2002年12月17,18日
JLC CAL Group Meeting@信州大学

T517 ビームテスト
筑波CALのデータ解析（途中経過）

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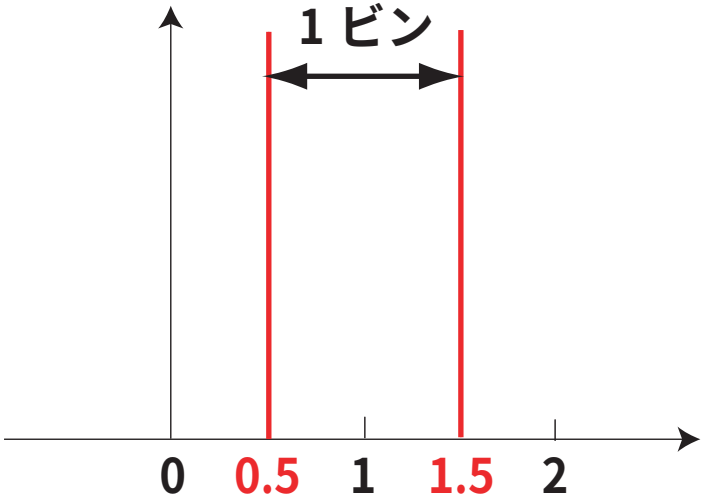
1. ペデスタルの評価
2. muon calibration
3. 筑波CALで求めたシャワー中心
4. ドリフトチェンバーとの比較
5. まとめ

ペデスタルの評価

＜手順＞

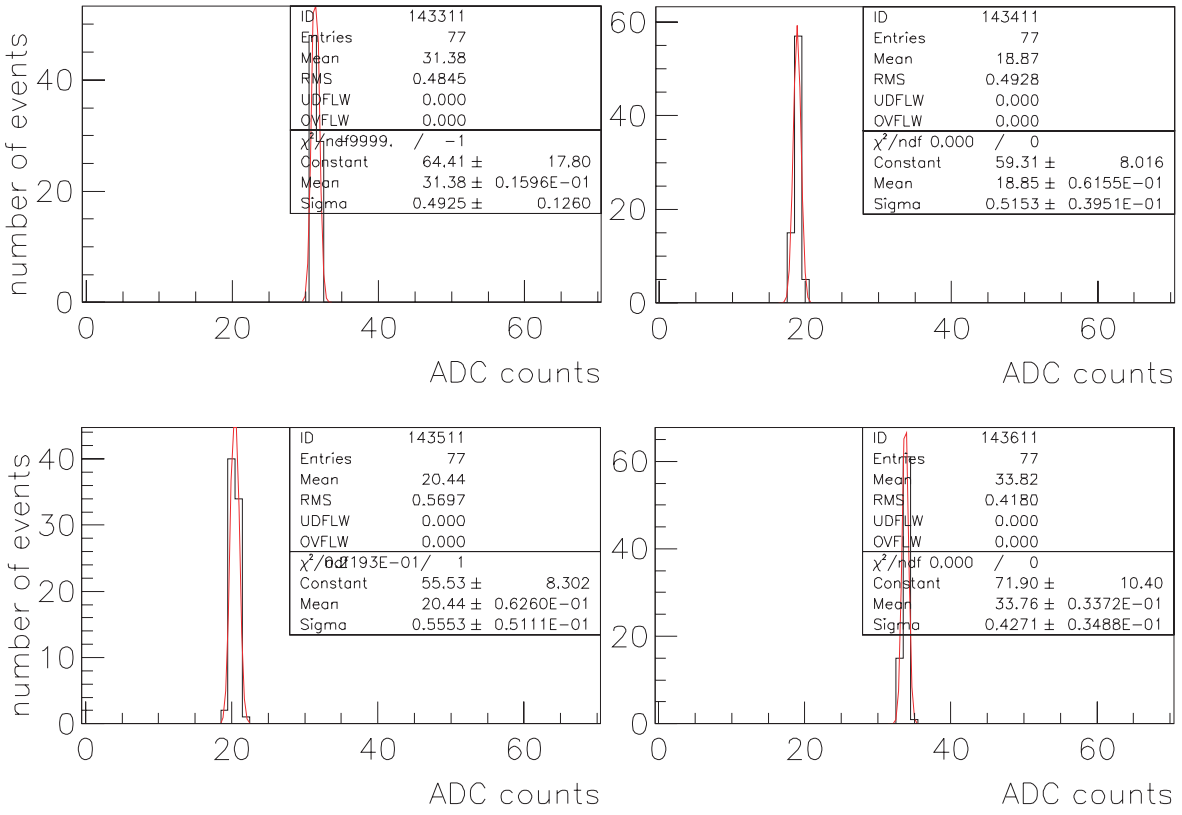
1. 各チャンネル毎のペデスタルのヒスト
   ↓
   gaussianでフィット

   ＊　ビン割りはビンの中心が整数値になるようにした



2. フィットした時のmean
   ↓
   そのチャンネルのペデスタル

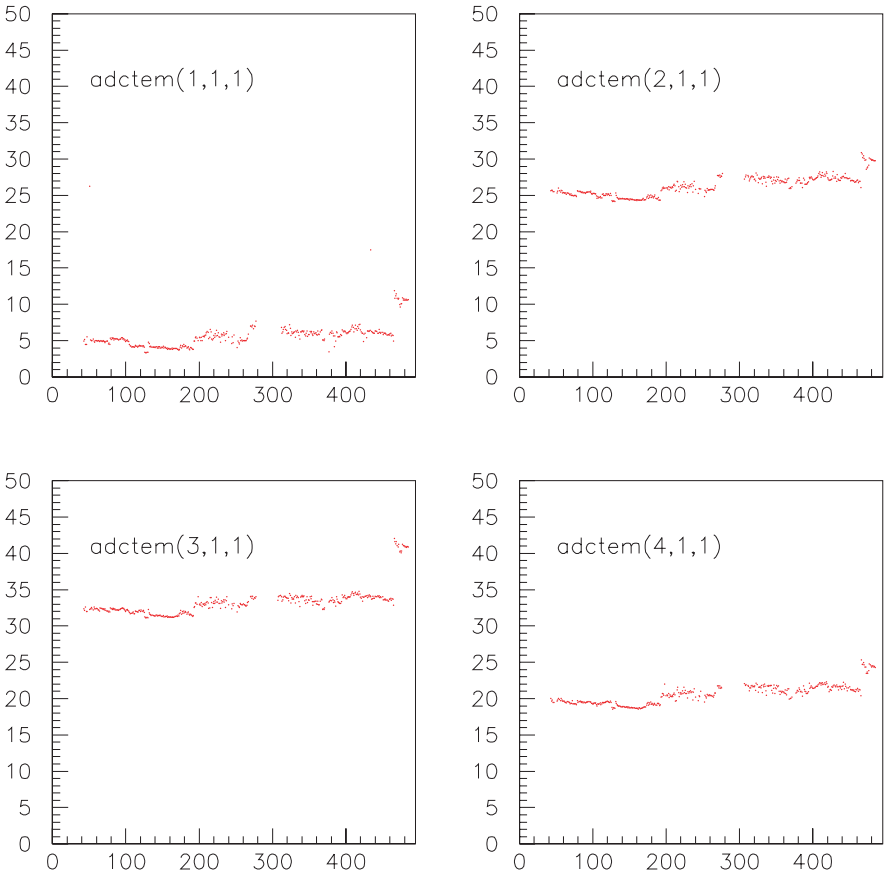
＜フィットの例＞



この作業を全ランについて行う

各チャンネル毎のペデスタルのシフト

- ラン毎にどれだけ
  ペデスタルがシフトしているか？



ペデスタルのデータが
全く入っていないランが
存在する

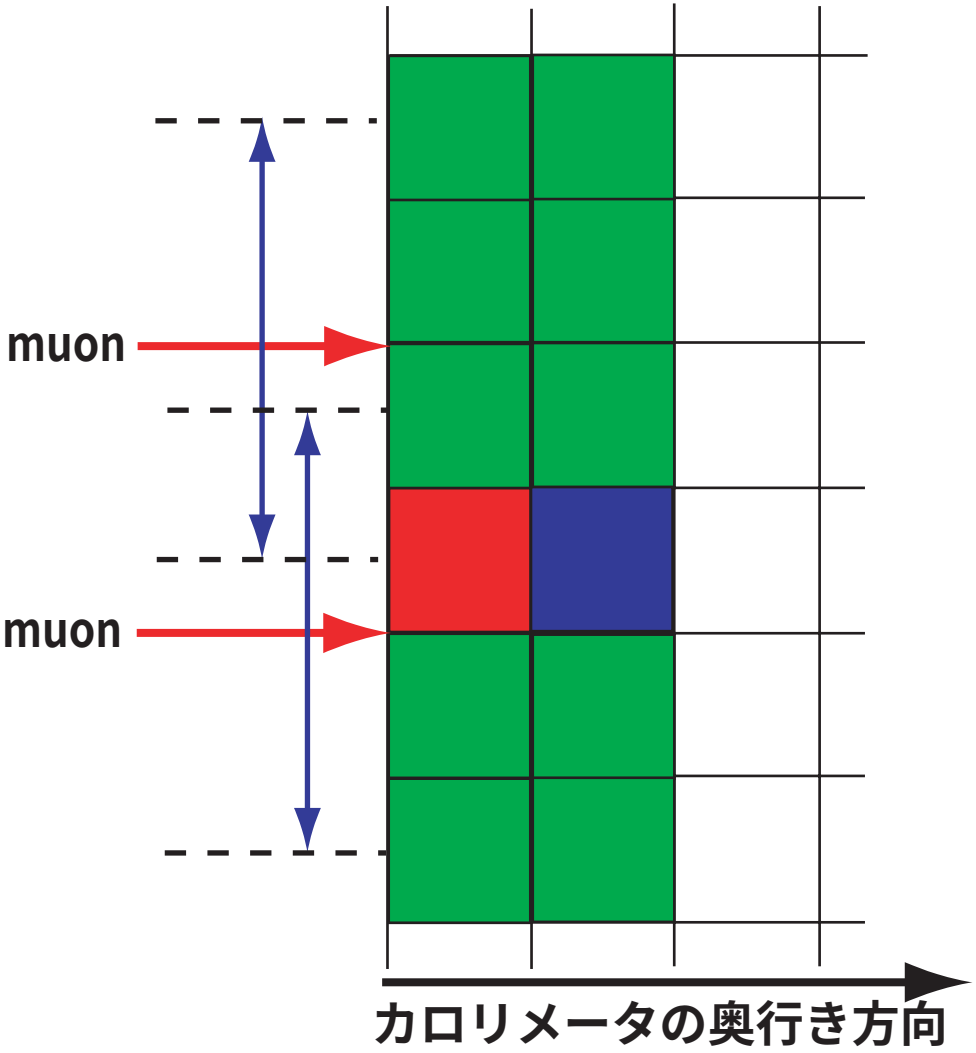
run1 ~ run50
run55
run277 ~ run 310
run372 ~ run 376

現在の解析では
ペデスタルがおかしいランは
使っていない

calibration constant

2 GeV muon 入射のデータを使用

＜カットの方法＞



：信号なし

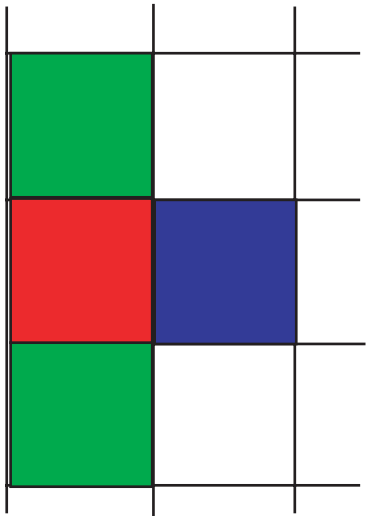
adctem − pedestal $< \sigma_{pede} \times 20$

：信号あり

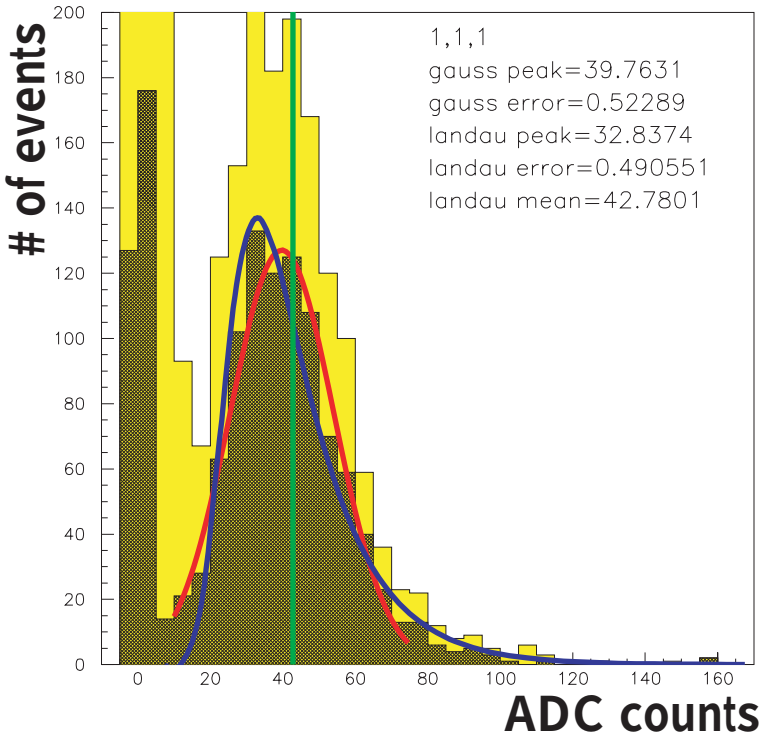
adctem − pedestal $> \sigma_{pede} \times 20$

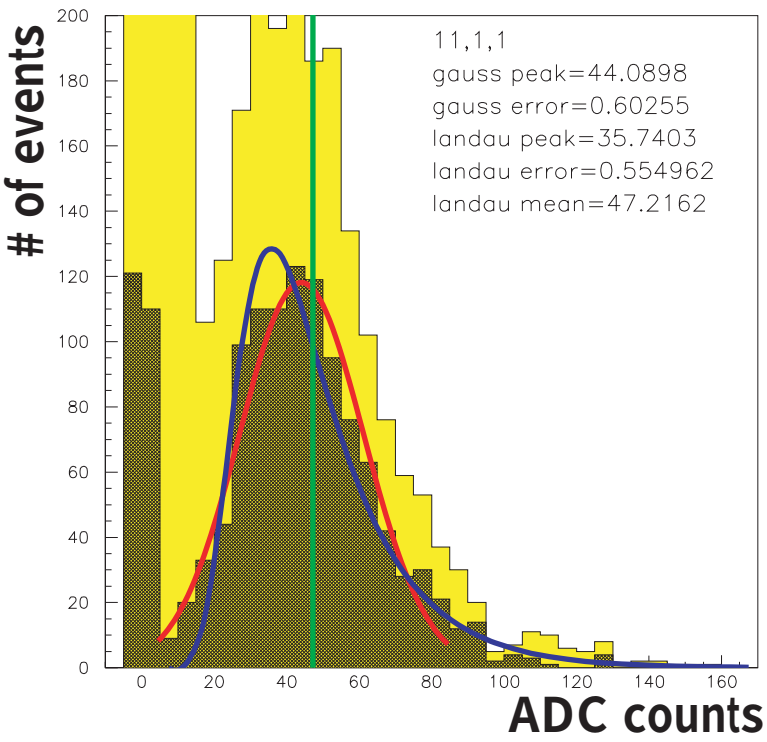
統計量が少なくなり
error が大きくなってしまう

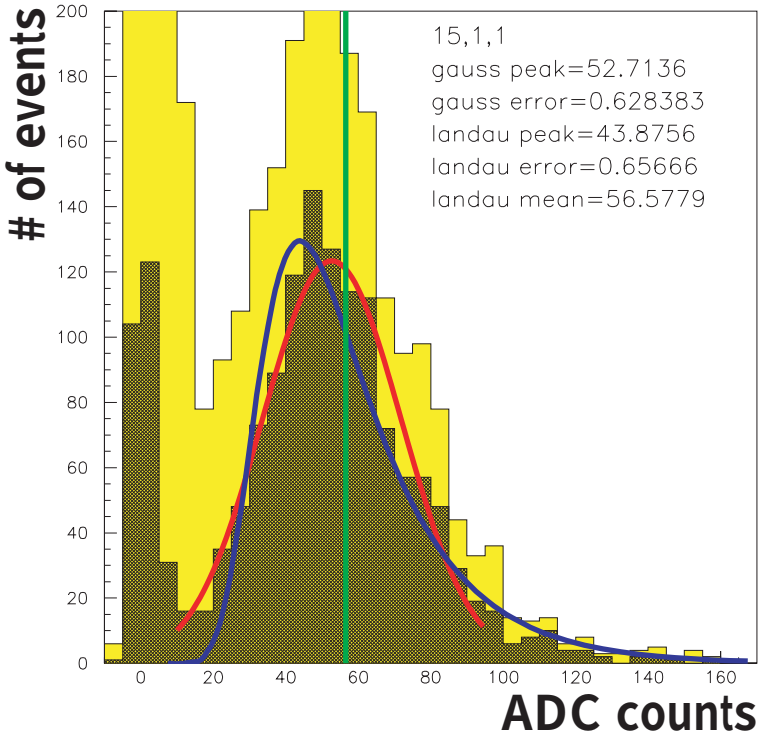
カットを緩くする

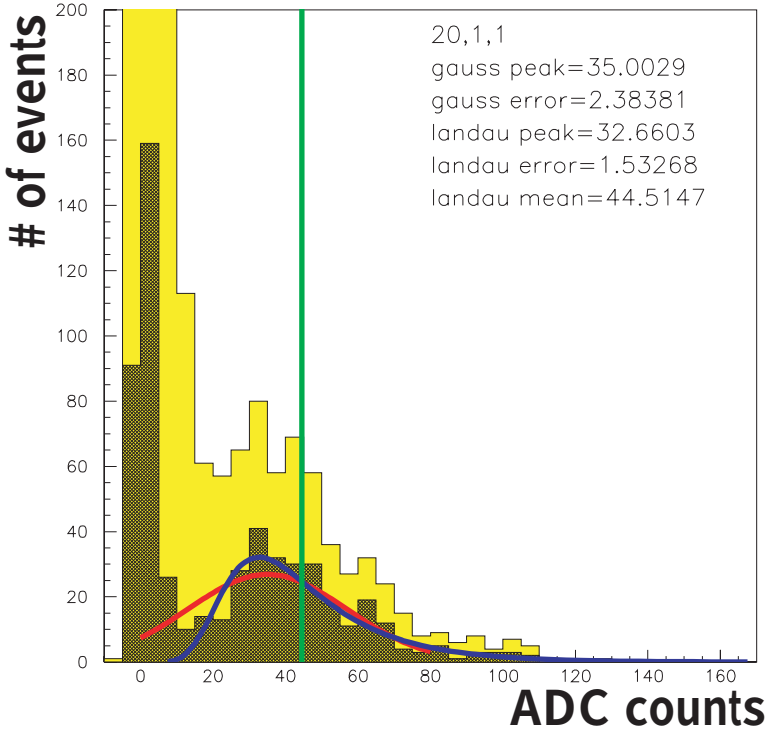


カットをかける範囲を
狭めて
イベント数を確保する


1,1,1
gauss peak=39.7631
gauss error=0.52289
landau peak=32.8374
landau error=0.490551
landau mean=42.7801
# of events
ADC counts


11,1,1
gauss peak=44.0898
gauss error=0.60255
landau peak=35.7403
landau error=0.554962
landau mean=47.2162
# of events
ADC counts

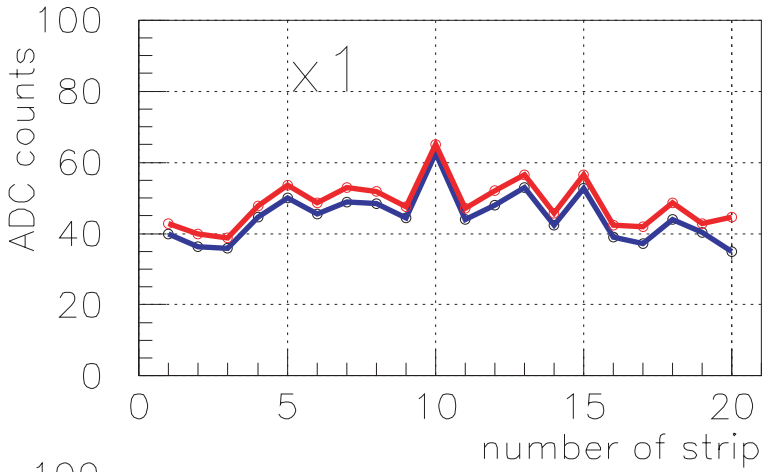

15,1,1
gauss peak=52.7136
gauss error=0.628383
landau peak=43.8756
landau error=0.65666
landau mean=56.5779
# of events
ADC counts

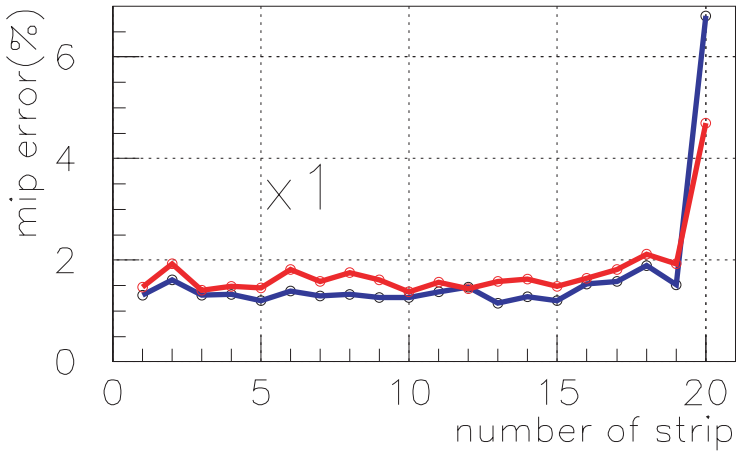

20,1,1
gauss peak=35.0029
gauss error=2.38381
landau peak=32.6603
landau error=1.53268
landau mean=44.5147
# of events
ADC counts

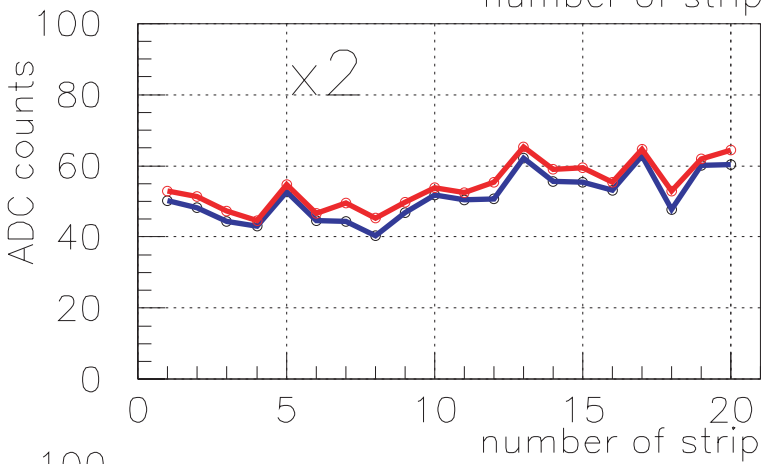
各channel 毎の Calibration Constant

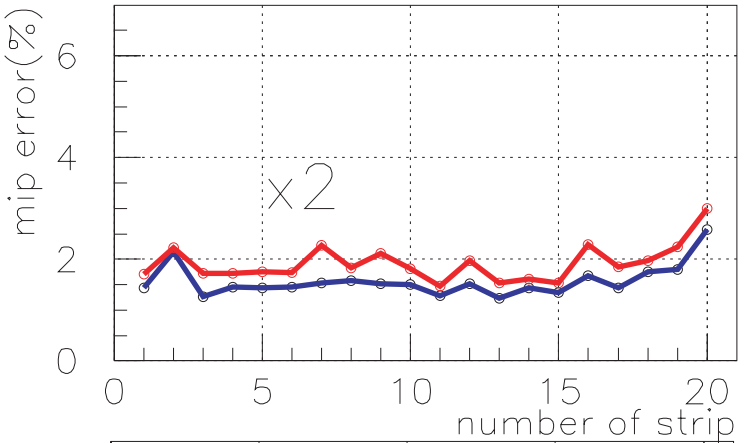
：gaussian fit mean

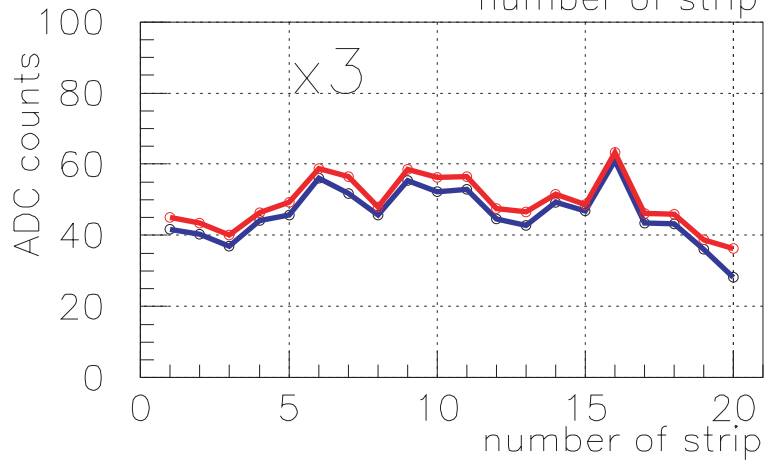
：landau fit mean

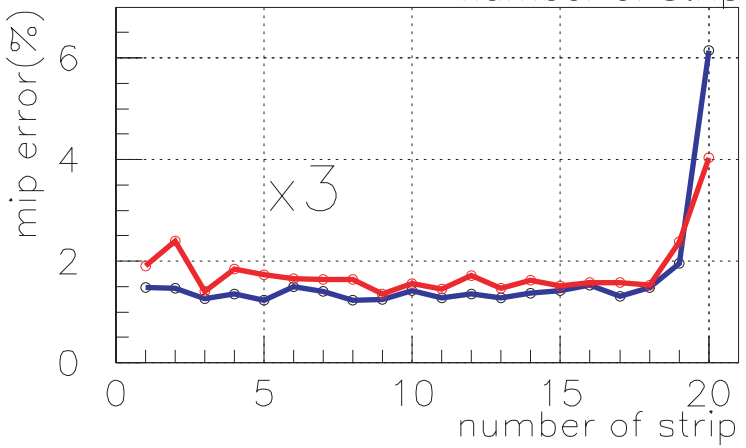


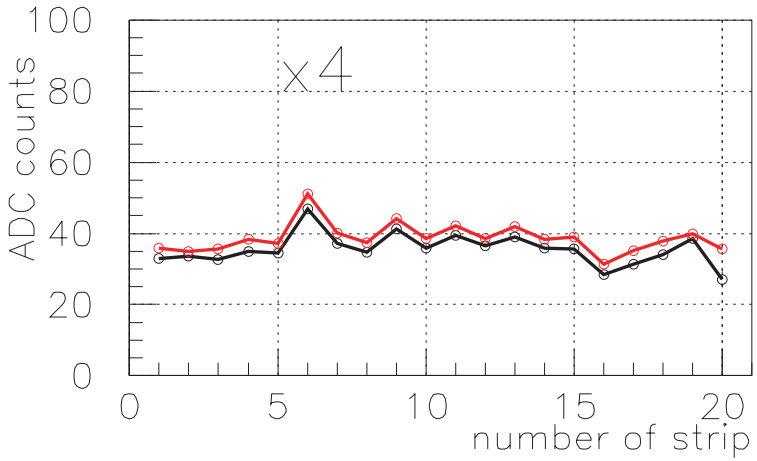


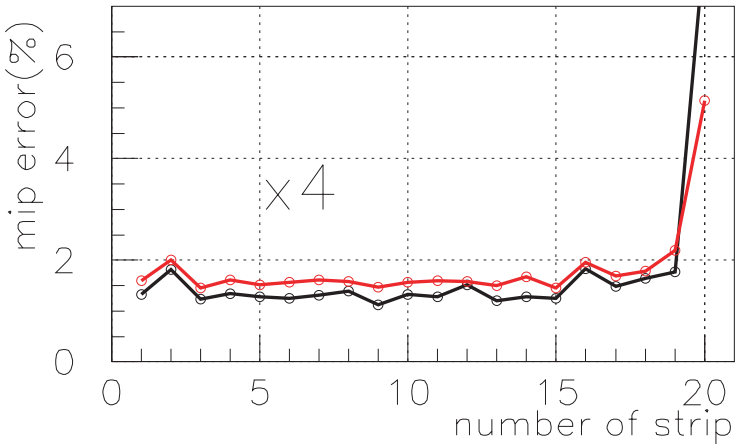


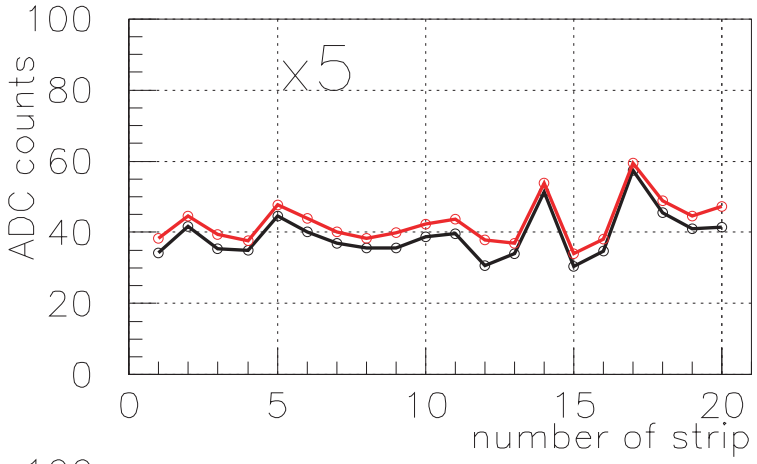


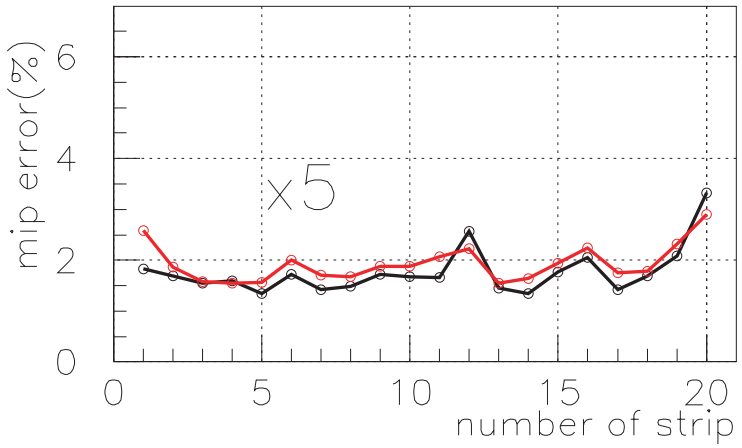


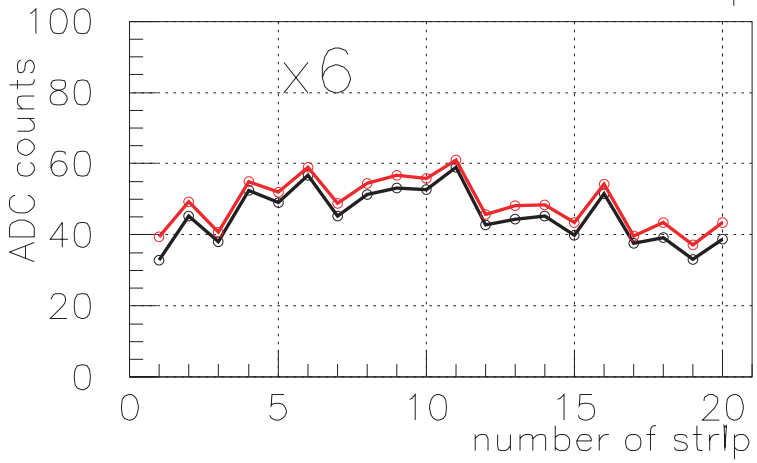


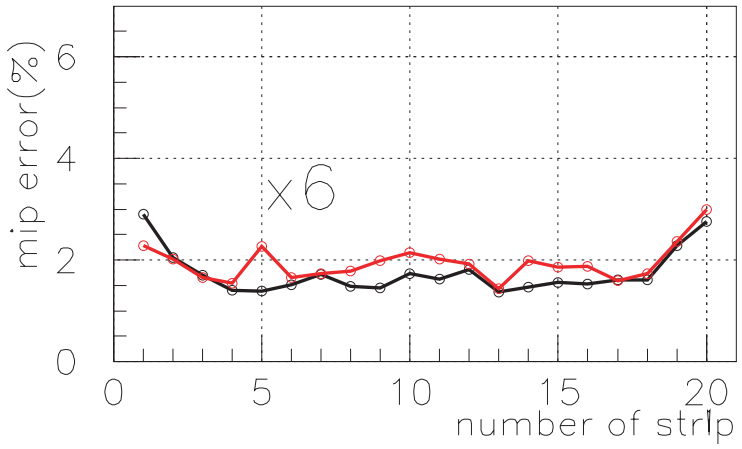

ADC counts
number of strip
x4

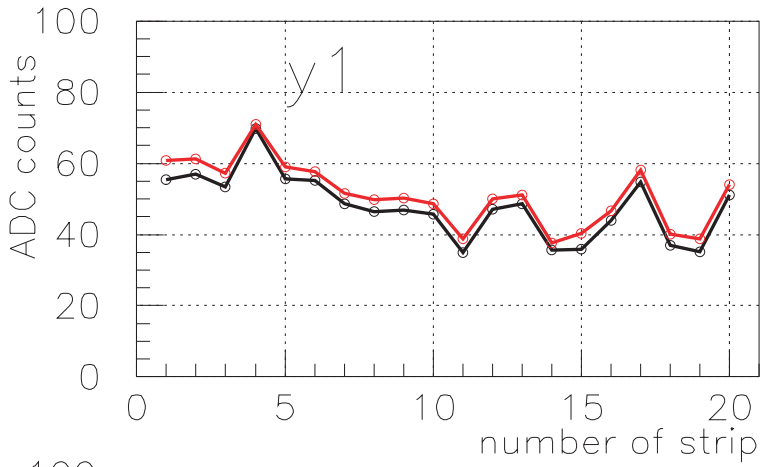

mip error(%)
number of strip
x4

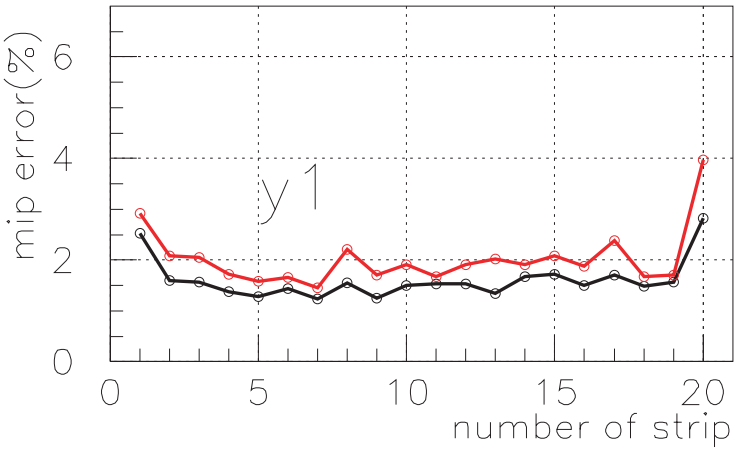

ADC counts
number of strip
x5

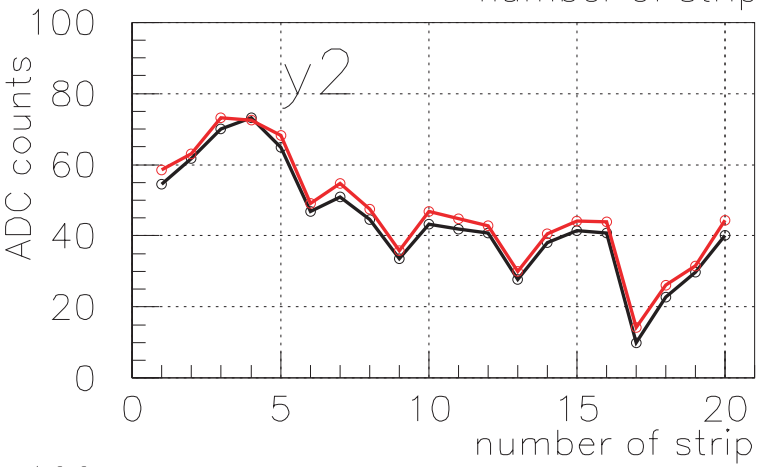

mip error(%)
number of strip
x5

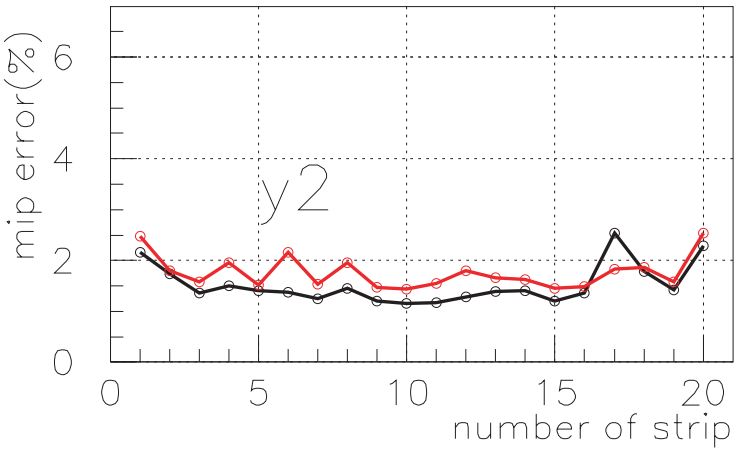

ADC counts
number of strip
x6

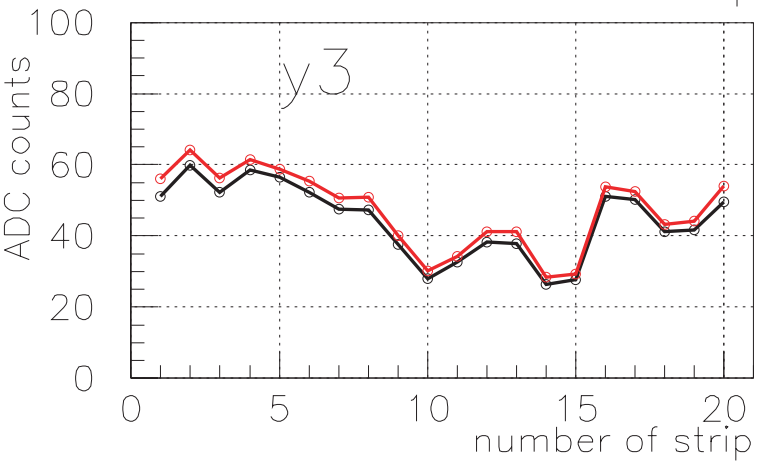

mip error(%)
number of strip
x6

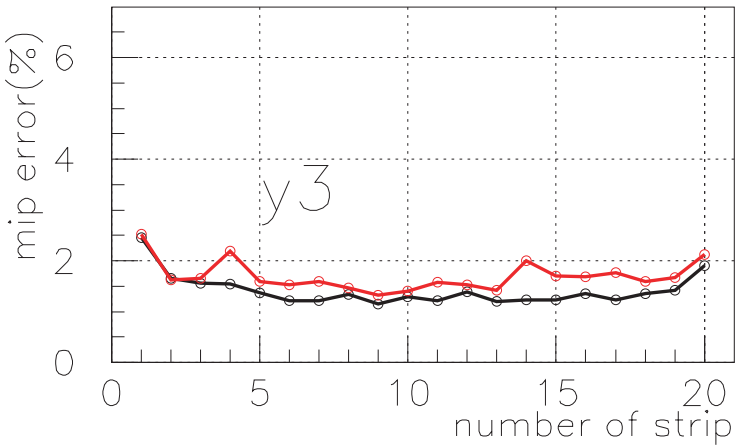

y 1
ADC counts
number of strip

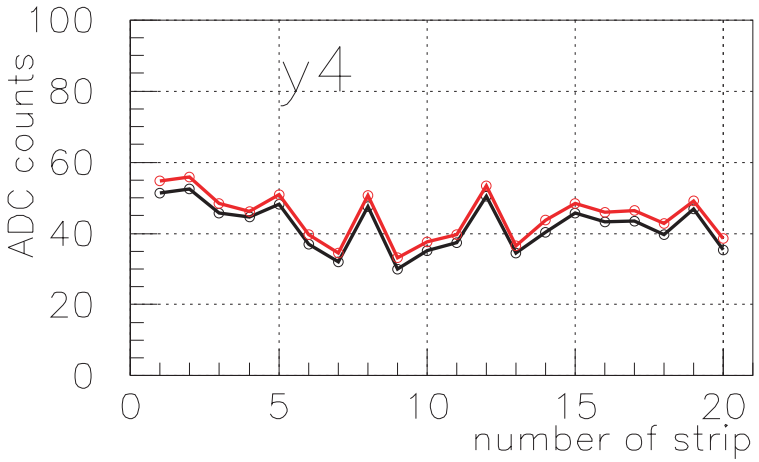

y 1
mip error(%)
number of strip

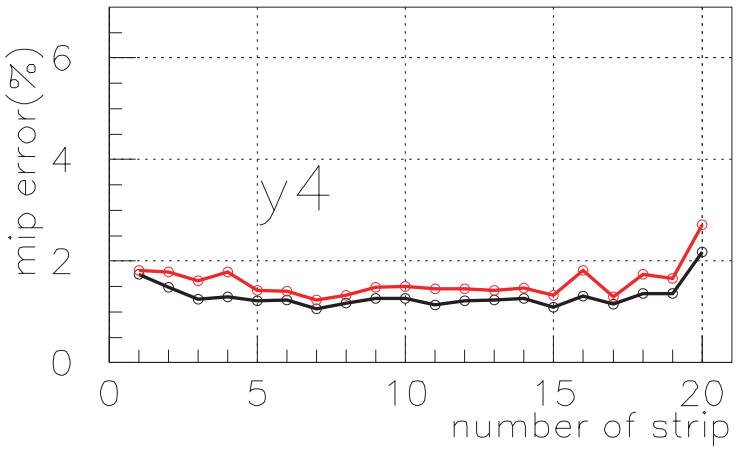

y2
ADC counts
number of strip

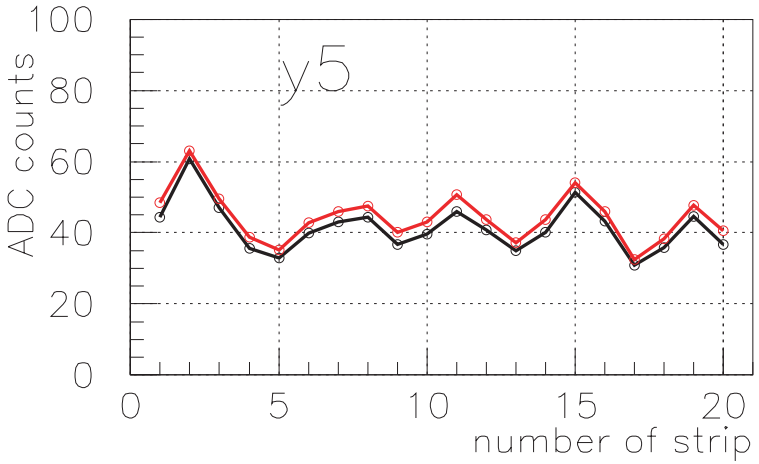

y2
mip error(%)
number of strip

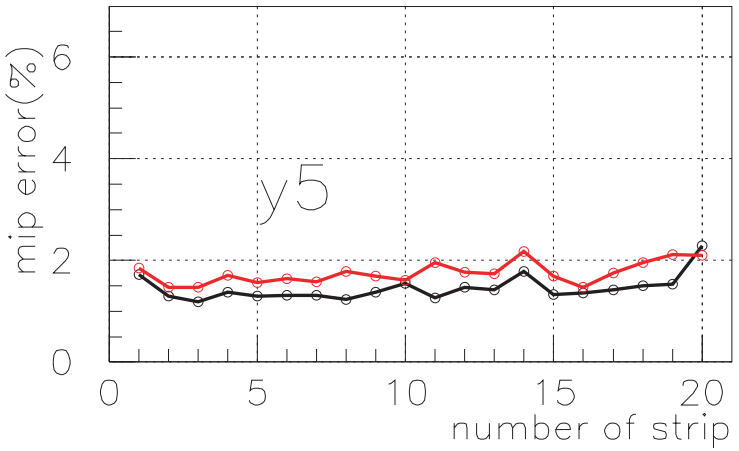

y3
ADC counts
number of strip

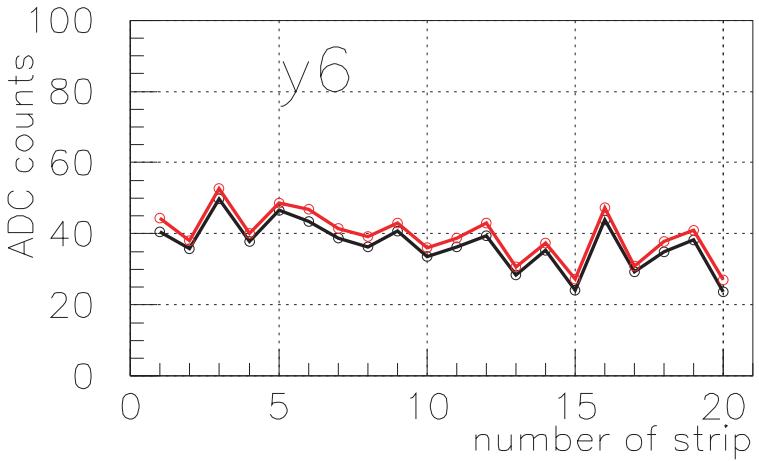

y3
mip error(%)
number of strip

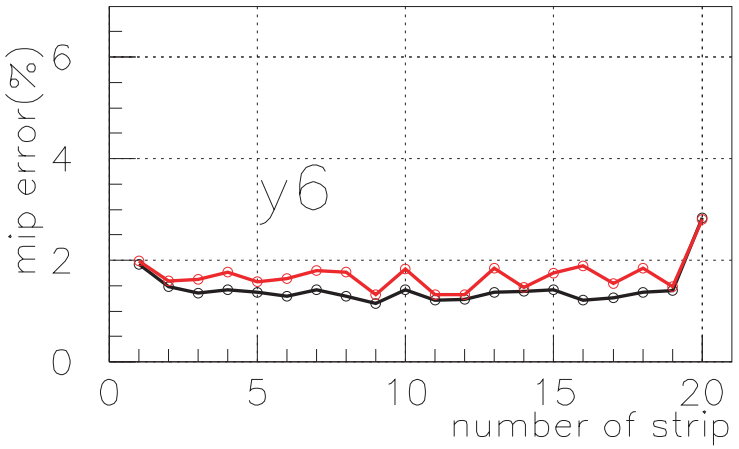

y4
ADC counts
number of strip


y4
mip error(%)
number of strip


y5
ADC counts
number of strip


y5
mip error(%)
number of strip


y6
ADC counts
number of strip


y6
mip error(%)
number of strip

Calibation Constant の比較

自分が求めたcalibration constant の値と
山本さんが求めた値の比較をした

＜山本さんの cut の条件＞

見たい strip を含む S.L. で
strip 番号の異なる strip に信号が無いこと

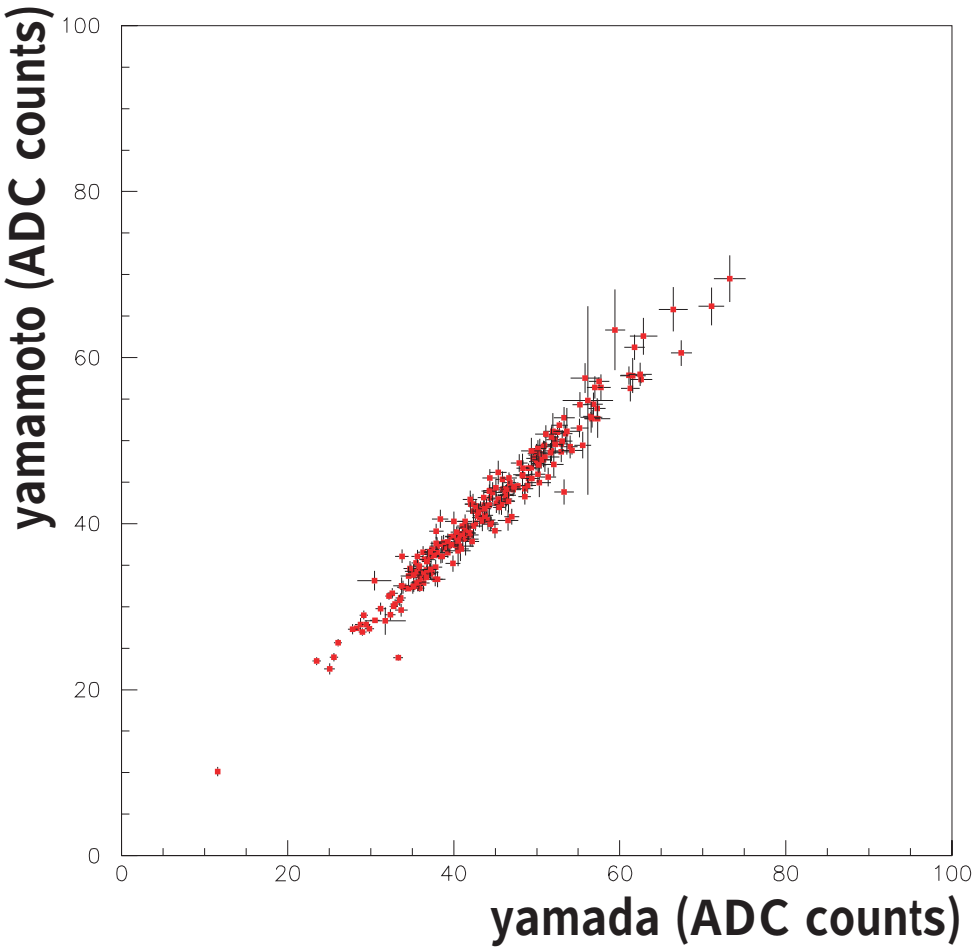
見たい strip の前後の S.L. で
strip 番号の同じ strip に信号が有ること

信号なし

adctem ＜ pedestal ＋ 5 rms

信号あり

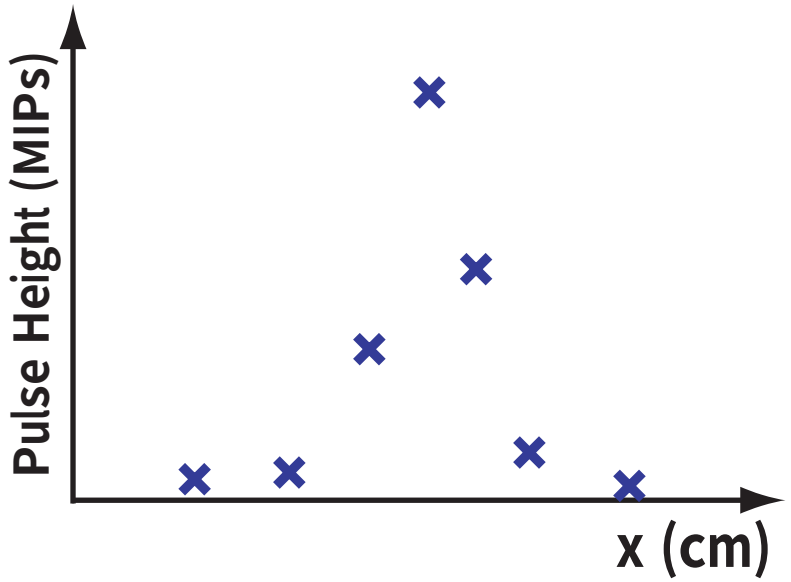
adctem ＞ pedestal ＋ 5 rms



筑波 CAL から求めるシャワー中心

e^- 4 GeV　中心入射の run を使用

全イベントについて
各 S.L. 毎にシャワーの拡がりを plot する

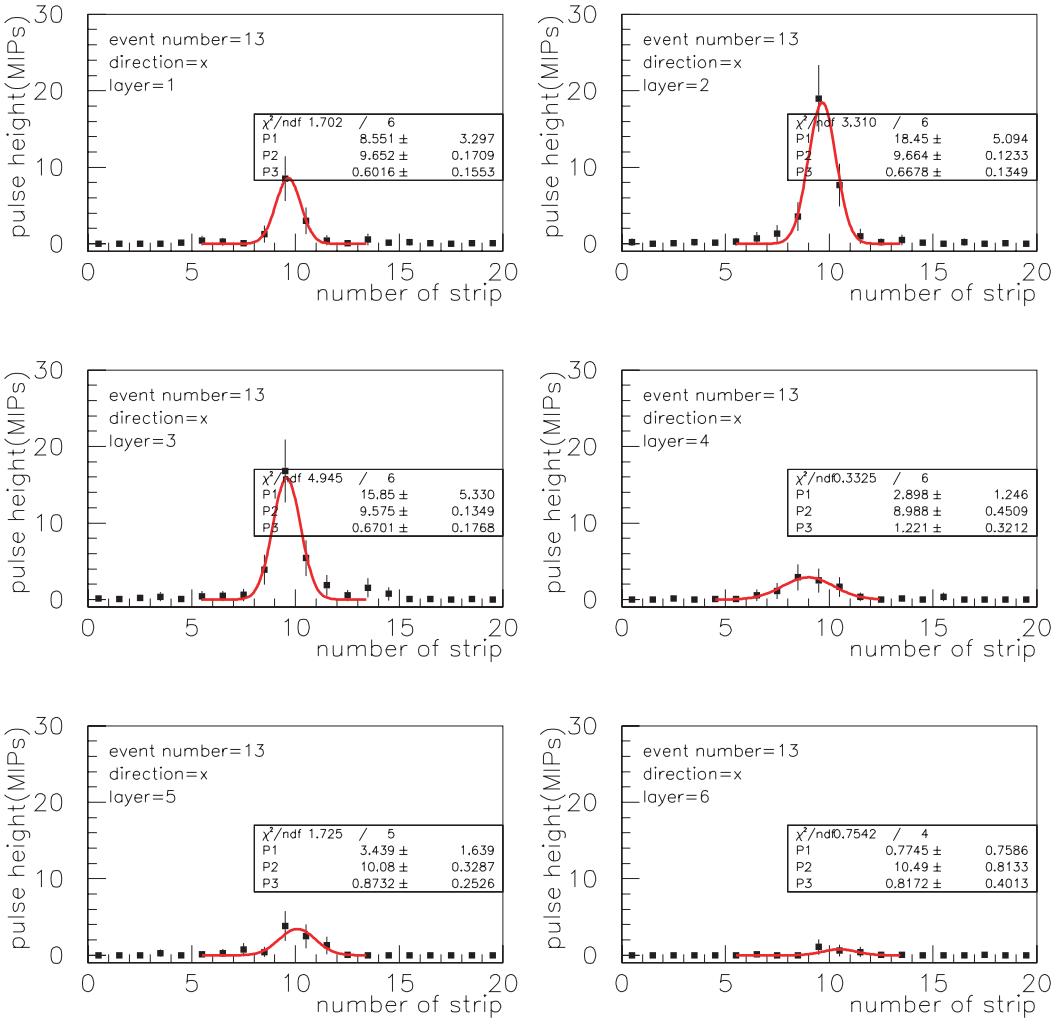


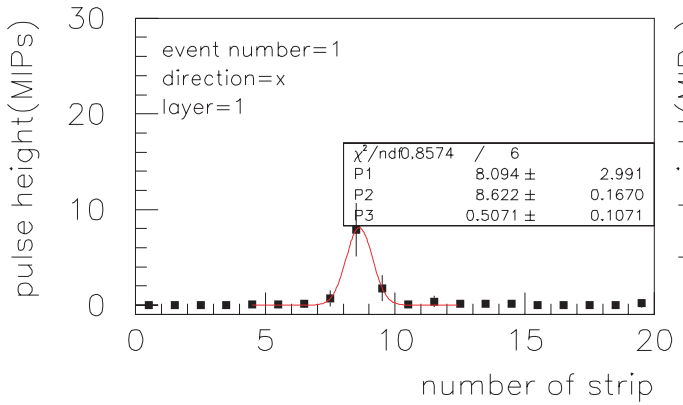
これを gaussian でフィット

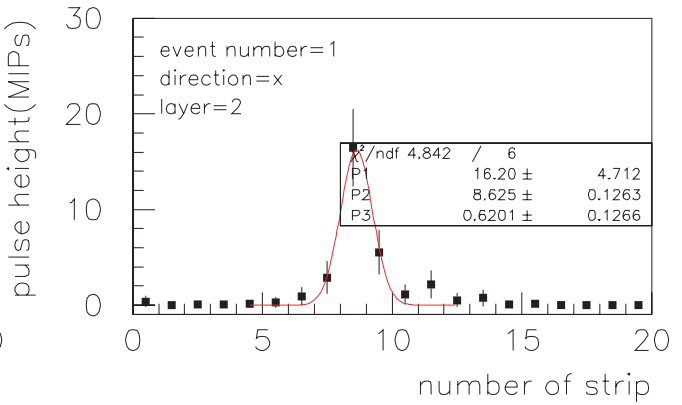
mean = その S.L. でのshower 中心

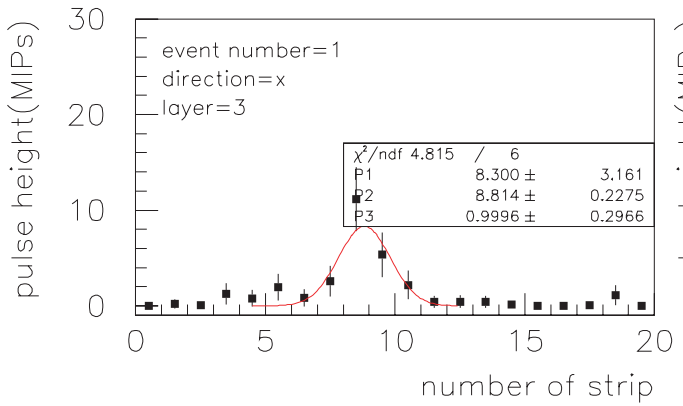
とする

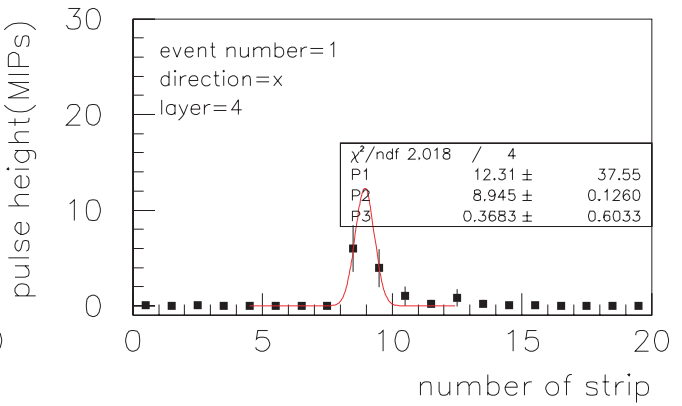
＜ある１イベントのフィット例＞

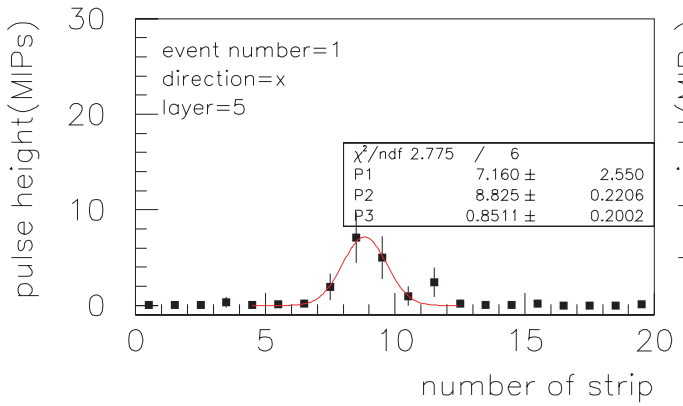


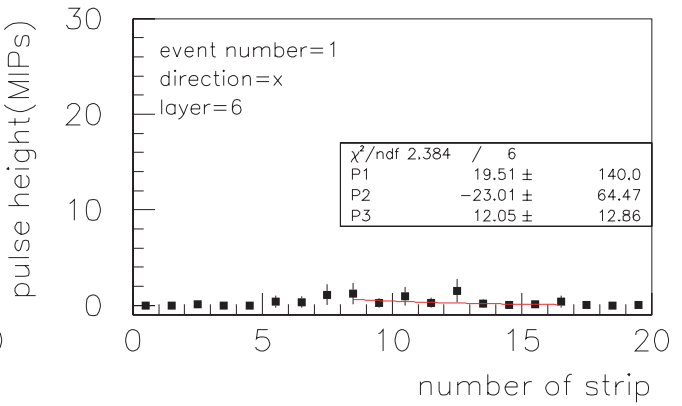

event number=1
direction=x
layer=1
χ²/ndf 0.8574 / 6
P1 8.094 ± 2.991
P2 8.622 ± 0.1670
P3 0.5071 ± 0.1071
pulse height(MIPs)
number of strip

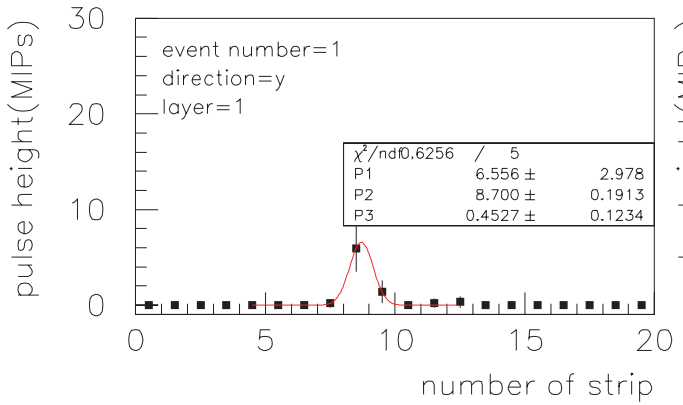

event number=1
direction=x
layer=2
χ²/ndf 4.842 / 6
P1 16.20 ± 4.712
P2 8.625 ± 0.1263
P3 0.6201 ± 0.1266
pulse height(MIPs)
number of strip

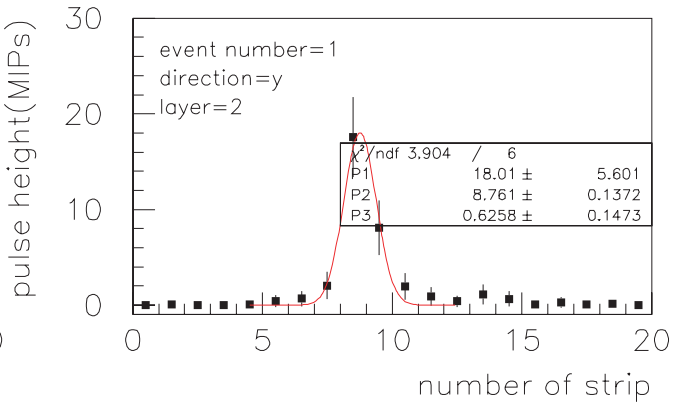

event number=1
direction=x
layer=3
χ²/ndf 4.815 / 6
P1 8.300 ± 3.161
P2 8.814 ± 0.2275
P3 0.9996 ± 0.2966
pulse height(MIPs)
number of strip

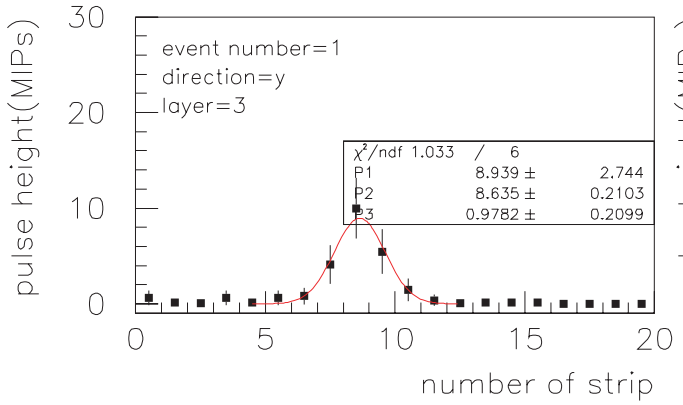

event number=1
direction=x
layer=4
χ²/ndf 2.018 / 4
P1 12.31 ± 37.55
P2 8.945 ± 0.1260
P3 0.3683 ± 0.6033
pulse height(MIPs)
number of strip

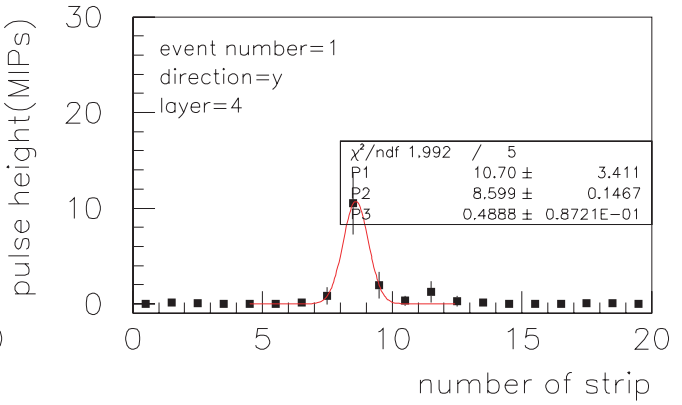

event number=1
direction=x
layer=5
χ²/ndf 2.775 / 6
P1 7.160 ± 2.550
P2 8.825 ± 0.2206
P3 0.8511 ± 0.2002
pulse height(MIPs)
number of strip

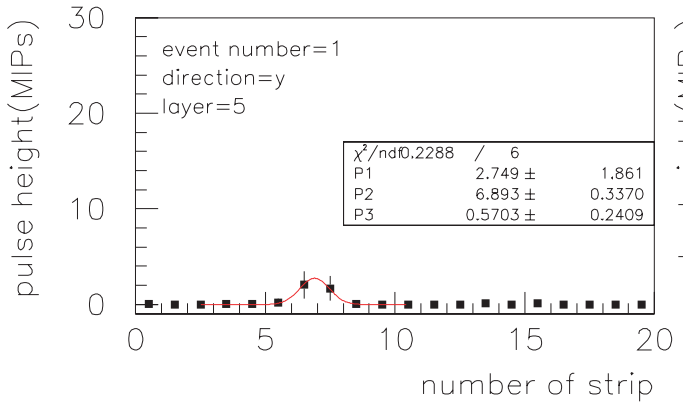

event number=1
direction=x
layer=6
χ²/ndf 2.384 / 6
P1 19.51 ± 140.0
P2 −23.01 ± 64.47
P3 12.05 ± 12.86
pulse height(MIPs)
number of strip

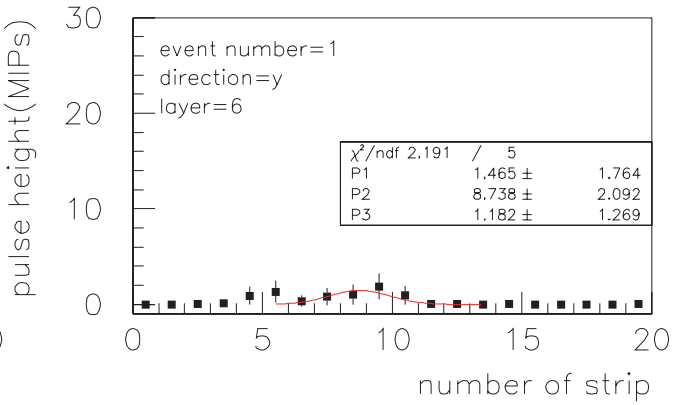

event number=1
direction=y
layer=1
χ²/ndf 0.6256 / 5
P1 6.556 ± 2.978
P2 8.700 ± 0.1913
P3 0.4527 ± 0.1234
pulse height(MIPs)
number of strip


event number=1
direction=y
layer=2
χ²/ndf 3.904 / 6
P1 18.01 ± 5.601
P2 8.761 ± 0.1372
P3 0.6258 ± 0.1473
pulse height(MIPs)
number of strip


event number=1
direction=y
layer=3
χ²/ndf 1.033 / 6
P1 8.939 ± 2.744
P2 8.635 ± 0.2103
P3 0.9782 ± 0.2099
pulse height(MIPs)
number of strip


event number=1
direction=y
layer=4
χ²/ndf 1.992 / 5
P1 10.70 ± 3.411
P2 8.599 ± 0.1467
P3 0.4888 ± 0.8721E-01
pulse height(MIPs)
number of strip

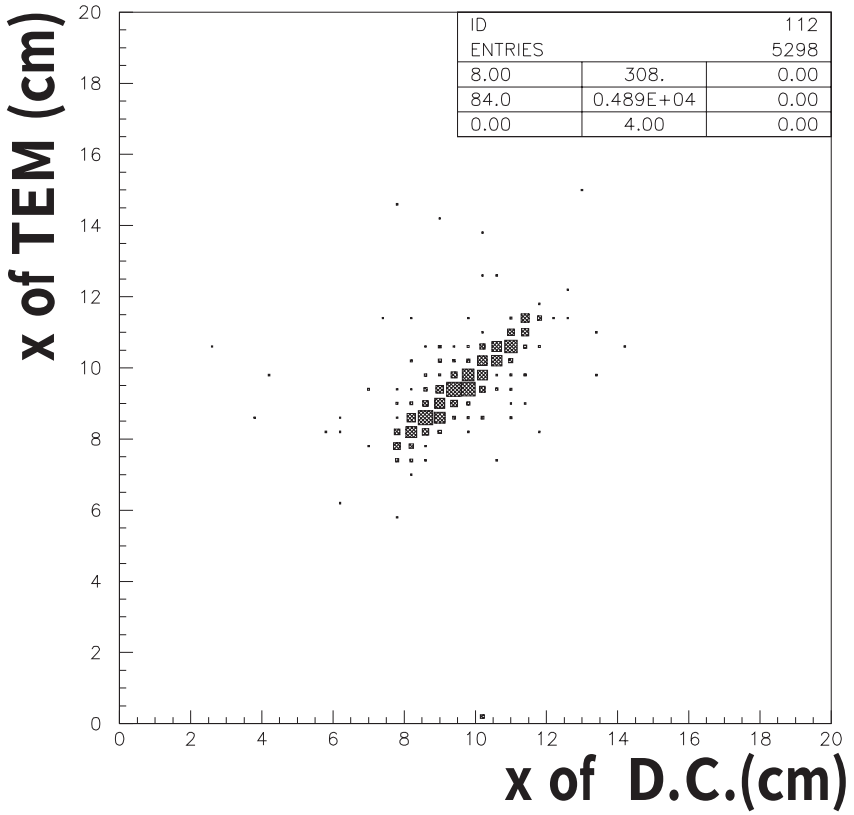

event number=1
direction=y
layer=5
χ²/ndf 0.2288 / 6
P1 2.749 ± 1.861
P2 6.893 ± 0.3370
P3 0.5703 ± 0.2409
pulse height(MIPs)
number of strip


event number=1
direction=y
layer=6
χ²/ndf 2.191 / 5
P1 1.465 ± 1.764
P2 8.738 ± 2.092
P3 1.182 ± 1.269
pulse height(MIPs)
number of strip

ドリフトチェンバーとの比較

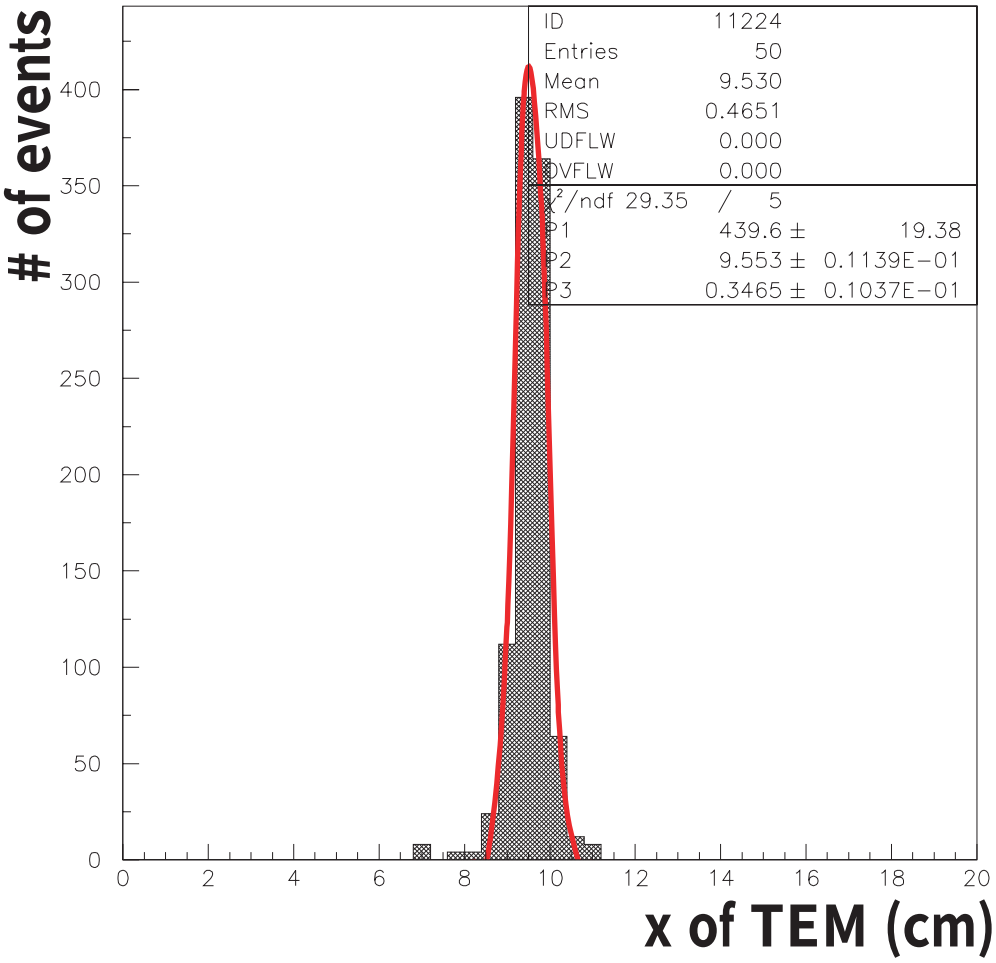
筑波 CAL で求めたシャワーの中心位置
|||
粒子入射位置

として
これと、ドリフトチェンバーから求めた
カロリメータへの粒子入射位置と比較する

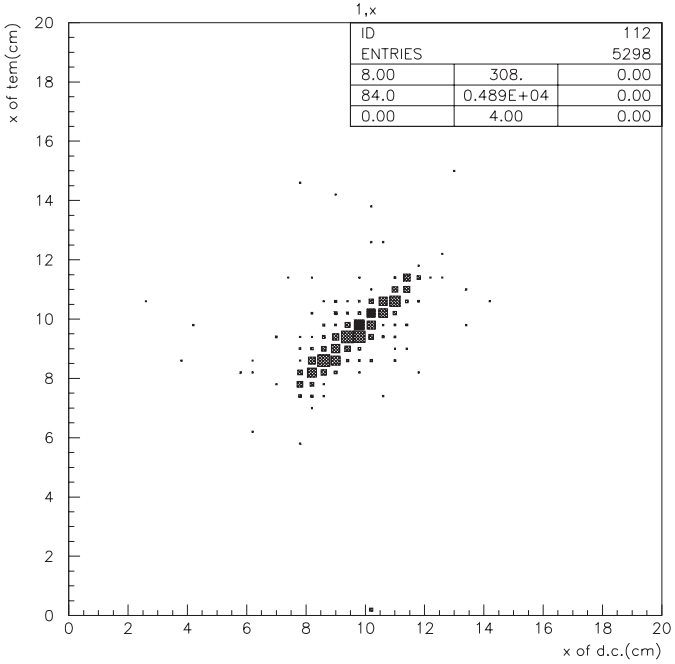


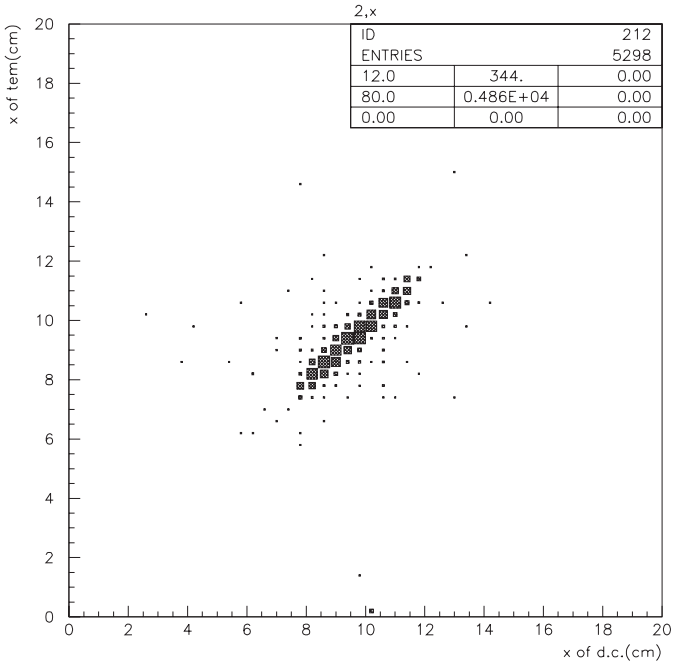
この 2-D histgram を
ビン毎にスライスし、分布をとる

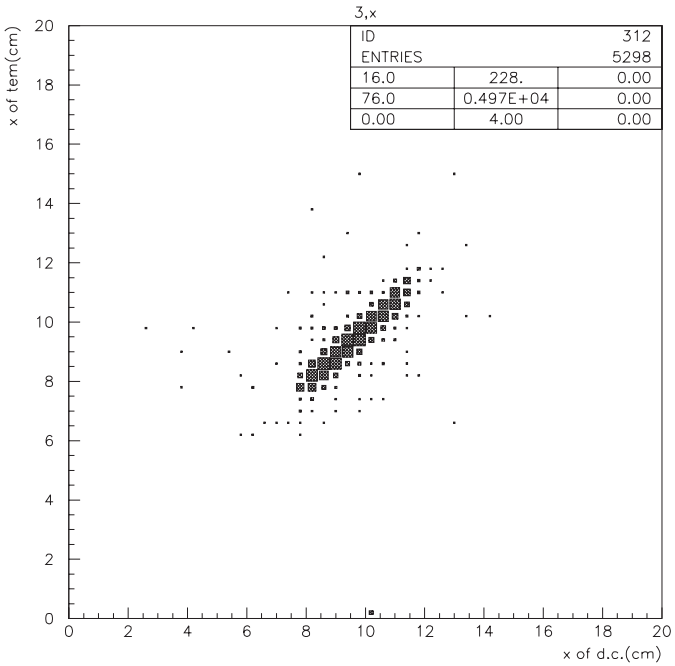
＜分布の例＞

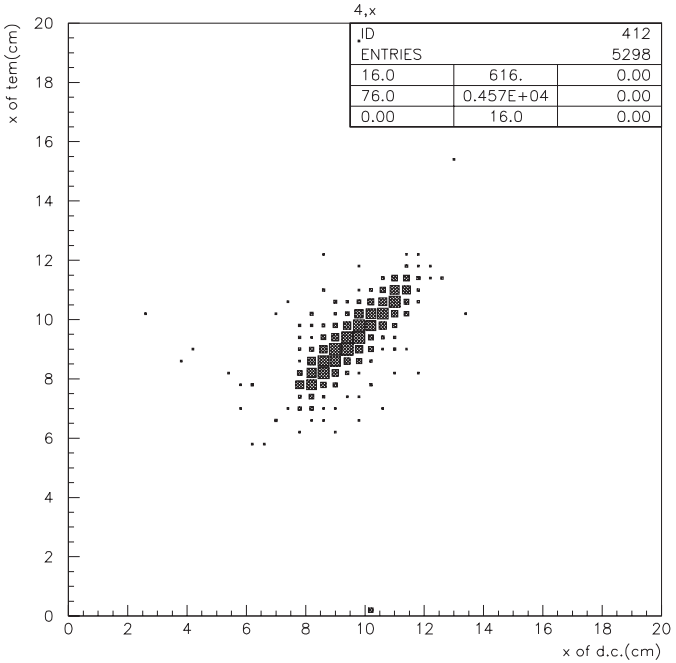


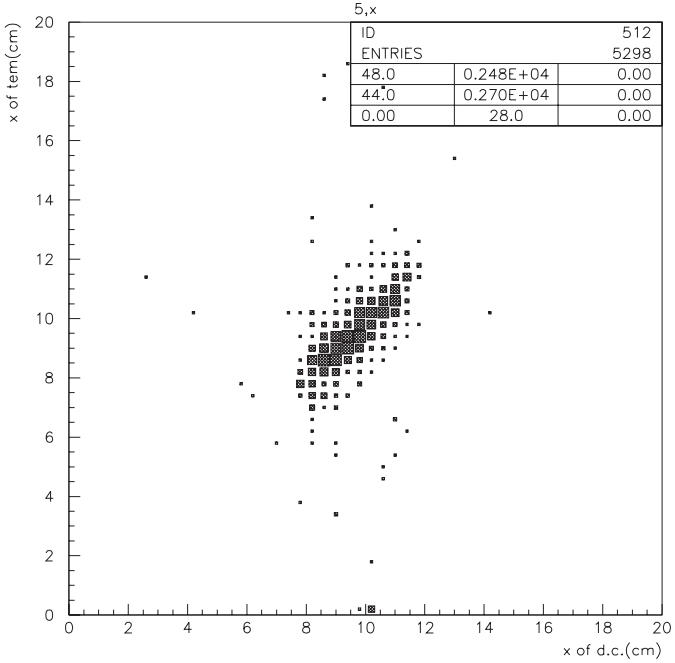
X 方向

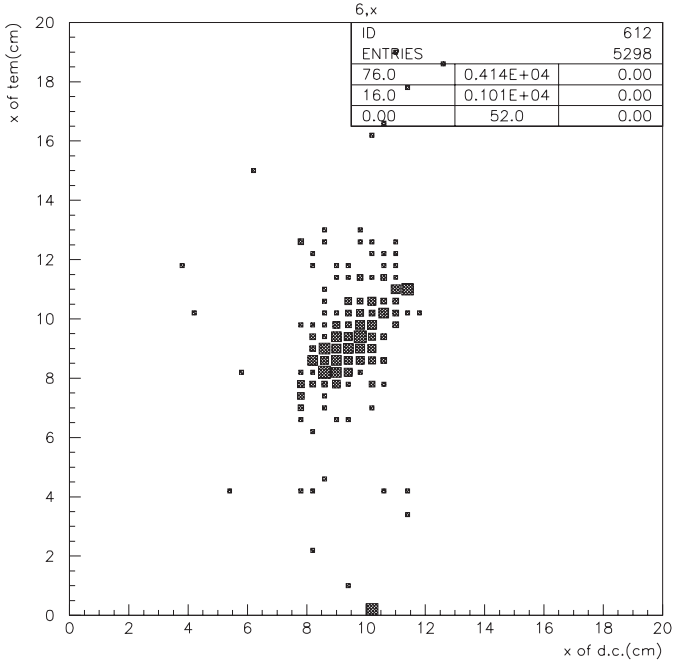

1,x
ID 112
ENTRIES 5298
8.00 308. 0.00
84.0 0.489E+04 0.00
0.00 4.00 0.00
x of tem(cm)
x of d.c.(cm)


2,x
ID 212
ENTRIES 5298
12.0 344. 0.00
80.0 0.486E+04 0.00
0.00 0.00 0.00
x of tem(cm)
x of d.c.(cm)

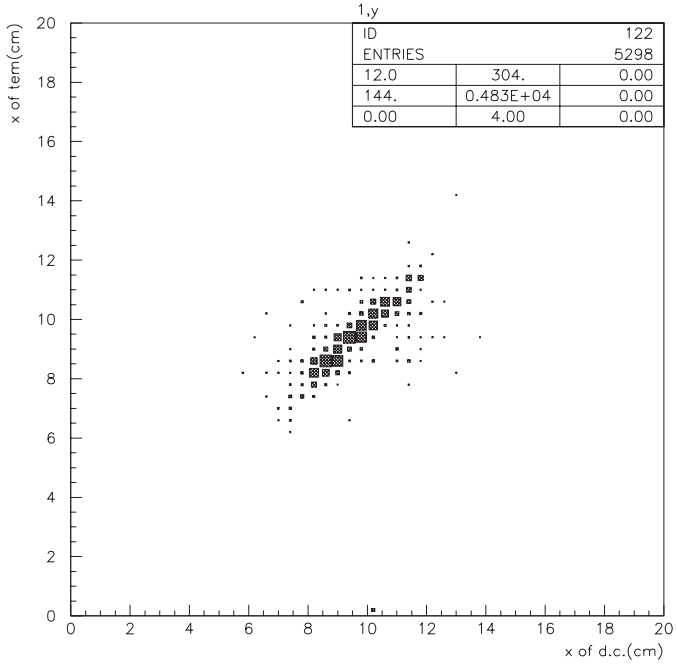

3,x
ID 312
ENTRIES 5298
16.0 228. 0.00
76.0 0.497E+04 0.00
0.00 4.00 0.00
x of tem(cm)
x of d.c.(cm)

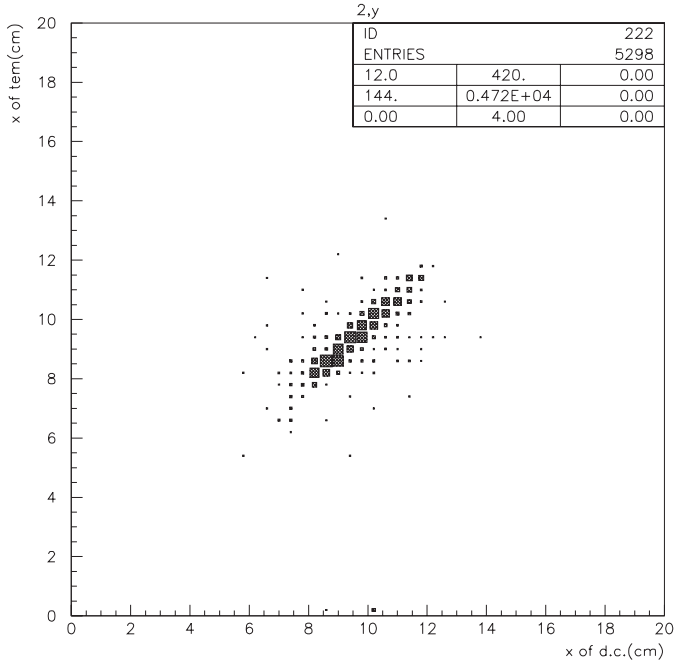

4,x
ID 412
ENTRIES 5298
16.0 616. 0.00
76.0 0.457E+04 0.00
0.00 16.0 0.00
x of tem(cm)
x of d.c.(cm)

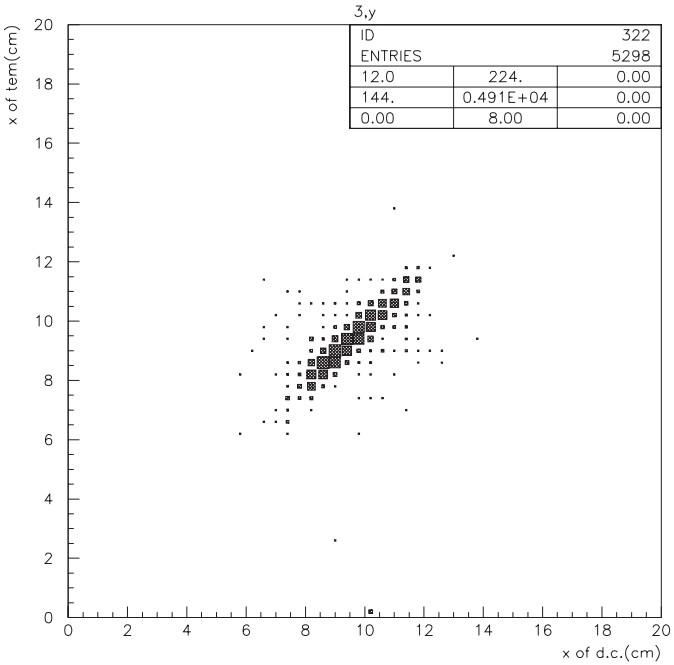

5,x
ID 512
ENTRIES 5298
48.0 0.248E+04 0.00
44.0 0.270E+04 0.00
0.00 28.0 0.00
x of tem(cm)
x of d.c.(cm)

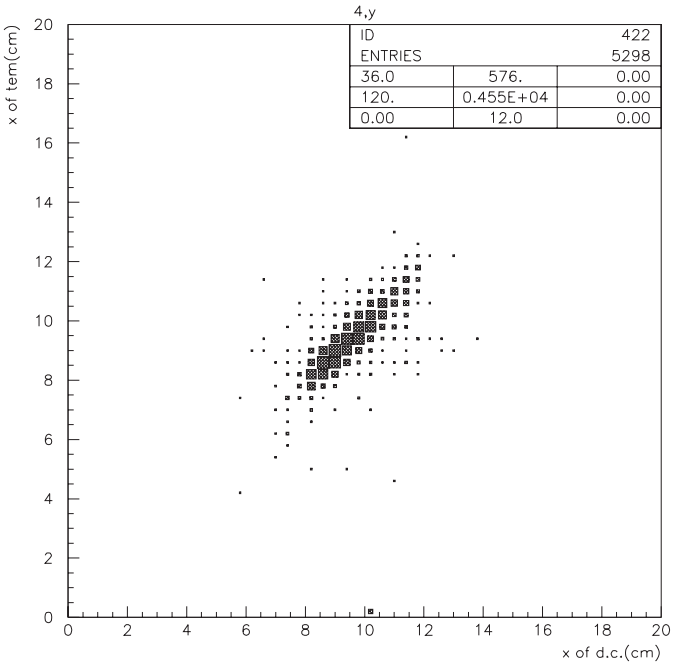

6,x
ID 612
ENTRIES 5298
76.0 0.414E+04 0.00
16.0 0.101E+04 0.00
0.00 52.0 0.00
x of tem(cm)
x of d.c.(cm)

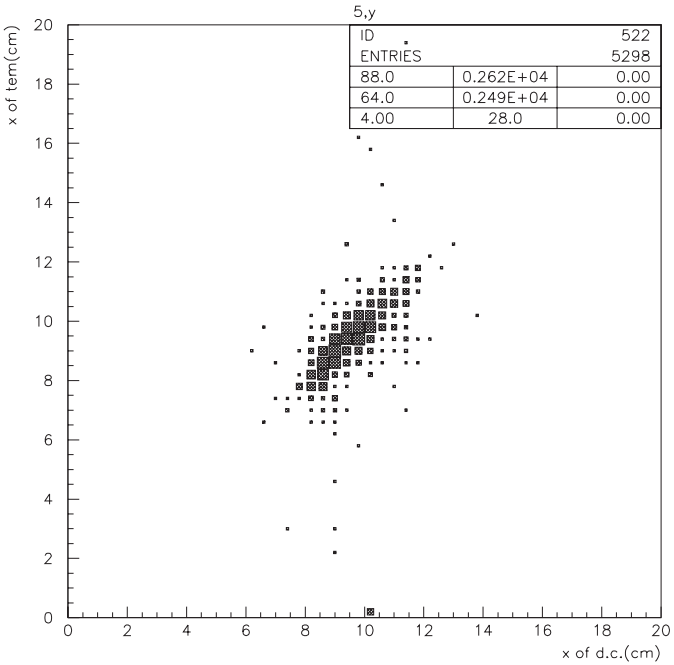
Y 方向

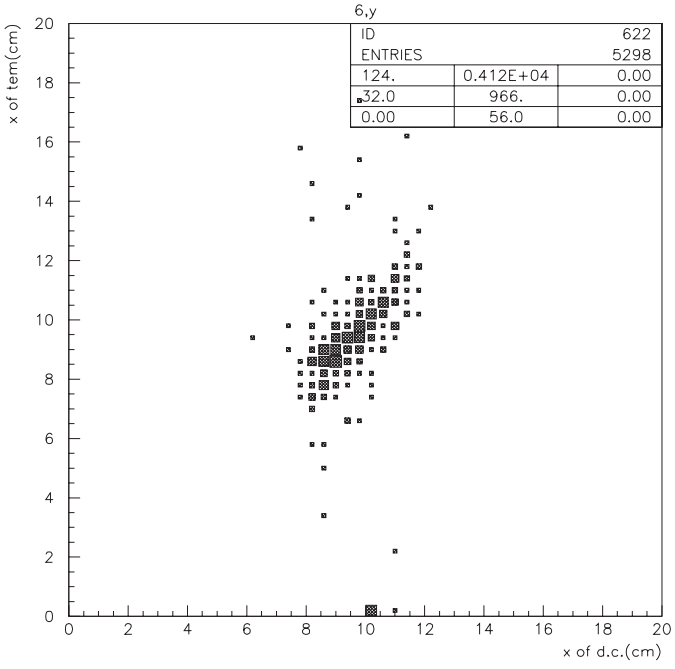

1,y
ID 122
ENTRIES 5298
12.0 304. 0.00
144. 0.483E+04 0.00
0.00 4.00 0.00
x of tem(cm)
x of d.c.(cm)


2,y
ID 222
ENTRIES 5298
12.0 420. 0.00
144. 0.472E+04 0.00
0.00 4.00 0.00
x of tem(cm)
x of d.c.(cm)

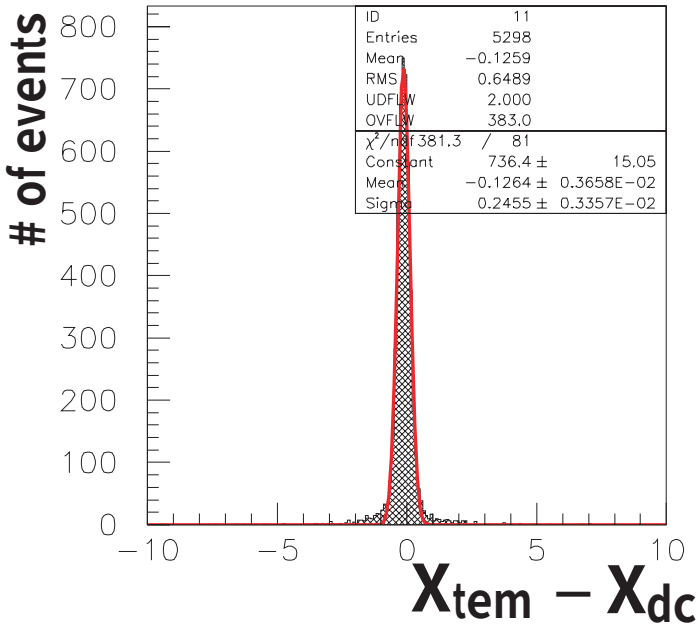

3,y
ID 322
ENTRIES 5298
12.0 224. 0.00
144. 0.491E+04 0.00
0.00 8.00 0.00
x of tem(cm)
x of d.c.(cm)

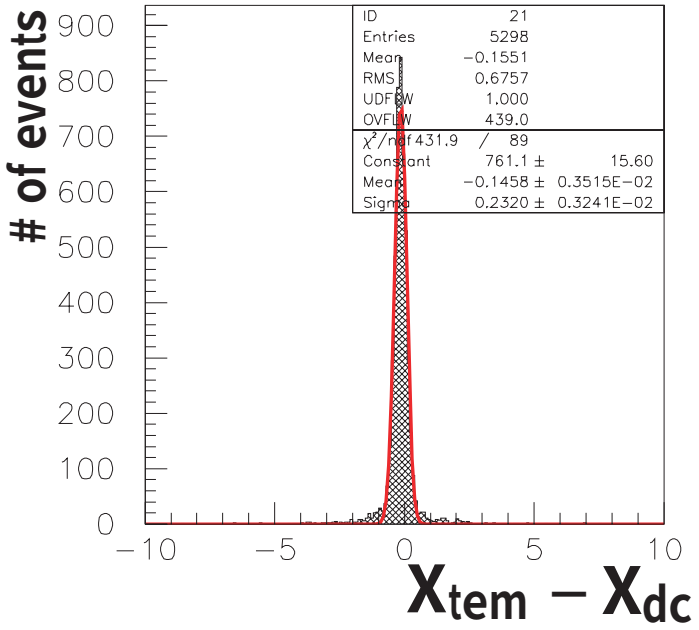

4,y
ID 422
ENTRIES 5298
36.0 576. 0.00
120. 0.455E+04 0.00
0.00 12.0 0.00
x of tem(cm)
x of d.c.(cm)

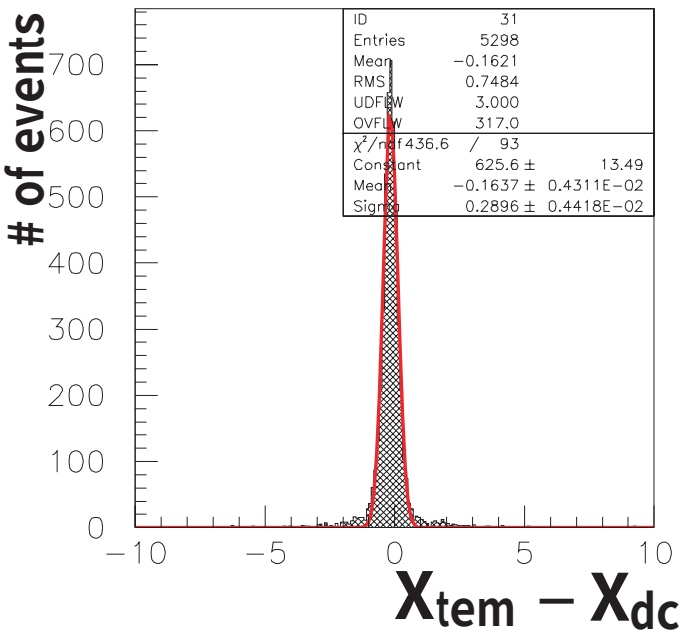

5,y
ID 522
ENTRIES 5298
88.0 0.262E+04 0.00
64.0 0.249E+04 0.00
4.00 28.0 0.00
x of tem(cm)
x of d.c.(cm)

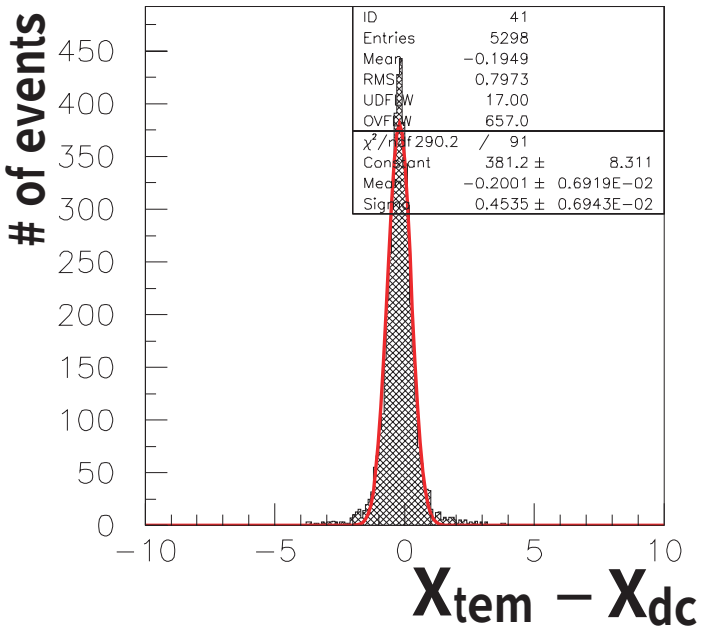

6,y
ID 622
ENTRIES 5298
124. 0.412E+04 0.00
32.0 966. 0.00
0.00 56.0 0.00
x of tem(cm)
x of d.c.(cm)

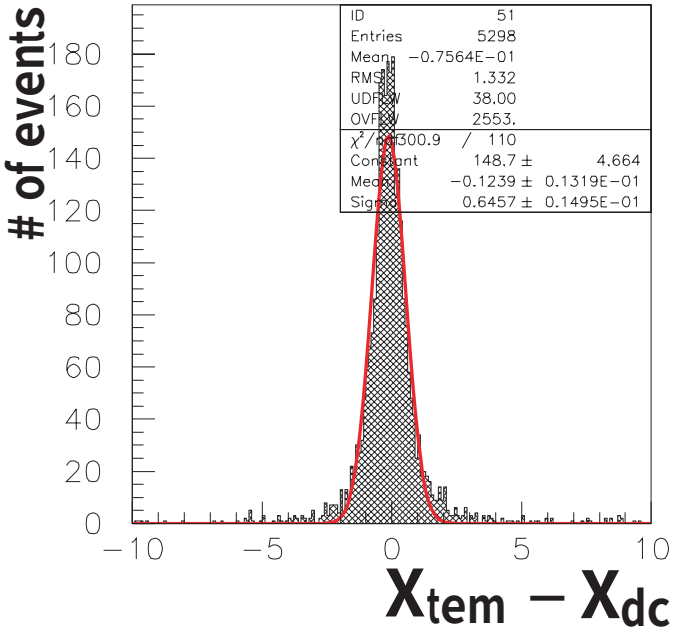
＜粒子入射位置の差　筑波CAL vs D.C. ＞　X 方向

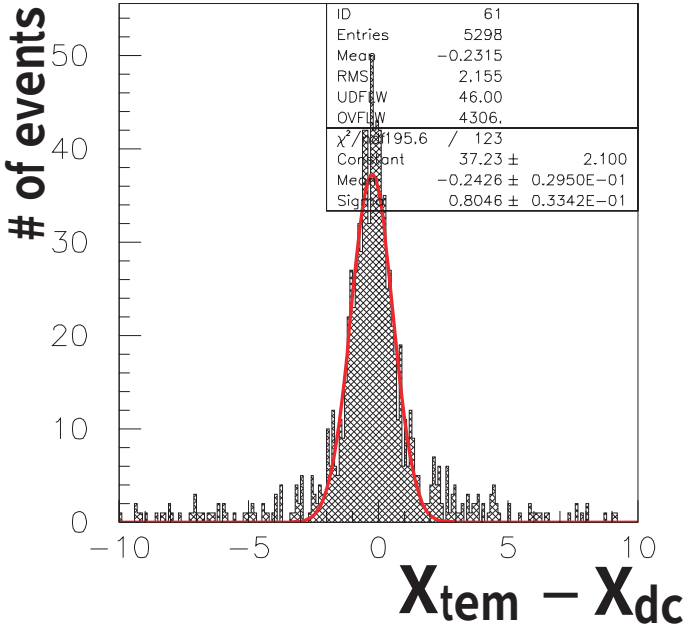




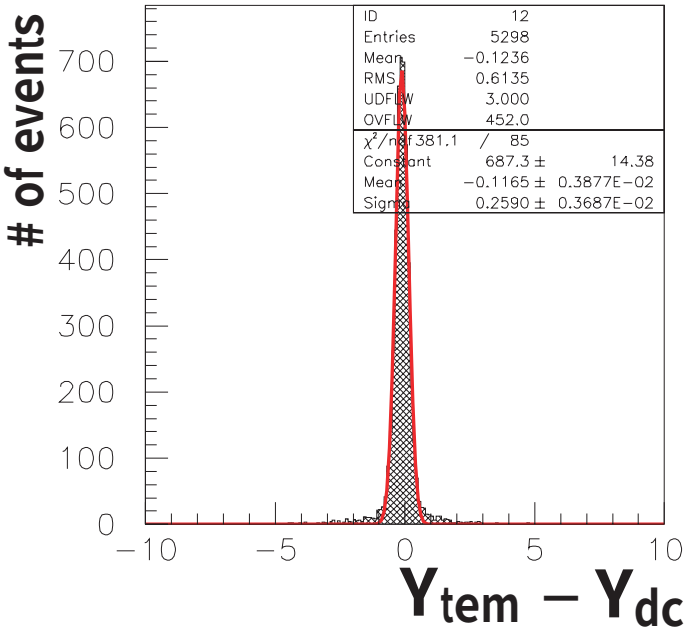


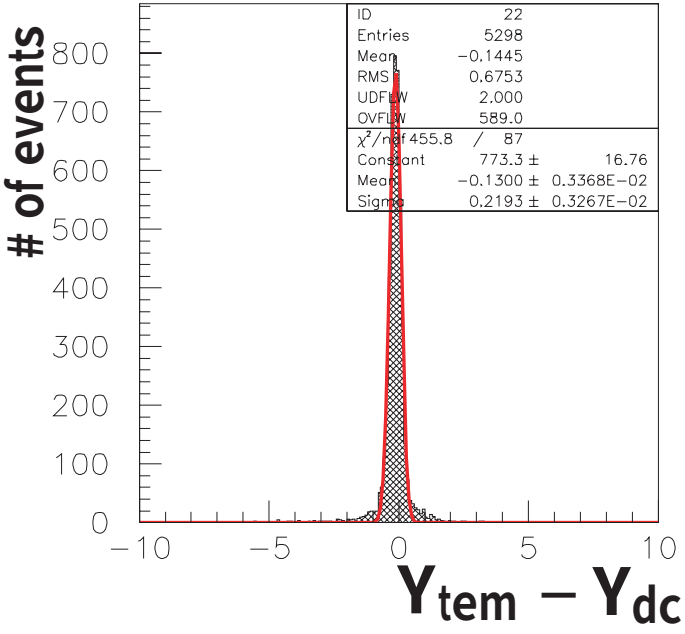


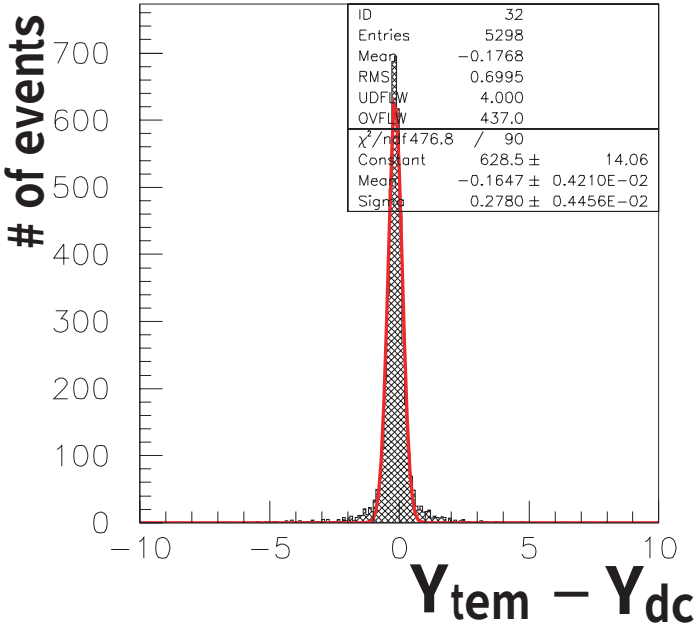


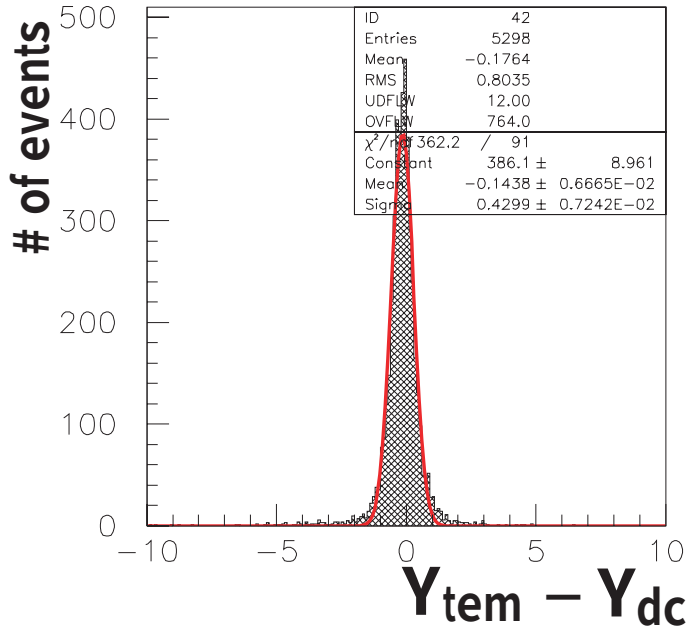


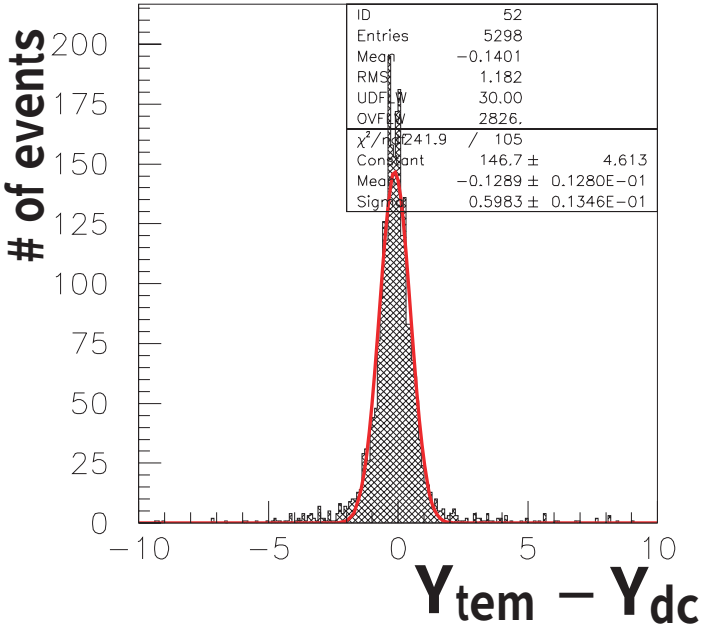
＜粒子入射位置の差　筑波CAL vs D.C. ＞　Y 方向

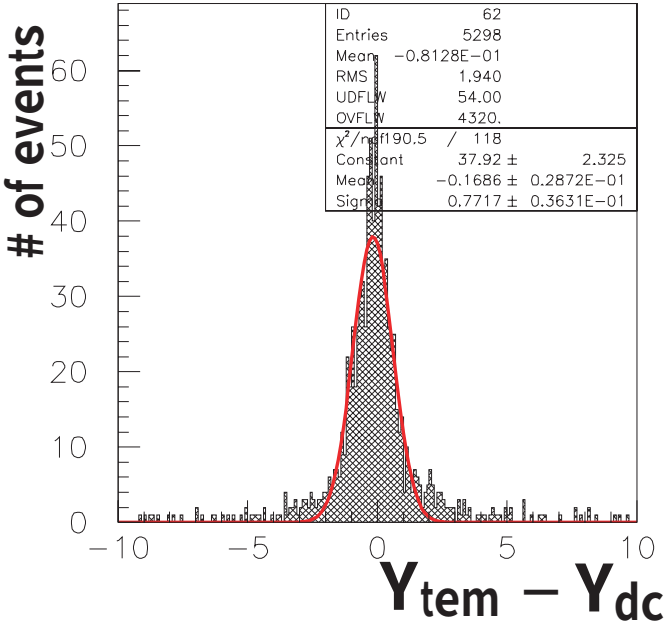




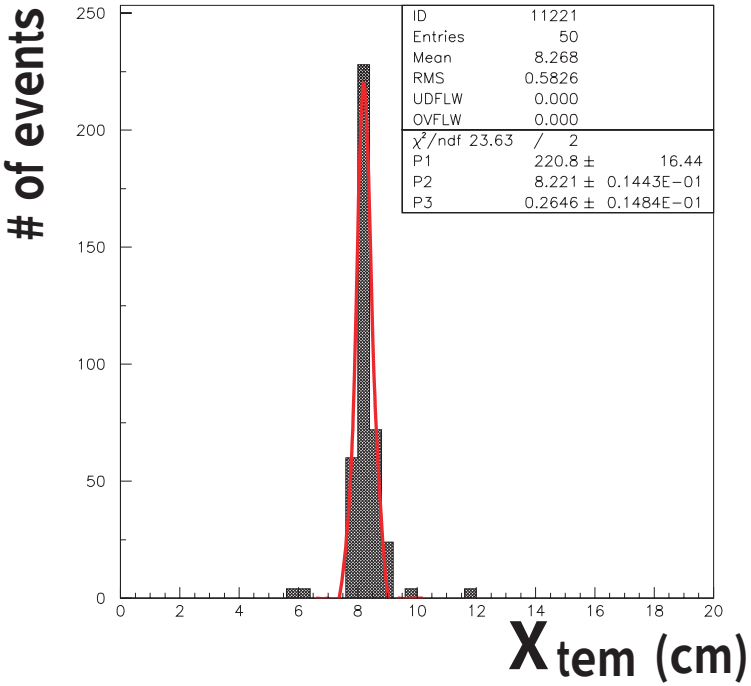


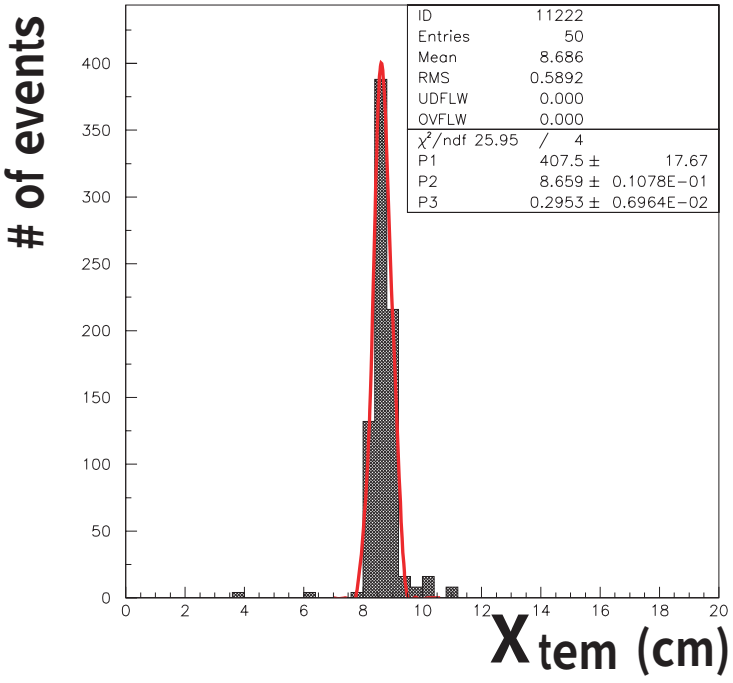


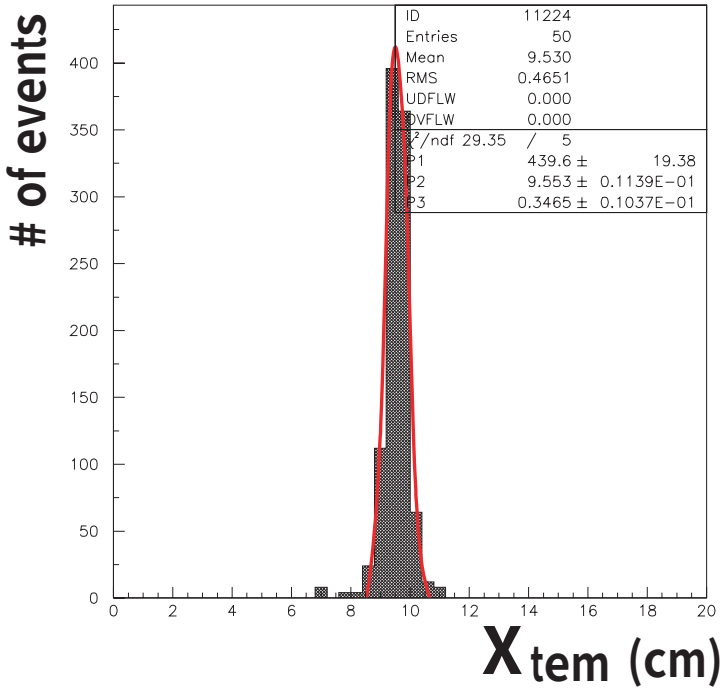


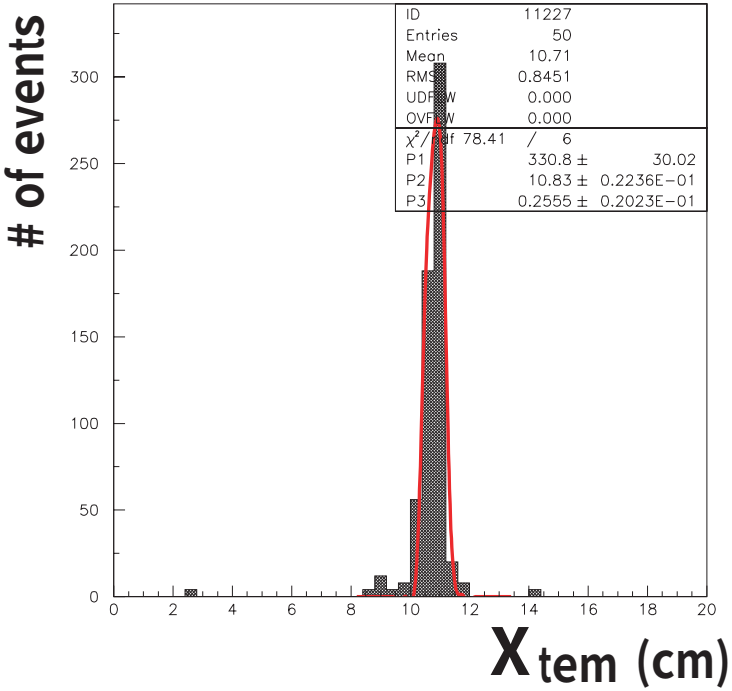


＜スライス面での X_{tem} or Y_{tem} の分布例＞









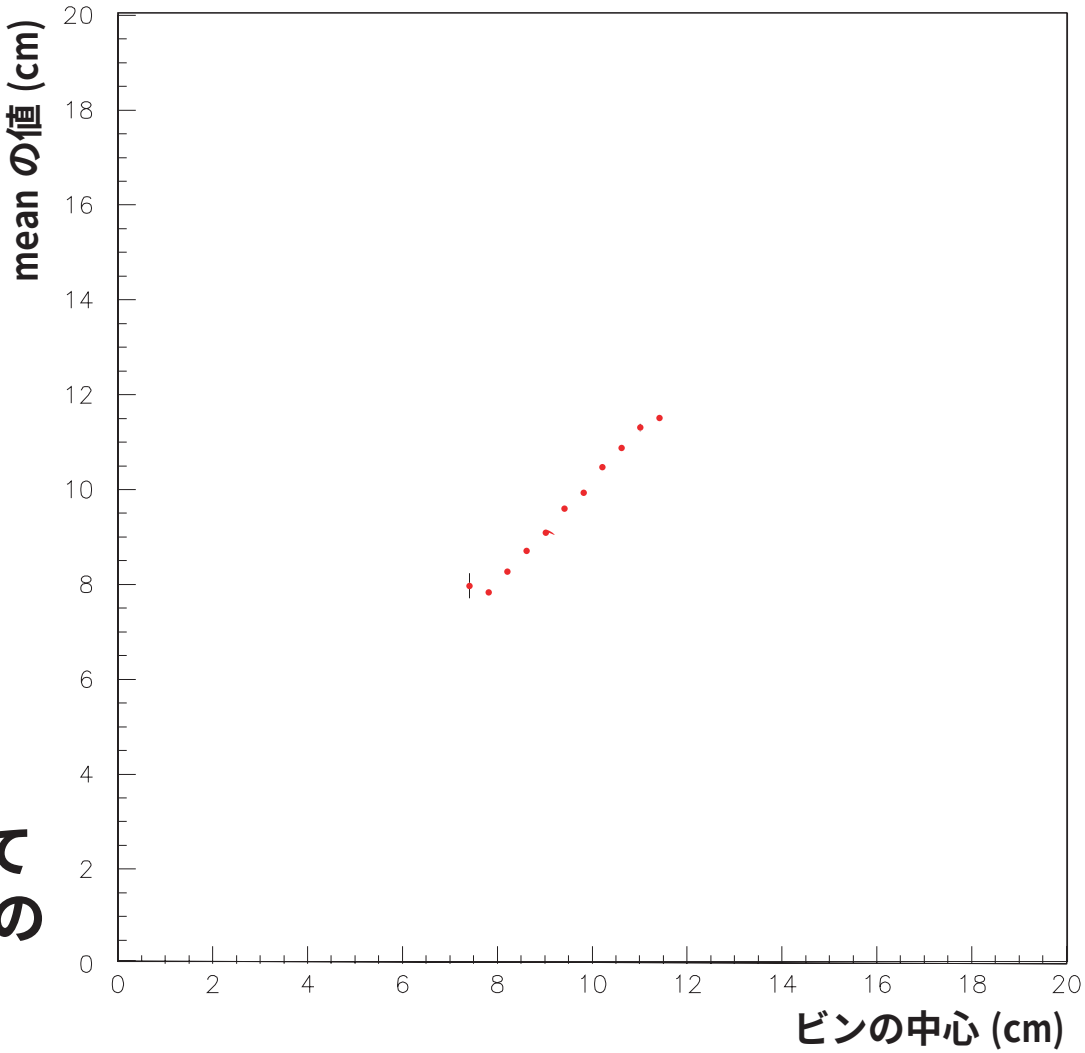
（つづき）

分布を gaussian でフィット
したときの mean

=

筑波CALから求められた
そのスライス面での
シャワーの中心

として
mean とスライスしたビンの中心
(1ビンの幅＝ 0.4 cm)
との相関をとってみる

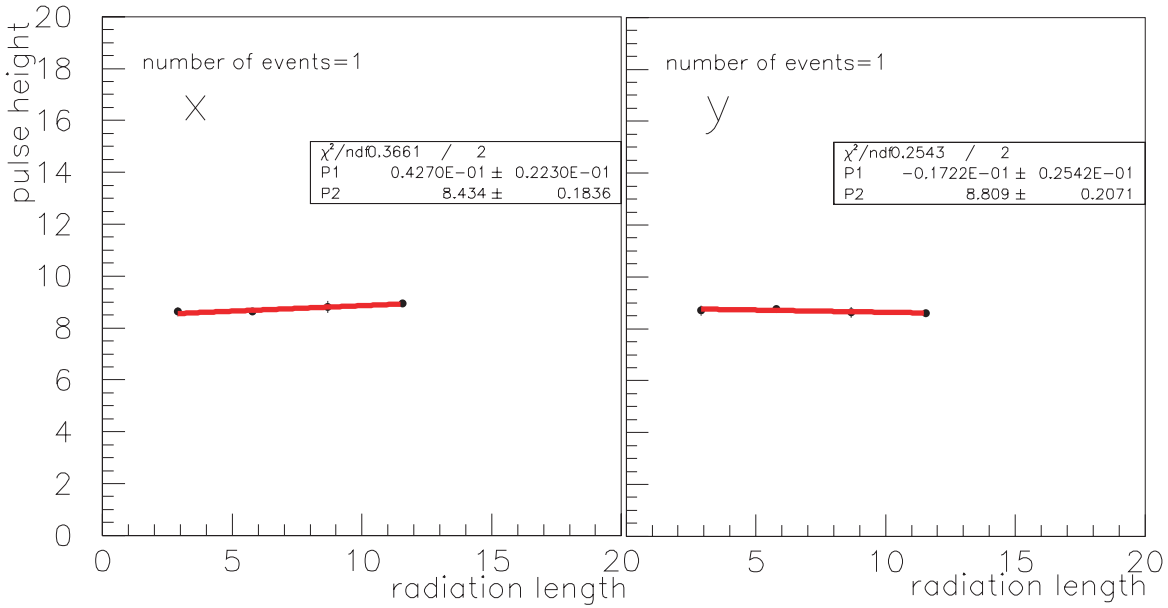


このプロットを関数でフィットして
筑波CAL から求めた粒子入射位置の
補正関数を導出する
（これから）

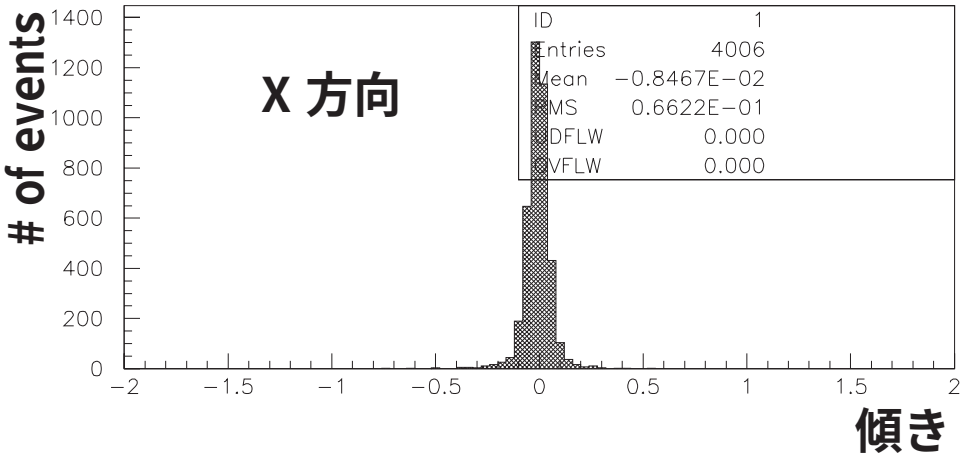
シャワー方向の解析

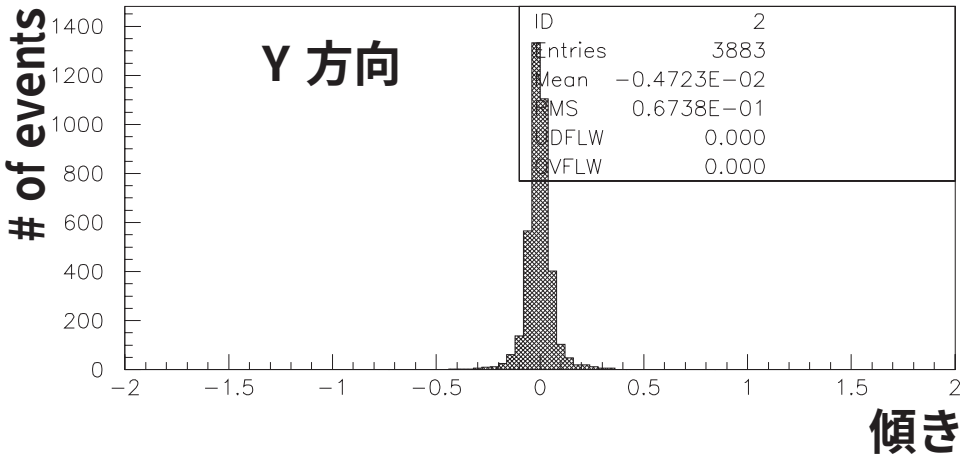
先頁で求めた各S.L. 毎のシャワー中心を
直線でフィットすることで
シャワーの方向を決定する

＜4 S.L. まででフィット＞

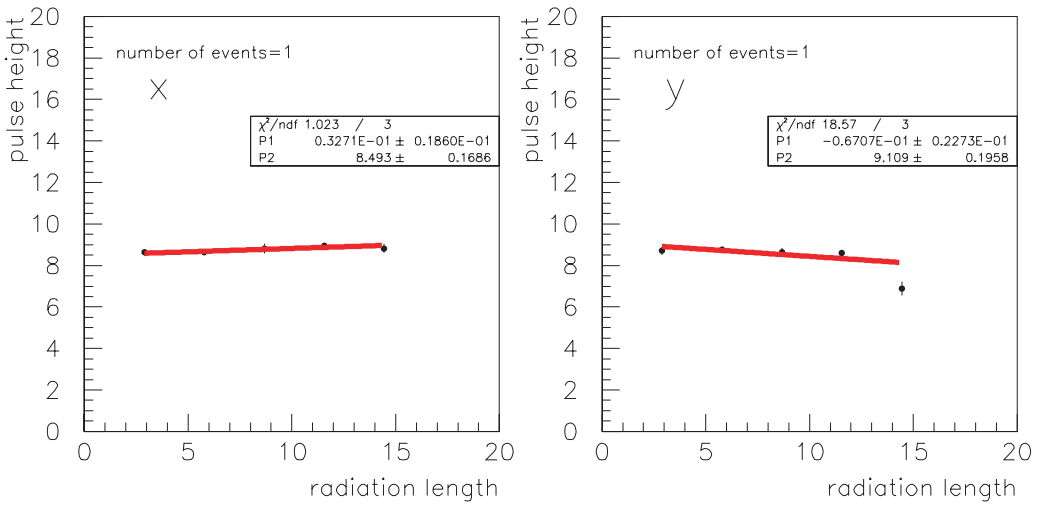


このときの直線の傾きの分布は
下図のようになる

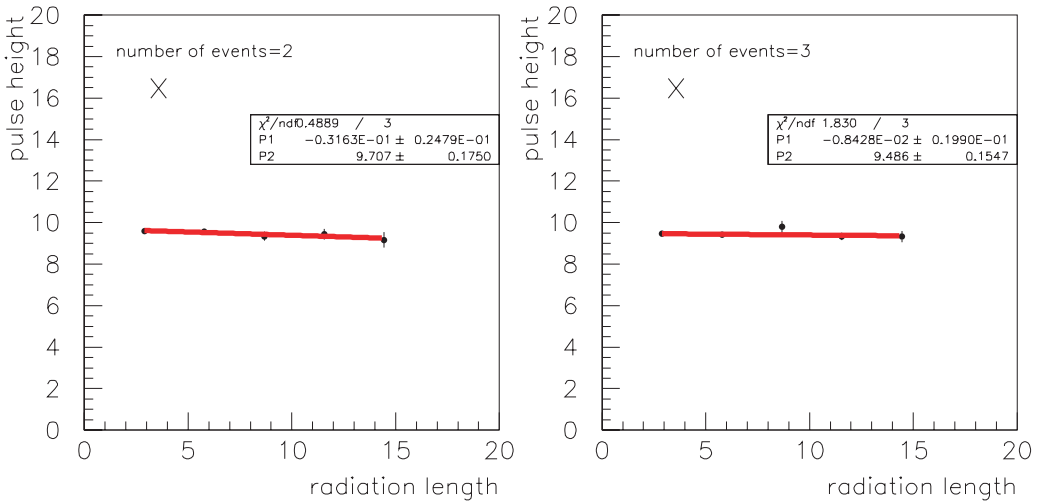




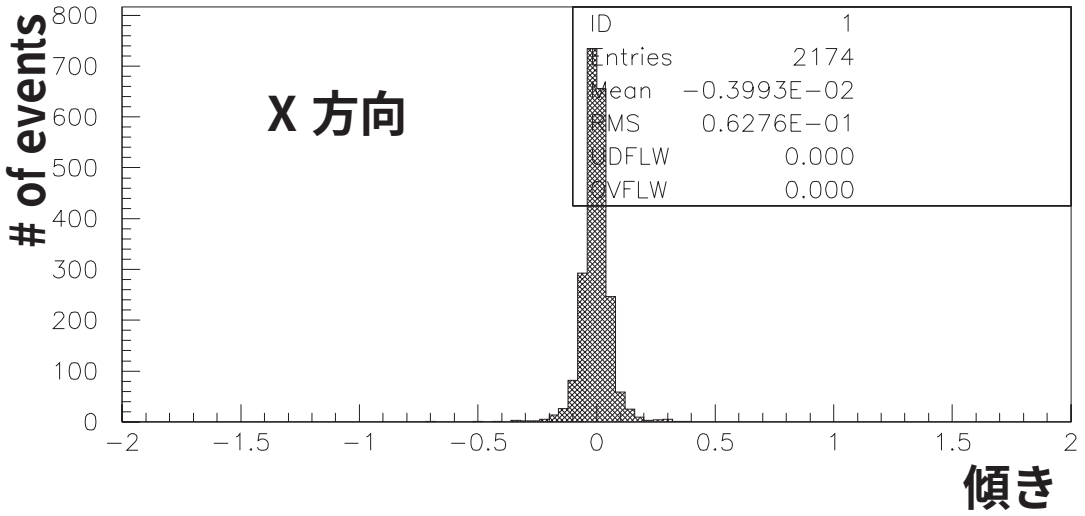
＜5 S.L. まででフィット＞

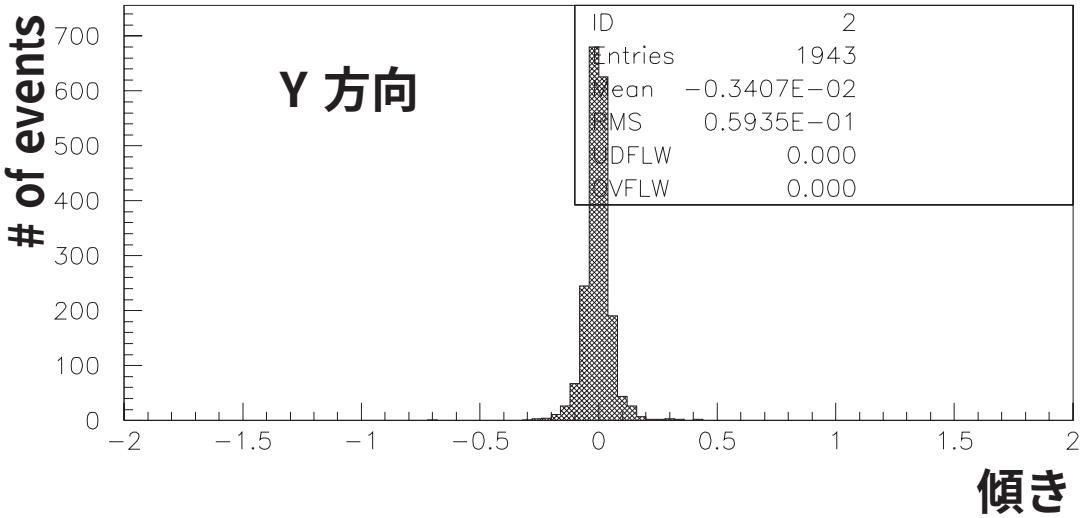

number of events=1
X
χ²/ndf 1.023 / 3
P1 0.3271E-01 ± 0.1860E-01
P2 8.493 ± 0.1686
pulse height
radiation length

number of events=1
y
χ²/ndf 18.57 / 3
P1 -0.6707E-01 ± 0.2273E-01
P2 9.109 ± 0.1958
pulse height
radiation length

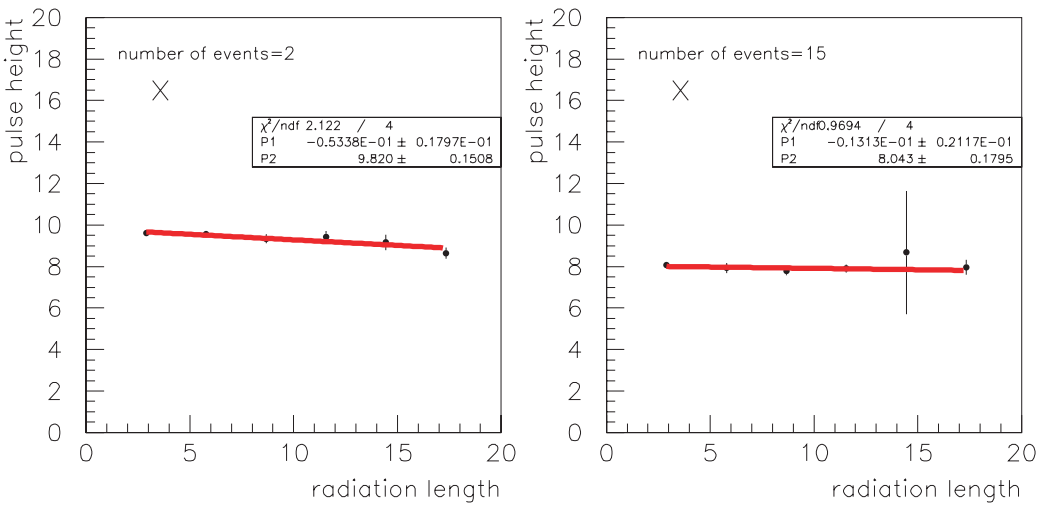

number of events=2
X
χ²/ndf0.4889 / 3
P1 -0.3163E-01 ± 0.2479E-01
P2 9.707 ± 0.1750
pulse height
radiation length

number of events=3
X
χ²/ndf 1.830 / 3
P1 -0.8428E-02 ± 0.1990E-01
P2 9.486 ± 0.1547
pulse height
radiation length

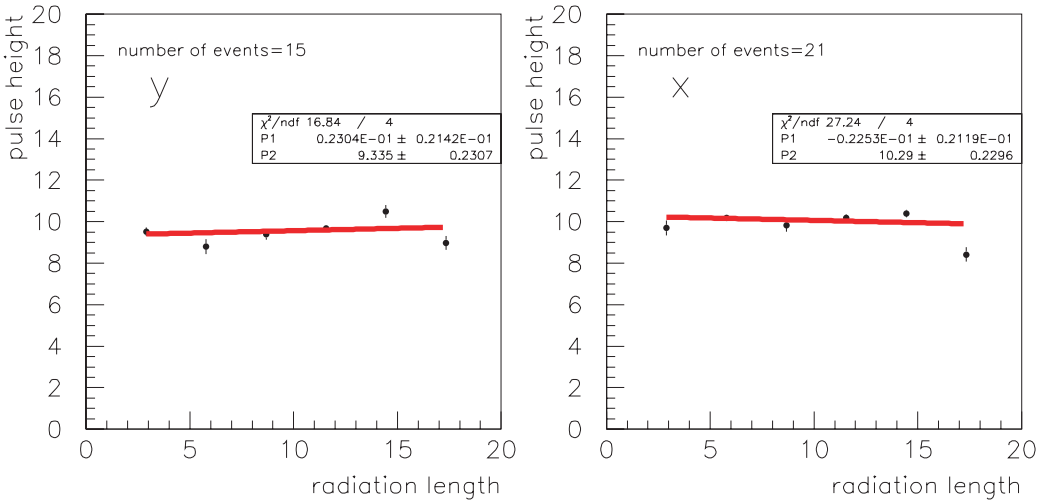

X 方向
ID 1
Entries 2174
Mean -0.3993E-02
RMS 0.6276E-01
UDFLW 0.000
OVFLW 0.000
# of events
傾き


Y 方向
ID 2
Entries 1943
Mean -0.3407E-02
RMS 0.5935E-01
UDFLW 0.000
OVFLW 0.000
# of events
傾き

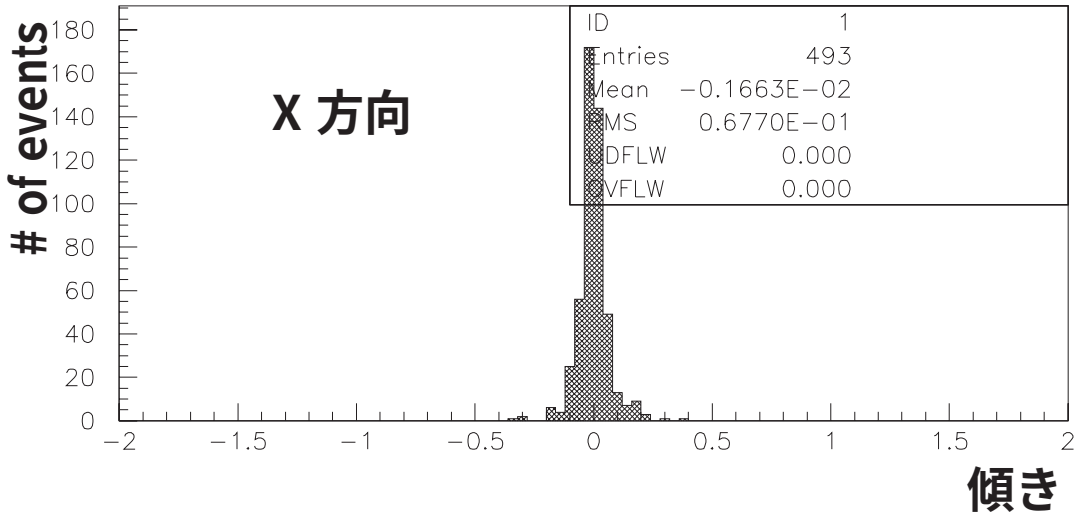
＜6 S.L. まででフィット＞

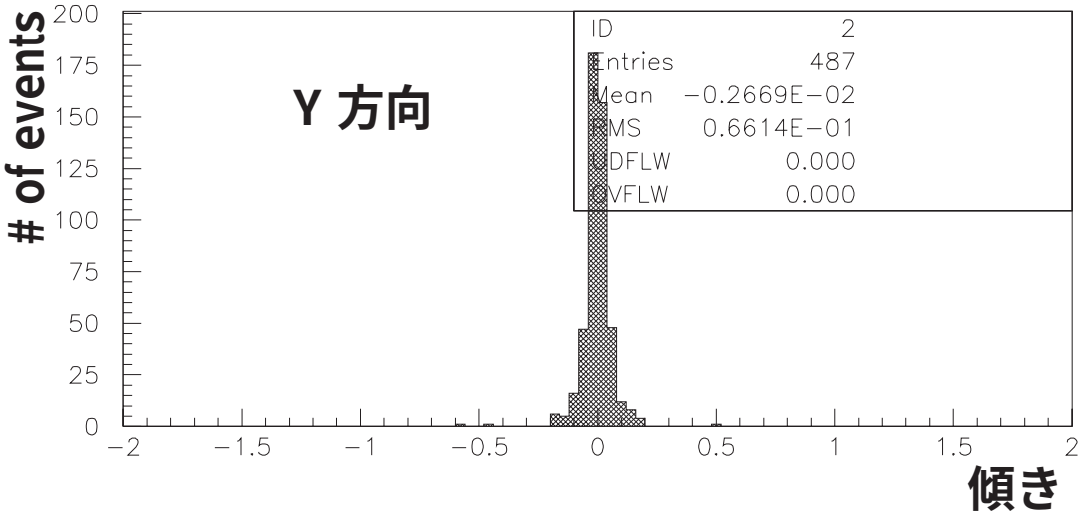

number of events=2
X
χ²/ndf 2.122 / 4
P1 −0.5338E−01 ± 0.1797E−01
P2 9.820 ± 0.1508
pulse height
radiation length

number of events=15
X
χ²/ndf 0.9694 / 4
P1 −0.1313E−01 ± 0.2117E−01
P2 8.043 ± 0.1795
pulse height
radiation length


number of events=15
y
χ²/ndf 16.84 / 4
P1 0.2304E−01 ± 0.2142E−01
P2 9.335 ± 0.2307
pulse height
radiation length

number of events=21
X
χ²/ndf 27.24 / 4
P1 −0.2253E−01 ± 0.2119E−01
P2 10.29 ± 0.2296
pulse height
radiation length


X 方向
ID 1
Entries 493
Mean −0.1663E−02
RMS 0.6770E−01
UDFLW 0.000
OVFLW 0.000
# of events
傾き


Y 方向
ID 2
Entries 487
Mean −0.2669E−02
RMS 0.6614E−01
UDFLW 0.000
OVFLW 0.000
# of events
傾き

まとめ

- T517 ビームテストのデータ解析を行った

  - ペデスタルデータが入っていないランがあった
    理由はよくわからない

  - muon を用いて calibration constant を求めたところ
    各チャンネルでの値はおよそ 50 ADC counts になった

  - 筑波CAL から求めた粒子入射位置と
    ドリフトチェンバーから求めたそれとを比較した
    今後、筑波CAL とドリフトチェンバーとの相関から
    粒子入射位置についての補正関数を早急に求める必要が有る