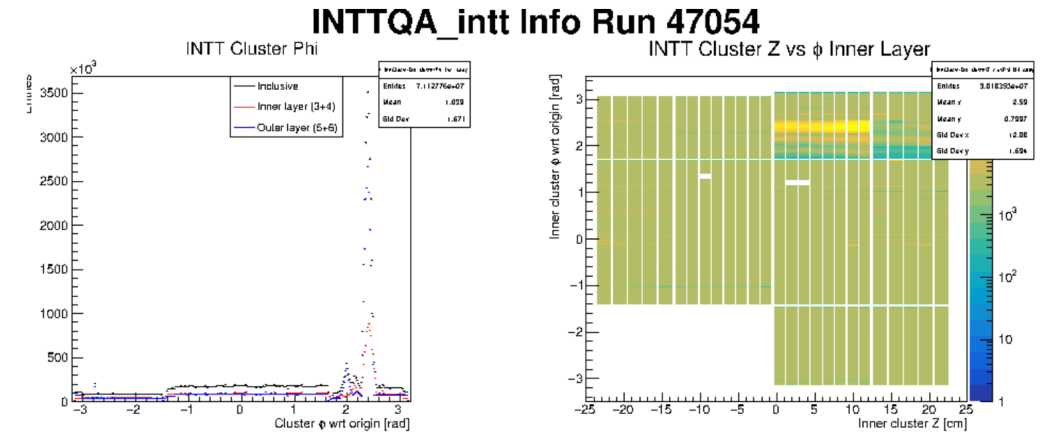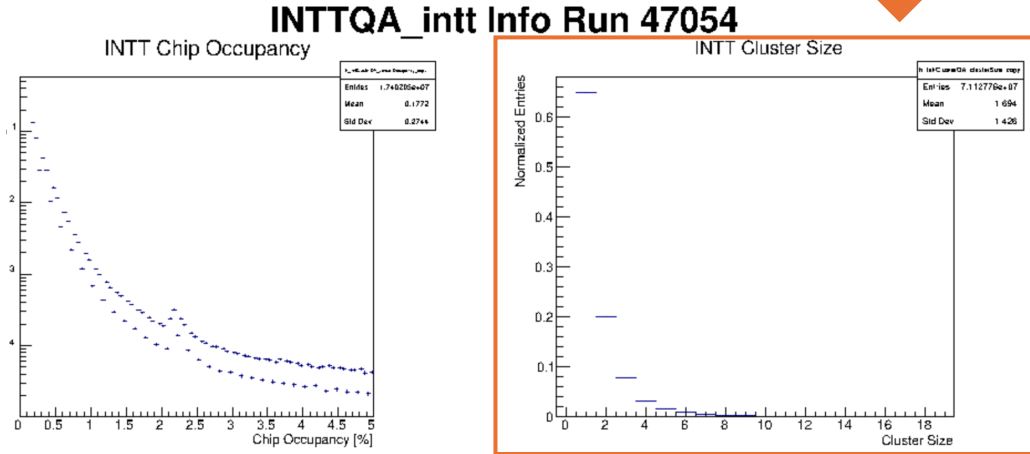# Offline QA

Offline QAの現在

- Cluster sizeのsizeごとの分布の2peakについて原因を探っている。
- Pull requestが進んでいる。
  現在は、joeとreference plotのroot fileの置き場所について相談しており、今回確認をしたい。
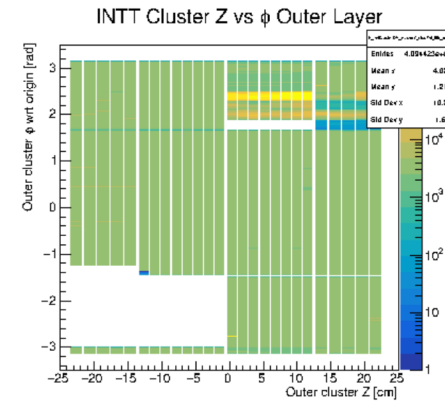
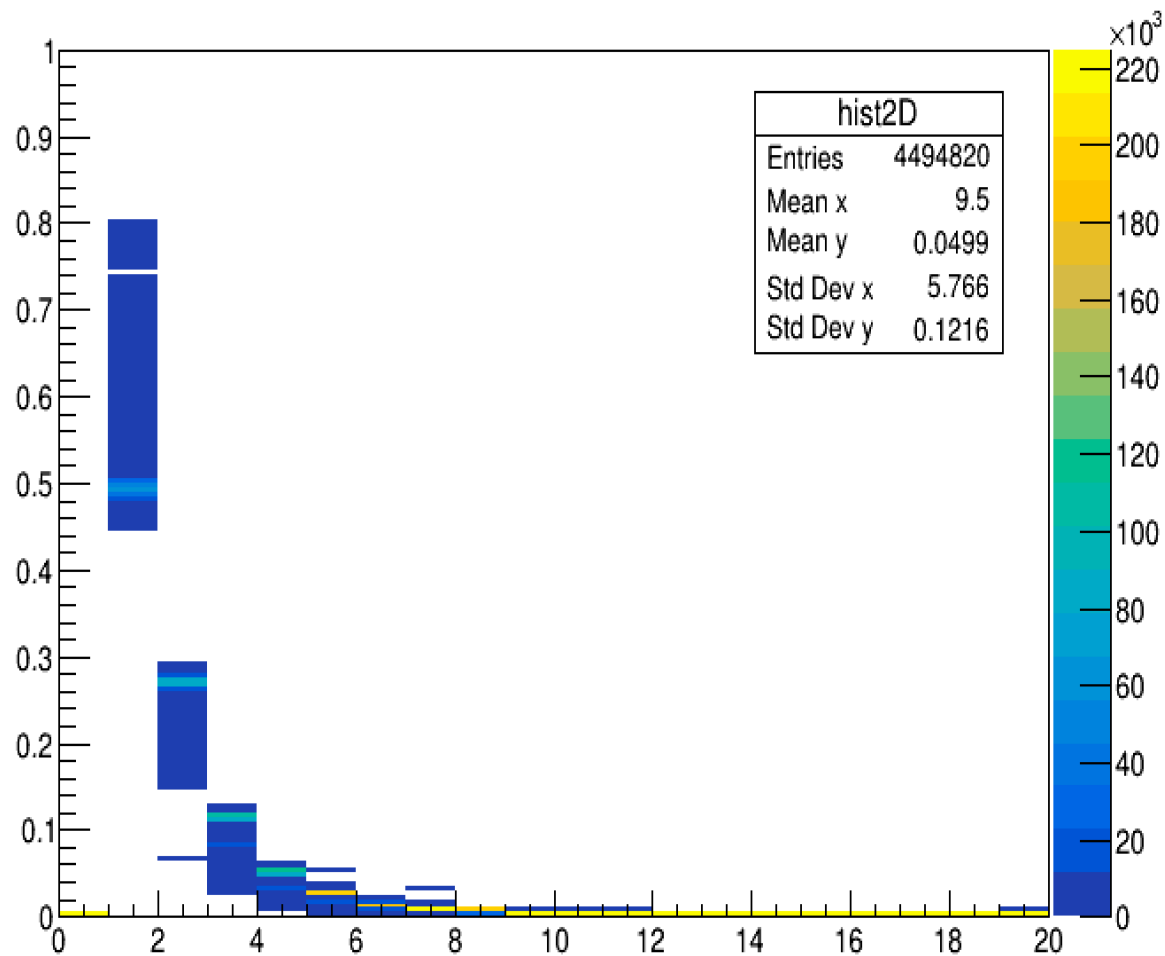# Offline QA (Run2024 website)

We have offline QA plots run by run

Making **reference plots** is ongoing

Cluster size (DAC0=30) Run46400~48400– total 4494820 files

Linear

Log
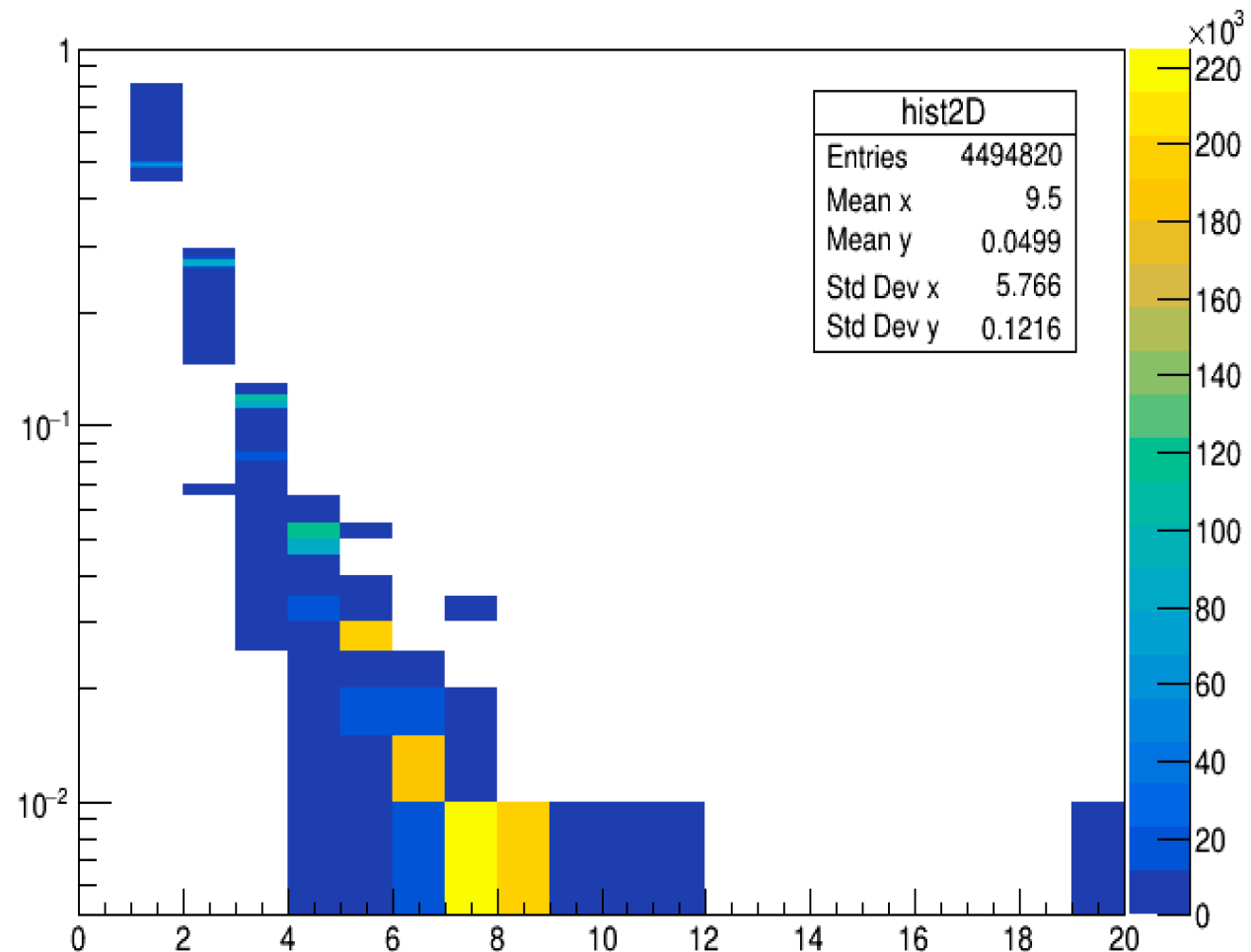
Y ：Fraction=(Entries／ all Entries)
X ：cluster size

DAC0 = 30
Only Physics Run

Cluster size (DAC0=35) Run49900~51600 – total 4817320 files

Linear

Log

hist2D

Entries	5087600
Mean x	9.500
Mean y	0.04991
Std Dev x	5.766
Std Dev y	0.1285
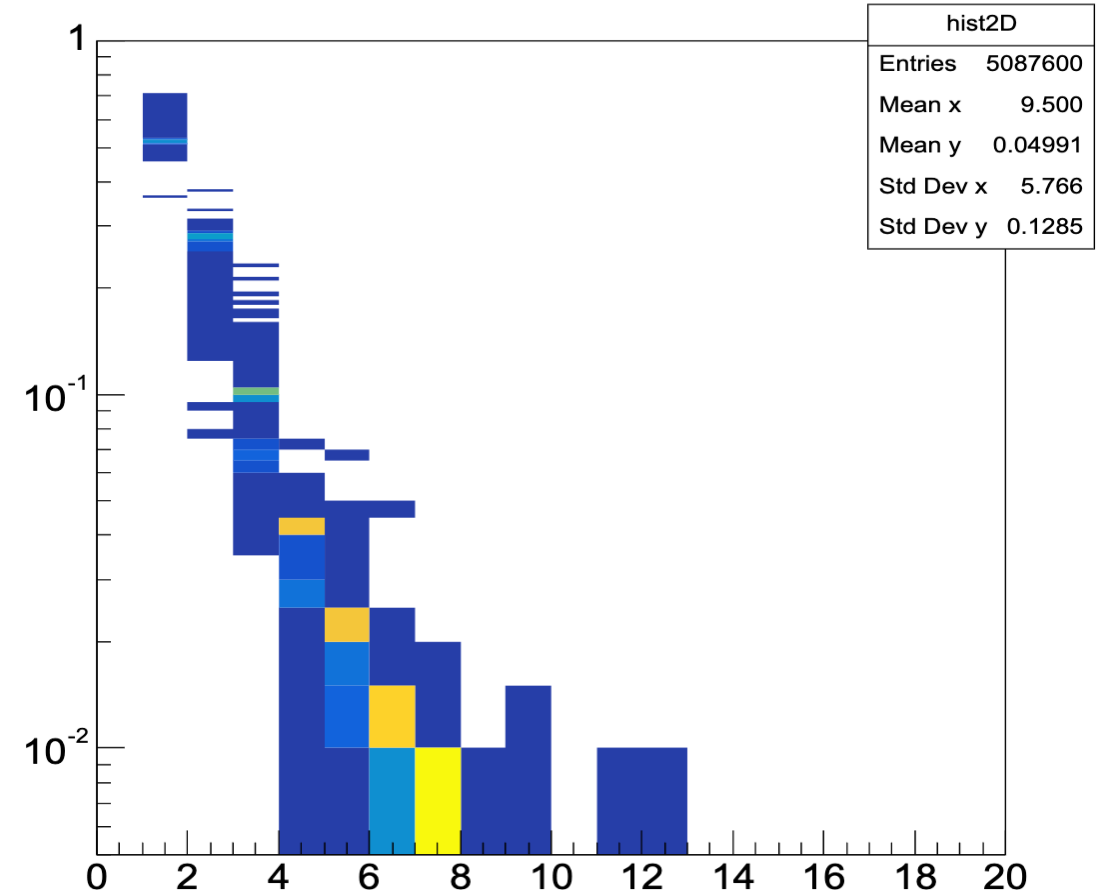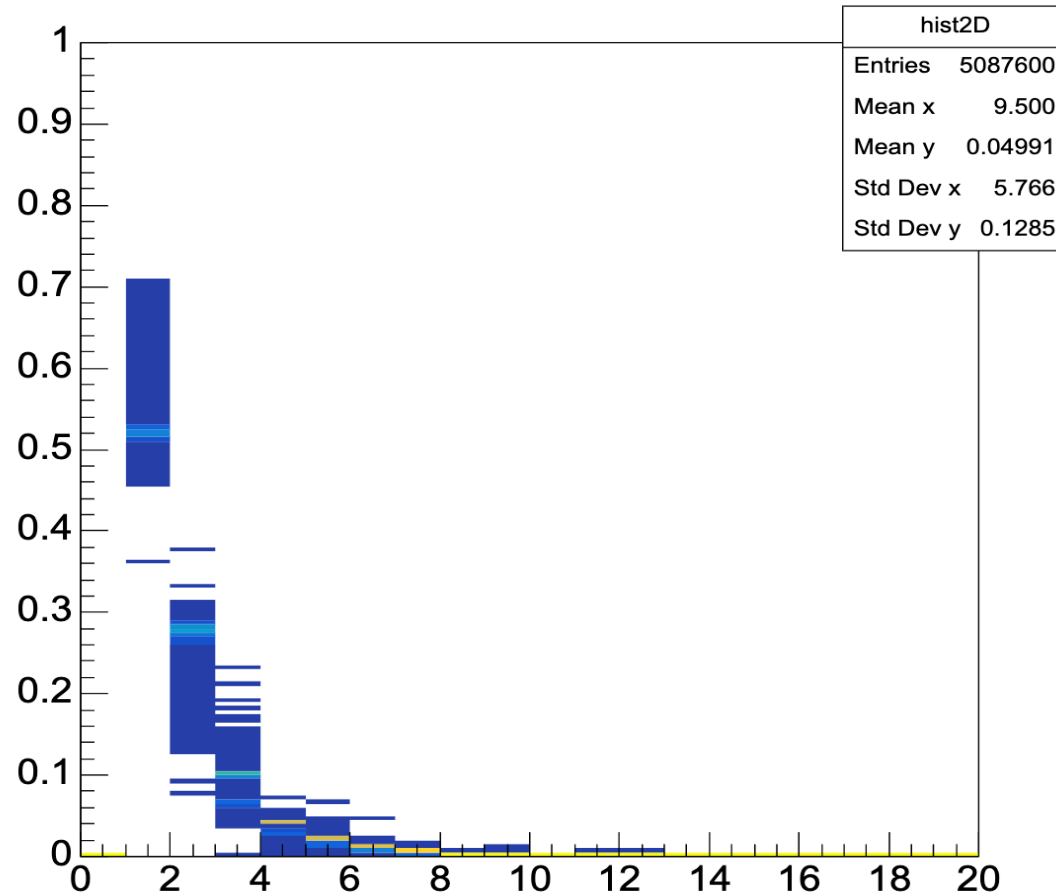
Y : Fraction＝(Entries／ all Entries)
X : cluster size

DAC0 = 35
Only Physics Run

Reference plot (DAC0=30)

Linear

Log
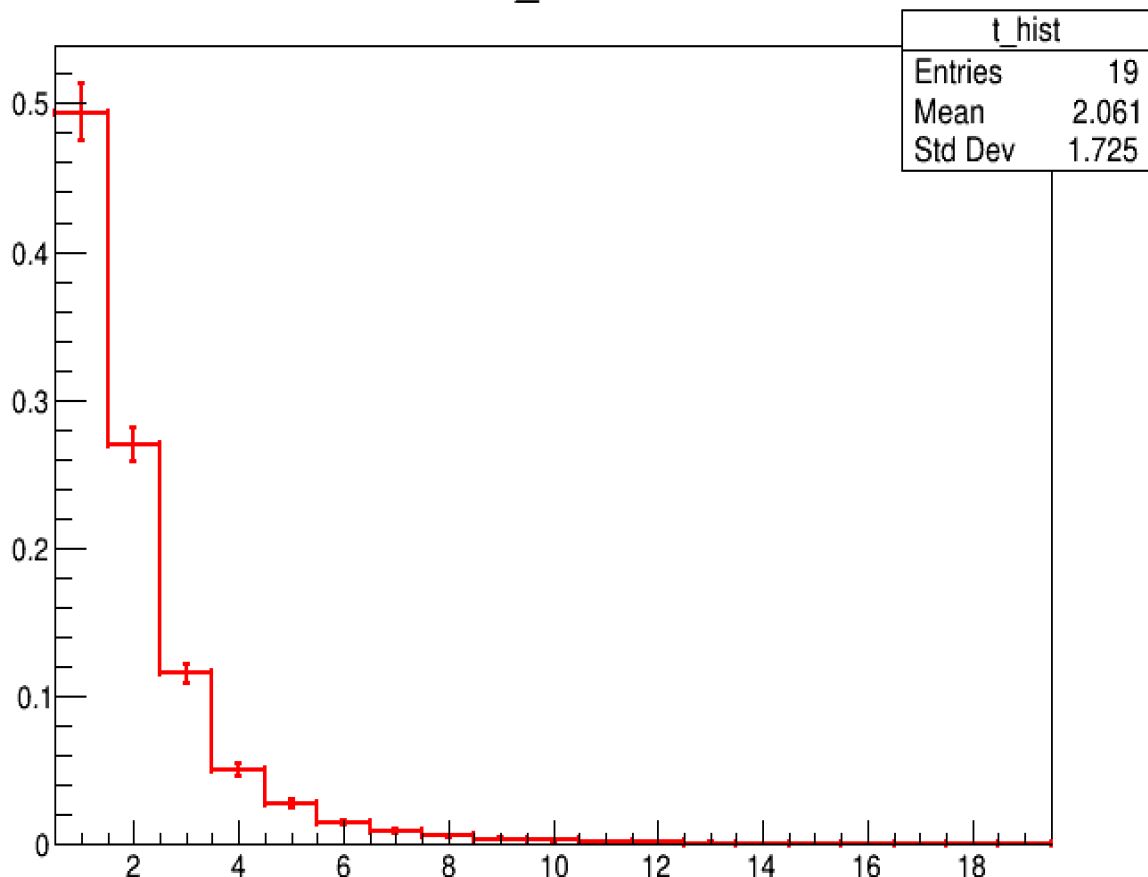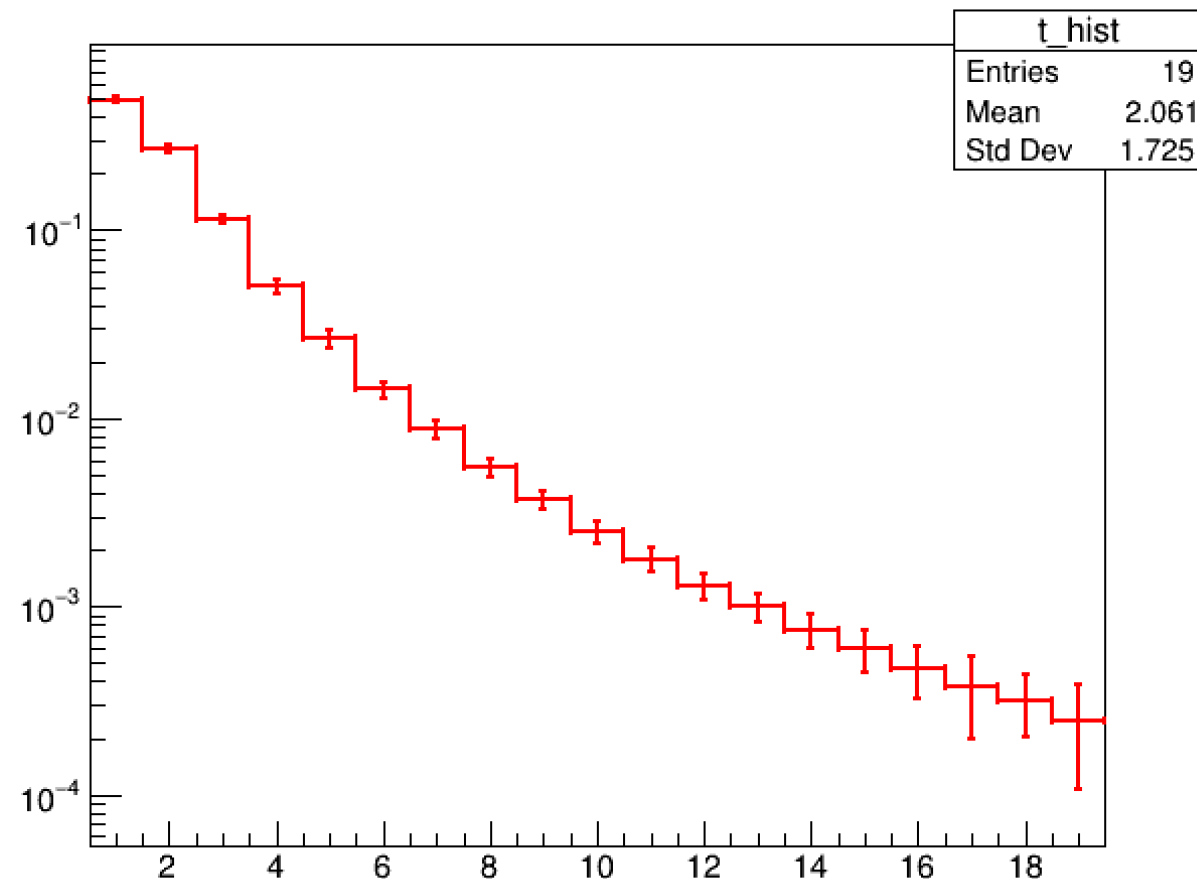
Y : Fraction=(Entries/ all Entries) error Y = 3σ

X : cluster size

DAC0 = 30
Only Physics Run

Reference plot (DAC0=35)

Linear
Log

t_hist

t_hist	
Entries	11
Mean	1.886
Std Dev	1.373

t_hist

t_hist	
Entries	11
Mean	1.886
Std Dev	1.373
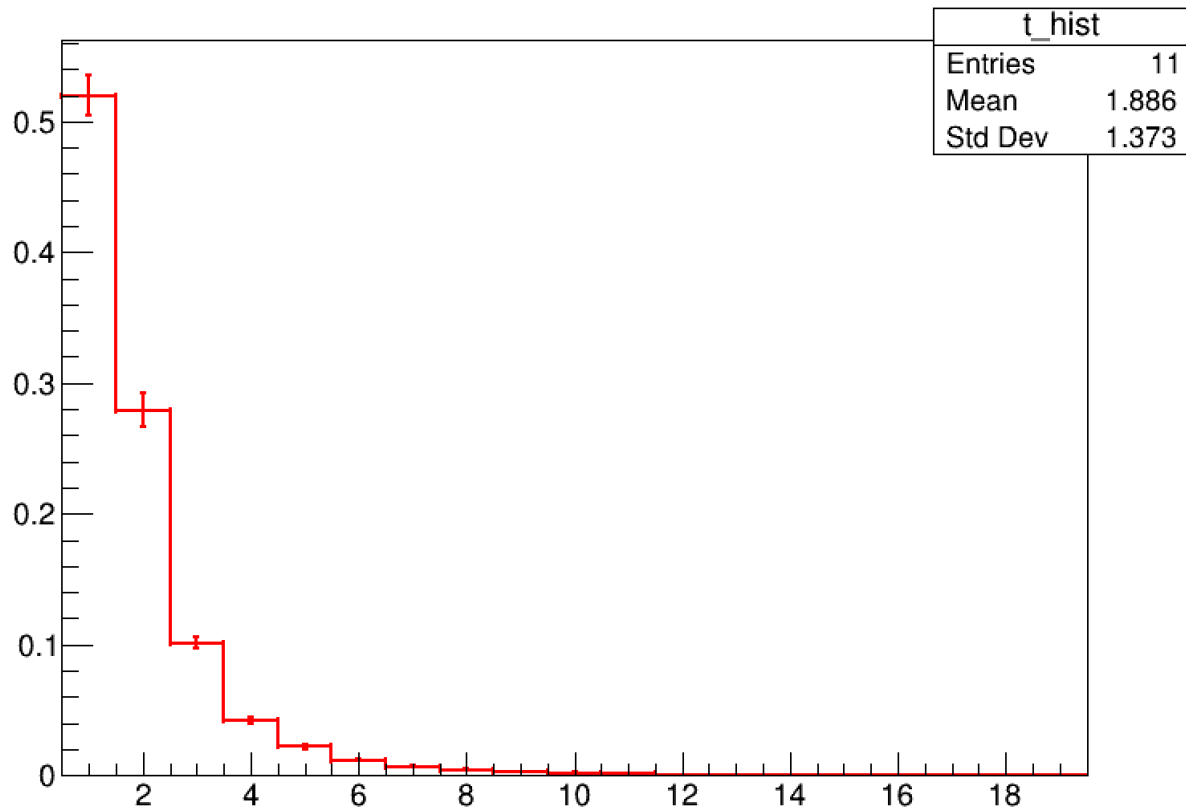
Over size 12 is lowest num to fit
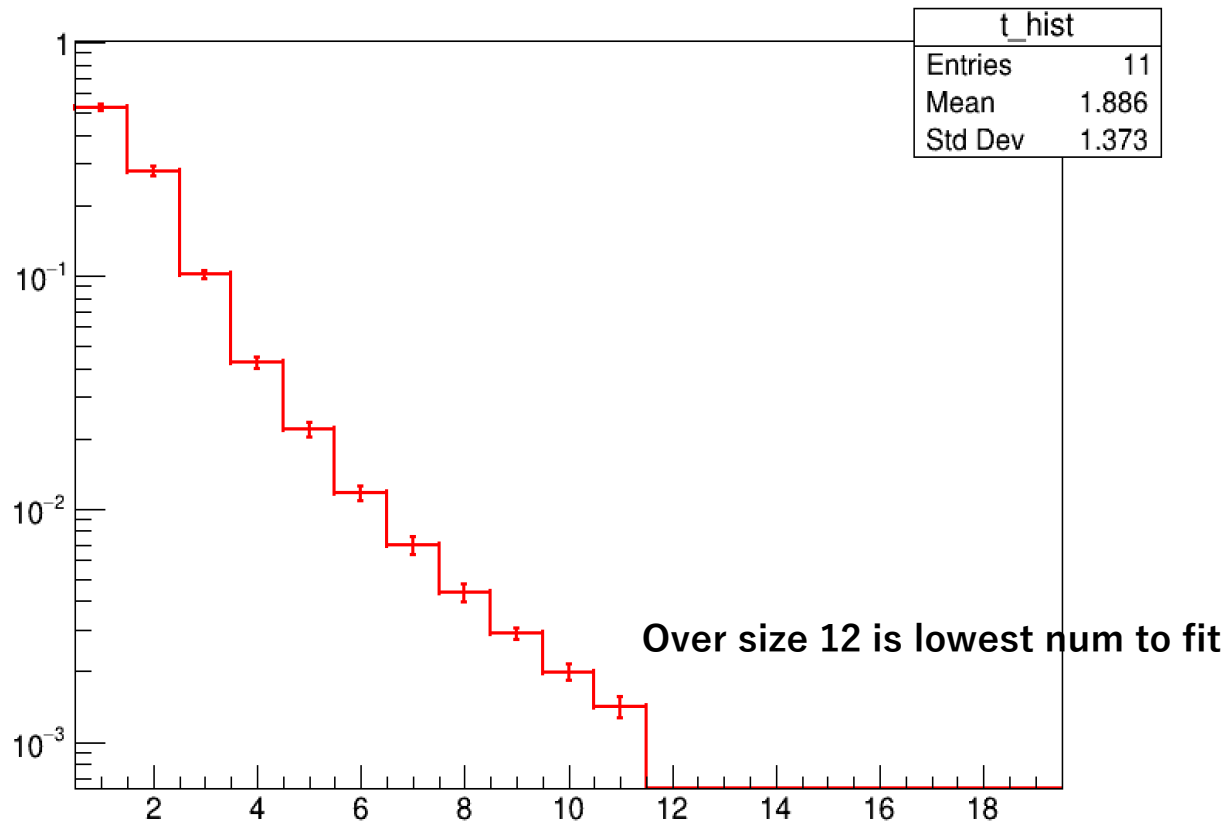
Y ：Fraction＝(Entries/ all Entries)※   error Y ＝ 3σ

X ：cluster size

※ Mean value by gauss fitting size by size

Compare between DAC0=30 and 35

t_hist
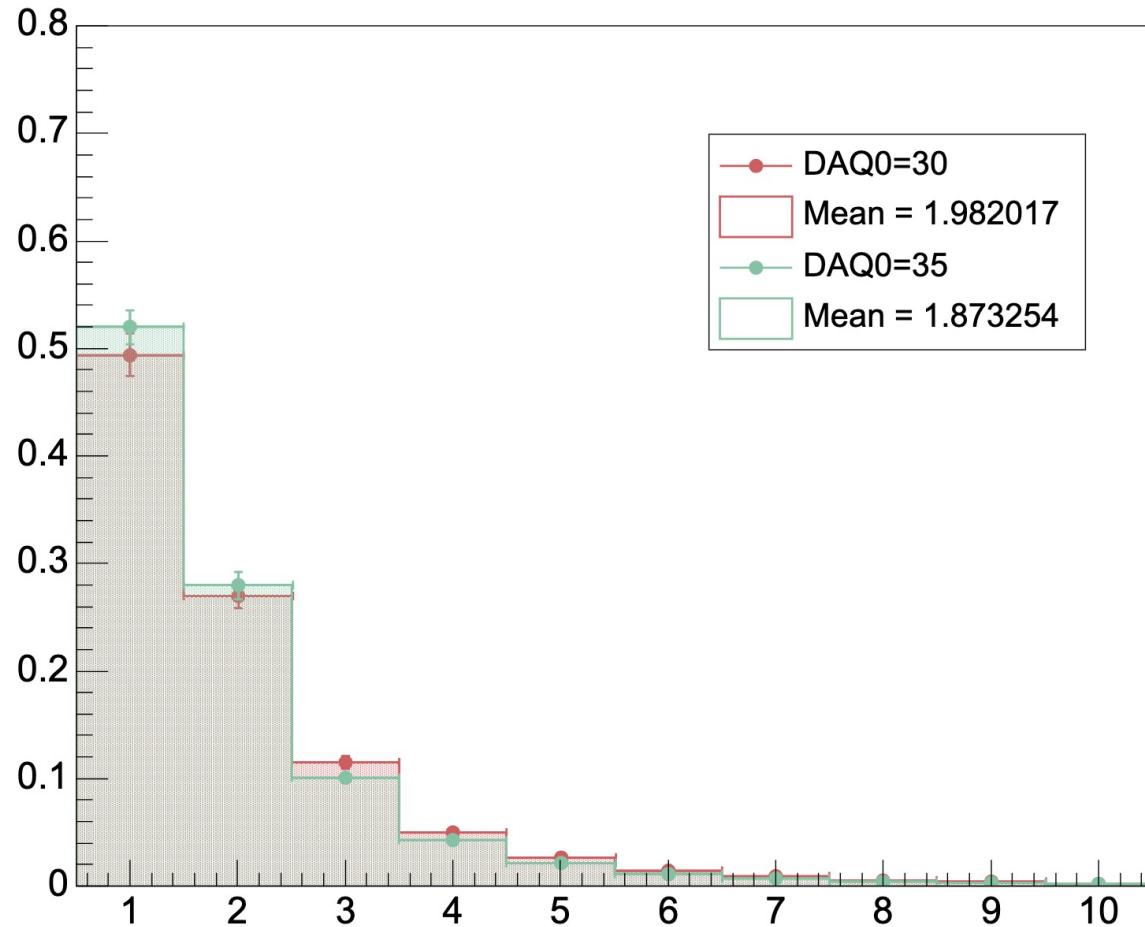
- The plot shows **different** distribution between DAC0 = 30 and 35

It is necessary to change the reference plot to be added depending on the DAC0 value.

Y ：**Fraction=(Entries/ all Entries)**
X ：**cluster size**

Test web
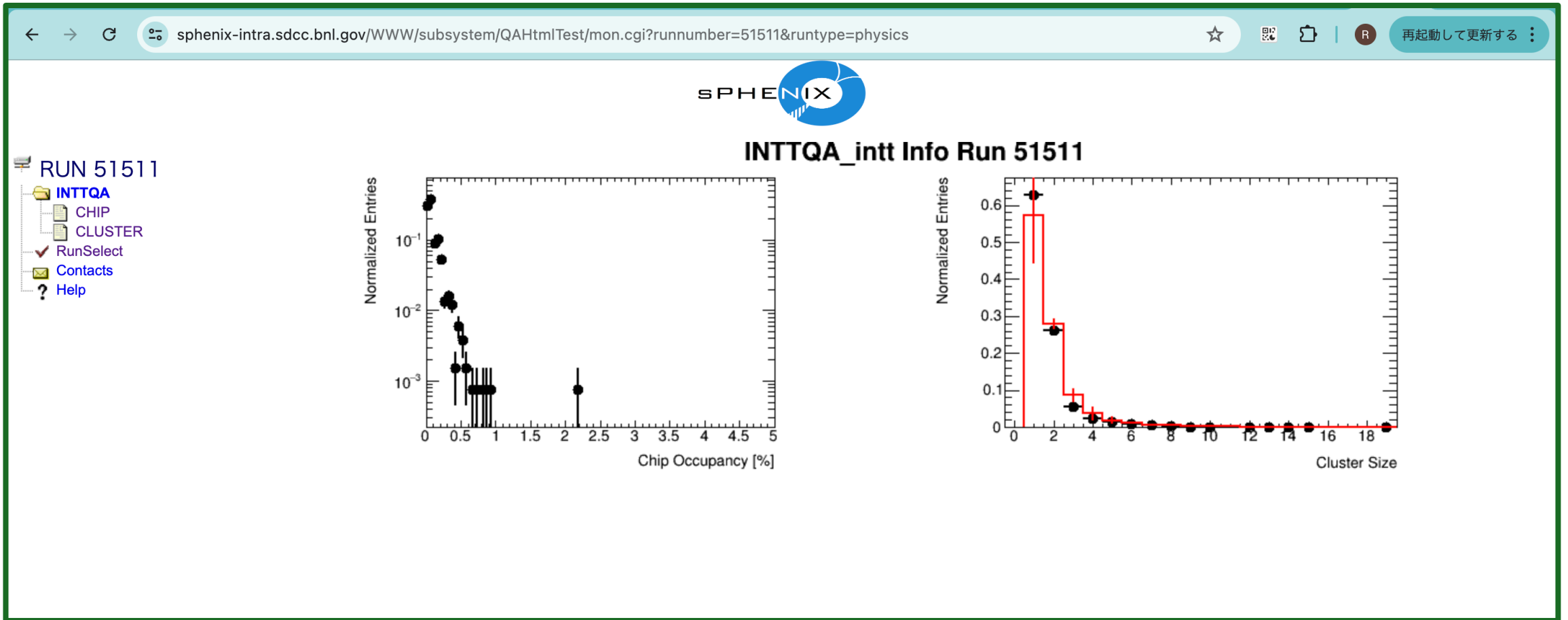
This is QAHtmlTest, everyone can make plots here.
It looks the same on the offcial website.

Study of 2 peak
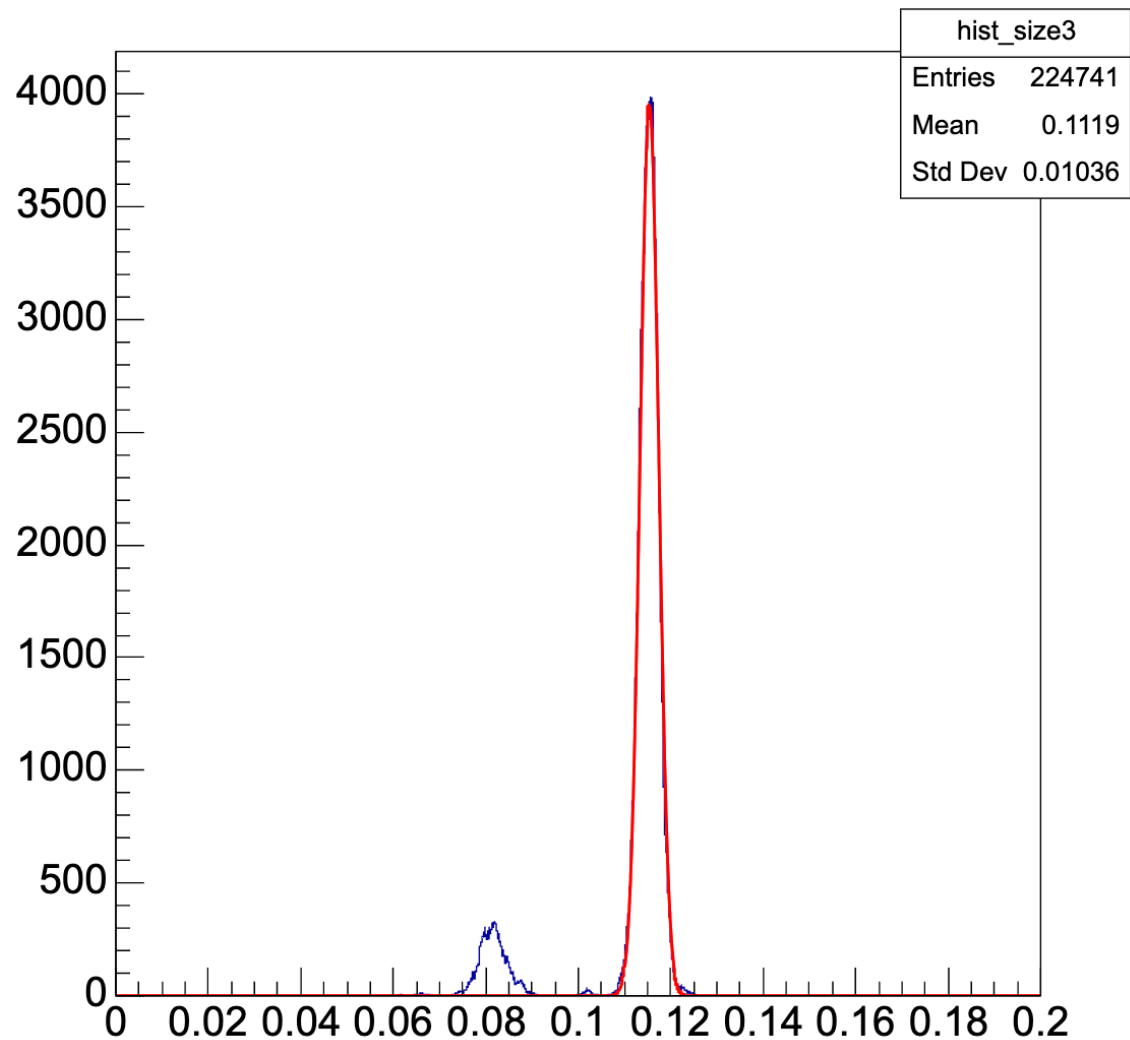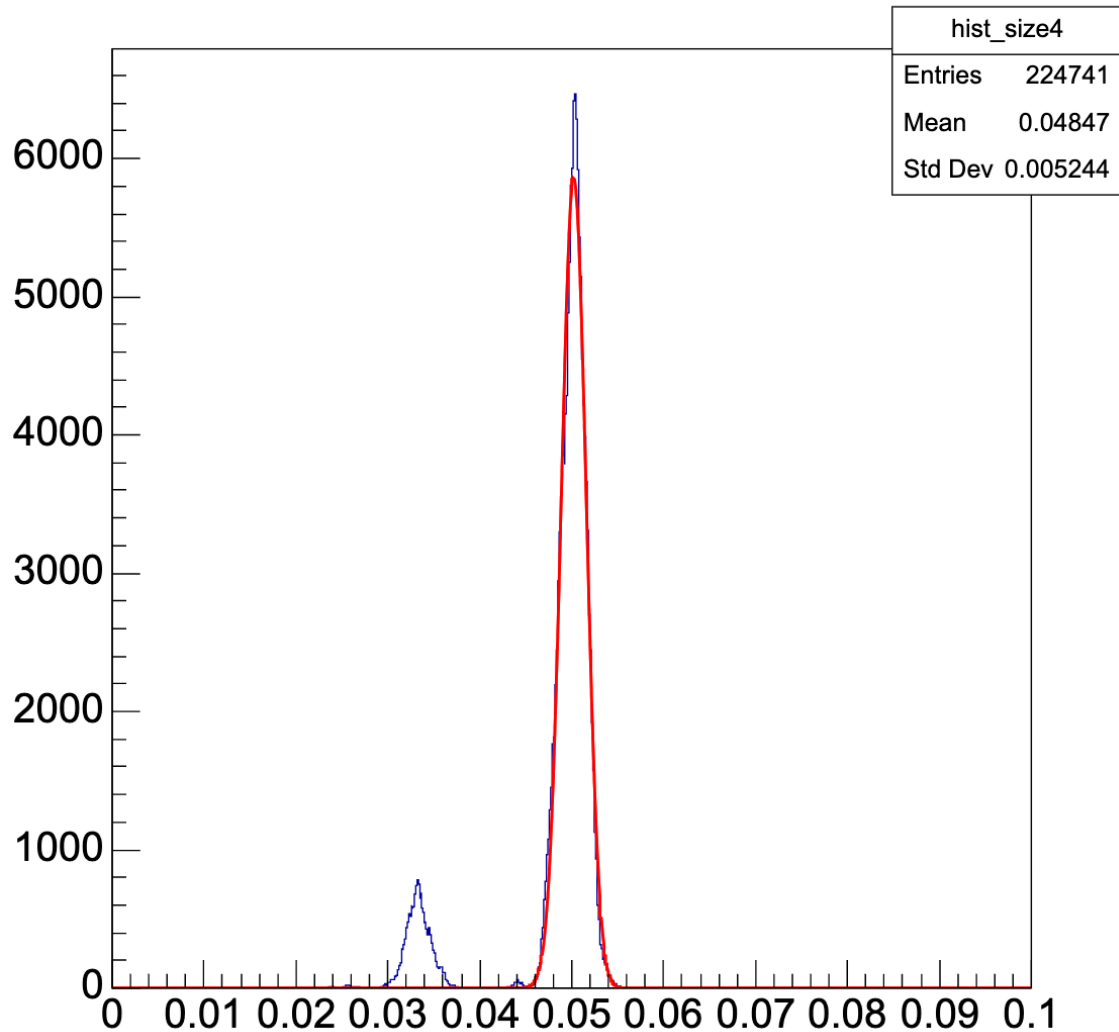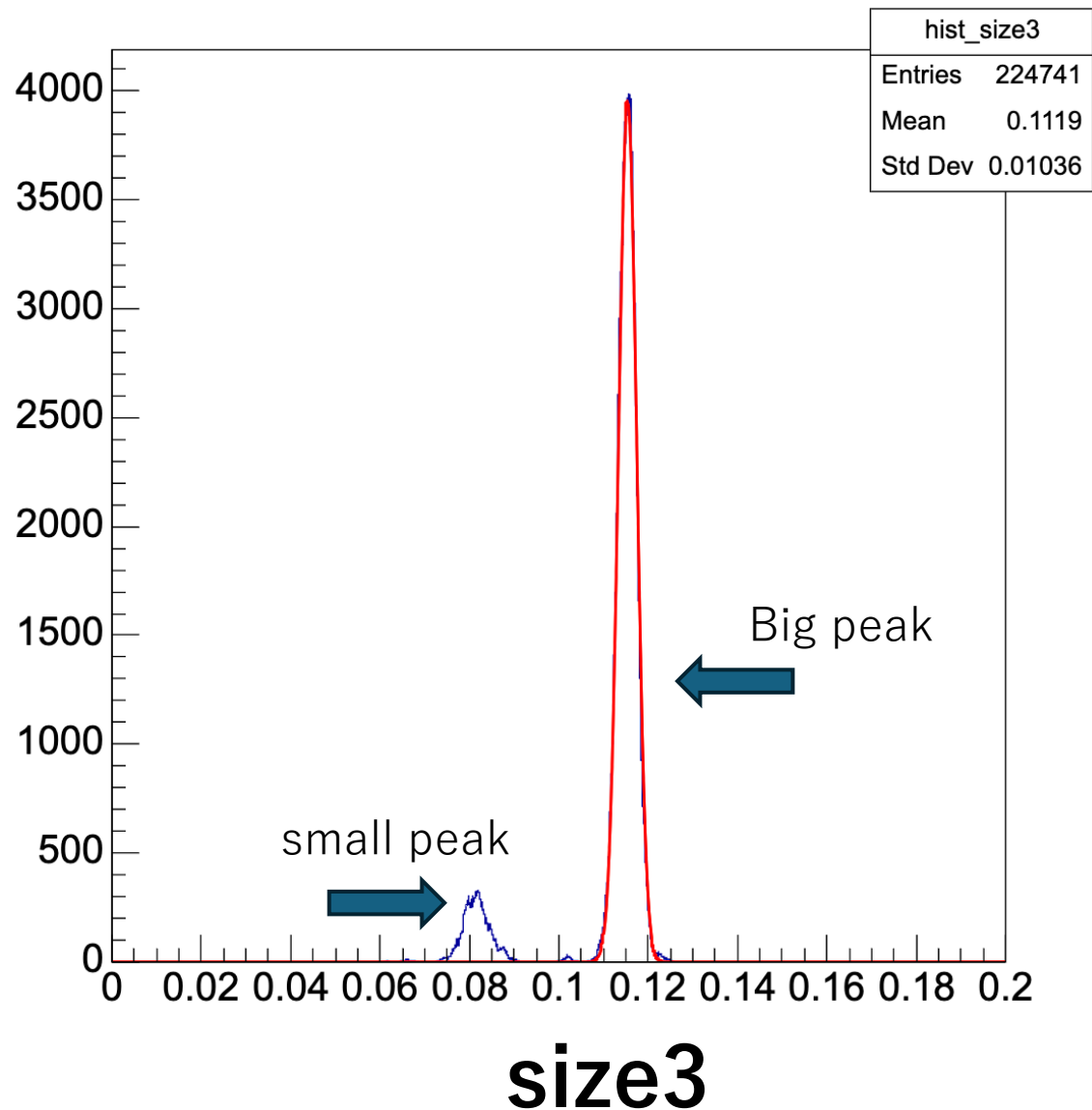
Study of 2 peak

Study of 2 peak

Cluster size に影響すると考える要因を調査

- Magnet
- Crossing angle

特定のRunでの調査

Bad : part of small peak
good : part of big peak

Bad

good

Bad

good
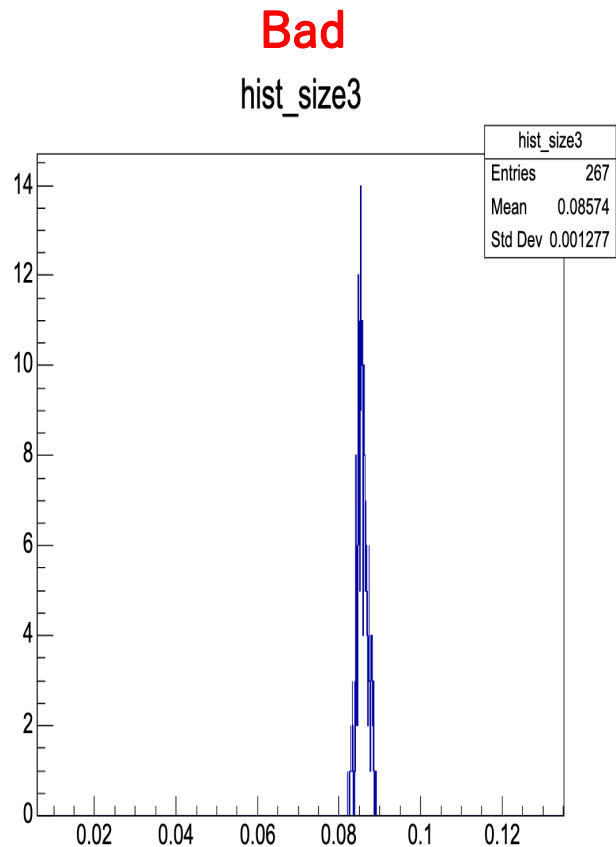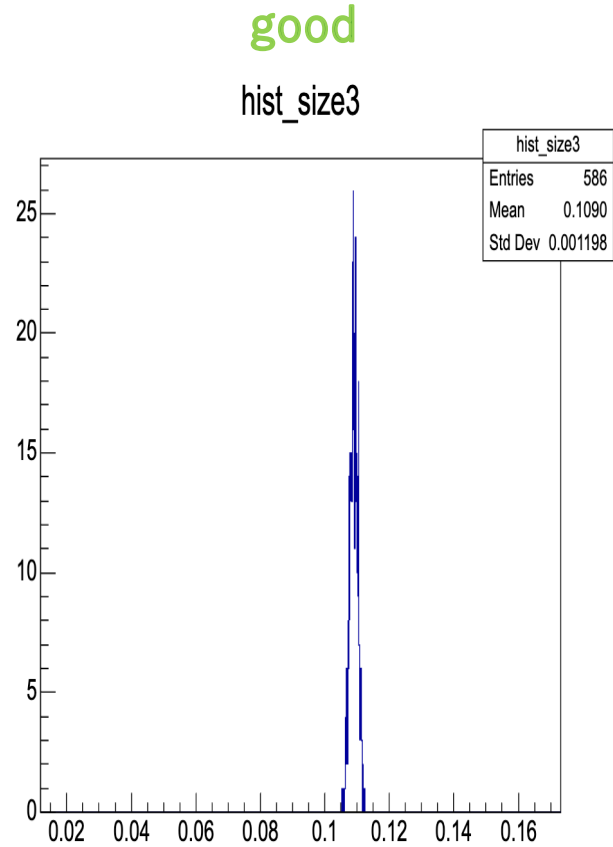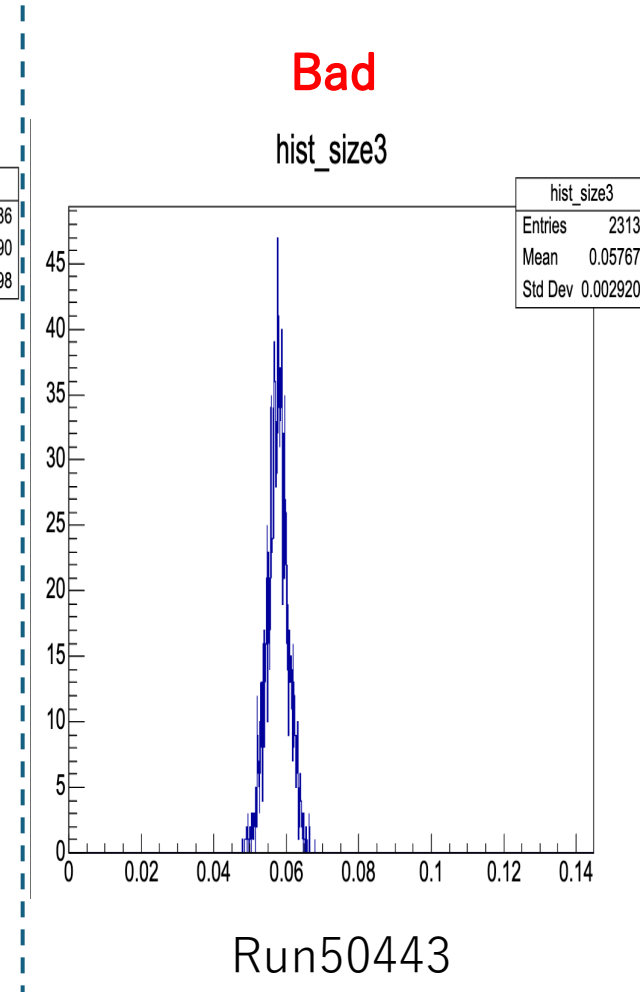
Run47098   Run47114   Run50443   Run50076

DAC0=30   **DAC0=35**

特定のRunでの調査

Bad

good

Bad

good
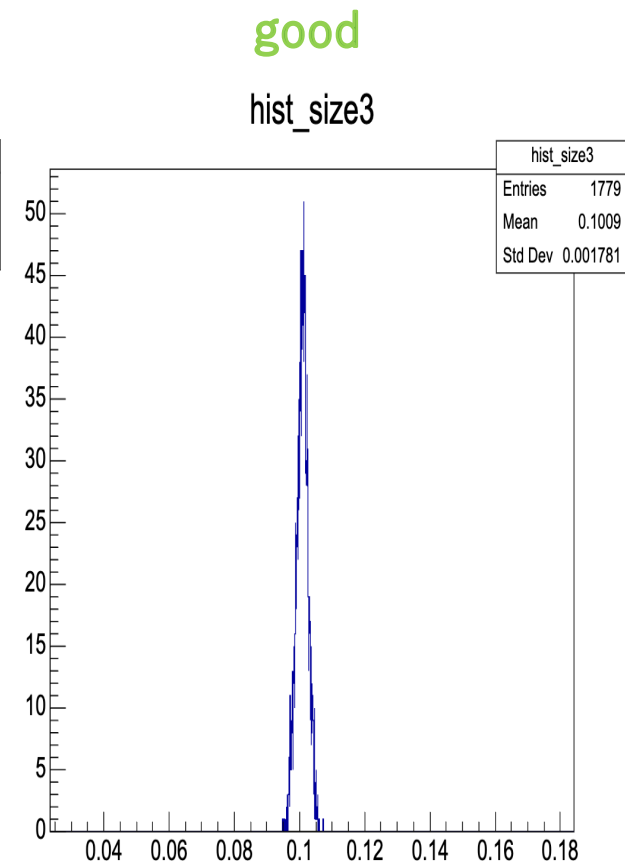
DAC0=30   Run特有の症状だとわかる   DAC0=35

Info of magnet

In SQL database

```
daq=> SELECT DISTINCT magnet_on FROM magnet_info;
 magnet_on
-----------
 f
 t
(2 rows)
```

t : ON
f : OFF

DAC0=30の解析に使用したRun
Run46400~48400

DAC0=35の解析に使用したRun
Run49900~51600

Run with Magnet OFF

```
daq=> SELECT * FROM magnet_info where magnet_on='f';
 runnumber |    current     | magnet_on
-----------+----------------+-----------
     46031 | 4.2794992e+07  | f
     46254 |  4.278944e+07  | f
     46389 | 4.2789204e+07  | f
     46481 |  4.289526e+07  | f
     46838 |  4.916517e+06  | f
     46839 |  7.983226e+06  | f
     46840 | 1.1399286e+07  | f
     49483 |        144667  | f
     49484 |  1.575927e+06  | f
     49485 |  2.574119e+06  | f
     49486 |  3.899875e+06  | f
     49487 |  4.538153e+06  | f
     49488 |  6.306959e+06  | f
     49489 | 1.4843864e+07  | f
     49490 | 1.9457984e+07  | f
     49491 | 2.5441912e+07  | f
     49492 |  2.981594e+07  | f
     49493 |  3.453278e+07  | f
     49494 |  3.978356e+07  | f
     49772 |        225797  | f
     49826 | 1.9902958e+07  | f
     49827 | 2.2100994e+07  | f
     49829 | 2.6522424e+07  | f
     52234 |  2.639811e+06  | f
     52253 | 2.9818356e+07  | f
(25 rows)
```
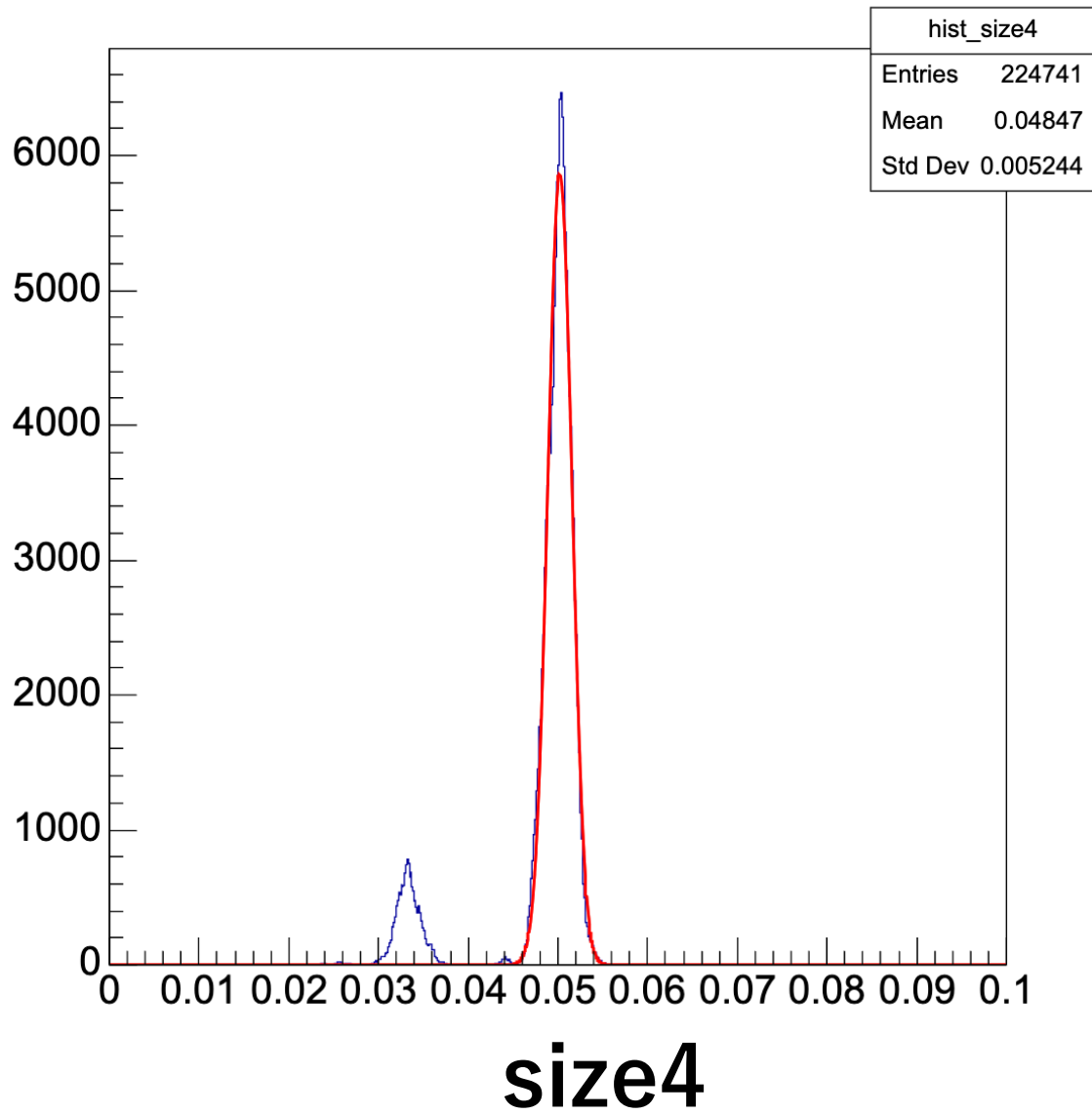
Crossing angle

Run #	Crossing Angle (mrad)
52078	1.5 mrad
52077	1.5 mrad
51607-	1.5 mrad
51557 -	1.5 mrad
-	1.5 mrad
51499 -	1.5 mrad
51485-	1.5 mrad
51374-	1.5 mrad
	1.5 mrad
	1.5 mrad
51274-	1.5
51240 -	from 0 to +1.5 mrad
51200-	0
51195	0
51189-51191	0 to +1.5 mrad
	0
51106-	+1.5mrad
51092-	+1.5mrad
50962-	0
50928-50938	+1.5mrad
50885 - 50927	0
	0
50853-50863	0
50650-	0
50612 -	0
50595 - 50607	0
50558 - 50571	0
50545 - 50554	0
50510 ~ 50536	
50465-	0
50436 ~ 50459	0 and +1.5 mrad

色のついた部分はsmall peak（DAC0=35）に位置付けられるもの

Crossing angleの影響を受けている可能性高いように見える

しかし、**DAC0=30（Run46400~48400)**は同様の症状が見えているが**crossing angle変更前**のため、別の問題である可能性が高い

DAC0=30

47036	47115
47037	47116
47038	47117
47039	47118
47040	47119
47041	47120
47042	47121
47043	47122
47051	47123
47053	47124
47054	47125
47055	47126
47056	47127
47058	47128
47059	47129
47060	47130
47061	47131
47063	47133
47064	47135
47066	47136
47067	47138
47068	47139
47075	47140
47082	47141
47083	47142
47086	47143
47087	47146
47088	47150
47089	47152
47090	47153
47091	47154
47098	47155
47099	47156
47100	47157
47101	47158
47102	47160
47103	47161
47104	47162
47106	47216
	47217
	47218
	47219
	47220
	47222
	47229
	47230
	47310
	47311

しかし、Run46400~48400のうち
Run47051~47230に集中していることわかった。

この時期に何らかの状態が悪かった可能性が高い。

現在は この時期のOnline QAを確認しながら原因を探っている。

色ぬられている部分がsmall peak

Pull requestの現在の状況

- Joeには今回のreference plotについて説明は済んでおり、ファイルの置き場所について議論になった。

- 元々はsdcc内の自分のローカルディレクトリーに保存していたreference root fileを読み込むようにしていたが、別のグローバル？なディレクトリーに移すように頼まれた。

- 現在は仮でtgディレクトリー内のINTTに新しくディレクトリーを作成し、そこから読み込むように設定している。

```
[-bash-4.2$ cd /sphenix/tg/tg01/commissioning/INTT/QA/cluster/reference/
[-bash-4.2$ ls
physics_daq30_templete.root   physics_daq35_templete.root
```

Back up

How to select physics Run

In SQL database

```
phnxrc@opc0:~$ psql daq
psql (14.7)
Type "help" for help.

daq=> select * from run WHERE runtype = 'physics';
 runnumber | runtype |     brtimestamp     |     ertimestamp     | updatetimestamp | eventsinrun | marked_invalid | has_comment | qcomment
-----------+---------+---------------------+---------------------+-----------------+-------------+----------------+-------------+----------
     46040 | physics | 2024-06-19 13:15:54 | 2024-06-19 13:26:22 |                 |       16267 |             -1 |           0 |
     48801 | physics | 2024-07-20 02:08:02 | 2024-07-20 02:42:44 |                 |    19339925 |             -1 |           0 |
     44614 | physics | 2024-06-04 01:48:07 | 2024-06-04 01:49:41 |                 |      378367 |             -1 |           0 |
     43275 | physics | 2024-05-20 21:39:56 | 2024-05-20 21:47:20 |                 |     5882834 |             -1 |           0 |
     50613 | physics | 2024-08-07 05:58:29 | 2024-08-07 06:24:45 |                 |    12219895 |             -1 |           0 |
     43277 | physics | 2024-05-20 21:52:19 | 2024-05-20 22:04:32 |                 |     5122924 |             -1 |           0 |
     46042 | physics | 2024-06-19 13:39:15 | 2024-06-19 13:41:38 |                 |        2361 |             -1 |           0 |
     46041 | physics | 2024-06-19 13:27:32 | 2024-06-19 13:37:49 |                 |       15978 |             -1 |           0 |
     44615 | physics | 2024-06-04 01:51:57 | 2024-06-04 01:52:44 |                 |      286444 |             -1 |           0 |
     43279 | physics | 2024-05-20 22:11:02 | 2024-05-20 22:12:18 |                 |      200488 |             -1 |           0 |
     48802 | physics | 2024-07-20 02:45:08 | 2024-07-20 02:46:34 |                 |      865467 |             -1 |           0 |
     46044 | physics | 2024-06-19 13:54:35 | 2024-06-19 14:05:13 |                 |       10420 |             -1 |           0 |
     44616 | physics | 2024-06-04 01:54:45 | 2024-06-04 02:42:11 |                 |    20344952 |             -1 |           0 |
     46043 | physics | 2024-06-19 13:43:15 | 2024-06-19 13:53:27 |                 |       10636 |             -1 |           0 |
```

You can get text file of database in your directory using this code

```
phnxrc@opc0:~/INTT/SHISHIKURA/data$ psql -d daq -o physics_run.txt -c "SELECT runnumber FROM run WHERE runtype = 'physics' AND runnumber BETWEE
N 46400 AND 48400"
phnxrc@opc0:~/INTT/SHISHIKURA/data$ ls
physics_run.txt
```

-d : select database,   -o : text file name,   -c : select data

Offline QA seems to show only physics run plot

Offline QA plot file (run48000~48100)

```
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048000-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048001-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048002-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048006-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048007-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048008-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048009-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048020-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048022-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048026-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048027-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048065-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048066-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048067-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048068-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048069-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048070-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048072-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048073-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048076-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048077-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048078-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048079-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048080-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048081-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048082-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048083-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048084-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048085-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048088-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048089-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048090-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048095-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048096-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048097-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p004-00048098-00001.root
HIST_DST_TRKR_CLUSTER_run2pp_new_2024p005-00048099-00001.root
```

SQL database(only physics run)

```
select runnumber from run WHERE runtype = 'physics' AND
runnumber BETWEEN 48000 AND 48100 order by runnumber ASC
```

runnumber	
----------	48067
	48068
48000	48069
48001	48070
48002	48072
48003	48073
48004	48076
48005	48077
48006	48078
48007	48079
48008	48080
48009	48081
48011	48082
48020	48083
48022	48084
48023	48085
48026	48086
48027	48088
48028	48089
48029	48090
48060	48091
48061	48094
48062	48095
48063	48096
48065	48097
48066	48098
	48099
	48100

/sphenix/data/data02/sphnxpro/clusterhist/run_48000_48100

How to select by DAC0 value

```
phnxrc@intt0:/logdisk/phnxrc/INTT/top_pedestal$ grep -e DAC0 -e EDT top_pedestal_2024_07_*_intt1.log | grep -v DAC4
```

```
top_pedestal_2024_07_31_intt1.log:DAC0 30 3478262240 -> 0xcf5211e0
top_pedestal_2024_07_31_intt1.log:Wed 31 Jul 2024 01:06:24 PM EDT
top_pedestal_2024_07_31_intt1.log:DAC0 30 3478262240 -> 0xcf5211e0
top_pedestal_2024_07_31_intt1.log:Wed 31 Jul 2024 01:17:23 PM EDT
top_pedestal_2024_07_31_intt1.log:DAC0 30 3478262240 -> 0xcf5211e0
top_pedestal_2024_07_31_intt1.log:Wed 31 Jul 2024 01:45:10 PM EDT
top_pedestal_2024_07_31_intt1.log:DAC0 30 3478262240 -> 0xcf5211e0
top_pedestal_2024_07_31_intt1.log:Wed 31 Jul 2024 04:11:50 PM EDT
top_pedestal_2024_07_31_intt1.log:DAC0 35 3478262320 -> 0xcf521230
top_pedestal_2024_07_31_intt1.log:Wed 31 Jul 2024 05:47:42 PM EDT
top_pedestal_2024_07_31_intt1.log:DAC0 35 3478262320 -> 0xcf521230
top_pedestal_2024_07_31_intt1.log:Wed 31 Jul 2024 06:00:06 PM EDT
top_pedestal_2024_07_31_intt1.log:DAC0 35 3478262320 -> 0xcf521230
top_pedestal_2024_07_31_intt1.log:Wed 31 Jul 2024 06:04:20 PM EDT
```

This time is when we changed DAC0 value from 30 to 35

Genki taught me how to get information, thank you very much!

How to select by DAC0 value

This time is when we changed DAC0 value from 30 to 35

```
top_pedestal_2024_07_31_intt1.log:Wed 31 Jul 2024 04:11:50 PM EDT
top_pedestal_2024_07_31_intt1.log:DAC0 35 3478262320 -> 0xcf521230
```

I checked run number from datetime

In SQL database

```
daq=> select * from run WHERE brtimestamp BETWEEN '2024-07-31 00:00:00' AND '2024-07-31 23:59:59';
 runnumber | runtype |      brtimestamp      |      ertimestamp      | updatetimestamp | eventsinrun |
-----------+---------+-----------------------+-----------------------+-----------------+-------------+-
     49746 | calib   | 2024-07-31 00:08:11   | 2024-07-31 00:19:11   |                 |     4975135 |
     49747 | calib   | 2024-07-31 00:23:13   | 2024-07-31 00:33:26   |                 |     4516181 |
     49748 | physics | 2024-07-31 00:36:45   | 2024-07-31 00:39:08   |                 |     1204535 |
     49749 | physics | 2024-07-31 00:41:26   | 2024-07-31 01:42:56   |                 |    31183735 |
     49750 | physics | 2024-07-31 01:46:05   | 2024-07-31 01:50:04   |                 |     1811712 |
     49751 | physics | 2024-07-31 01:52:11   | 2024-07-31 02:47:12   |                 |    28622534 |
     49752 | physics | 2024-07-31 02:49:30   | 2024-07-31 02:59:48   |                 |     5495129 |
     49753 | junk    | 2024-07-31 04:13:45   | 2024-07-31 04:13:59   |                 |        1701 |
     49754 | junk    | 2024-07-31 04:14:53   | 2024-07-31 04:38:36   |                 |     1093416 |
     49755 | junk    | 2024-07-31 04:40:15   | 2024-07-31 04:40:35   |                 |       83437 |
     49756 | junk    | 2024-07-31 04:41:22   | 2024-07-31 04:51:10   |                 |     4755660 |
```
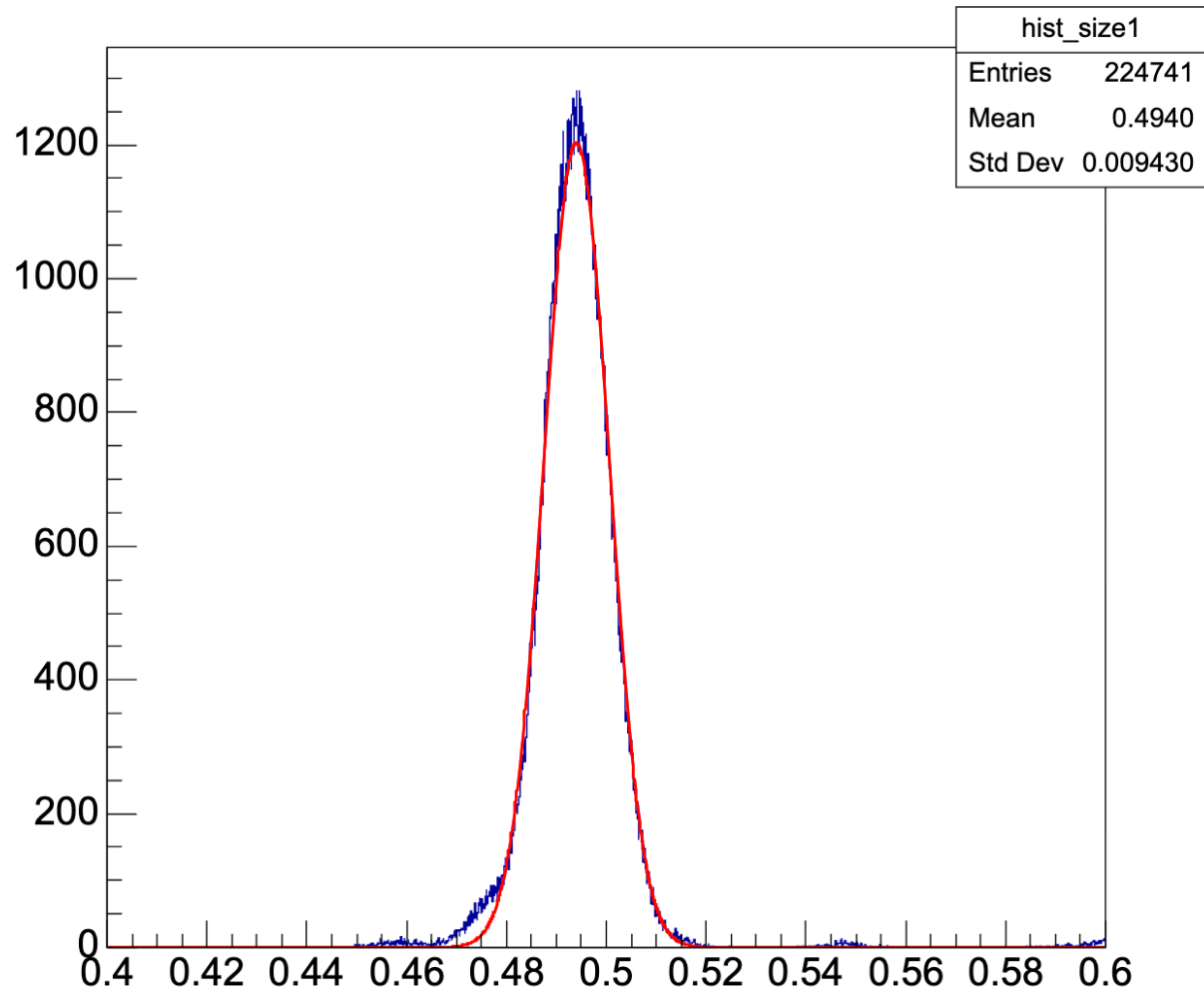
We changed DAC0 value from 30 to 35 from **run49753**

Make text file by database

```
psql -d daq -o physics_run.txt -c "SELECT runnumber FROM run WHERE runtype = 'physics' AND runnumber
BETWEEN 49753 AND 51700"
```
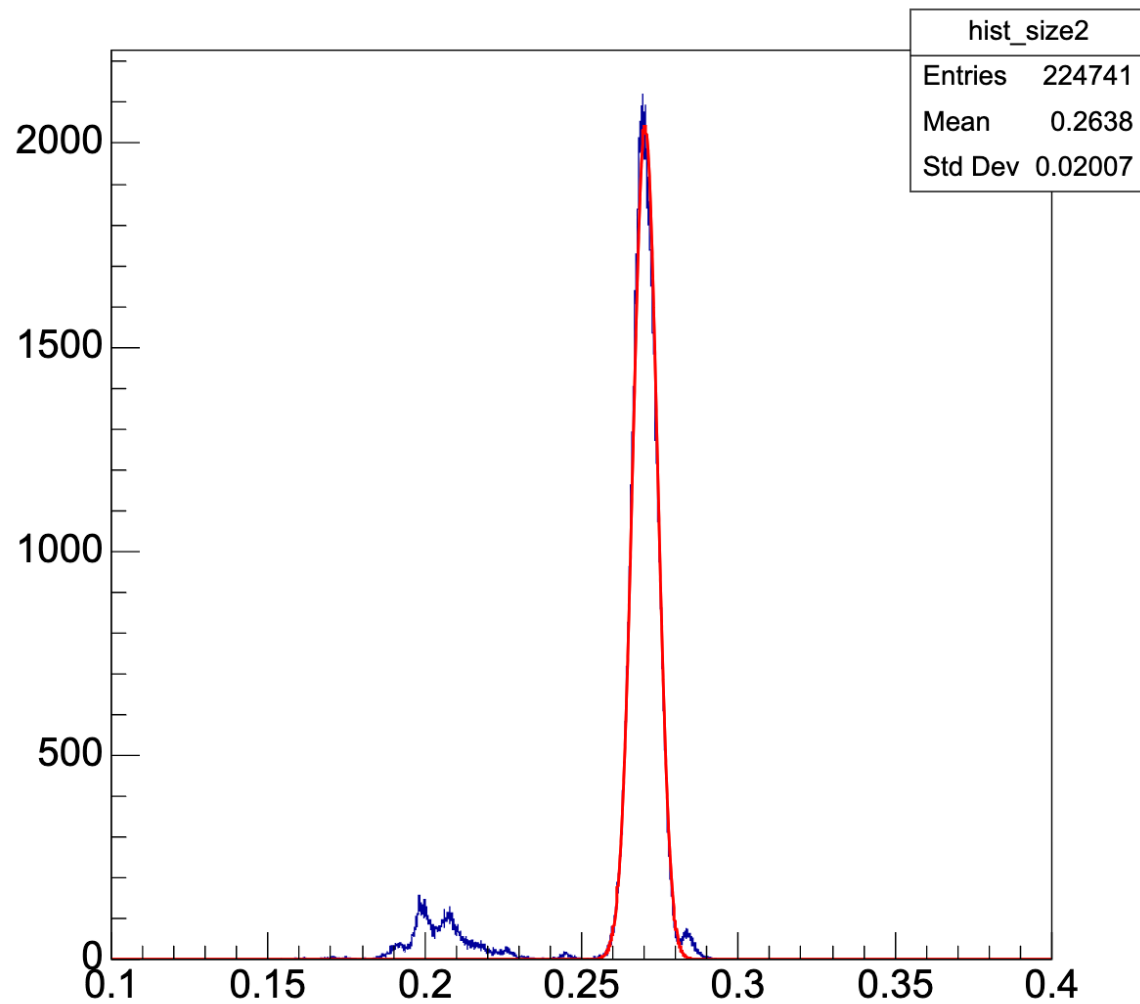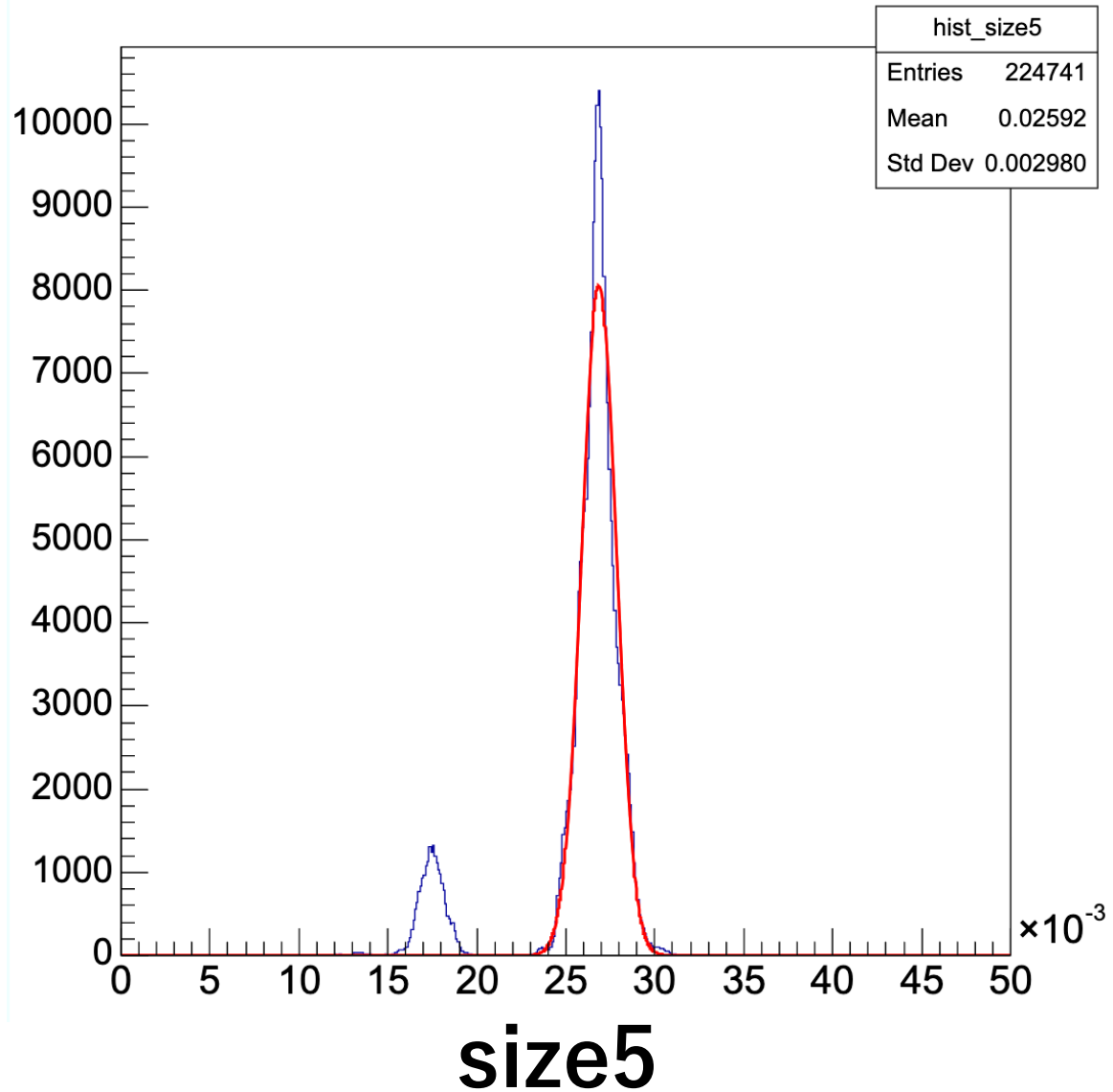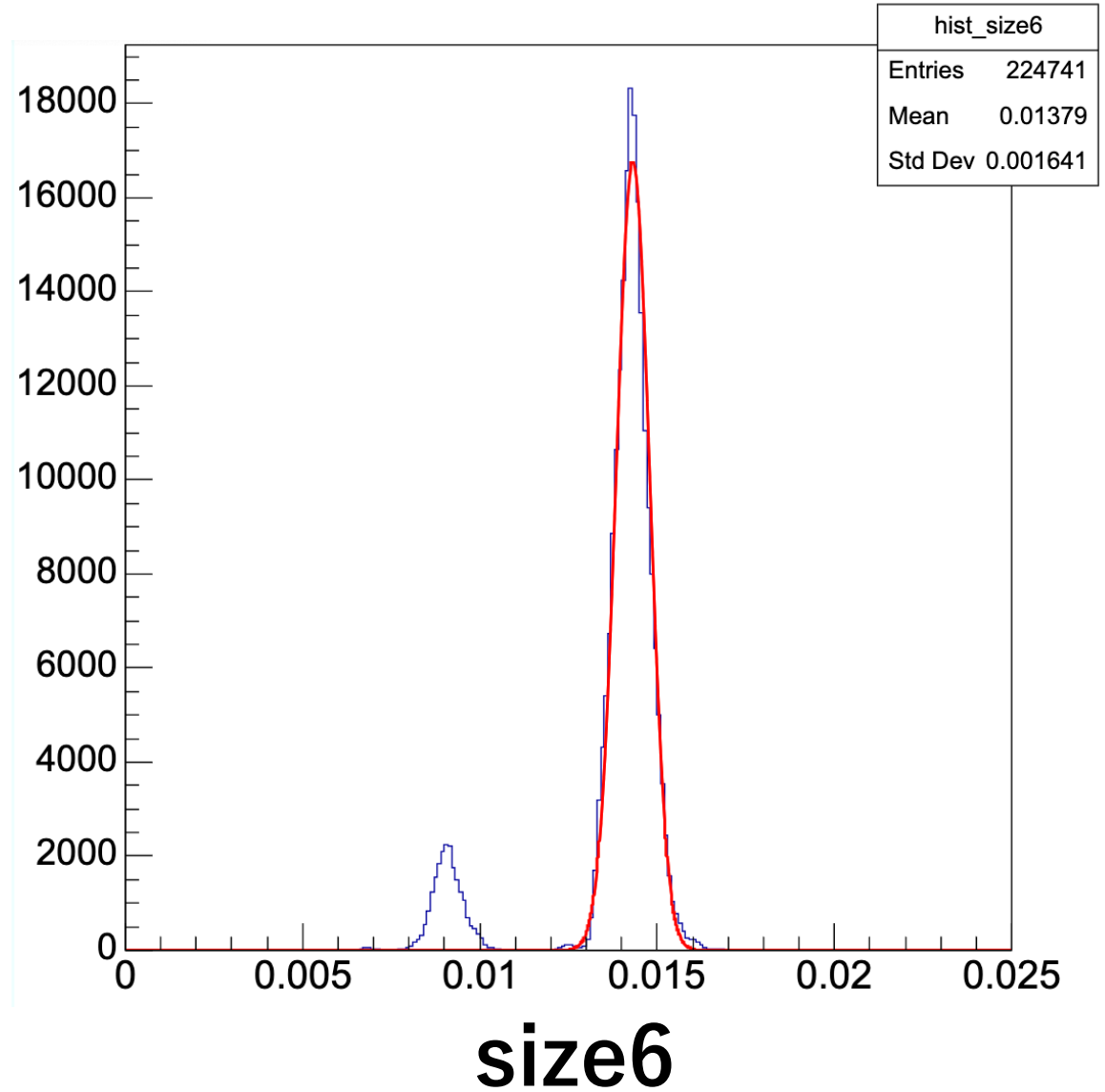
Fitting size by size

Fitting size by size

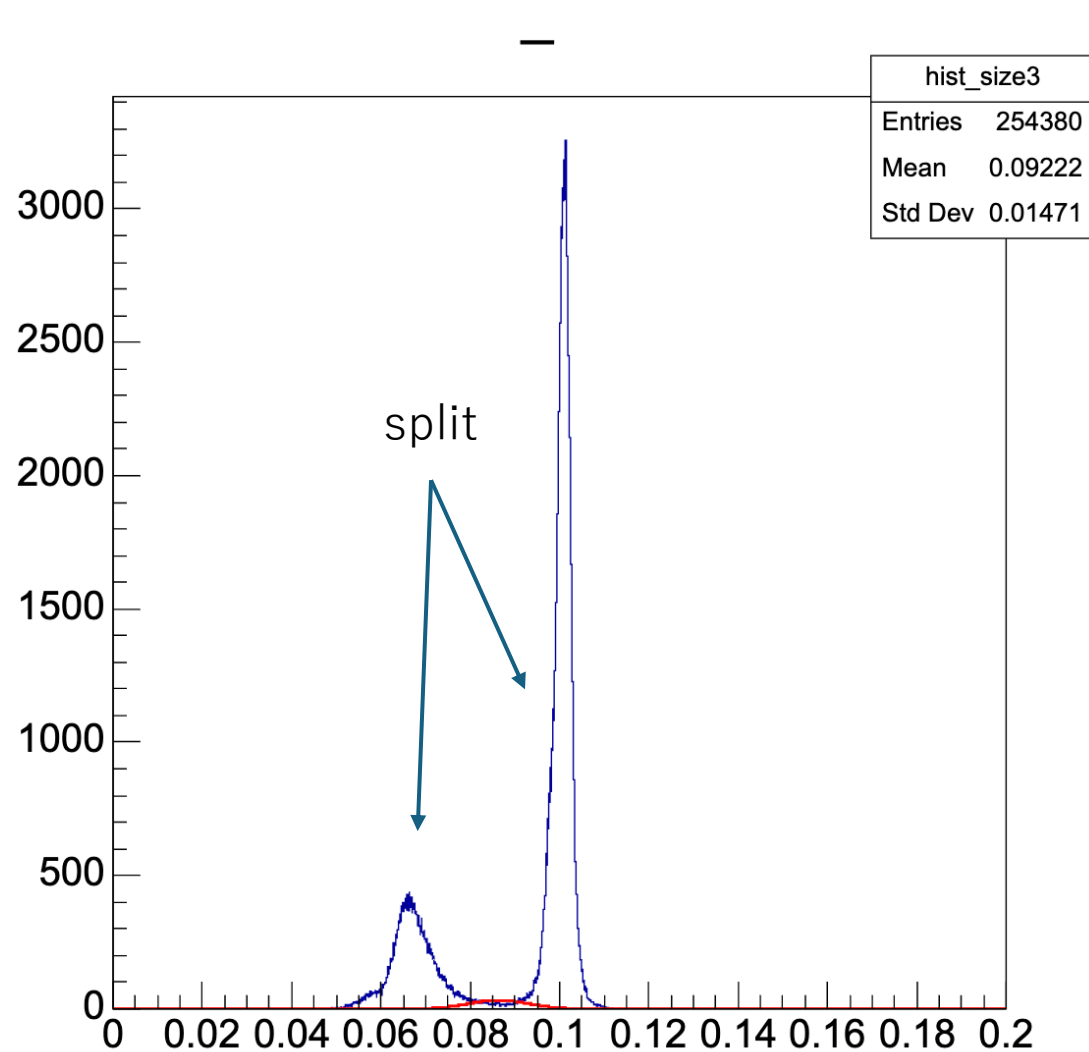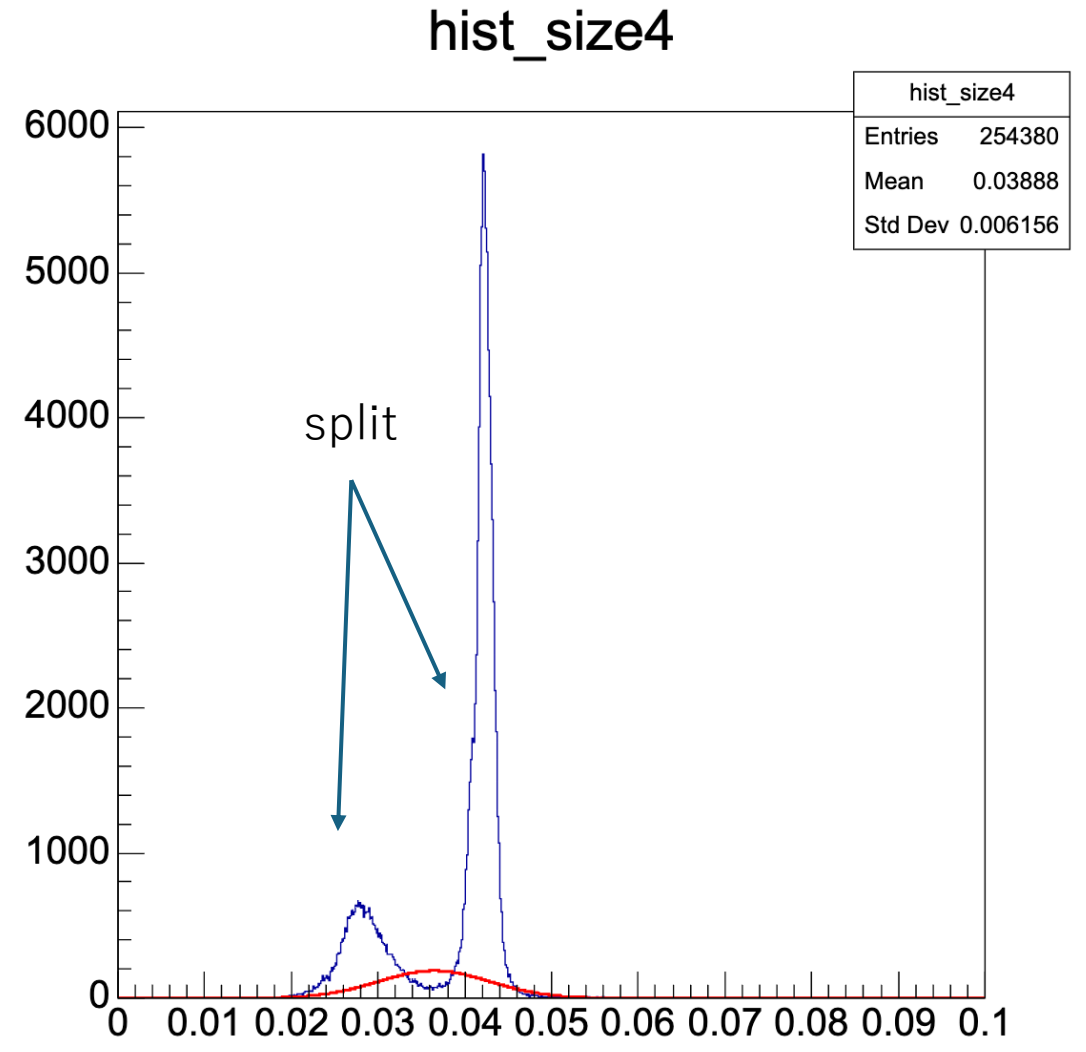# Fitting size by size

Fitting size by size
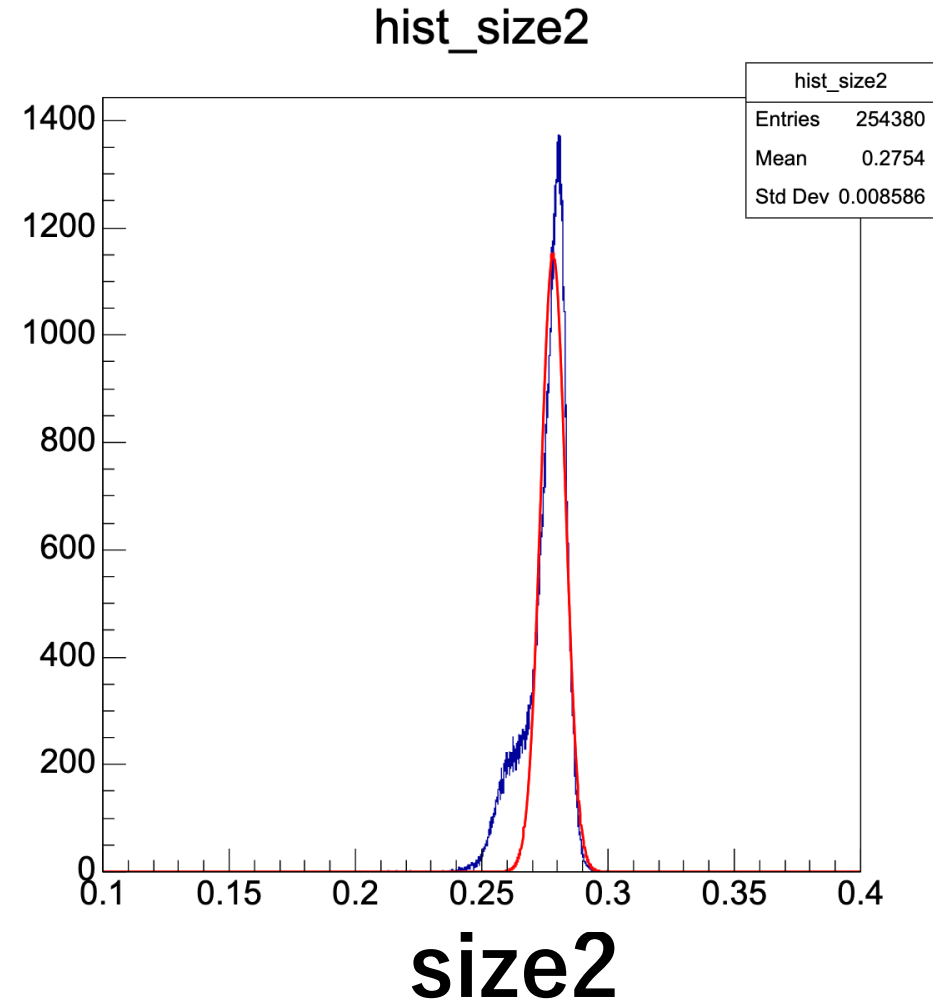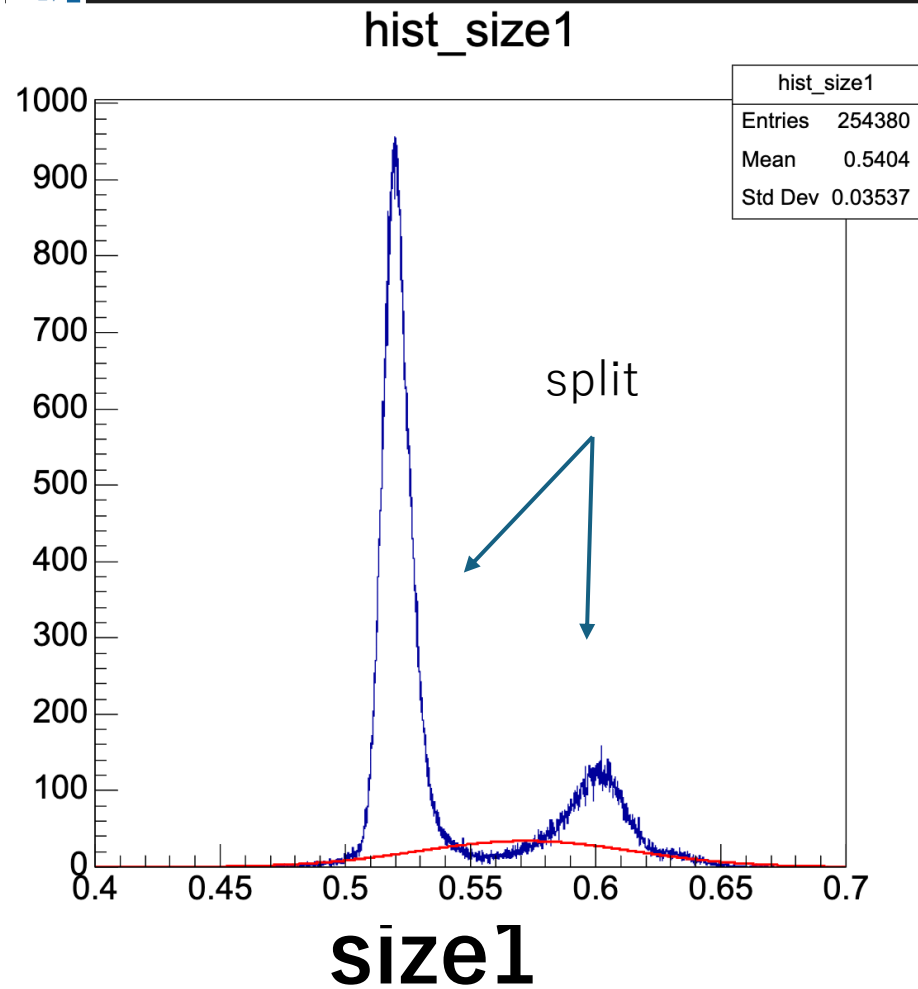
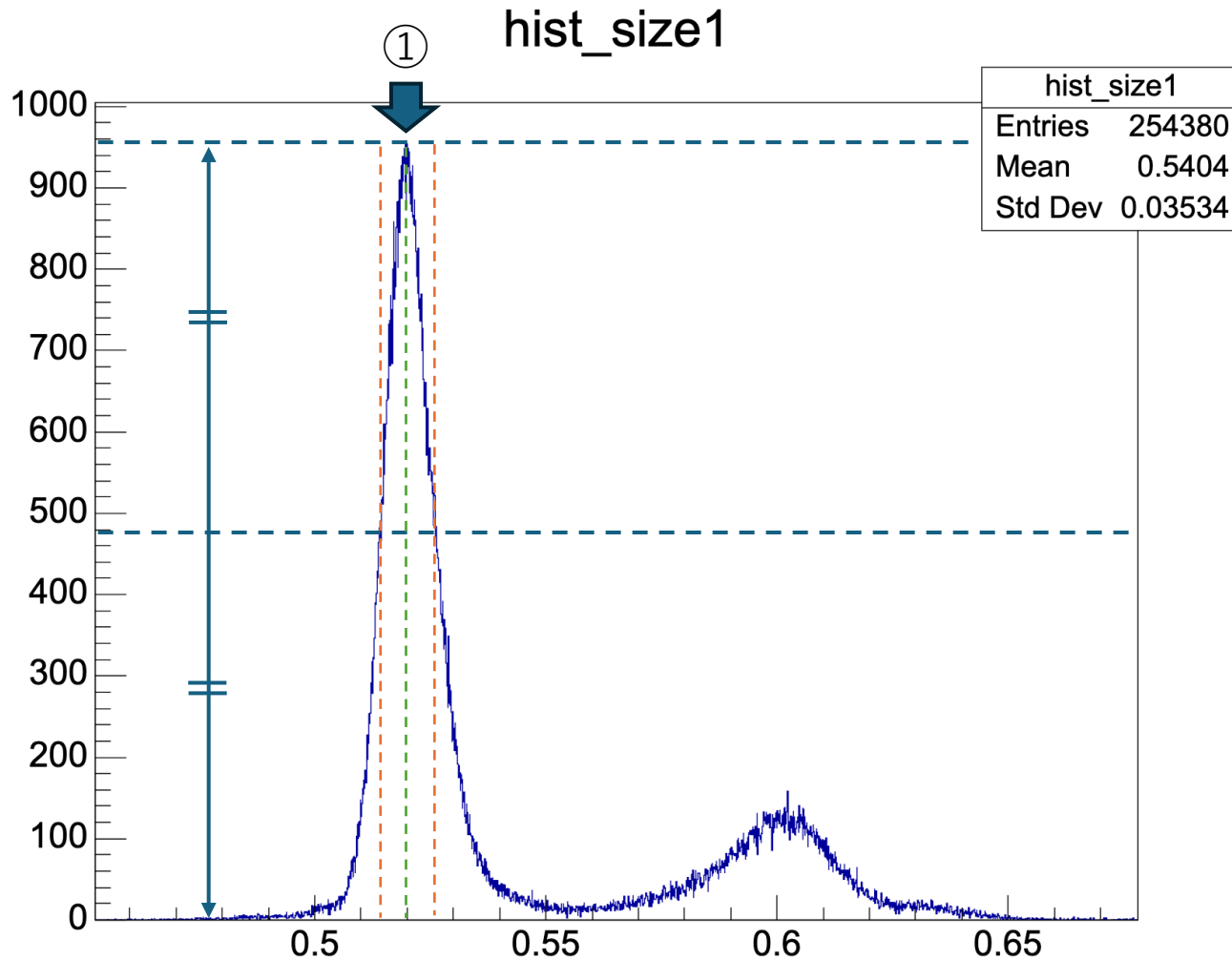size3   Gauss fitting doesn't work well   size4
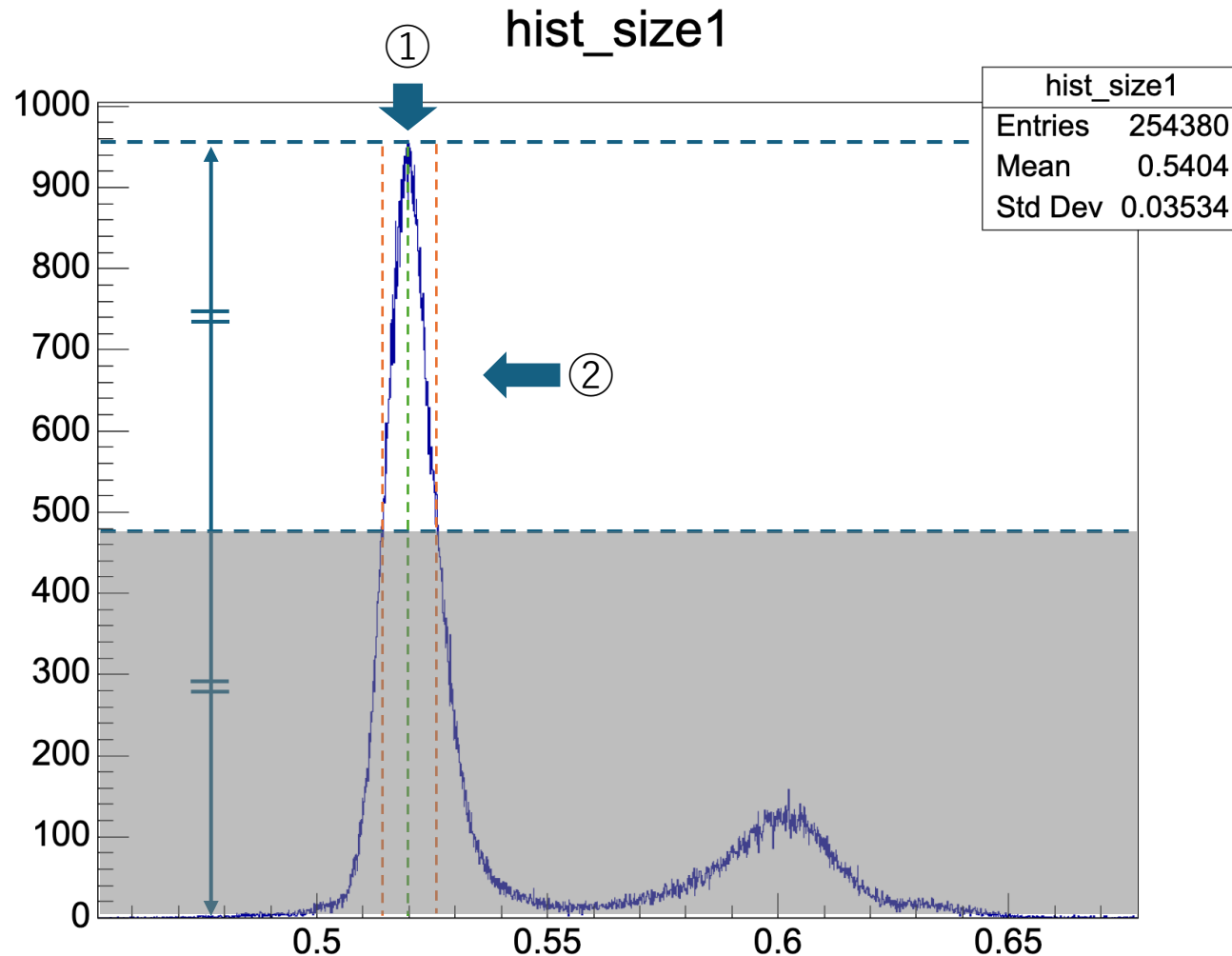
How to fit well (Cheng-Wei method)   Thank you !!

①Get the maximum bin

②Get a group of FWHM (over ①/2)

③Get mean x value of the group

④Get width x value of the group

⑤Set fitting range by ③ and ④

```cpp
vector<double> group_info = find_Ngroup (hist1D);
double group_mean = (group_info[2] + group_info[3]) / 2.;
double group_width = (group_info[3] - group_info[2]) / 2.;
double fit_ratio = 1.2;
TF1 *gausFit = new TF1("gausFit", "gaus", hist1D->GetXaxis()->GetXmin(), hist1D->GetXaxis()->GetXmax());
hist1D->Fit(gausFit, "NQ", "", group_mean - group_width * fit_ratio, group_mean + group_width * fit_ratio);
```
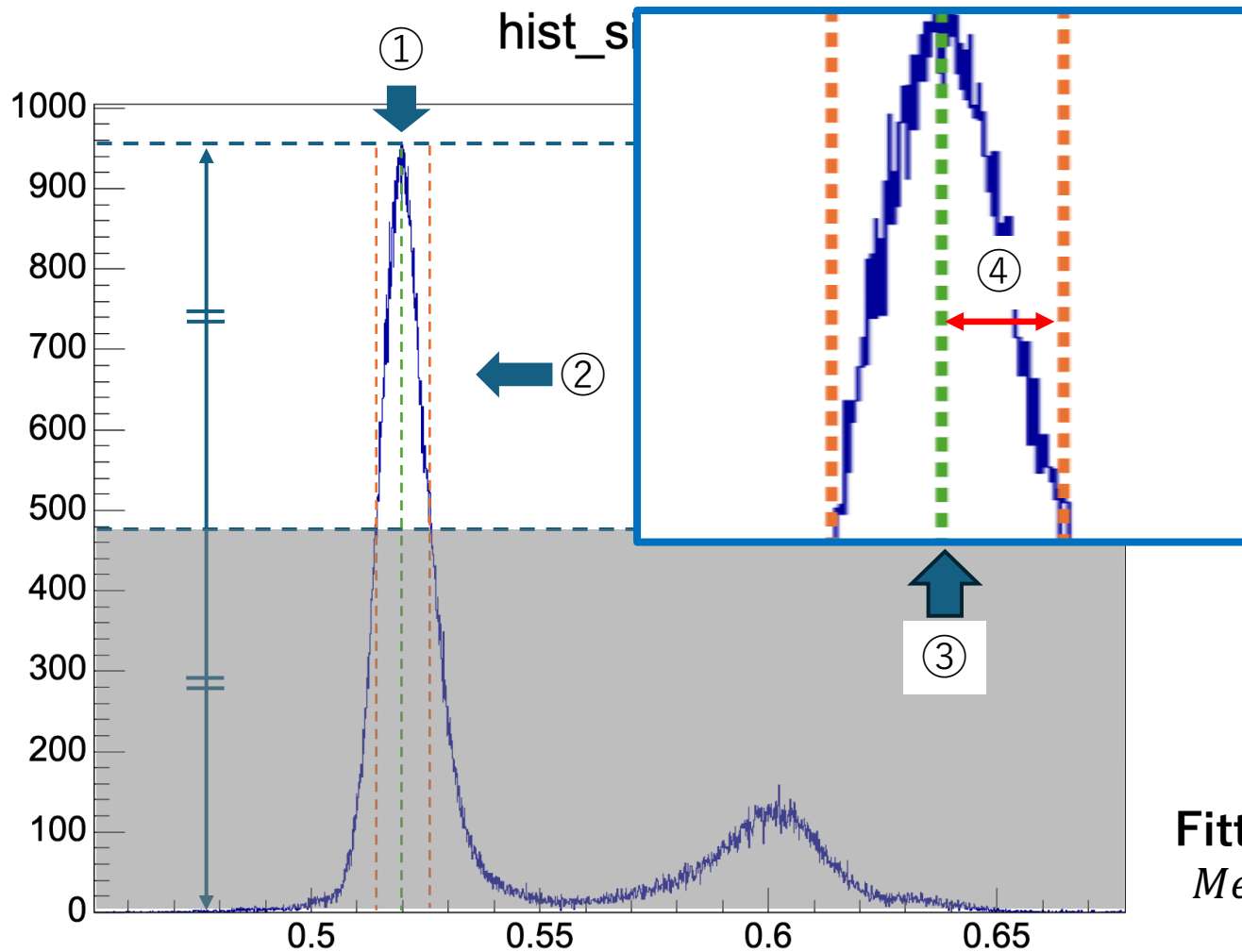
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hist1D->Fit(gausFit, "NQ", "", group_mean - group_width * fit_ratio, group_mean + group_width * fit_ratio);
```

How to fit well (Cheng-Wei method) Thank you !!

①Get the maximum bin

②Get a group of FWHM (over ①/2)

③Get mean x value of the group

④Get width x value of the group

⑤Set fitting range by ③ and ④

**Fitting range**

$$Mean - Width * 1.2 < x < Mean + Width * 1.2$$

```
vector<double> group_info = find_Ngroup (hist1D);
double group_mean = (group_info[2] + group_info[3]) / 2.;
double group_width = (group_info[3] - group_info[2]) / 2.;
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```
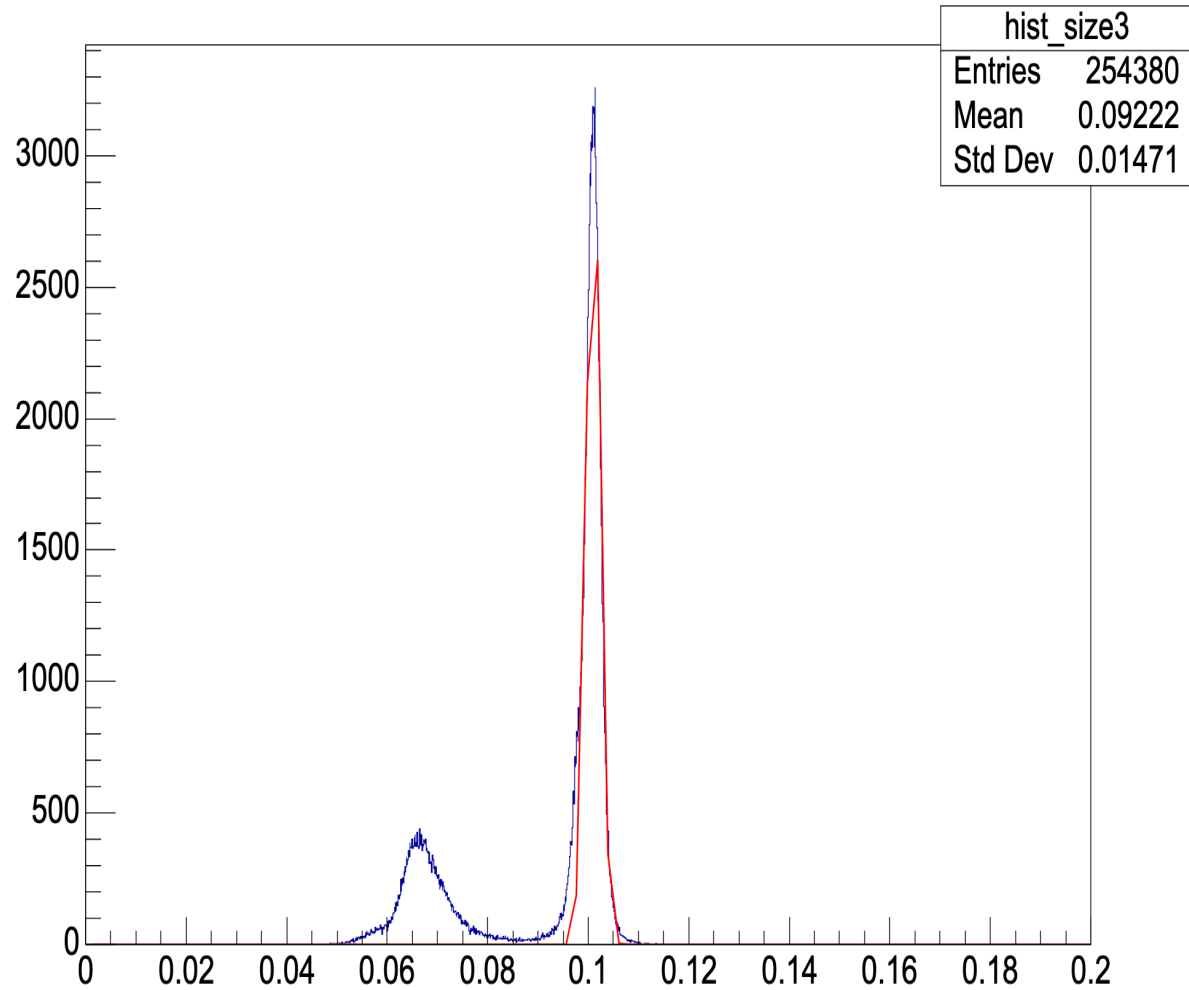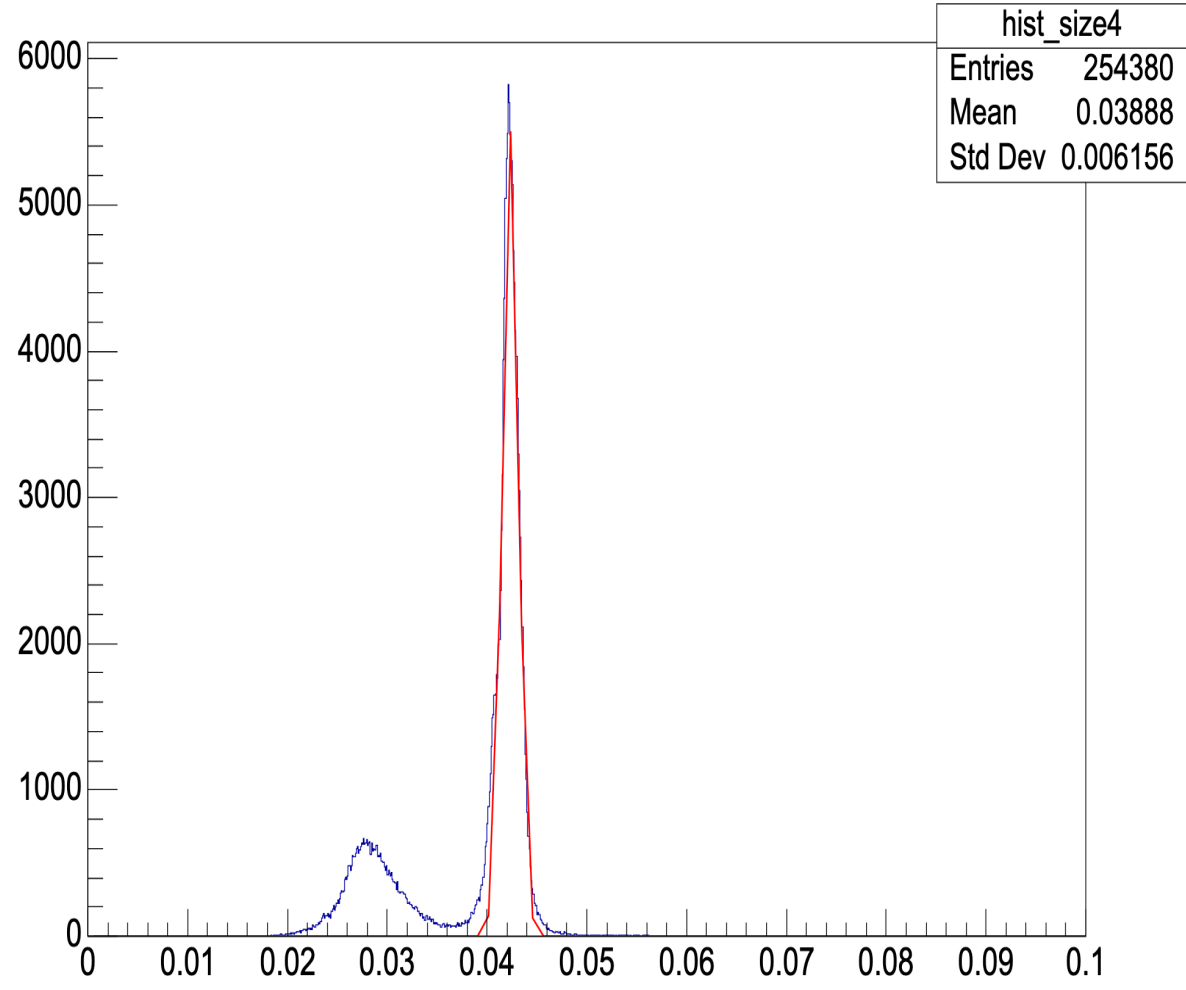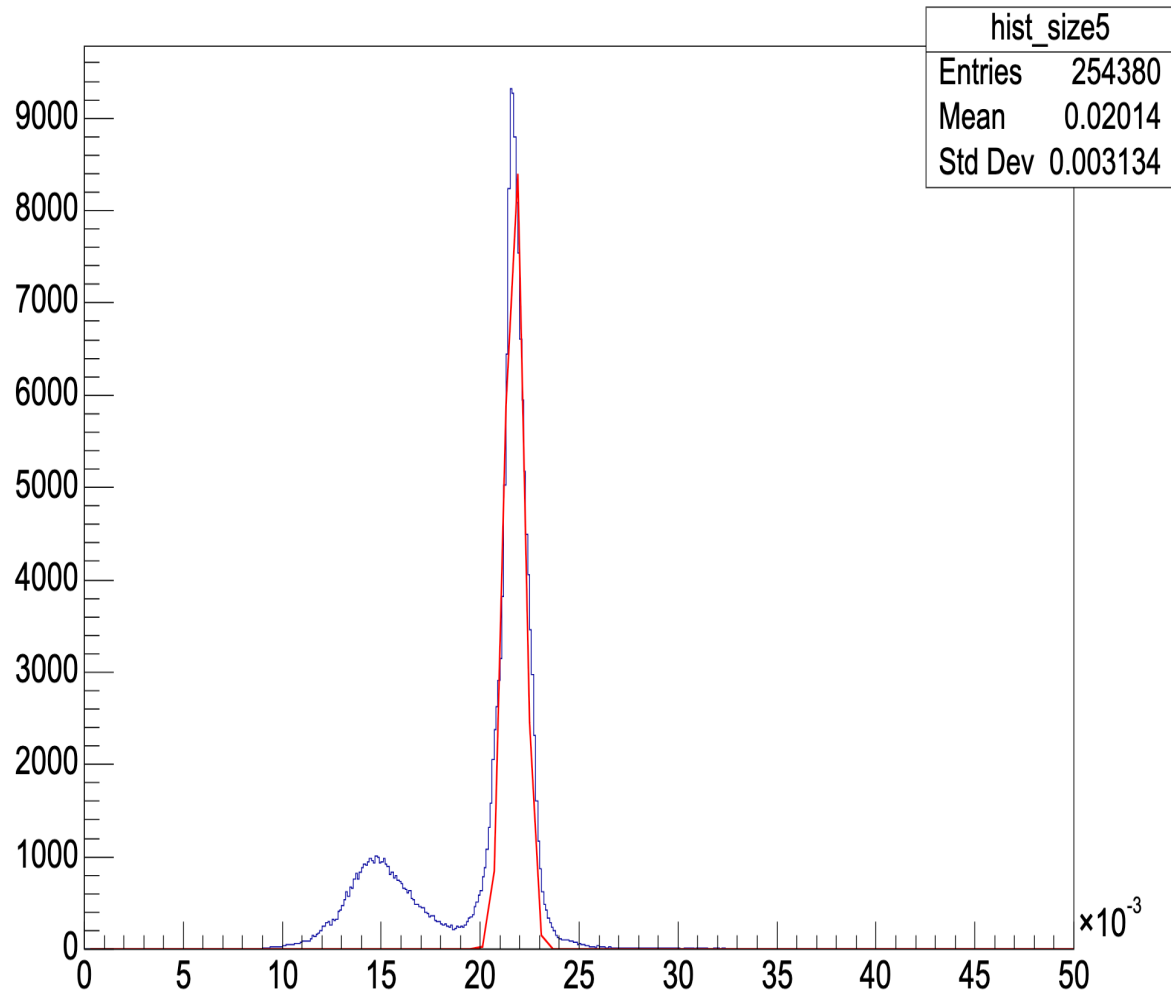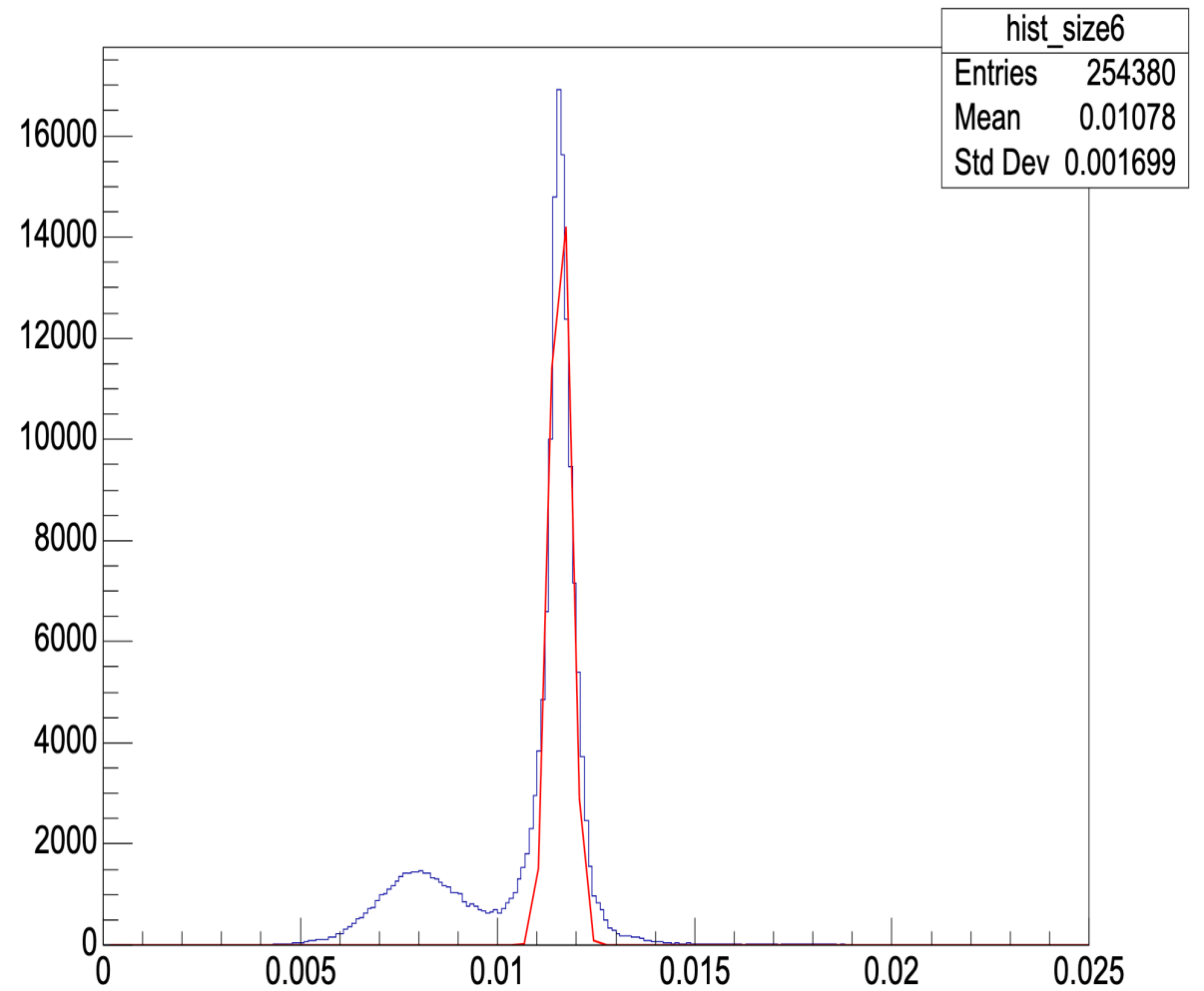
Fitting size by size
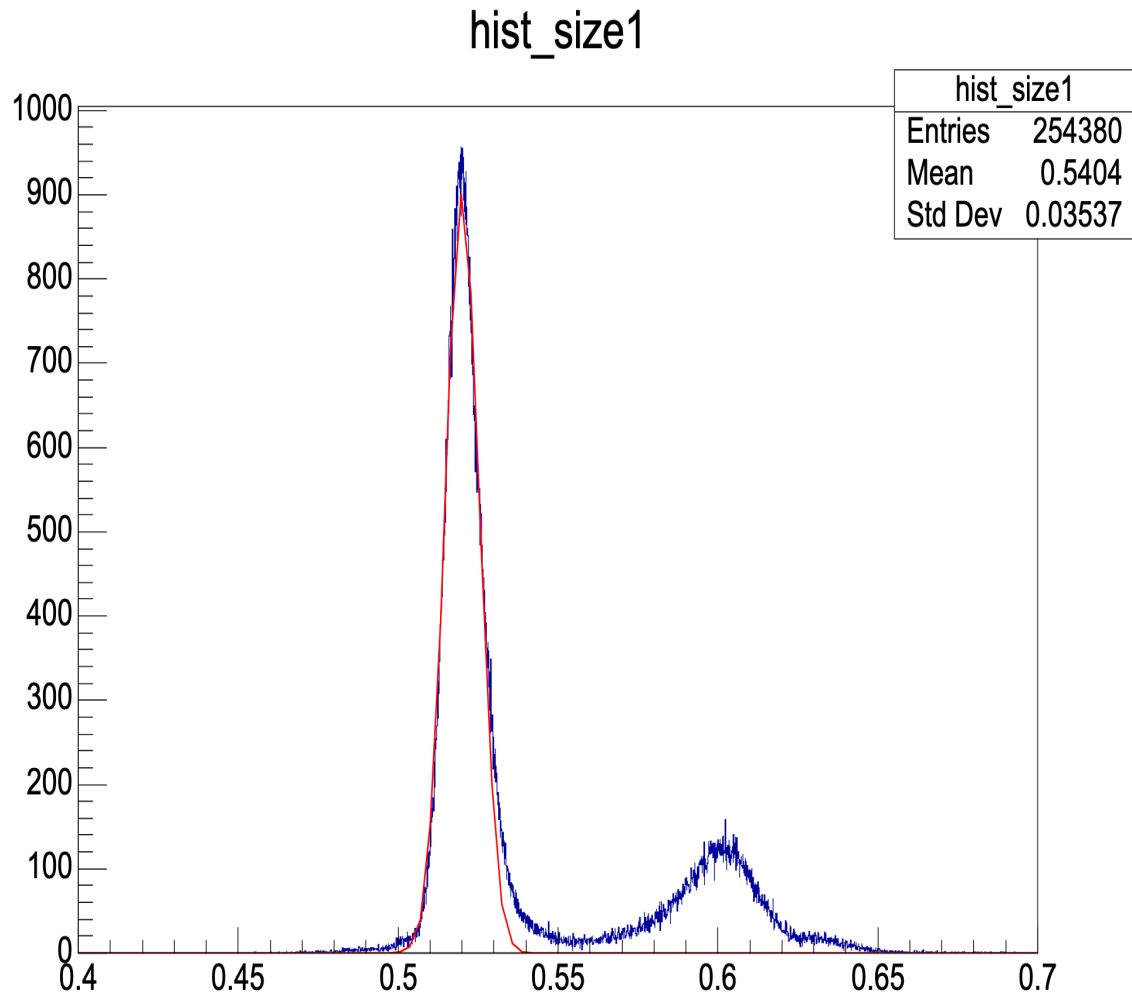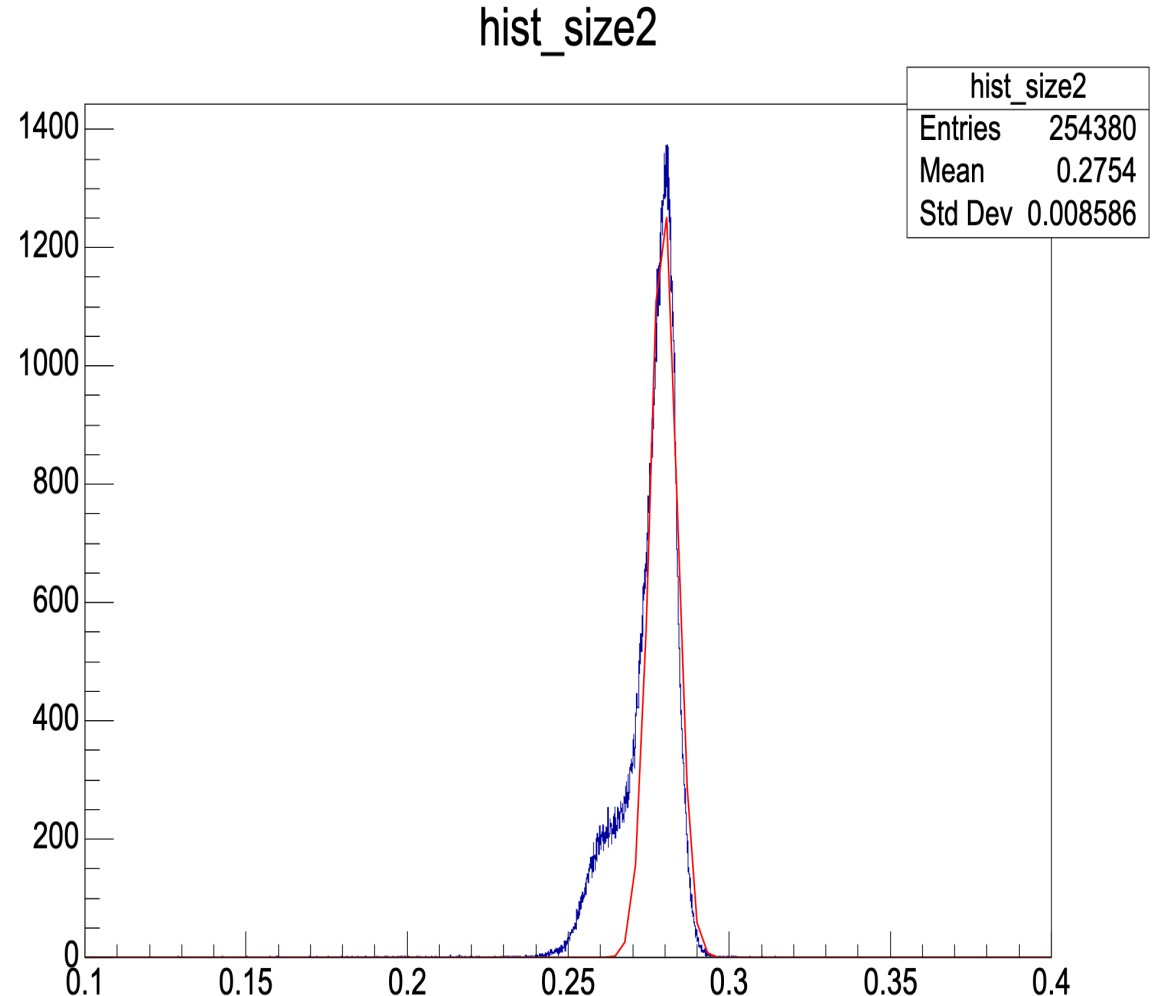
Fitting size by size

Fitting size by size

size5

size6

Summary

- I modified the reference plot
- Cluster distribution is different between DAC0=30 and 35
- Need to change the reference plot depending on the DAC0 value.

Ongoing

- **Adding the reference plot to offline QA website is ongoing.**
- **I succeeded in getting the reference plot onto test web thanks to Xudong.**
- **I am studying about the split distribution**
  - Magnet ON/OFF?