中国科学技术大学
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LightFCP

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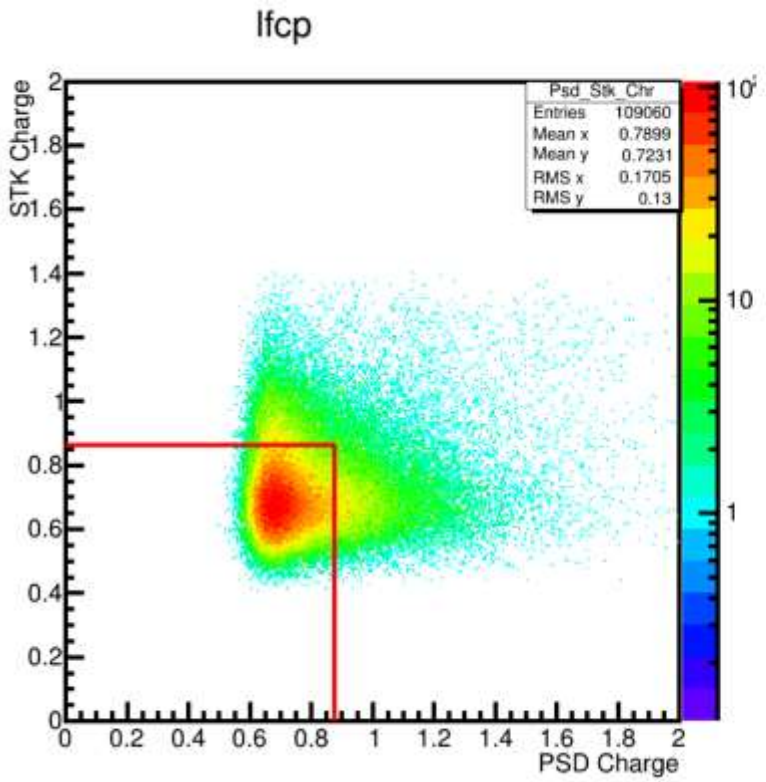
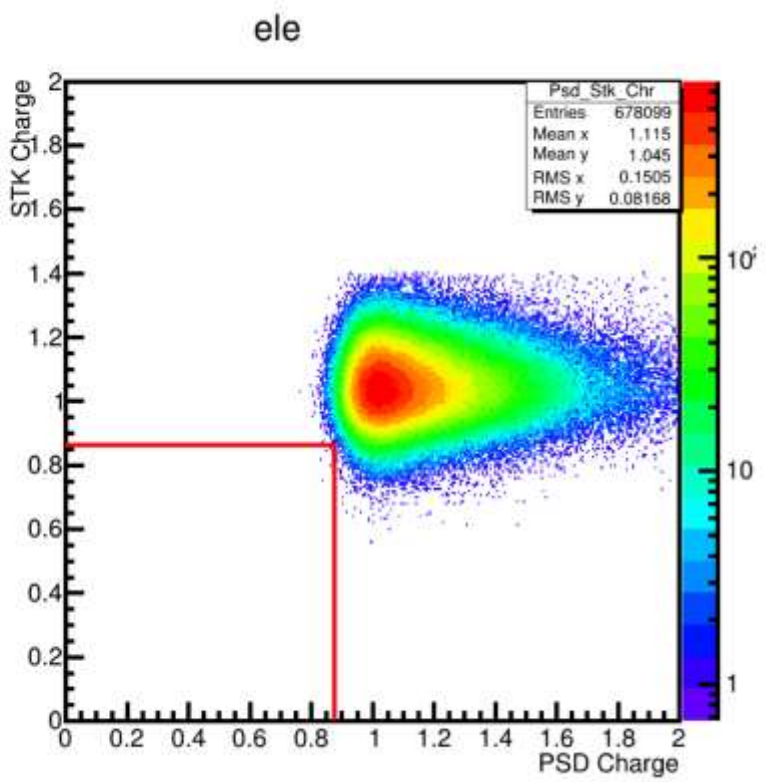
Signal Interval

使用 PSD 和 STK 的拟合结果画出信号区间。

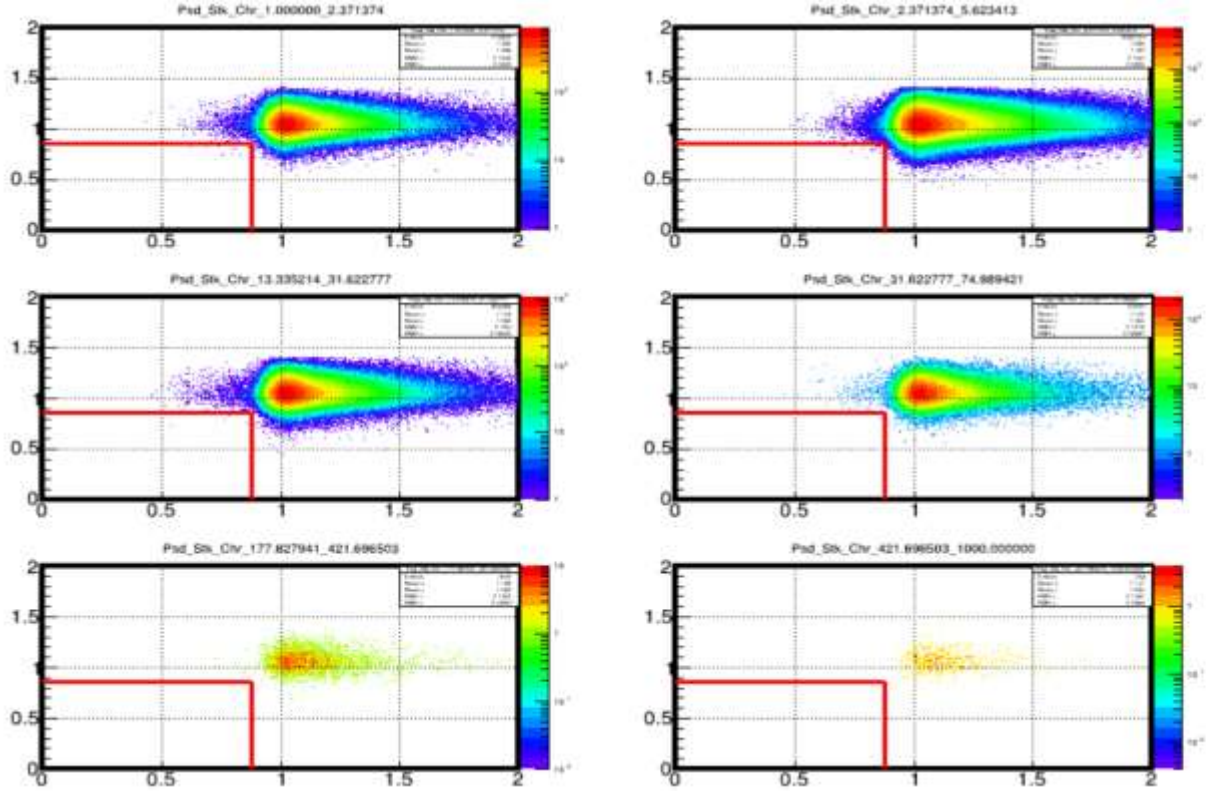
该区间下可以有效去除大部分电子事例。



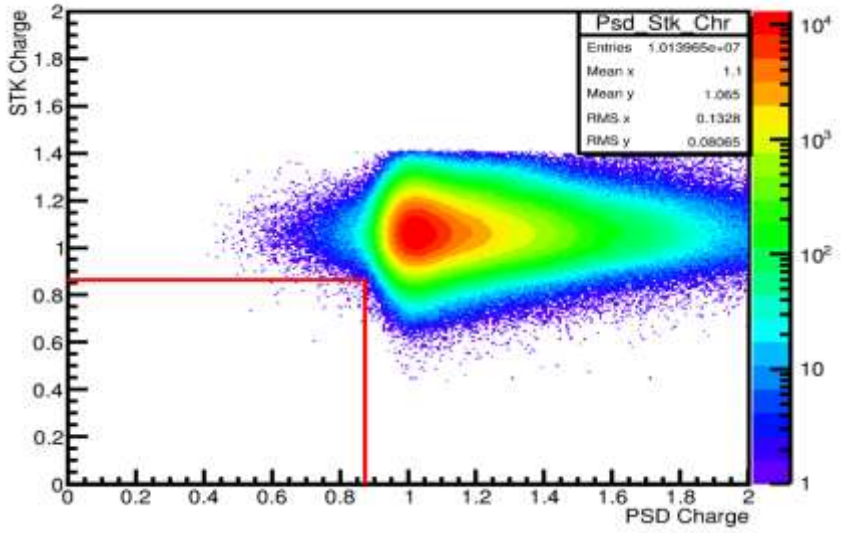


	mean	sigma	signal edge	efficiency
PSD	0.6807	0.0656	0.8777	79.9%
STK	0.6844	0.0896	0.8637	81.2%

Different energy interval



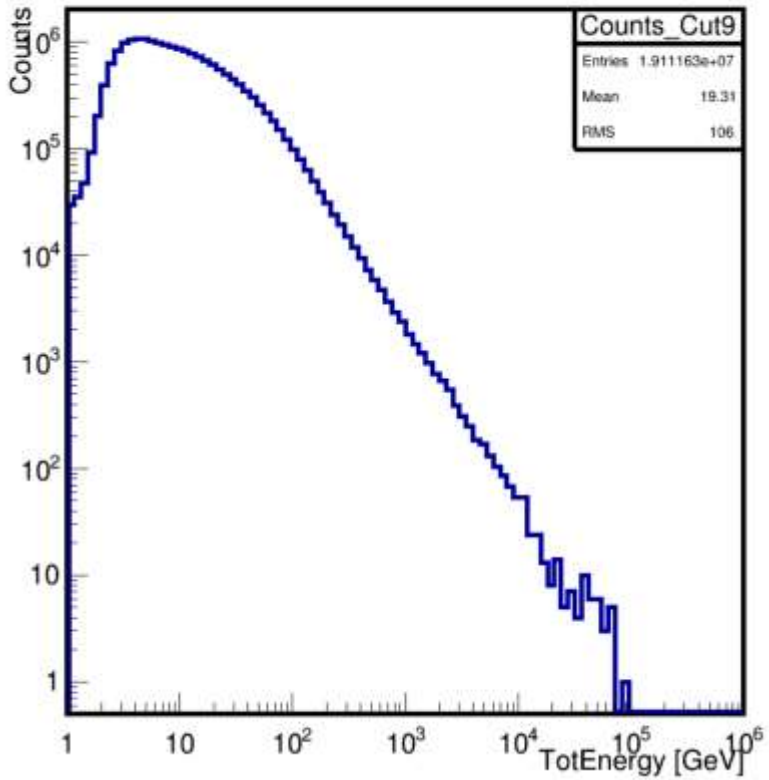
data



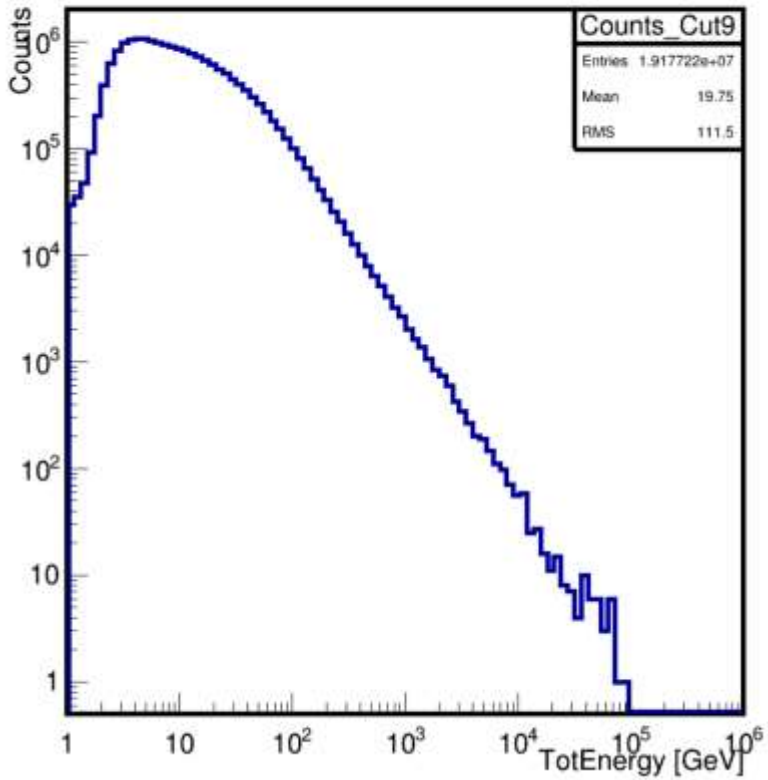
高能宇宙线在信号区间内的事例相对低能宇宙线小（统计量导致的）。

Remove bad data from different STK layers

before

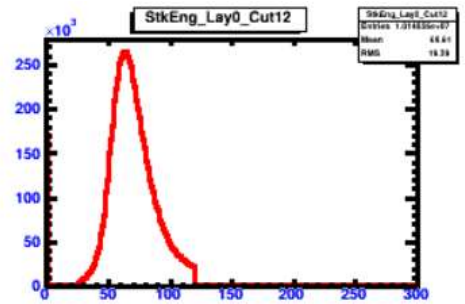


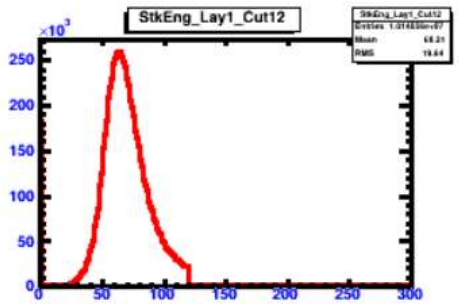
after

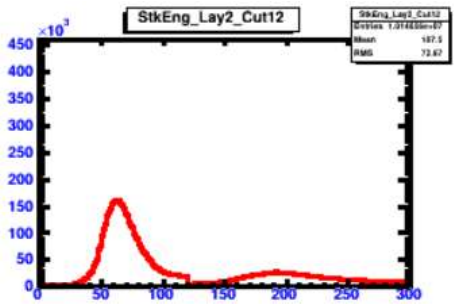


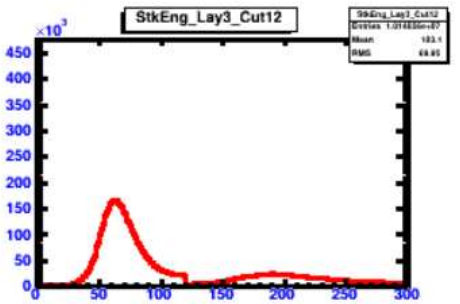

```
if(TMath::Abs(stkeng[i]-mean) < 2*sigma){
  aaa[i] = stkeng[i];
  bbb[i] = stkchr[i];
```

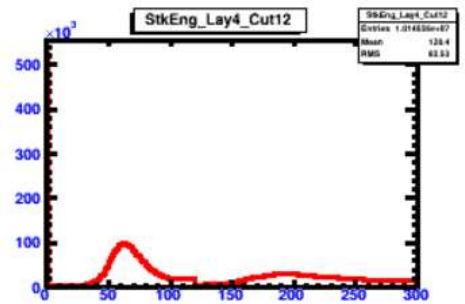
STK ADC of different layers

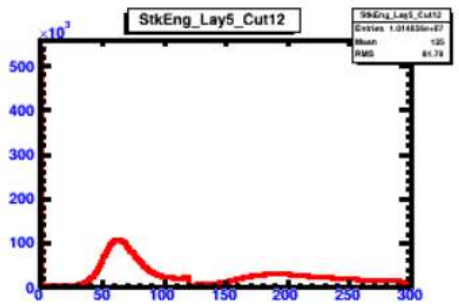


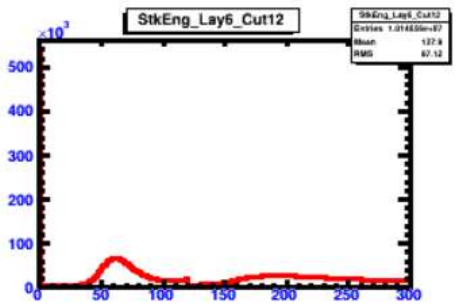


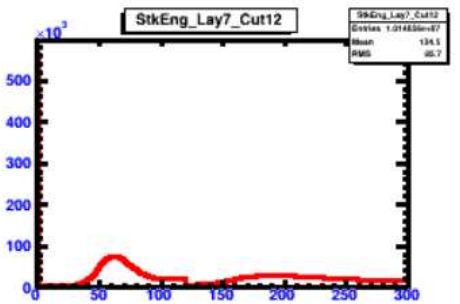


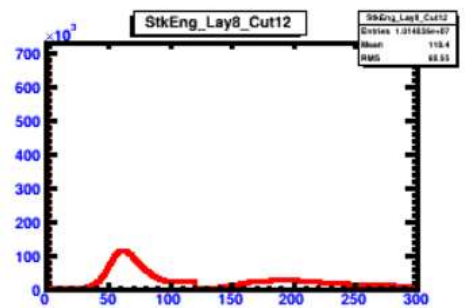


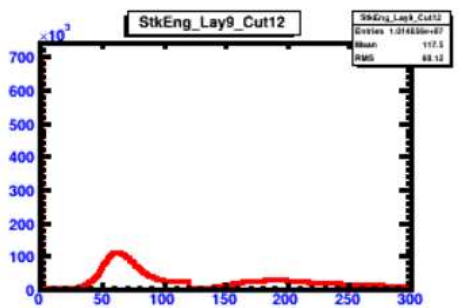


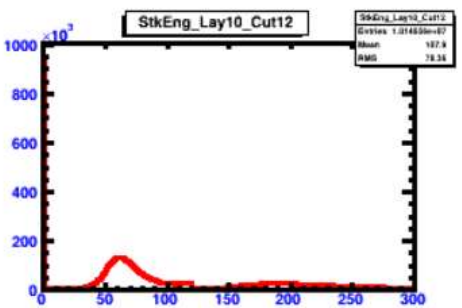


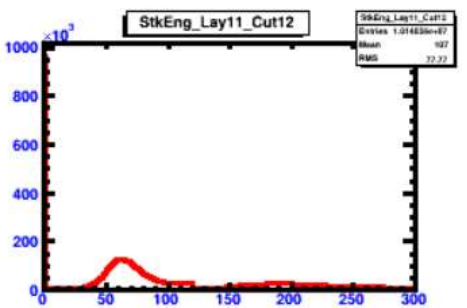








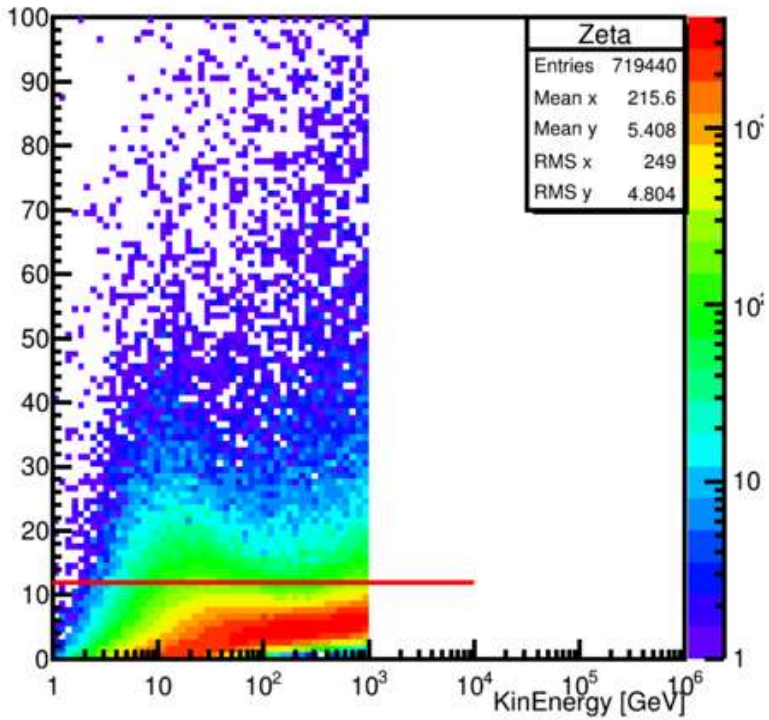




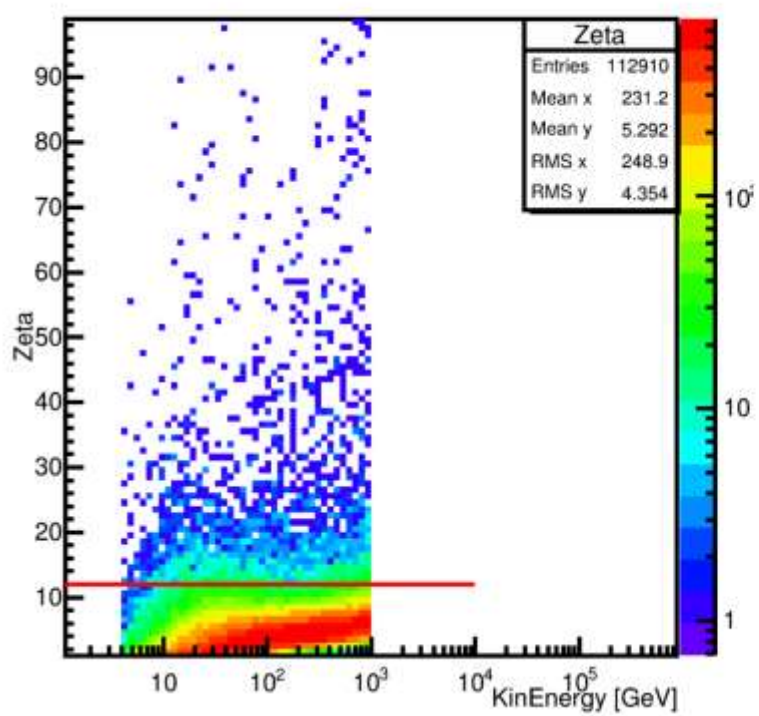
Zeta Value

$$\zeta = 0.125 \times 10^{-8} \times (sumRms)^4 Flast$$

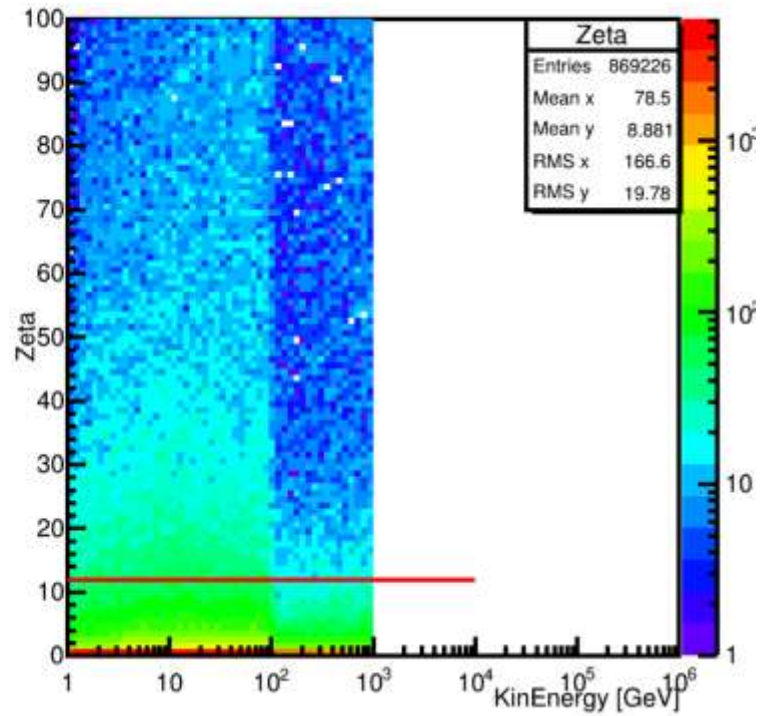
eletron



lfcp



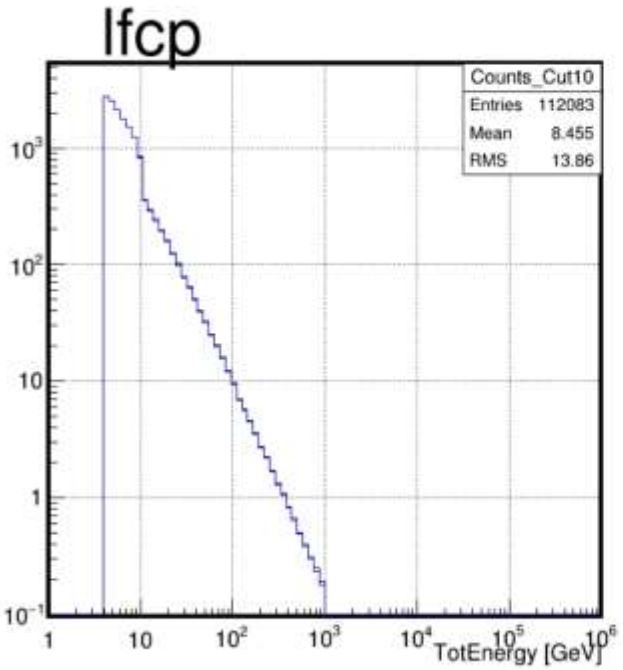
proton

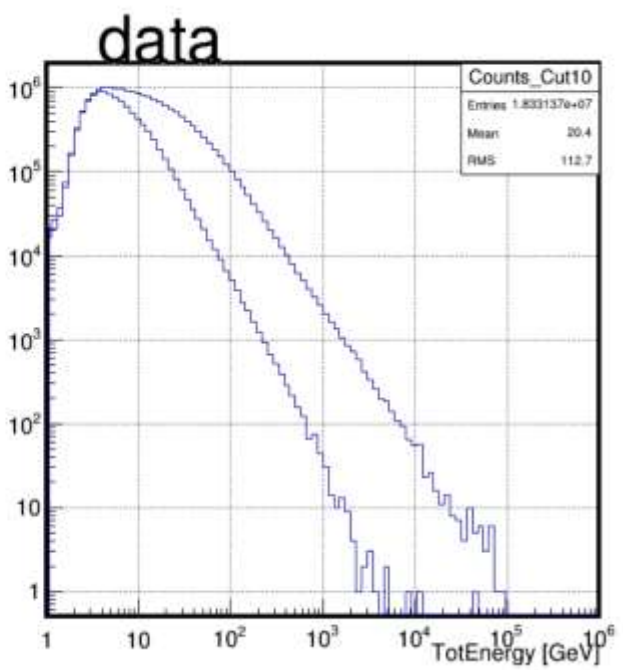


Zeta Value

ZetaValue Cut 对 LFCP 几乎没有影响。

LFCP 的截断是 reweight 导致的。





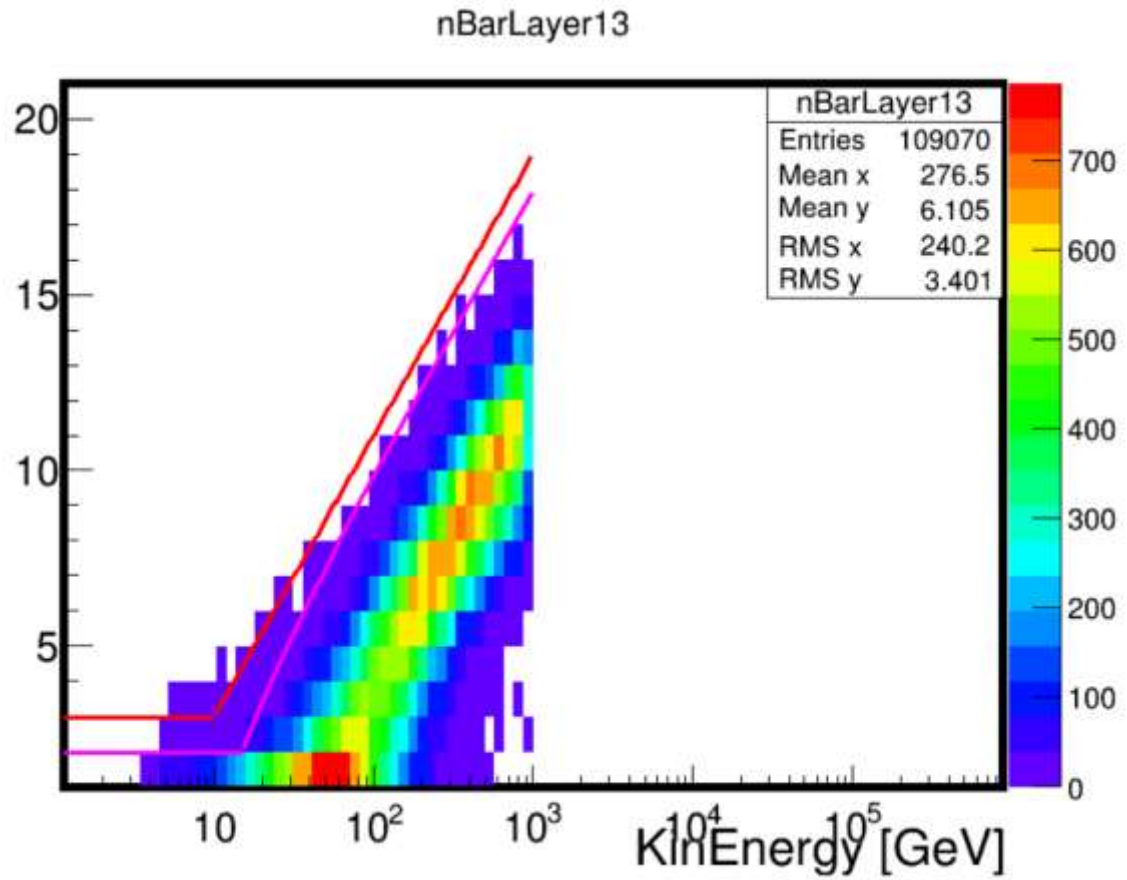
How to optimize nBarLayer13 Cut for LFCP

Before: (TotEnergy [GeV])

$$Threshold = 8 \times log_{10} TotEnergy - 5$$

After: (TotEnergy [GeV])

$$Threshold = 8 \times log_{10}(TotEnergy - 15) - 6$$



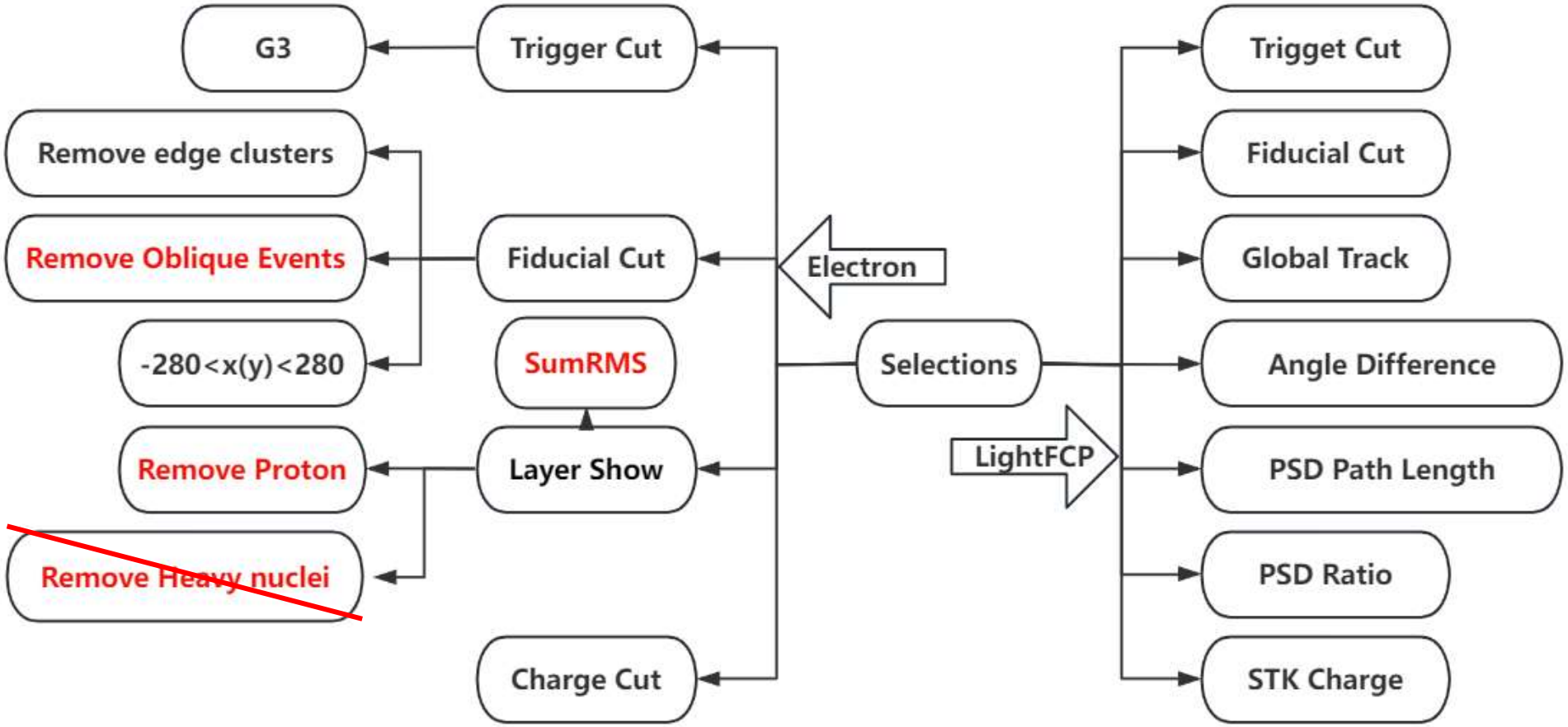
附录

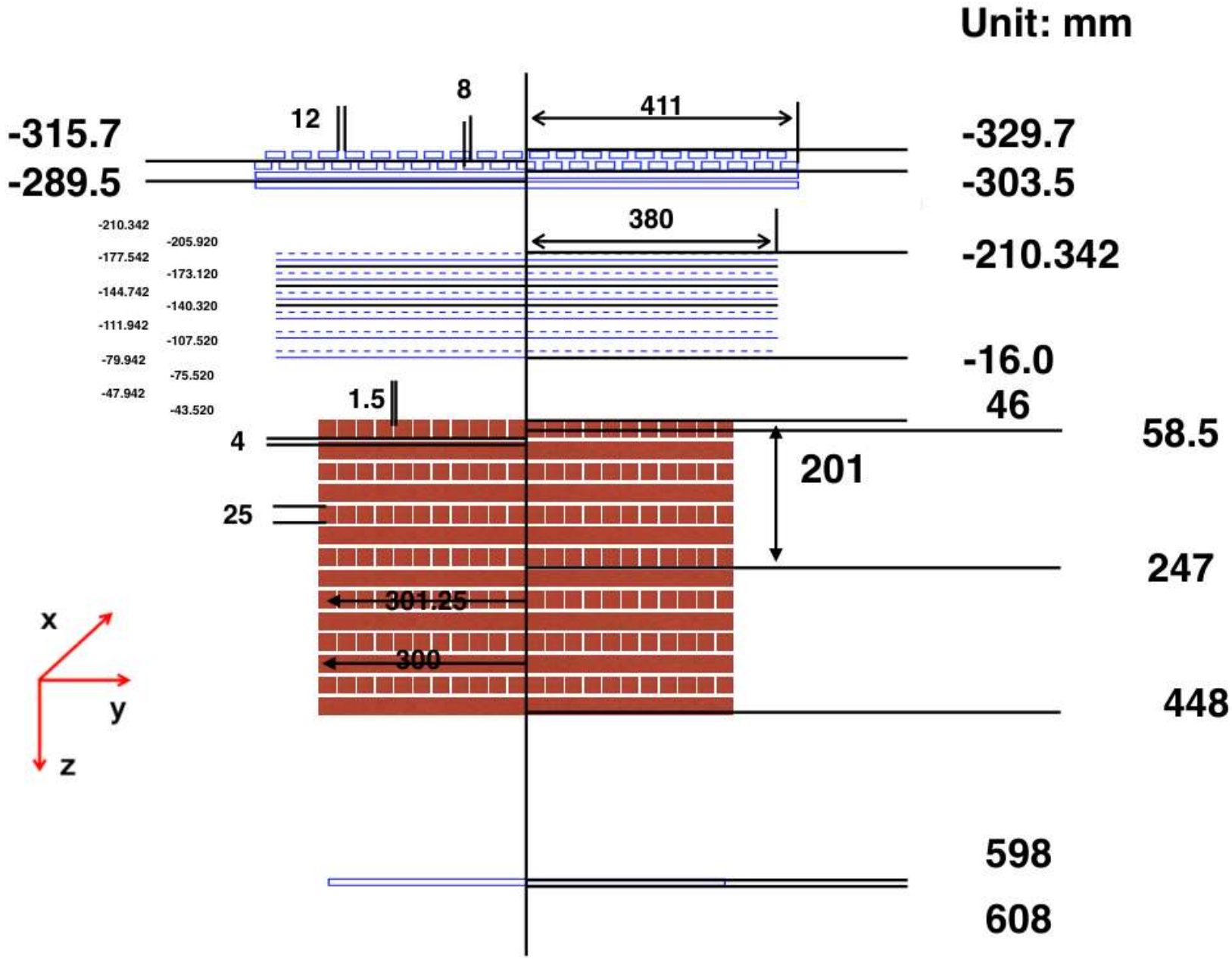
- Selections
- Construction of Dampe

Selections

- Pre-Selections
  - Trigger: G0, G3, G4.
  - Fiducial.
  - Global Track.
    - Angle difference between BGO track and STK track. (<4°)
- PSD Cuts
  - PSD charge. (≠0)
  - PSD path length. (10mm)
  - PSD two end ratio.
- STK Cuts
  - STK energy < 120 ADC.
  - Remove ladder's edge cluster.
  - More than 2 layers remain.

Selections


G3
Trigger Cut
Remove edge clusters
Remove Oblique Events
Fiducial Cut
-280<x(y)<280
SumRMS
Remove Proton
Layer Show
Remove Heavy nuclei
Charge Cut
Electron
Selections
LightFCP
Trigget Cut
Fiducial Cut
Global Track
Angle Difference
PSD Path Length
PSD Ratio
STK Charge

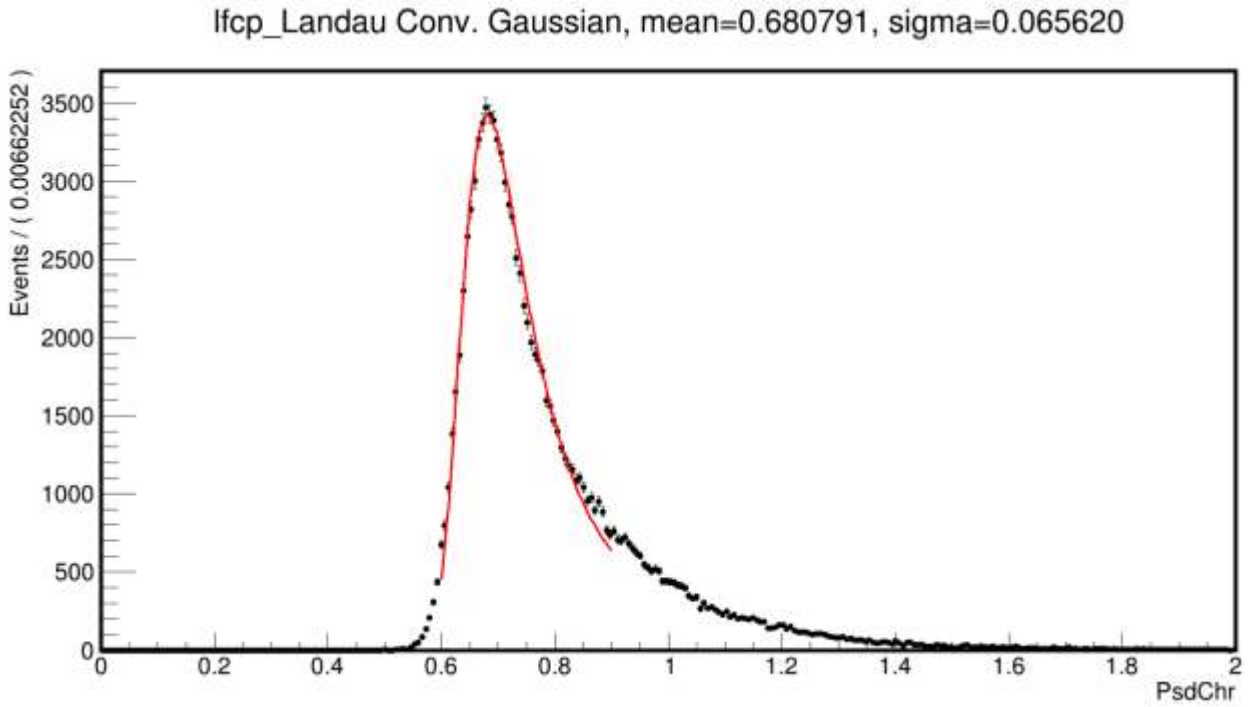

Unit: mm
-315.7
-289.5
12
8
411
-329.7
-303.5
380
-210.342
-210.342
-205.920
-177.542
-173.120
-144.742
-140.320
-111.942
-107.520
-79.942
-75.520
-47.942
-43.520
-16.0
1.5
46
4
58.5
201
25
247
301.25
300
448
x
y
z
598
608

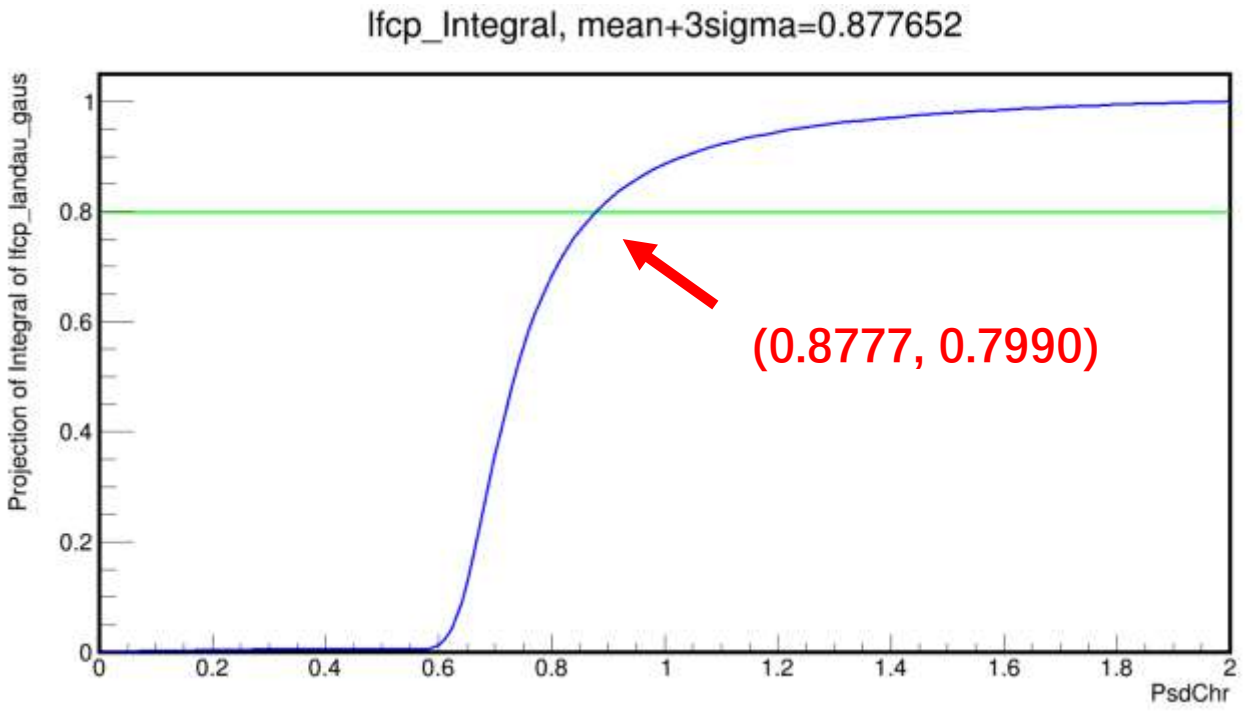
Zeta

```
double DmpAlgLightFCP::GetZetaValue(){
  double zeta=0;
  double fflast=fBgoRecTool->GetSumLayerFraction(13, 13);
  double fsumRMSSqrt=fBgoRecTool->GetSumDefaultSqrtRMS(0, 13);
  zeta = fflast*TMath::Power(fsumRMSSqrt, 4)/(8e6);
  return zeta;
  }
```

Fit

- 用朗道卷积高斯拟合 LightFCP 的 PSD 电荷谱。
- 对 PSD 电荷谱从 0 积分到 mean+3*sigma。





Fit

- 用朗道卷积高斯拟合 LightFCP 的 STK 电荷谱。
- 对 STK 电荷谱从 0 积分到 mean+2*sigma。