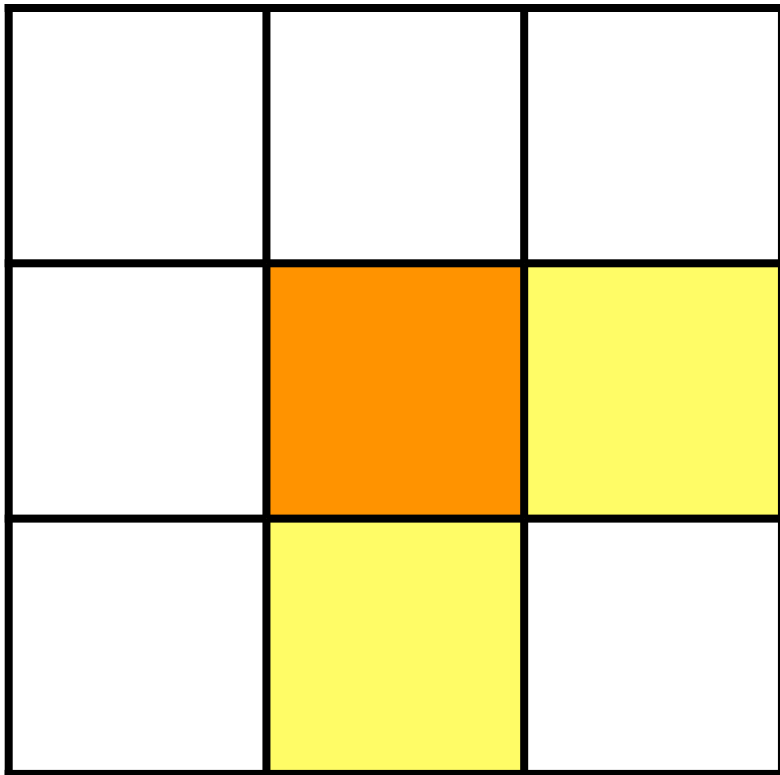# Bug of cluster position in tsim

2023/01/19
TRG meeting
Y.Unno

# Bug in cluster postion in tsim

- Communication with Isabel Haide triggered to find wrong definition of cluster position("getPostionX(),Y(),Z()") in TRGECLCluster dataobject.
  - Cluster consists of energy in 3x3 TCs

- (A) Cluster position in FW is center of most energetic TC in the cluster

- (B) "getPostion" returns TC energy weighted position in the cluster

- In ecl trigger logic, "getPosition" is not used anywhere
  - Logic is based on TCID of most energetic TC in a cluster
- In grl tsim, "getPosition" is used for track-cluster matching
- This bug will be fixed.

# Trk-cluster matching check w/ particlegun

- Check track-cluster matching for (A) and (B) with simple simulation
  - "cdcecl_X" where X=0,1,2,3
  - "cdcecl_0" is "N of matched CDC track and ECL cluster is 1"
- Particle gun
  - 10K events
  - e+ or e- randomly
  - N(track) = 1 or 2 or 3 or 4 (4 cases)
  - Momentum = 0.7 to 7.0 GeV uniformly
  - Theta = 33 to 128 degree (ECL barrel region) uniformly
  - Phi = 0 to 360 degree uniformly
  - From IP
- No background
- Without any payload(?) for tsim-cdc(Is this OK!?)
- No event display check done
- No truth information in tsim-ecl
- No requirement on opening angle between any tracks
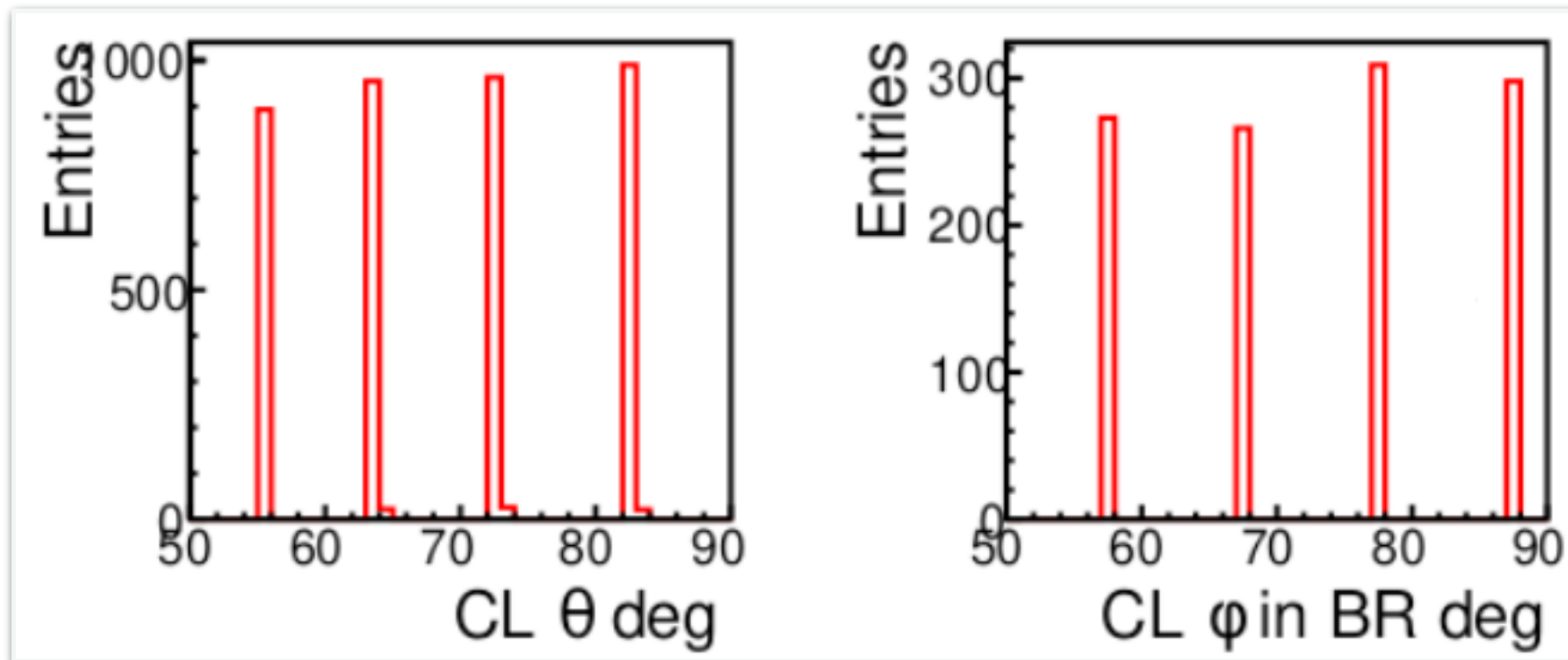- No check on L1
- W/ release06-01-04

# CL variable plots

- N(trk)=1 and (A) case as an example
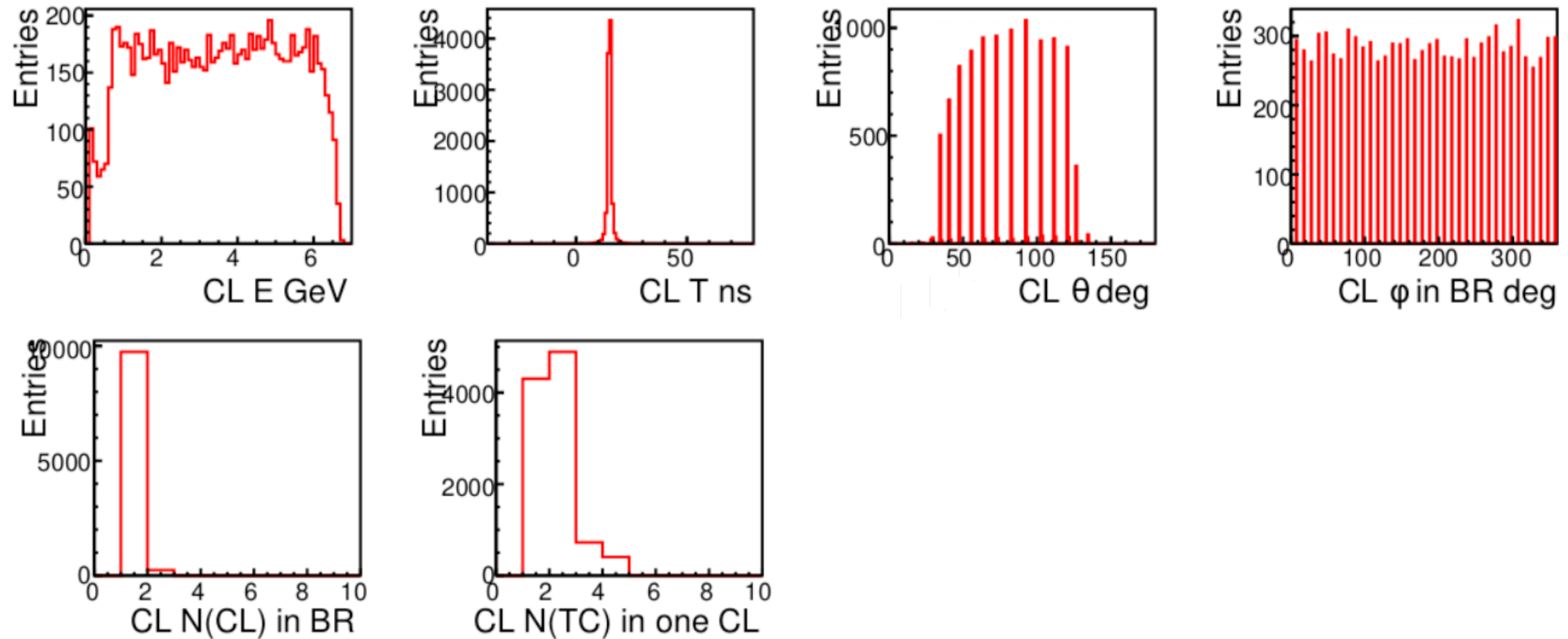
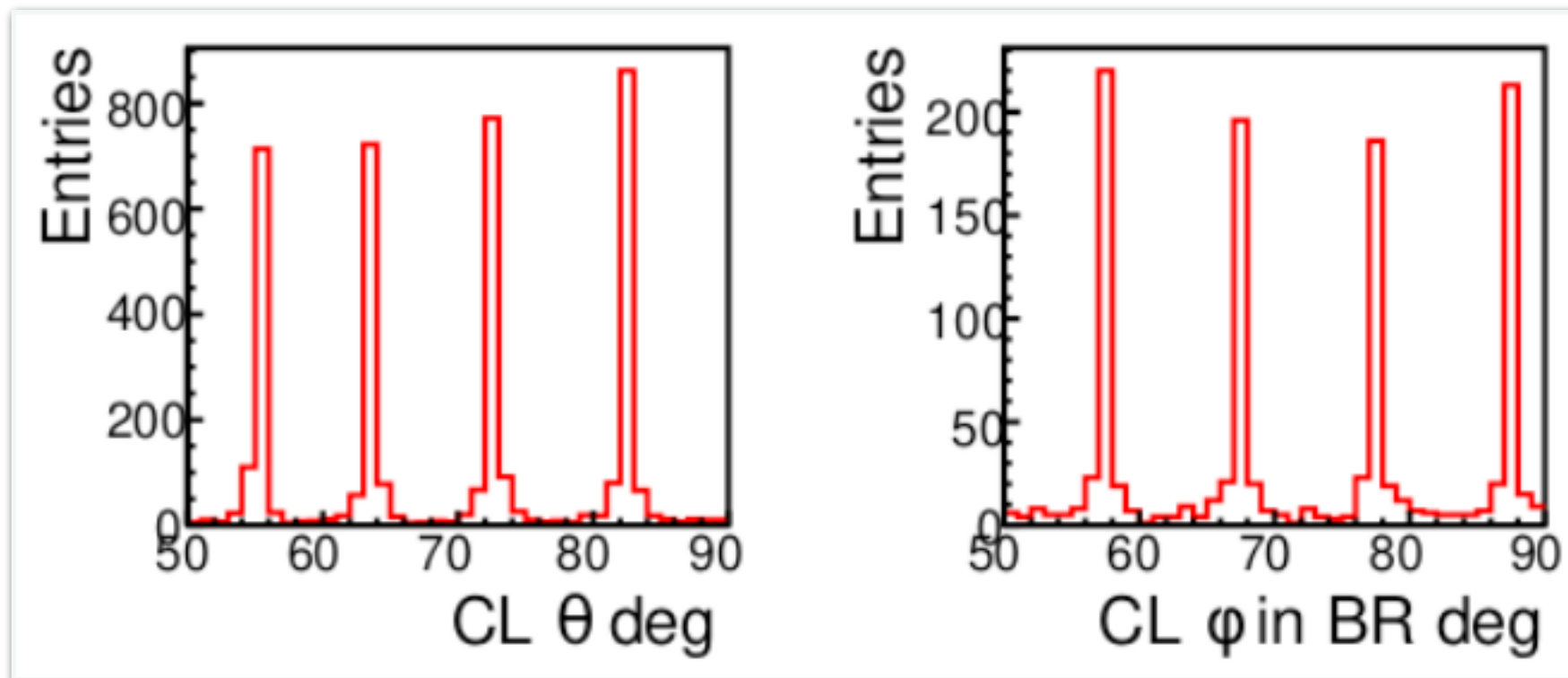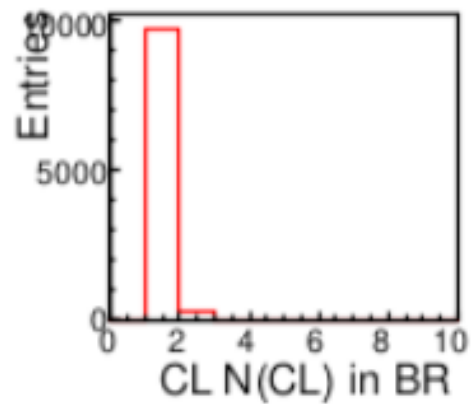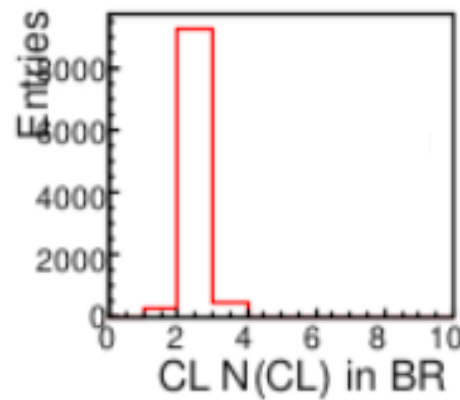# CL postion (A) and (B)

**(A)**



**(B)**

# "cdcecl_X" for (A) and (B)

**N(trk)=1**



|          | [A]    |   | [B]  |   | [A/B] |
|----------|--------|---|------|---|-------|
| cdcecl_0 | 8953 / |   | 9001 | = | 0.99  |
| cdcecl_1 | 15 /   |   | 16   | = | 0.94  |
| cdcecl_2 | 3 /    |   | 3    | = | 1.00  |
| cdcecl_3 | 0 /    |   | 0    | = | 0.00  |

**N(trk)=2**

|          | [A]    |   | [B]  |   | [A/B] |
|----------|--------|---|------|---|-------|
| cdcecl_0 | 1958 / |   | 1896 | = | 1.03  |
| cdcecl_1 | 7880 / |   | 7962 | = | 0.99  |
| cdcecl_2 | 42 /   |   | 56   | = | 0.75  |
| cdcecl_3 | 5 /    |   | 9    | = | 0.56  |

**N(trk)=3**
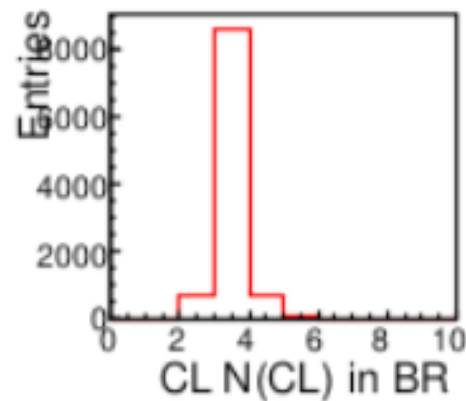
|          | [A]    |   | [B]  |   | [A/B] |
|----------|--------|---|------|---|-------|
| cdcecl_0 | 361 /  |   | 261  | = | 1.38  |
| cdcecl_1 | 2670 / |   | 2579 | = | 1.04  |
| cdcecl_2 | 6858 / |   | 7024 | = | 0.98  |
| cdcecl_3 | 101 /  |   | 122  | = | 0.83  |

**N(trk)=4**
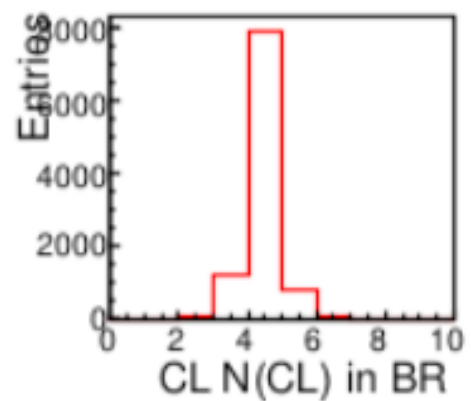
|          | [A]    |   | [B]  |   | [A/B] |
|----------|--------|---|------|---|-------|
| cdcecl_0 | 46 /   |   | 44   | = | 1.05  |
| cdcecl_1 | 657 /  |   | 572  | = | 1.15  |
| cdcecl_2 | 3215 / |   | 3161 | = | 1.02  |
| cdcecl_3 | 6080 / |   | 6221 | = | 0.98  |

# Summary/ plan

- A bug of cluster position in TRGECLCluster dataobject found
  - Affects track-cluster matching in tsim-grl
  - bugfix will be done in tsim-ecl
- No change in "cdctrg_0" for N(trk)=1 between (A) and (B)
- More check will be done someday later…

# Backup