P907 Calorimeter Considerations

We first have to define what we want to do with the calorimeter.

Generally speaking, the calorimeter can measure the energies and angles of the neutral hadrons (photons) in the very forward direction. This is just as important a question as the charged hadron inclusive production, and there is much less information on it. For example, a large fraction of the neutrino production arises from leading neutrons, neutral kaons, and other neutral hadrons. Even the fraction of the energy carried off by these is very uncertain, probably by a factor of two. In Monte Carlo calculations of the neutrino spectrum and flux, these are pretty much just guessed at. This will lead to significant uncertainties in the MINOS calculated fluxes which are probably larger than those from the charged hadrons.

There is probably no point in making the calorimeter larger than the RICH in transverse dimensions. This sets the maximum transverse dimensions to about 4 m (??). Costs and complexity considerations may restrict it to about half that.

We presumably want to detect neutrons, K^0's, and gammas (from π^0's). Thus we need an EM section in front to separate neutrons from photons, and measure the photon energy as well as practical. With sufficient segmentation and photon energy resolution, it may be possible to measure forward π^0 production at high energies.

Segmentation and directionality should be good enough to distinguish events with at least two hadrons in the calorimeter. It should be possible to reconstruct Λ^0 and K^0 decays (mostly decaying in the RICH).

We also have to be careful that the calorimeter can handle the beam rates.

Possible "Second-hand" Calorimeters

Fermilab has a tradition of scrapping old detectors. Thus we will be lucky to find something already existing that comes close to satisfying the above.

The E871 calorimeter is actually sitting in about the right place. However it is too small (<1 m transverse dimensions), is not well segmented, and does not have an EM section.

According to Joel Butler, FOCUS has a lead glass array (actually from the old kaon experiment) followed by a tile hadron calorimeter. The hadrometer is about 2 m x 2 m, the lead glass a bit smaller. The lead glass can obviously be restacked into another configuration. The hadrometer could also be reconfigured by building new frames. It might be possible to make it work somehow. This is a large, fairly complicated piece of equipment; it may be a challenge to move it and get it going.