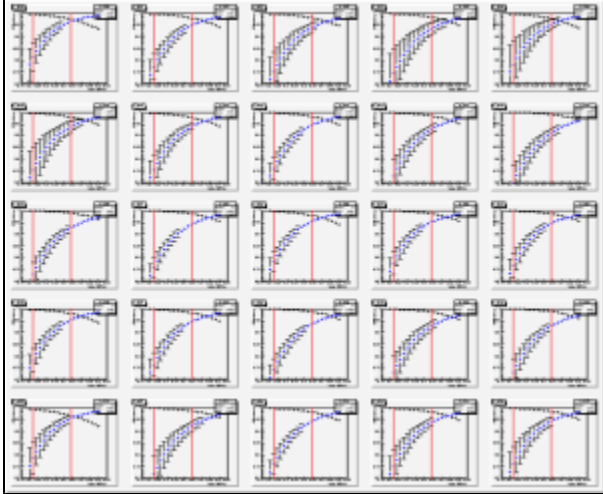


Veto Efficiency

The MIP peak calibration fit can be used to estimate the efficiency of veto settings for the ACD. The fit is a falling exponential plus a gaussian. The Gaussian represents the charged particles which we want the veto to reject. The falling exponential has three components: backscplash, residual signal from previous particles, and backscplash. In general we do not want to reject these components, since not falsely rejecting backscplash is one of the objectives of the ACD.

The efficiency plot below is for one set of PMT's on the top panel. The increasing line with the larger error bars is the efficiency on the low energy spectrum (fraction of low energy spectrum NOT vetoed) while the decreasing line is the charged particle efficiency (fraction of charged particles vetoed). The larger error on the low spectrum is due to the fact that it is an exponential, so errors in the fit have a greater effect on the efficiency.

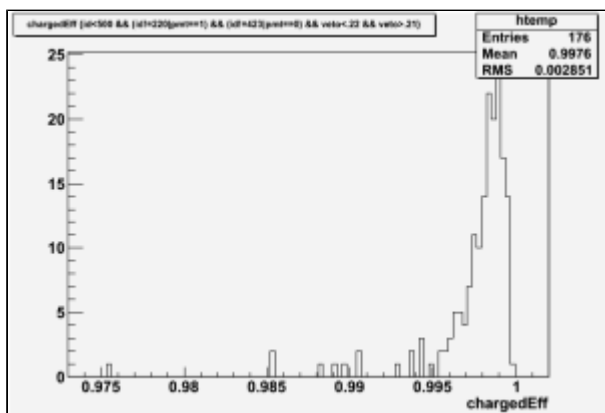


The two red lines on the above plots correspond to 0.22 MIPs and 0.44 MIPs. We are particularly interested in efficiencies at these values because of the setup of the ACD cuts. There is one cut which automatically will automatically veto a 100 MeV event if any tile records over 0.44 MIPs (The cut is `AcdTotalTileEventEnergyRatio>0.8`). When a track points directly to a tile, there is a tighter cut at 0.22 MIPs, since such an event is less likely to be backscplash (The cut is `Tkr1SSDVeto==0 && AcdTkr1ActiveDist>-16 && AcdTkr1ActDistTileEnergy>.4`).

It is important to note that the histograms from which these efficiencies are calculated only go up to ~2000 PHA. Generally, about 15 percent of events occur above 2000 PHA. To account for this, the total number of charged particles is multiplied by 1.15 before being used to find the efficiency.

0.22 MIP Efficiency

The 0.22 MIP cut only applies when there is a track pointing to the tile. Such an event is less likely to be backscplash and so we are interested only in the charged particle efficiency at this cut, not the low energy spectrum efficiency. Below is a histogram of the charged particle veto efficiencies for a veto at 0.22 MIPs. The average efficiency is 0.9976. Two PMTs (0_210 and 1_423) are not included because the histograms are too messy to find reasonable efficiencies. Over 91% (161/176) of the PMTs have efficiencies of above 0.995 and 25% (44/176) have efficiencies of above 0.999.



0.44 MIP Efficiency

Below are the histograms of the charged particle and low energy spectrum efficiencies for a veto at 0.44 MIPs. The mean efficiencies are 0.9835 for the charged particles and 0.9544 for the low energy spectrum. The average error on the low energy spectrum efficiency increases as the veto threshold rises, and at 0.44 MIPs is about 0.01.

