# ECAL analysis (in progress...)

Daniel Jeans 18/05/09

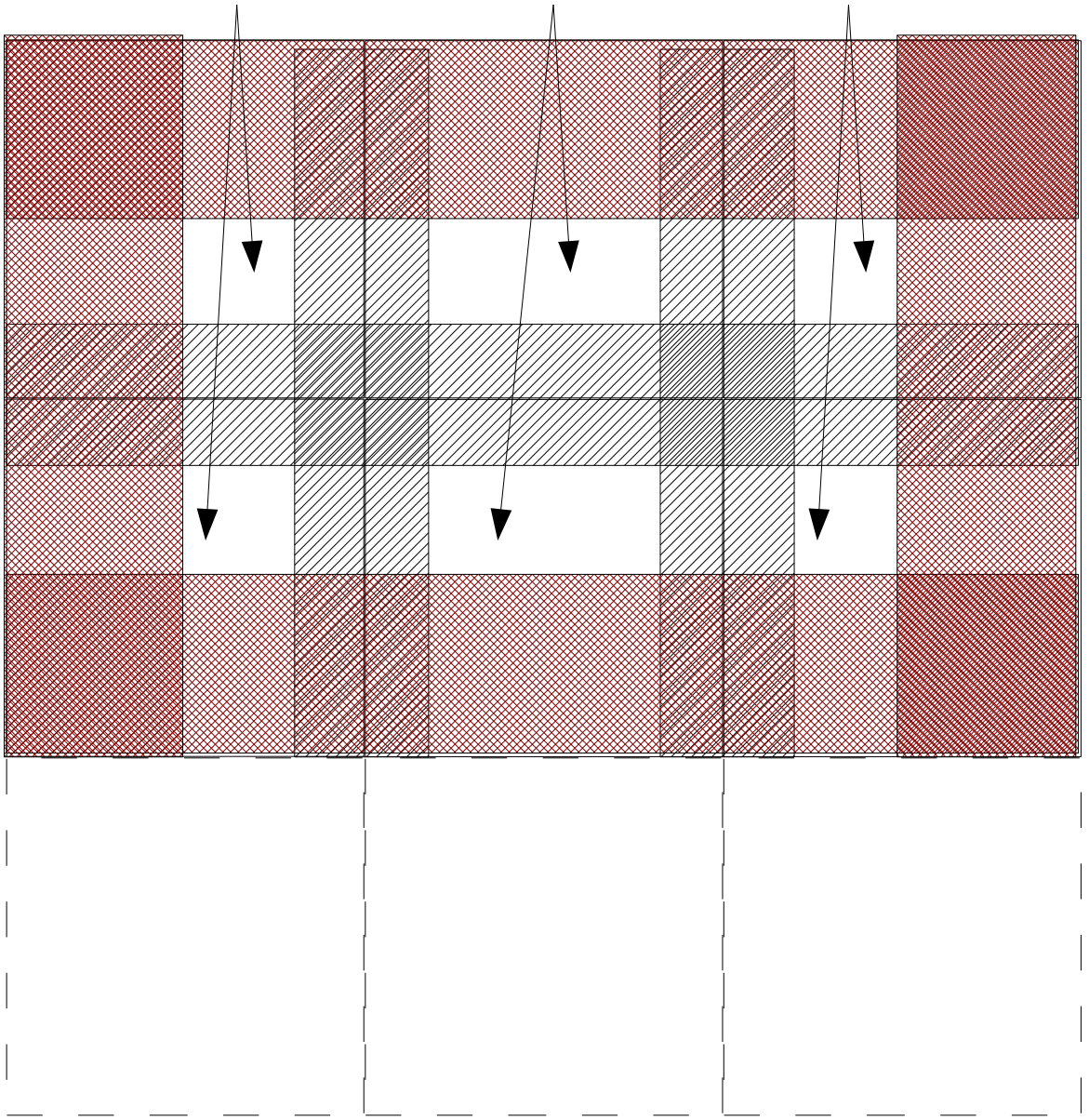
- 2007 data, selection of nice-looking runs

- standard event selection

- lower detector slabs partially instrumented
  Ignore hits in this region (at least for now)

- all numbers preliminary

Most ECAL analyses done with data where electron hits these regions of detector



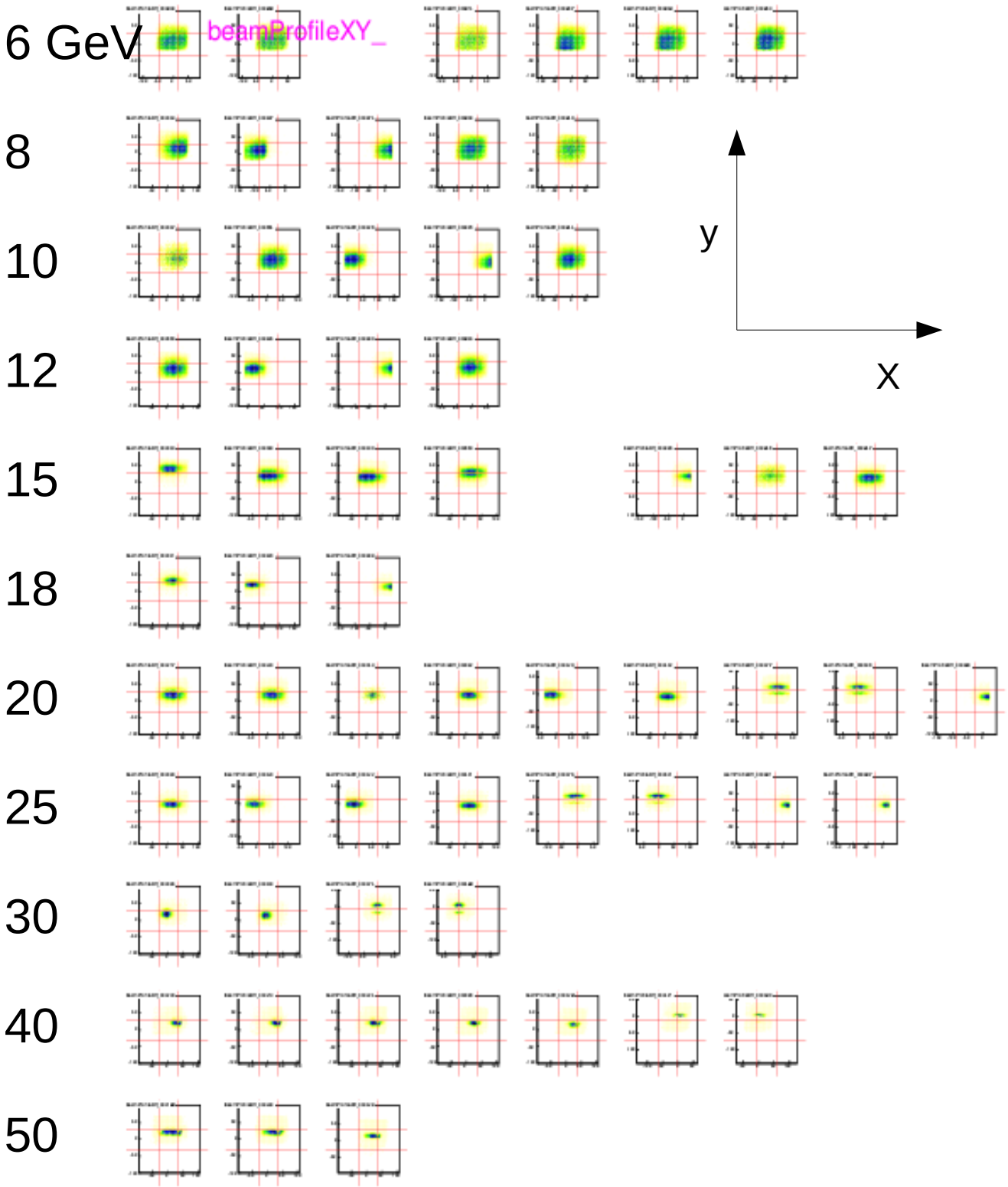
~unaffected by inter-wafer gaps and lateral leakage

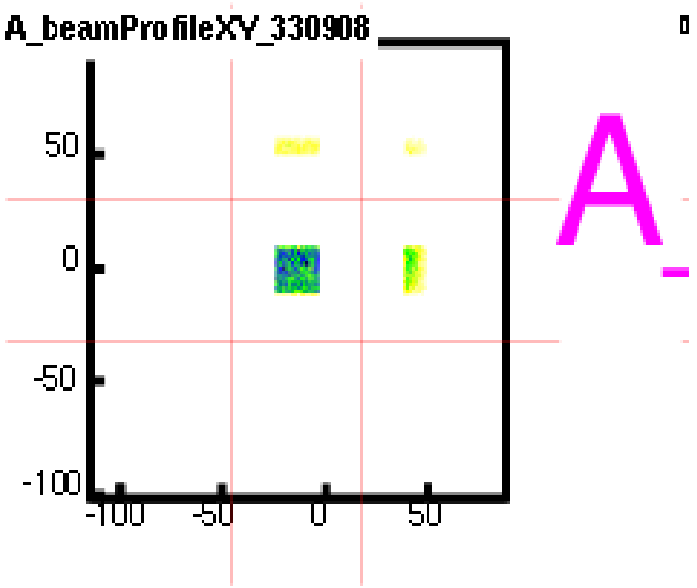
Distribution of shower barycentre in considered runs

One plot per run

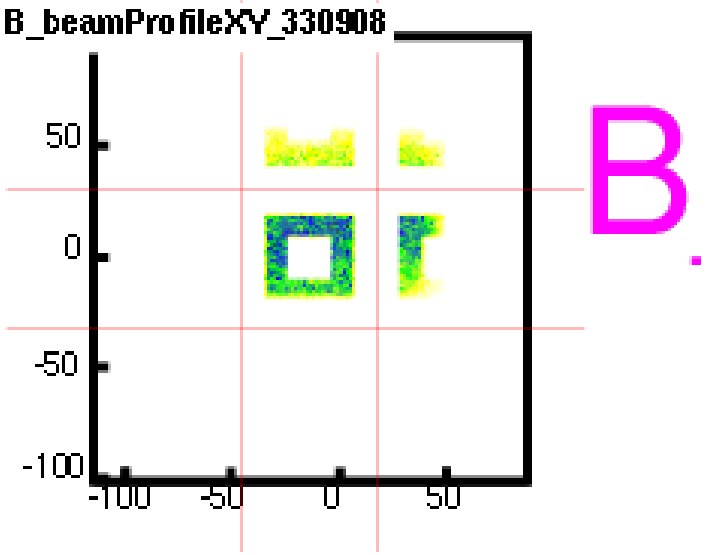
Red lines show interwafer gaps

Some runs at wafer edges/corners, some in wafer centre.






A

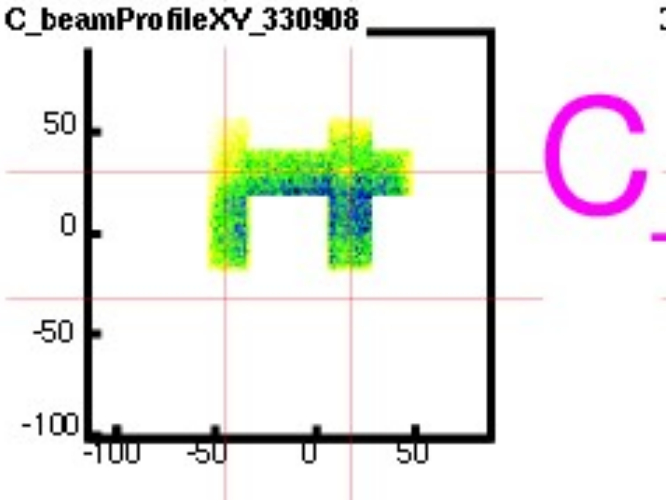



B

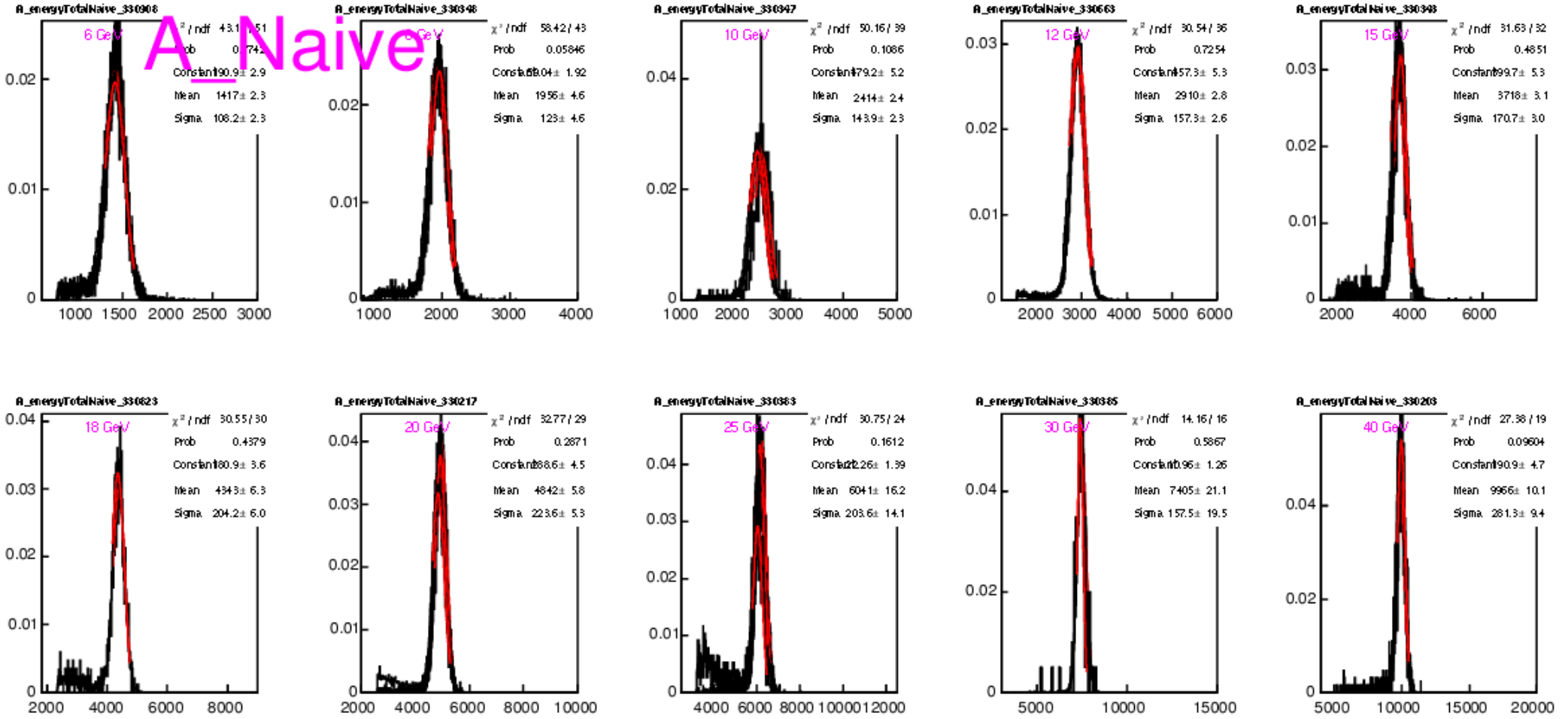
Split detector into 3 regions according to distance from wafer edge

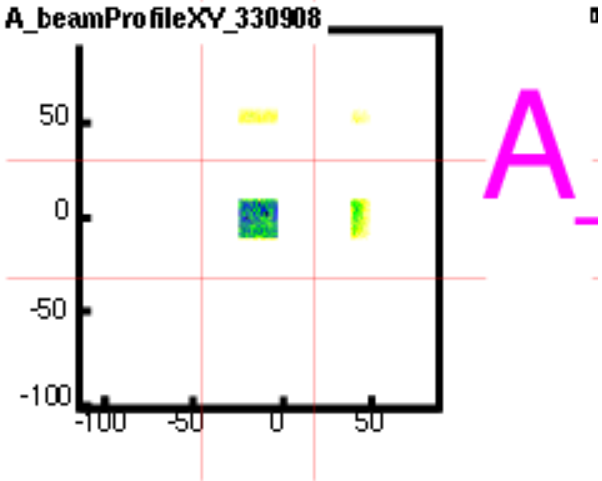
(for now edge of detector treated in same way as interwafer gap: this is being fixed...)

Look at performance in different regions



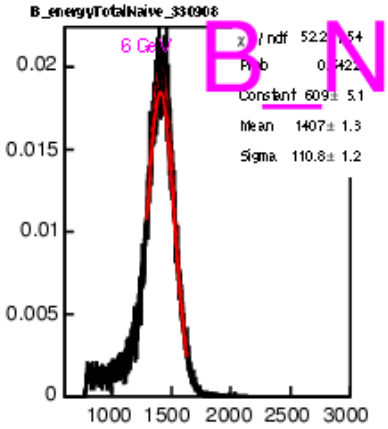

C



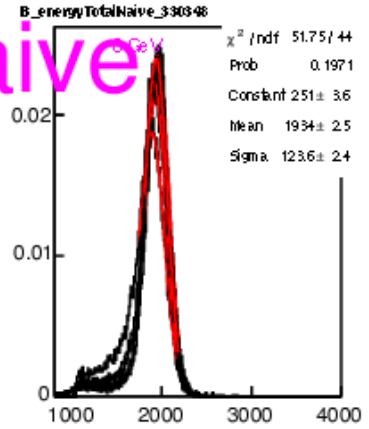



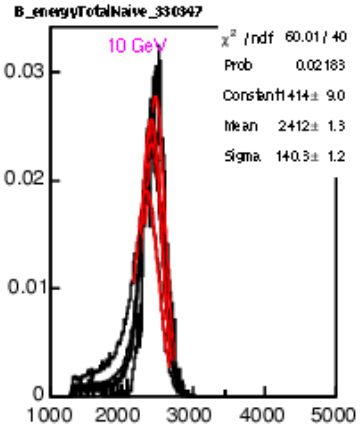

Energy distributions in region A

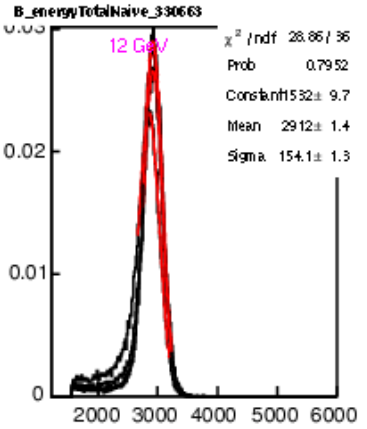
Some runs have more low energy tail than others

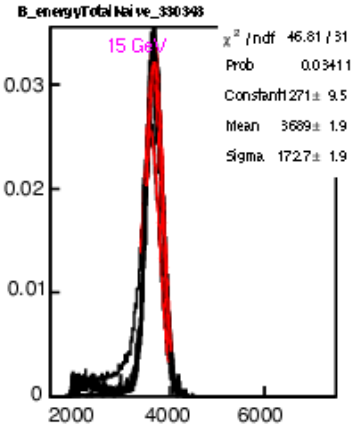


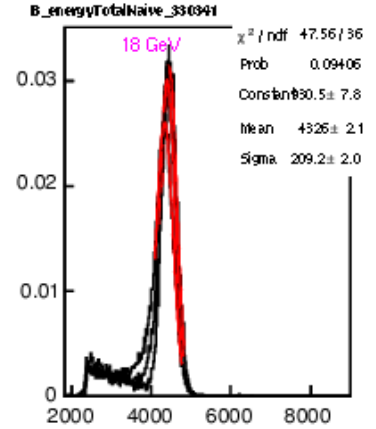

# B_Naive

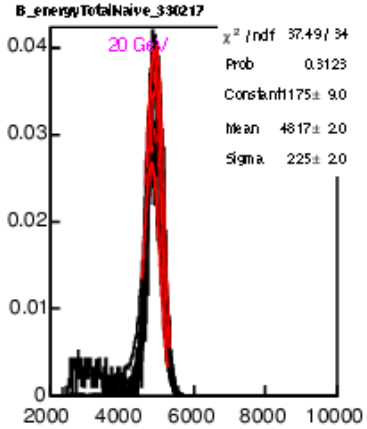


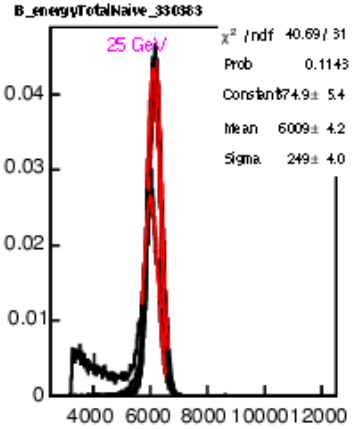



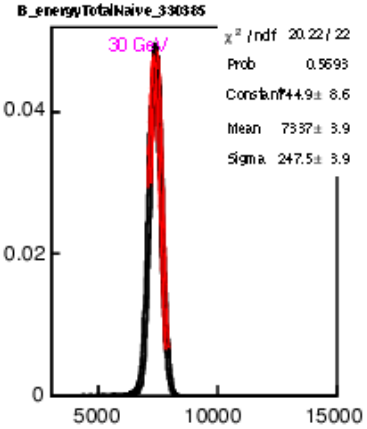



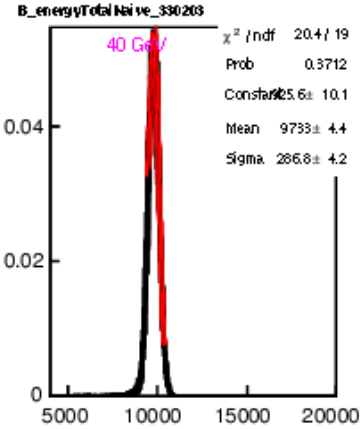



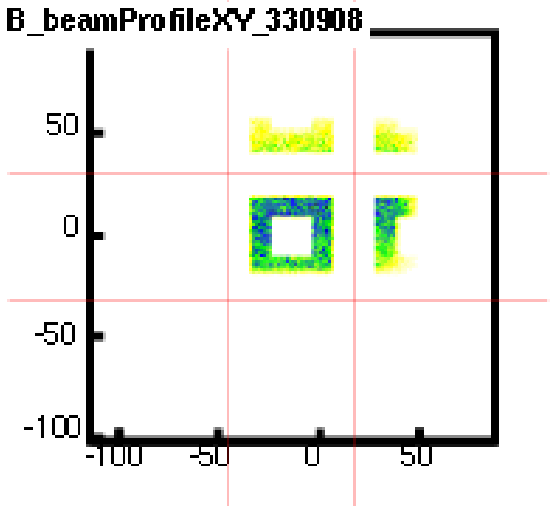



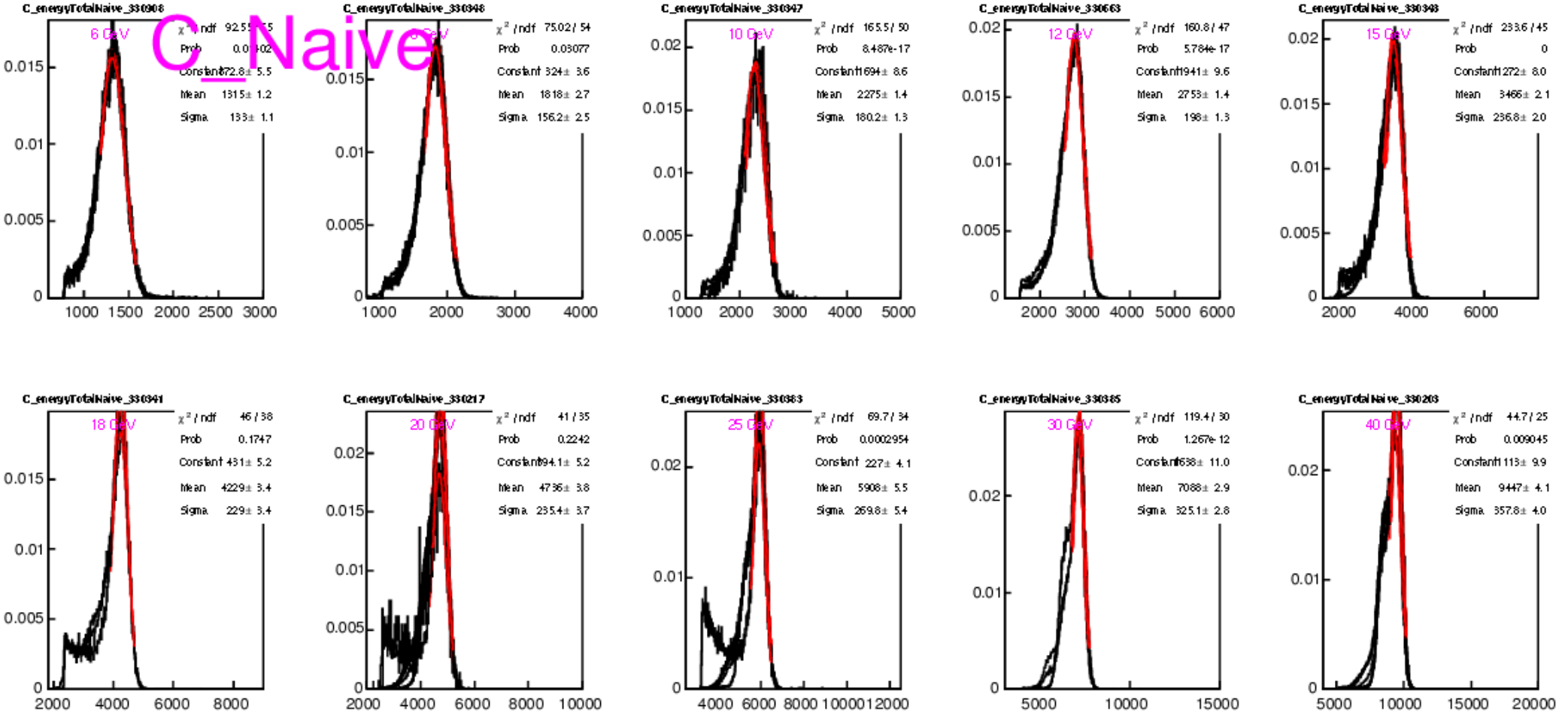



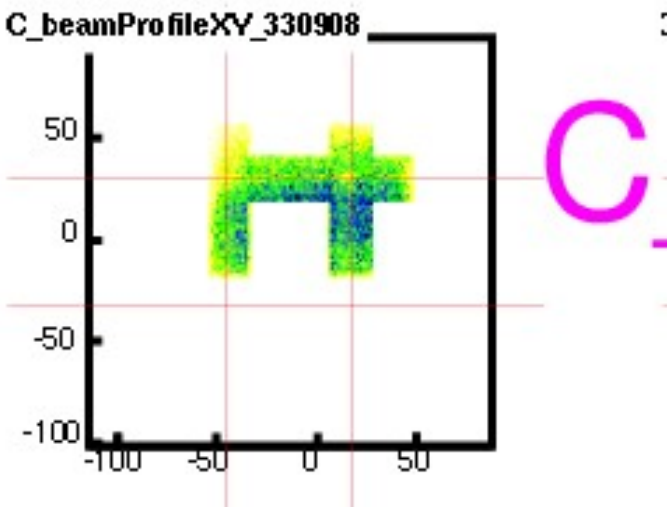




B.

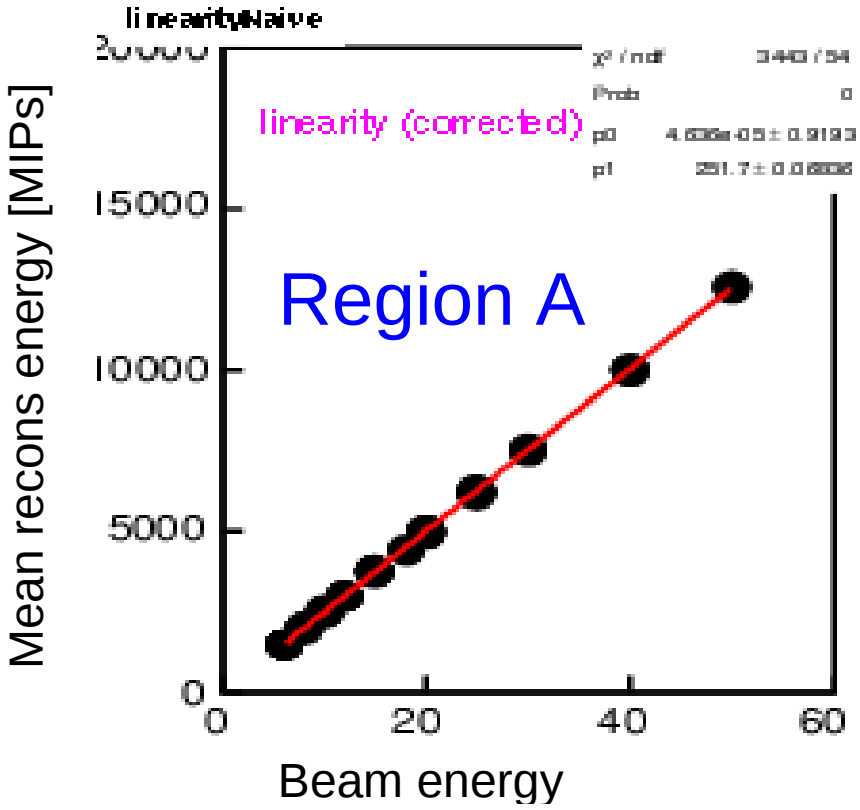
Energy distributions in region B

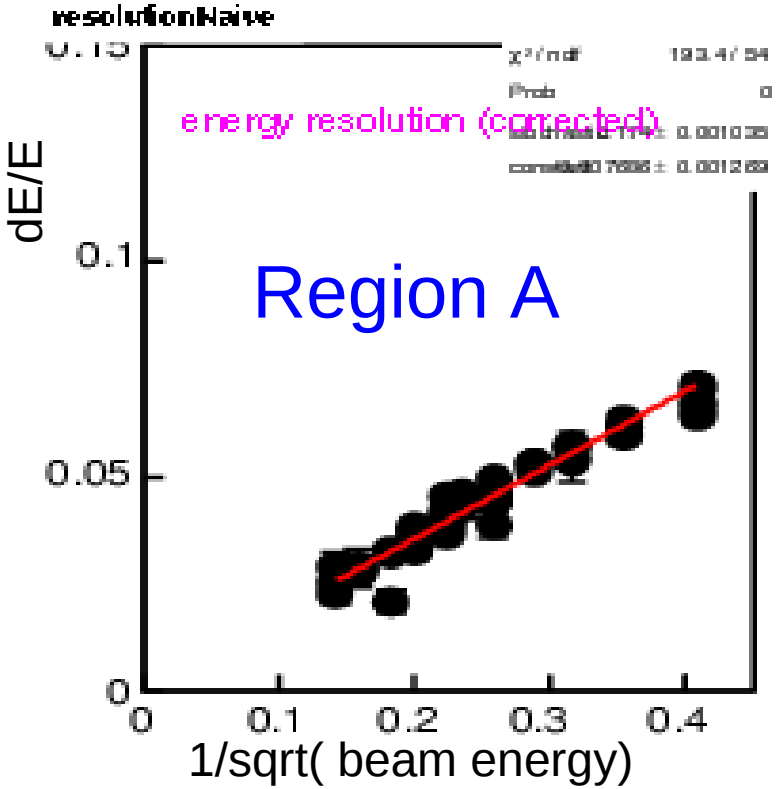


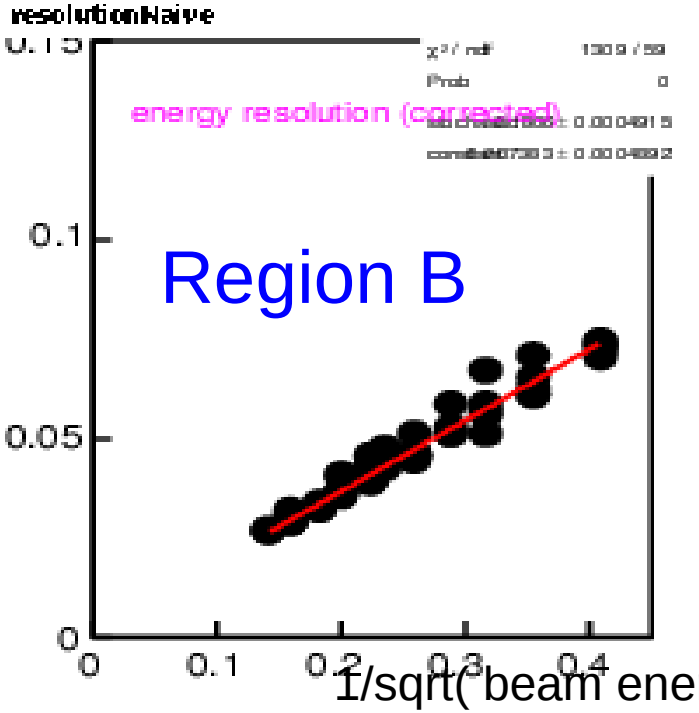




Energy distributions in region C

n.b. some runs affected more by transverse leakage than others



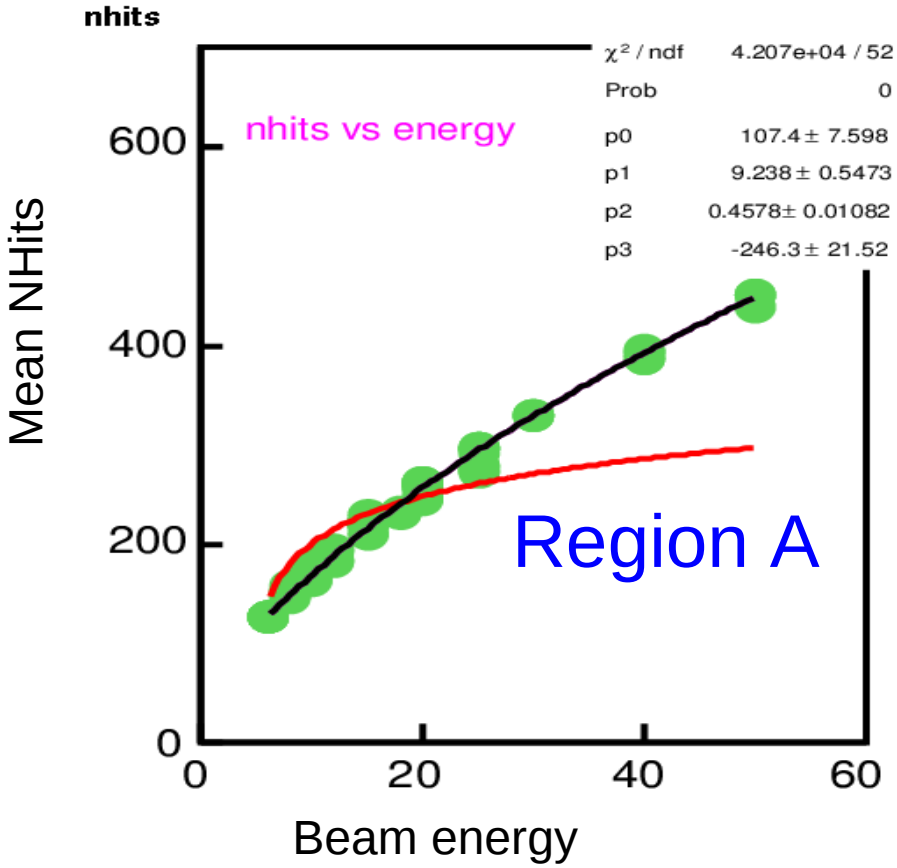



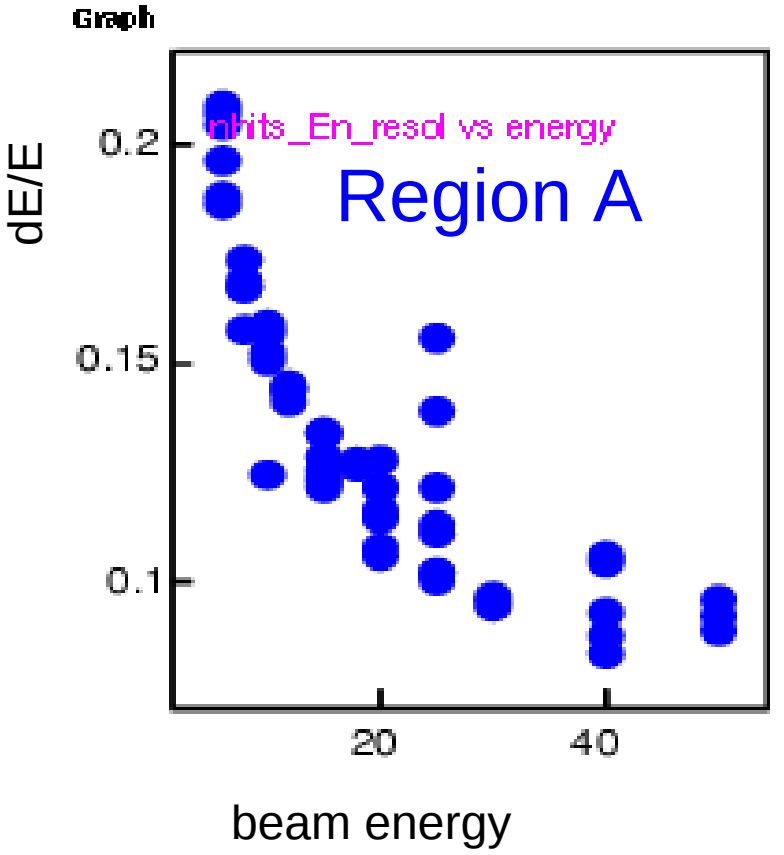




Energy resolution

region A : 17.40%/sqrt(E) + 0.77%
region B:  18.1%/sqrt(E) + 0.74%

Strange that region B has larger stochastic term?
Would (naively?) expect larger const term...




Energy resolution for digital ECAL

Nhits distribution (>0.6 MIP)

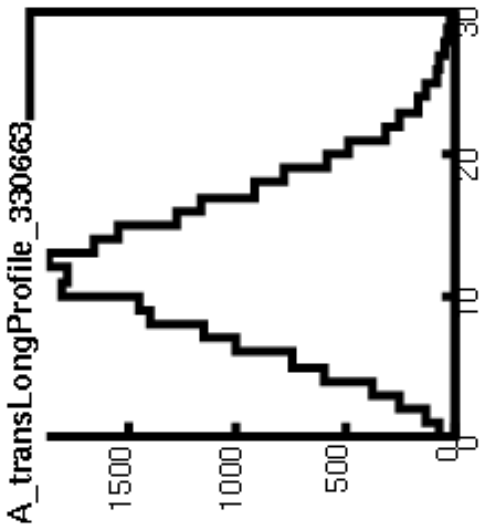
Not logarithmic

Fit to NHits = a*(E+b)^c + d

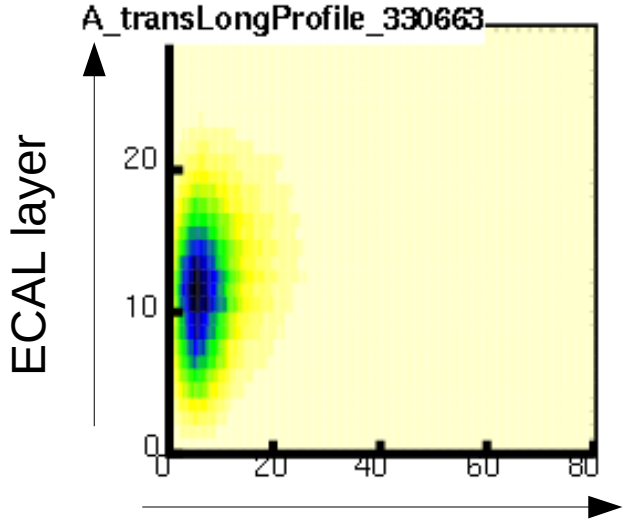
A = 108
B = 9.2
C = 0.46
D = -246

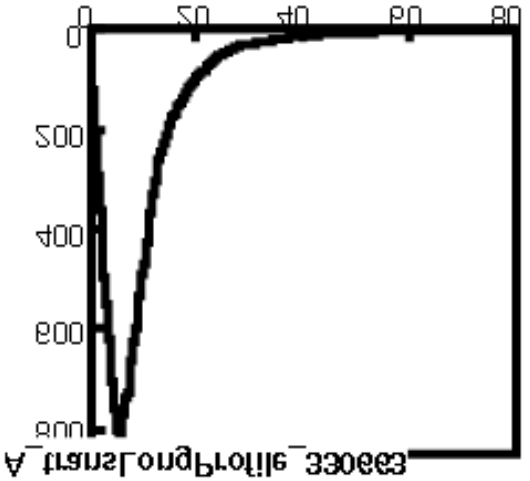
# Shower shape studies

## With respect to shower barycentre

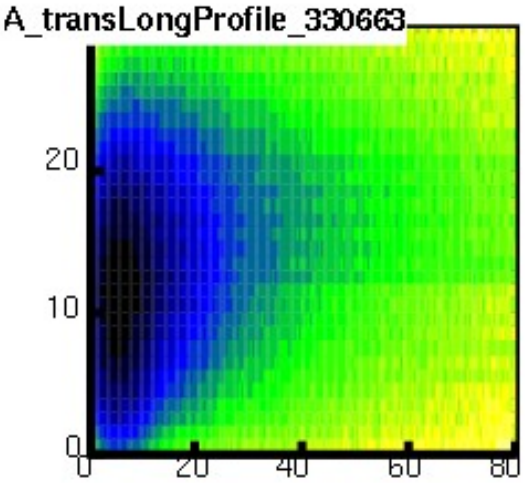



Colour = mean energy



Colour = log(mean energy)



## Future plans:

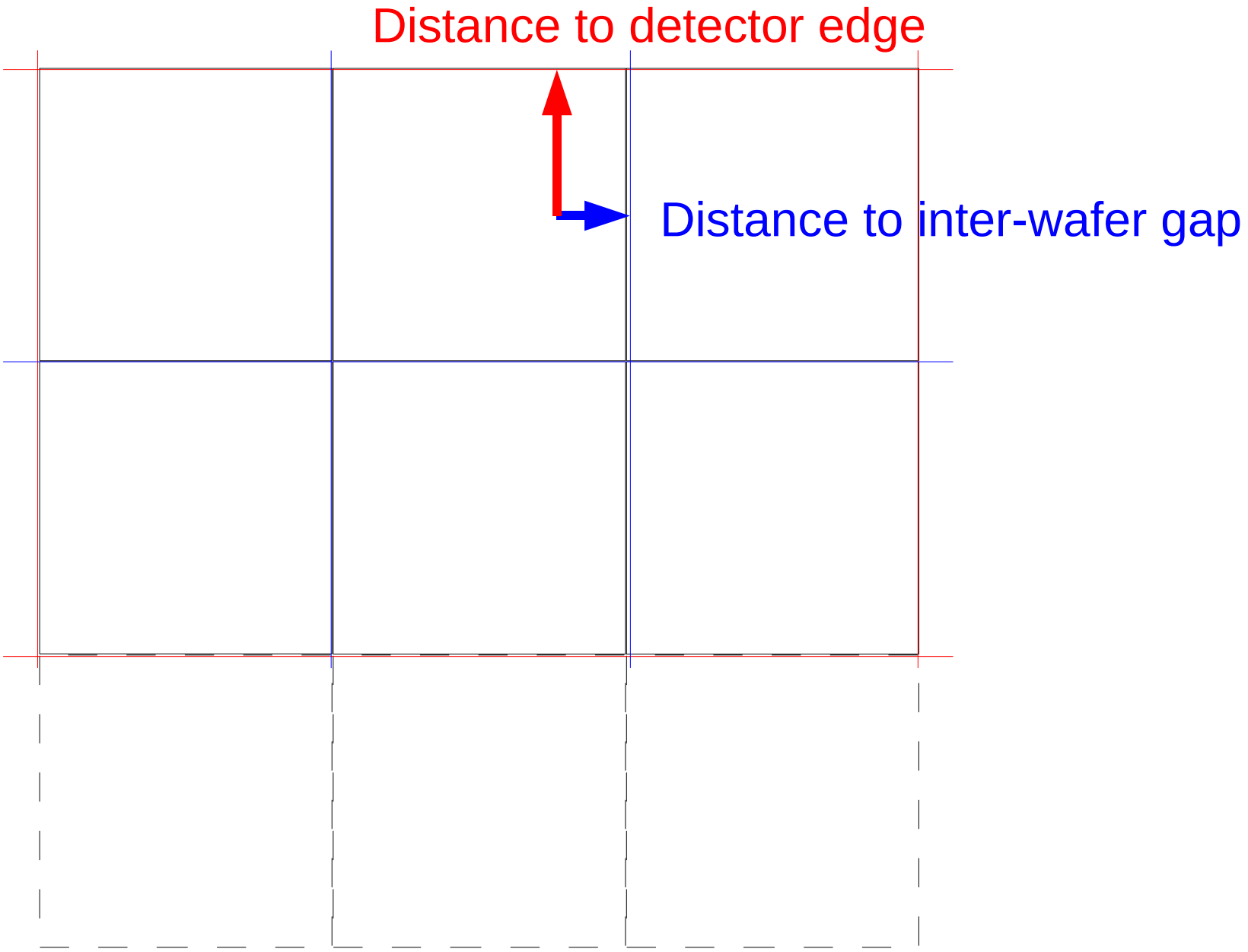
Continue with analysis:

- Separate effects of lateral leakage and interwafer gaps

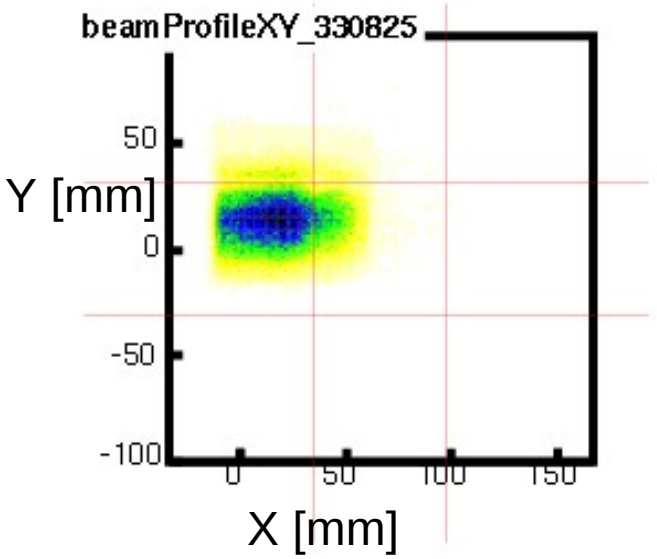
Include tracking info (instead of barycentre)

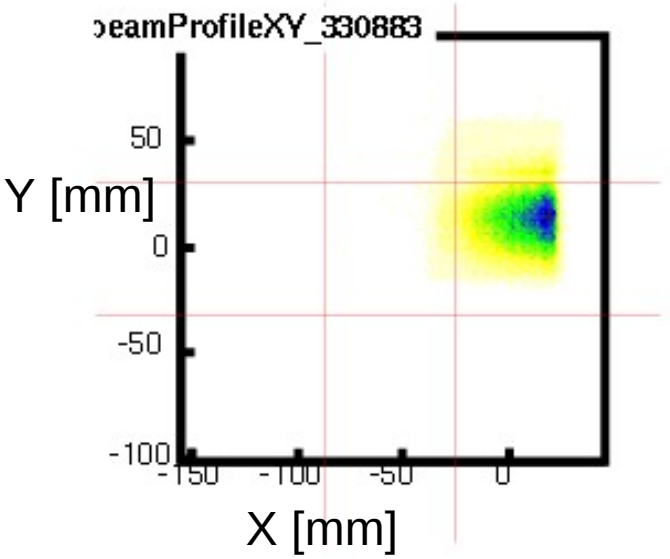
Look at interwafer gap corrections

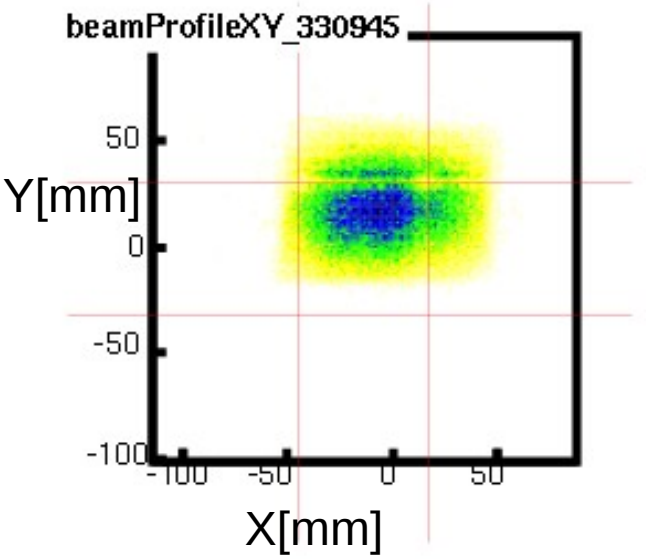
Backup slides

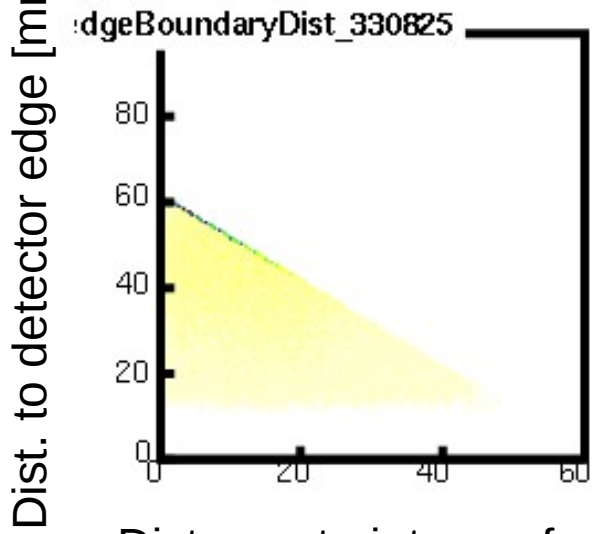


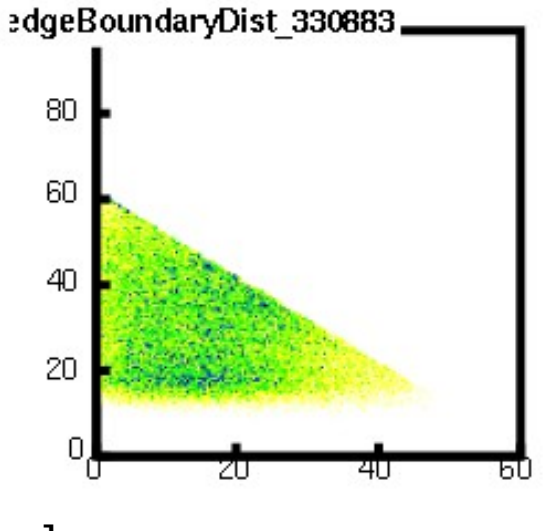

This ignores difference in gap widths in x and y...

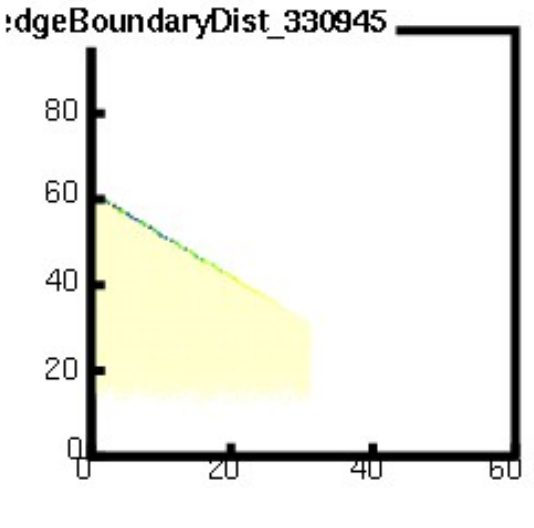

beamProfileXY_330825
Y [mm]
X [mm]


beamProfileXY_330883
Y [mm]
X [mm]


beamProfileXY_330945
Y[mm]
X[mm]

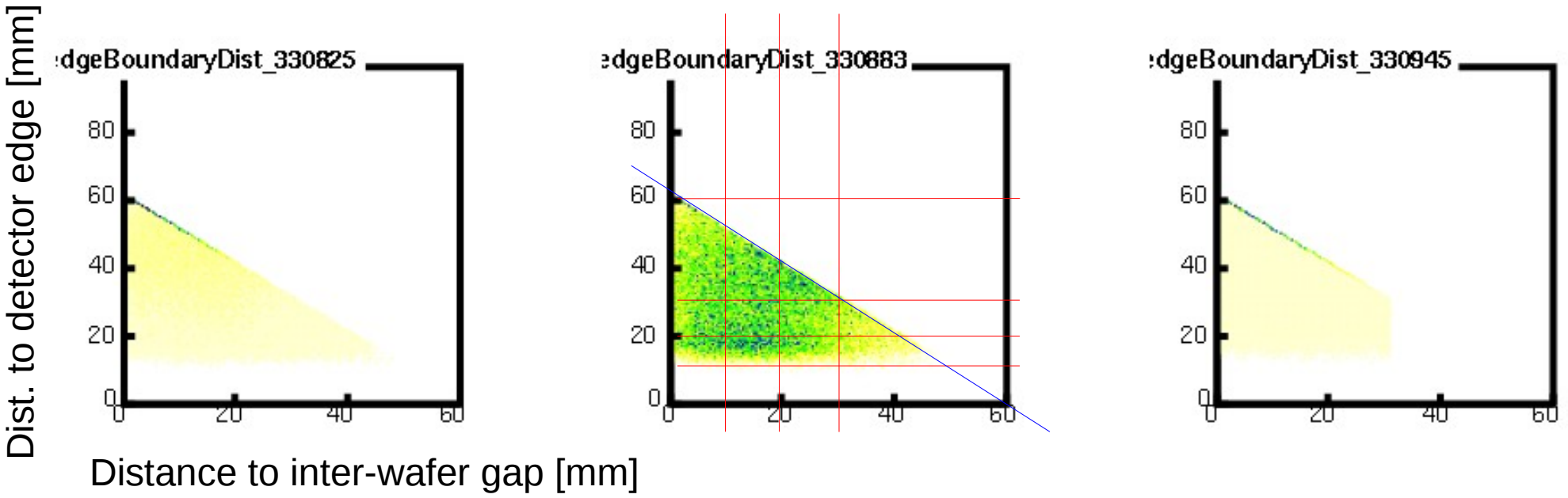

edgeBoundaryDist_330825
Dist. to detector edge [mm]
Distance to inter-wafer gap [mm]


edgeBoundaryDist_330883

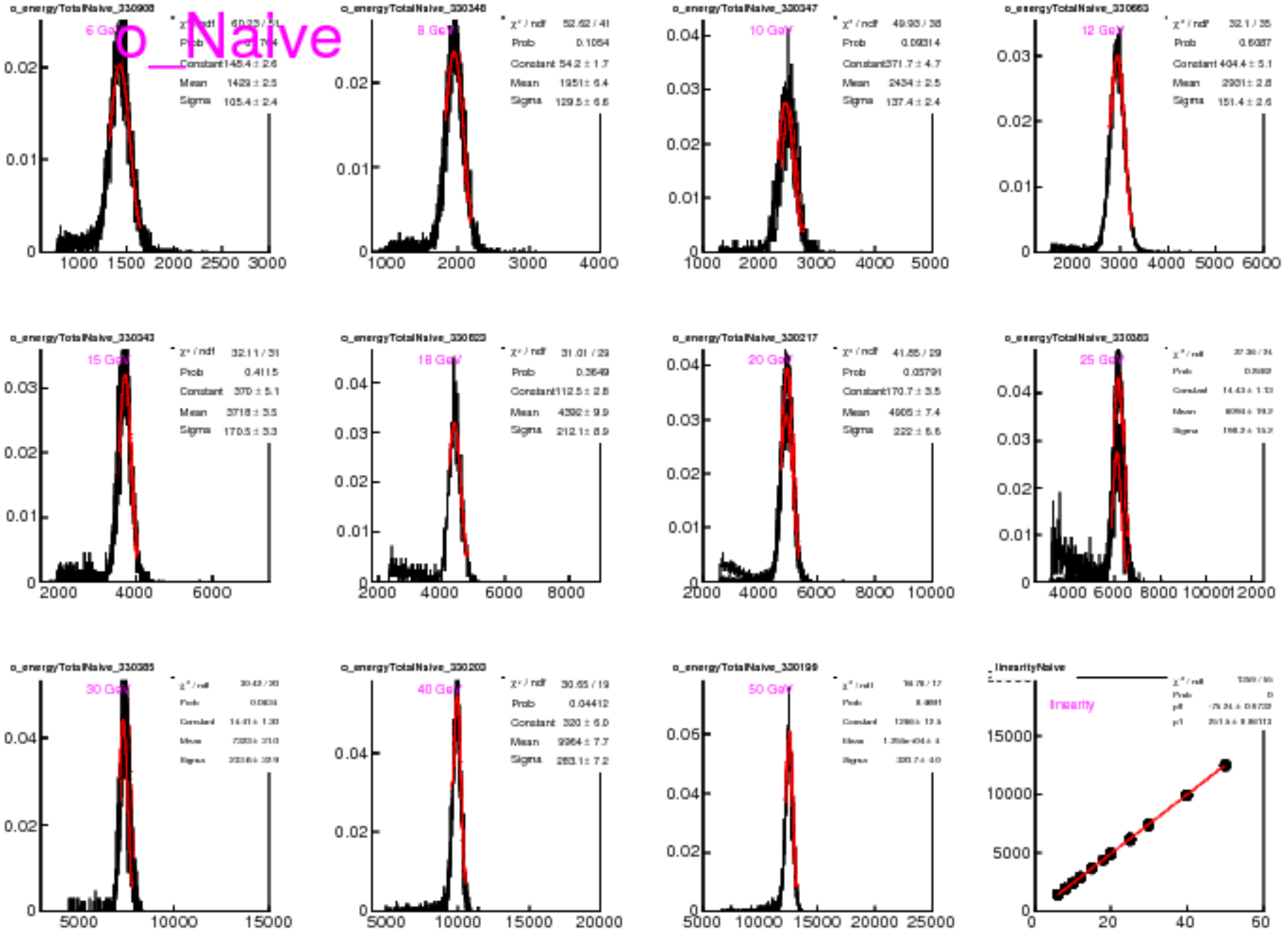

edgeBoundaryDist_330945

Split this [dist to inter-wafer / dist to edge] space into 15 regions

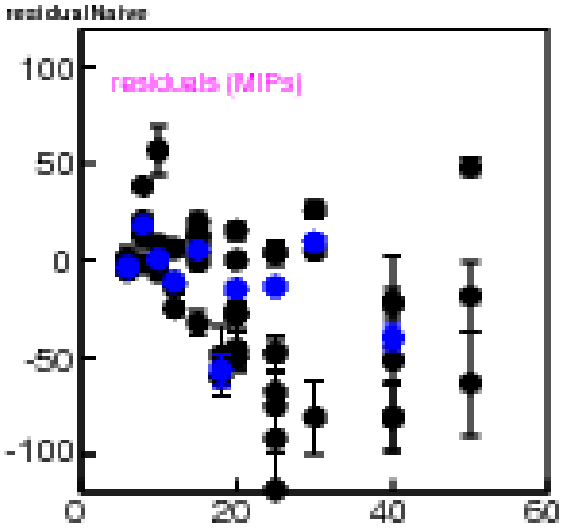
Measure performance in each region

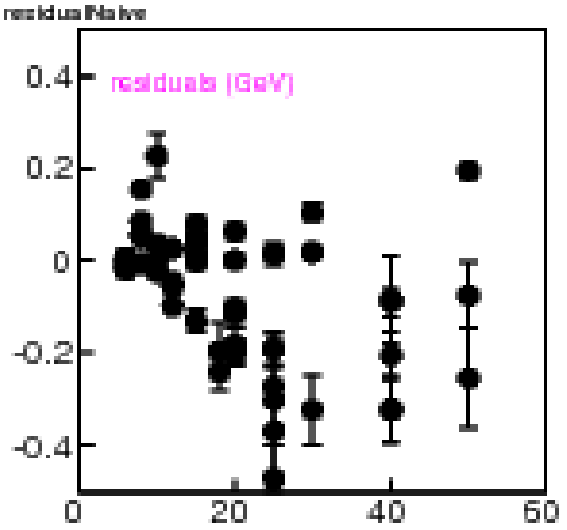


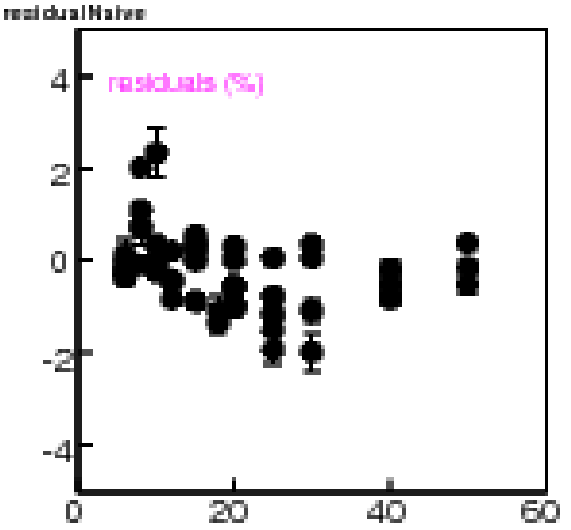
Reconstructed energy in region far from edge & far from gaps



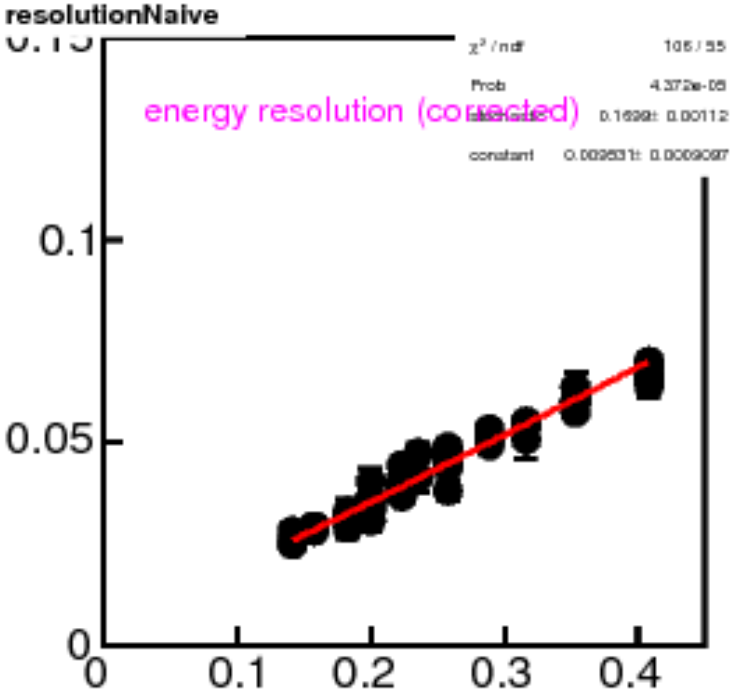
far from edge & far from gaps



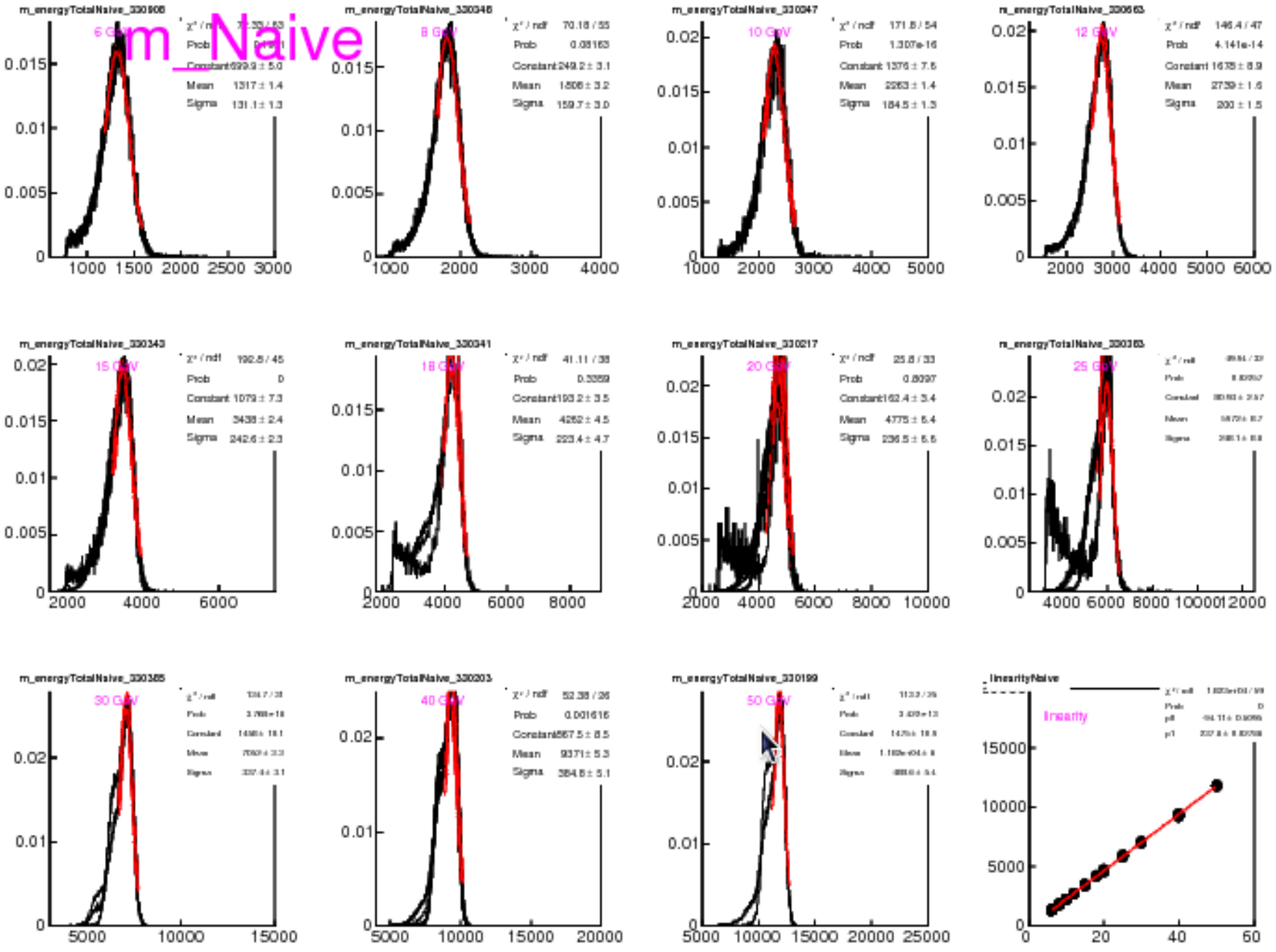

Residuals from linearity



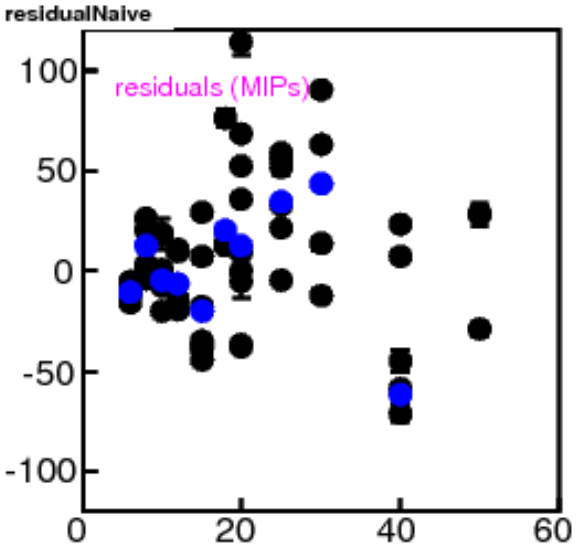

Energy resolution

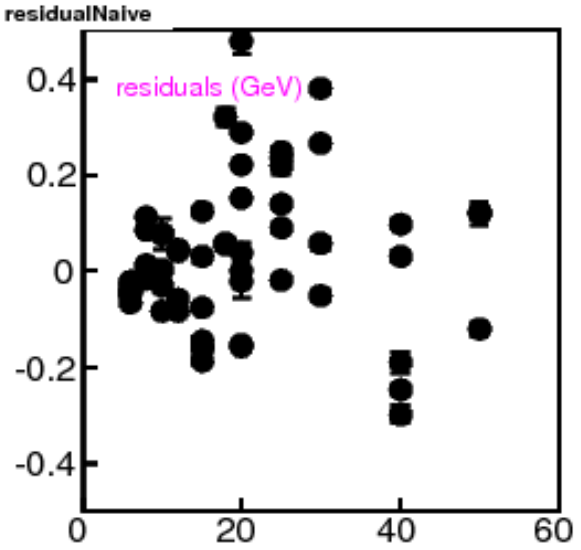
sigE/E = 17.0/sqrt(E) (+) 1.0 %

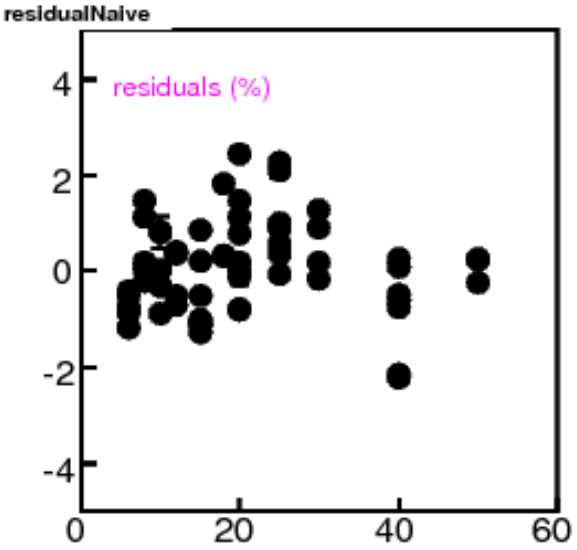
Reconstructed energy in region far from edge & near to gaps

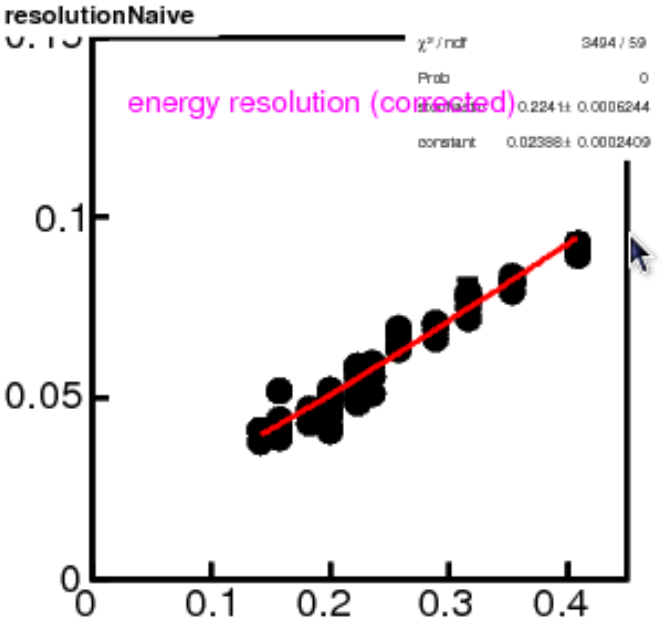


far from edge & near to gaps




Energy resolution

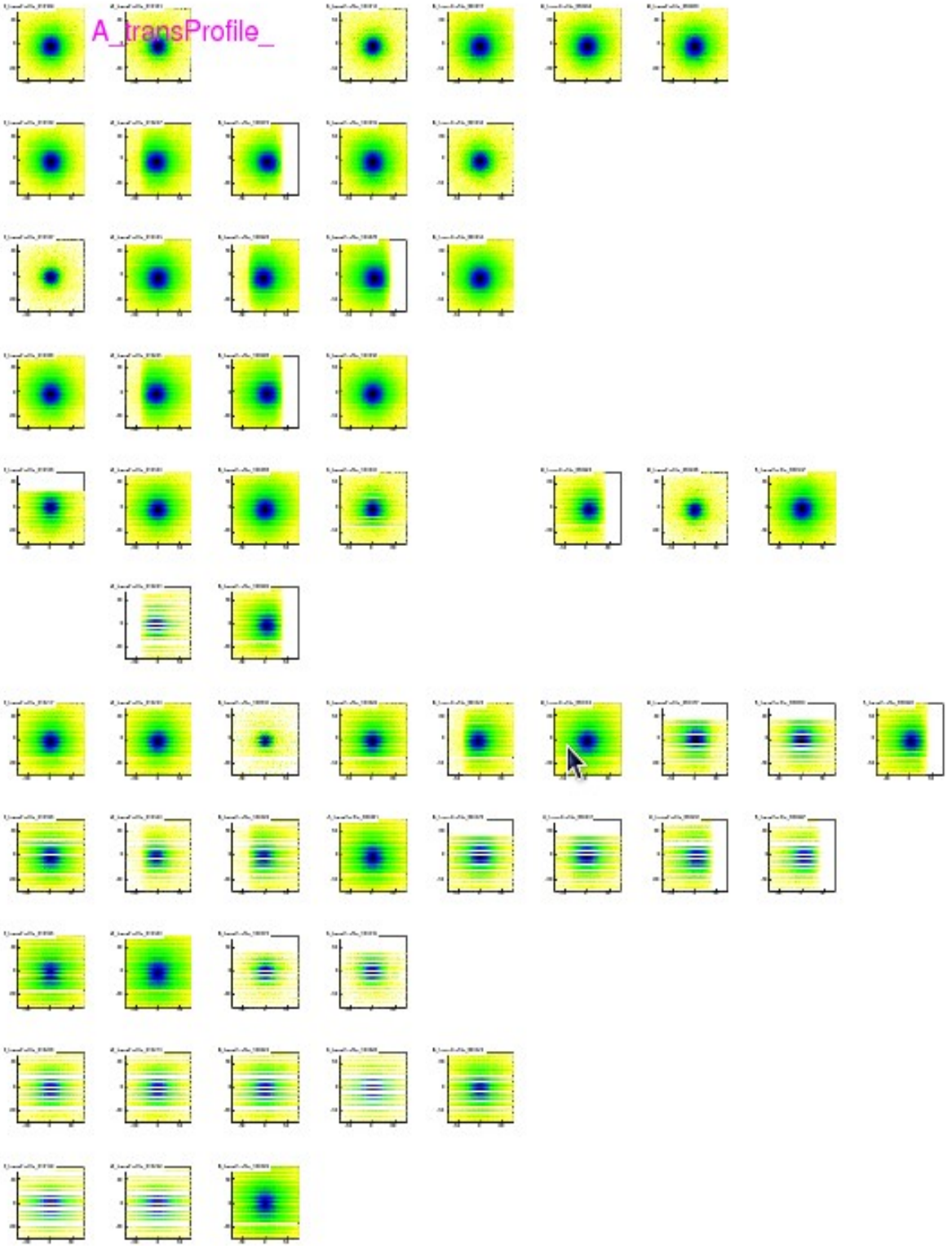
sigE/E ~ 22.4/sqrt(E) (+) 2.4 %

Shower shapes,

x vs. y (integrated over depth)
w.r.t. shower centre of gravity

(log energy scale)

One plot per run

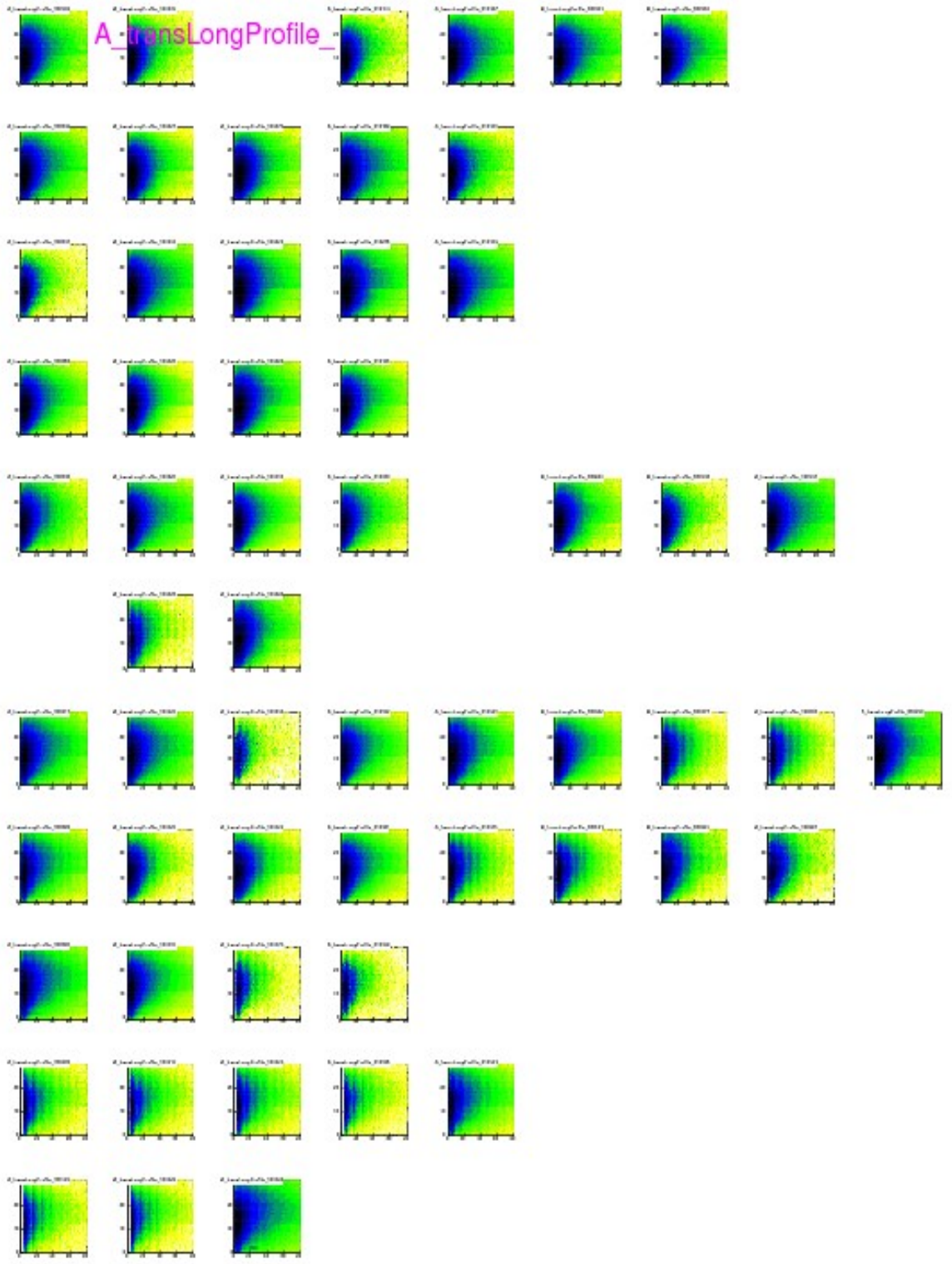


Shower shapes,

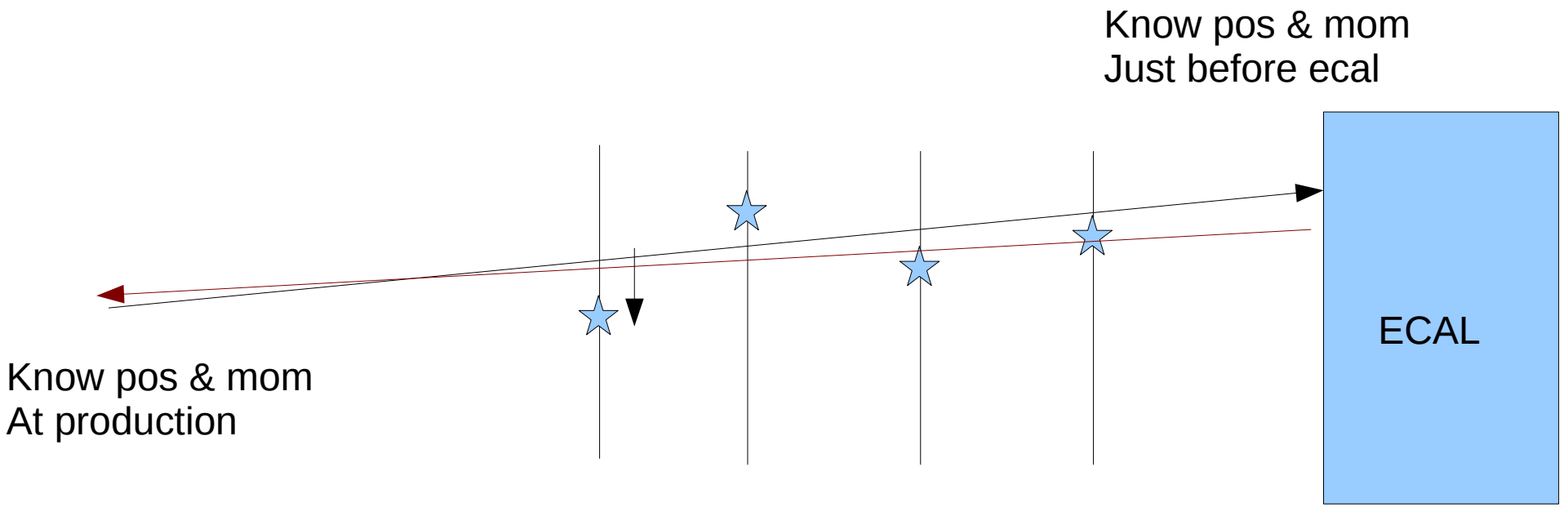
r vs. layer (integrated over phi)
w.r.t. shower centre of gravity

(log energy scale)

One plot per run

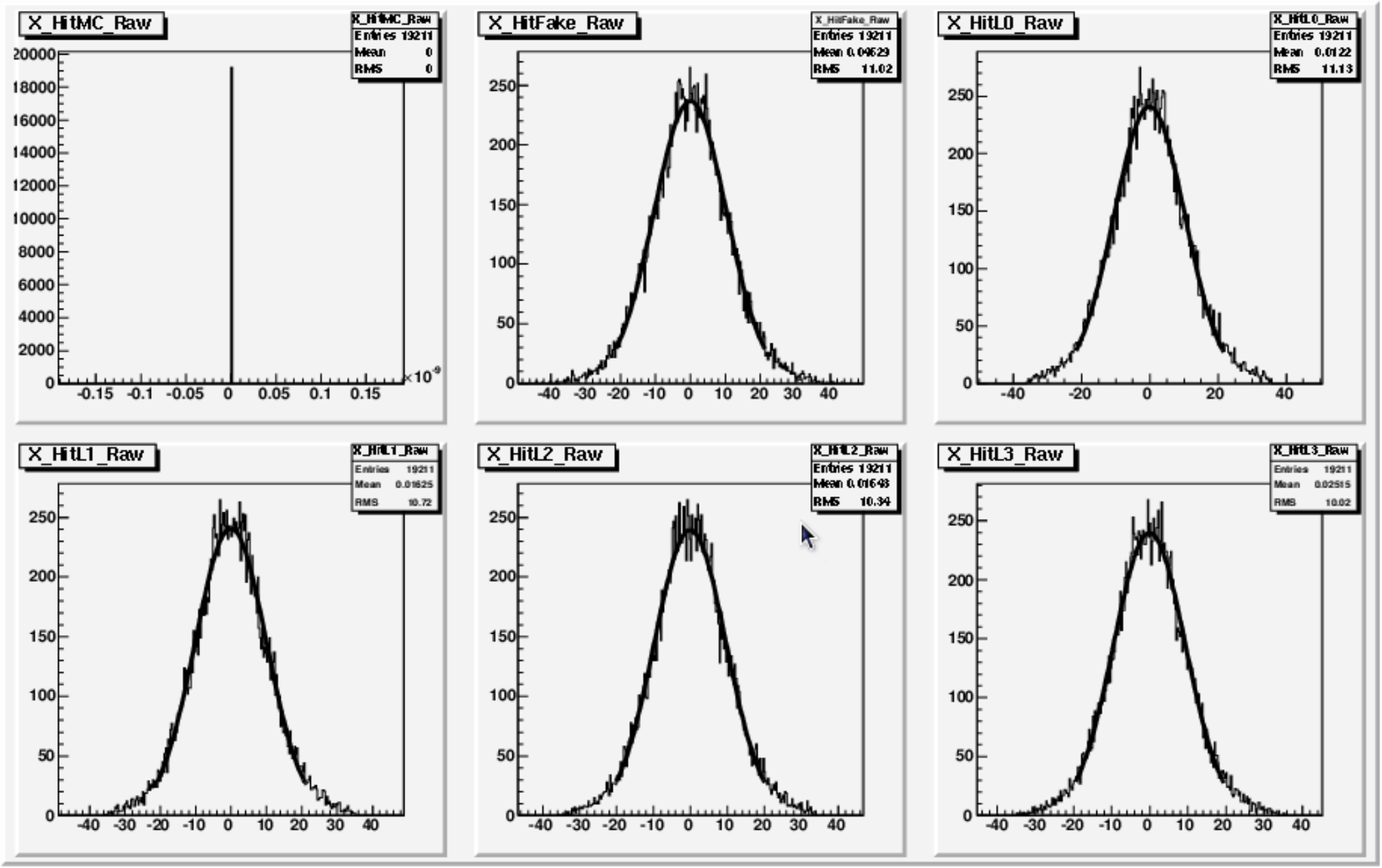


Measuring track scatter in MC



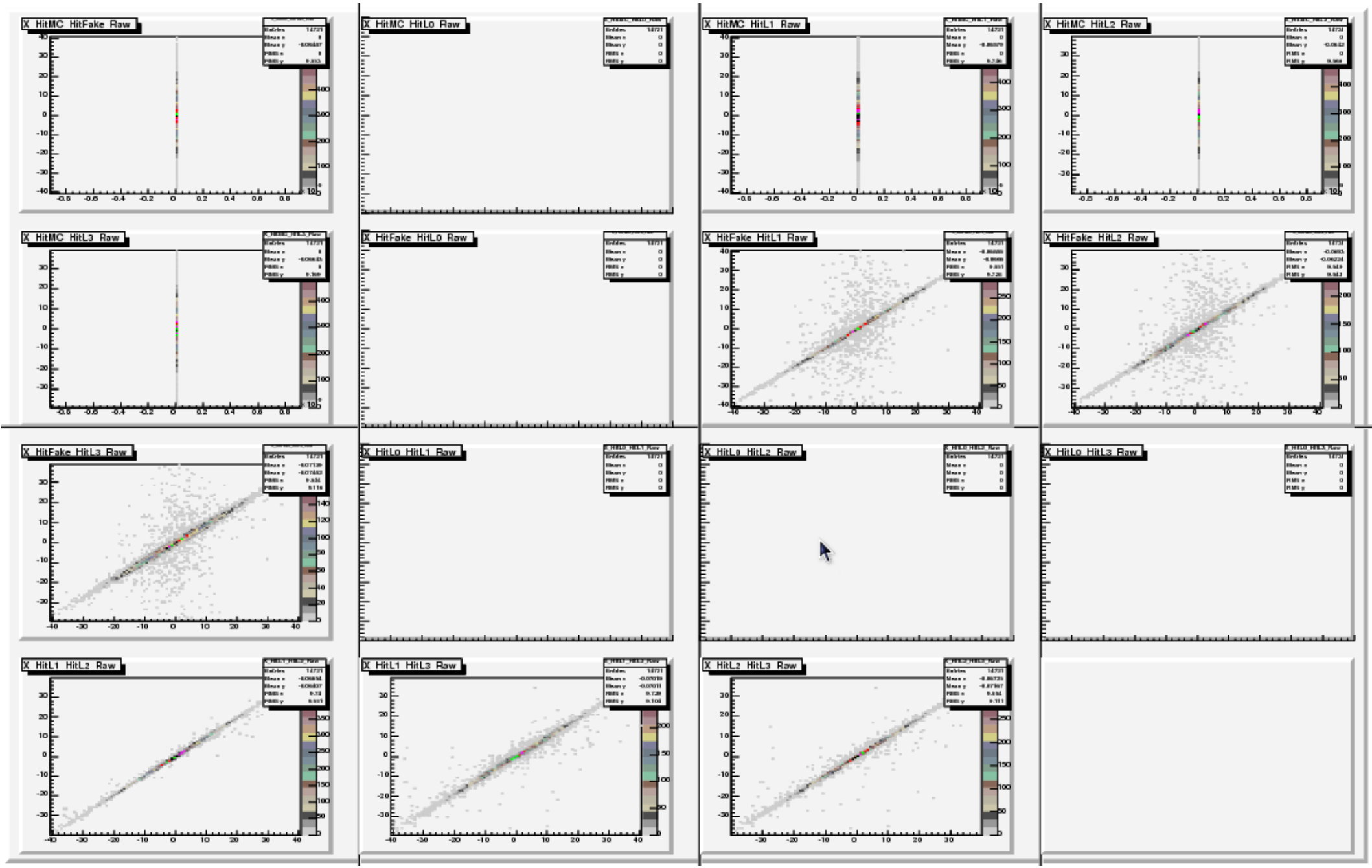

Measure distance between extrapolated position and real hit position

This depends on scattering of the beam in material in the beamline

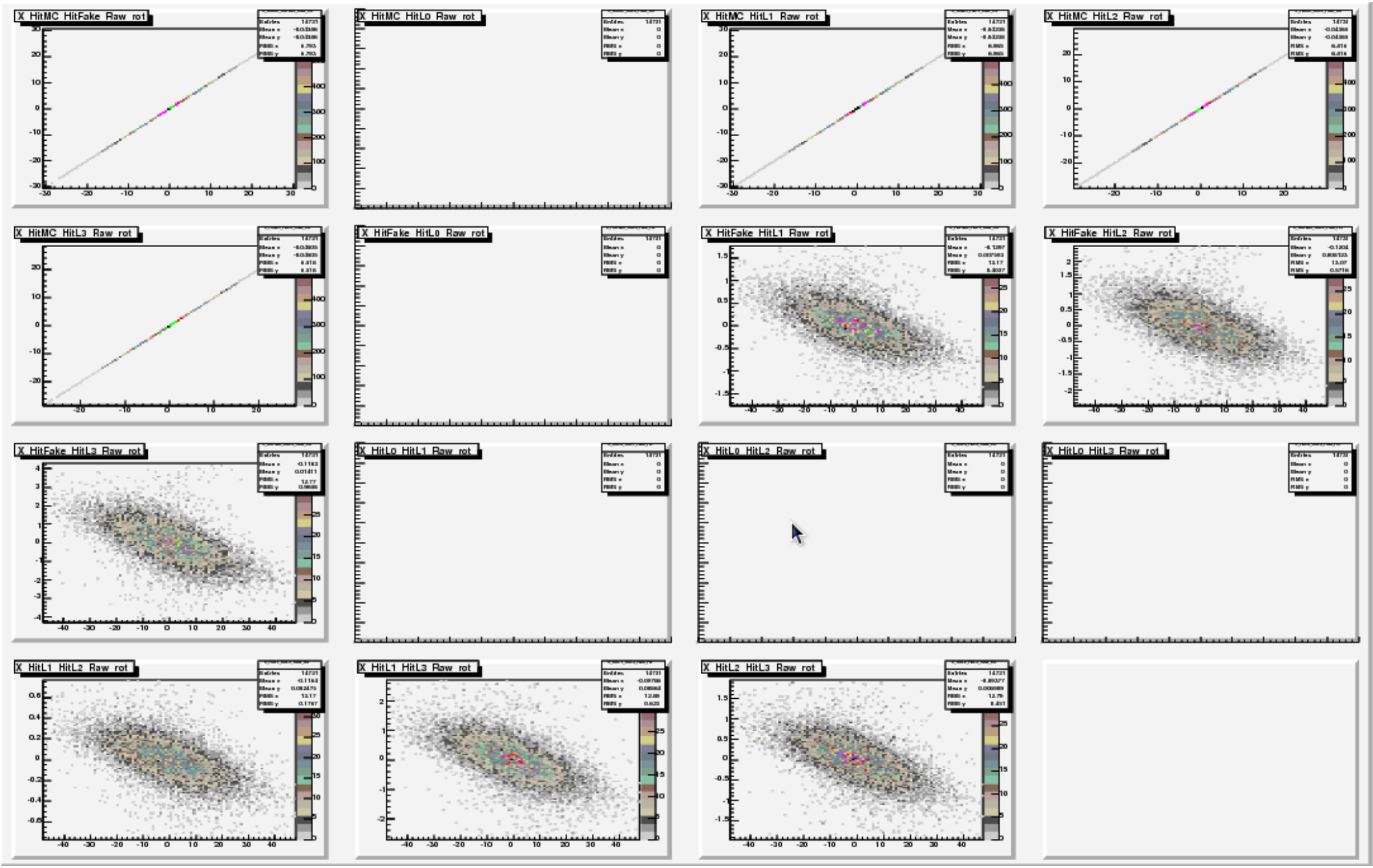



20 gev electrons, extrap from MC production position

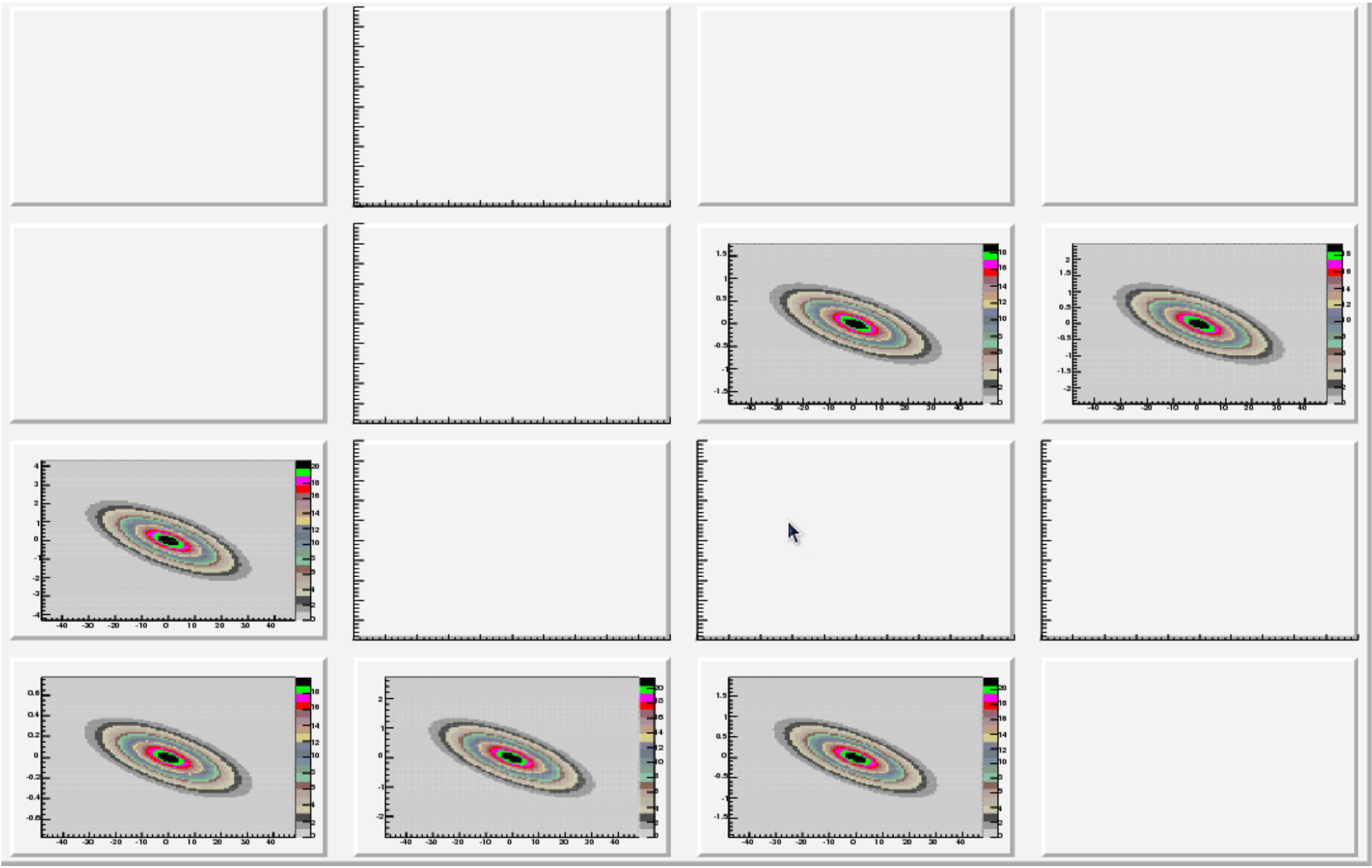
Also need to get correlations between the offset between different layers



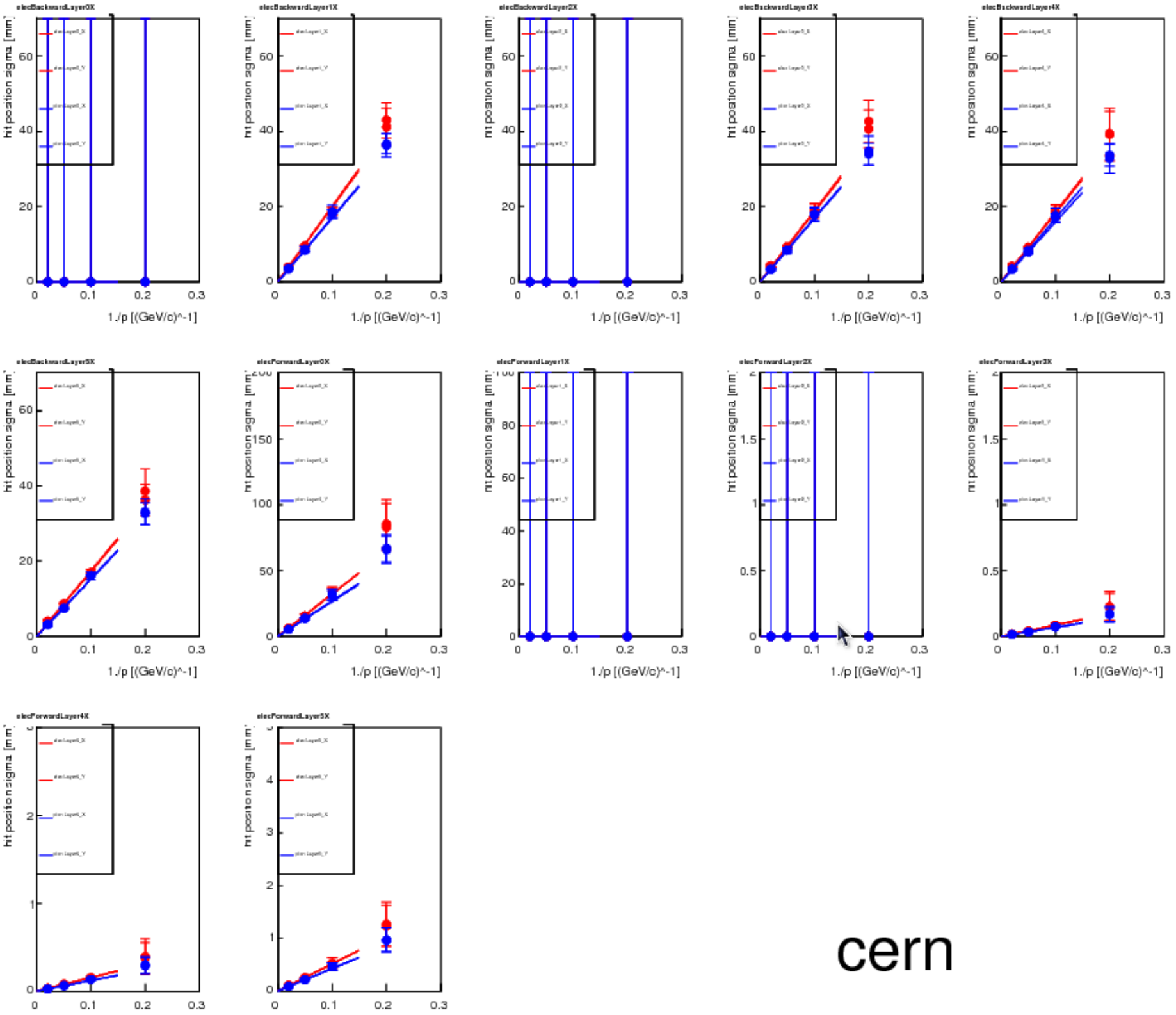
To get good measurement of correl, easier to rotate by 45 degrees



Then fit to 2d gaussian; extract size of scattering and the correlations



Do this for electrons & pions at different energies,
in different beam-line set-ups


elecBackwardLayer0X
elecBackwardLayer1X
elecBackwardLayer2X
elecBackwardLayer3X
elecBackwardLayer4X
elecBackwardLayer5X
elecForwardLayer0X
elecForwardLayer1X
elecForwardLayer2X
elecForwardLayer3X
elecForwardLayer4X
elecForwardLayer5X
hit position sigma [mm]
1./p [(GeV/c)^-1]

cern

Track scattering matrices are input to track fit

CERN07, FNAL08 done
CERN06 underway

Paul Dauncey is measuring the alignment of the drift-chambers

Still do do:
- MC digitisation to match data & MC