low-energy resolution in the calorimeter. That's fine, but that wasn't one of the original goals of the beam test, and I haven't worked to optimize the analysis for the low end.

Regarding profile fitting, we had a section – discussion and results – on this in the previous beam test paper, where we had the fortune of going up to 40 GeV. We certainly can put it in again, but in this case I'd emphasize schemes to improve the resolution by varying the layer weighting etc.

My concern is that if we report resolution using the current TBRecon, we will be reporting merely my lack of ability to model the non-linearities, rather than anything intrinsic to the detectors or the method. The BTEM electronics are not related to the flight electronics, and results we obtain with the current TBRecon do not represent the performance we expect from GLAST.

Energy calibration in TBRecon Giebels

Berrie and Thomas are trying to verify the low-energy calibration in the output of TBRecon using two datasets: muons collected in the SLAC cleanroom after the ESA running, and protons from January 2000 ESA runs. Thomas has also simulated 13.5 GeV protons. For results, see
http://www.slac.stanford.edu/~berrie/meeting.html

Conclusions:

1. There is significant scatter in the muon peak energy from recon, particularly for bars lower in the calorimeter.
2. For protons, there is much less scatter around the mean.
3. The simulated protons give a most-probable energy deposition of about 10 MeV, with a significant tail to large depositions. So, the shape is as expected for a Landau distribution, but should the mode or the mean have been 13 MeV?

I questioned the trigger conditions and the data screening for the muon runs. The Landau shape should be a good fit only if short pathlength trajectories through logs are rejected (i.e. only if muons that escape out the sides of bars are rejected). The fits might be biased otherwise. Berrie replied that the trigger was generated by upper and lower plastic paddles (JEG: Did anyone verify the timing?), and that he applied no such geometry cuts in recon.

Richard suggested an absolute calibration at the low end of LEX4 with a two-step process:
1. proton runs to give an absolute calibration in a limited number of bars.
2. muons (with adequate geometry cuts to ensure nearly vertical and no short pathlengths through bars) to give a relative calibration between bars. I remarked that I used the following geometry cut in the muon calibrations from the clean room prior to ESA:

```
good = hitThisBar && missedBarToTheLeft && missedBarToTheRight &&
       hitCenterBarOnLayerAbove && hitCenterBarOnLayerBelow
```

(with obvious modifications for top layer, bottom layer, and edge bars).

Actions:

1. *(Giebels and Lindner) Proceed with the two-step gain calibration.*
2. *(Giebels) Verify our understanding of trigger logic and timing for muon runs in clean room after ESA with Gary Godfrey.*

Further work on integral linearity **Grove**

At GSI we collected a more detailed charge-injection calibration of the integral linearity of the CAL front-end electronics. I added a few more calibration points throughout each gain scale to cover more completely both the non-linearity near pedestal and the approach to saturation in each gain range.

I've completed peak-fitting for this calibration. I've also compared this calibration to the calibration at SLAC in Jan 2000. See
http://gamma.nrl.navy.mil/glast/calsw/ni_fragments.pdf

Conclusions:

1. There was a general drift in gain downward by a few percent in all ranges.
2. The largest fractional changes occur near pedestal, as one would expect.
3. There are large pedestal changes between SLAC and GSI, in some cases ~50% of the pedestal value.
4. There are changes in integral nonlinearity of order 5 – 10% in the bottom ~10% of each range. Note that this is precisely where the muon peak falls in the LEX4 range, so the response curves we derive from the improved GSI data will not necessarily be appropriate for SLAC data.

Actions:

1. *(Grove) Fit GSI intlin data.*
2. *(Grove) Improve fits to SLAC intlin data.*

GSI analysis **Grove**

Analysis of BTEM Cal and Test Box data continues with IDL.

I have found pedestals and muon gains for all large PINs in the both the BTEM Calorimeter and the Test Box. I've generated a new list of PINs with degraded optical bonds. Lab tests are in progress now to measure the absolute light yield in the Test Box crystals.

Simple scatter plots of upstream and downstream crystals in the Test Box for several different electronic and mechanical configurations emphasize the ease of charge-identification in the CsI. With material upstream from the Test Box, Ni daughter fragments from Co (Z = 27) down to Ar (Z = 18) are readily apparent.

Software for dE/dx calculation and partial cross sections exists and has been extracted from CREME96. Both sets of routines need a new interface to make them easier to use. I've made first estimates of energy depositions in each detector material for each beam configuration. It is apparent from comparing these calculations to the observed signals that the there is additional material upstream from the CsI that I have not yet accounted for.

See http://gamma.nrl.navy.mil/glast/calsw/ni_fragments.pdf

Actions:

1. *(Grove) Get more info on upstream material, beam aperture from GSI.*
2. *(Grove) Generate simple saturation curve from muon, C, and Ni points in a few bars.*
3. *(Sandora) Complete electronic and source calibrations of Test Box crystals.*
4. *(Tylka) Improve interface to dE/dx and partial cross-section routines from CREME96.*