University of Michigan

# EMCAL outline

MIPP

## GOAL: make EMCAL interface to DSTMaker package (for pass 3)

- Pedestals: read them from DB and subtruct. Codes are ready. Thanks to Andre (pass 1, share experience)
  Problem: about 30 runs with bad pedestals (32 channels with 0 or out of range - electronics)
- Merged EM clusters in single plane. How to separate them? (major) See details in Durga's slides:
  - TSpectrum function (Durga), status - works
  - Durga's method, good for up to 3 showers, more studies to do
  - Turgun's method, works with unlimited number of showers, more studies to do
  - compare different approaches - Durga
- Reconstruct the longitidunal showers (major):
  - apply the trackfinding algorithm. Advantage - highly efficient, disadvantage - a lot of combinatoric background.
  - will try to reduce combinatoric with $\chi^2$ cut
  - select plane with most number of clusters. Find the clusters in other planes with closest position (4 mm). Advantage - minimum combinatorics, disadvantage - possible losses of soft showers (method used for energy calobration)
  - another approach: use not one but 3 planes data to make list of clusters to search in other planes. Assumption: the showers are almost parallel or with slopes within about $\pm$0.2 rad (2 wires per 25 cm length).
- Revisit alignment of EMCAL's PWC chambers with pass 2 data. There are small gaps between chambers: 2-7 mm

# $EMCAL$ outline, continue

- Match showers in X-Y views:

  - use energy correlation cut: $|E_X - E_Y| < 10000$ - select events along $45^o$ line within $\pm$10000 (Michael).

  Disadvantage - background in low energy region.

  - use $\chi^2$ cut which based on plane-by-plane energy corellation. Algorithm was tuned using 20 GeV/c electrons.

  Disadvantage: possible losses at the low energy region.

  - we will compare both methods and look for improvement

- Match showers with incoming tracks:

  - track - EMCAL match alignment variable found to be a little different depending on tracking type: $X_{trk} - X_{emcal}$ offset for 20 GeV/c data using SPFit is 0.93 cm. For same data with SegC456 it appears to be 0.19 cm, difference: $\approx$7 mm. In Y-view: no difference

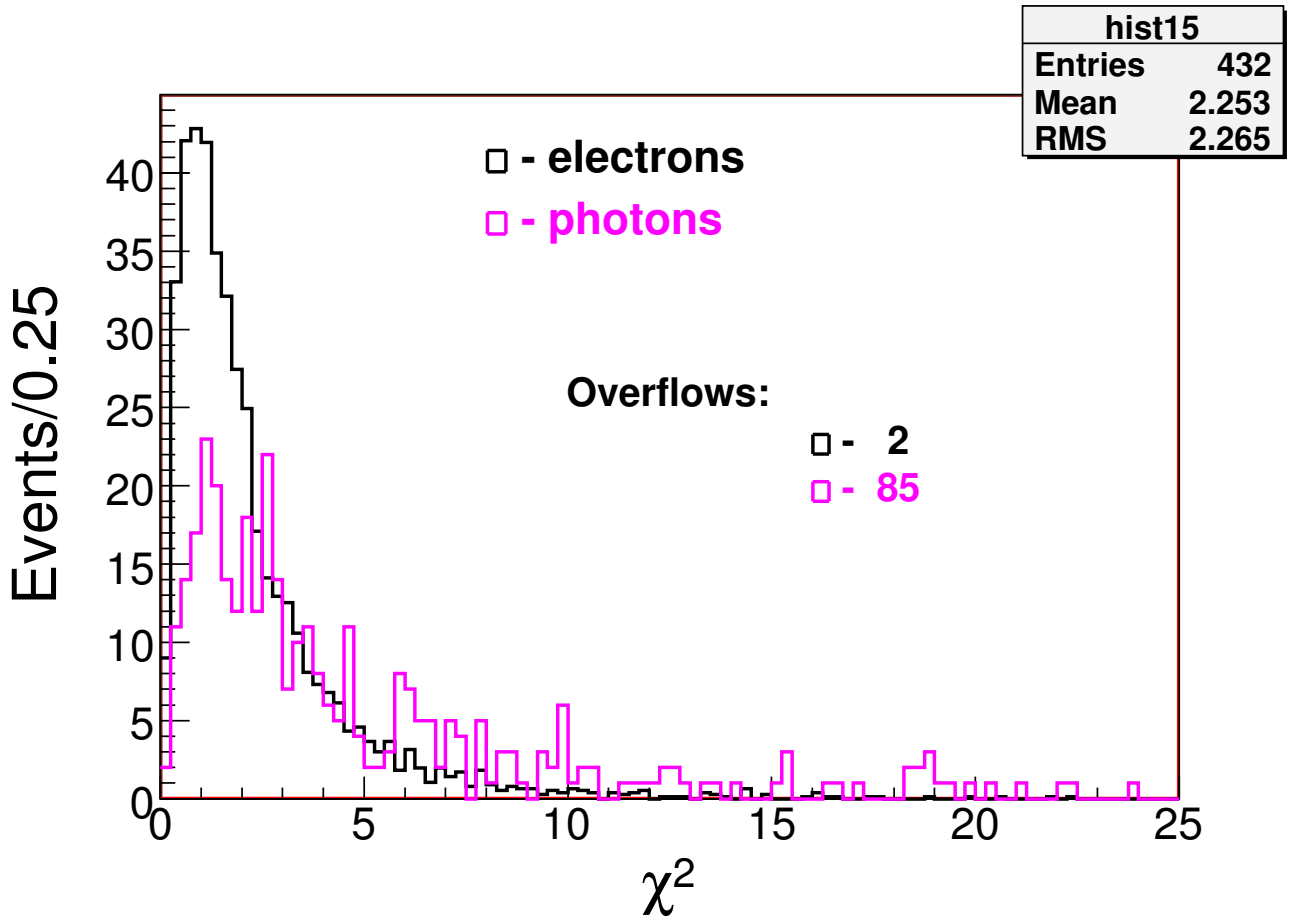
  - early experience - matching offset depends on the track momentum: $\Delta X/\Delta p \approx$ 6mm per 10 GeV/c momentum change.

  - How handle alignment - use different sets of offsets: one for pass 2 data and another for the DST data. Place both sets into DB afterwards

- Make detailed list of calorimeters data to be placed in DST

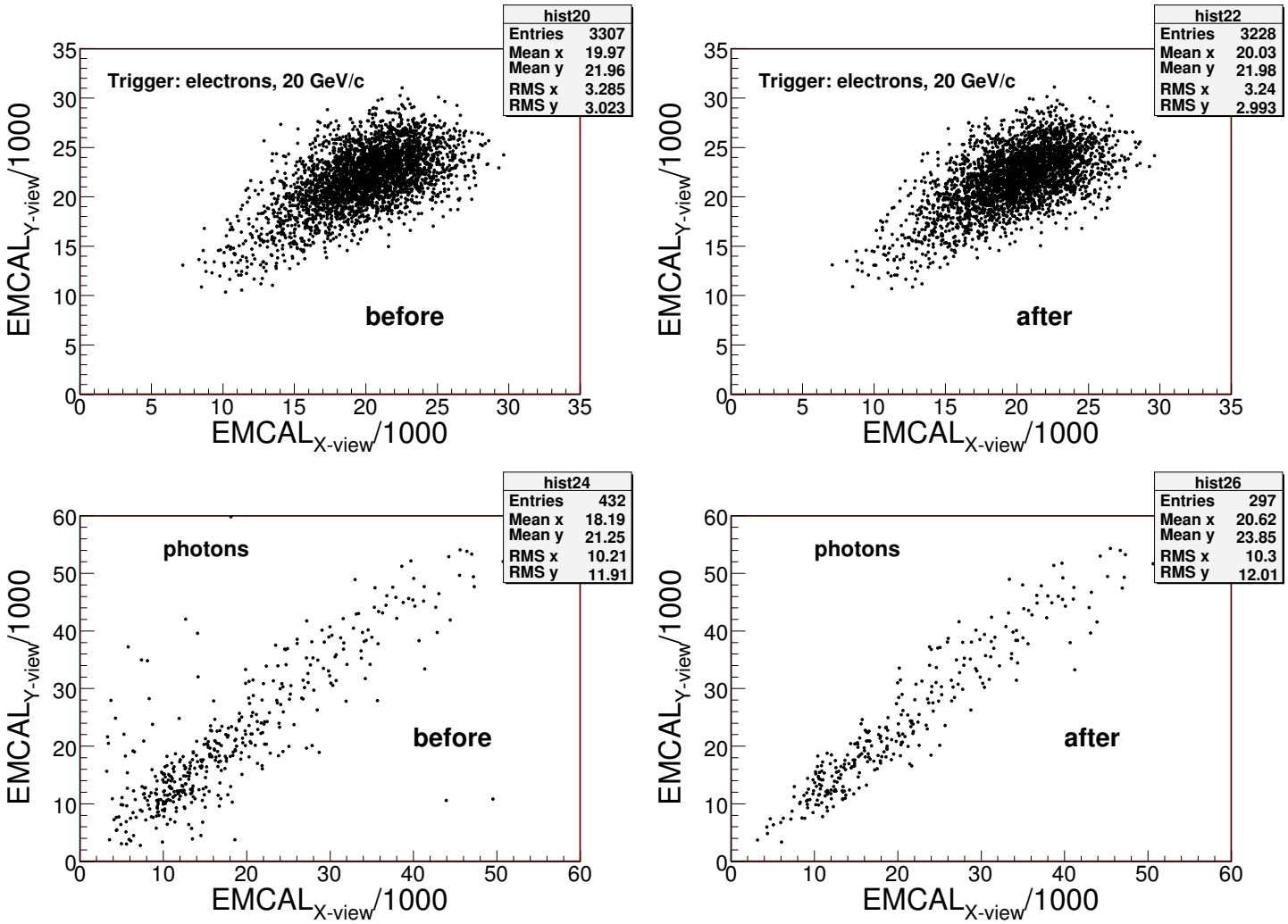
# view matching chi$^2$





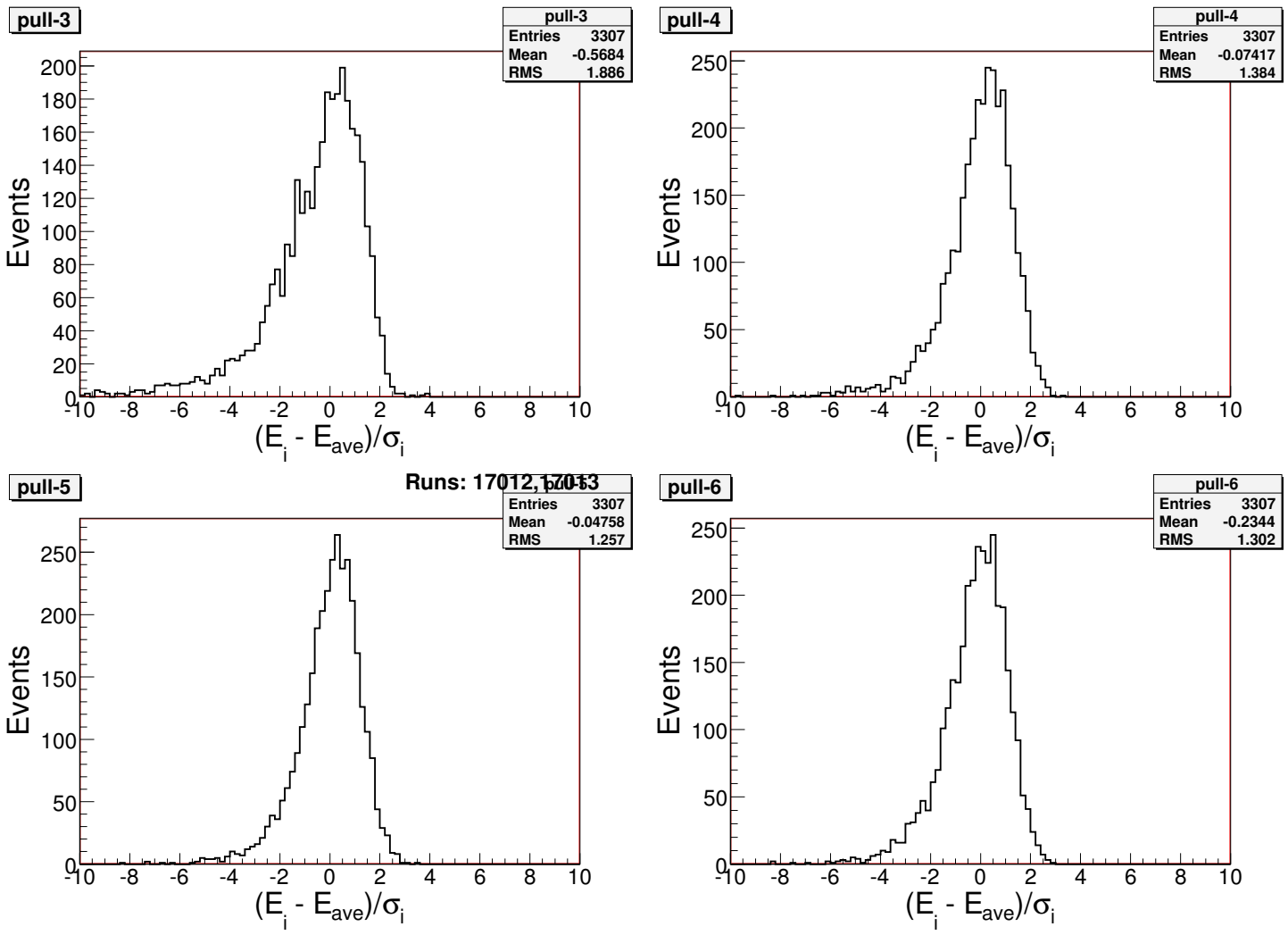

How to match the shower in X-view with the same shower in Y-view? One of possible way is by using $\chi^2$ variable: $\chi^2 = \sum[(E_i - \frac{F_i(E_{i-1}+E_{i+1})}{2})/\sigma_i]^2$, where i - plane number, $E_i$ - sum of ADC for plane i, $\sigma_i = 0.2 \cdot E_i$ - energy uncertainties in given plane, $F_i$ - the scale factor which take care the longitudinal shape of shower. $F_i$ and $\sigma_i$ were tuned using 20 GeV electron data. Photons - the single shower events in $\pi^-$ data without forward-going charged tracks.

# before and after $chi^2$ cut



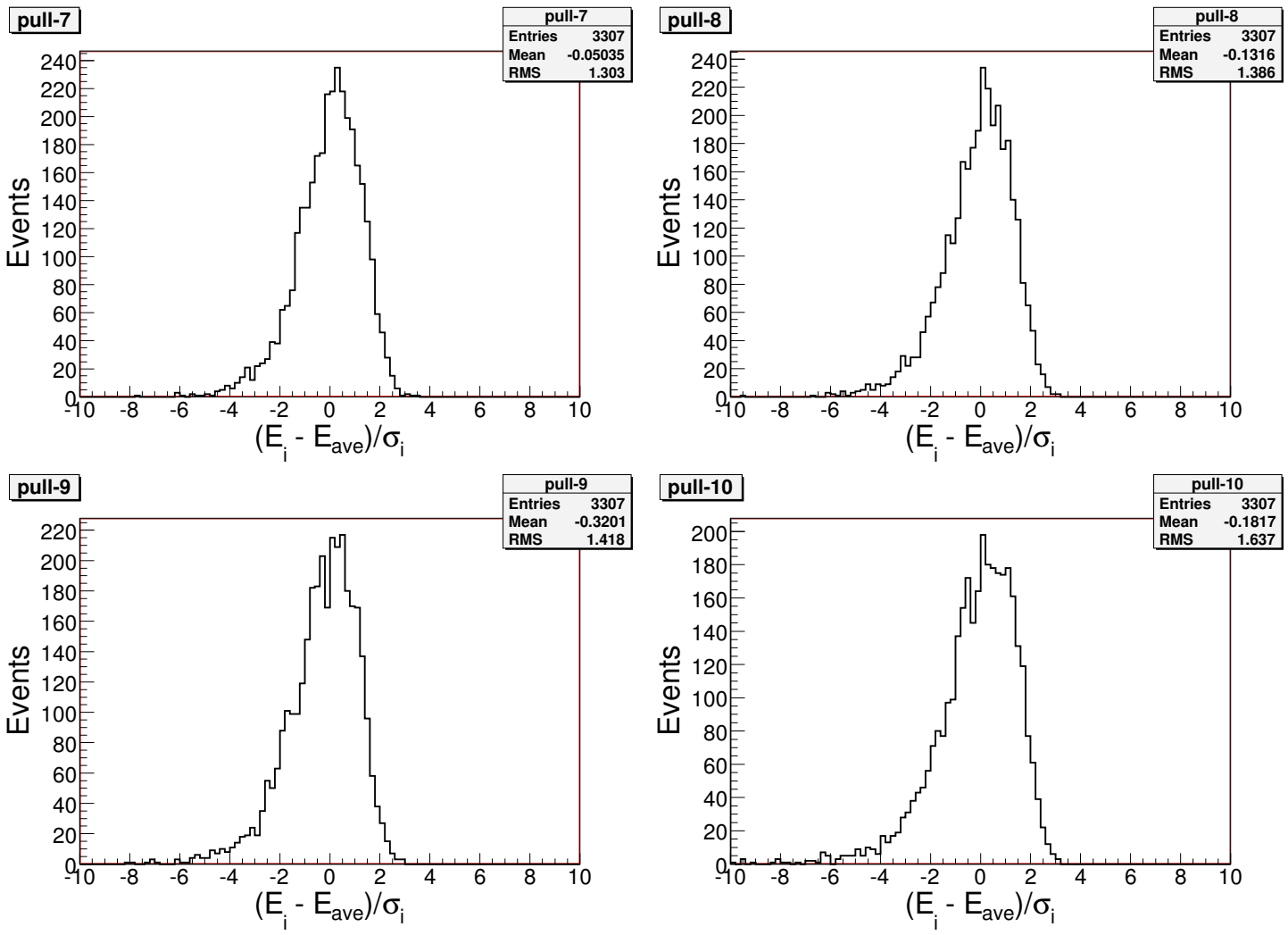

How the $chi^2$ cut works? Left plot: before $chi^2 < 9$ cut, right - after. Electron shower was prior to matching with single track.

# $F_i$ tuning for planes 3 – 6



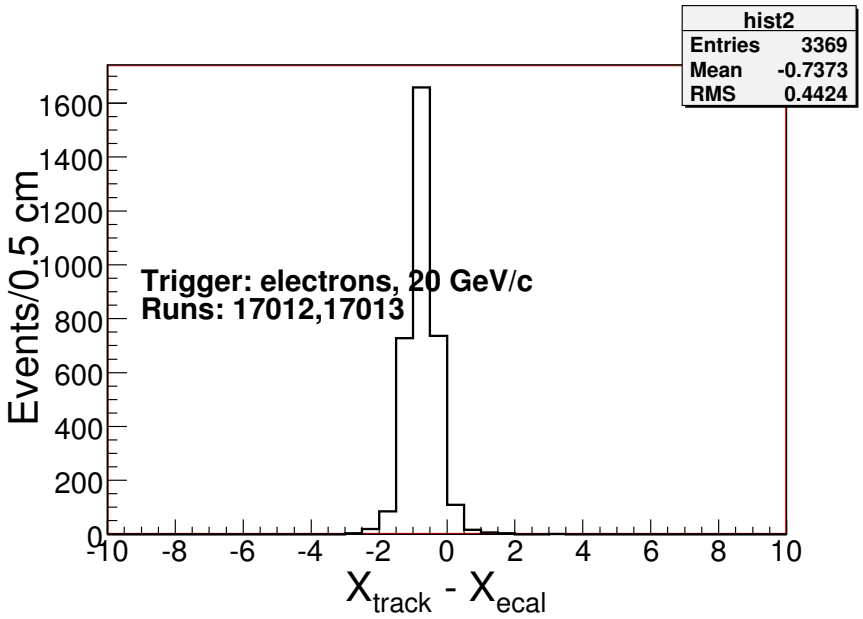

The $(E_i - \frac{F_i(E_{i-1}+E_{i+1})}{2})/\sigma_i$ distributions for planes 3-6.

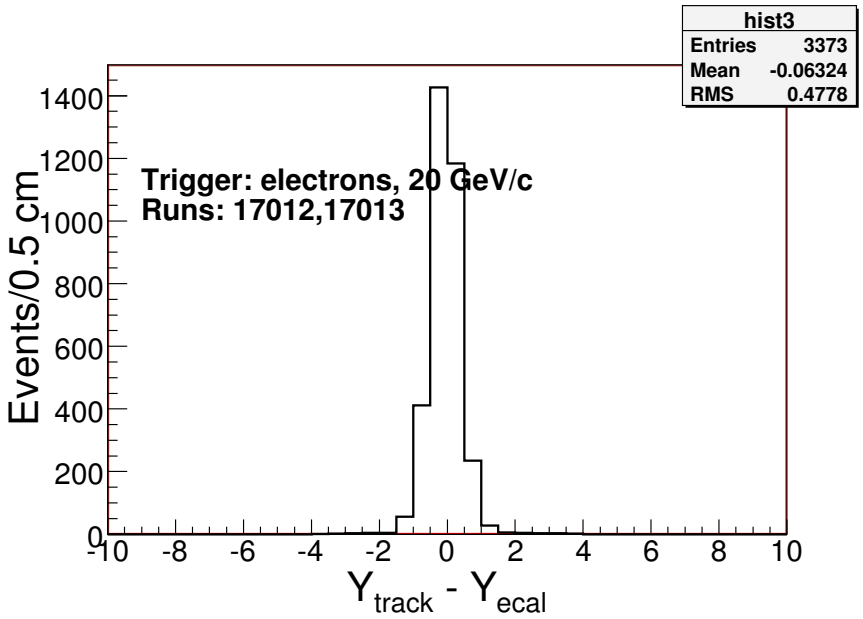
# $F_i$ tuning for planes 7 – 10




The $(E_i - \frac{F_i(E_{i-1}+E_{i+1})}{2})/\sigma_i$ distributions for planes 7-10.

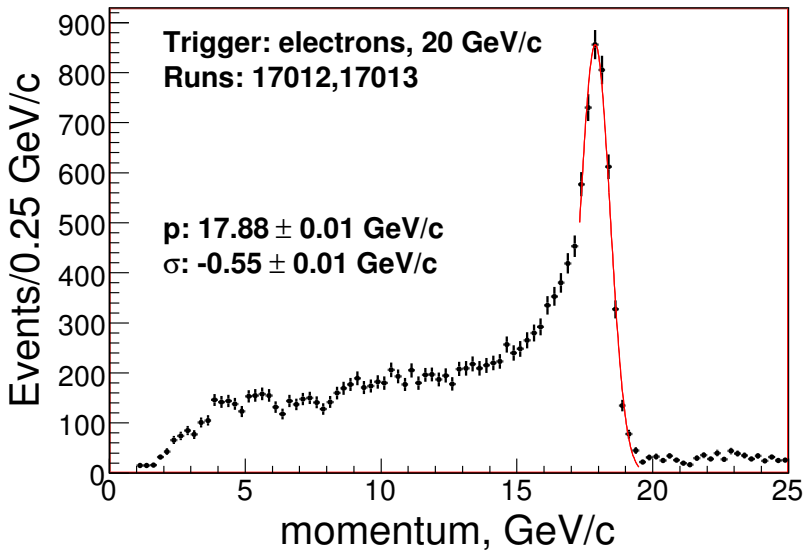
# track – EMCAL matching

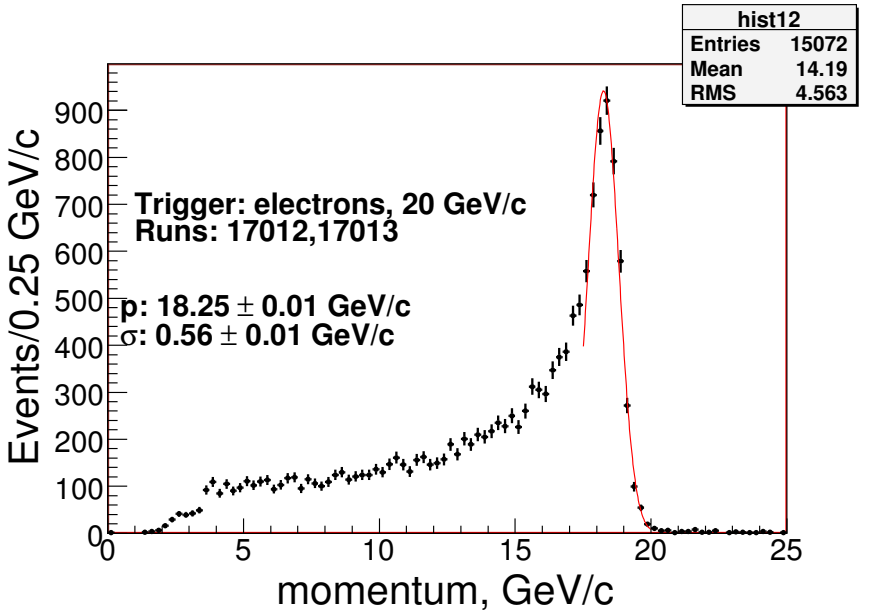



SegC456 track - EMCAL matching plots, where initial offsets are for SPFit tracks. So, the difference between SPFit and SegC456 projections are: -7 mm in X-view and negligible small in Y-view.

# $SPFit\ vs\ TrkCand$




Left plot done with SPFit tracks, right - with TrkCand. In DST data we need to have option to use those TPC tracks which is in match with SegC456.