

Study on Crystal ECal

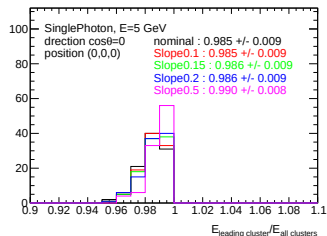
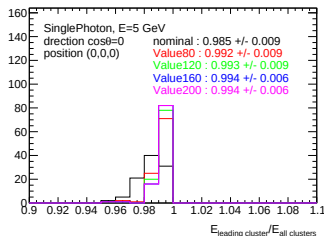
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Single photon

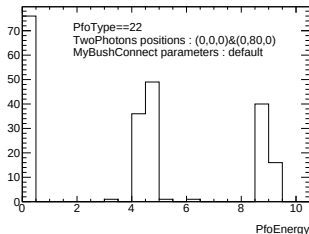
- 100 events of single 5 GeV photon
- Tune the Arbor parameter and check the efficiency
(LeadingClusterEnergy / AllClusterEnergy)



- With higher threshold, the clusters are merged together so the efficiency is higher, but the separation power of diphoton needs to be checked.

Overlay

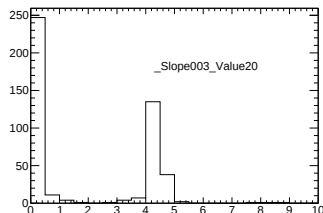
- 5 GeV photon, default parameter (slope, value) : (0.05, 40)
- Two photons' distance : 20,40,60,80 mm
- Reconstruct with default parameters for distance=80 mm:
 - There is a single photon with energy >7 GeV in 56 events
 - There are 88 photons with energy in $[3,7]$, which corresponds to 44 two-photon events.



Parameter tuning—distance=80 mm

- Change the reco parameter and check the two photon separation.
- Parameter range : slope: 0.03,0.05,0.1, Value : 20,40,80

Slope	Value	Two photons with energy in [3,7]
0.05	40	44%
0.05	20	93%
0.03	20	93%

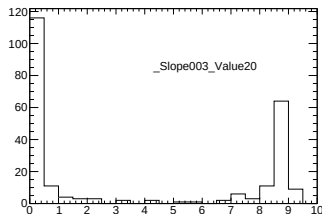


- With lower threshold, the diphoton separation is better, but the energy resolution is poor.

Parameter tuning—distance=20 mm

- Change the reco parameter and check the two photon separation.
- Parameter range : slope: 0.03,0.05,0.1, Value : 20,40,80

Slope	Value	Two photons with energy in [3,7]
0.03	20	4%
0.05	20	4%
0.05	10	6%
0.1	20	1%

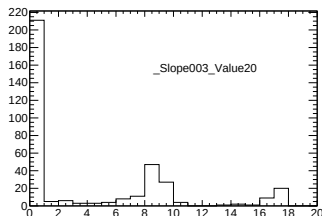


- It is hard to separate the two photons. With higher threshold, the clusters are merged to form a 10 GeV single photon. With lower threshold, there are many small clusters and 5 GeV photon is not reconstructed.

Parameter tuning—10GeV diphoton with distance=18 mm

- Change the reco parameter and check the two photon separation.
- Parameter range : slope: 0.03,0.05,0.1, Value : 20,40,80

Slope	Value	Two photons with energy in [6,14]
0.05	40	10%
0.05	20	49%
0.03	20	49%



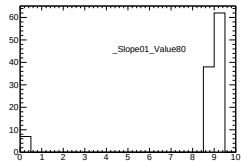
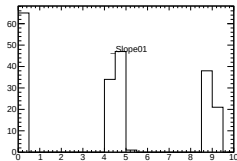
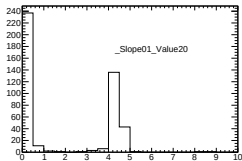
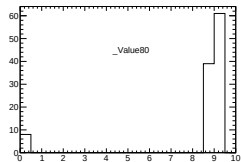
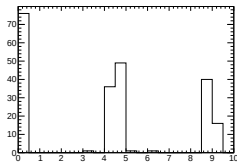
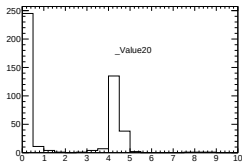
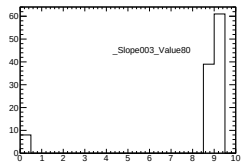
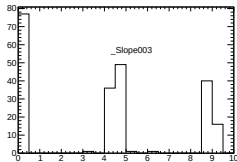
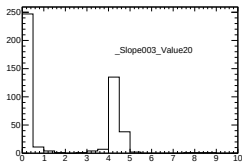
- In two 10 GeV photons, the energy resolution is very poor when we can separate the photons in 49% of the events.

Conclusion

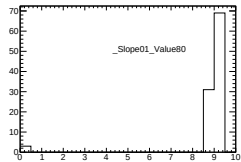
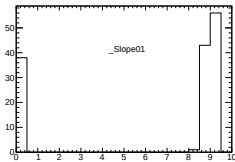
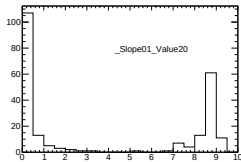
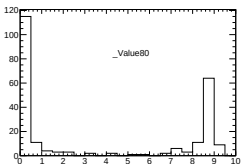
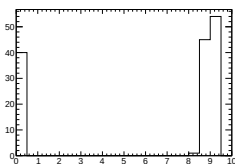
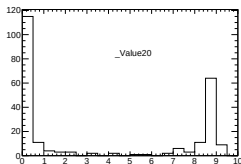
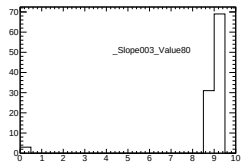
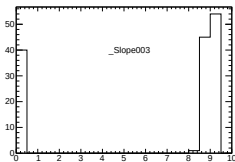
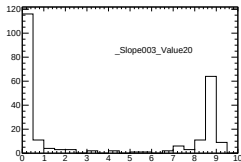
- In general, small slope and threshold value will have good separation power but will introduce more small clusters which will result in poor energy resolution.
- Many distributions of PfoEnergy with different setups in backup.

Backup

PfoEnergy of distance=80 mm



PfoEnergy of (0,0,0)&(0,20,0)



PfoEnergy of 10 GeV (0,0,0)&(0,18,0)

