ECLTRG plots on 3DBhabha & random bit

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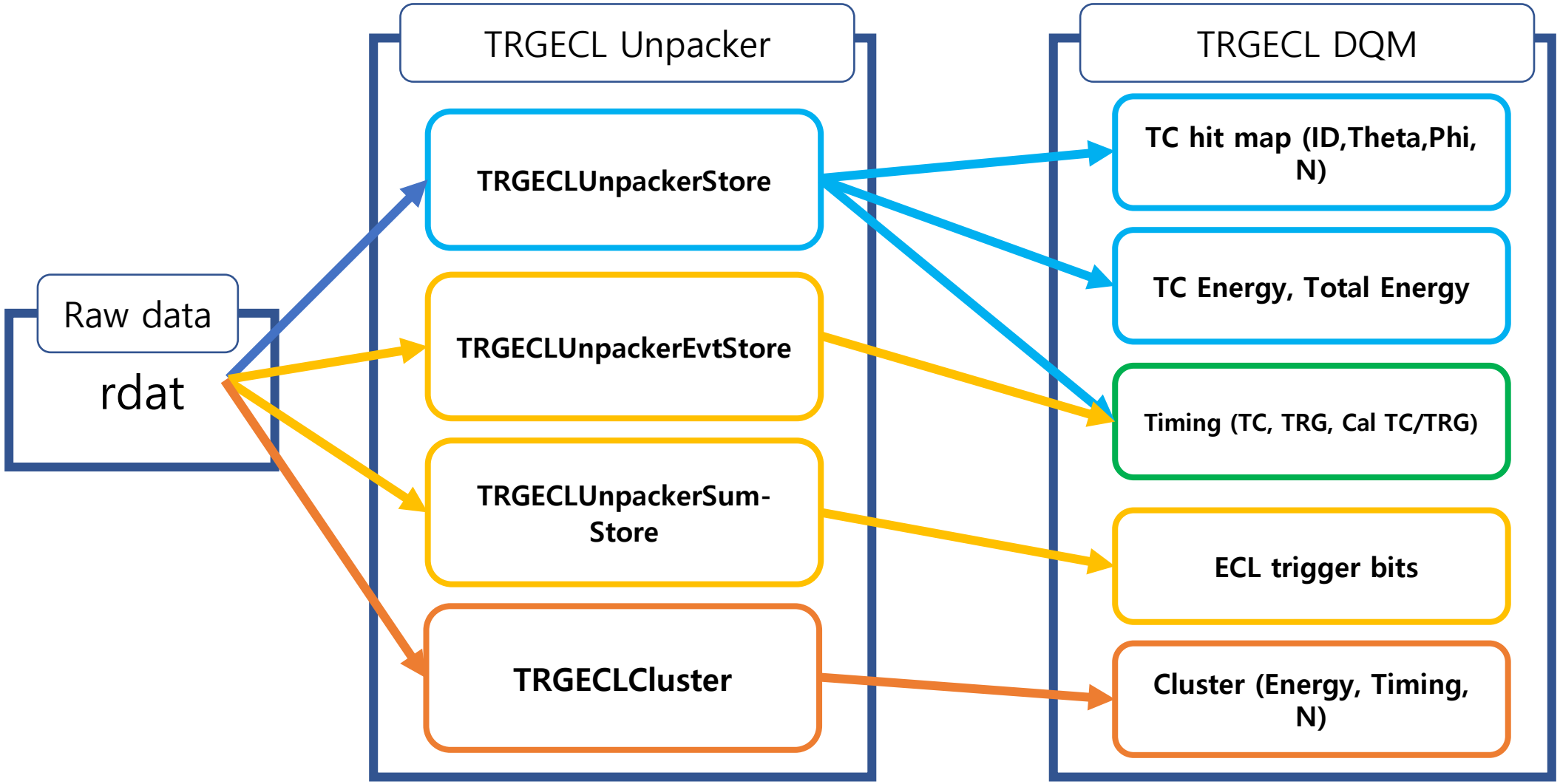
TRGECL DQM Data flow

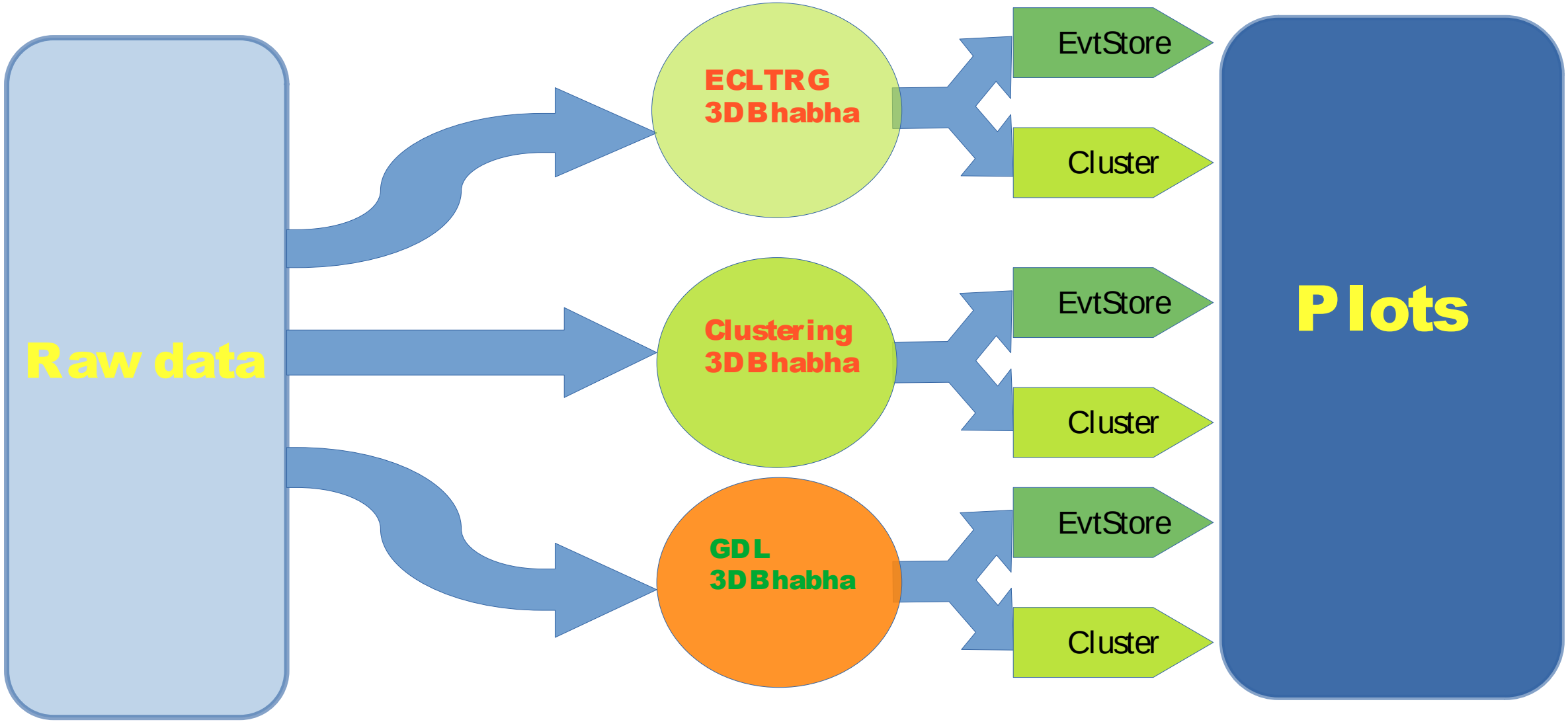


3D Bhabha events

- Skim method
  - ECLTRG ETM
    - TRGECLUnpackerEvtStore
    - TRGECLCluster
  - TRG GDL
    - psnmbit

- Sample information
  - Exp24 run1184
    - Rate (Trig. output) at start [Hz]: 2681.7898763
    - Integrated Luminosity [10^33 /cm^2]: 628604.220558
    - prescale bha3d 100
  - Exp17 run205
    - Rate (Trig. output) at start [Hz]: 4527.37972005
    - Integrated Luminosity [10^33 /cm^2]: 50601.6337645
    - prescale bha3d 1

TRGECL DQM Analysis

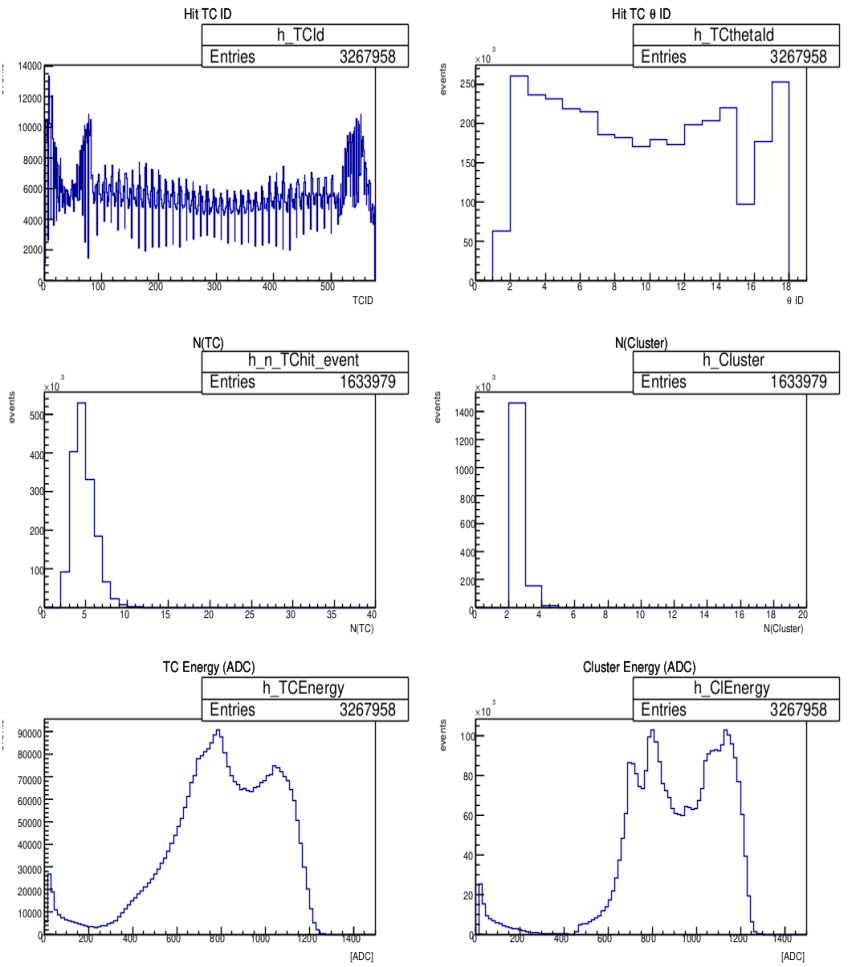


The detail of analysis method

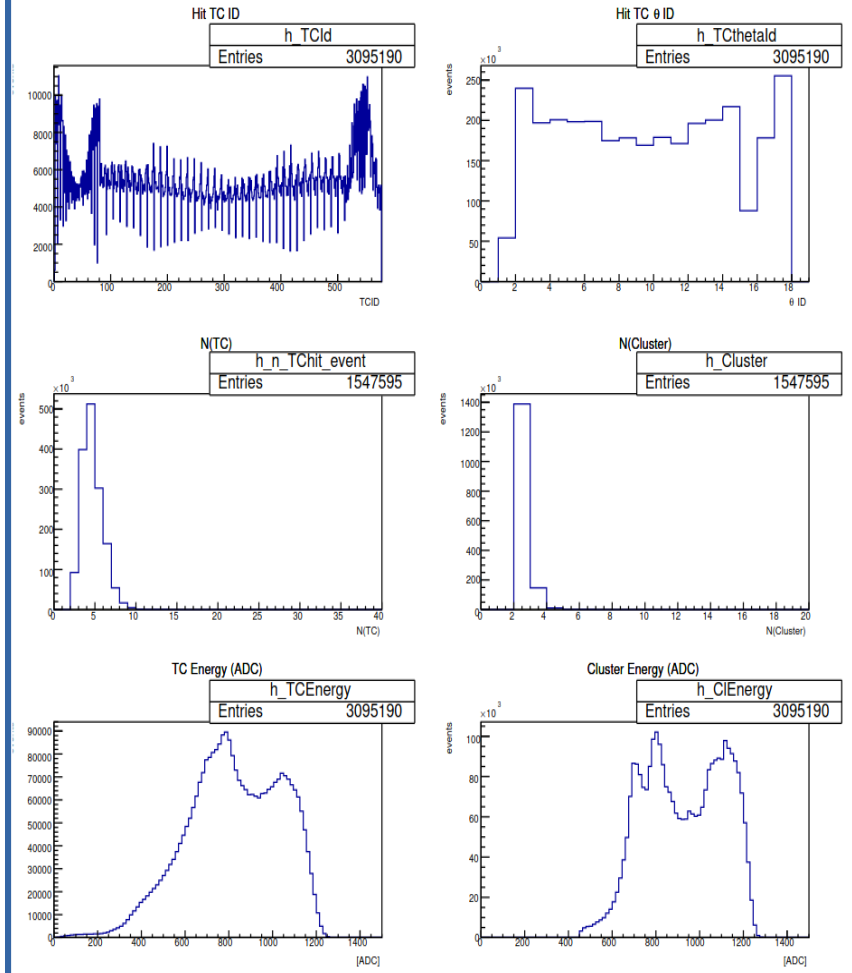
- ECLTRG ETM
  - 1)TRGECLUnpackerEvtStore
    - Most energetic TC/energy, cluster energy, # of cluster, # of TC, Total energy from TRGECLUnpackerEvtStore
  - 2)TRGECLCluster
    - Most energetic TC/energy, cluster energy, # of cluster from TRGECLCluster
    - # of TC, Total Energy from TRGECLUnackerStore

Exp24 run1184 3DBhabha ECLTRG Clueter

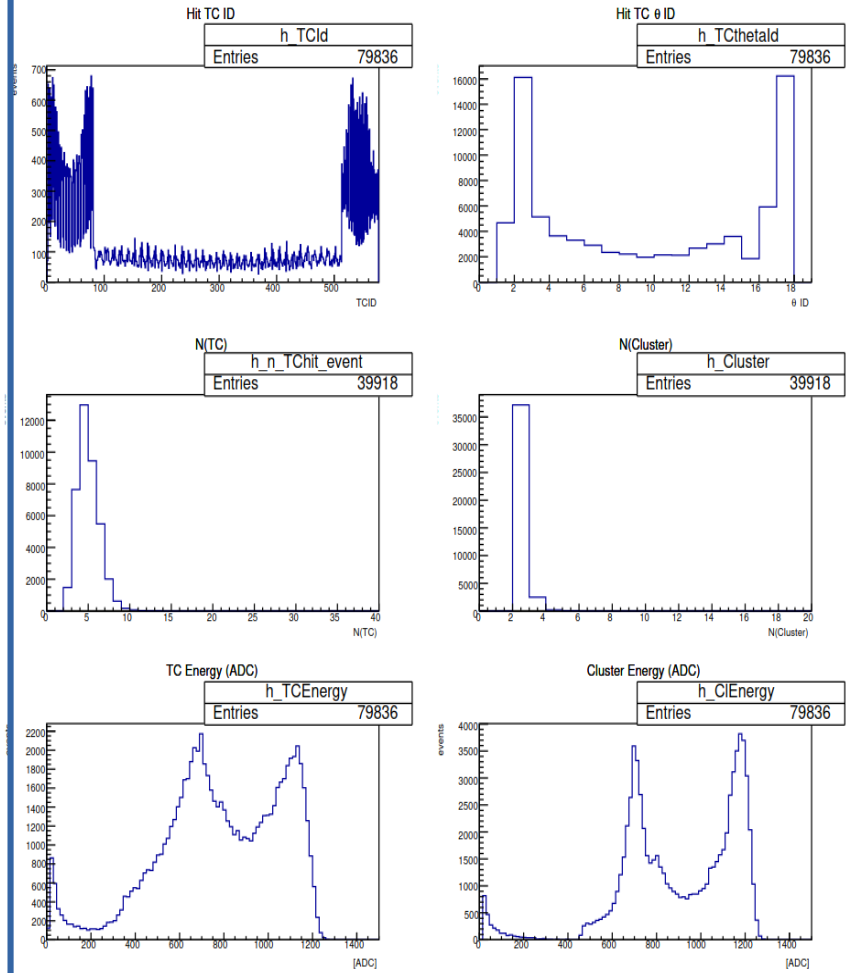
ETM EvtStore



ETM Cluster

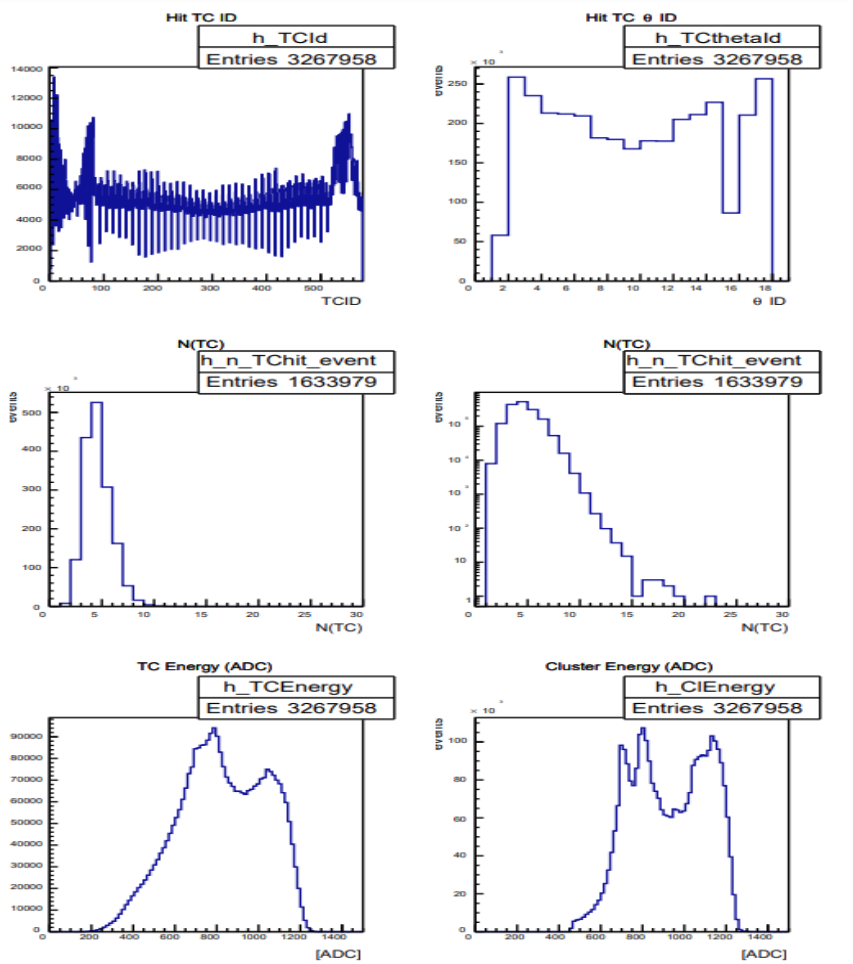


TRG GDL

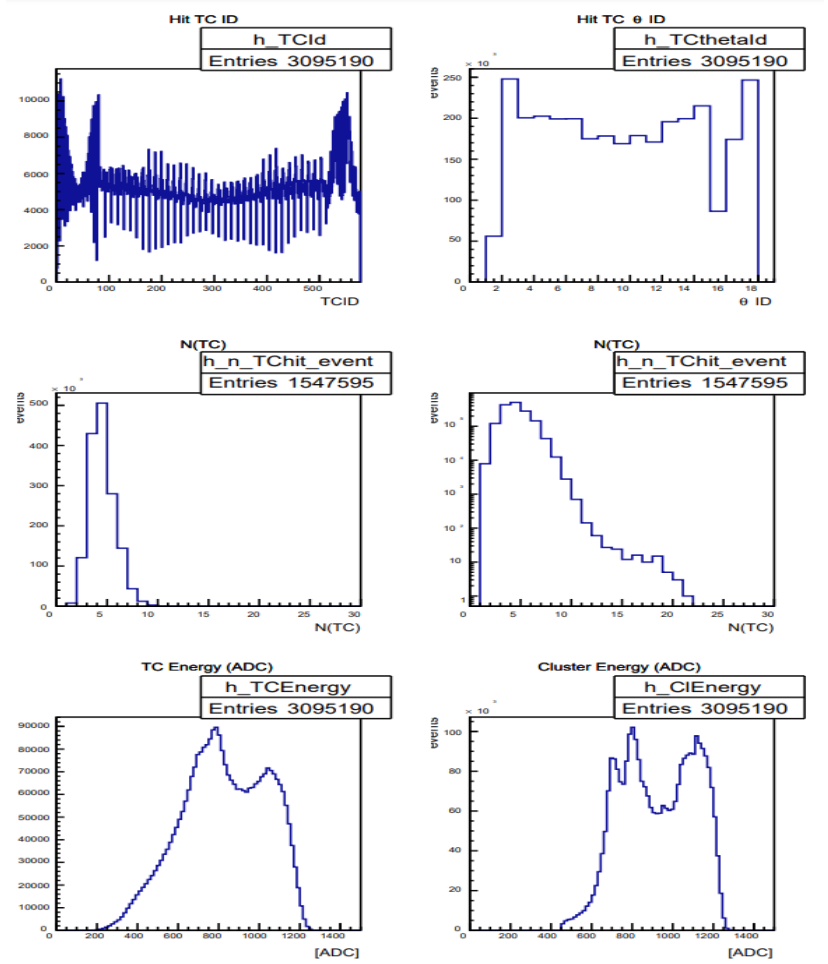


Exp24 run1184 3DBhabha ECLTRG EvtStore

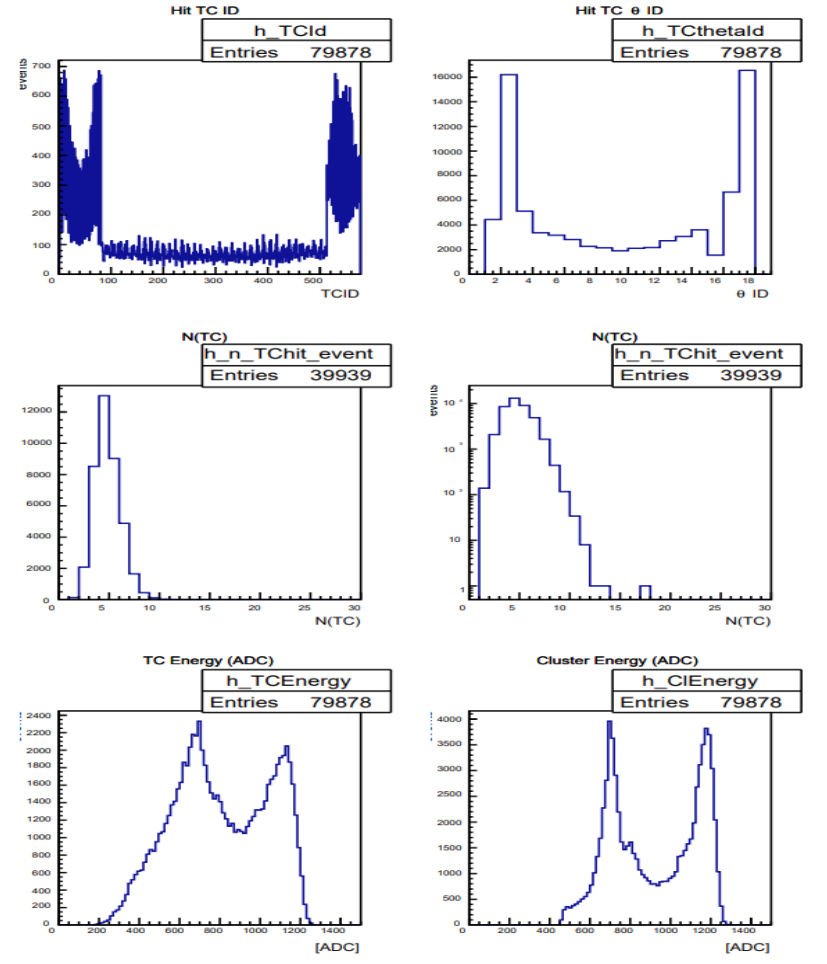
ETM EvtStore



ETM Cluster

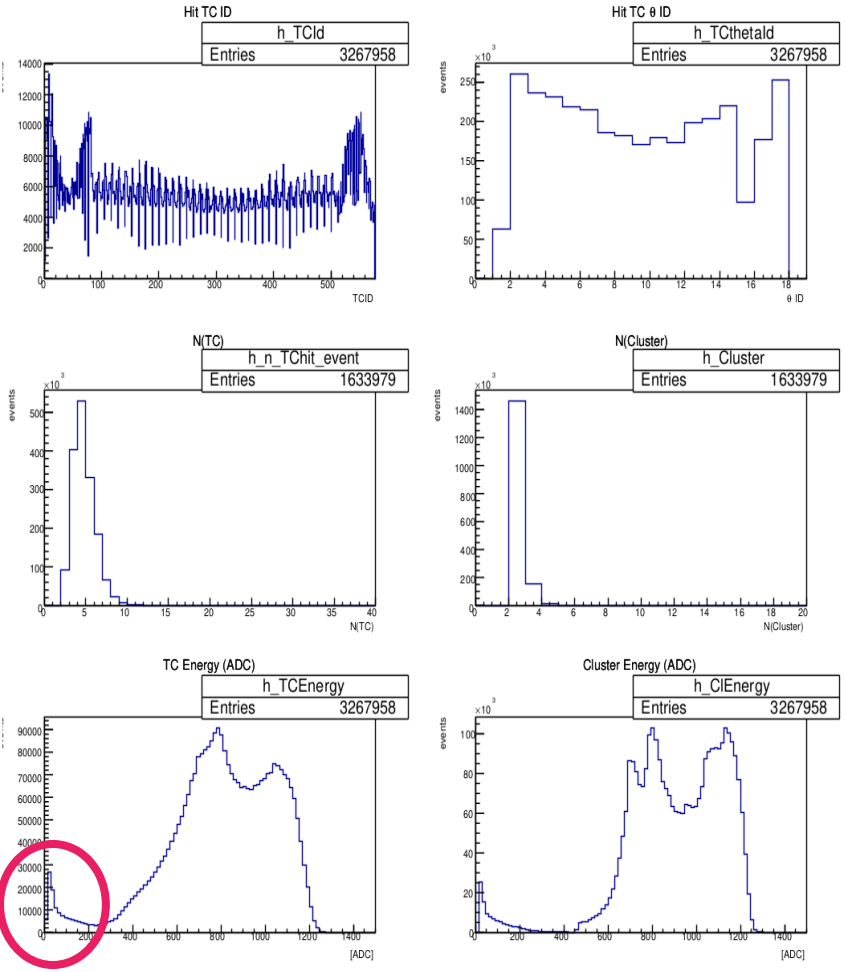


TRG GDL



Exp24 run1184 3DBhabha ECLTRG Cluster

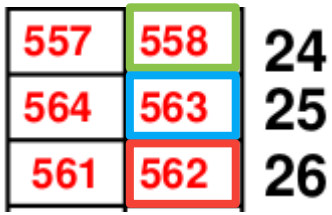
ETM EvtStore



- Skim method :
  - TRGECLUnpackerEvtStores.e_b2bhabhav == 1
- Analysis method :
  1. Find most/second energetic clusters from TRGECLCluster
  2. Get the number of clusters from TRGECLCLuster
  3. Get the the cluster position/energy of energetic clusters
  4. Compare the TCID between TRGECLUnpackerStore and cluster position
  5. Get the corresponding TC ID/TC energy from TRGECLUnpackerStore
  6. Get the number of Hit TC from TRGECLUnpackerStore

The detail of low Cluster energy

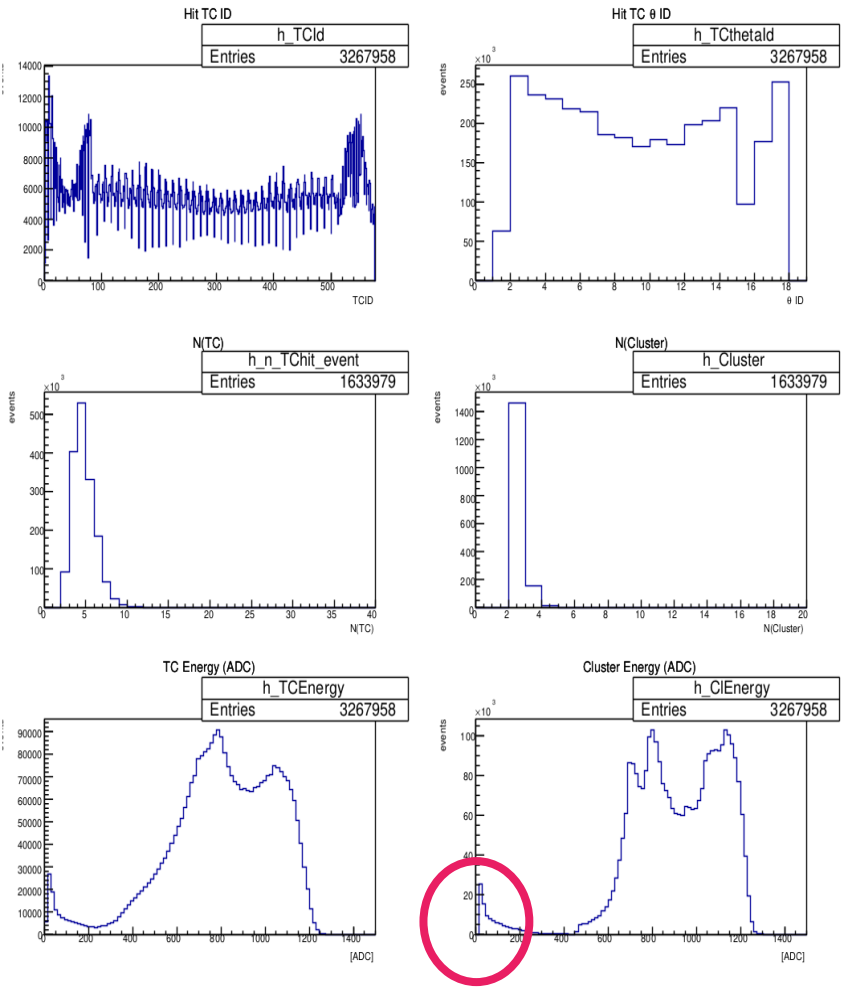
- Clustering error
  - TRGECLClusters.m_MaxTCId = 23, 563
  - TRGECLClusters.m_edep = 6069, 3890.25 [MeV] (factor : 5.25MeV/ADC)
  - TRGECLUnpackerStores.m_tcid = 22, 23, 24, 558, 562, 563
  - TRGECLUnpackerStores.m_energy = 109, 1007, 40, 120, 454, 167
  - TRGECLUnpackerEvtStores.e_cl_energy[6] = 1156 , 741 , 0 , 0 , 0 , 0



- **TCID 562 is real energetic TC**
- **TRGECLCluster said 563 is energetic TC**
-
- **The ratio : 116336 / 1634163~7.1%**

Exp24 run1184 3DBhabha ECLTRG plots

ETM EvtStore



- Skim method :
  - TRGECLUnpackerEvtStores.e_b2bhabhav == 1
- Analysis method :
  1. Find most/second energetic clusters from TRGECLCluster
  2. Get the number of clusters from TRGECLCLuster
  3. Get the the cluster position/energy of energetic clusters
  4. Compare the TCID between TRGECLUnpackerStore and cluster position
  5. Get the corresponding TC ID/TC energy from TRGECLUnpackerStore
  6. Get the number of Hit TC from TRGECLUnpackerStore

The detail of low TC energy

- Cluster position mismatching
  - TRGECLClusters.m_MaxTCId = 38, 273
  - TRGECLClusters.m_edep = 4551.75, 183.75 [MeV] (factor : 5.25MeV/ADC)
  - TRGECLUnpackerStores.m_tcid = 38, 39, 273, 570, 575
  - TRGECLUnpackerStores.m_energy = 832, 35, 35, 274, 420

- **Max TC ID of TRGECLCluster : 38, 279**
- **Max TC ID of TRGECLUnpackerStores: 38, 575**
-
- **The ratio : 94395 / 1634163 ~5.8%**

Investigating the different shape

Message ID: **792**	Entry time: **2021/04/ 7 Wed 01:49 UTC**
JSTTime:	2021/04/ 7 10:48 JST
Author:	Taichiro Koga
Type:	Parameter
Category:	GDL Configuration
Subject:	Major prescale change of bhabha related bits
Firmware:	no change
Software:	no change
Slow control:	no change
Parameter:	updated

```
Prescale of bhabha related bits are changed as follows. Exp number will be changed from 17 to 18.
-lume   1->100
-bha3d  1->100
-bhabha 1->100
-bhapur 1->10
-lml3   1->100
-lml5   1->100
-c1hie  1->0
-c1hume 1->0
-n1hie  1->0
-n1lume 1->0
-c3hie  1->0
-c3lume 1->0
-n3hie  1->0
-n3lume 1->0
-lml1   1->2
-lml4   1->10

In addition, new y related bits are newly used
-fioiecl1 1->100
-yioiecl1 0->1

Saved as 20210407_2_col.
```

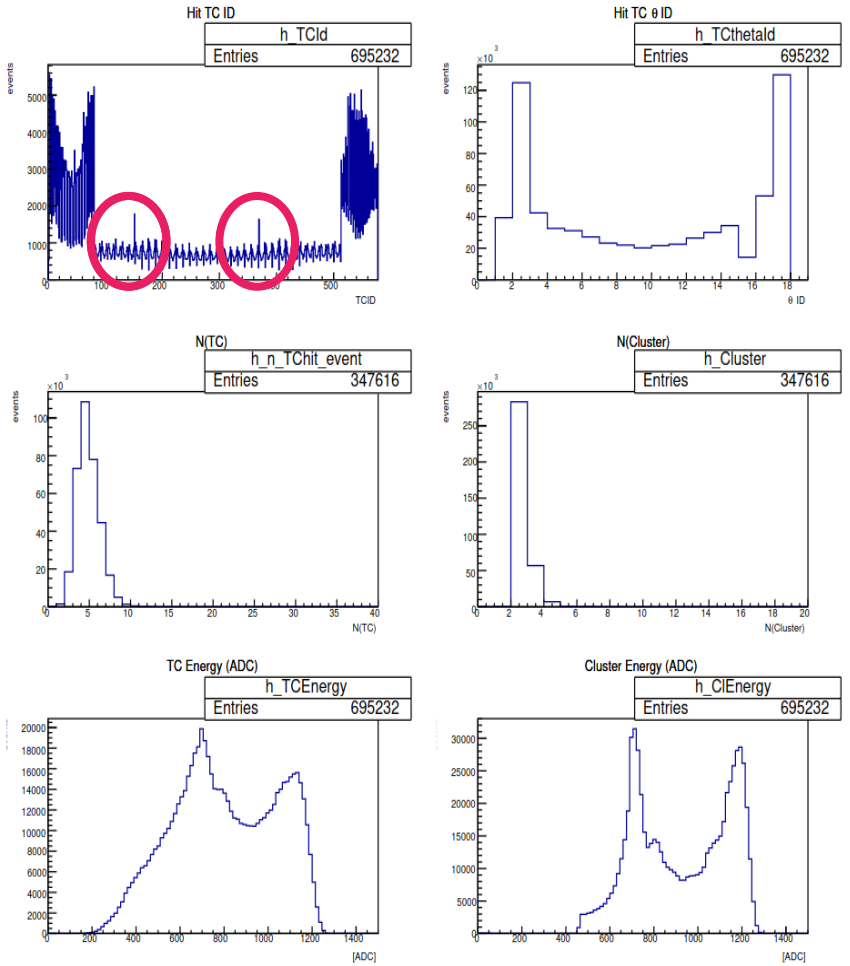
- Guess 1)
  - Some bhabha events, especially barrel events, are discarded by GDL mechanism
- Guess 2)
  - Prescale affect ETM shape, but GDL is little affected.

- Prescale was changed when start exp18.

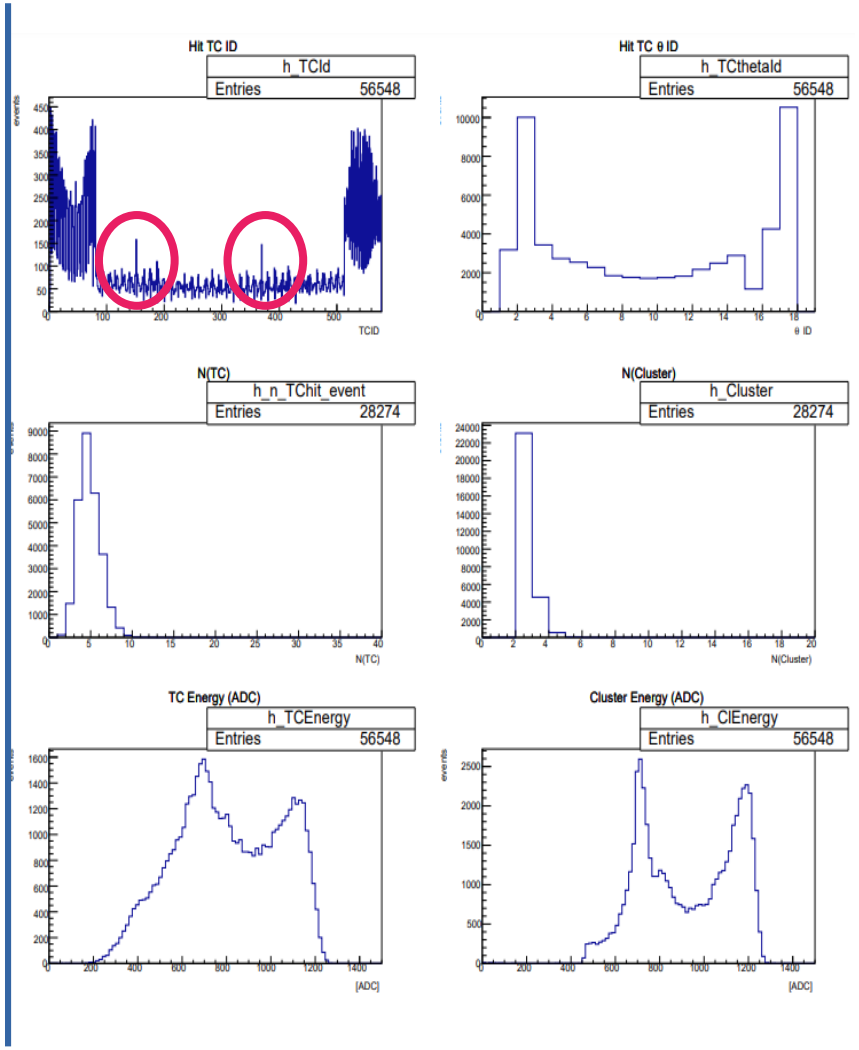
- https://elog.belle2.org/elog/TRG+operation/792

Exp17 3DBhabha ECLTRG plots

TRG GDL EvtStore run205



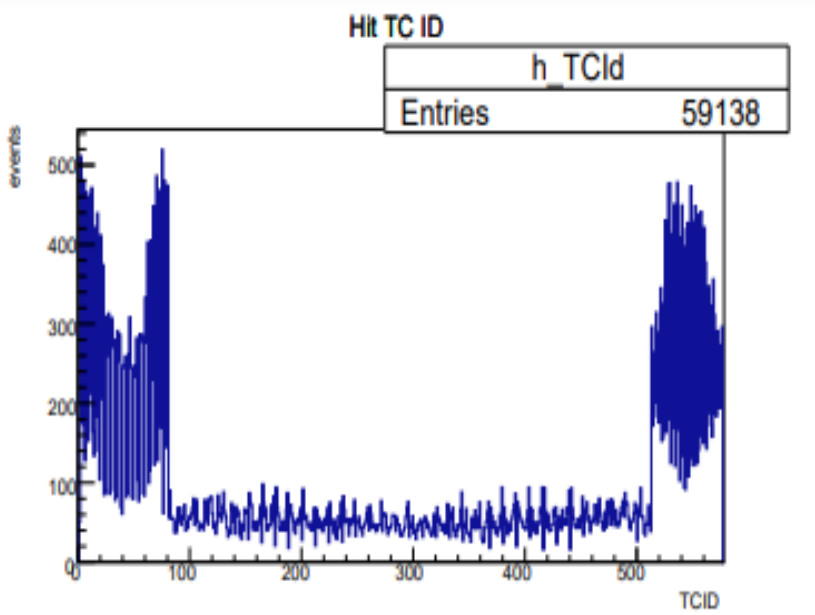
TRG GDL EvtStore run219



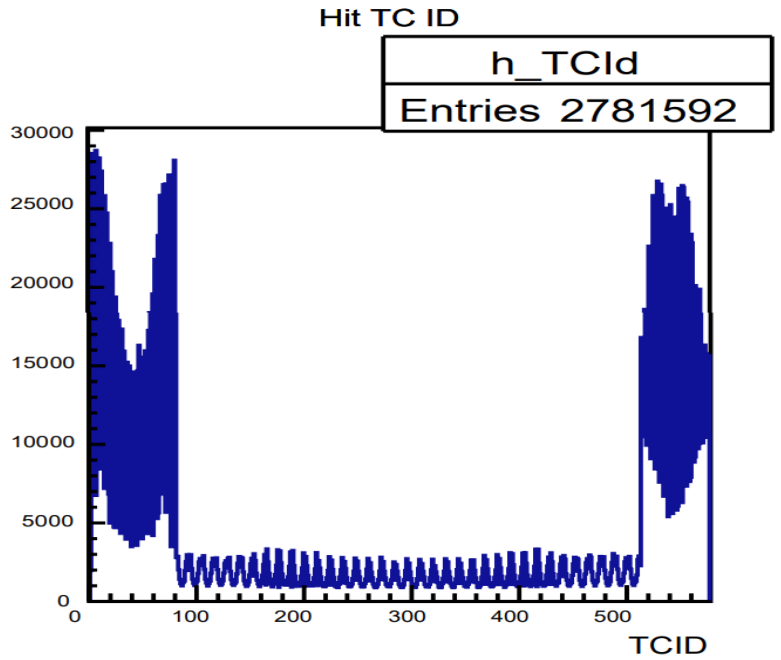
- The barrel peaks appear in exp 17
- TCID : 151, 369

3DBhabha ECLTRG plots

TRG GDL EvtStore exp18



TRG GDL EvtStore exp16



- The barrel peaks disappear in other exp

Random events

- Skim method
  - TRG GDL
    - Psnmbit : 77,78
    - TimType : 5,6

- Sample information
  - Exp24 run1184
    - Rate (Trig. output) at start [Hz]: 2681.7898763
    - Integrated Luminosity [10^33 /cm^2]: 628604.220558
    - prescale bha3d 100
  - Exp17 run205
    - Rate (Trig. output) at start [Hz]: 4527.37972005
    - Integrated Luminosity [10^33 /cm^2]: 50601.6337645
    - prescale bha3d 1

  - Preparing
    - Exp17 run209,211,213,244
    - Exp26 run272,671,1121,1260

The detail of Skim method

- TRG GDL
  - Timtype == 5 (beam abort gab time random trigger timtype)
  - Timtype == 6 (delayed_bhabha random trigger timtype)
  - TRGECLUnpackerEvtStores.e_hit_win == 3 || 4
    - Psnmbit == 77 (beam abort gab time random trigger bit)
    - Psnmbit == 78 (delayed_bhabha random trigger bit)

To do

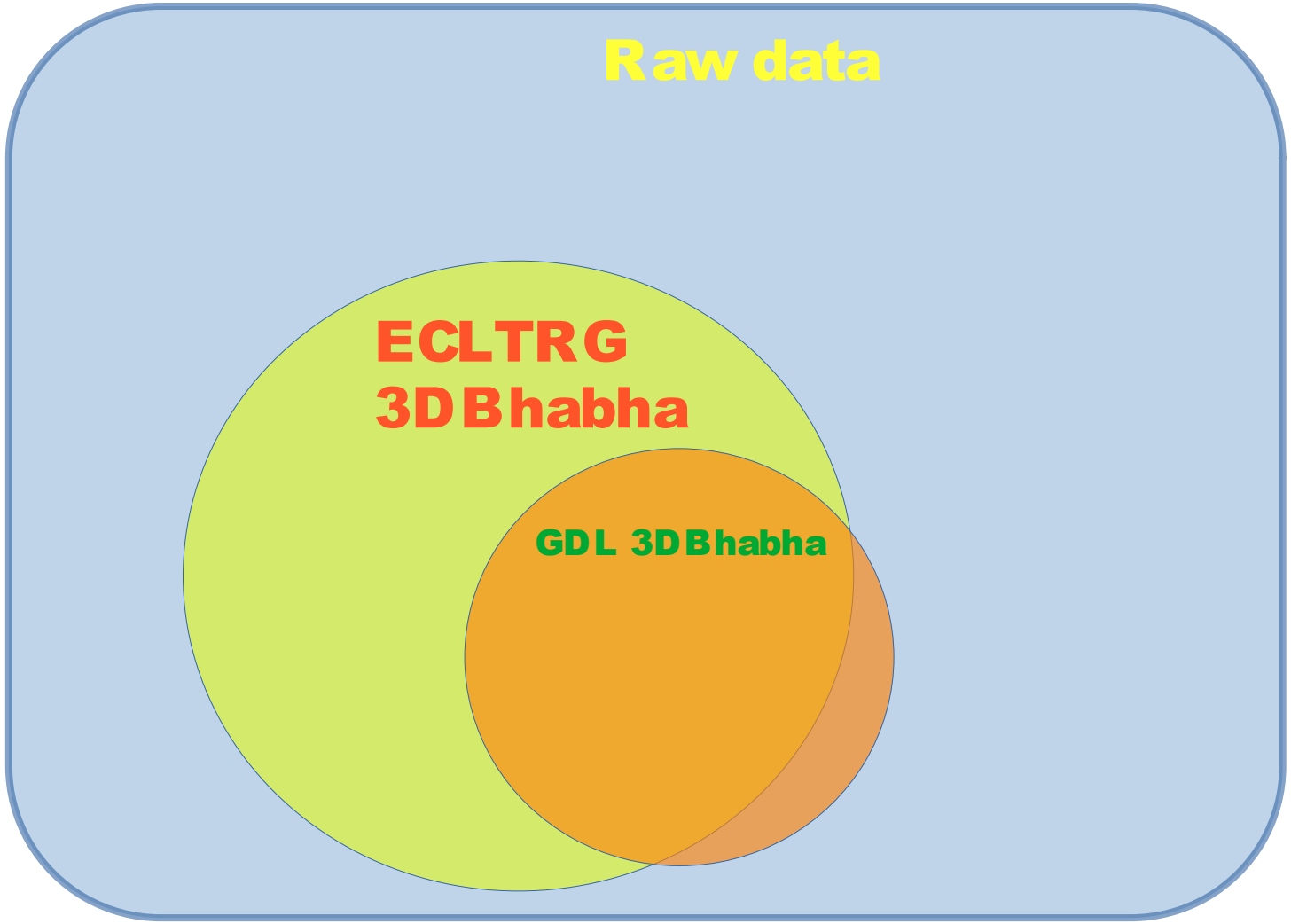
- 3DBhabha
  - Investigate two peaks in barrel e17r205
  - Understand the detail of the GDL mechanism
    - Compare the number of ftdl & psnm & Evt 3DBhabha.

- Random
  - Prepare more run data
  - Study about TRGSummary random trigger bit

- Event timing related plot (when event timing is determined by ecl trigger)
- TOP eventT0 as a function of TC energy used in event timing when event timing is determined by ecl trigger.

Back up

TRGECL DQM Analysis



3D Bhabha events

- Skim method
  - ECLTRG ETM
    - TRGECLUnpackerEvtStore
    - TRGECLCluster
  - TRG GDL
    - psnmbit

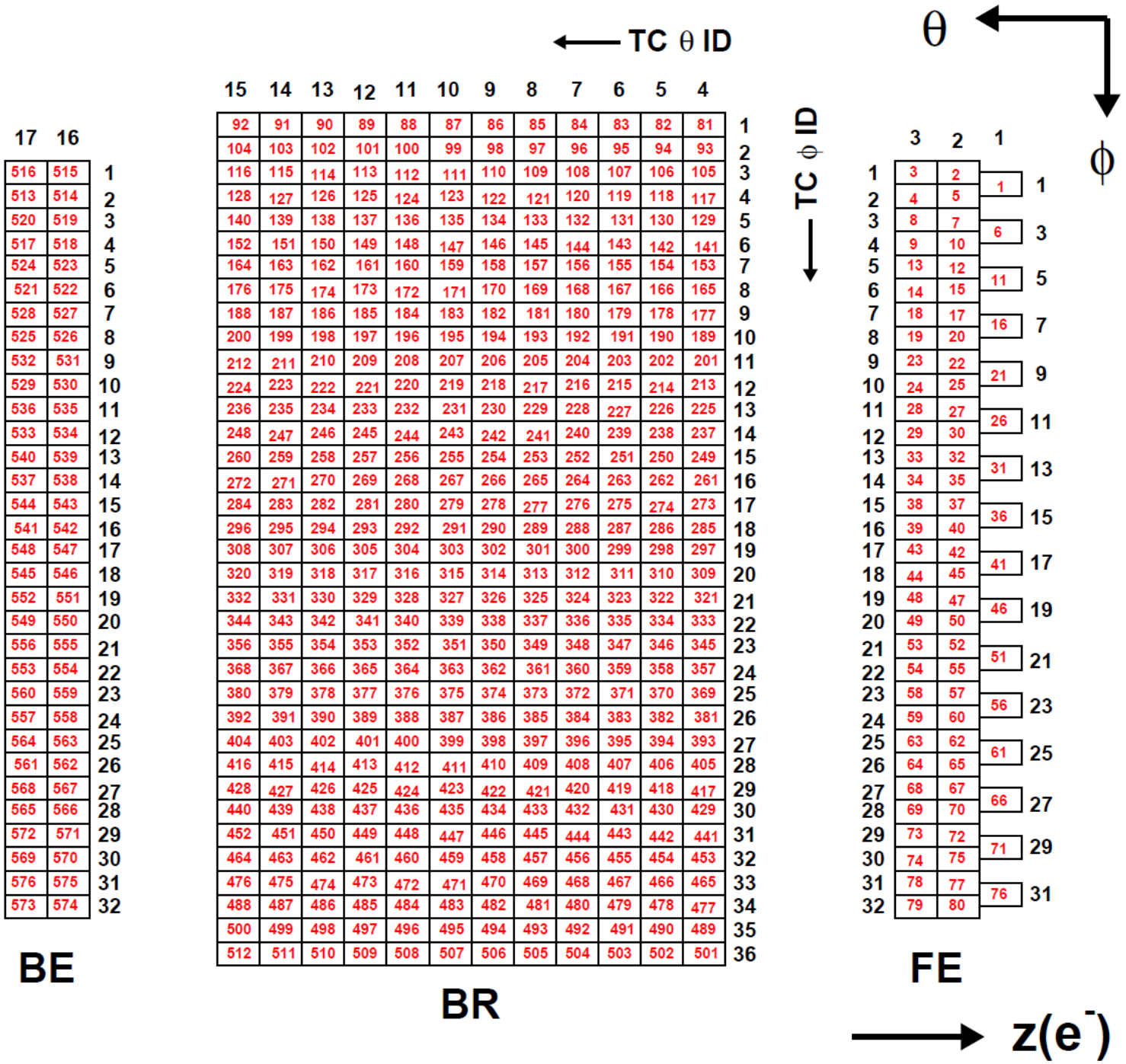
- Sample information
  - Exp24 run1184
    - Rate (Trig. output) at start [Hz]: 2681.7898763
    - Integrated Luminosity [10^33 /cm^2]: 628604.220558
    - prescale bha3d 100
  - Exp17 run205
    - Rate (Trig. output) at start [Hz]: 4527.37972005
    - Integrated Luminosity [10^33 /cm^2]: 50601.6337645
    - prescale bha3d 1

The detail of Skim method

- TRGECLUnpackerEvtStores.e_evt_hit_win == 3 || 4, e_evt_time_win ±1
  - ECLTRG ETM
    - TRGECLUnpackerEvtStore
      - TRGECLUnpackerEvtStores.e_b2bhabhav == 1
    - TRGECLCluster
      - The energetic tc and energy of clusters from TRGECLClusters
      - (1) $165^\circ < \Sigma\theta < 190^\circ$
      - (2) $160^\circ < \Delta\phi < 200^\circ$
      - (3) E(CL1) > 3 GeV & E(CL2) > 3 GeV && (E(CL1) > 4.5 GeV || E(CL2) > 4.5 GeV)
  - TRG GDL
    - Psnmbit == 49,(exp16 = 50)

The detail of analysis method

- ECLTRG ETM
  - 1)TRGECLUnpackerEvtStore
    - Most energetic TC/energy, cluster energy, # of cluster, # of TC, Total energy from TRGECLUnpackerEvtStore
  - 2)TRGECLCluster
    - Most energetic TC/energy, cluster energy, # of cluster from TRGECLCluster
    - # of TC, Total Energy from TRGECLUnackerStore


TC θ ID
15 14 13 12 11 10 9 8 7 6 5 4
92 91 90 89 88 87 86 85 84 83 82 81 1
104 103 102 101 100 99 98 97 96 95 94 93 2
116 115 114 113 112 111 110 109 108 107 106 105 3
128 127 126 125 124 123 122 121 120 119 118 117 4
140 139 138 137 136 135 134 133 132 131 130 129 5
152 151 150 149 148 147 146 145 144 143 142 141 6
164 163 162 161 160 159 158 157 156 155 154 153 7
176 175 174 173 172 171 170 169 168 167 166 165 8
188 187 186 185 184 183 182 181 180 179 178 177 9
200 199 198 197 196 195 194 193 192 191 190 189 10
212 211 210 209 208 207 206 205 204 203 202 201 11
224 223 222 221 220 219 218 217 216 215 214 213 12
236 235 234 233 232 231 230 229 228 227 226 225 13
248 247 246 245 244 243 242 241 240 239 238 237 14
260 259 258 257 256 255 254 253 252 251 250 249 15
272 271 270 269 268 267 266 265 264 263 262 261 16
284 283 282 281 280 279 278 277 276 275 274 273 17
296 295 294 293 292 291 290 289 288 287 286 285 18
308 307 306 305 304 303 302 301 300 299 298 297 19
320 319 318 317 316 315 314 313 312 311 310 309 20
332 331 330 329 328 327 326 325 324 323 322 321 21
344 343 342 341 340 339 338 337 336 335 334 333 22
356 355 354 353 352 351 350 349 348 347 346 345 23
368 367 366 365 364 363 362 361 360 359 358 357 24
380 379 378 377 376 375 374 373 372 371 370 369 25
392 391 390 389 388 387 386 385 384 383 382 381 26
404 403 402 401 400 399 398 397 396 395 394 393 27
416 415 414 413 412 411 410 409 408 407 406 405 28
428 427 426 425 424 423 422 421 420 419 418 417 29
440 439 438 437 436 435 434 433 432 431 430 429 30
452 451 450 449 448 447 446 445 444 443 442 441 31
464 463 462 461 460 459 458 457 456 455 454 453 32
476 475 474 473 472 471 470 469 468 467 466 465 33
488 487 486 485 484 483 482 481 480 479 478 477 34
500 499 498 497 496 495 494 493 492 491 490 489 35
512 511 510 509 508 507 506 505 504 503 502 501 36
BR
TC ϕ ID
17 16
516 515 1
513 514 2
520 519 3
517 518 4
524 523 5
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BE
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10 24 25
11 28 27 26 11
12 29 30
13 33 32 31 13
14 34 35
15 38 37 36 15
16 39 40
17 43 42 41 17
18 44 45
19 48 47 46 19
20 49 50
21 53 52 51 21
22 54 55
23 58 57 56 23
24 59 60
25 63 62 61 25
26 64 65
27 68 67 66 27
28 69 70
29 73 72 71 29
30 74 75
31 78 77 76 31
32 79 80
FE
z(e⁻)

Random events

- Skim method
  - TRG GDL
    - Psnmbit : 77 || 81,78
    - TimType : 5, 7 || 13

- Sample information
  - Exp24 run1184
    - Rate (Trig. output) at start [Hz]: 2681.7898763
    - Integrated Luminosity [10^33 /cm^2]: 628604.220558
    - prescale bha3d 100
  - Preparing
    - Exp17 run209,211,213,244
    - Exp26 run272,671,1121,1260

The detail of Skim method

- TRG GDL
  - Timtype == 5 (delayed_bhabha random trigger timtype)
  - Timtype == 7 || 13 (revolution & poisson random trigger timtype)
  - Psnmbit == 77 (beam abort gab time random trigger bit)
  - Psnmbit == 78 (delayed_bhabha random trigger bit)

220630

3D Bhabha events

- Skim method
  - ECLTRG ETM
    - TRGECLUnpackerEvtStore
    - TRGECLCluster
  - TRG GDL
    - psnmbit

- Sample information
  - Exp24 run1184
    - Rate (Trig. output) at start [Hz]: 2681.7898763
    - Integrated Luminosity [10^33 /cm^2]: 628604.220558
    - prescale bha3d 100
  - Exp17 run205
    - Rate (Trig. output) at start [Hz]: 4527.37972005
    - Integrated Luminosity [10^33 /cm^2]: 50601.6337645
    - prescale bha3d 1

The detail of Skim method

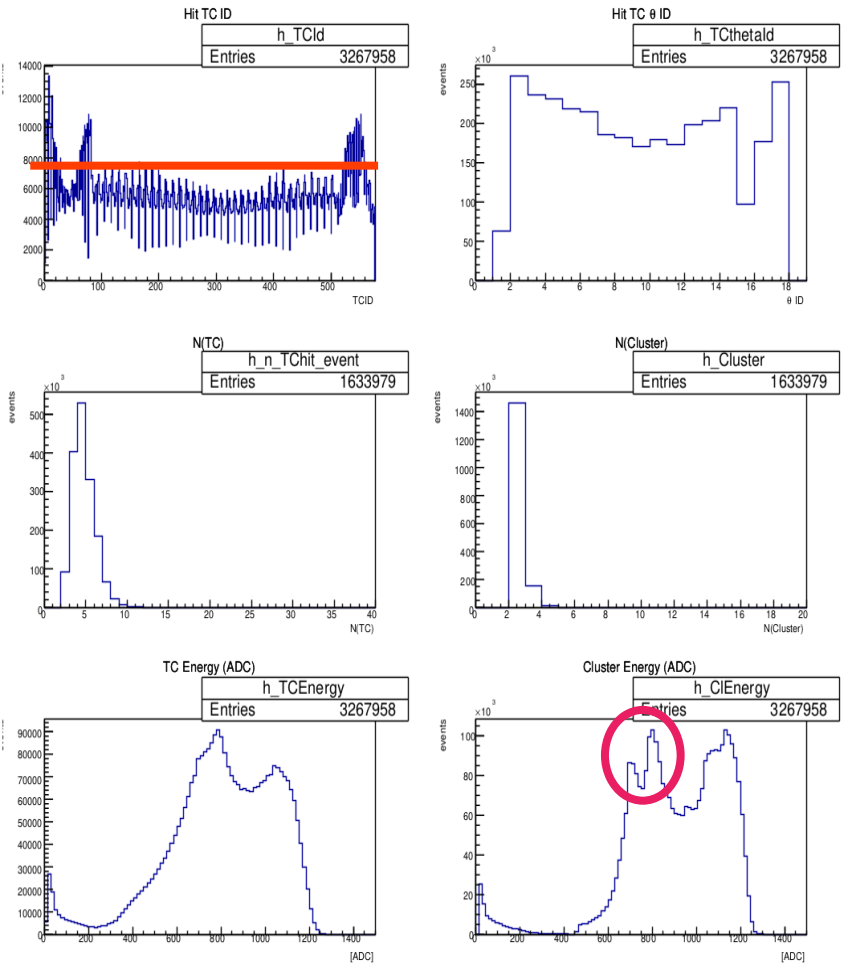
- TRGECLUnpackerEvtStores.e_hit_win == 3 || 4
  - ECLTRG ETM
    - TRGECLUnpackerEvtStore
      - TRGECLUnpackerEvtStores.e_b2bhabhav == 1
    - TRGECLCluster
      - The energetic tc and energy of clusters from TRGECLClusters
      - (1) $165^\circ < \Sigma\theta < 190^\circ$
      - (2) $160^\circ < \Delta\phi < 200^\circ$
      - (3) E(CL1) > 3 GeV & E(CL2) > 3 GeV && (E(CL1) > 4.5 GeV || E(CL2) > 4.5 GeV)
  - TRG GDL
    - Psnmbit == 49

The detail of analysis method

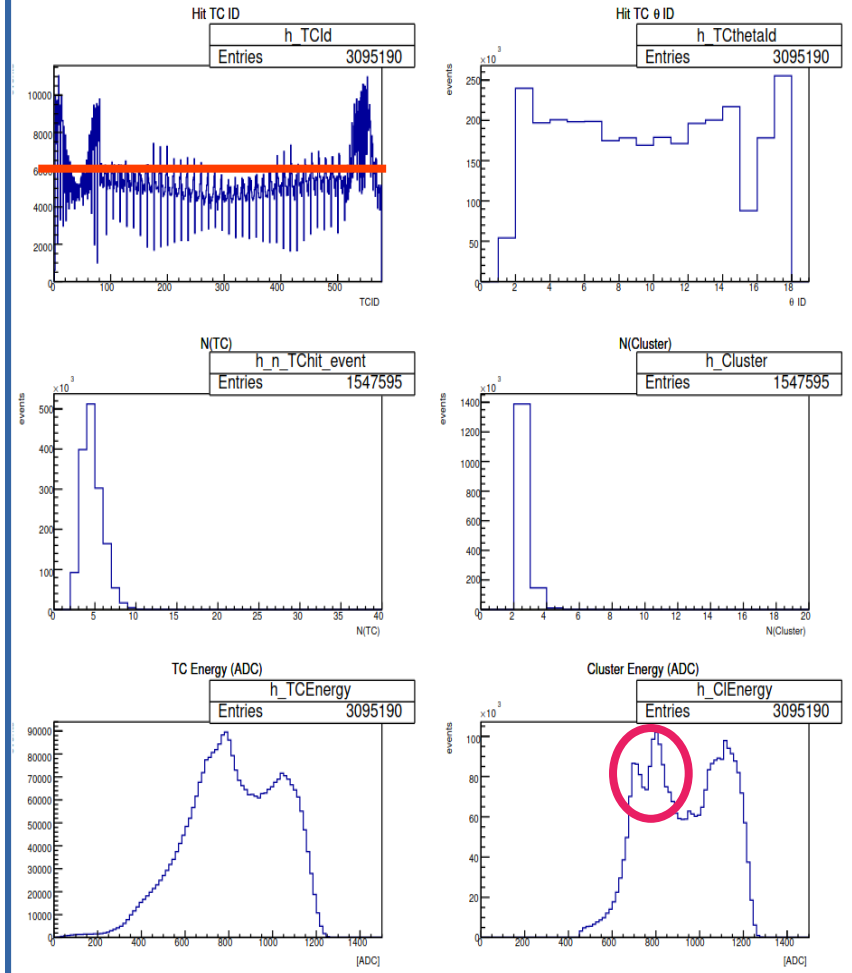
- ECLTRG ETM
  - 1)TRGECLUnpackerEvtStore
    - Most energetic TC/energy, cluster energy, # of cluster, # of TC, Total energy from TRGECLUnpackerEvtStore
  - 2)TRGECLCluster
    - Most energetic TC/energy, cluster energy, # of cluster from TRGECLCluster
    - # of TC, Total Energy from TRGECLUnackerStore

Exp24 run1184 3DBhabha ECLTRG plots

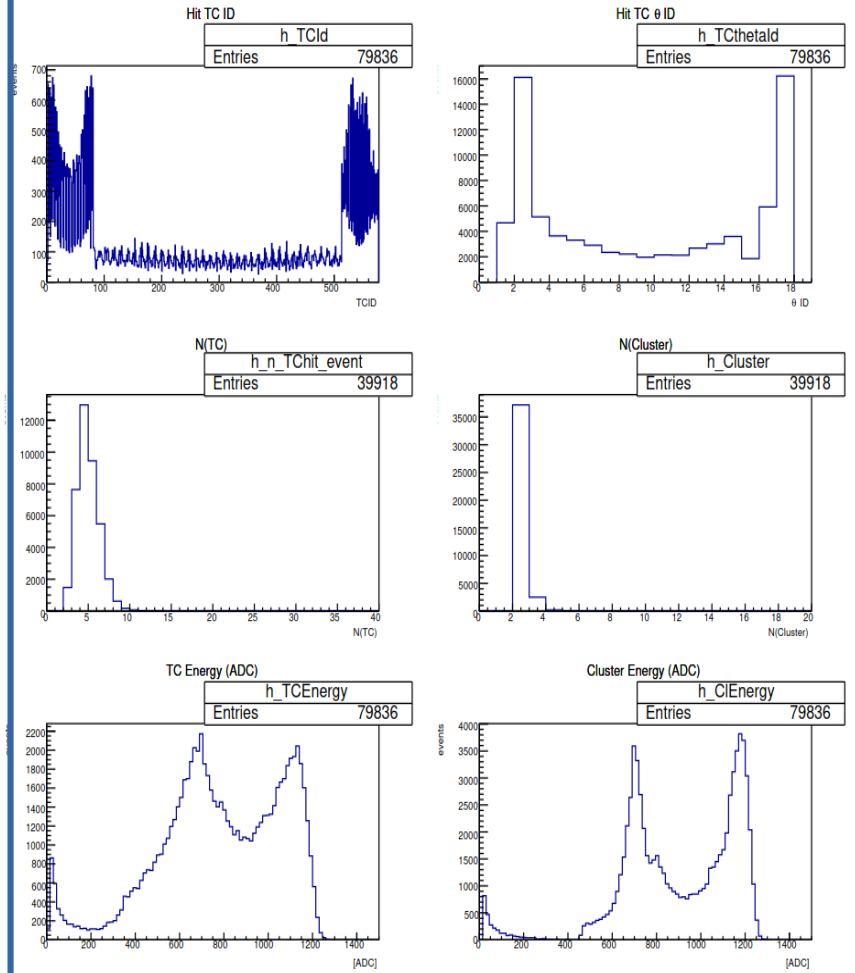
ETM EvtStore



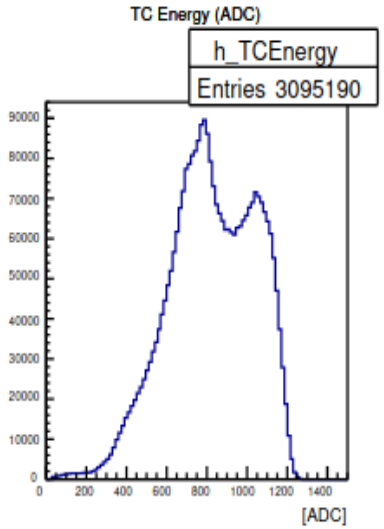
ETM Cluster

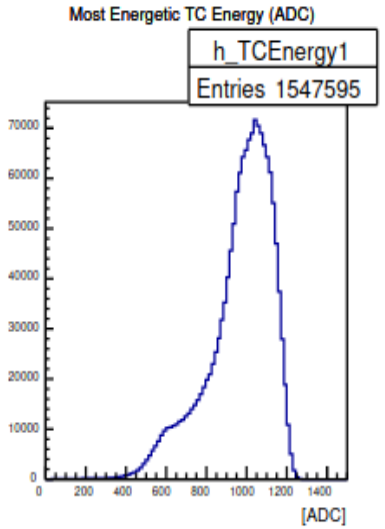


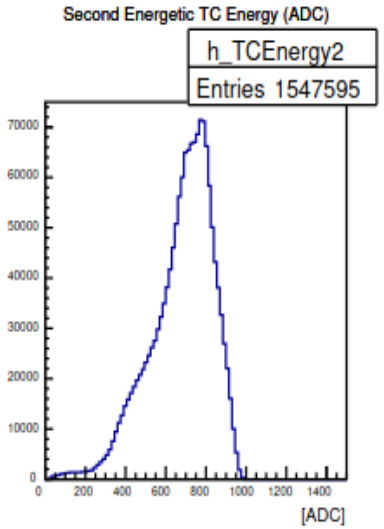
TRG GDL

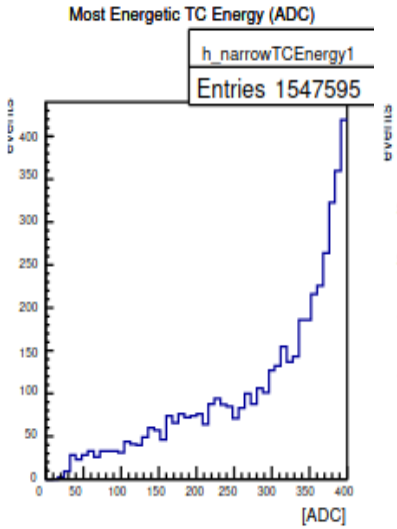


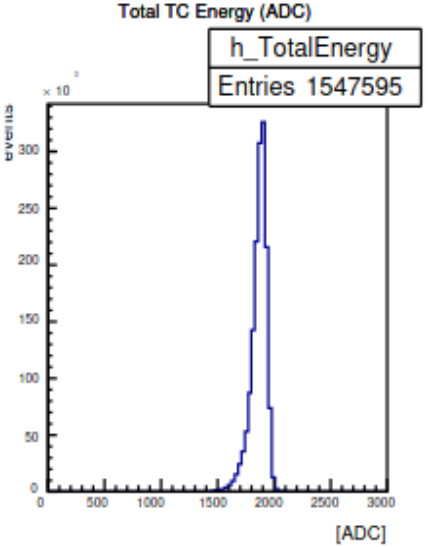
Exp24 run1184 3DBhabha ECLTRG plots

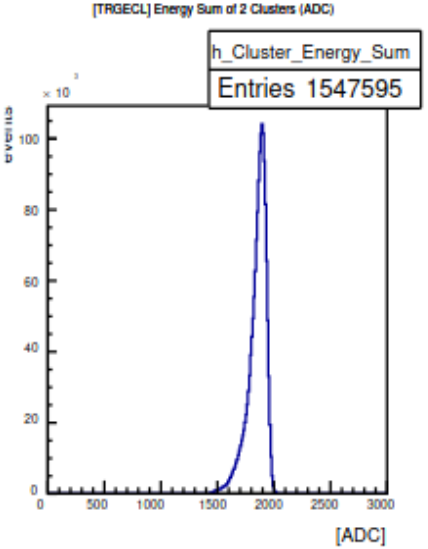


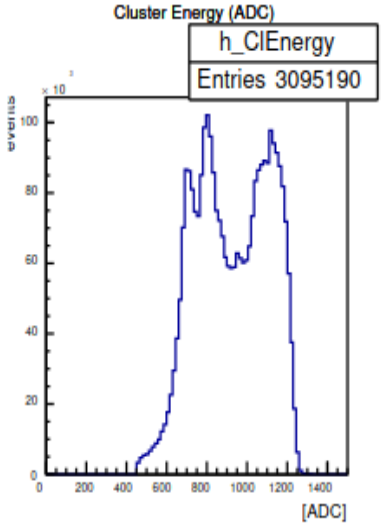


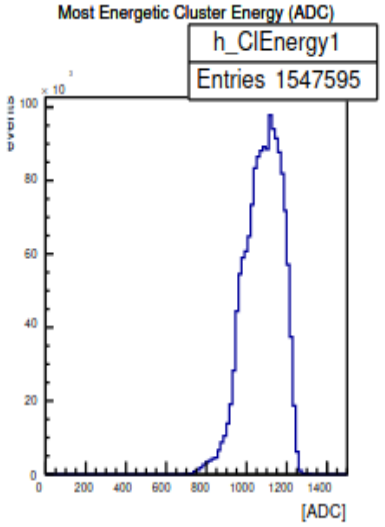


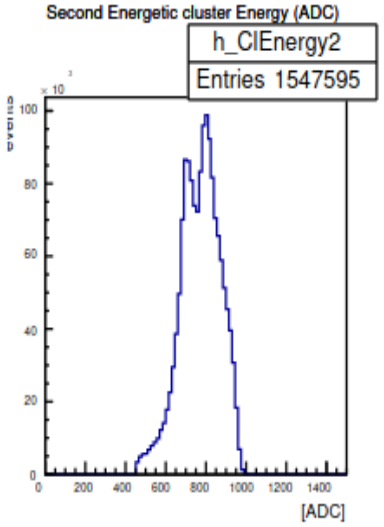


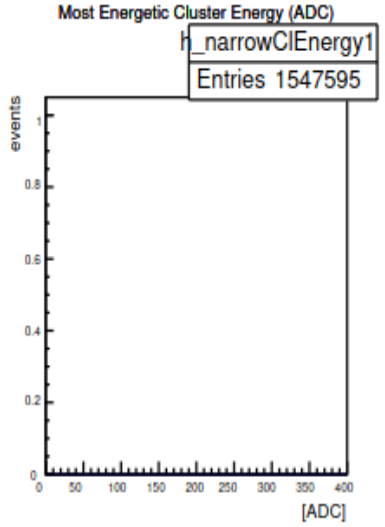












- Cluster Energy shape is strange
- But Total energy and two cluster energy sum plots are reasonable.

Investigating the different shape

Message ID: **792**	Entry time: **2021/04/ 7 Wed 01:49 UTC**
JSTTime:	2021/04/ 7 10:48 JST
Author:	Taichiro Koga
Type:	Parameter
Category:	GDL Configuration
Subject:	Major prescale change of bhabha related bits
Firmware:	no change
Software:	no change
Slow control:	no change
Parameter:	updated

```
Prescale of bhabha related bits are changed as follows. Exp number will be changed from 17 to 18.
-lume   1->100
-bha3d  1->100
-bhabha 1->100
-bhapur 1->10
-lml3   1->100
-lml5   1->100
-c1hie  1->0
-c1hume 1->0
-n1hie  1->0
-n1lume 1->0
-c3hie  1->0
-c3lume 1->0
-n3hie  1->0
-n3lume 1->0
-lml1   1->2
-lml4   1->10

In addition, new y related bits are newly used
-fioiecl1 1->100
-yioiecl1 0->1

Saved as 20210407_2_col.
```

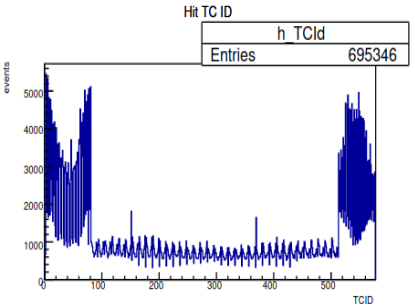
- Guess 1)
  - Some bhabha events, especially barrel events, are discarded by GDL mechanism
- Guess 2)
  - Prescale affect ETM shape, but GDL is little affected.

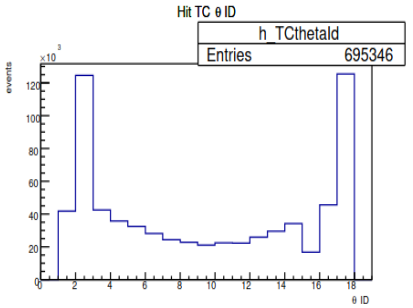
- Prescale was changed when start exp18.

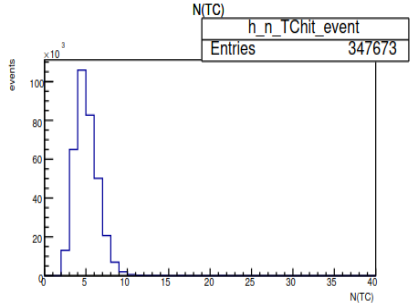
- https://elog.belle2.org/elog/TRG+operation/792

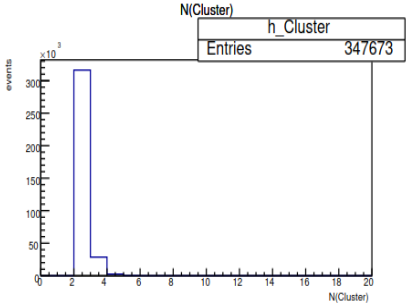
Exp17 run205 3DBhabha ECLTRG plots

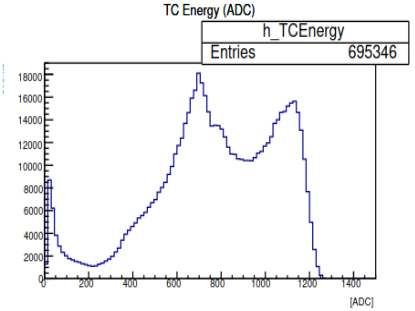
ETM EvtStore

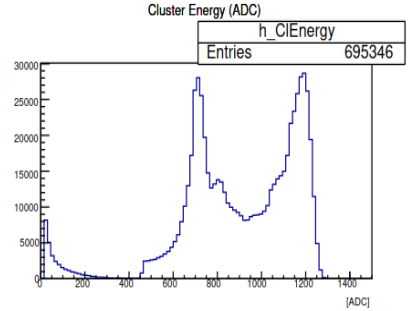




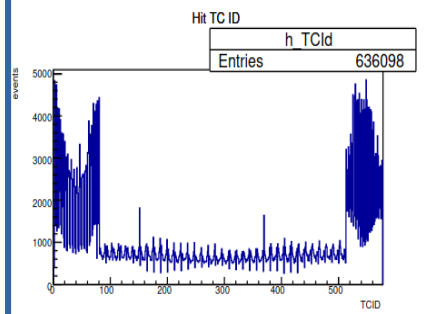


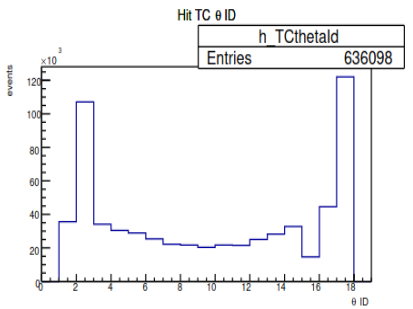


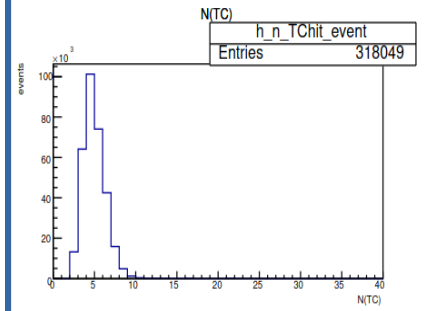


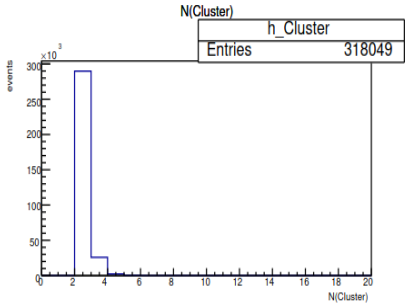


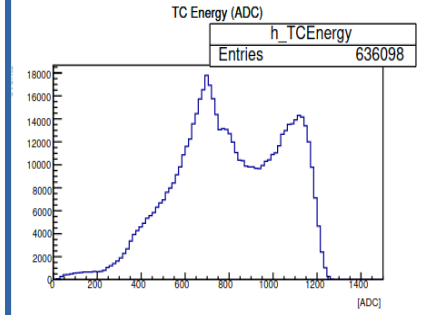
ETM Cluster

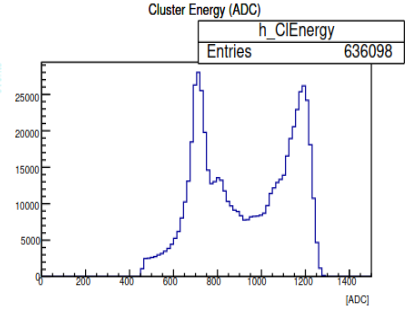




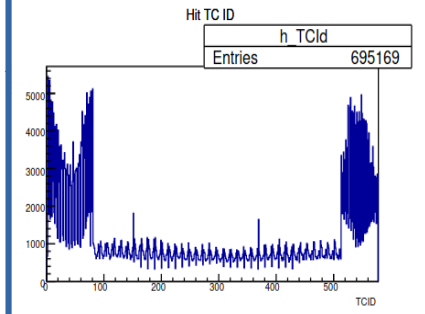


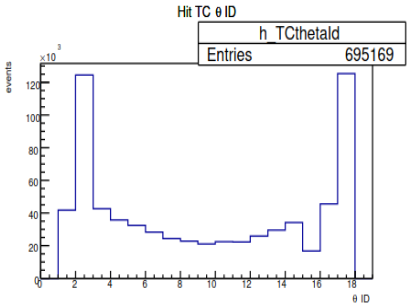


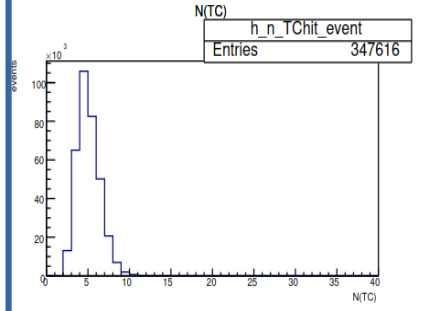


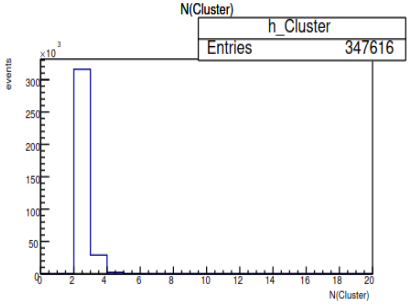


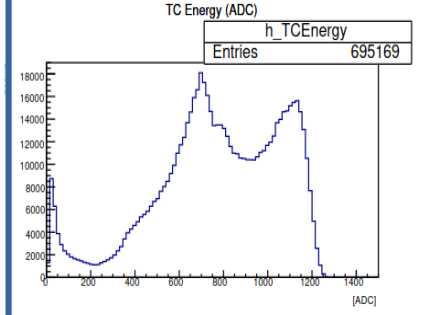
TRG GDL

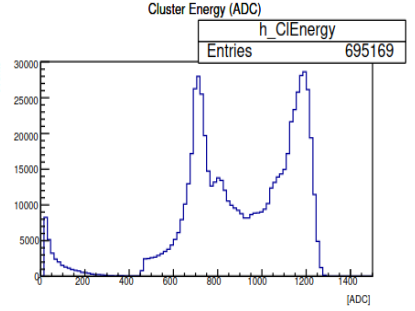






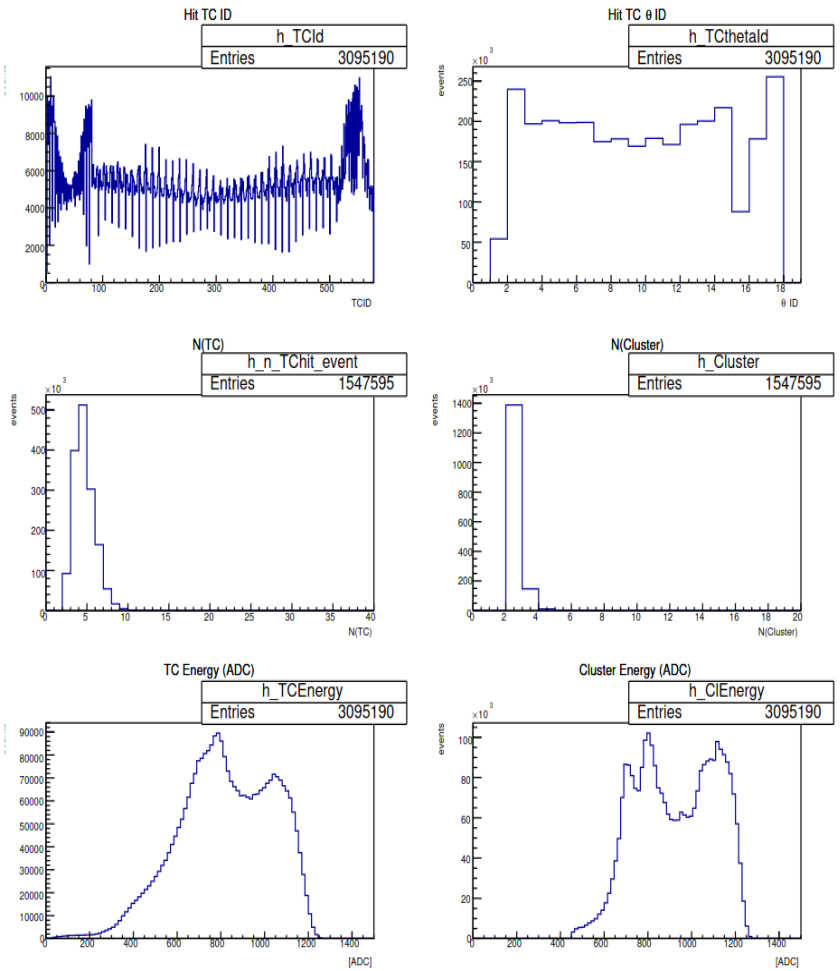




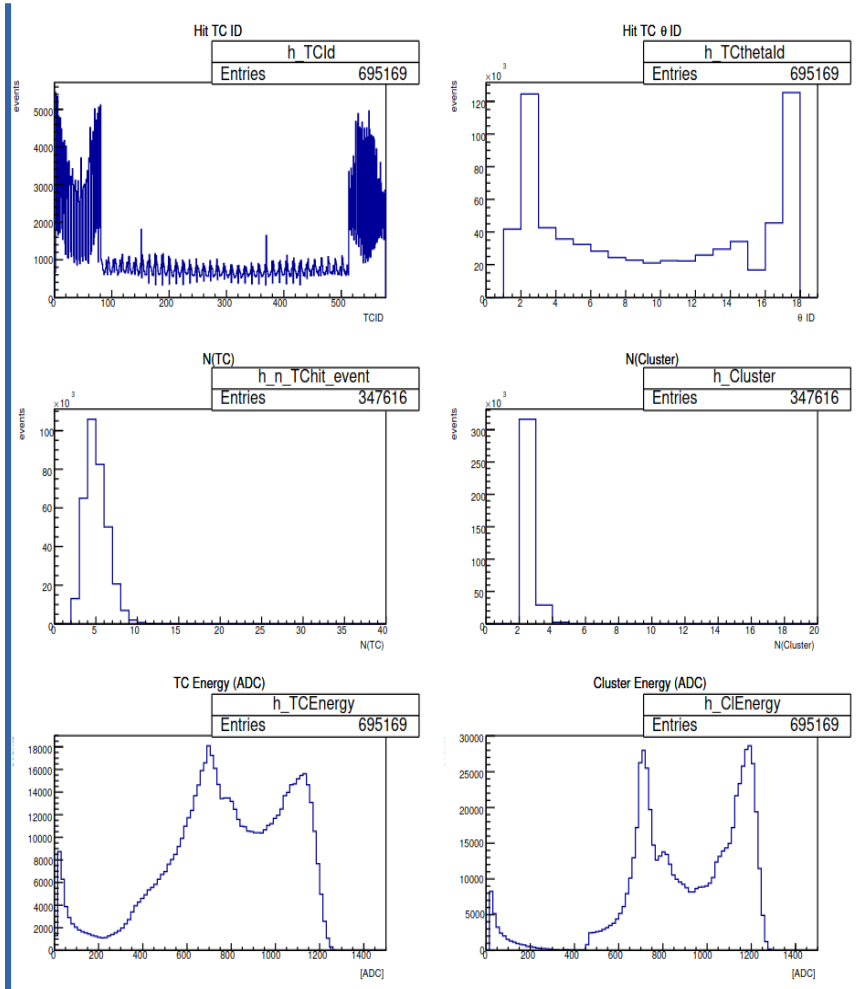


Exp24 vs Exp17 3D Bhabha plots

Exp24 Cluster



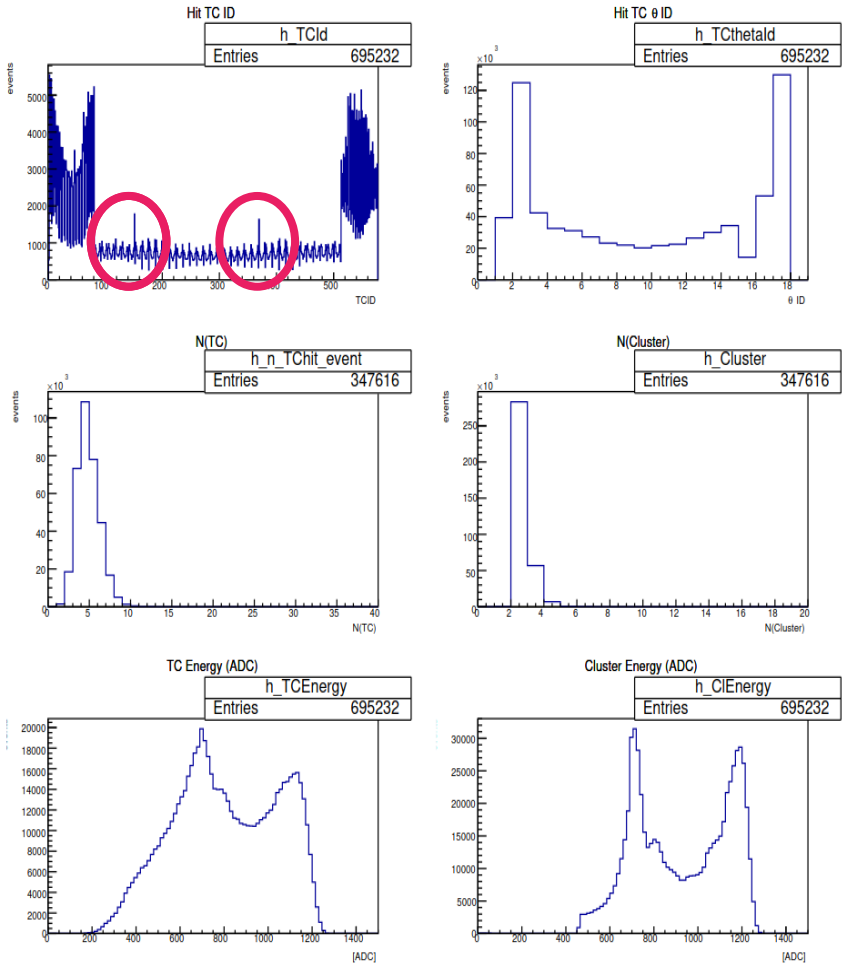
Exp17 Cluster



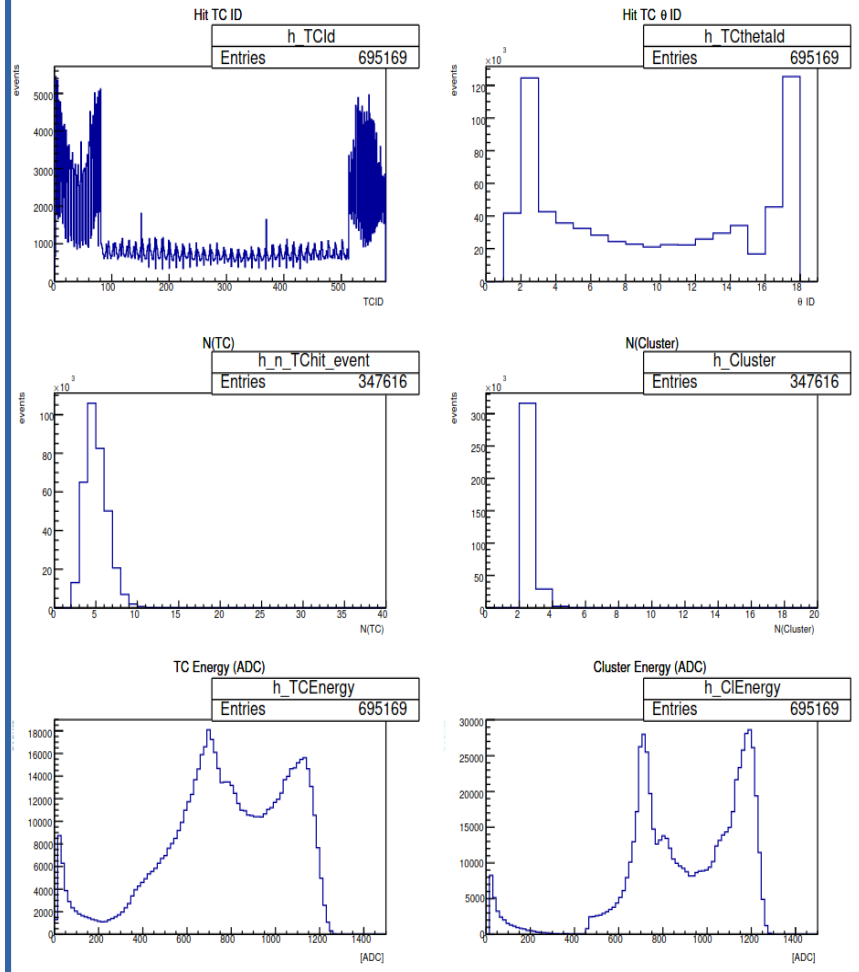
- The flat shape in exp24 data, but the end cap dominant shape in exp17
- Same skim & analysis method
- The different experiment number
- .

Exp17 run205 3DBhabha ECLTRG plots

TRG GDL EvtStore



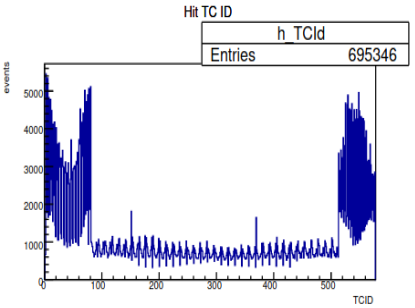
TRG GDL Cluster

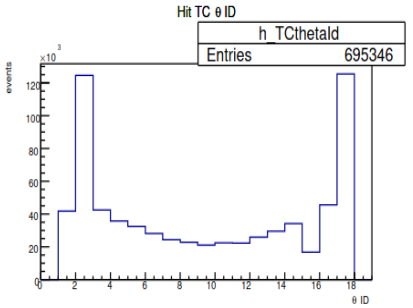


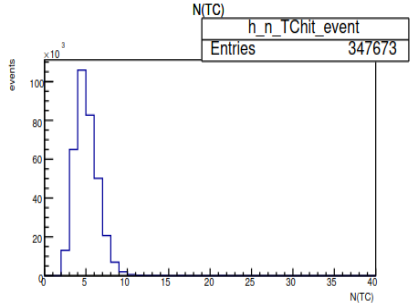
- The barrel peaks appear in both analysis method

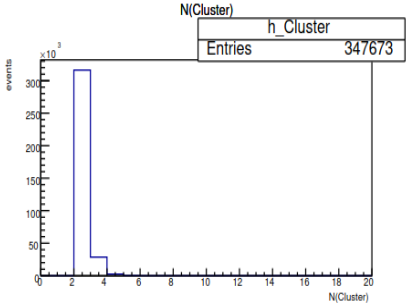
Exp17 run205 3DBhabha ECLTRG plots

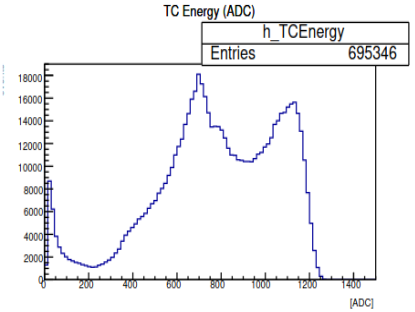
ETM EvtStore

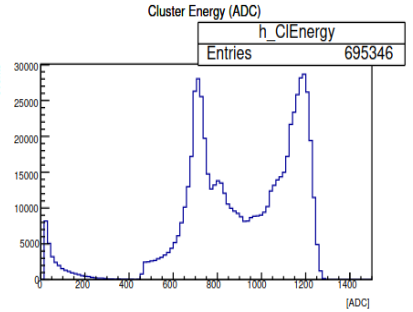




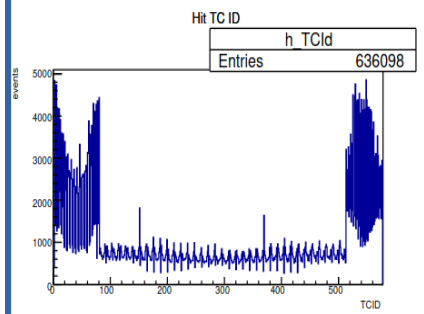


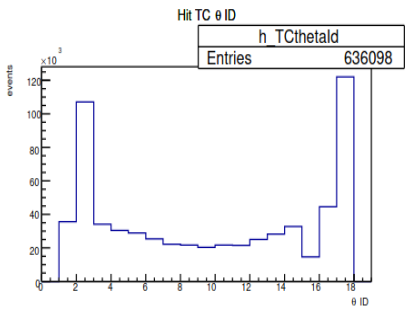


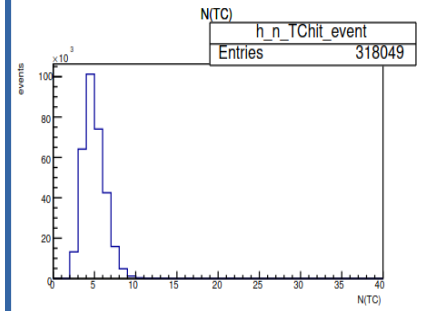


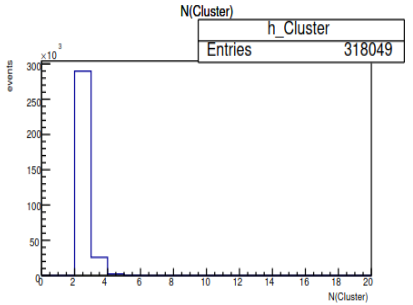


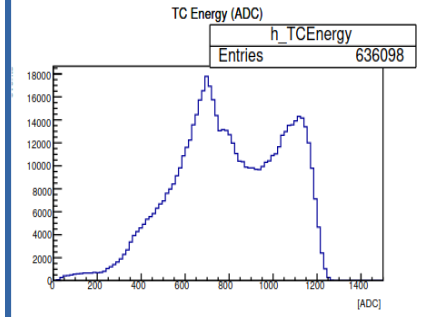
ETM Cluster

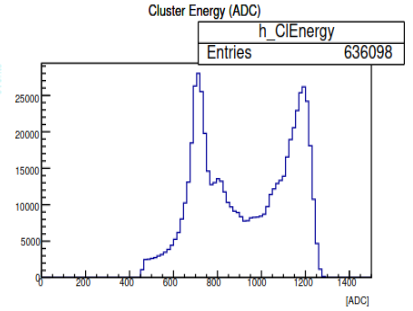




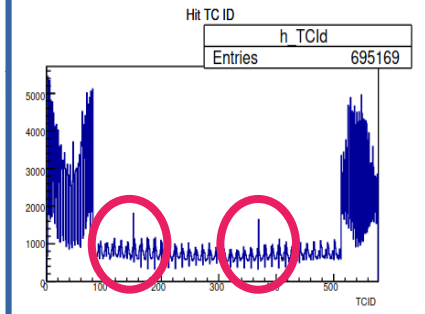


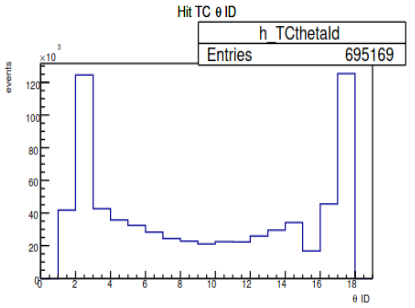


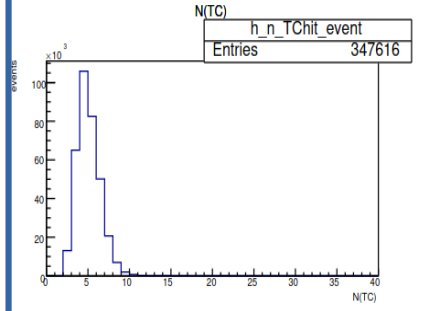


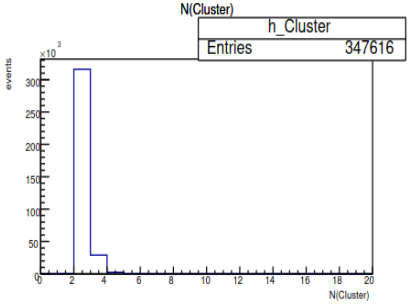


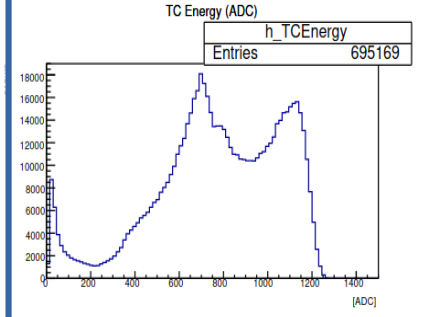
TRG GDL

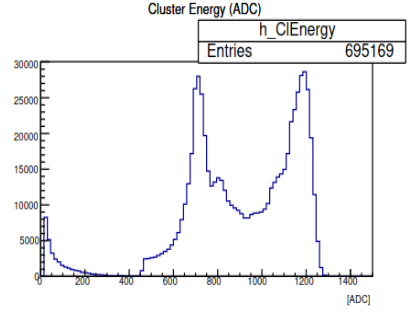












Random events

- Skim method
  - TRG GDL
    - Psnmbit : 77,78
    - TimType : 5,6

- Sample information
  - Exp24 run1184
    - Rate (Trig. output) at start [Hz]: 2681.7898763
    - Integrated Luminosity [10^33 /cm^2]: 628604.220558
    - prescale bha3d 100
  - Exp17 run205
    - Rate (Trig. output) at start [Hz]: 4527.37972005
    - Integrated Luminosity [10^33 /cm^2]: 50601.6337645
    - prescale bha3d 1

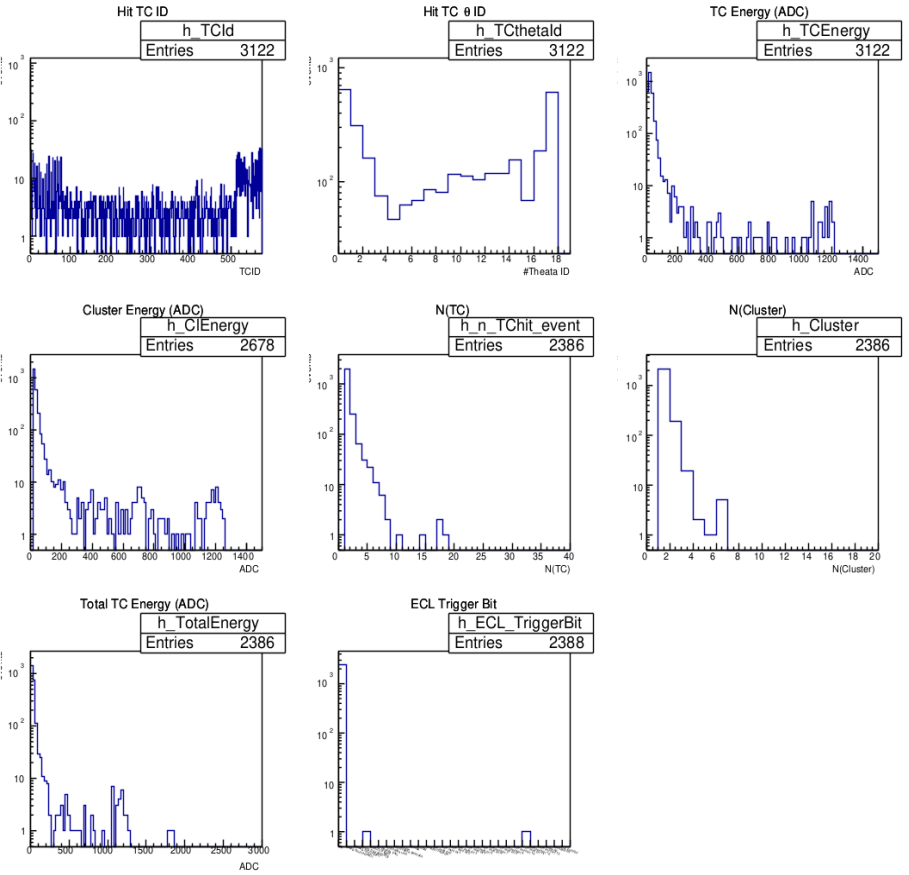
  - Preparing
    - Exp17 run209,211,213,244
    - Exp26 run272,671,1121,1260

The detail of Skim method

- TRG GDL
  - Timtype == 5 (beam abort gab time random trigger timtype)
  - Timtype == 6 (delayed_bhabha random trigger timtype)
  - TRGECLUnpackerEvtStores.e_hit_win == 3 || 4
    - Psnmbit == 77 (beam abort gab time random trigger bit)
    - Psnmbit == 78 (delayed_bhabha random trigger bit)

Exp24 run1184 timtype Random

TRG GDL beam abort



TRG GDL delayed_bhabha

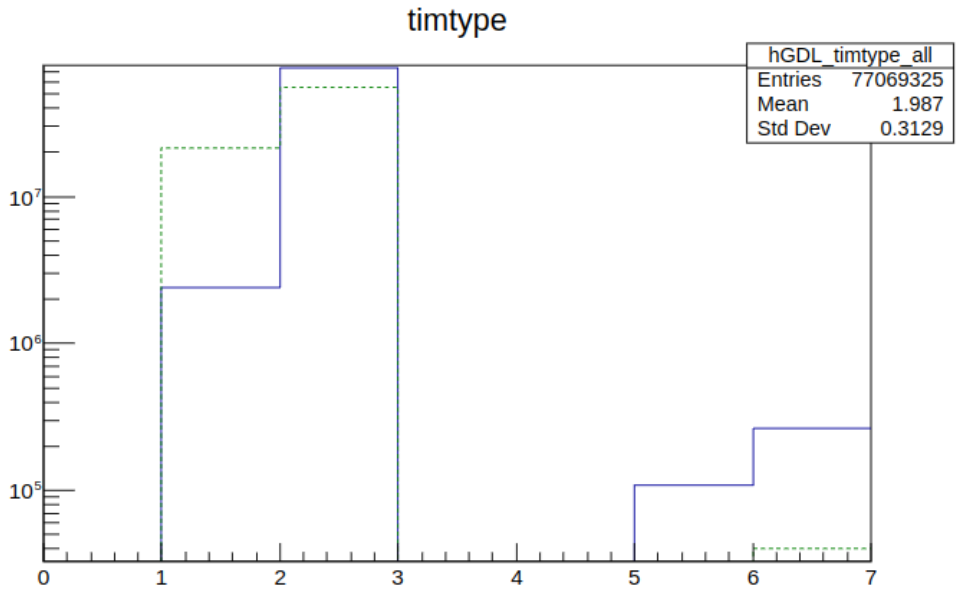
- Not enough sample
- No event in timtype delayed bhabha

Exp24 run1184 timtype Random

Data on kekcc

Bin 6 is zero!

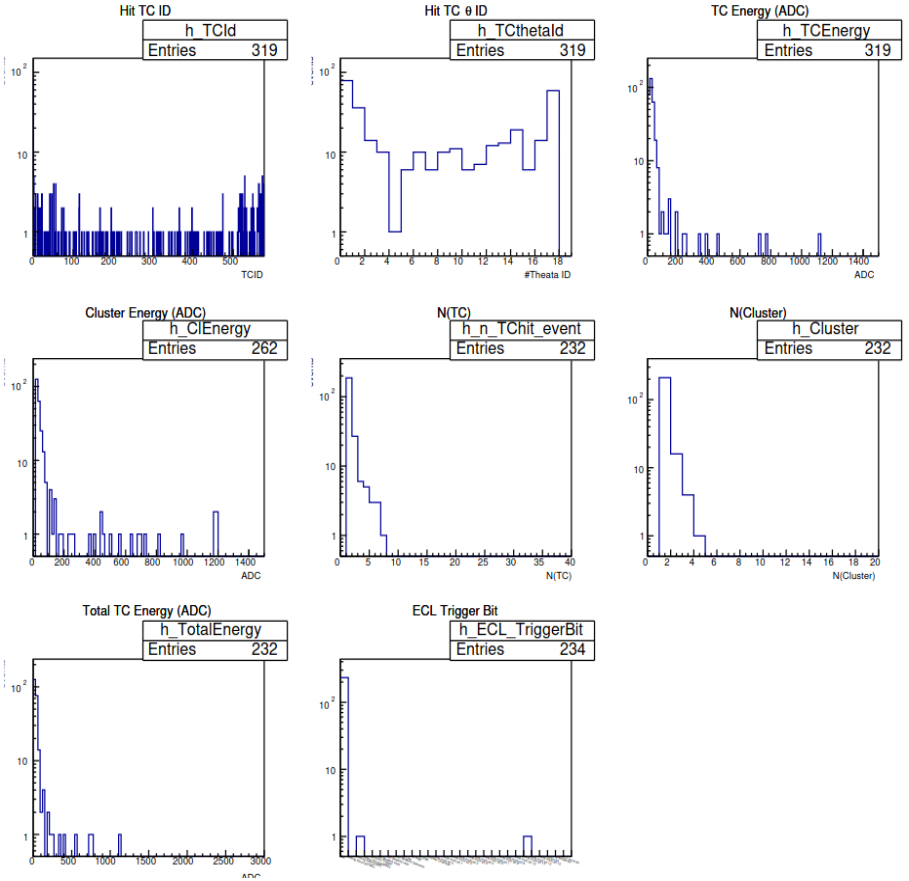
HLT DQM



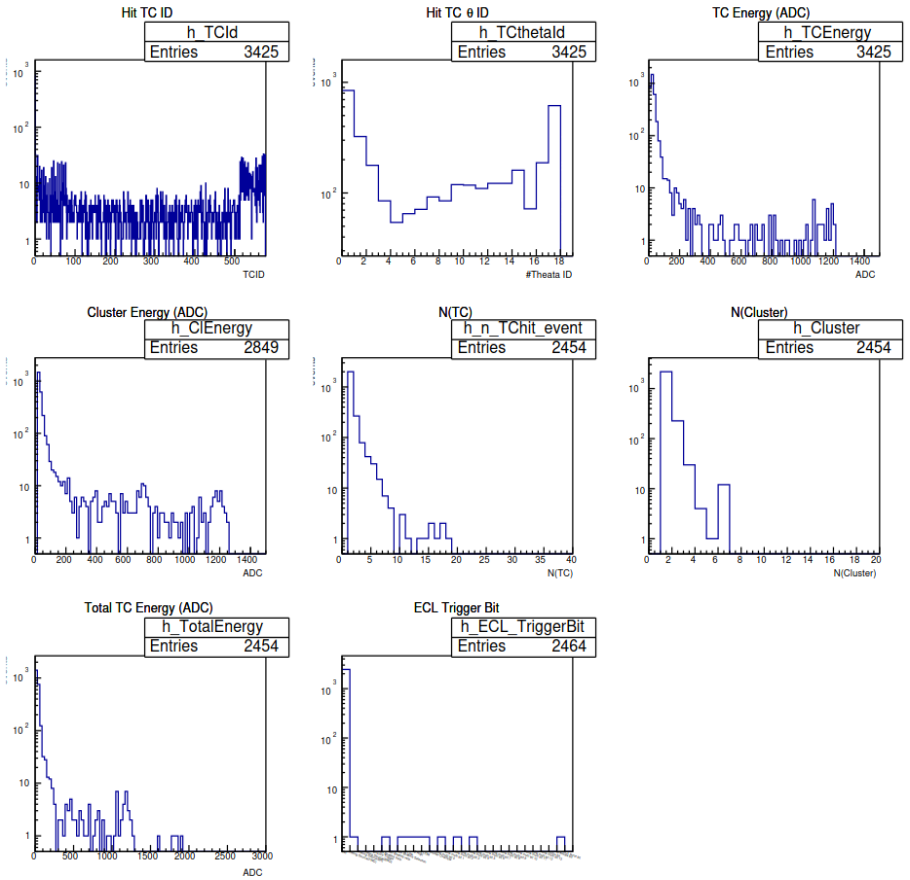
- Data on kekcc has no entry at timtype 6, but HLT DQM plot has many entries at timtype 6.

Exp24 run1184 psnm Random

TRG GDL beam abort



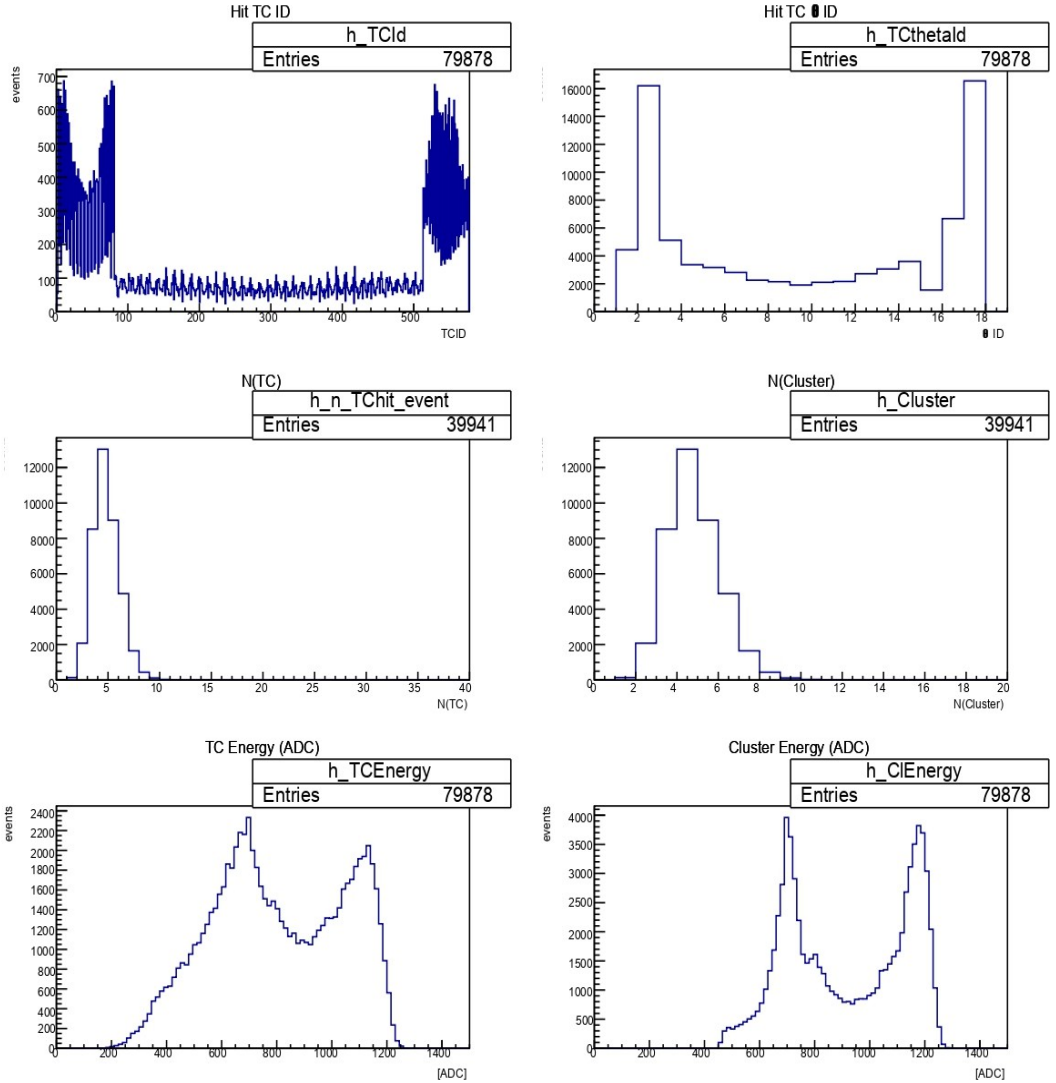
TRG GDL delayed_bhabha



- Not enough sample

220613

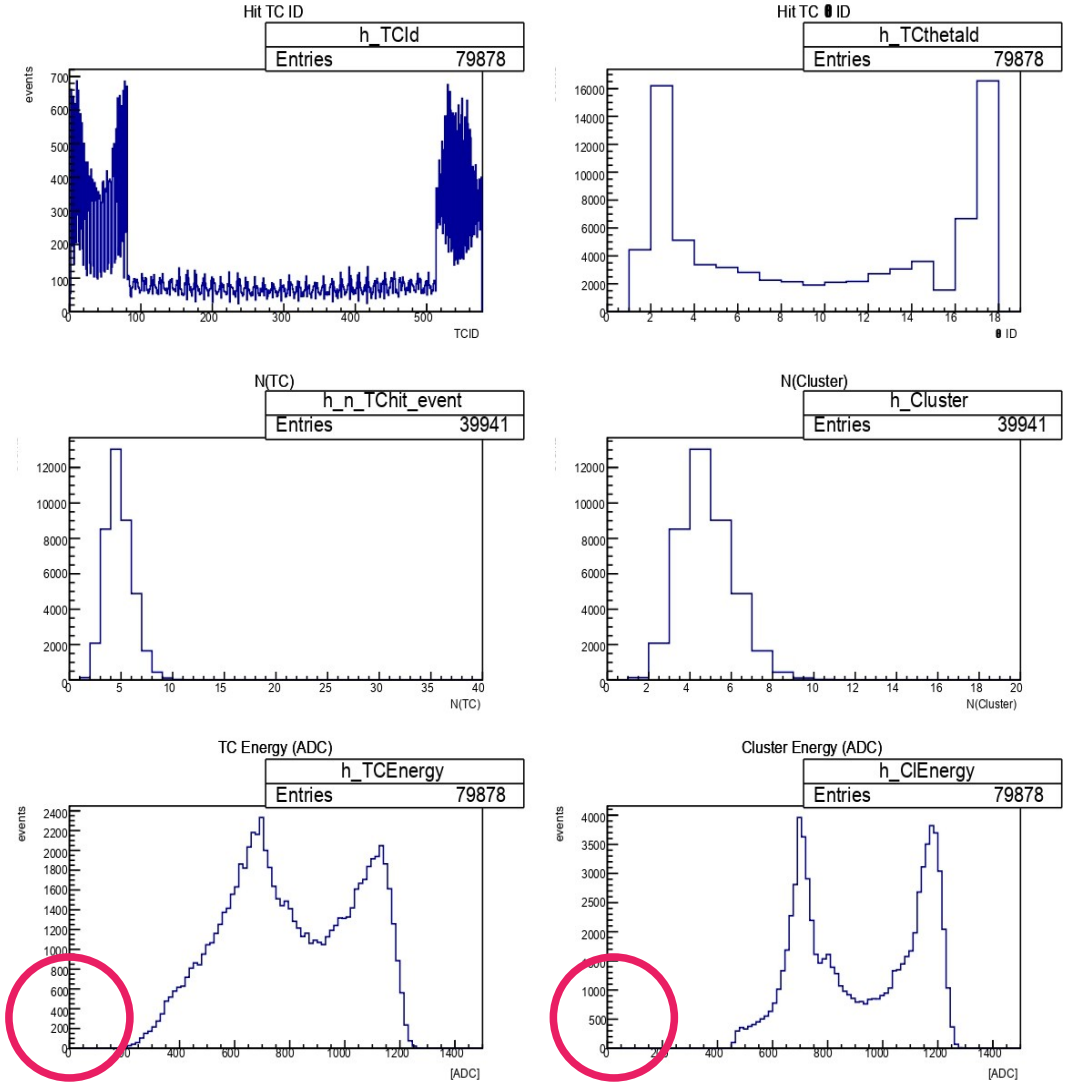
3Dbhabha bit result



- The finding logic of the most/second energetic TC/Cluster was modified.
- Previous
  - 1)Find most/second energetic cluster from TRGECLUnpackerSumStore
  - 2)Find most/second energetic TC ID/energy from cluster position of 1).
- New
  - 1)Find most/second energetic cluster from TRGECLUnpackerEvtStore
  - 2)Find most/second energetic TC ID/energy from TRGECLUnpackerStore

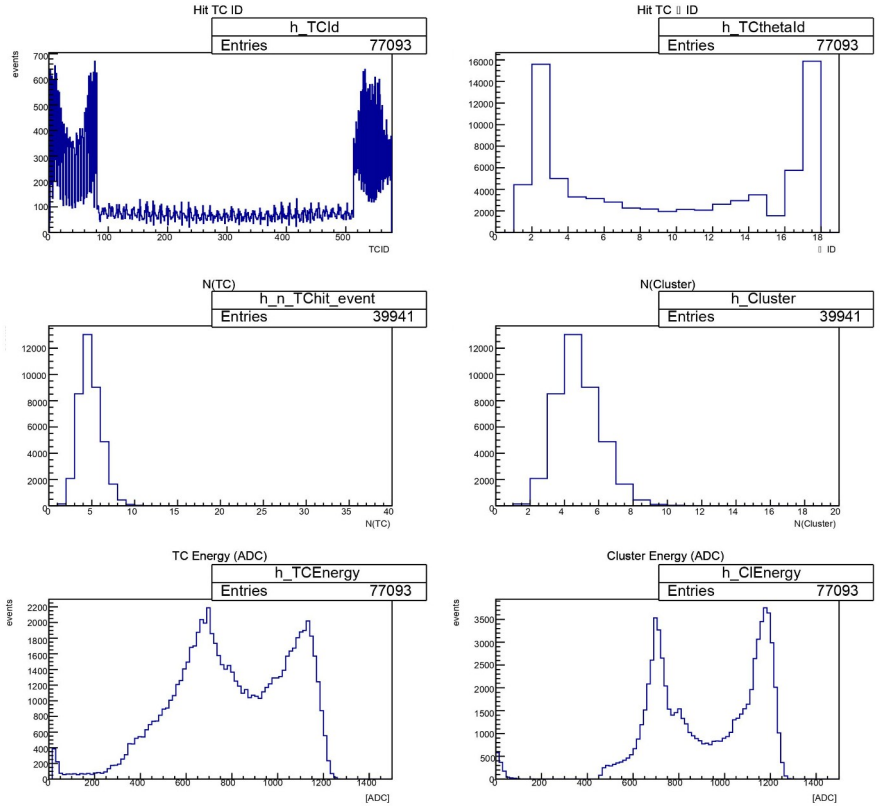
3Dbhabha bit result

New

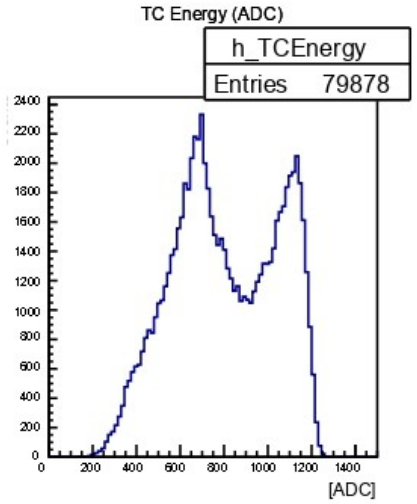


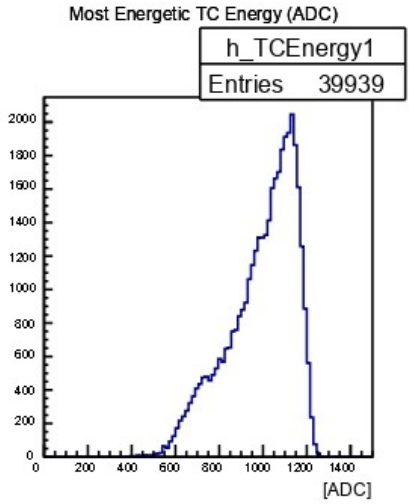
- The plots looks reasonable.
- The low energy events almost disappeared

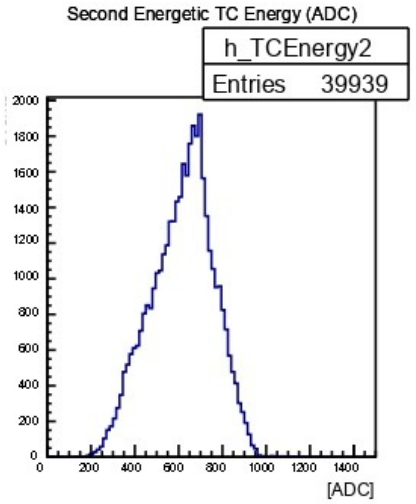
Old

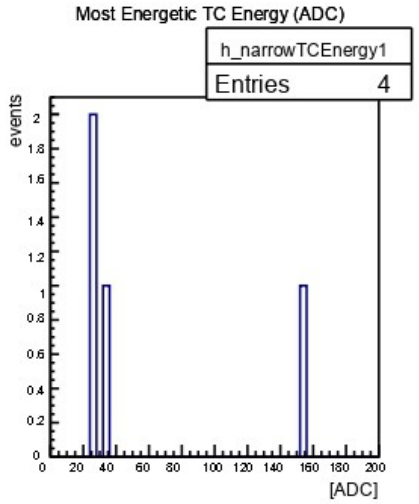


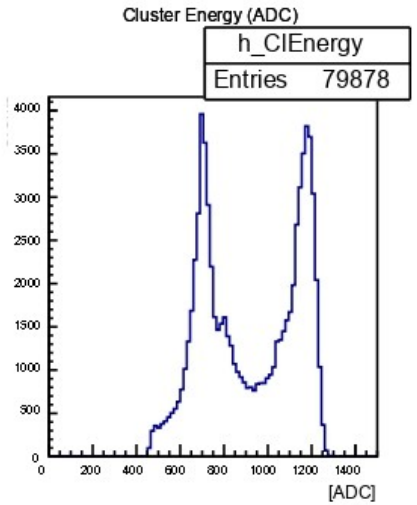
3Dbhabha bit result check

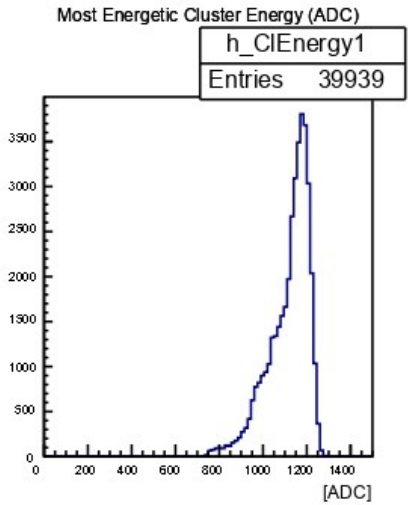


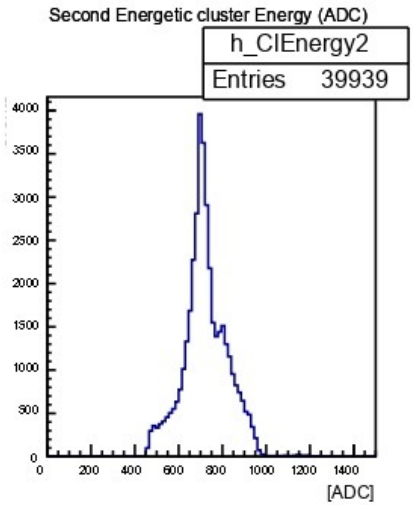


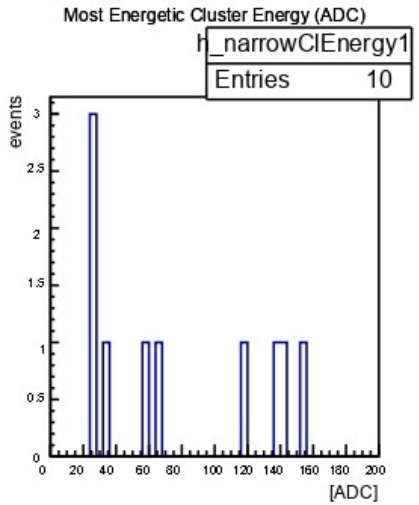












- Low TC energy events are still exist even though reducing
- The EvtStore mismatching remains in right two plots.

The detail of mismatching

- 3D Bhabha mismatching with trg bit
  - EvtStore mismatching
  - UnpackerStore mismatching

The detail of UnpackerEvtStore mismatching

- Case 1 : The Hit window of two cluster for 3D bhabha is not evt_win(3,4).
  - TRGECLUnpackerStores.m_tcid = 21, 73, 74, 491, 534, 539
  - TRGECLUnpackerStores.m_time = 23, 400, 386, 44, 405, 393
  - TRGECLUnpackerStores.m_hit_win = 3, 6, 6, 3, 6, 6
  - TRGECLUnpackerStores.m_revo_fam = 46, 46, 46, 46, 46, 46
  - TRGECLUnpackerStores.m_energy = 21, 28, 1053, 141, 158, 585
  - TRGECLUnpackerEvtStores.e_ncl = 2
  - TRGECLUnpackerEvtStores.e_l1_revo = 1131
  - TRGECLUnpackerEvtStores.e_evt_win = 3
  - TRGECLUnpackerEvtStores.e_cl_energy[6] = 141, 21, 0, 0, 0, 0

The Hit window of two cluster for 3D bhabha is not evt_win.

How can I check L1 timing shift?

The detail of UnpackerEvtStore mismatching

- Case 2 : The Hit window of two cluster for 3D bhabha is mixing.
  - TRGECLUnpackerStores.m_tcid = 22, 32, 63, 64, 114, 168, 435, 439, 455, 460, 526, 559, 566
  - TRGECLUnpackerStores.m_time = 48, 149, 543, 540, 140, 133, 143, 141, 125, 144, 531, 44, 120
  - TRGECLUnpackerStores.m_hit_win = 4, 4, 7, 7, 4, 4, 4, 4, 3, 4, 7, 3, 3
  - TRGECLUnpackerStores.m_revo_fam = 59, 59, 59, 59, 59, 59, 59, 59, 59, 59, 59, 59, 59
  - TRGECLUnpackerStores.m_energy = 113, 824, 519, 605, 116, 23, 47, 31, 27, 99, 751, 70, 32
  - TRGECLUnpackerEvtStores.e_ncl = 6
  - TRGECLUnpackerEvtStores.e_evt_win = 4
  - TRGECLUnpackerEvtStores.e_clenergy[6] = 116, 99, 47, 31, 27, 23

The Hit window of two cluster for 3D bhabha is mixing.
In this case, Hit windows of two clusters are 7 and 4.

The # of Case 1 is six. Eff: 5/39939 ≈ 0.0125%

The # of Case 2 is one. Eff: 1/39939 ≈ 0.0025%

events detail

The detail of UnpackerStore mismatching

Following the definition of 3DBhabha
At least two energetic cluster energy > ~570ADC (3GeV).

- Case 1 : Hit TC ≤ 2
  - TRGECLUnpackerStores.m_tcid = 528
  - TRGECLUnpackerStores.m_time = 109
  - TRGECLUnpackerStores.m_hit_win = 3
  - TRGECLUnpackerStores.m_revo_fam = 67
  - TRGECLUnpackerStores.m_energy = 24

- Case 2 : Hit TC > 2
  - TRGECLUnpackerStores.m_tcid = 129, 132, 180, 189, 218, 314, 388, 402, 452, 541
  - TRGECLUnpackerStores.m_time = 47, 24, 41, 52, 65, 35, 46, 54, 31, 80
  - TRGECLUnpackerStores.m_hit_win = 3, 3, 3, 3, 3, 3, 3, 3, 3, 3
  - TRGECLUnpackerStores.m_revo_fam = 28, 28, 28, 28, 28, 28, 28, 28, 28, 28
  - TRGECLUnpackerStores.m_energy = 154, 28, 34, 57, 20, 35, 149, 20, 22, 25

The detail of UnpackerStore mismatching

- Case 3 : Hit TC = 0
  - TRGECLUnpackerStores.m_tcid = 0
  - TRGECLUnpackerStores.m_time = -9999
  - TRGECLUnpackerStores.m_hit_win = -9999
  - TRGECLUnpackerStores.m_revo_fam = -9999
  - TRGECLUnpackerStores.m_energy = 0

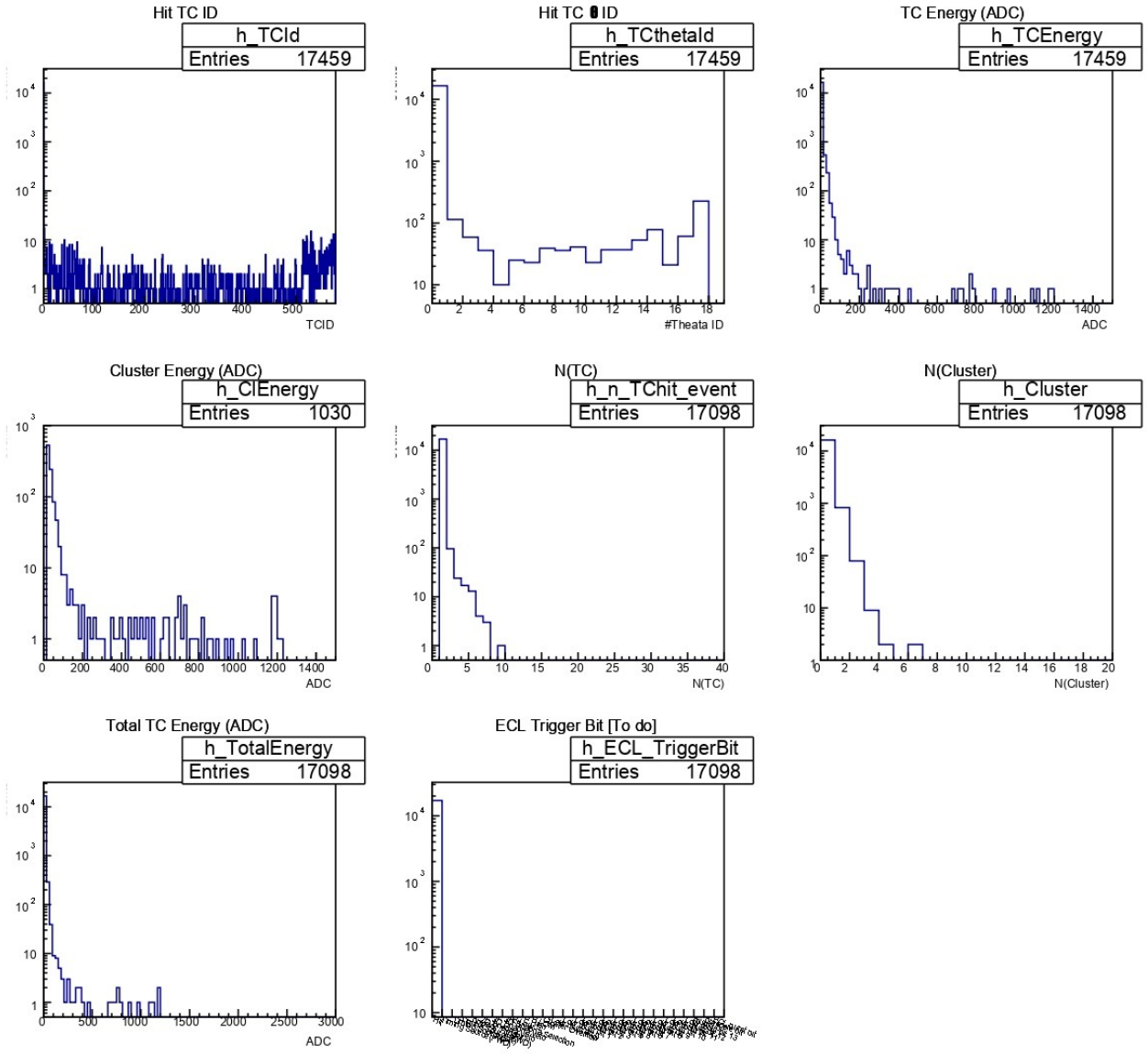
Following the definition of 3DBhabha
At least two energetic cluster energy > ~570ADC (3GeV).

The case 3 has no TC hit, but the 3DBhabha of trg_bit is on

The # of Case 1 is two. Eff: 2/39939 ≈ 0.005%
The # of Case 2 is two. Eff: 2/39939 ≈ 0.005%
The # of Case 3 is two. Eff: 2/39939 ≈ 0.005%

events detail

Radom trigger related plots

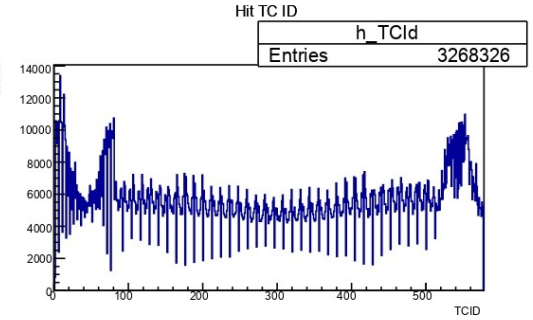


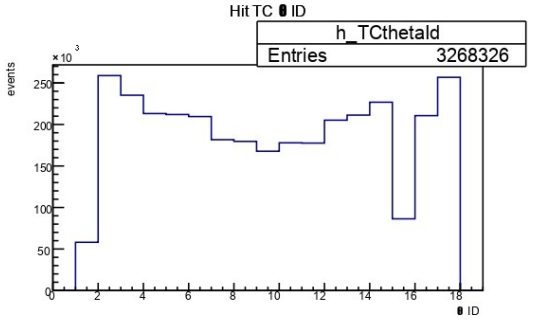
Modified condition

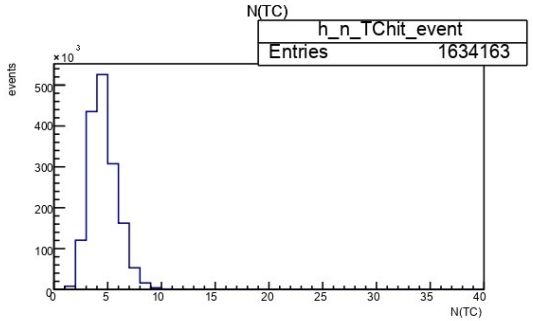
- 3D Bhabha trigger
  - TRGECLUnpackerEvtStores.e_b2bhabhav == 1
- Random tirgger
  - Psnm bit 77 == 1 (TRG random bit)
  - TRGECLUnpackerEvtStores.e_evt_win == 3 || 4

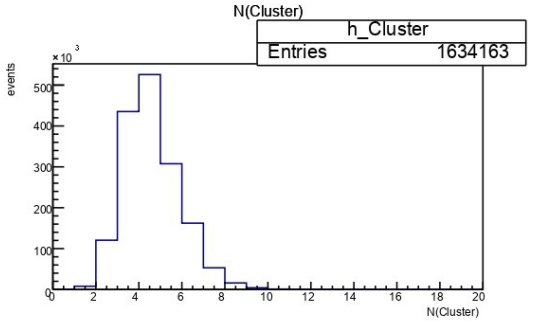
3Dbhabha bit result

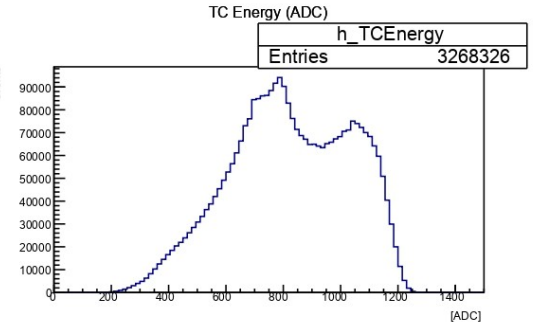
New

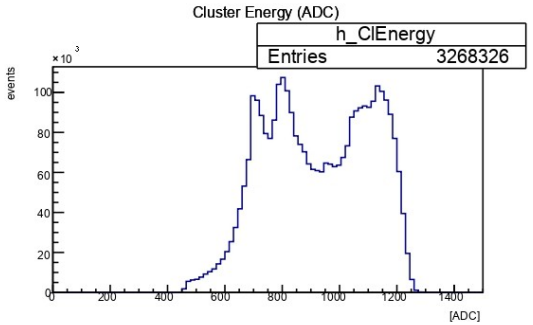




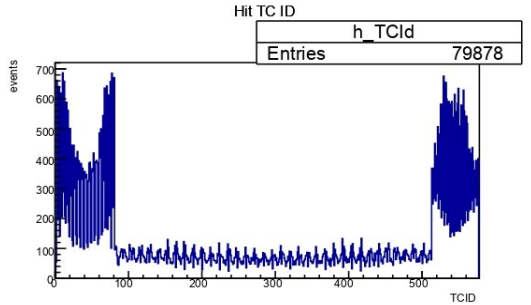


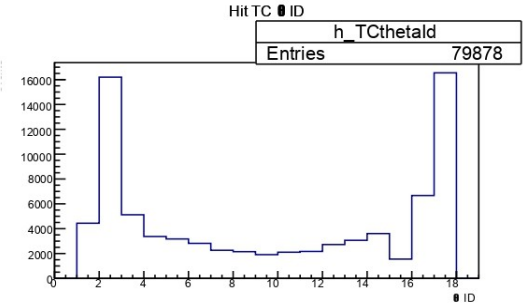


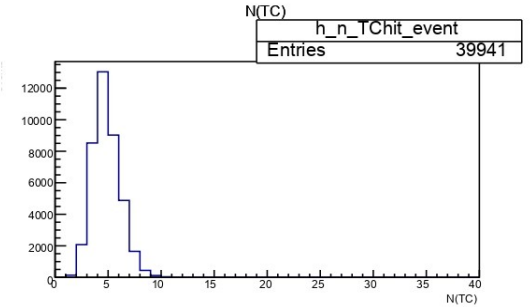


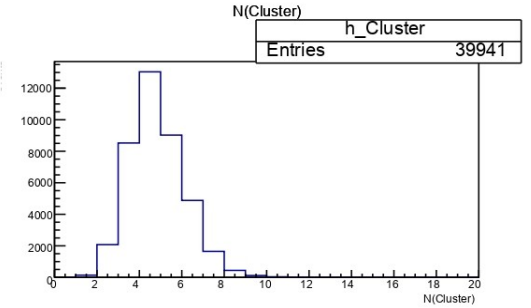


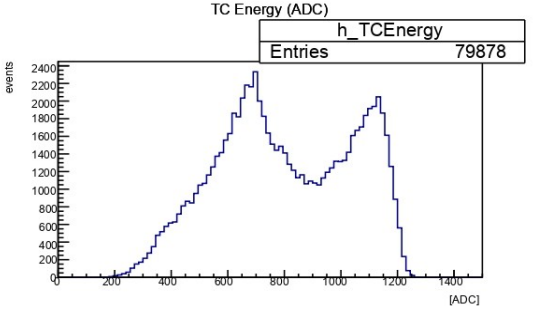
Previous

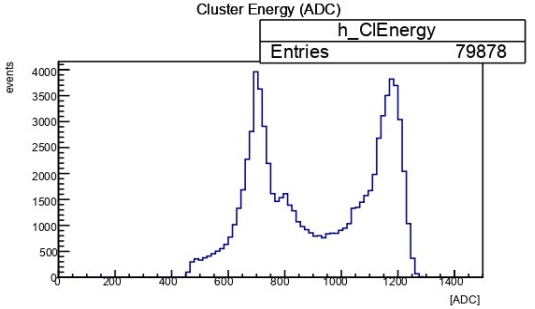




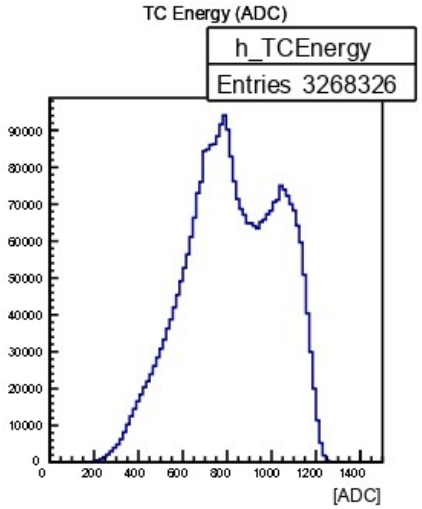


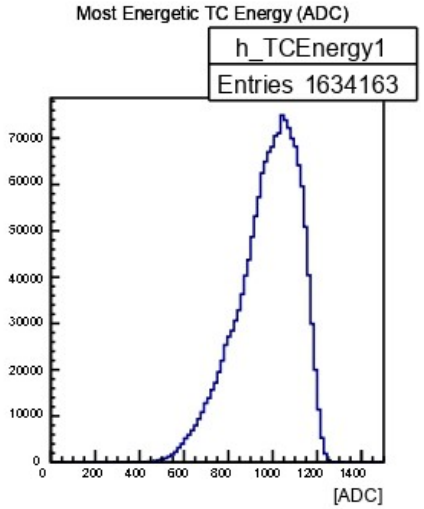


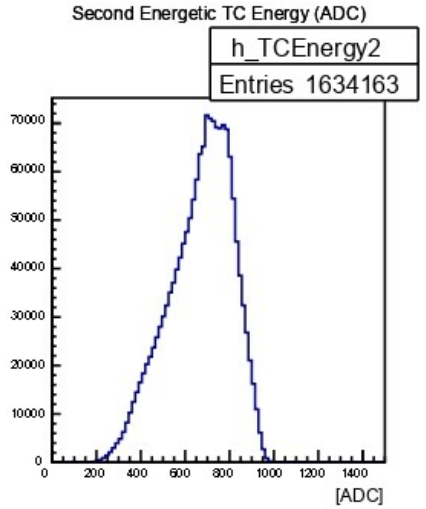


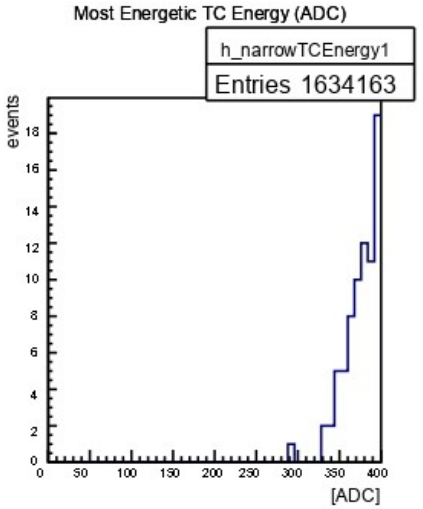


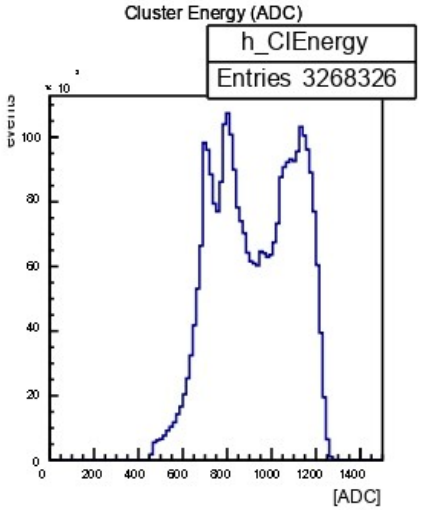
3Dbhabha bit result check

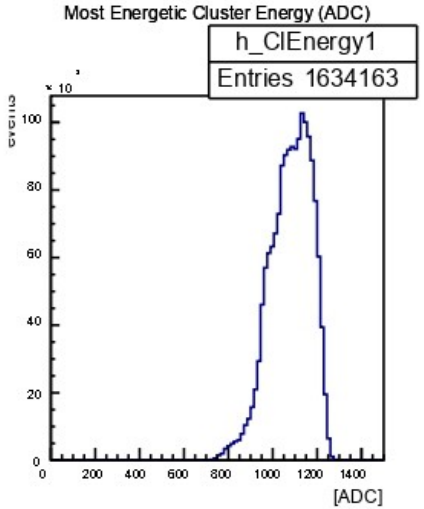


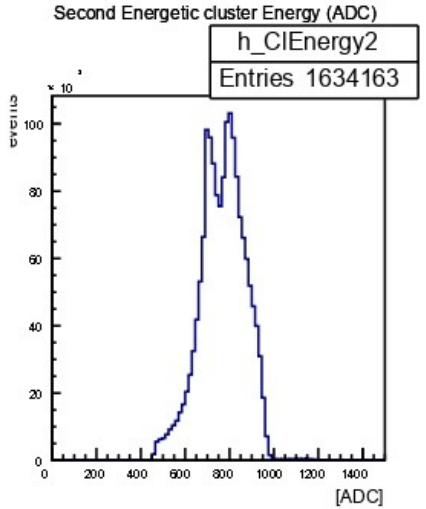


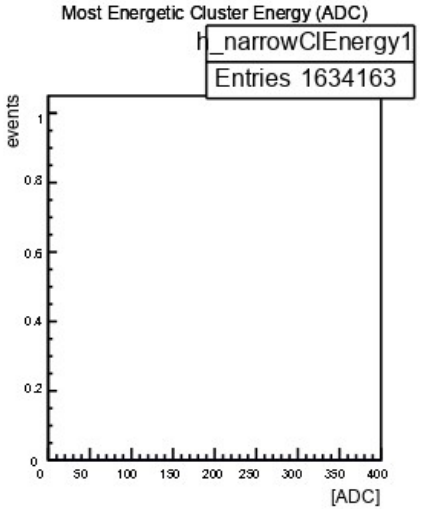






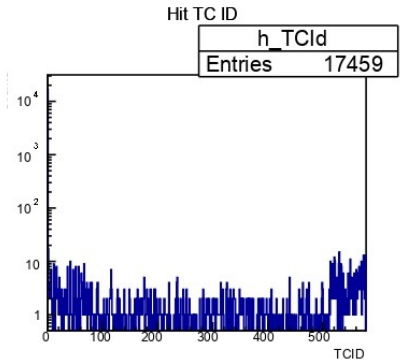


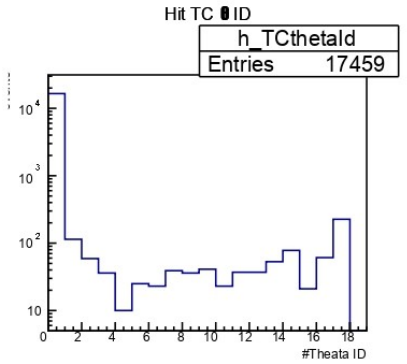


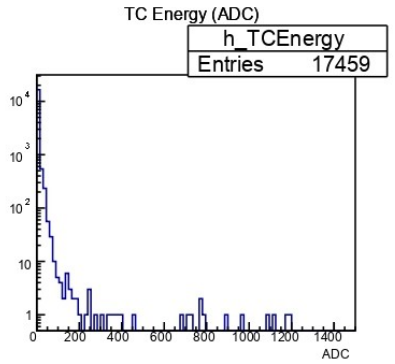


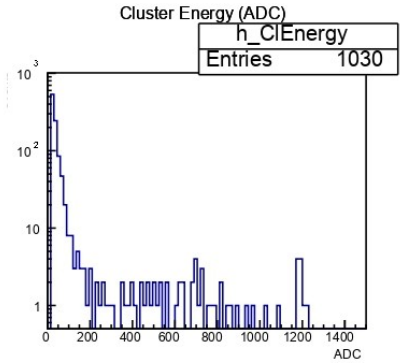
- The plots looks more clear for shifters.

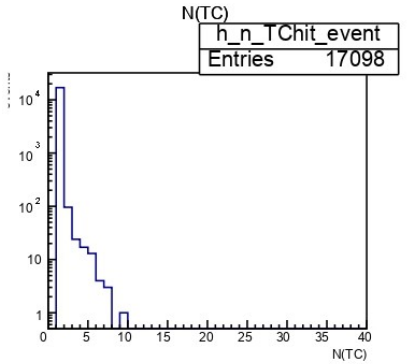
Random trigger related plots

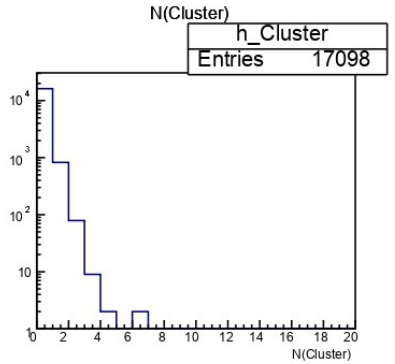


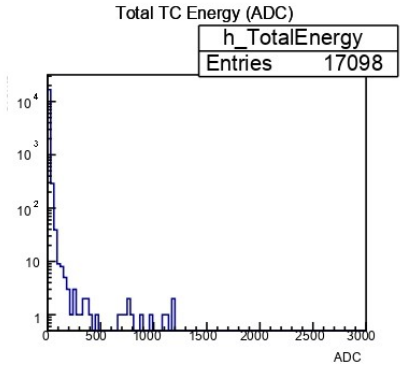


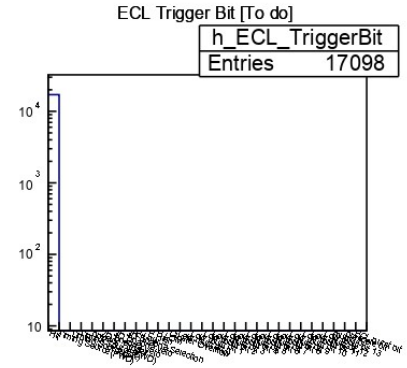












To do

ECLTRG Background study(BGoverlay)

Task list in LS1 and future

Subgroup	Task	Person	1/2022	4/2022	7/2022	10/2022	1/2023	4/2023
General	(LS1)							
General	(physics run)							
General	(Ehut ON)				by July	TBD	TBD	
DAQ	PCIe40	@Yun-Tsung Lai	commissioning	commissioning	copper→PCIe40	TBD	TBD	stability test ?
ECLTRG	ECLTRG Background study for high lumi/BG	@Unno Yuji @HanEol Cho						
ECLTRG	ECLTRG ETM UT3->UT4	@Shintaro Ito @Unno Yuji						
ECLTRG	ECLTRG hie, bhabha, etc. logic for high lumi/BG	@Junhao Yin @Christopher Hearty						
ECLTRG	ECLTRG calibration, automation	@Eunji Jang						
ECLTRG	ECLTRG software (database, tsim)	TBD (@Unno Yuji)						

TRGECL DQM Study

- Data sample
  - Run 24 exp 1184
  - The number of events : ~12M

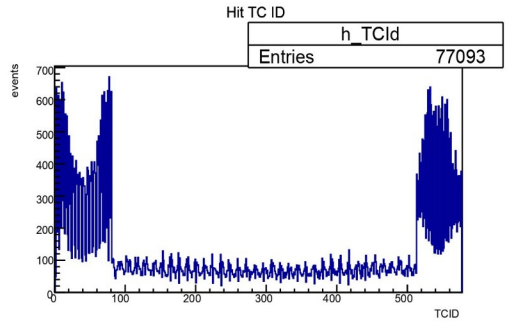
- Contents
  - TC Hit map with various E range
  - 3DBhabha plots
  - Random trigger plots *[to do]*

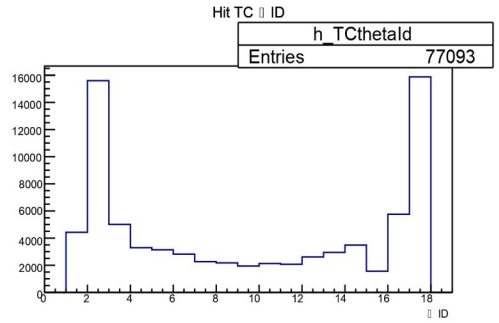
TC Hit map with various TC E range

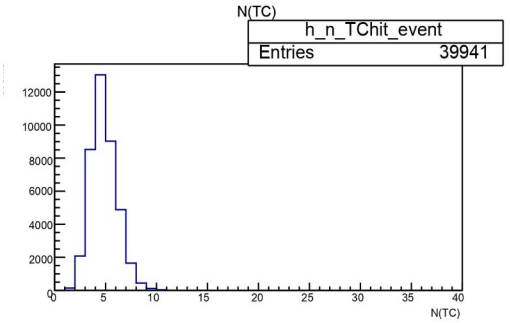
- TRGECL DQM needs plots with various TC energy range for the energy related error.

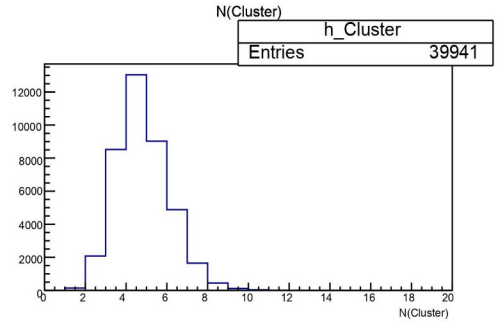
- Conversion factor : 5.25 MeV/ADC
- 1st range : 0.1 GeV < TC Energy < 0.5 GeV
- 2nd range: 0.5 GeV < TC Energy < 3.0 GeV
- 3rd range: 3.0 GEV < TC Energy

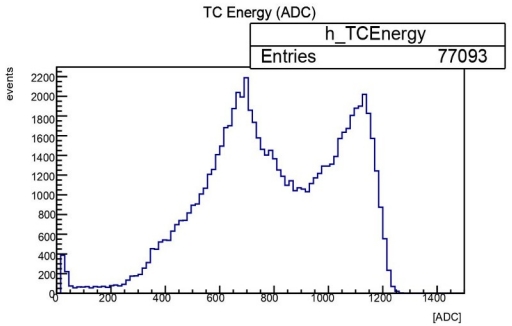
The plots with 3D Bhabha bit on

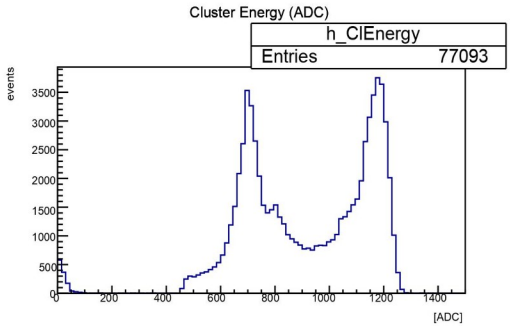








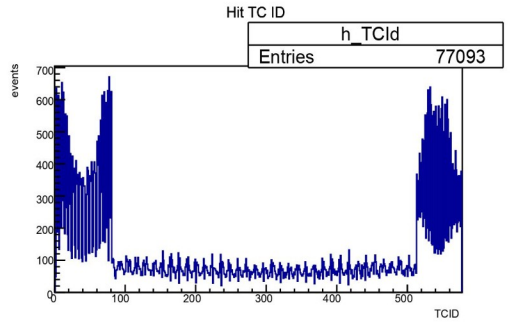


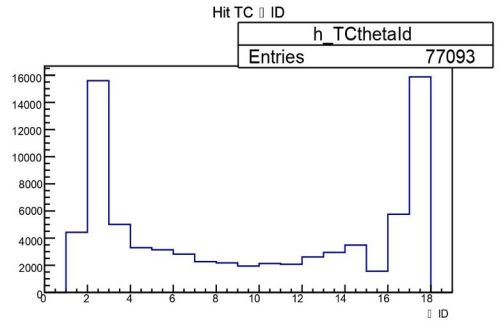


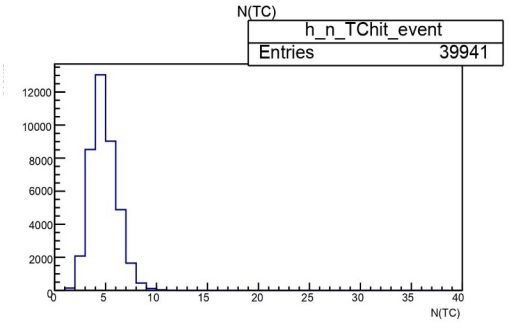
Definition of the 3D Bhabha bit on

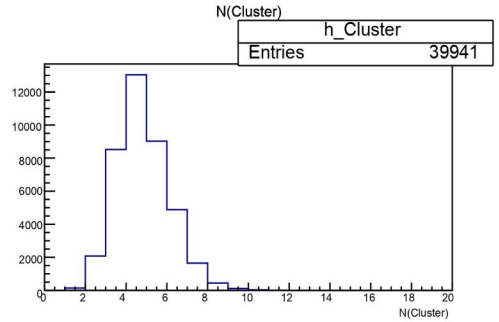
- TRG output bit #49 : ecl_3dbha and !veto
  - m_psnmBits->GetValue(1) >> 17 == 1
- Statistic : ~40K

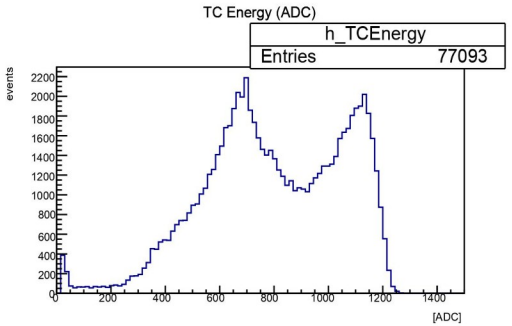
The plots with 3D Bhabha bit on

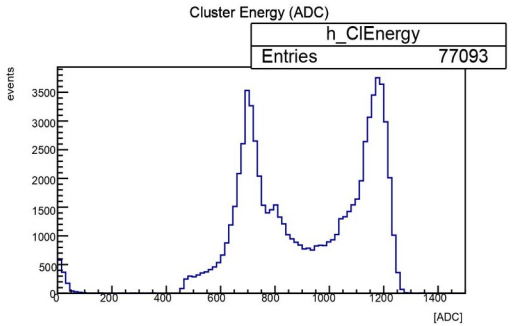












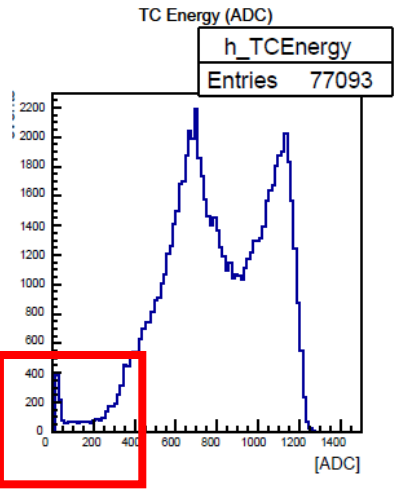
Definition of the plots

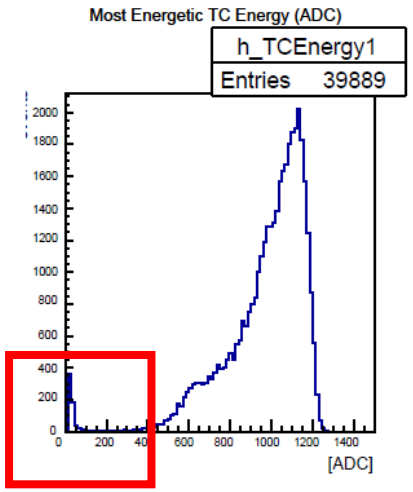
- Hit TC ID : Hit map of Most Energetic TC and Second Energetic TC
- Hit TC theta ID : Theta Hit map of Most Energetic TC in each two Clusters.
- N(TC) : The number of hit TCs from "EvtStores.e_etc"
- N(Cluster) : The number of clusters from "EvtStores.s_ncl"
- TC Energy : TC Energy of most Energetic TCs in each two Clusters.
- Cluster Energy : each "two" cluster Energy

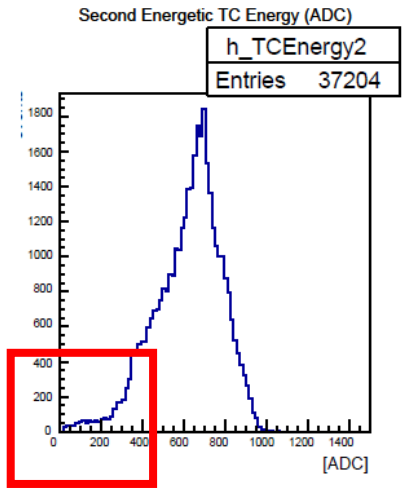
Example

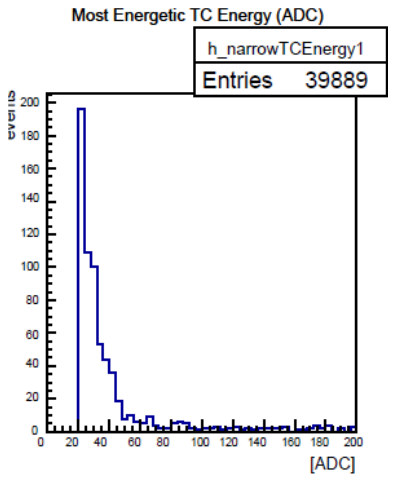
- Hit TCID(energy): 7(45), 10(1170), 549(412), 552(277)
  - Hit TC ID : 10, 549
  - Hit TC theta ID : 2, 17
  - TC Energy : 1170, 412
  - Cluster Energy : 1215, 689

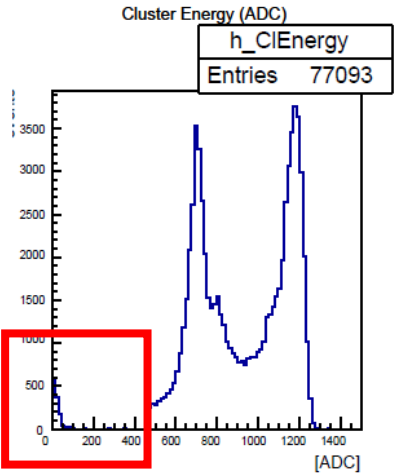
The plots with 3D Bhabha bit on

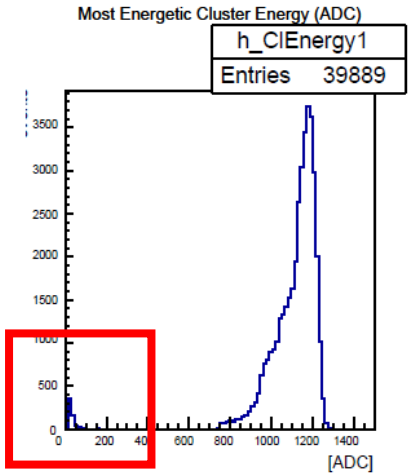


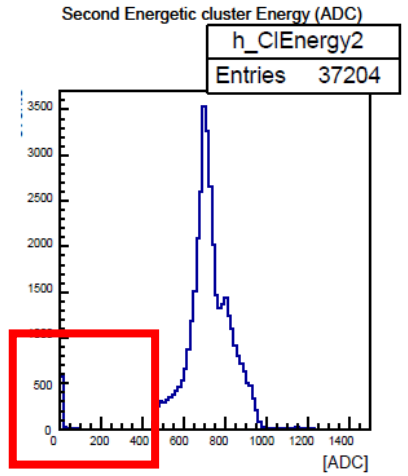


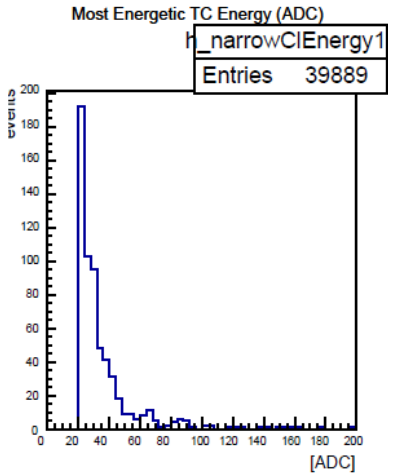






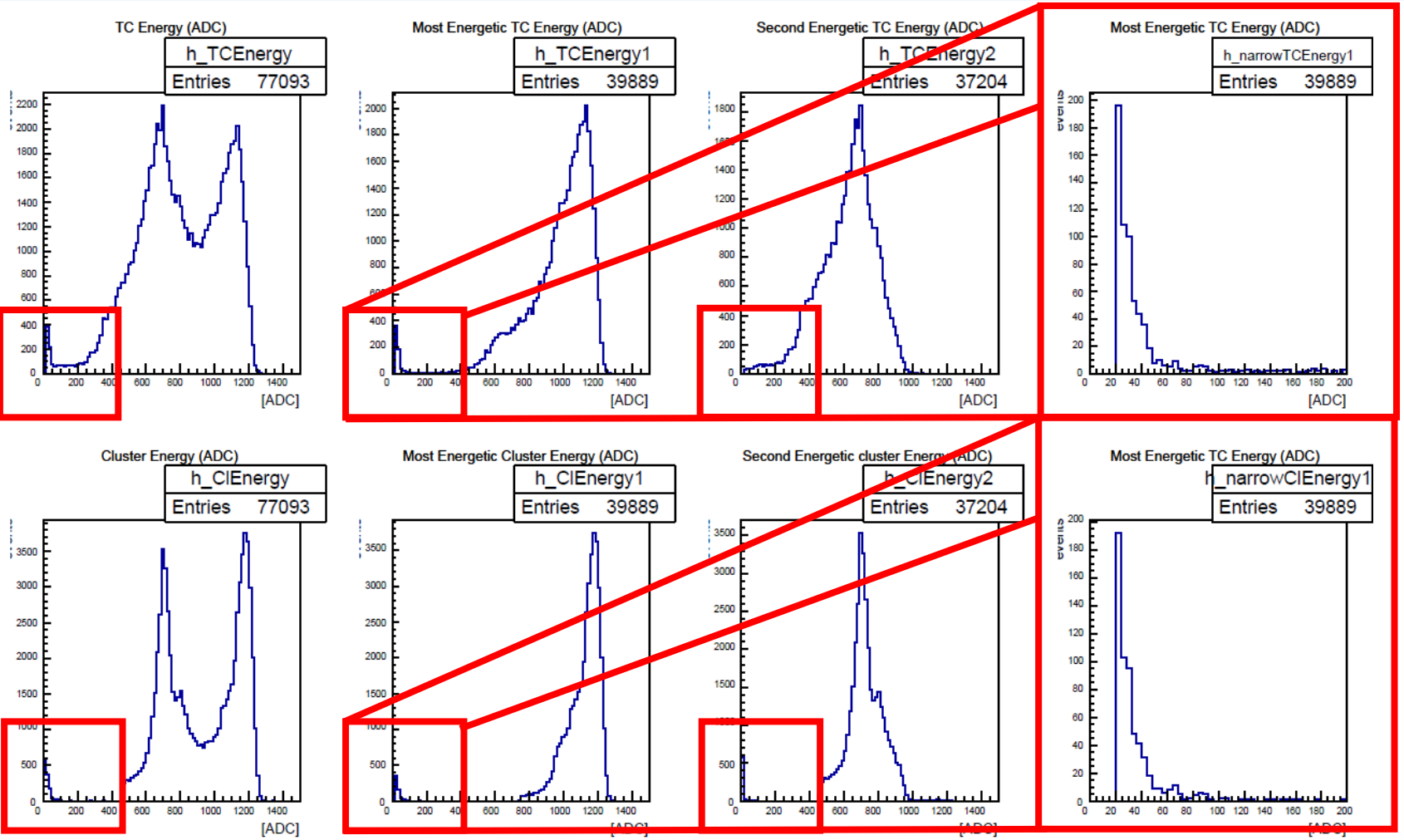






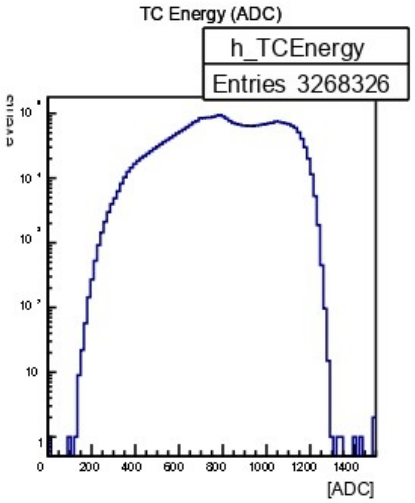
- TC Energy and Cluster Energy are from most/second energetic TC/cluster.

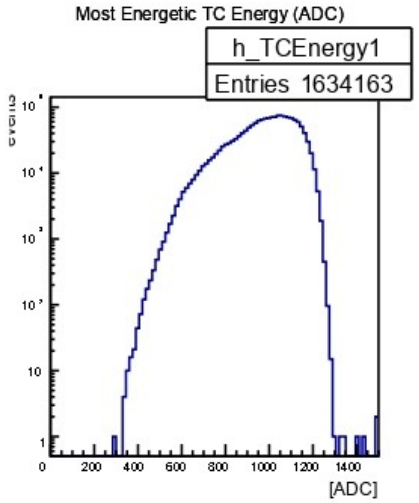
The plots with 3D Bhabha bit on

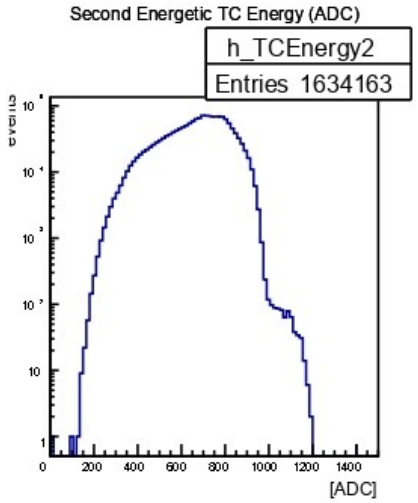


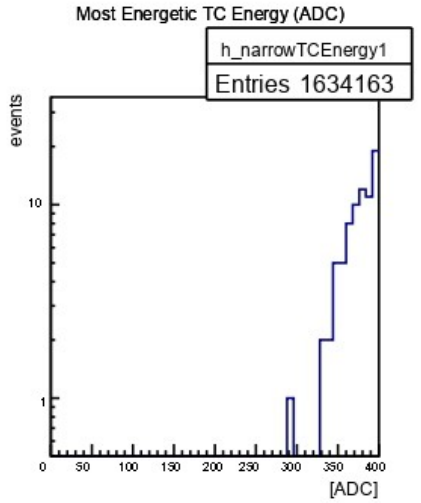
- TC Energy and Cluster Energy are from most/second energetic TC/cluster.
- But some cluster energy lower than 200 ADC (~1 GeV)

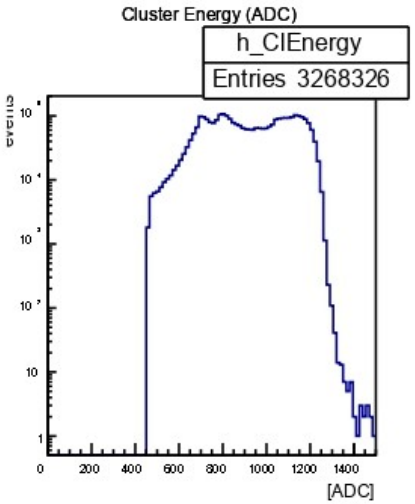
3Dbhabha bit result check-log scale

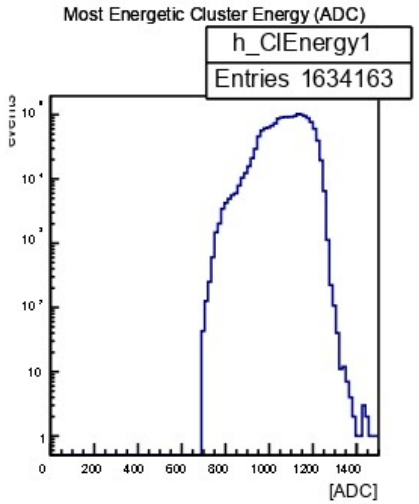


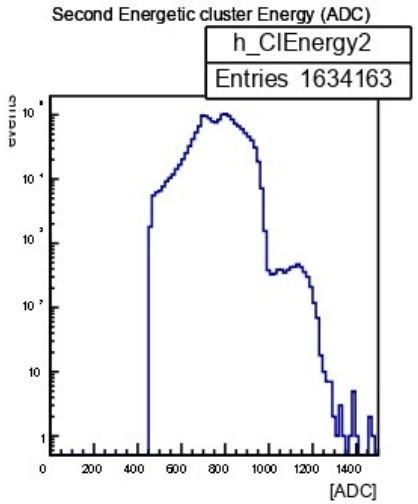


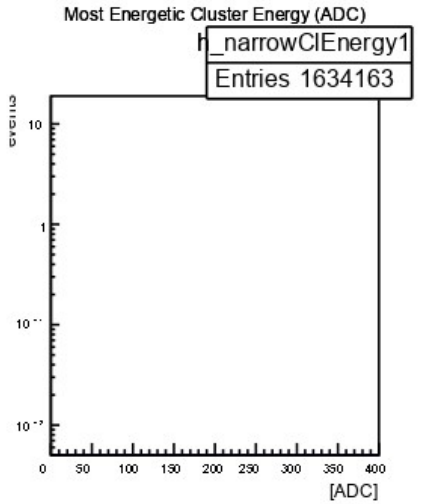












- The plots looks more clear for shifters.