BeamTest in RCNP

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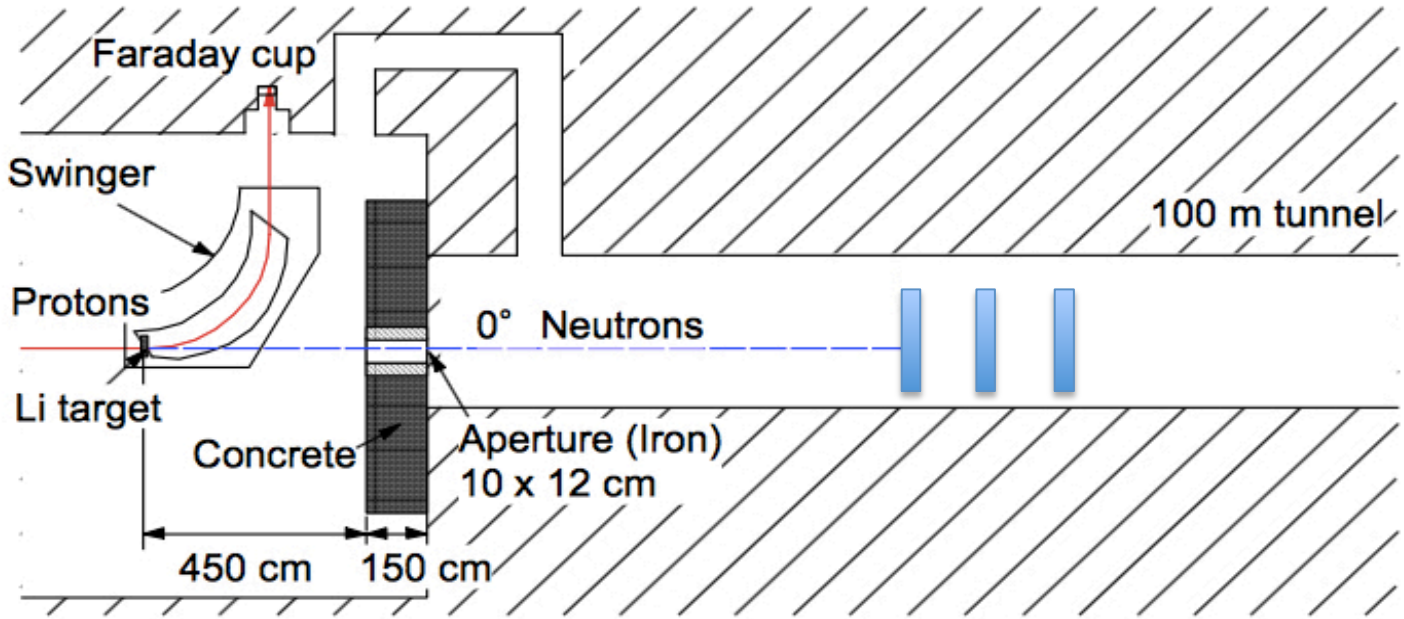
RCNP Experiment environment



$P + {}^{7}Li \rightarrow n + {}^{7}Be$

- Beam

Neutron flux : $4*10^{9}$ n/sr/muC

Beam chopper: 1/9

Beam current : 10 nA

-Target

Li Target : 2cm Diameter ,1cm thick

- Detector

1st ST : 2 (10cm*100cm*10cm)

2nd ST : 4 (200cm*10cm*10cm)

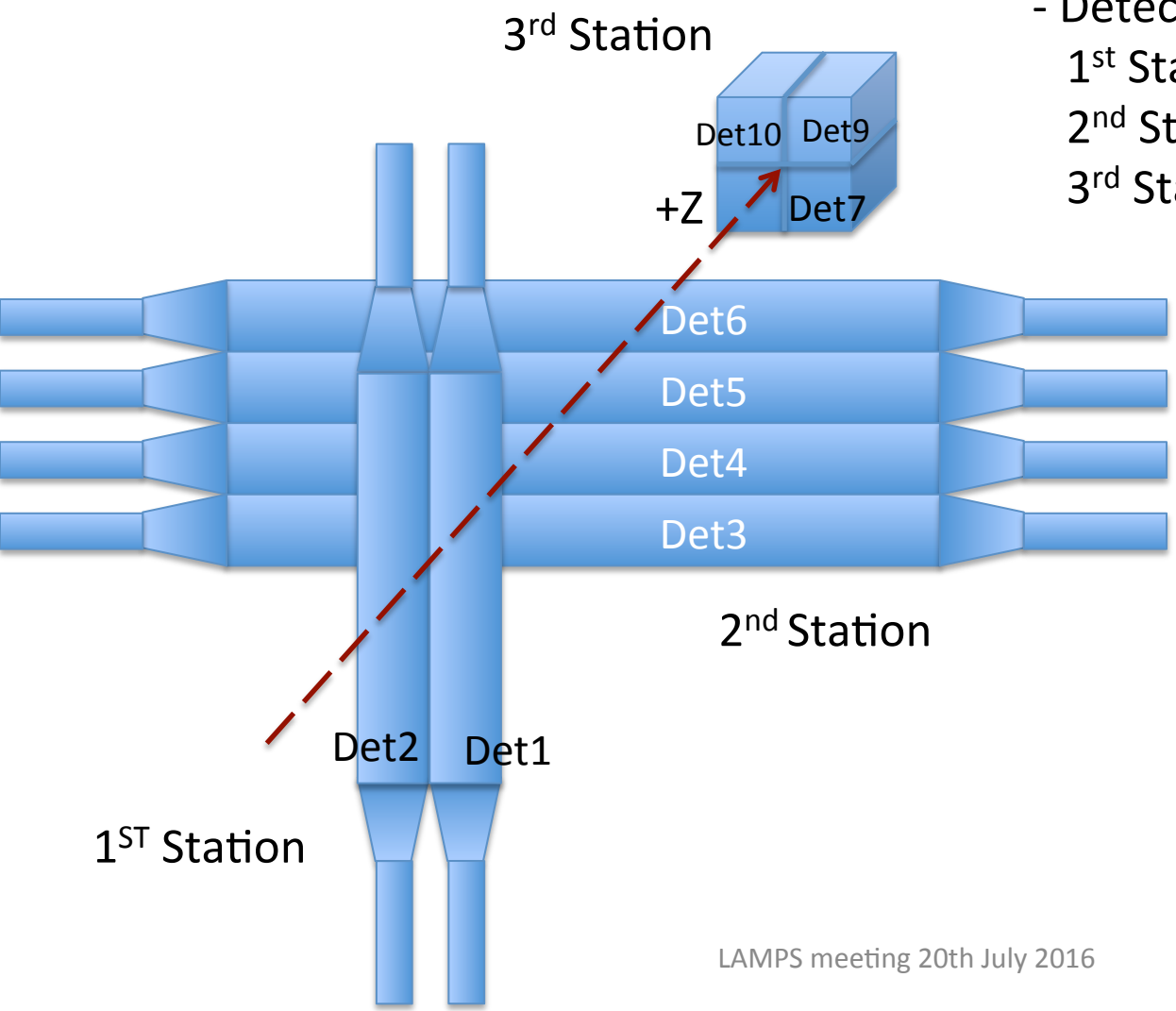
3rd ST : 4 (10cm*10cm*20cm)

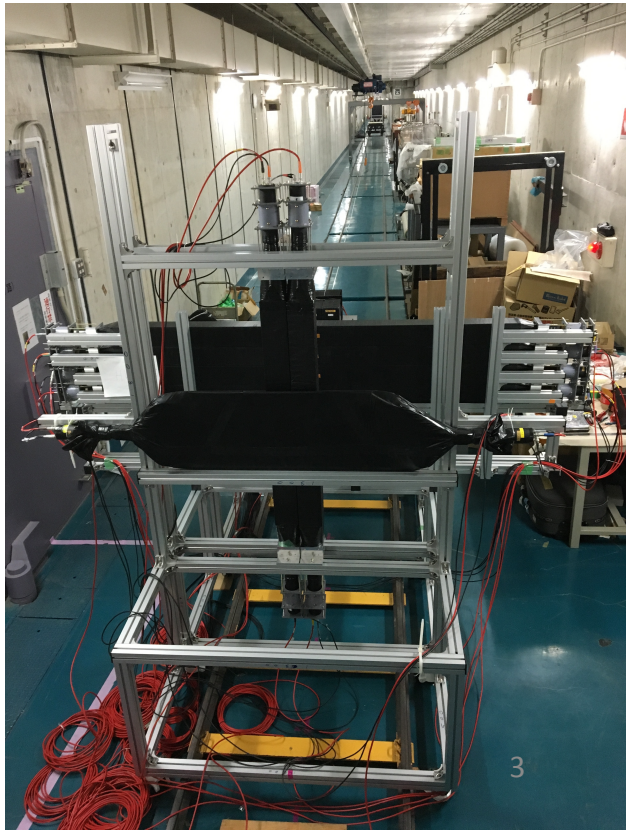
distance between target and detector : 15m

gap between stations : 60 cm

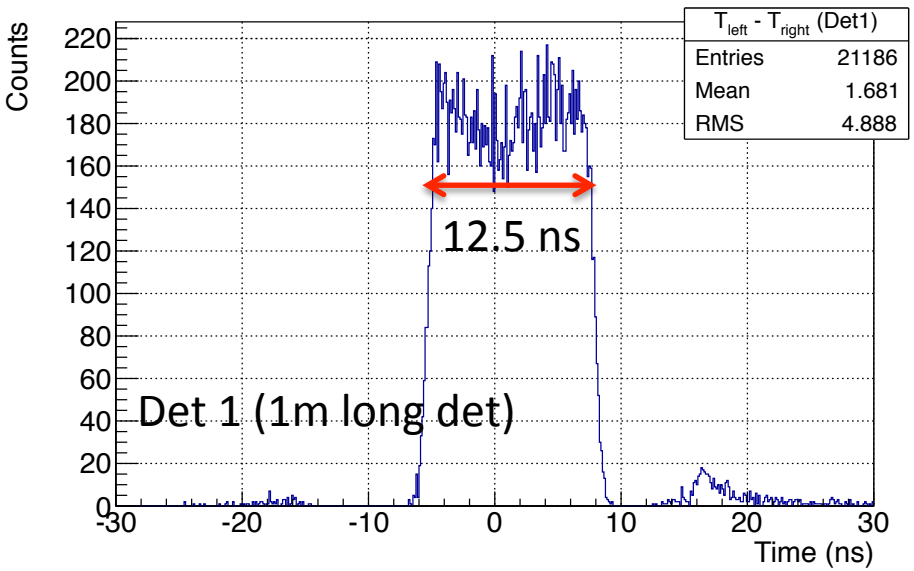
Detector setting structure

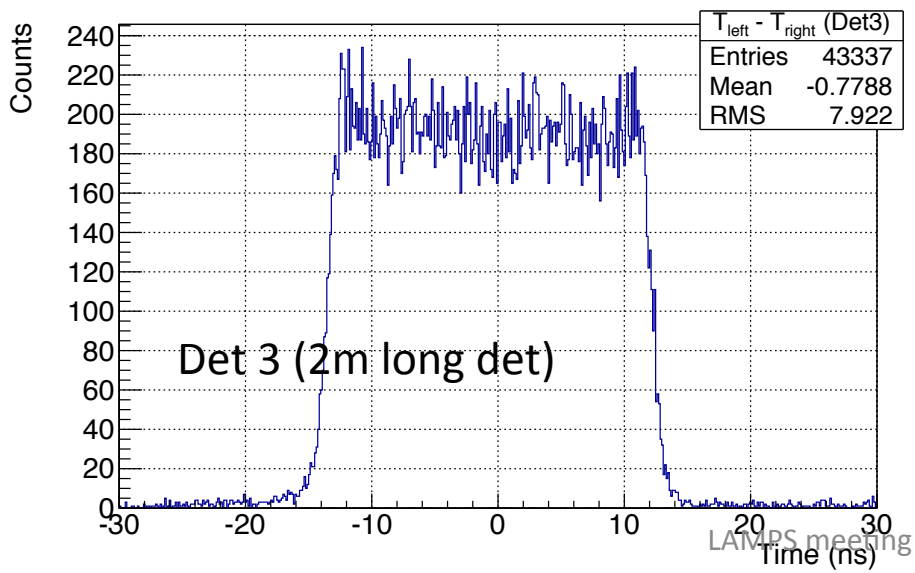
Scintillator : 11 개
PMT : 18 개
- Detector Size
  1st Station : 2 (10cm*100cm*10cm)
  2nd Station : 4 (200cm*10cm*10cm)
  3rd Station : 4 (10cm*10cm*20cm)





Time difference distribution of two PMTs



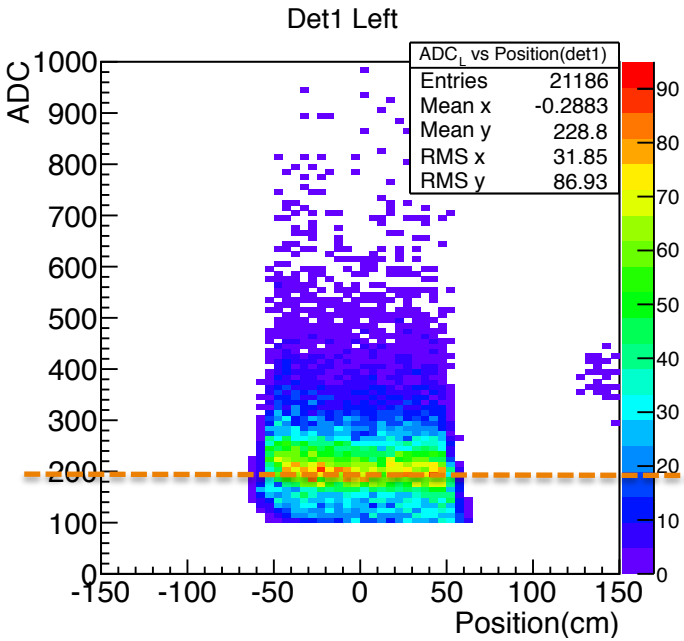


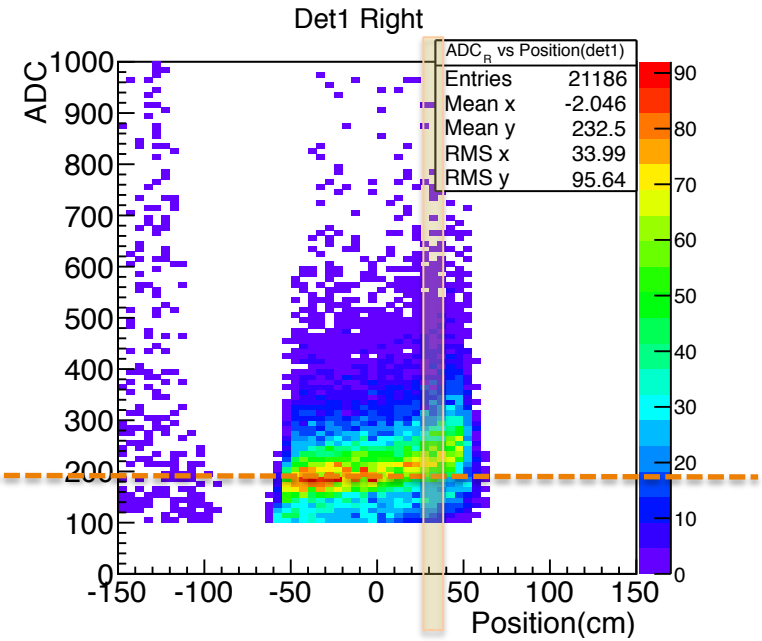
Hit position = $(T_{left} - T_{right})\, v_s/2$

Hit time = $((T_{left} + T_{right}) - L_{det}/v_s)/2$

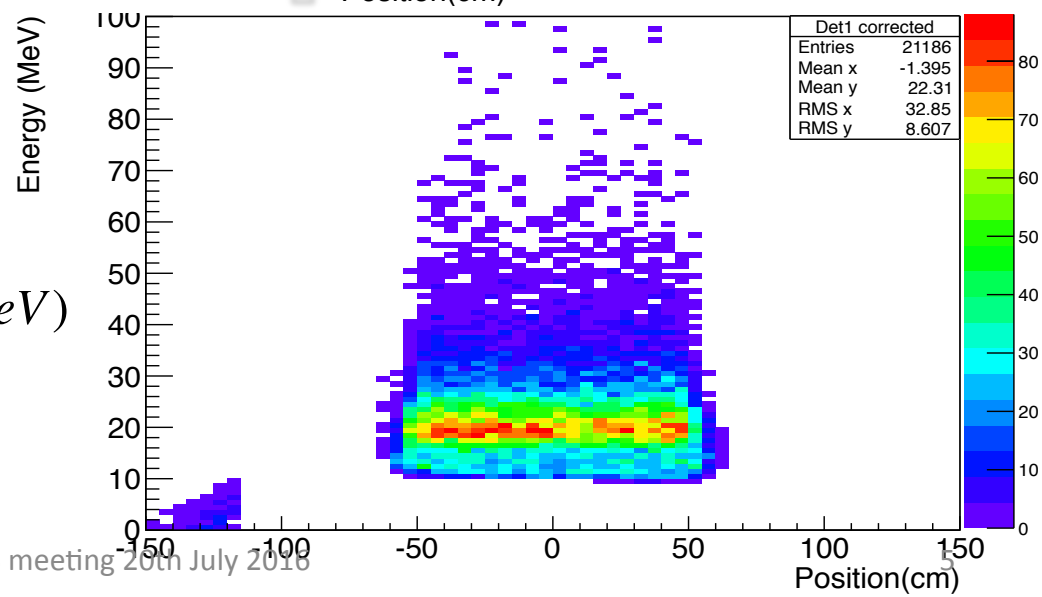
X axis : $T_{diff} = T_{left} - T_{right}$

Energy calibration



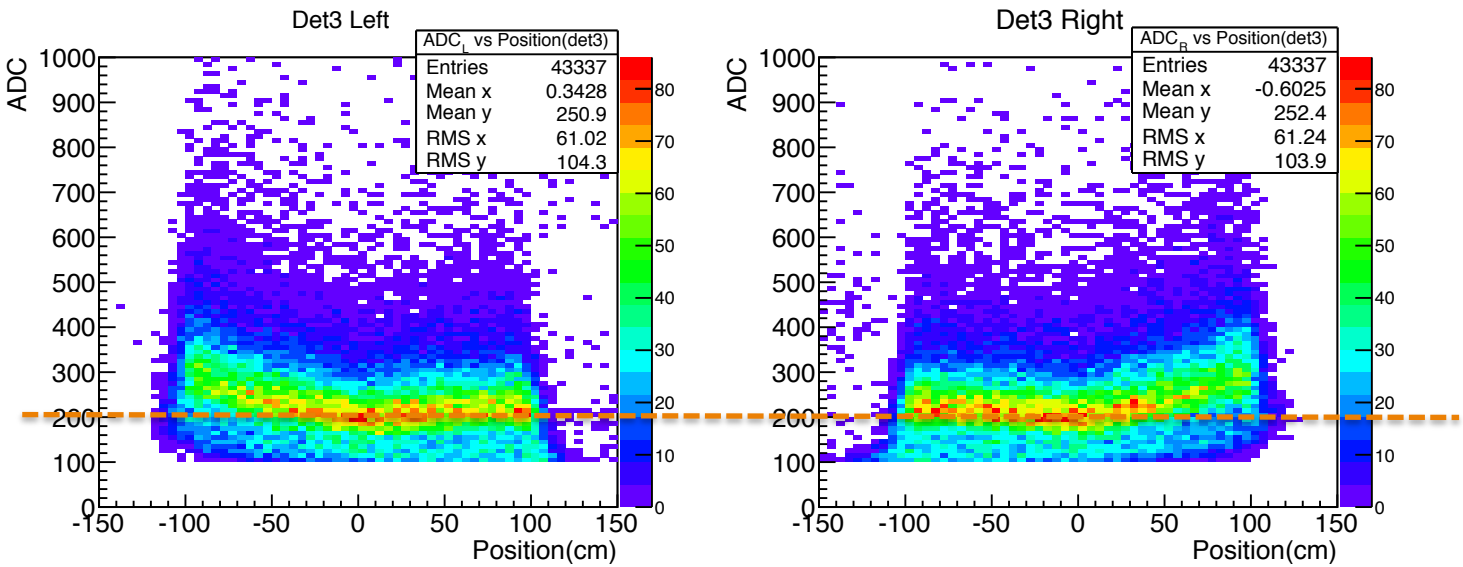


correction

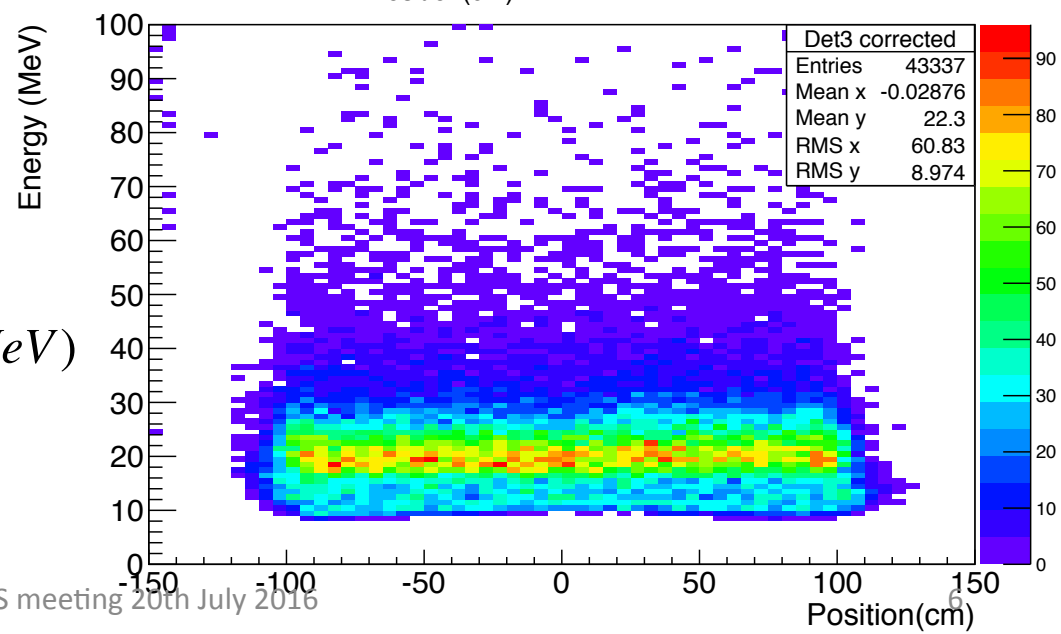


$$E(x) = \frac{1}{2}\left(\frac{H_L(x)}{f_L(x)} \times 20MeV + \frac{H_R(x)}{f_R(x)} \times 20MeV\right)$$

Energy calibration



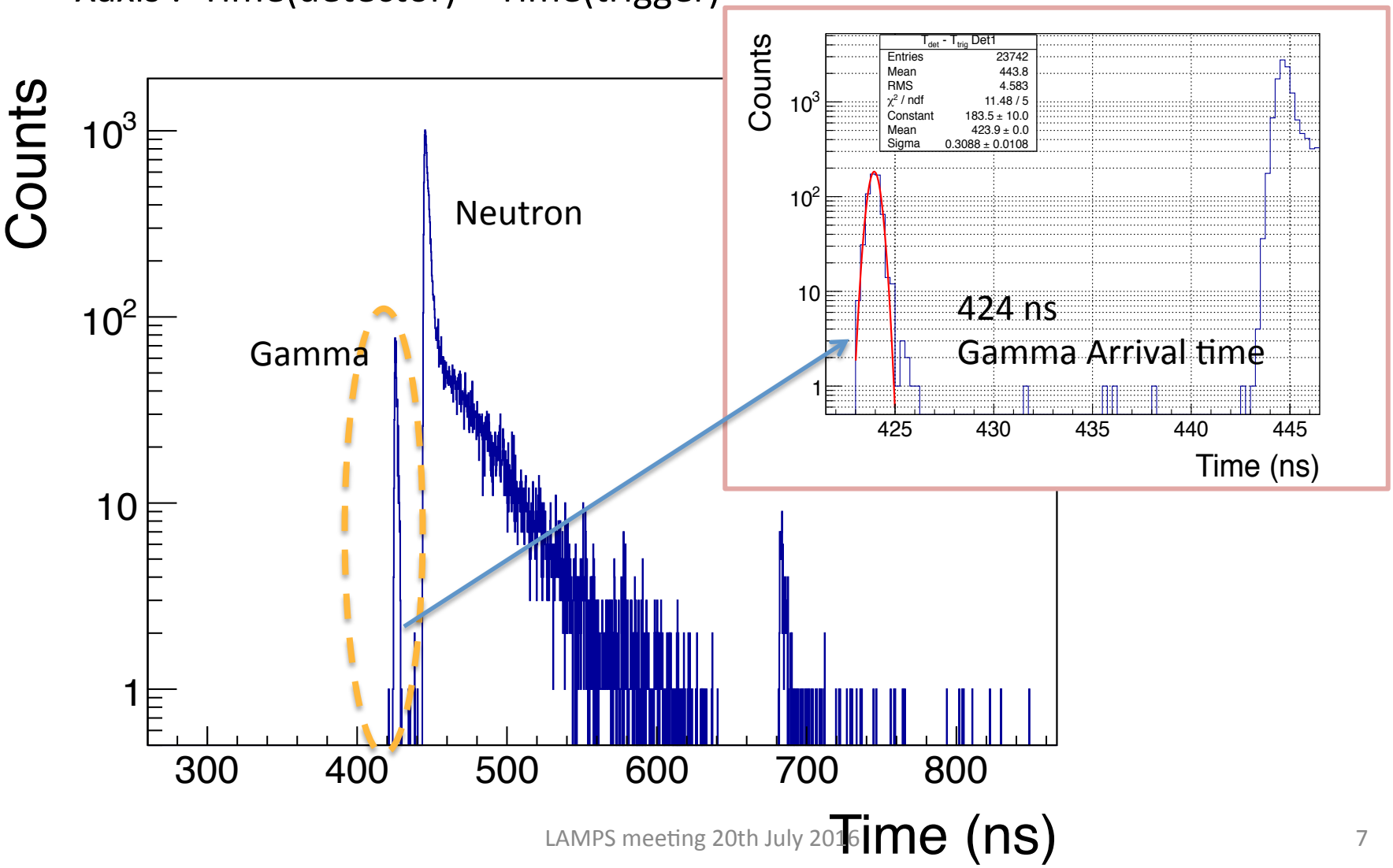
correction



$$E(x) = \frac{1}{2}\left(\frac{H_L(x)}{f_L(x)} \times 20MeV + \frac{H_R(x)}{f_R(x)} \times 20MeV\right)$$

Arrival time distribution on Det1

Xaxis : Time(detector) – Time(trigger)



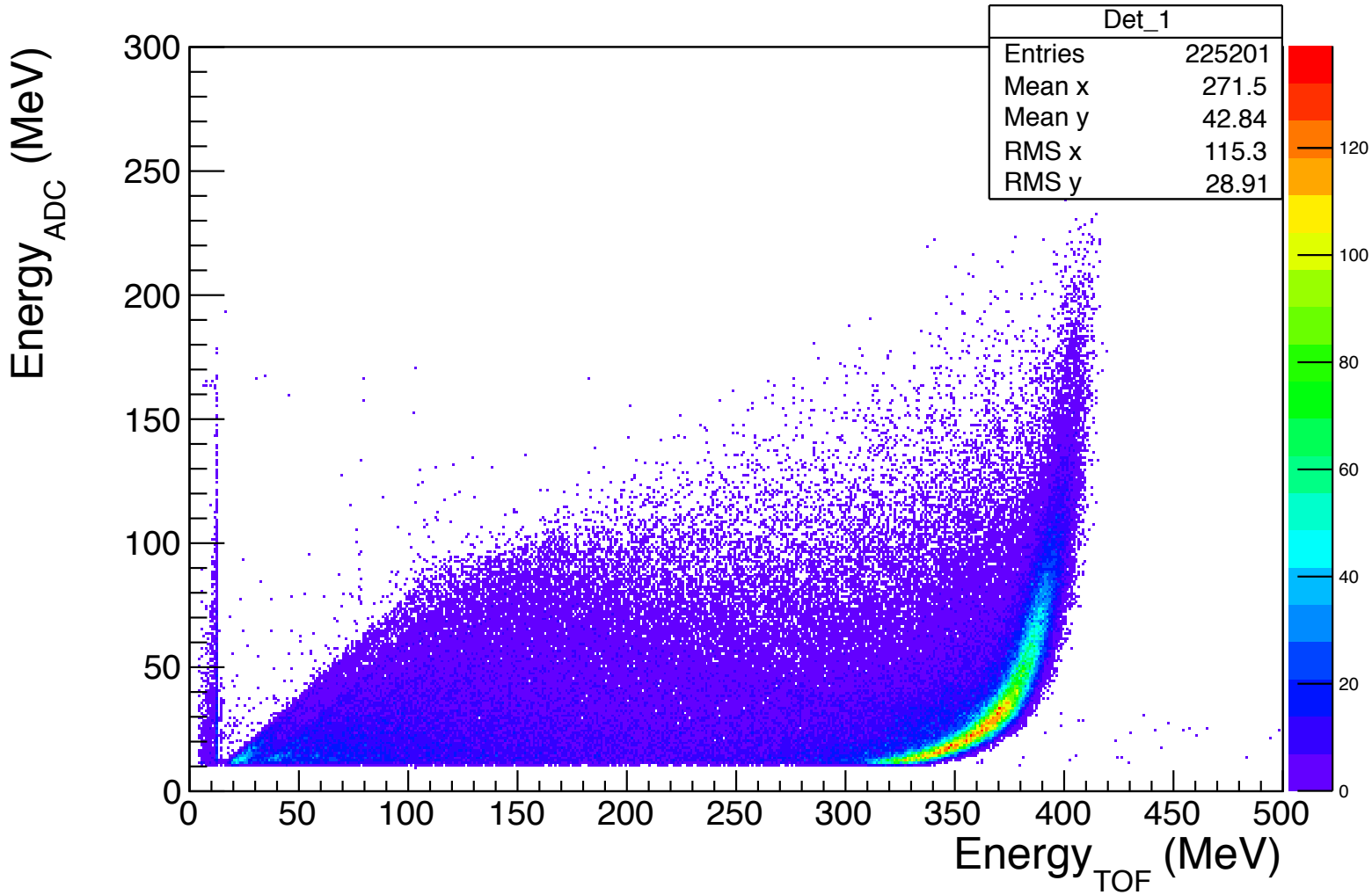
E_{adc} vs E_{tof}

X-axis : $E_{tof} = 939.6*t*c/sqrt(t^2c^2-L^2) -939.6$

Y-axis : electron-equivalent energy

Detector threshold : 100 cnt (10MeV)

Time Offset : 374 ns (424 ns – 50 ns)

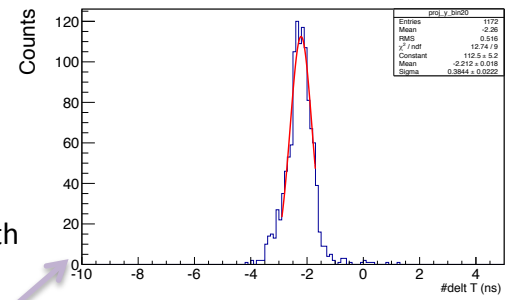


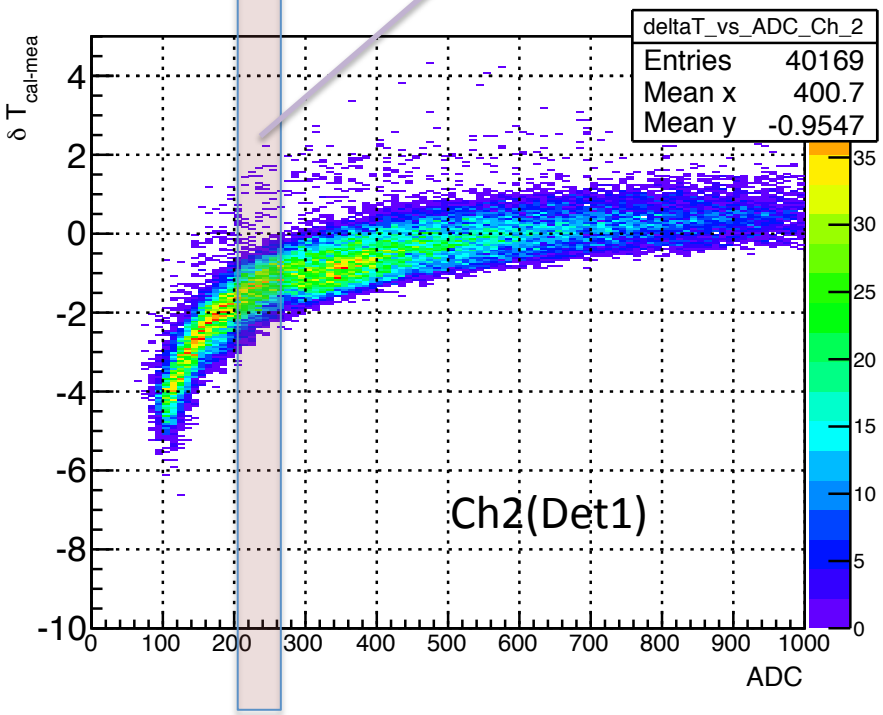
Time difference vs ADC signal height(ADC peak)

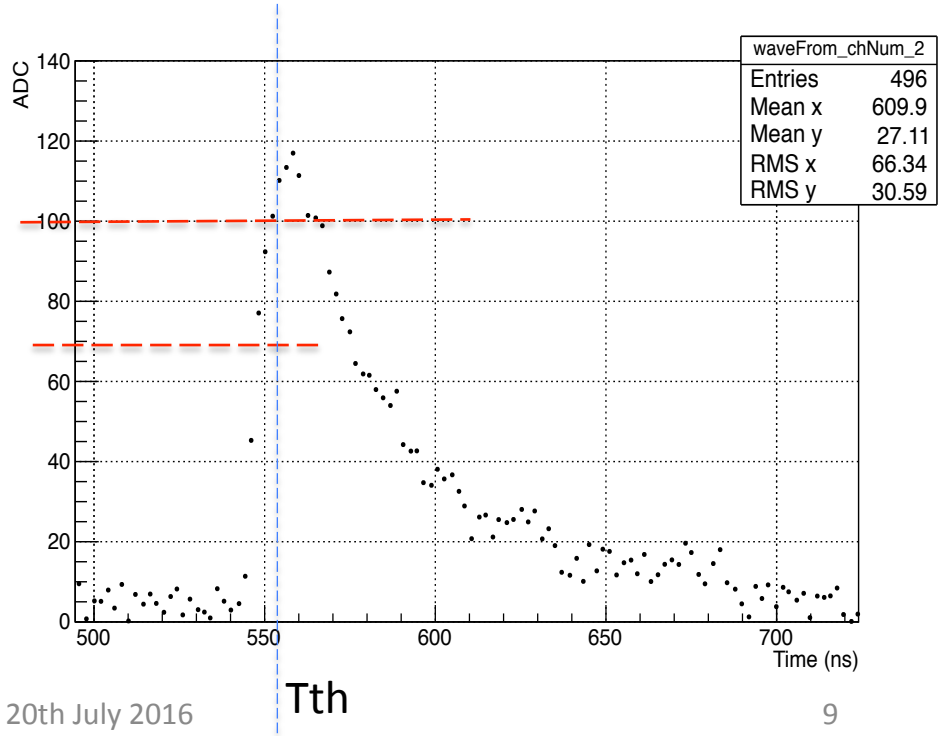
Show significant deltaT variation in the region of < 500 channel

Y-projection -> Get fitting-function (for time-walk correction)

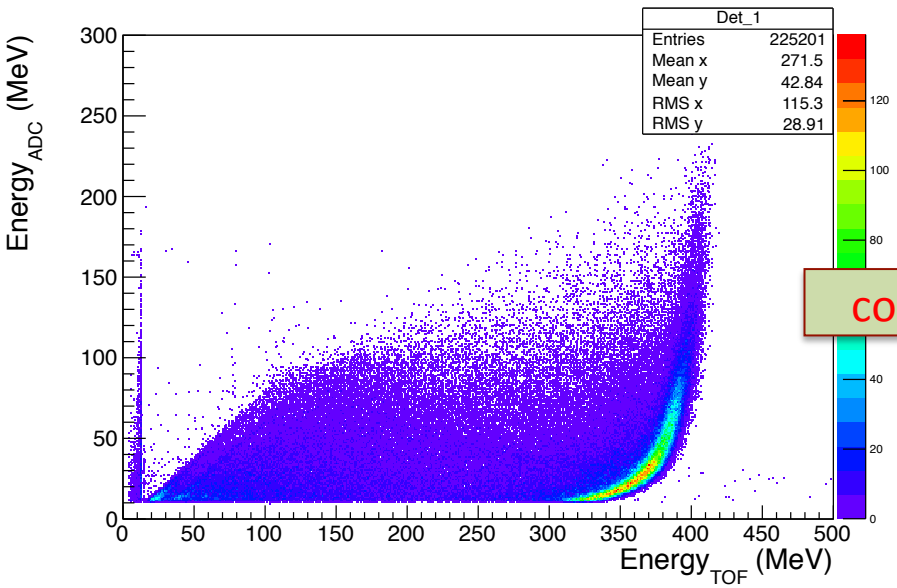
Y –axis: $T_{60\%adc\ peak}$ - T_{th}



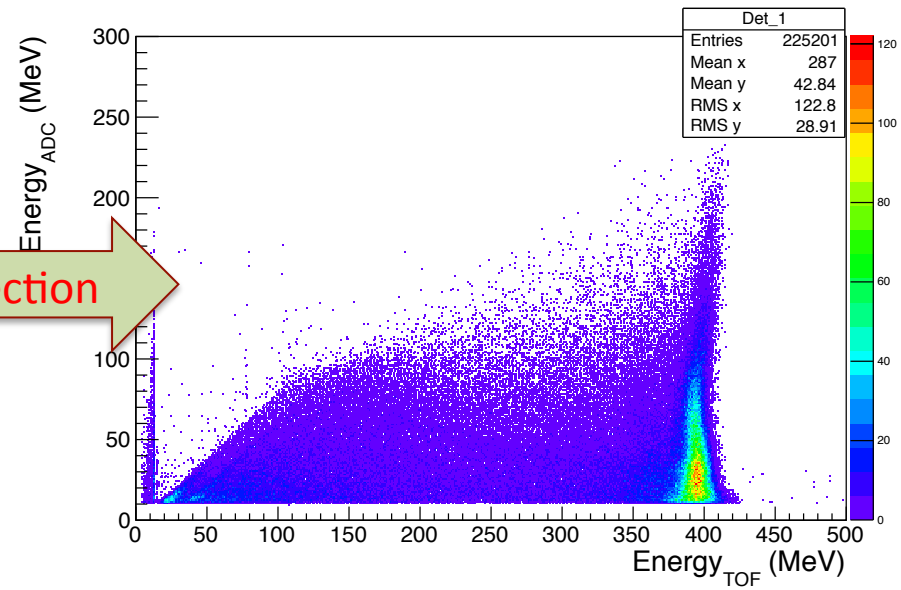


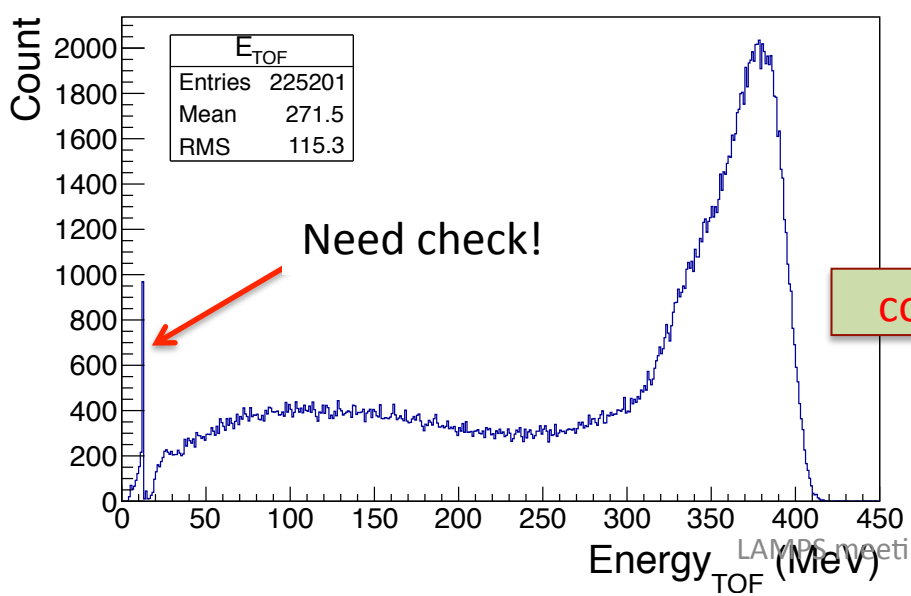


E_{adc} vs E_{tof} after time-walk Calibration

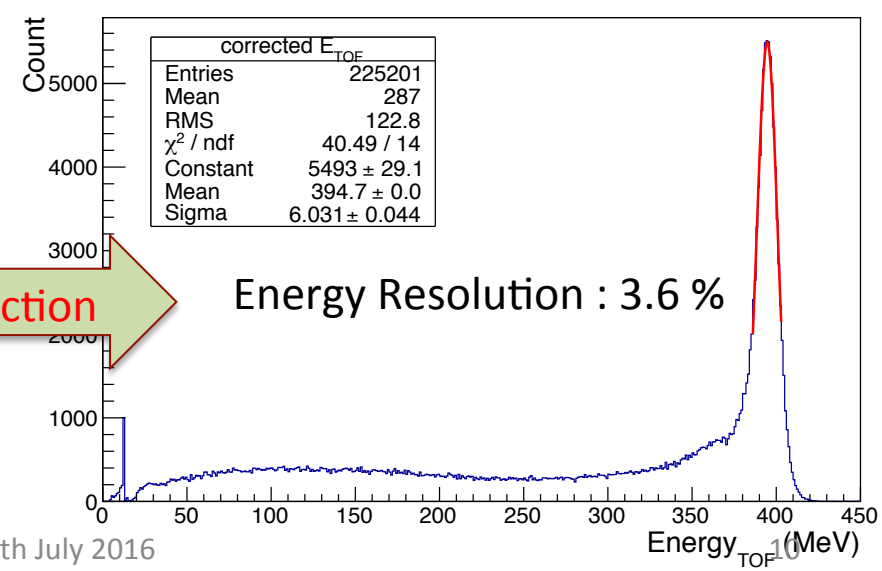


correction

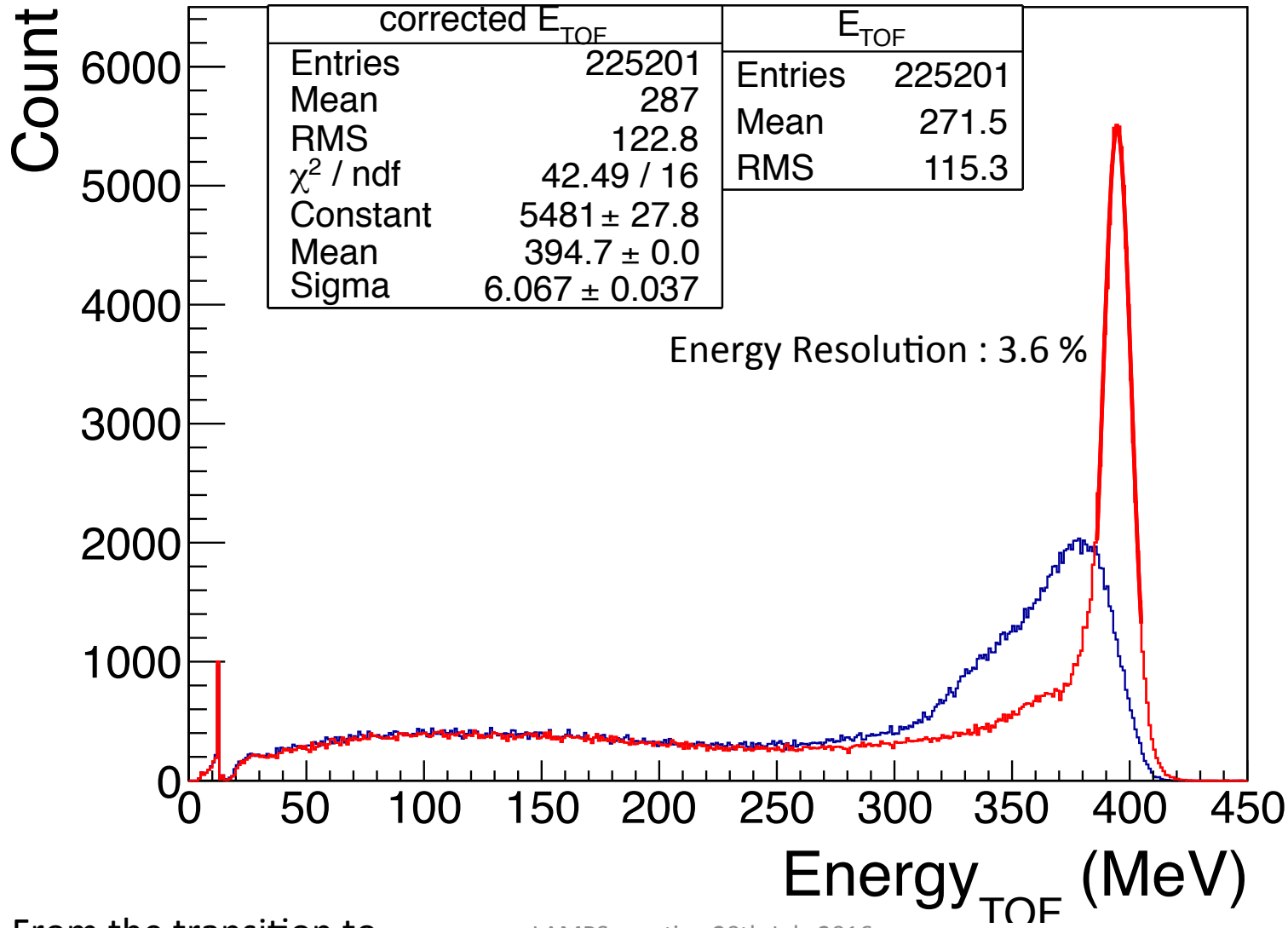




correction



TOF energy spectrum



From the transition to

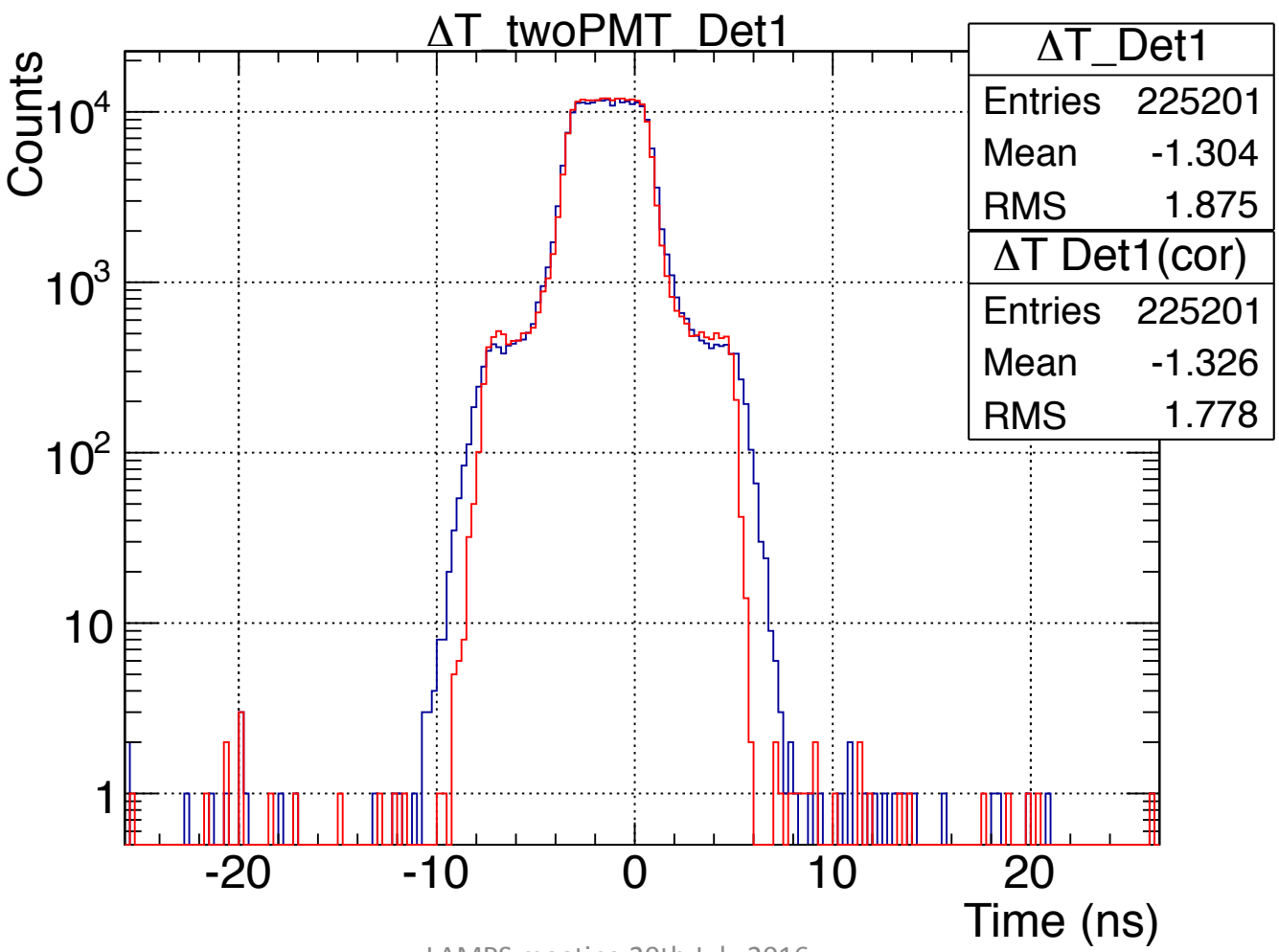
Summary

- We performed beam Test with 3 station structure(11 detectors)
  392 MeV (50 Run), 65 MeV(50 Run)

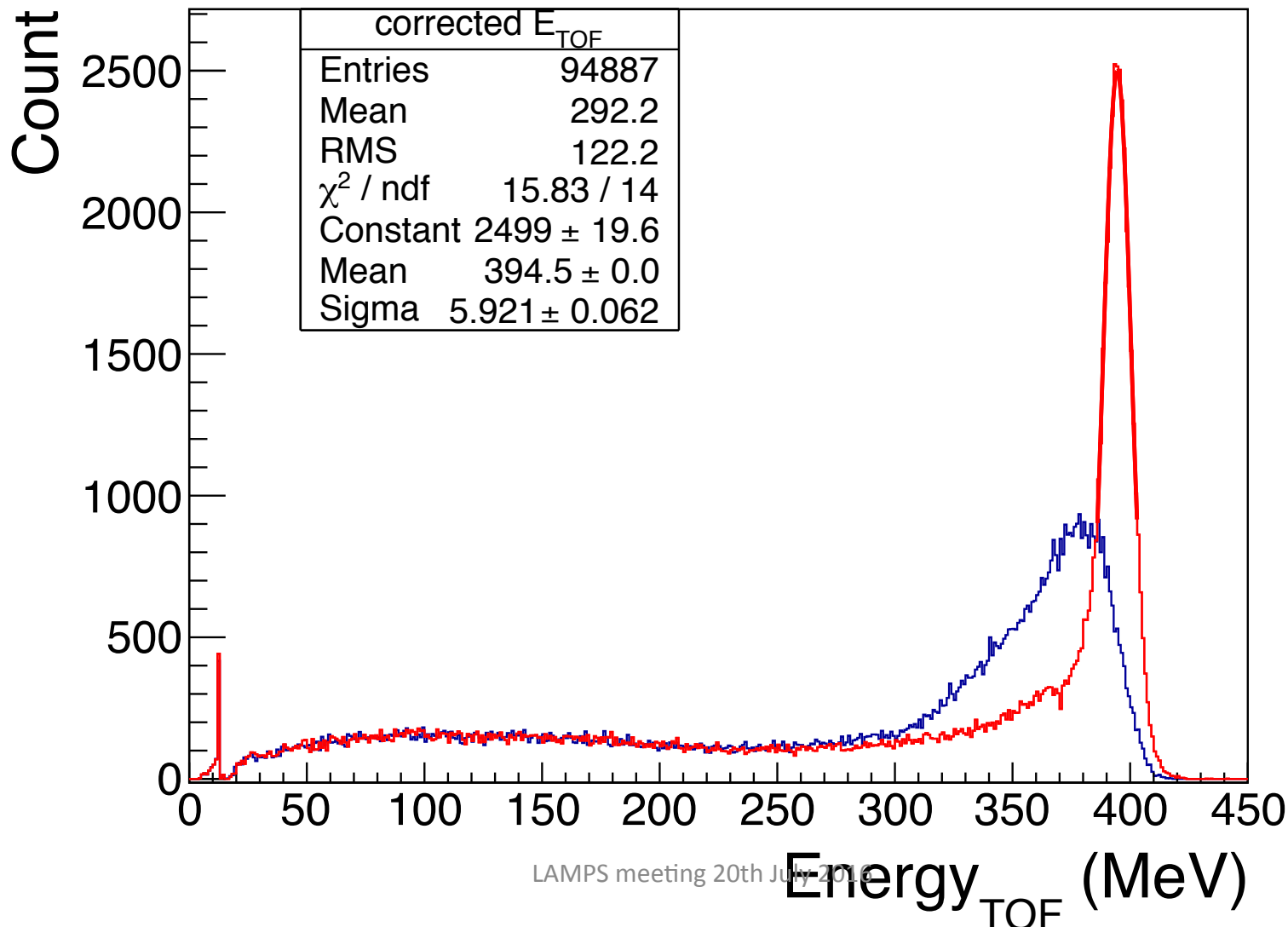
- After slewing correction, energy resolution shows ~ 3.6 % at the 15 m from target

Back up

Time difference between two PMT

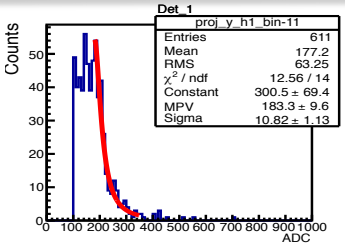


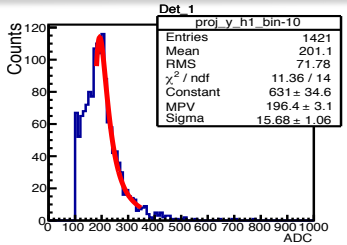
TOF energy spectrum

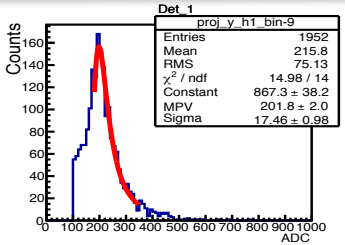


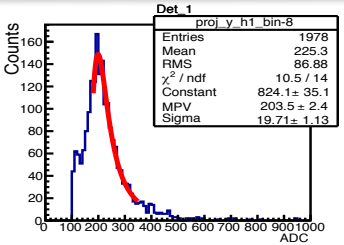
cosmicSetting_45

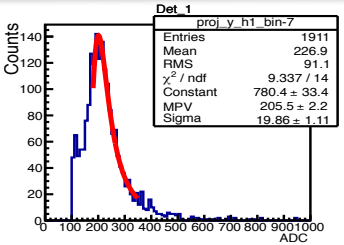
Det 1 ch2

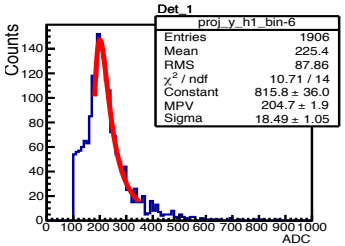


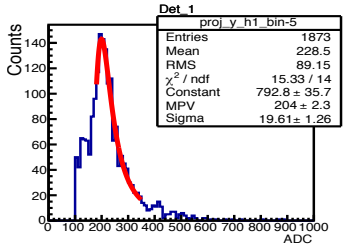


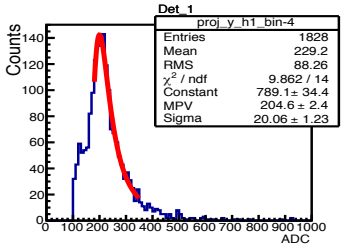


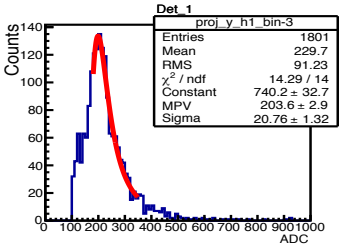


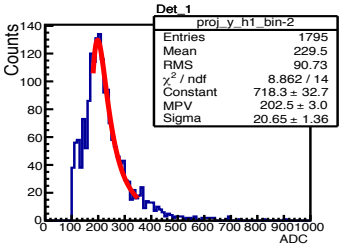


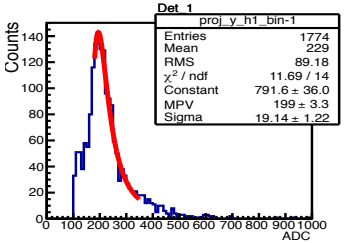


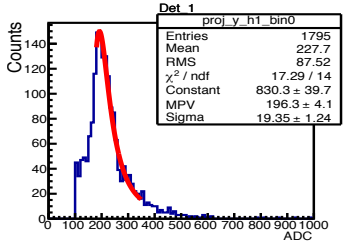


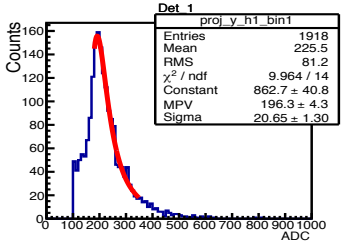


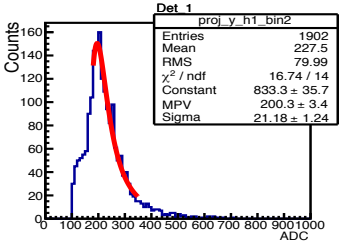


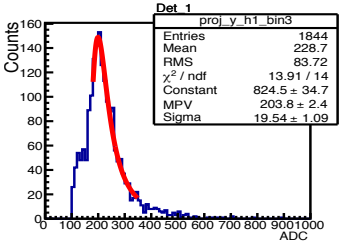


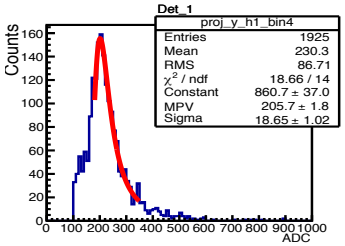


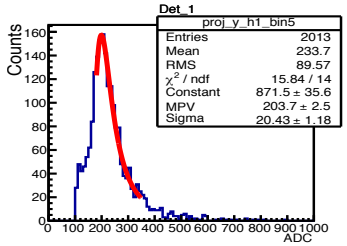


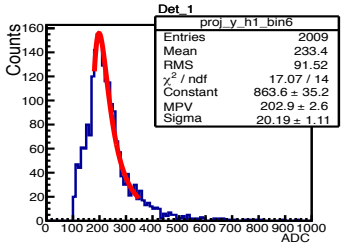


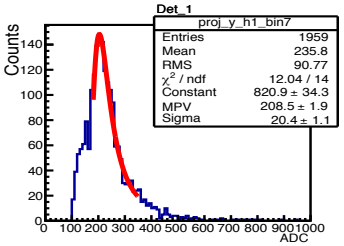


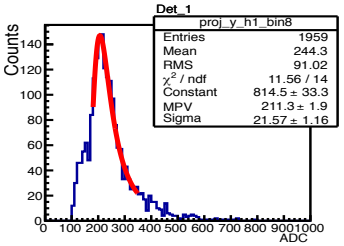


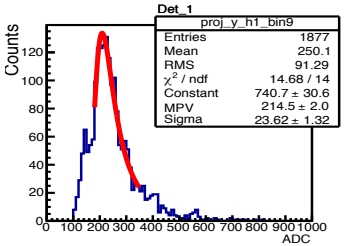


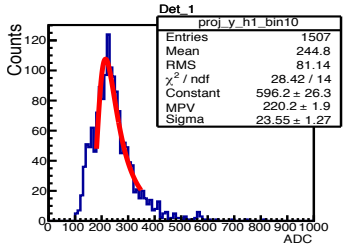




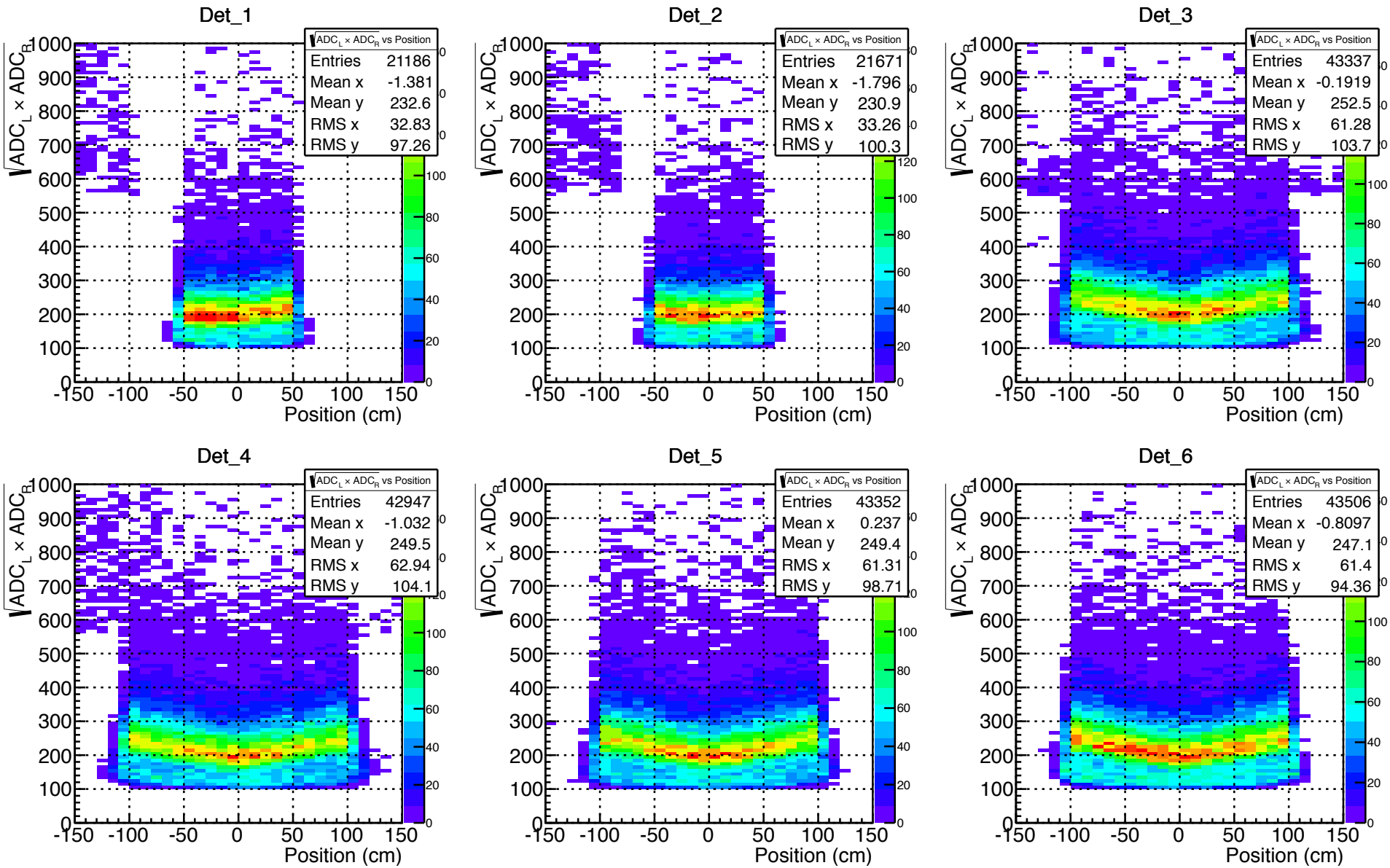






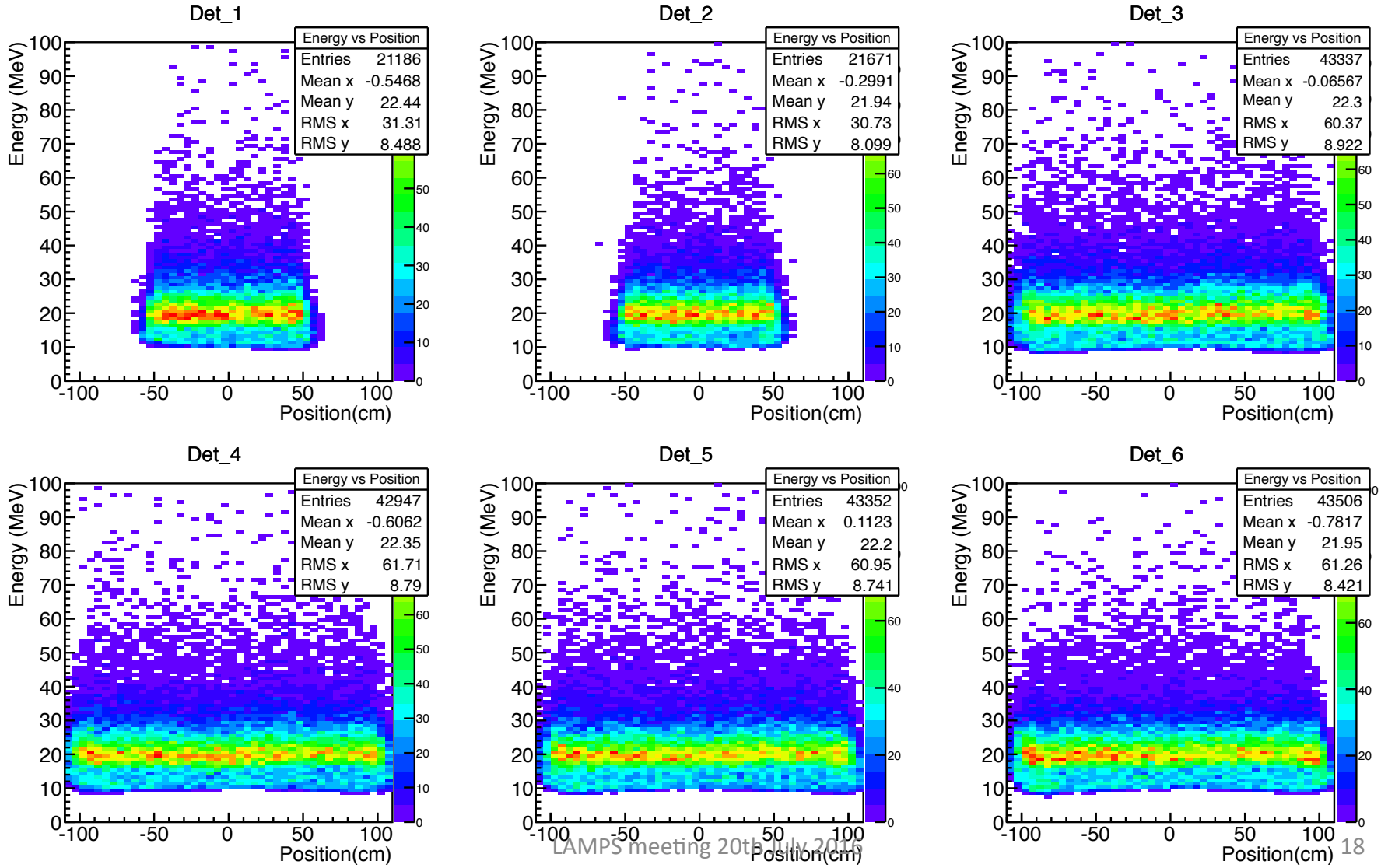


CosmicSetting45



Finding_EnergyCalibration_Cosmic_inRCNP_2016_07_11_R_L_shifted.C

CosmicSetting45



Energy calibration

Before calibration

After calibration