Test of plastic for ZDD by cosmic ray

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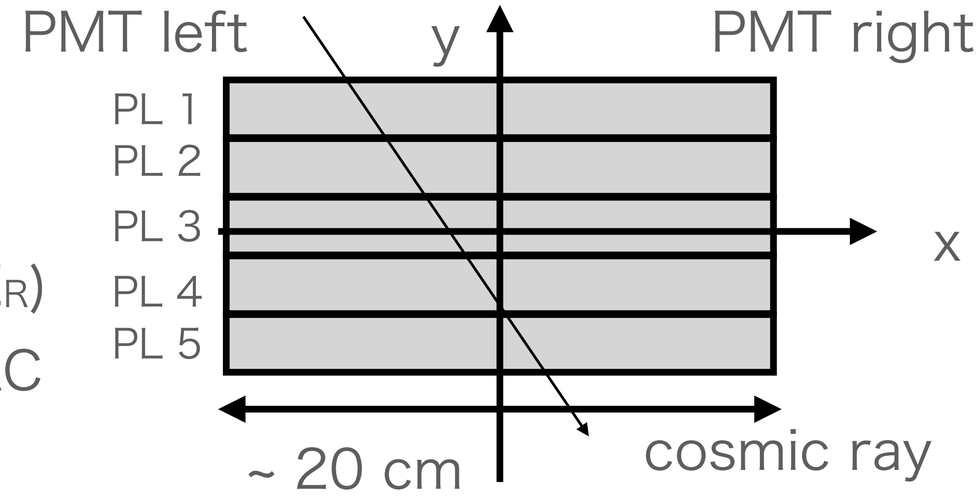
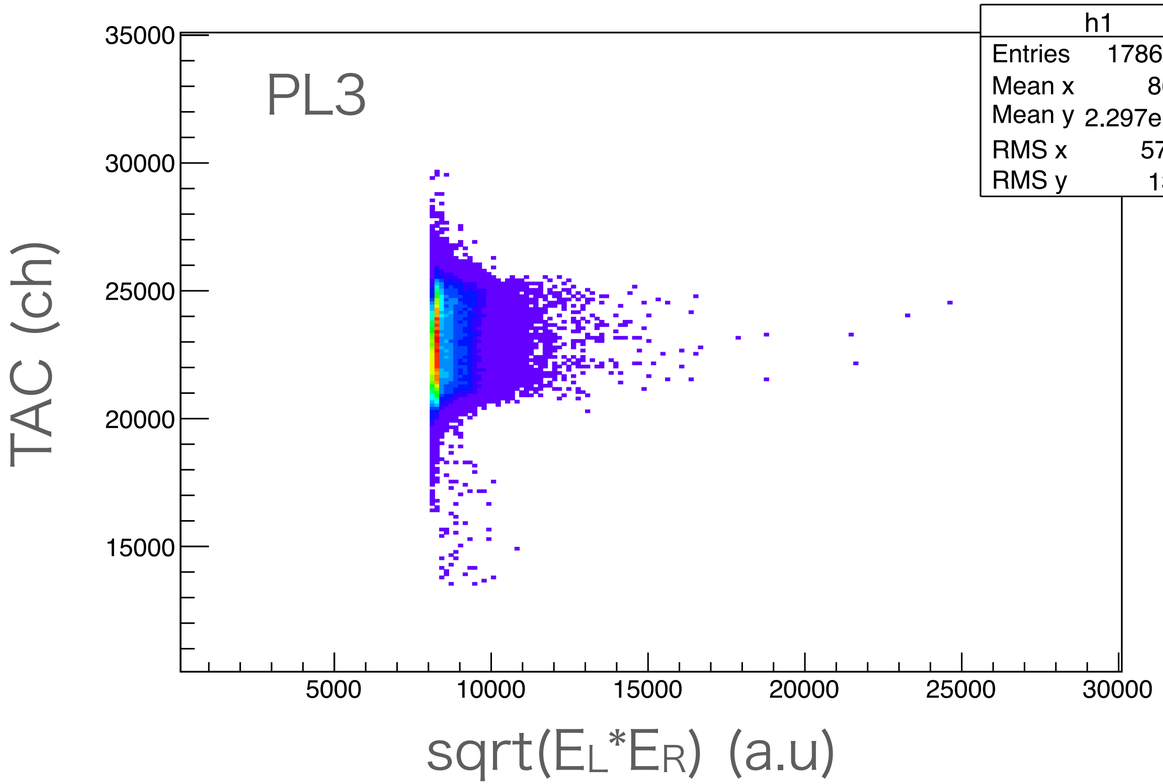
Plastic for ZDD

What is measured:

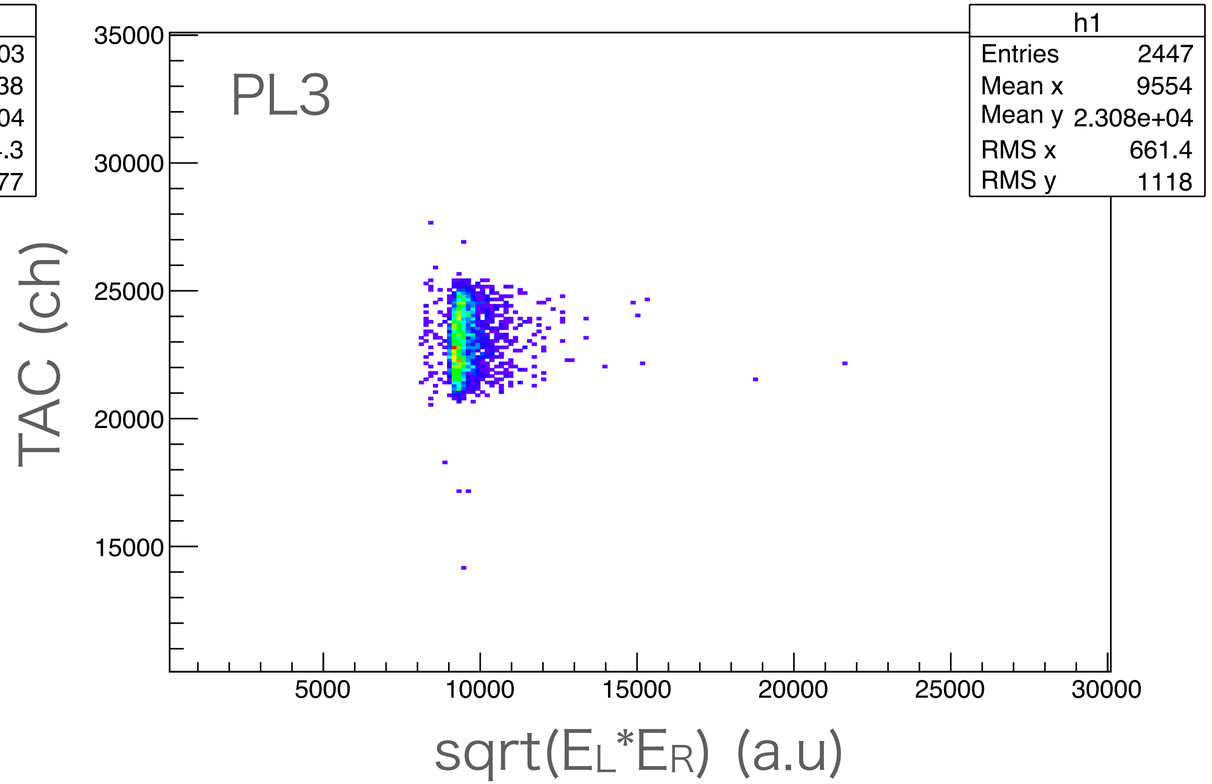
- Energy by QDC for left and right (E_L, E_R)
- Time difference of left and right by TAC



All the events

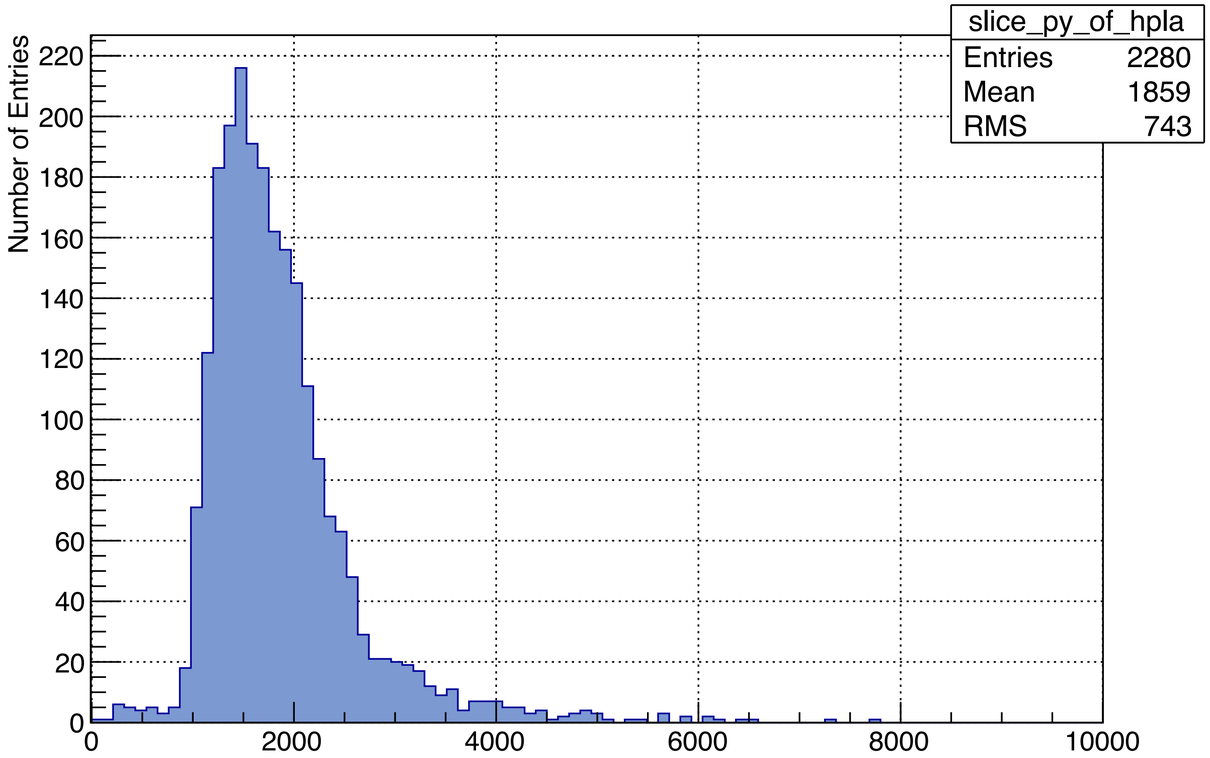


Events with 5 plastics (10 PMTs) fired (PLall gate)

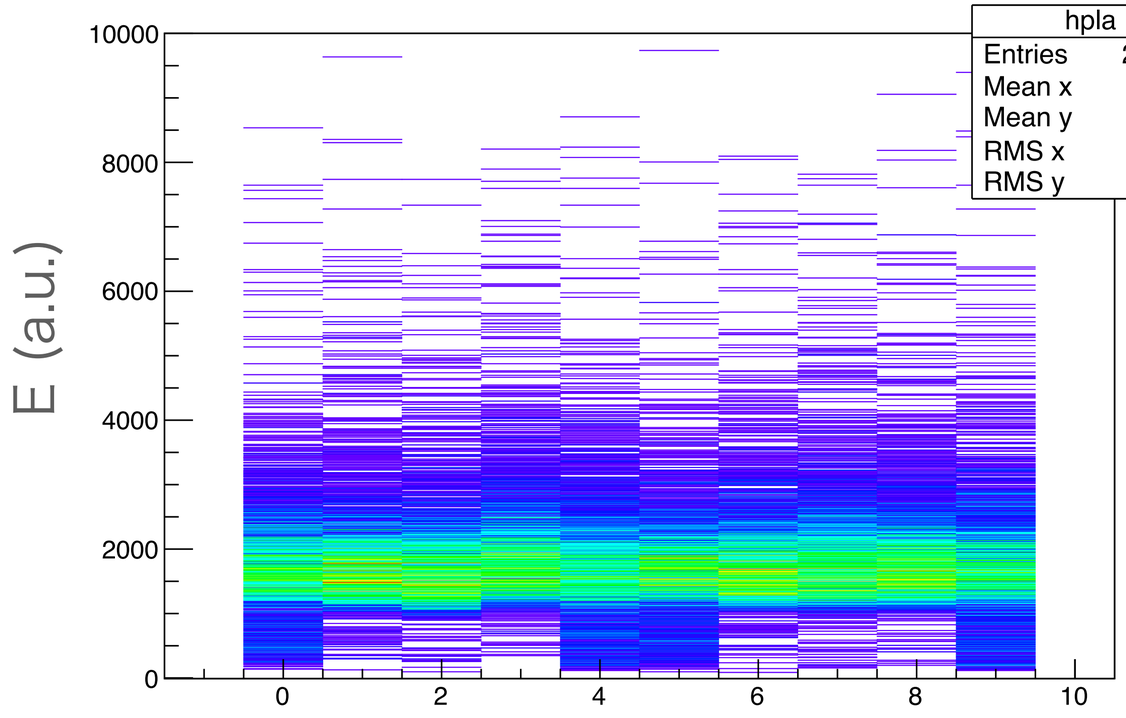


Energy calibration

1. Subtract the pedestals
2. Fit the spectra by PLall gate and obtain the peak positions
3. Peak positions are normalized



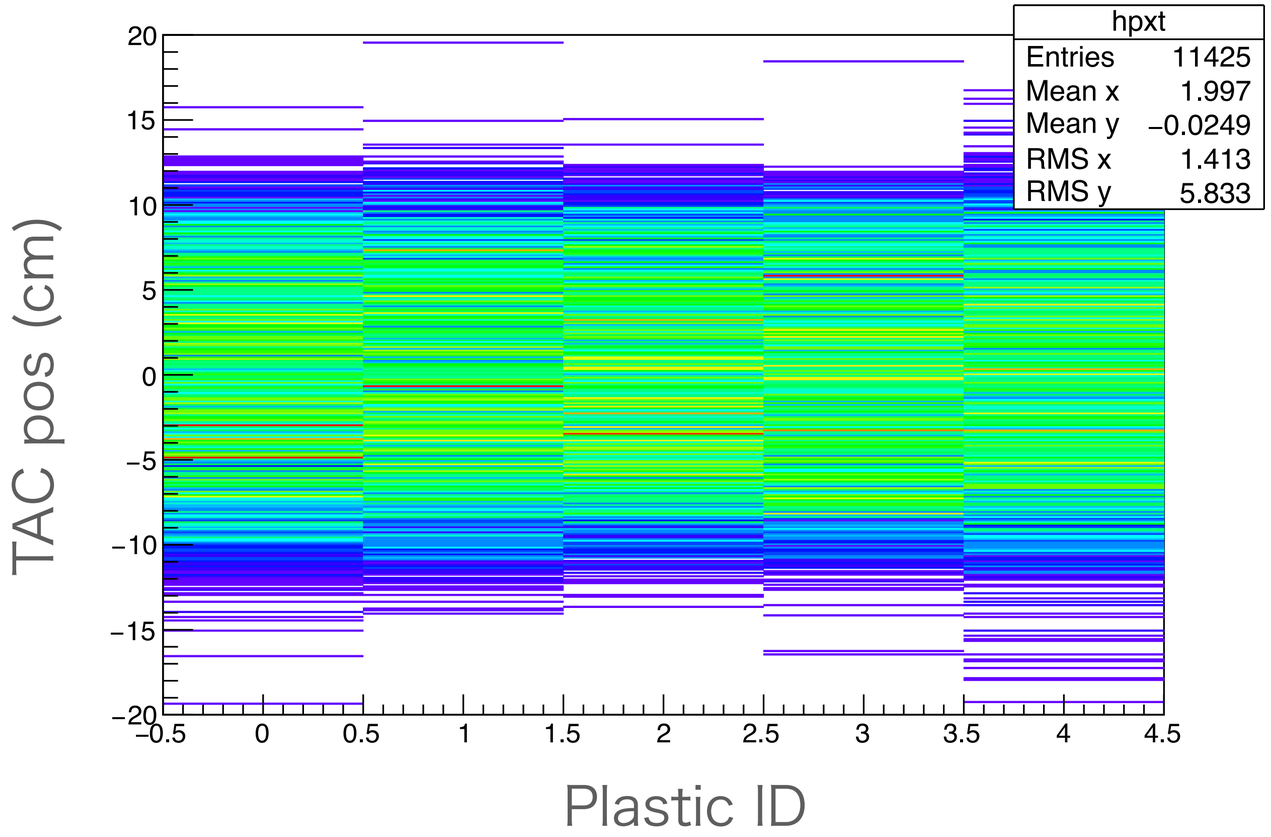
After calibration



Time to x position calibration

1. Apply PLall gate
2. Calculate the coefficient and offset assuming the distribution of TAC is from -10 to 10 cm and the center is 0 cm

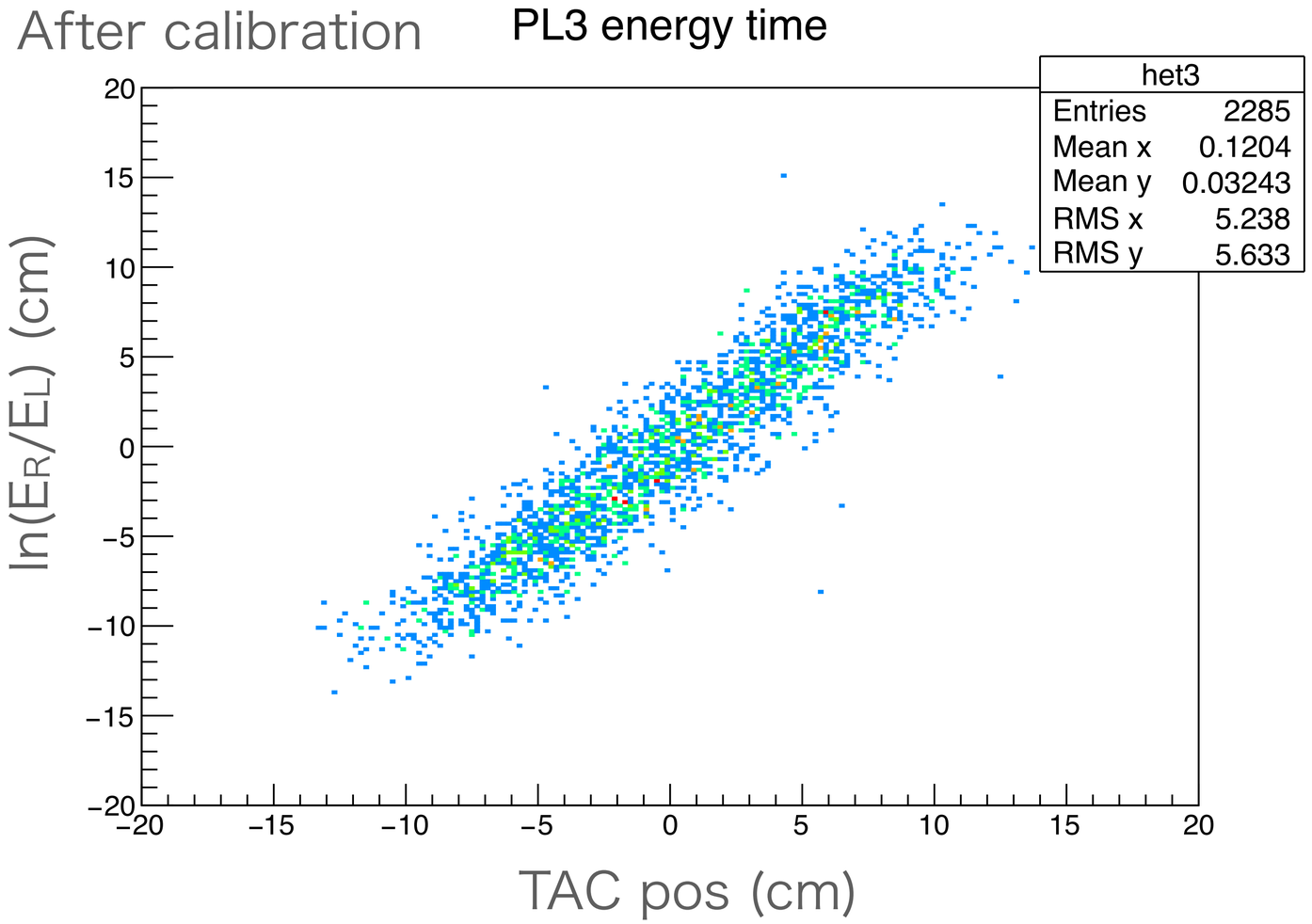
After calibration



Energy ratio to position calibration

1. Log of Energy ration ($\ln(E_R/E_L)$ has also x position information
2. Coefficient and offset of $\ln(E_R/E_L)$ obtained by using TAC as reference

After calibration

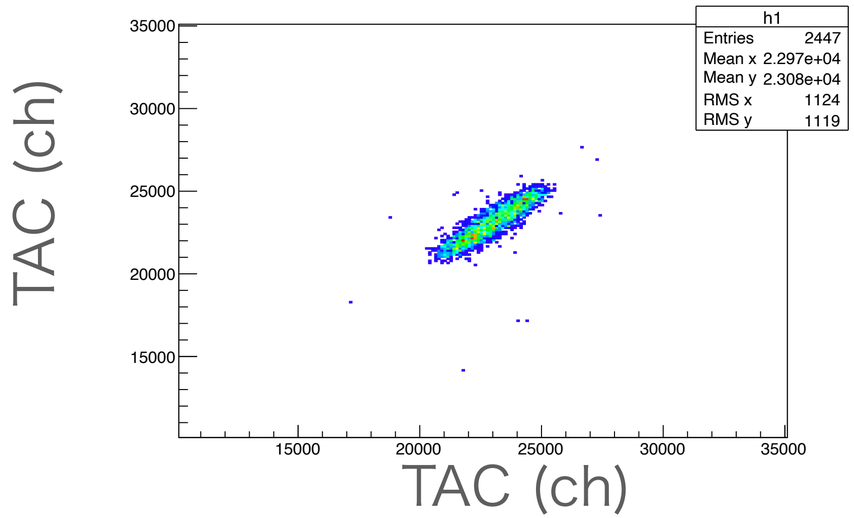


Tracking of cosmic by TAC and energy ratio

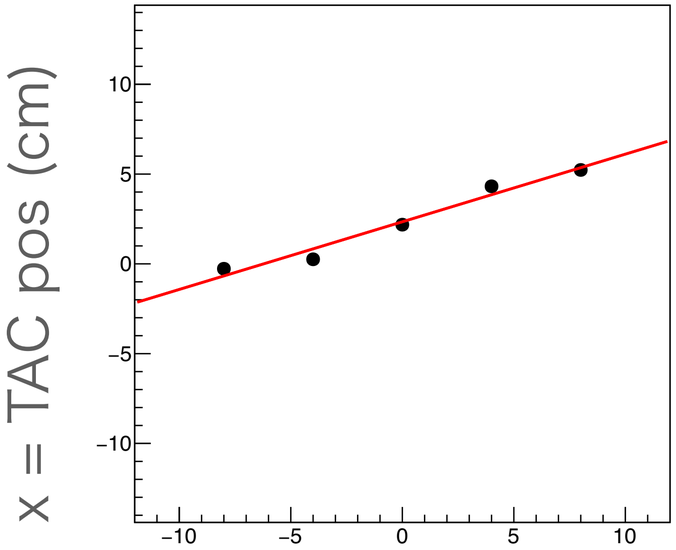
Tracking of cosmic ray by time difference and energy ratio, respectively.

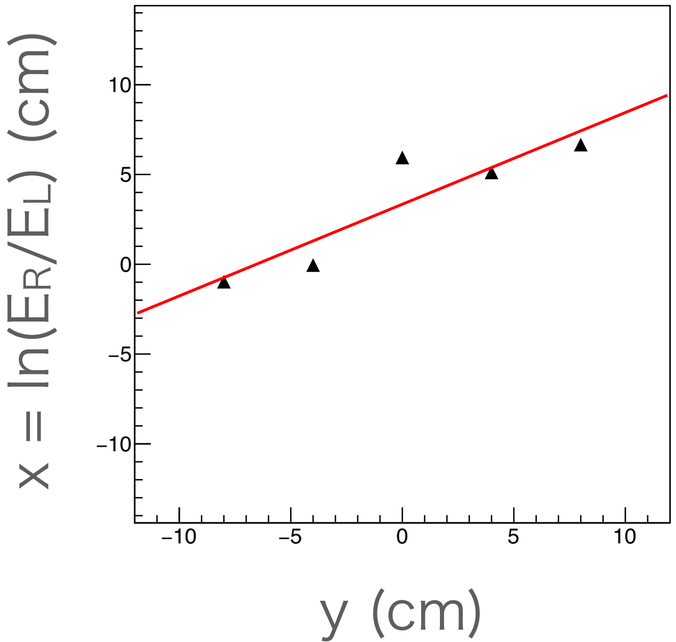
TAC vs TAC correlation for neighboring plastics has good (linear) correlation as below

Center positions of the plastics are used for y position in each plastic and fitted by linear function as right figures.



Sample of tracking

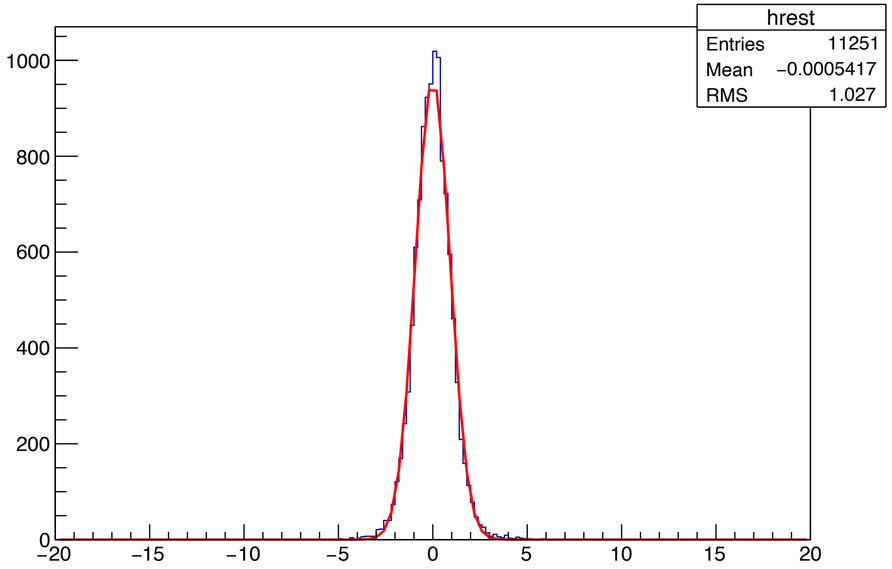




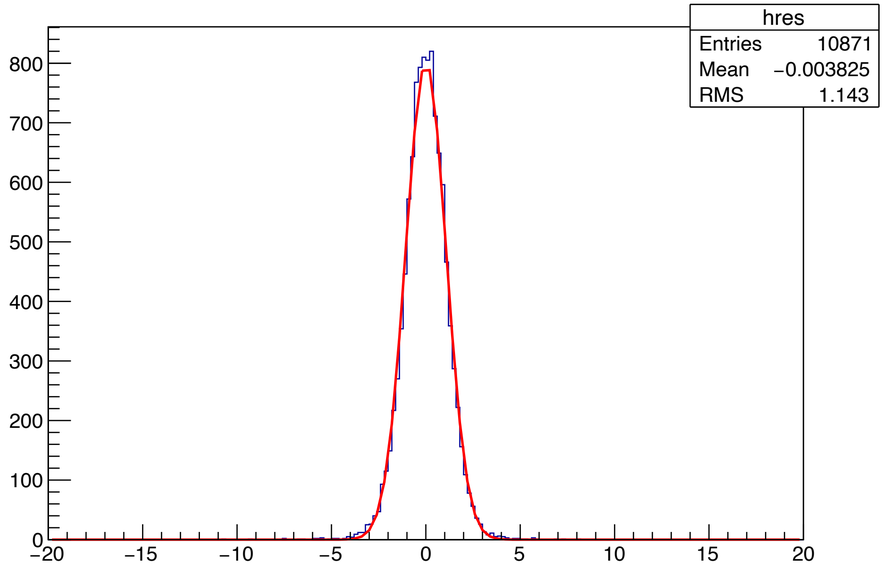
Resolution of x position by plastic

Residual (distance from the fitted trajectory) is defined to estimate the position resolution.

Residual distributions are fitted by Gaussian.
Obtained widths are 0.91 cm (TAC) and 1.07 cm (E ratio).
A bit better resolution for TAC measurement.



res. TAC pos (cm)



res. $\ln(E_R/E_L)$ (cm)