TPC PID Update

J.L. Klay, LLNL

07-Dec-2006

To-do list

1. dE/dx truncation parameter optimization

2. Normalize all dE/dx to I_0 - minimum ionizing

2. Nhits ↔ resolution study

3. Updated dE/dx plot (need to integrate statistics over many runs to increase density of kaons)

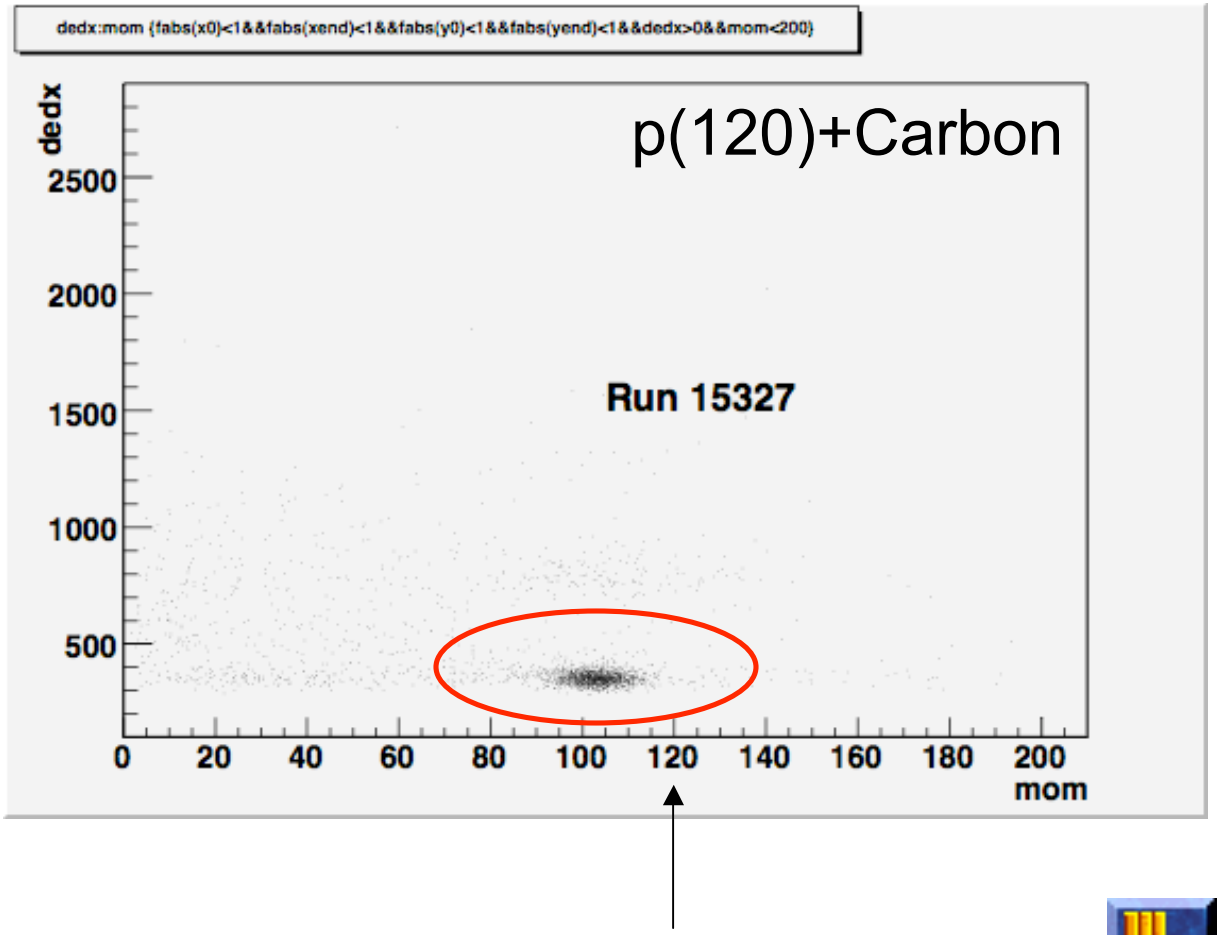
4. PID probabilities

Truncation optimization

Select beam tracks and look at <dE/dx> resolution as a function of truncation level

Hmmm…

Beam tracks should have p = 120 GeV/c

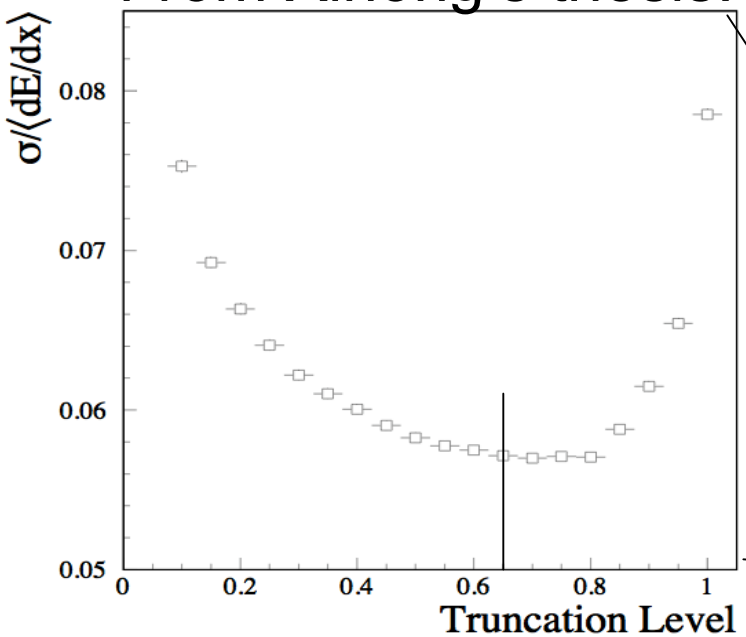


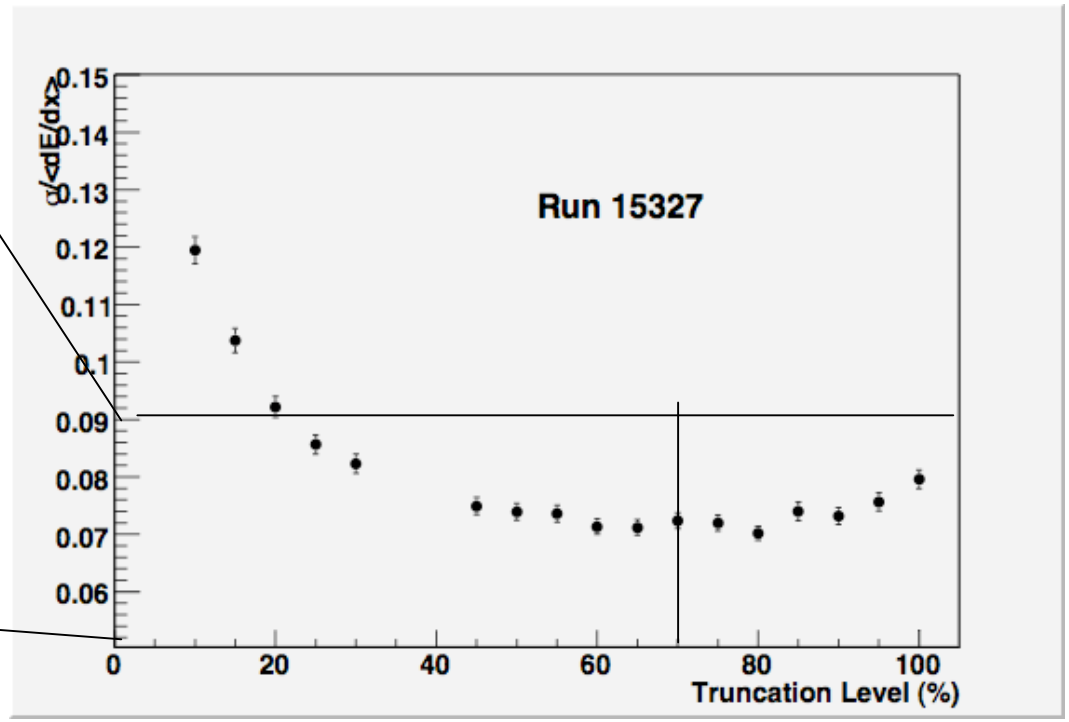
Truncation optimization

Similar shapes at large TL.

Ours is much worse at low TL.

From Xihong's thesis:



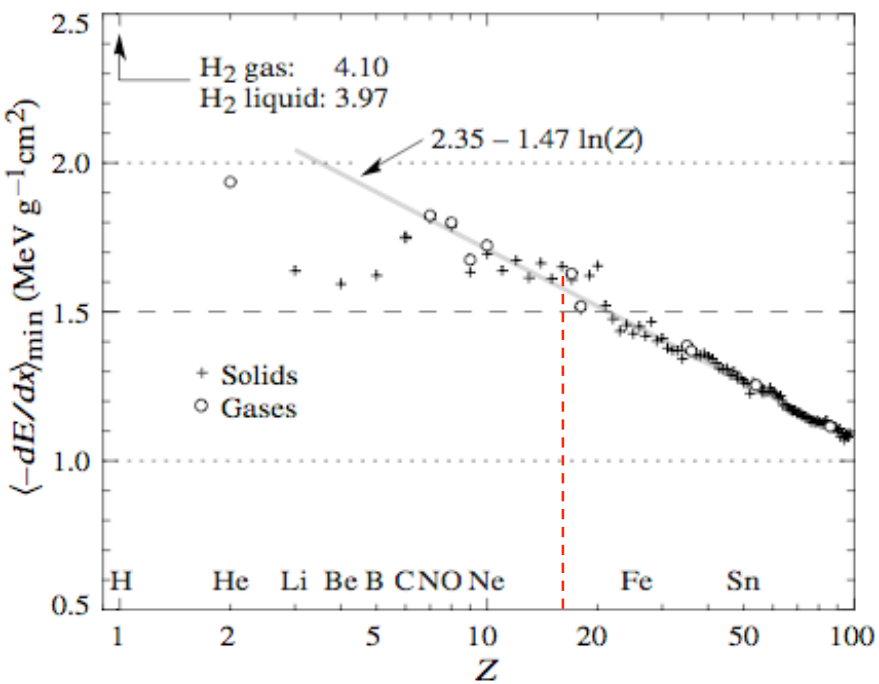


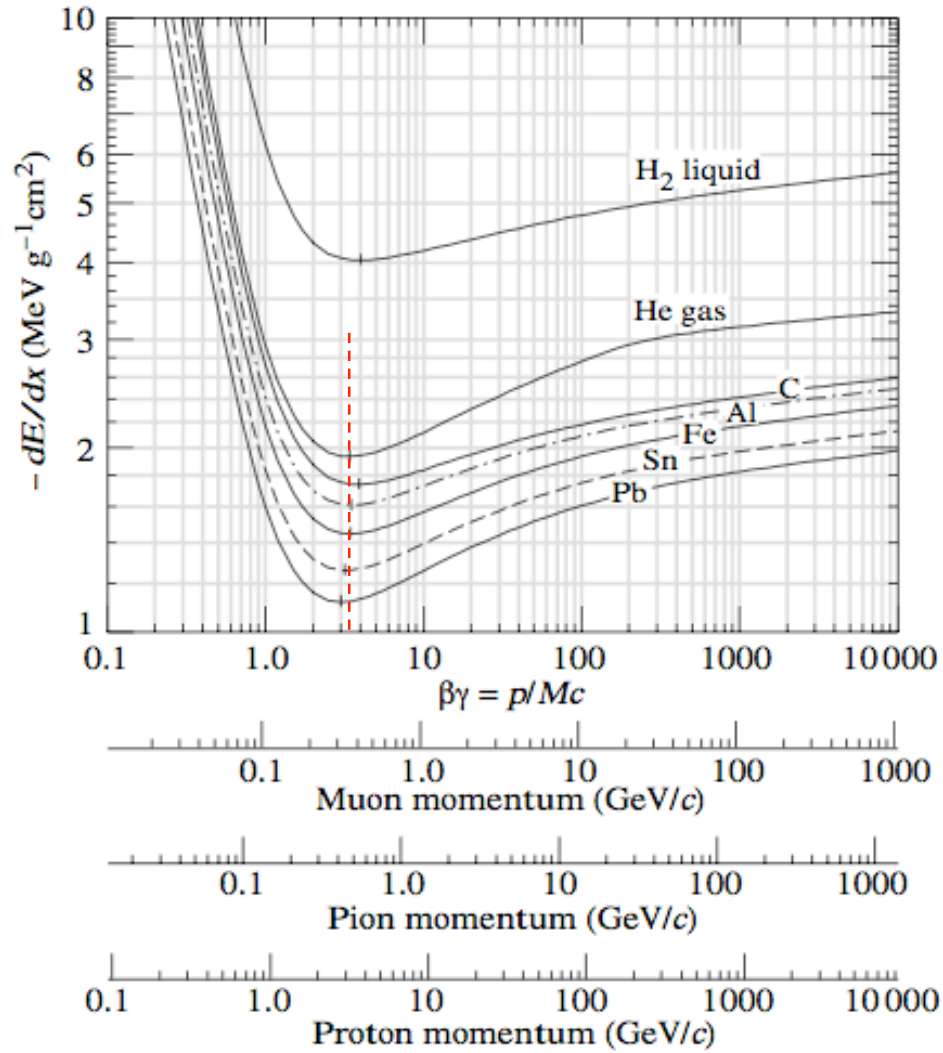
E910: 65%

E907: 70%

Minimum Ionization Normalization

In P10 (Ar Z=18)
$I_0 \sim 1.6$ MeV g^{-1} cm^2
$\beta\gamma \sim 3.5$
($p^{\pi} \sim 488$MeV/c)





I_0 Normalization

Pass “2.5” in progress

-Re-run reconstruction, TPCRPid with anode/drift corrections

-Select good tracks with 465 < p < 515 MeV/c, fit dE/dx for pion mean value

-Store results in DB

Next steps:

1. Use results to normalize all runs to absolute -<dE/dx> for P10
2. Extract single set of Bethe-Bloch parameters from summed statistics
3. Examine resolution as fcn of Nhits
4. Use 1,2,3 in pass3 to determine LL PID values, given (Nhits, <dE/dx>, p) for each track

Extracting I_0

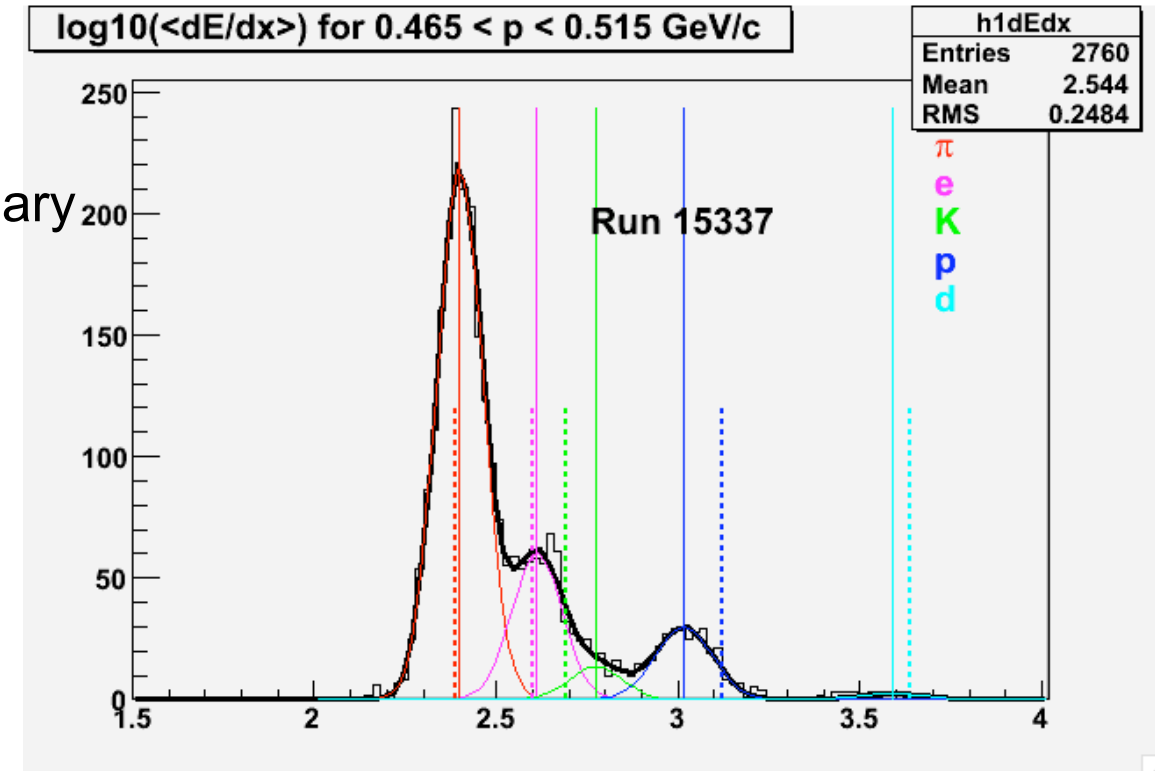
New code in cvs:

TPCRecoJP/TPCRdEdxCalib
TPCUtils/TPCdEdxCalibTable
(Plus helper functions in) TPCUtils/TPCRUtils

Dashed lines: predicted mean locations from preliminary Bethe-Bloch study

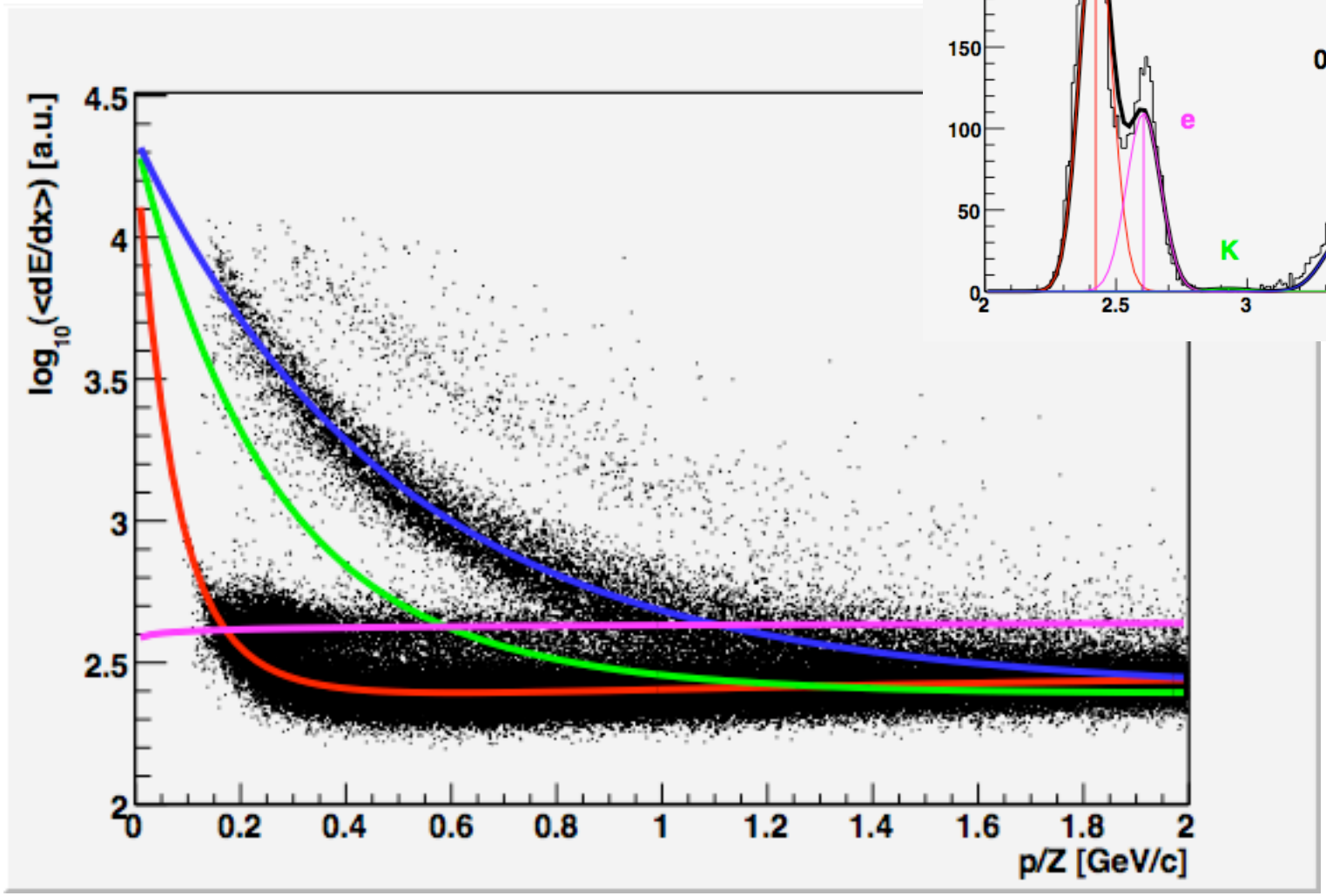
Solid lines: fitted locations

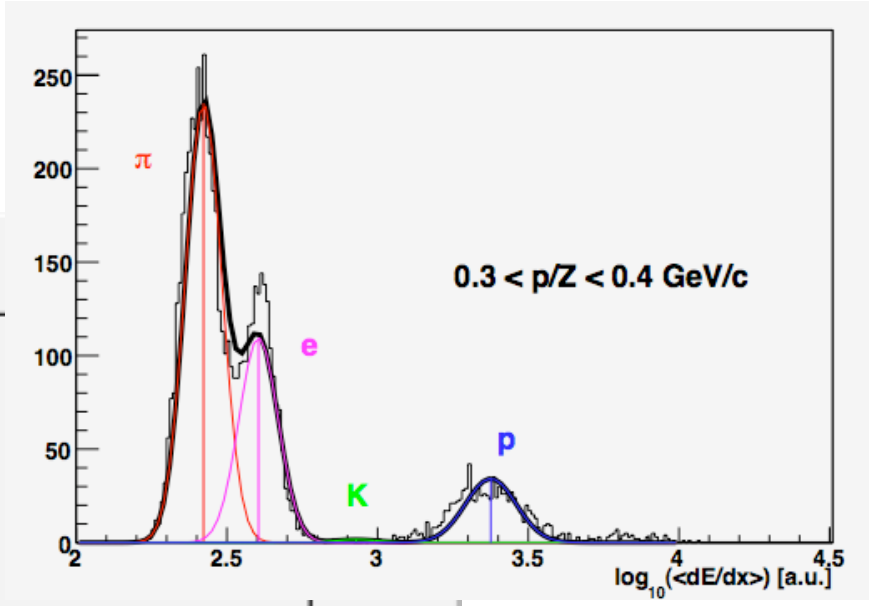
Red solid line location + uncertainty saved to DB as I_0 for this run



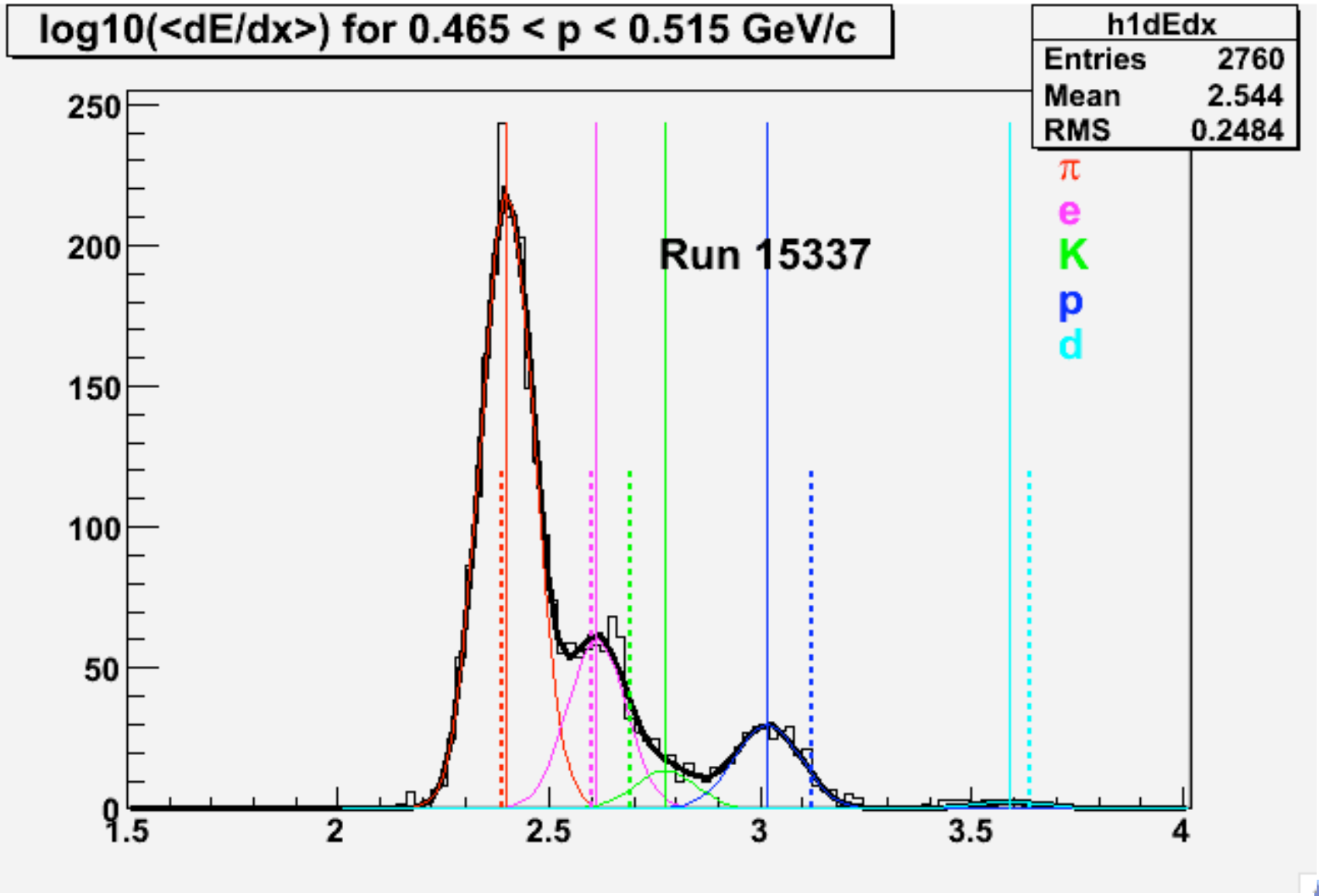
Bethe-Bloch Study

From run 15860

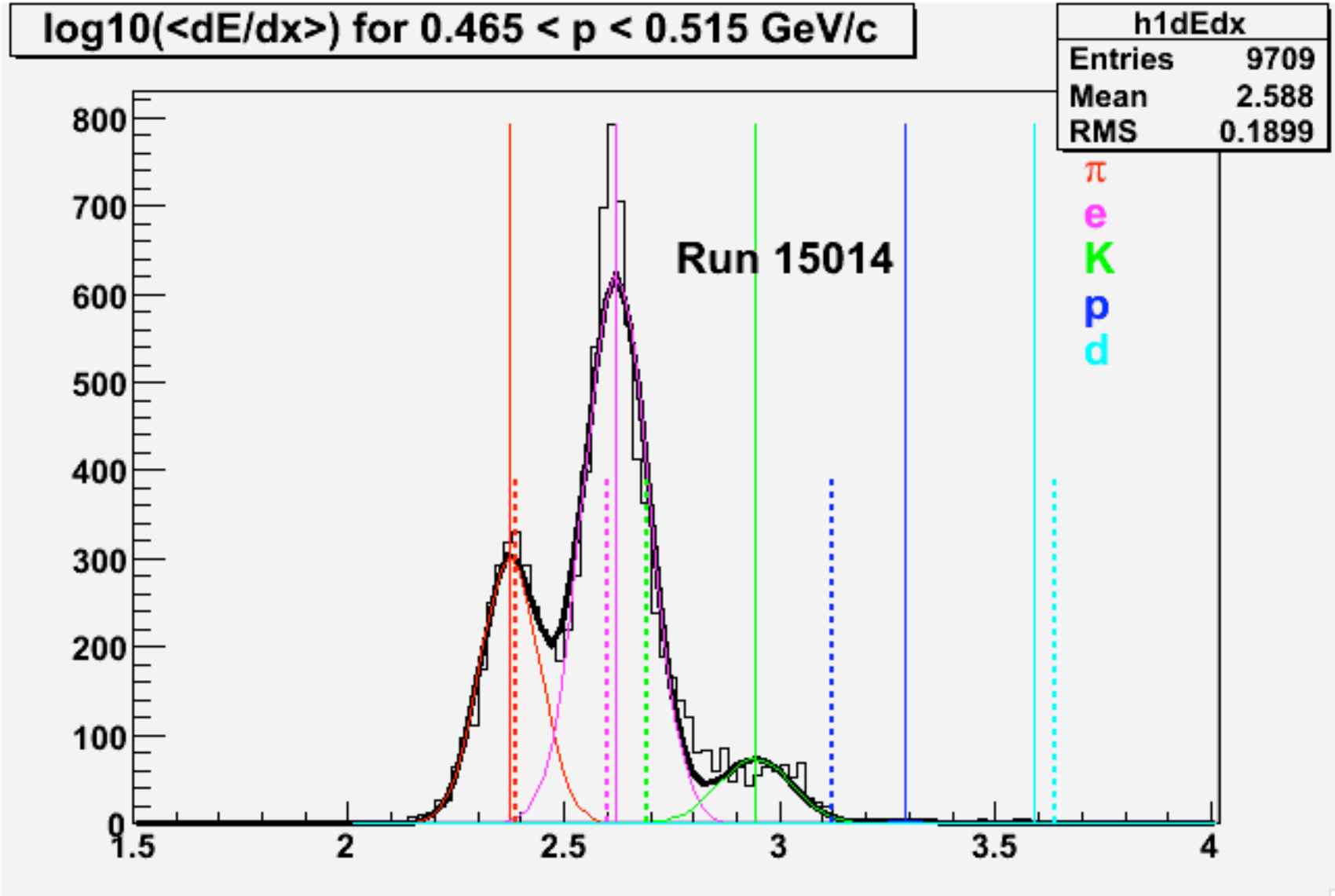




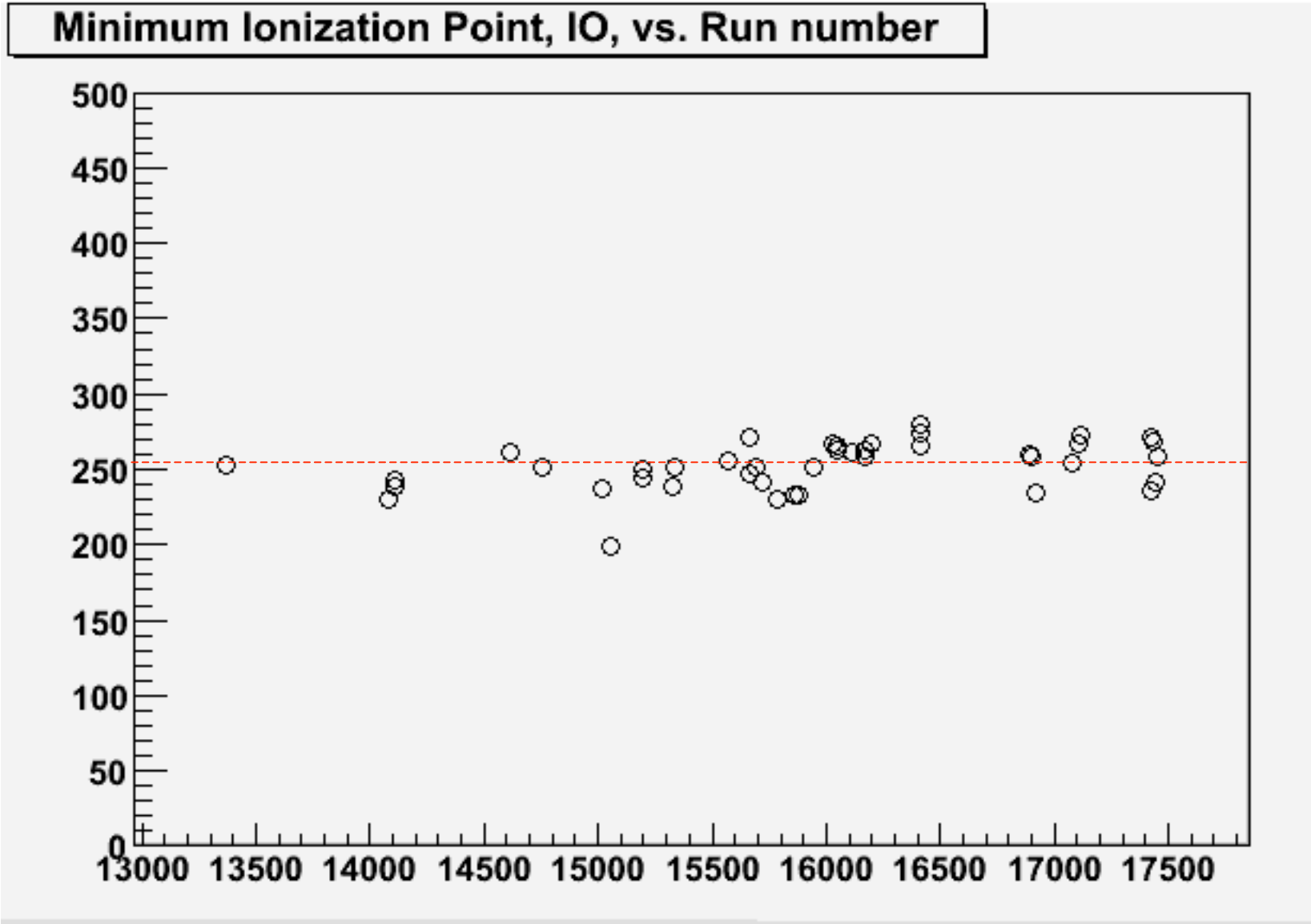
“Good” dE/dx Slice



“Bad” dE/dx Slice

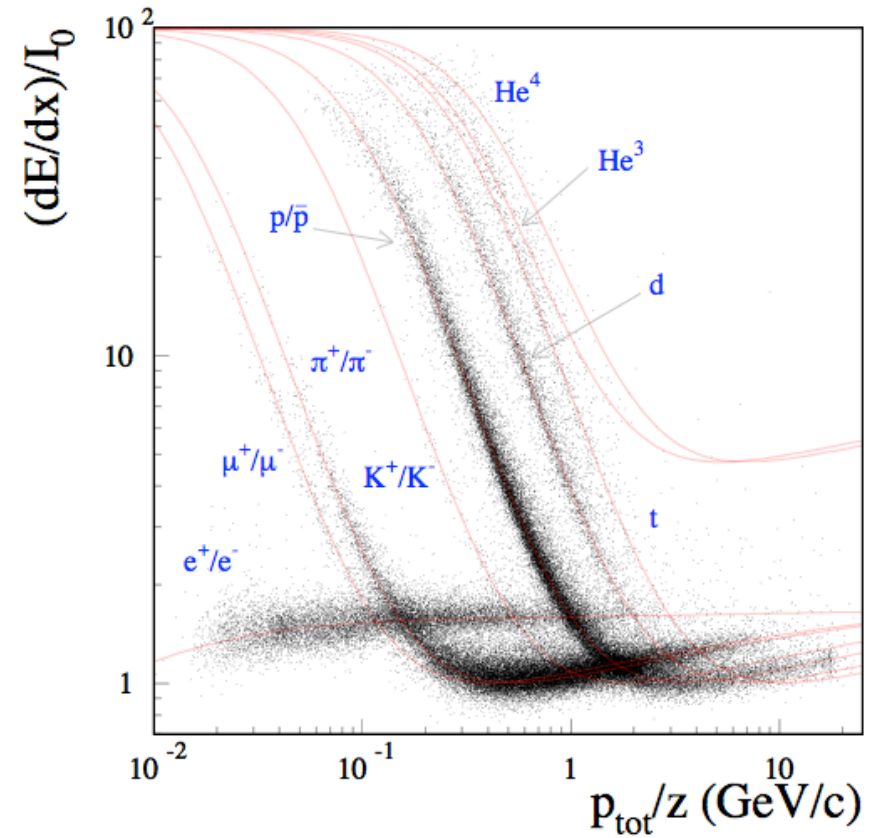


I_0 vs. run

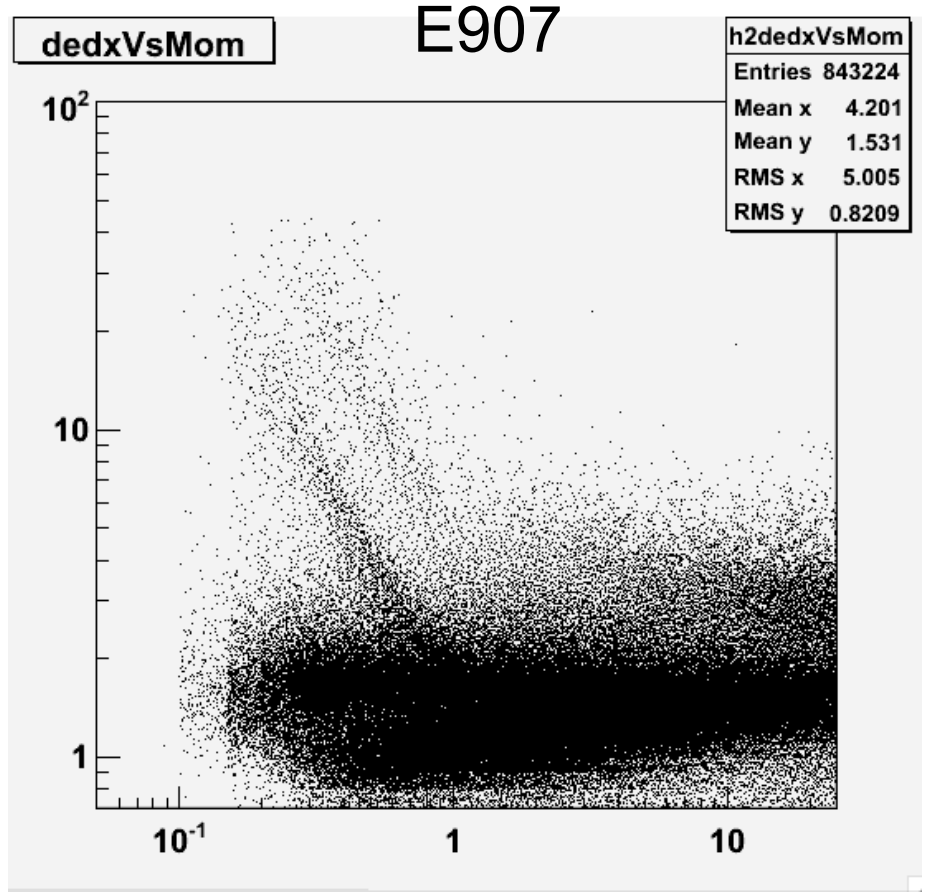

Minimum Ionization Point, IO, vs. Run number
500
450
400
350
300
250
200
150
100
50
0
13000
13500
14000
14500
15000
15500
16000
16500
17000
17500

dE/dx vs. momentum

E910



E907



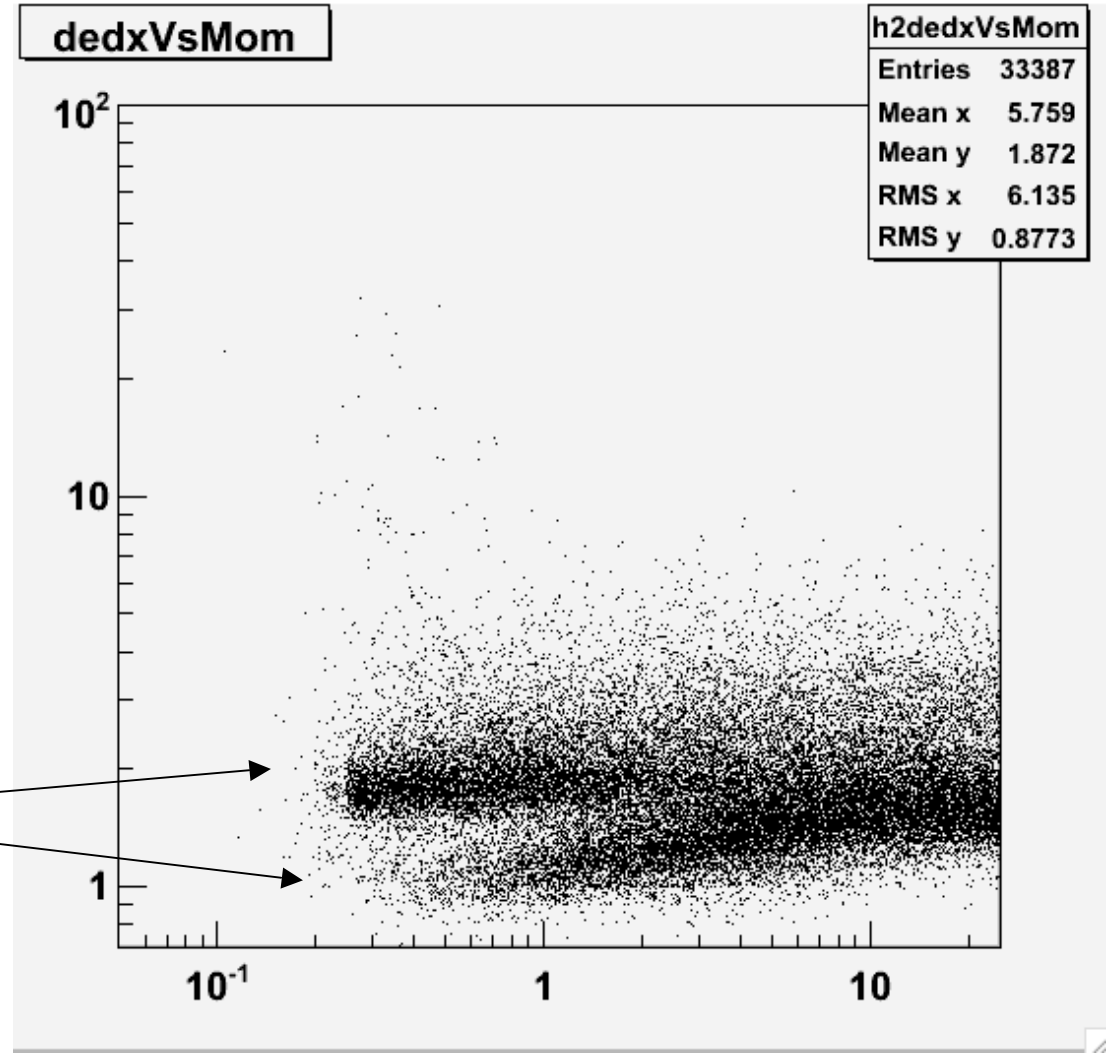
I select tracks with Nhits > 20 (but not necessarily target/vertex-related)

Do we really have so many electrons?

Why so crappy?

Cut hard on $(|x_0|,|y_0|) < 1$cm

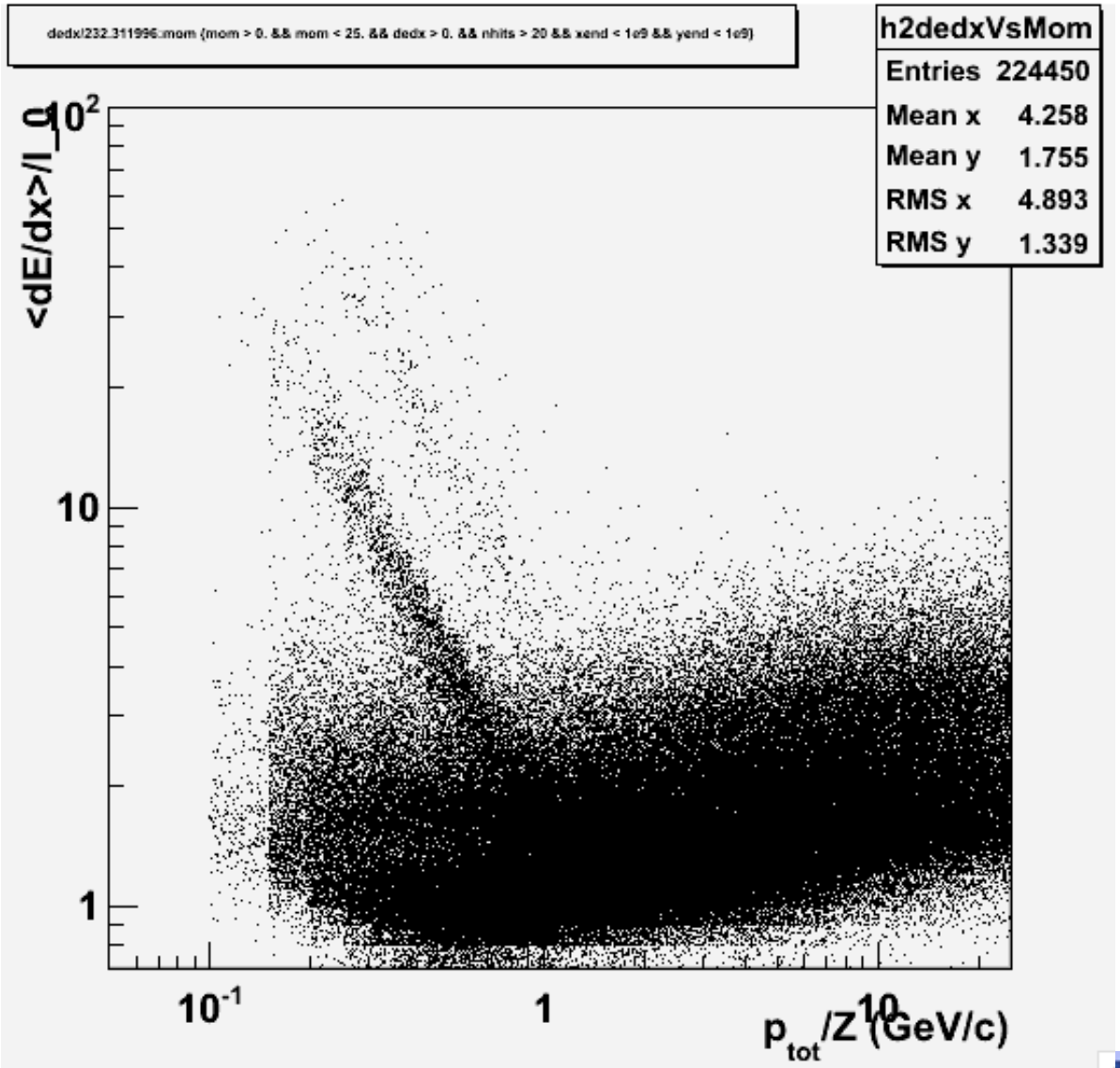
What is what here?



Run 15860 only

Plotting artifact?

It looked much better in linear, with p < 2, no?



Conclusions

I am puzzled by these results and I am digging around to try to understand it…

Any ideas?