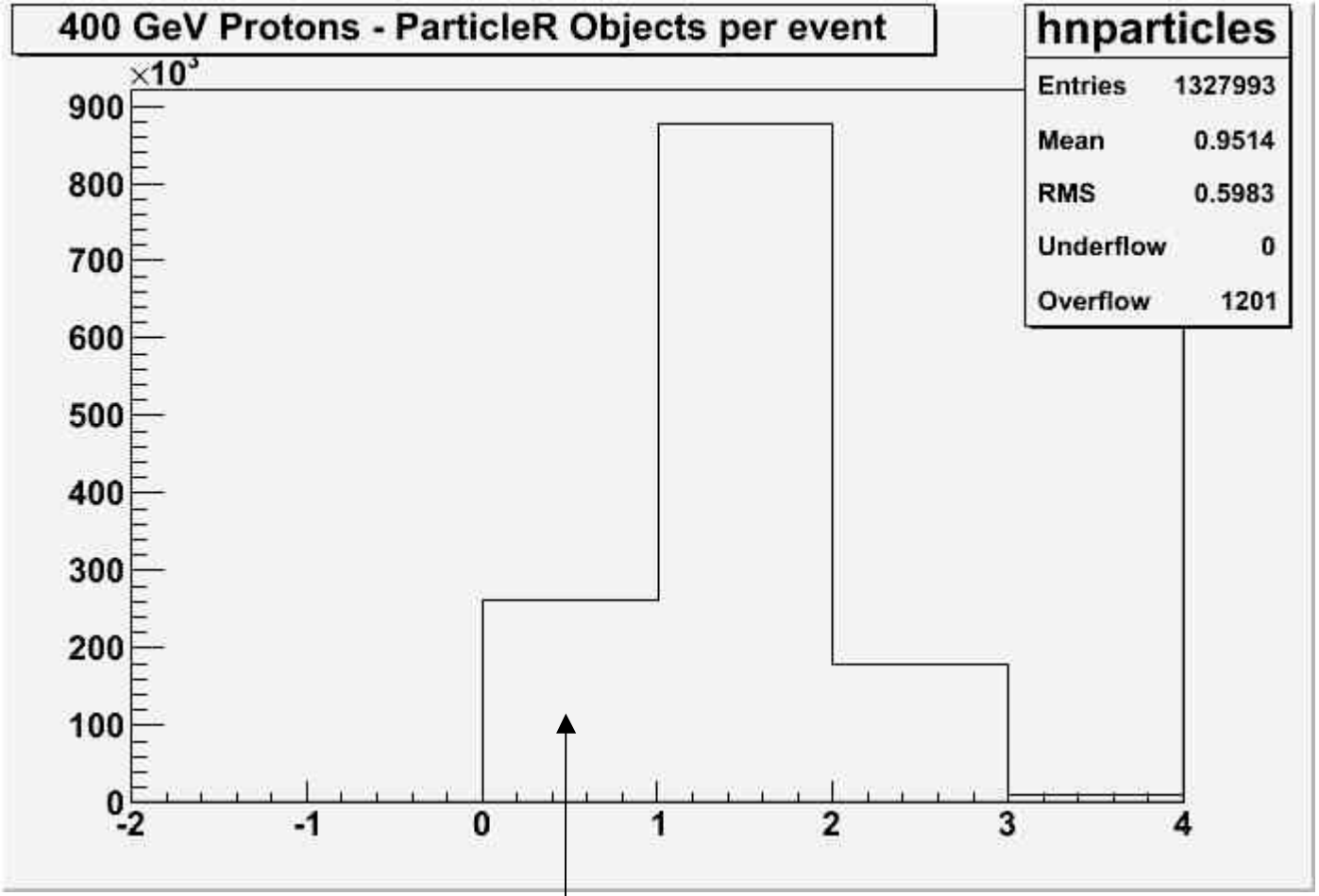
ECAL proton rejection
August 2010 TB data

Work in progress

We have analyzed TRACKER10 position protons runs
(perpendicular tracks p=400 GeV)

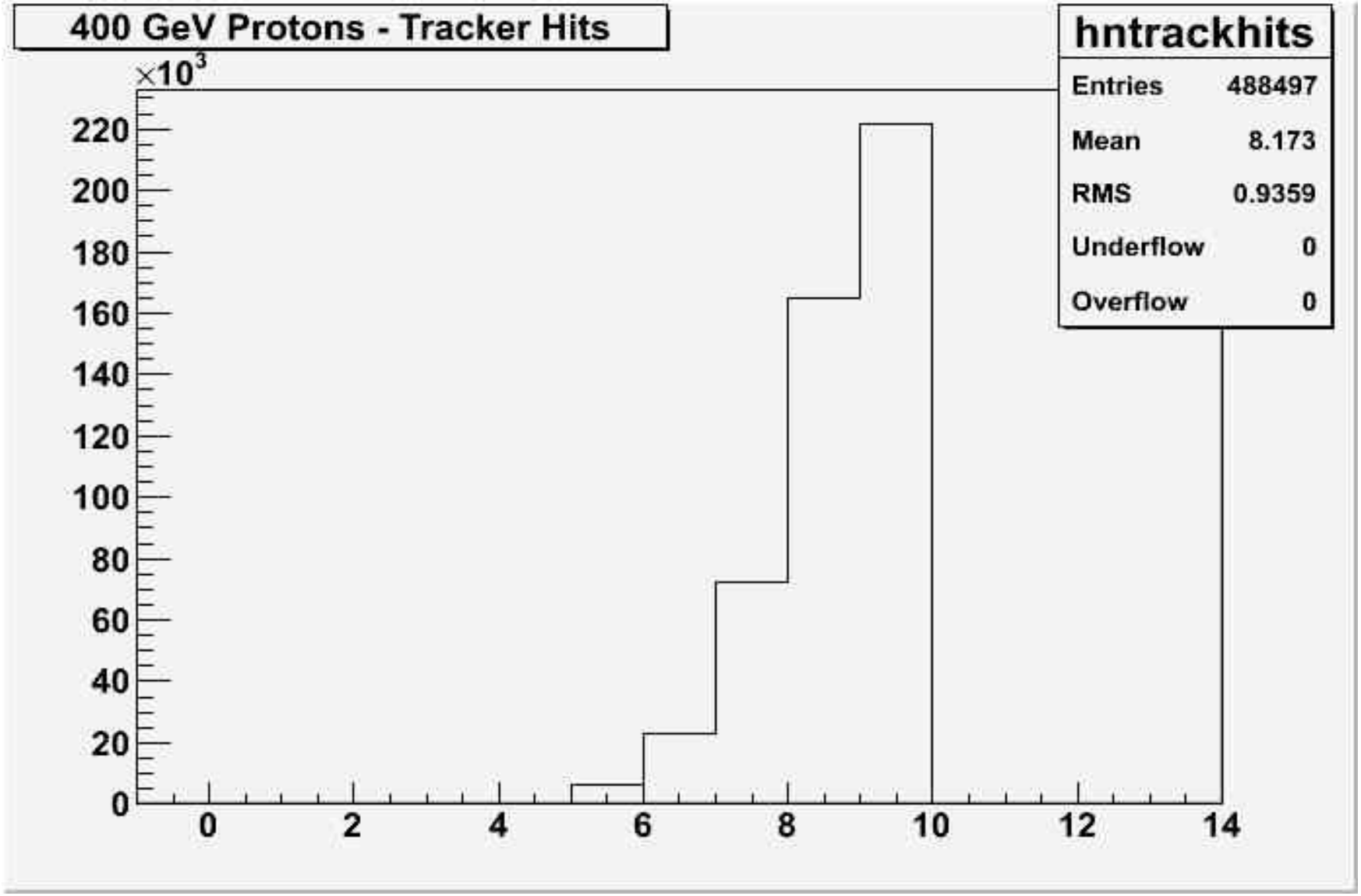
Because of the change of AMS geometry with PM,
software has changed, especially for the Tracker.

1 ParticleR Object



Why so many events with 0 ParticleR objects? To understand

At least 6 hits in TRK



Goodness of fit cuts for TRK

This is the most tricky part: we imposed the following conditions:

➔ Fit alghorythm for curvature fitting must use (in order)

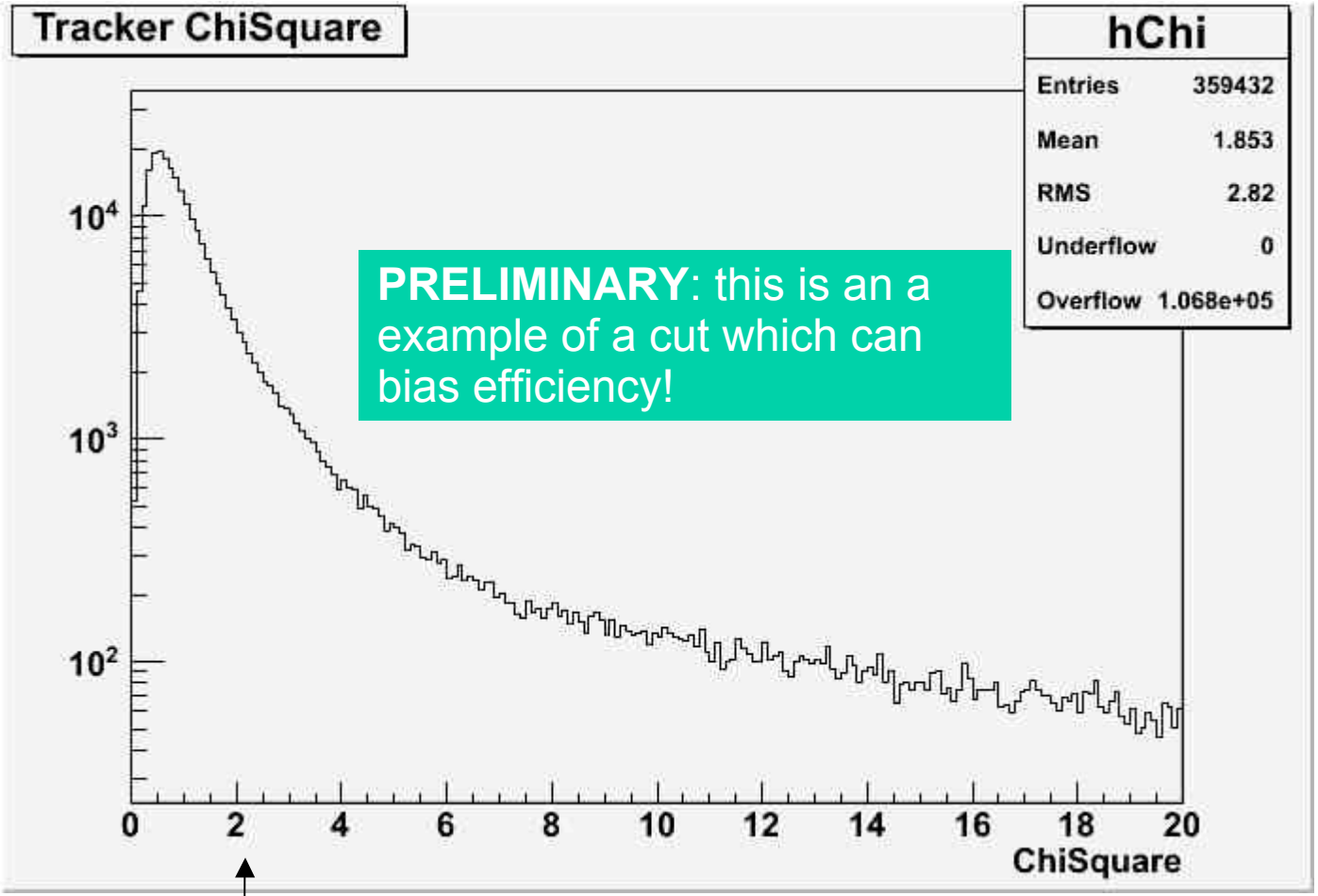
the inner tracker AND the two external ladders

the inner tracker AND the external ladder below ECAL

➔ChiSquare of the fit must be not too high (details in next slide)

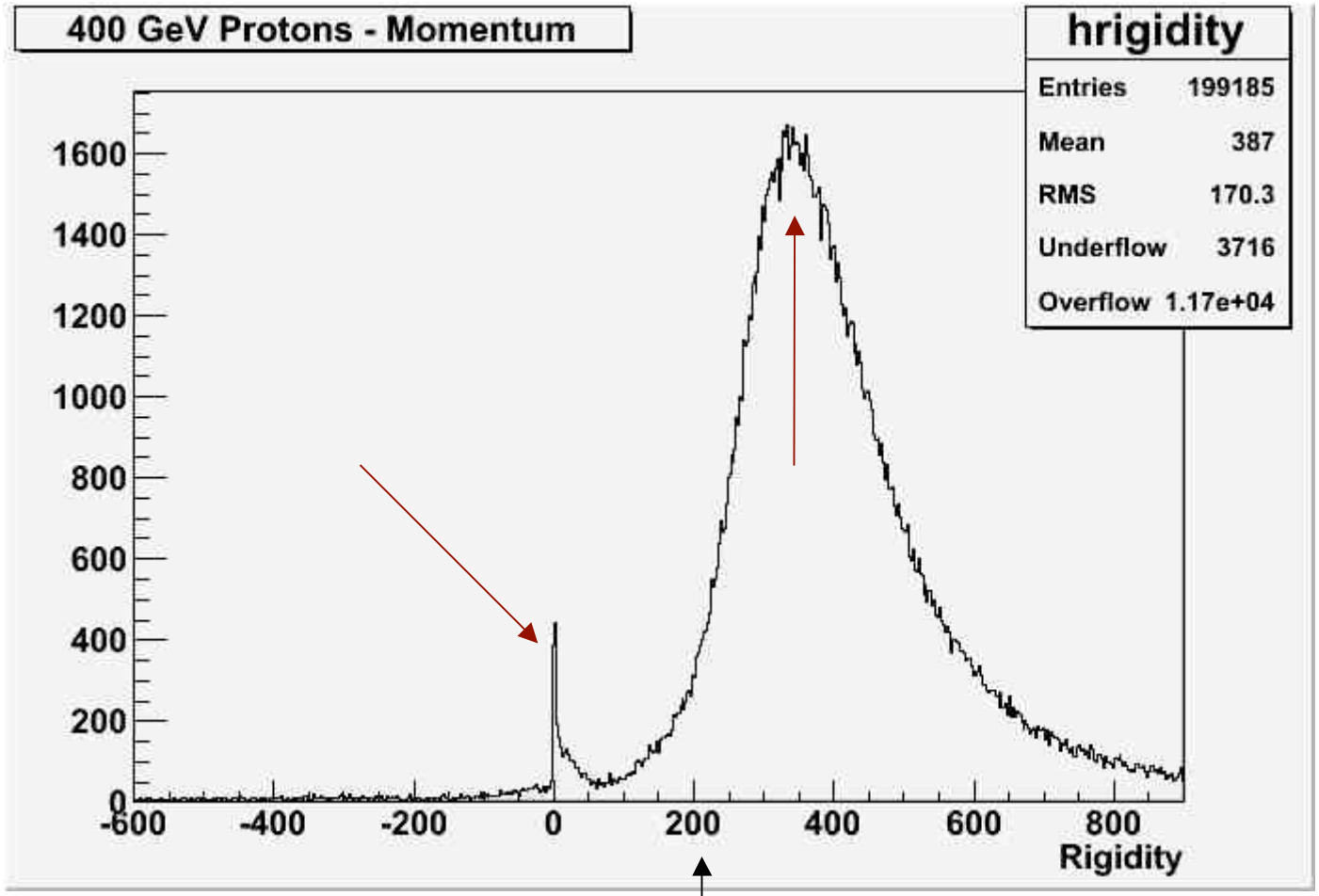
➔Rigidity must be compatible with beam energy (details in next slide)

ChiSquare



Chisquare cut: 2 (in arbitrary units)

Rigidity

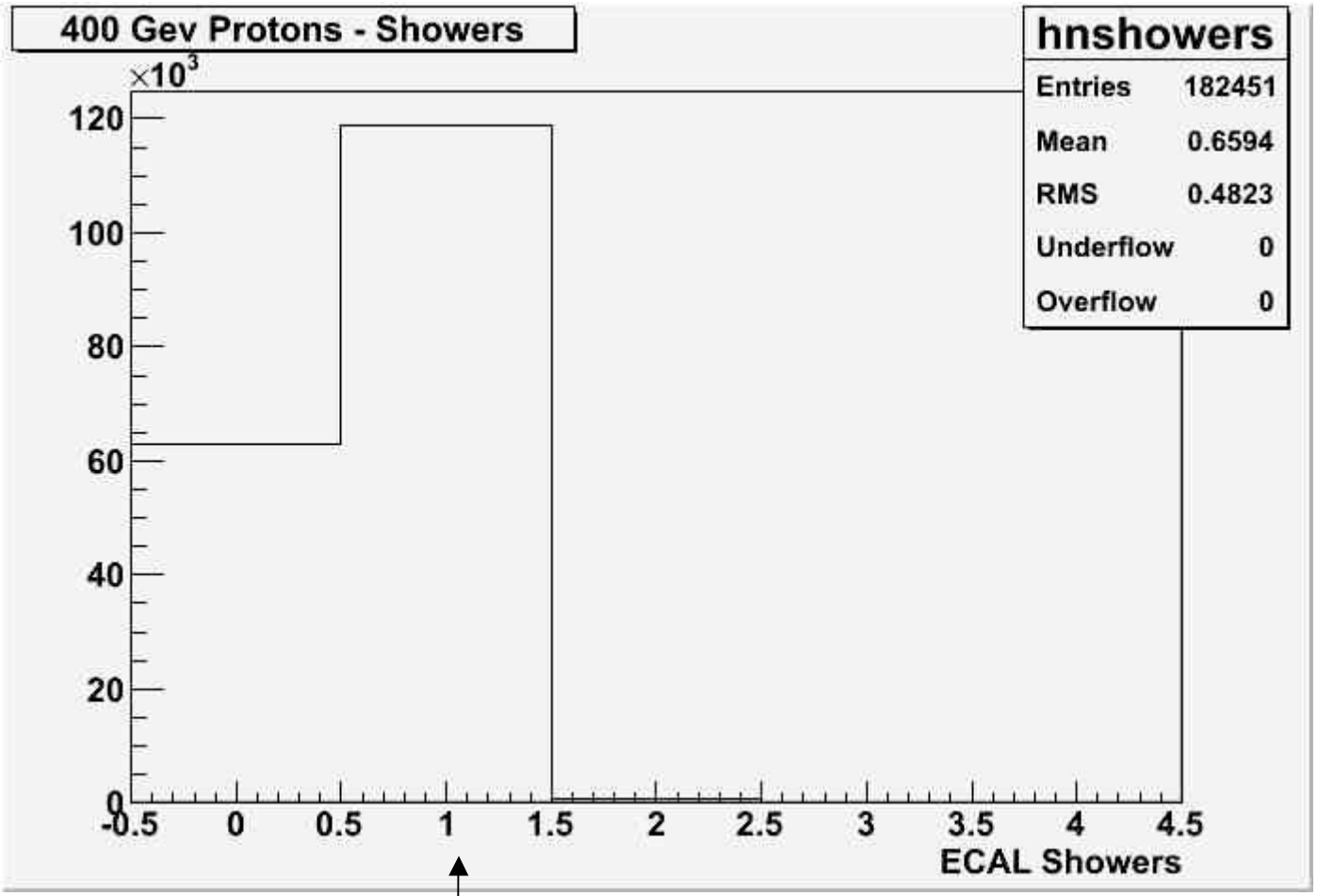


Plot improved with new tracker alignment

ECAL Showers

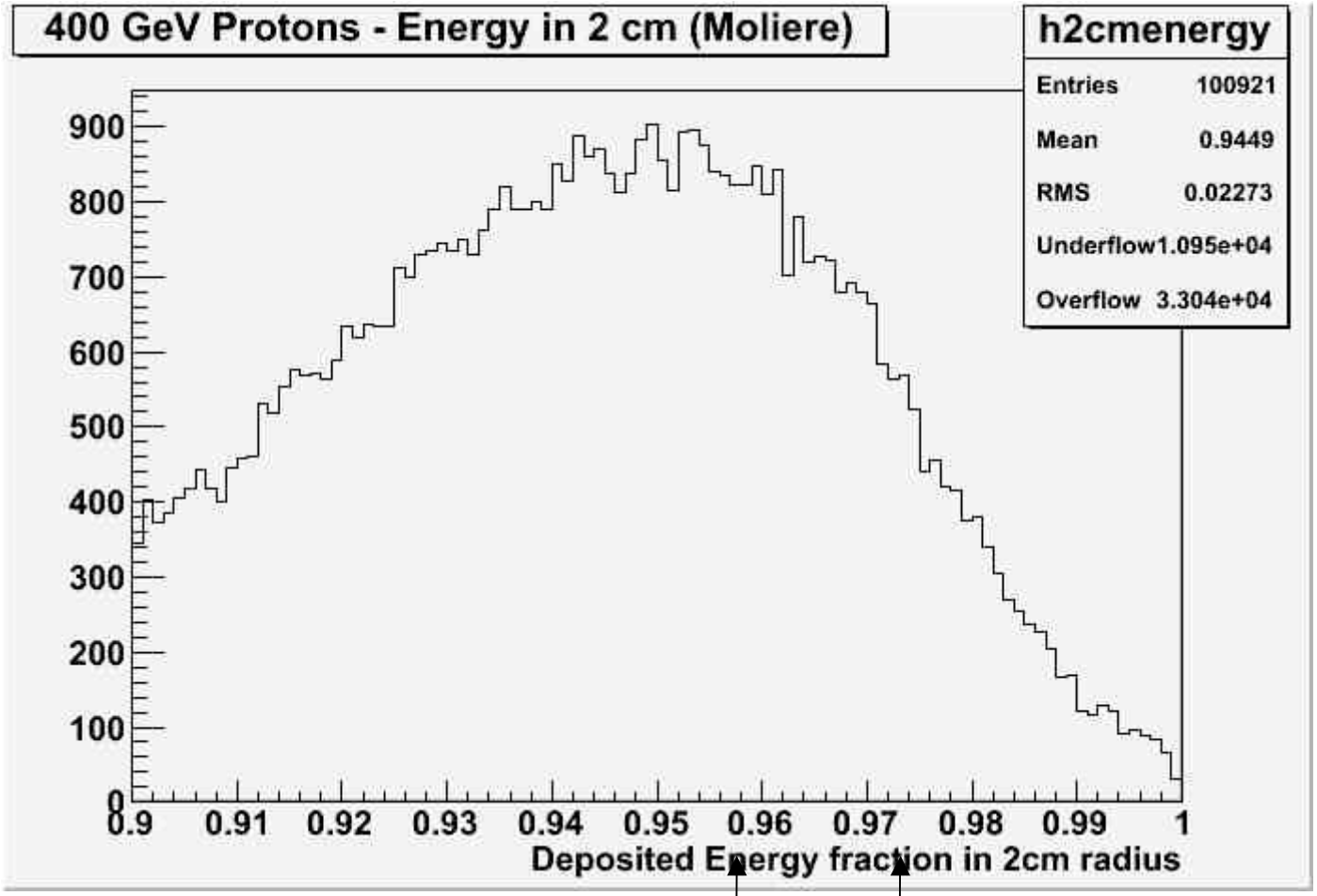
This sample is our normalization (~10% of total sample).
Now we impose ECAL cuts

Why so many events with 0 ECAL Showers?



At least 1 ECAL Shower

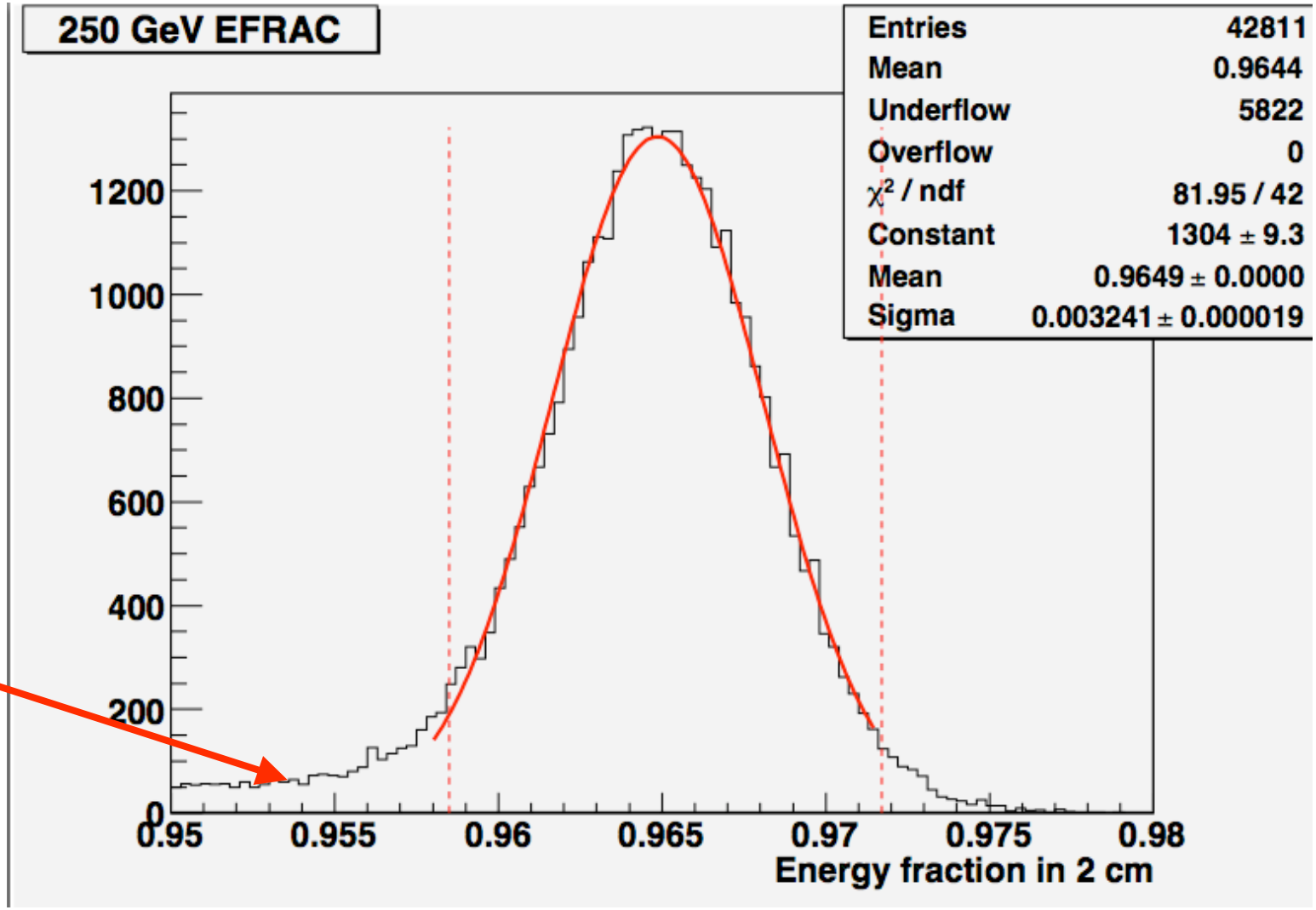
Deposited Energy in 2cm around axis



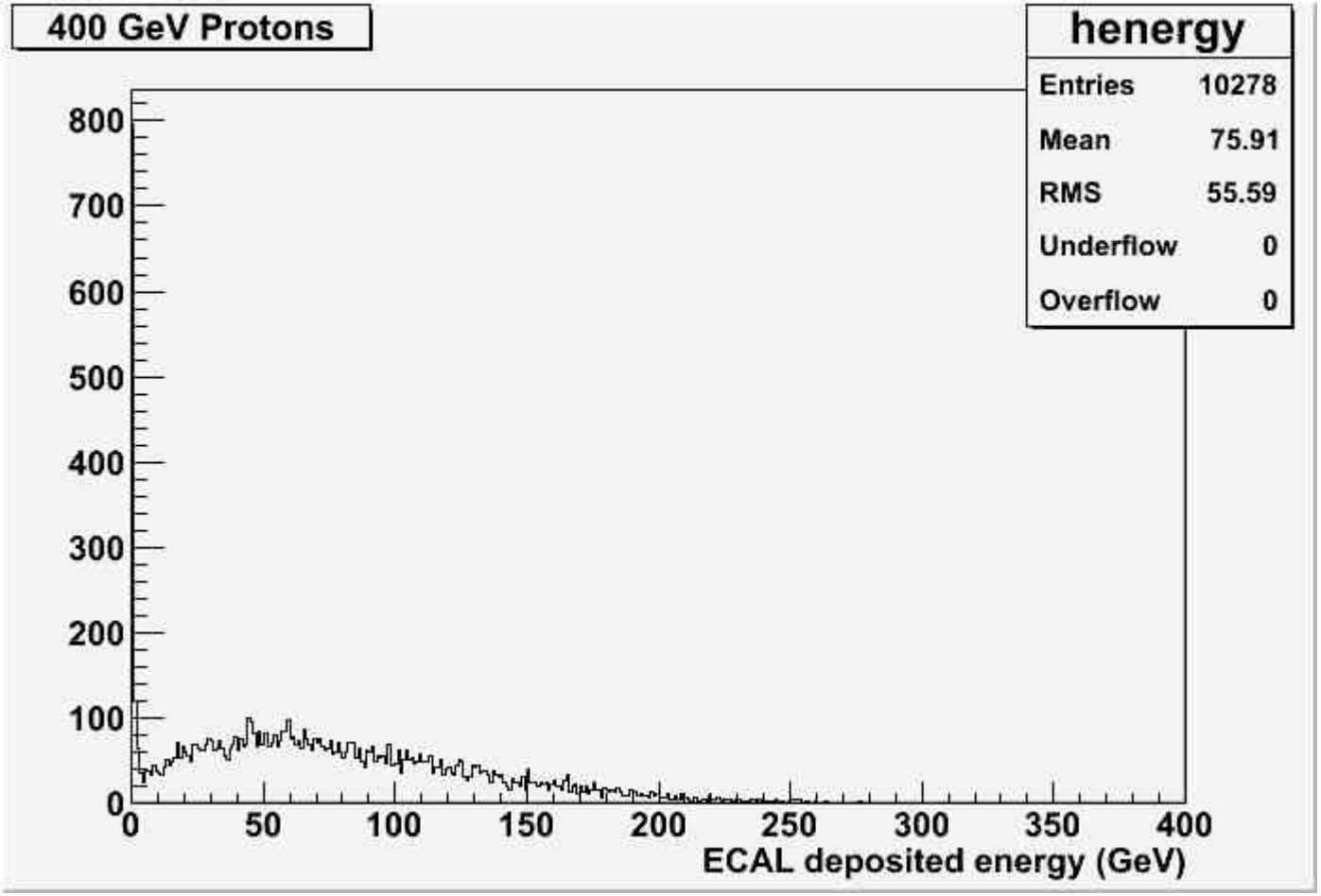
Deposited Energy in 2cm around axis (250GeV “electrons”)

The “electron” beam is really mostly composed by pions, with a fraction of ~5% electrons

residual pions

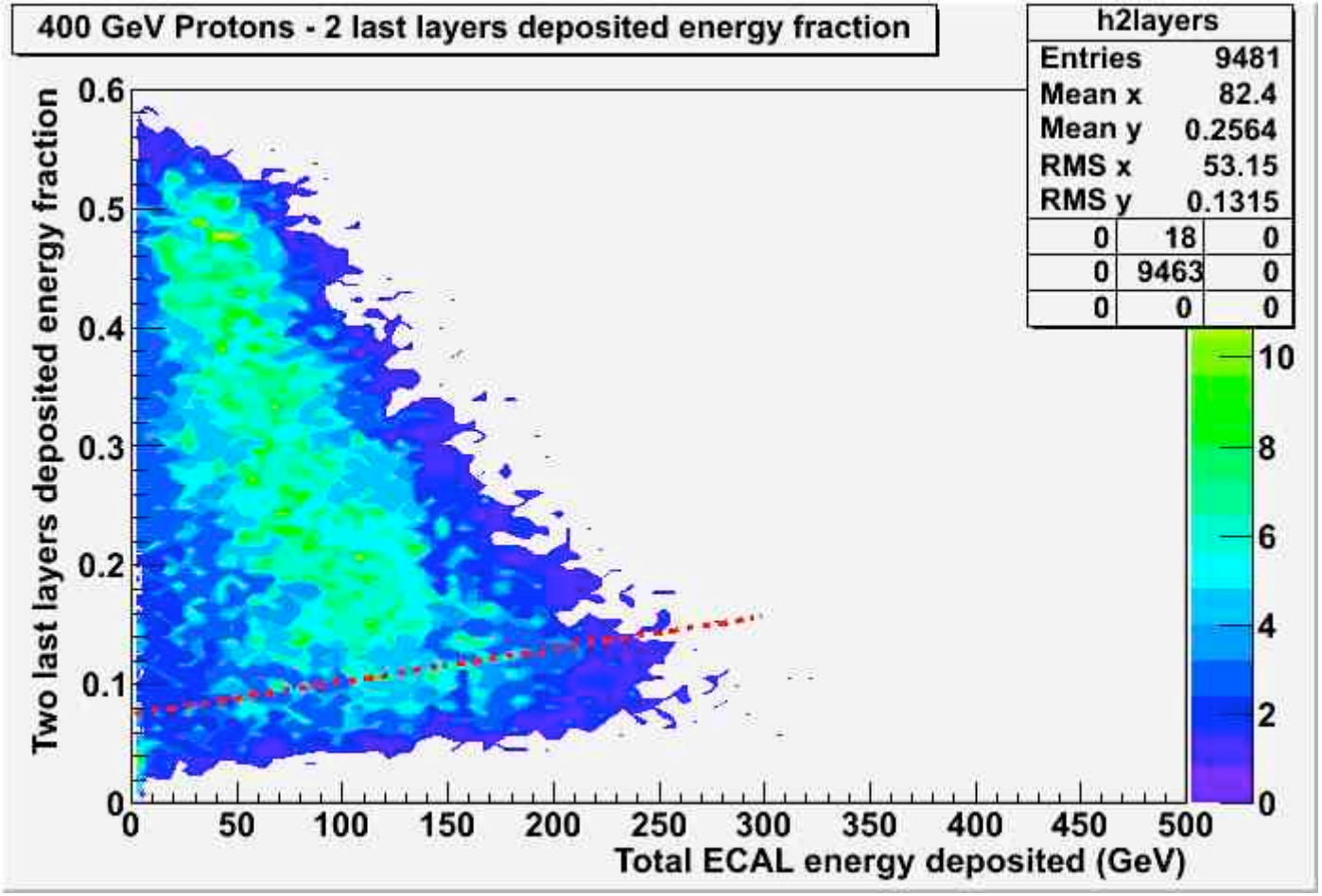


ECAL total deposited energy

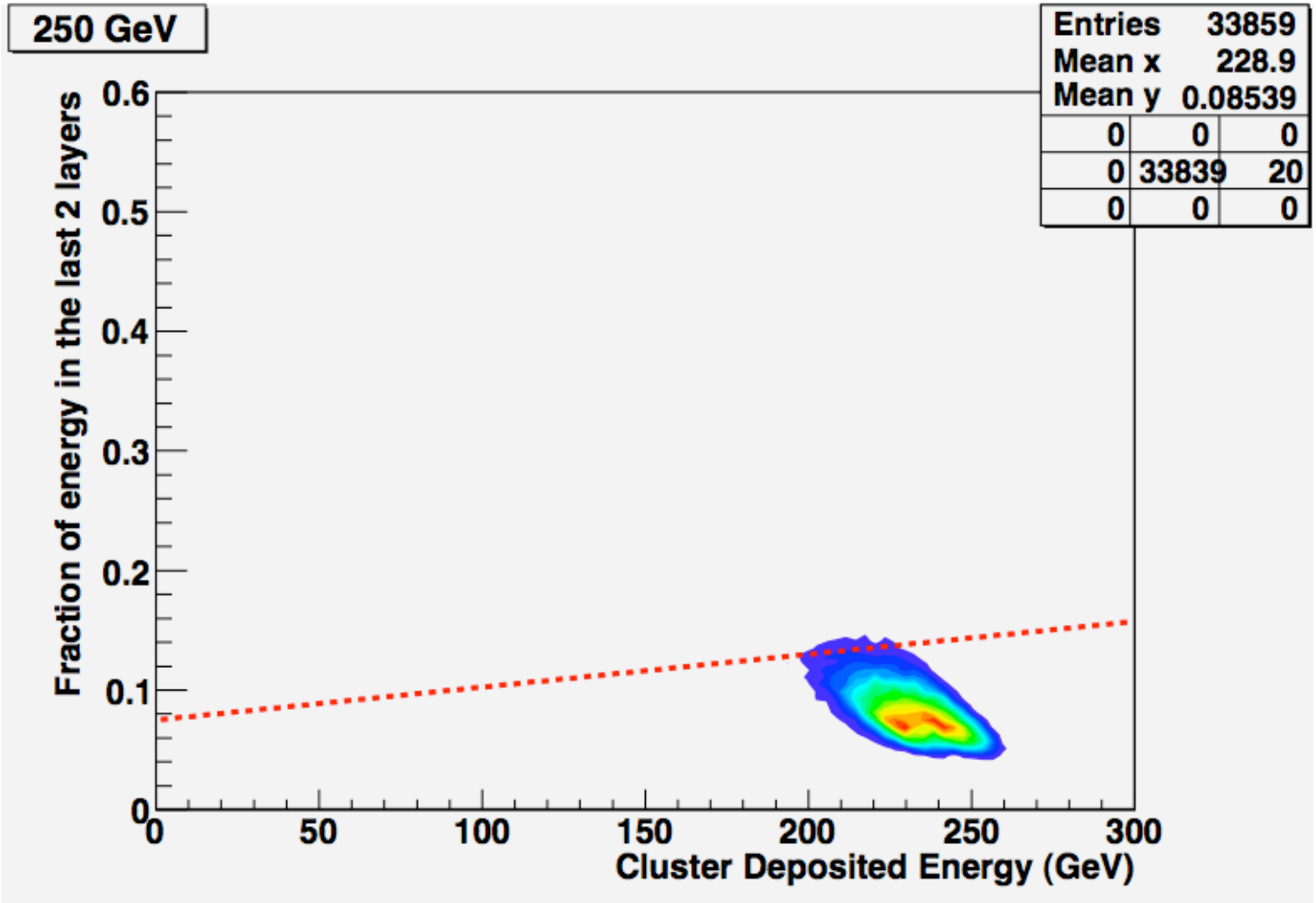


Deposited energy > 1 GeV

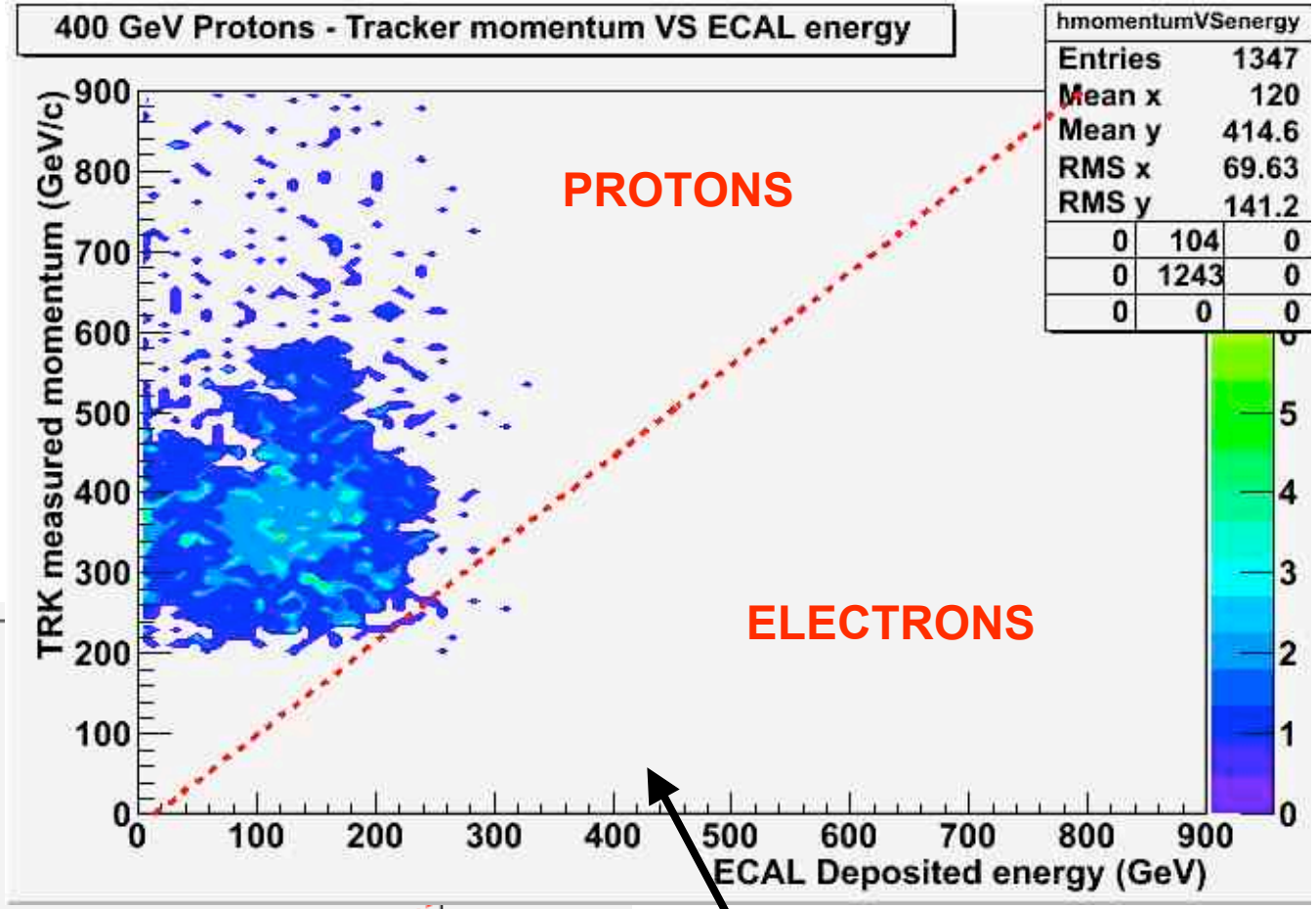
2 last layers deposited energy fraction

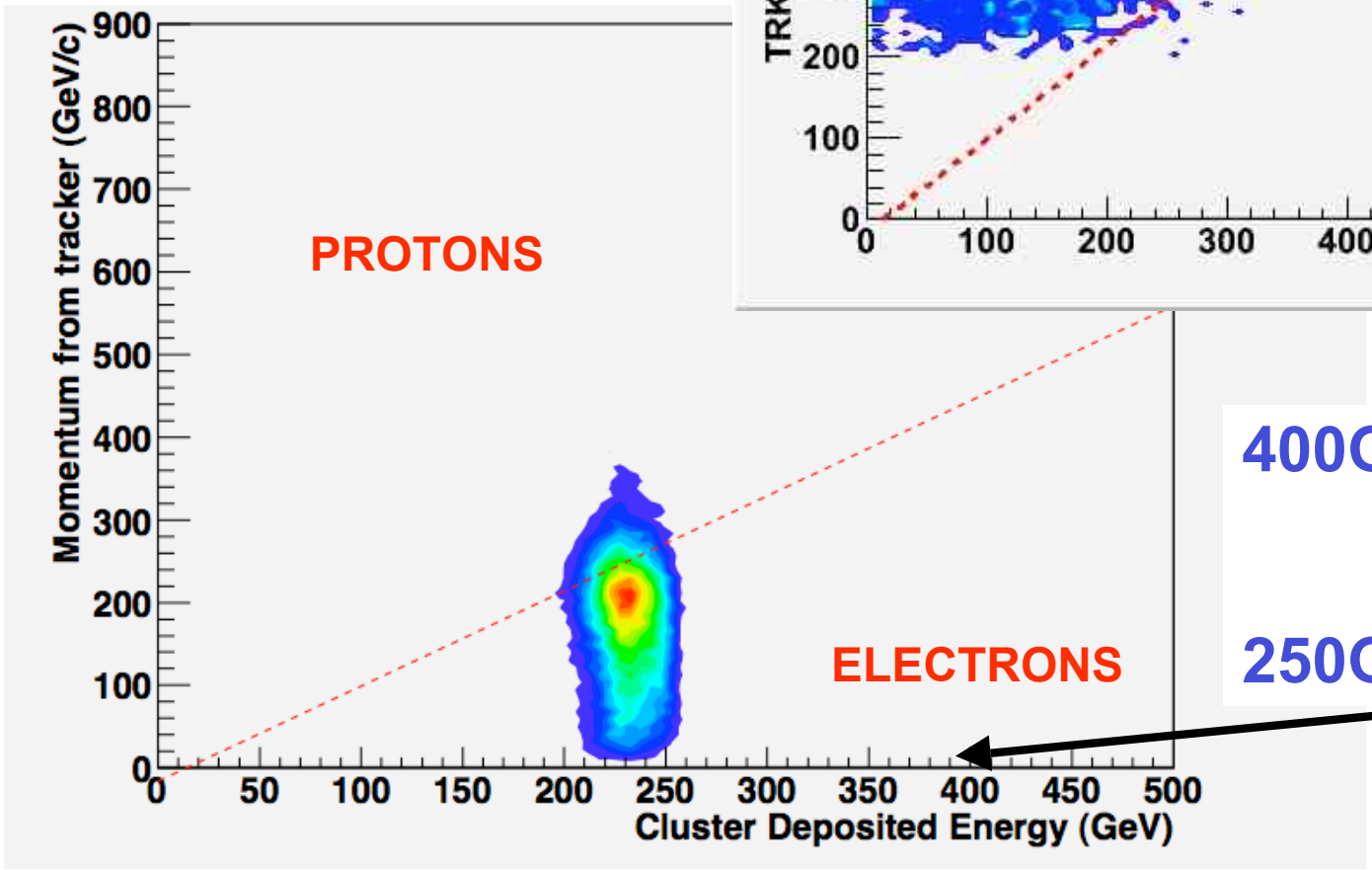


2 last layers deposited energy fraction (250GeV “electrons”)



Energy/Momentum matching

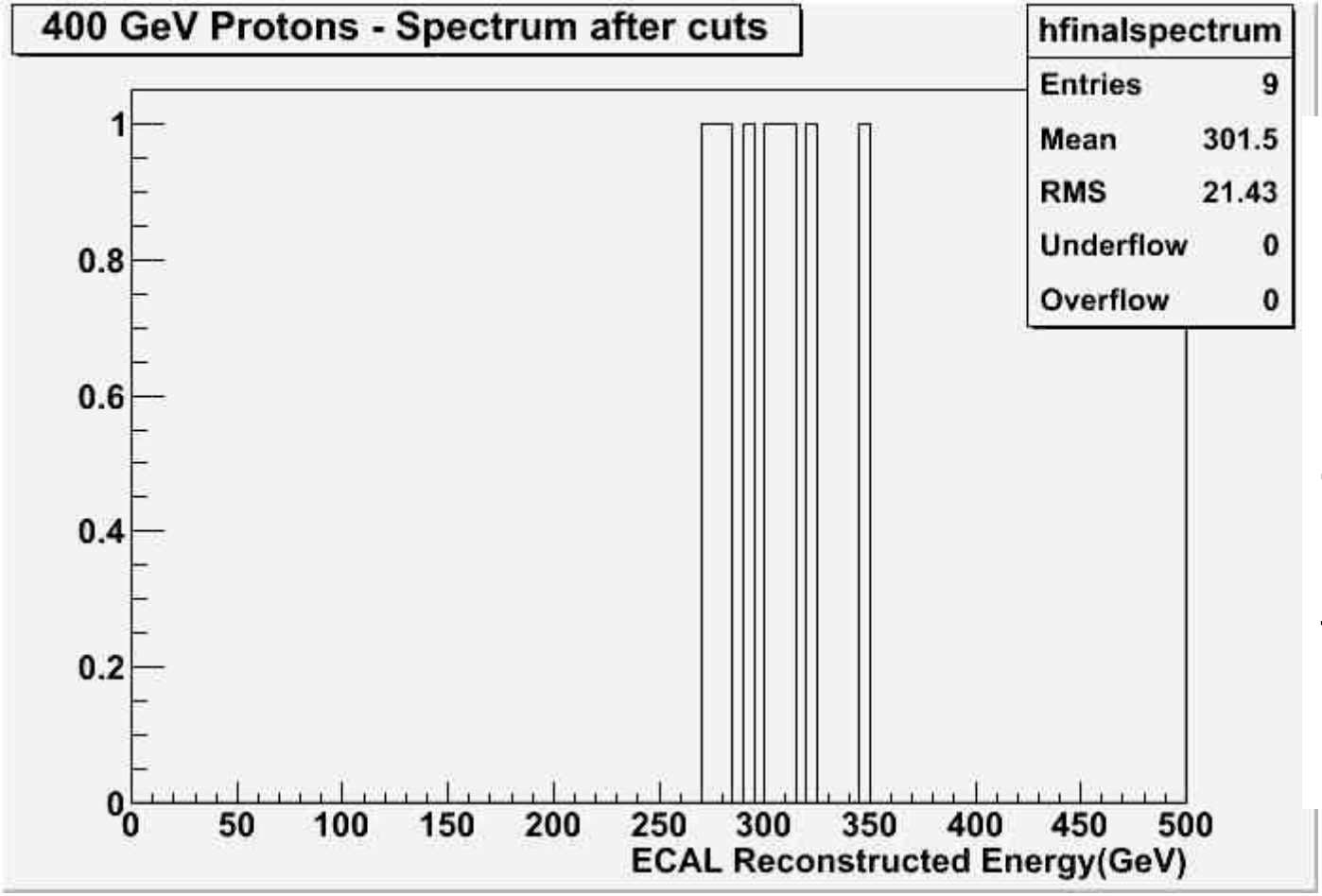




400GeV proton sample

250GeV electron sample

ECAL+Tracker rejection @400GeV



NOTE: 400GeV protons, identified as positrons by ECAL/Trk, have energy ~300GeV.

This gives an additional suppression factor p/e of (400/300)^-2.7 ~ 0.46 due to particle flux

Proton rejection: 9/182451 ~ 5*10^-5
Electron efficiency still to be evaluated. Preliminary value for 250GeV electrons is ~60%.
-> p/e rejection ~ 0.46 * 5 * 10^-5 / 0.6 ~ 3.8 * 10^-5

Summary and next steps

- most powerful cut for positron-proton separation is the energy/momentum matching
- preselection of events
  - possible bias (=if we select the “best” events, then E/p match more effective)
  - how to determine “absolute” efficiency
- ECAL variables: tuned with data using feb 2010 test beam, at energies 180, 250, 290GeV -> need MC to extend this tuning at other energies/angles of incidence
- comparison with MC (see next slide)

- A preliminary comparison with MC shows some differences in terms of cells with hits and total energy (in ADC counts)