Photon PID Efficiency with FCC-ee Detector

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FCC-ee detector

- FCC-ee machine energy regimes: Z, WW, HZ, tt (91.2 - 365 GeV)
- Detector design for FCC-ee is based on the CLIC detector

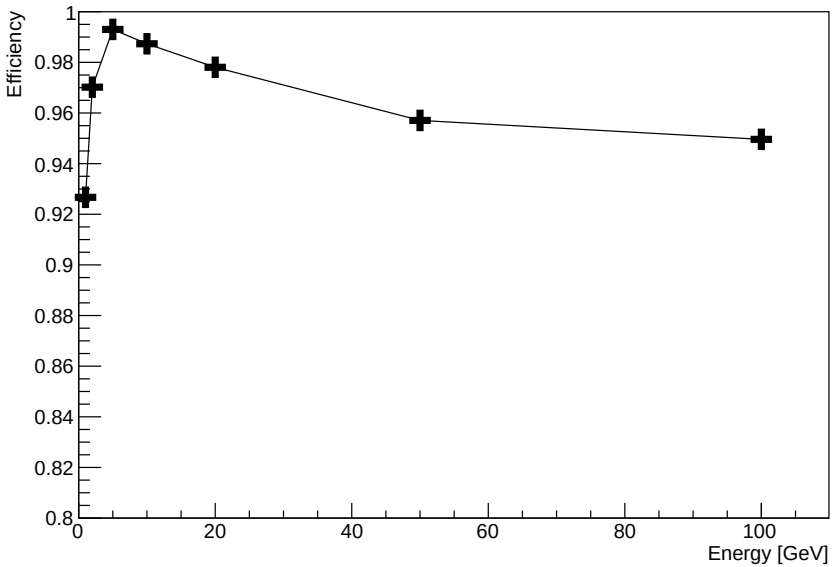
Overall dimensions of CLIC and FCC-ee detectors

	CLIC		FCC-ee
VTX Barrel	31-60 mm	$\Longrightarrow$	17-59 mm
Tracker radius	1486 mm	$\Longrightarrow$	2100 mm
ECAL thickness	40 layers, 22 X_0	$\Longrightarrow$	40 layers, 22 X_0
HCAL thickness	60 layers, 7.5 λ_I	$\Longrightarrow$	44 layers, 5.5 λ_I
Solenoid field	4 Tesla	$\Longrightarrow$	2 Tesla

- Standartd calorimeter calibration with 10 GeV photons, 10 GeV muons and 50 GeV K0L, no software compensation
- Photon reconstruction training with Zuds 380 GeV sample

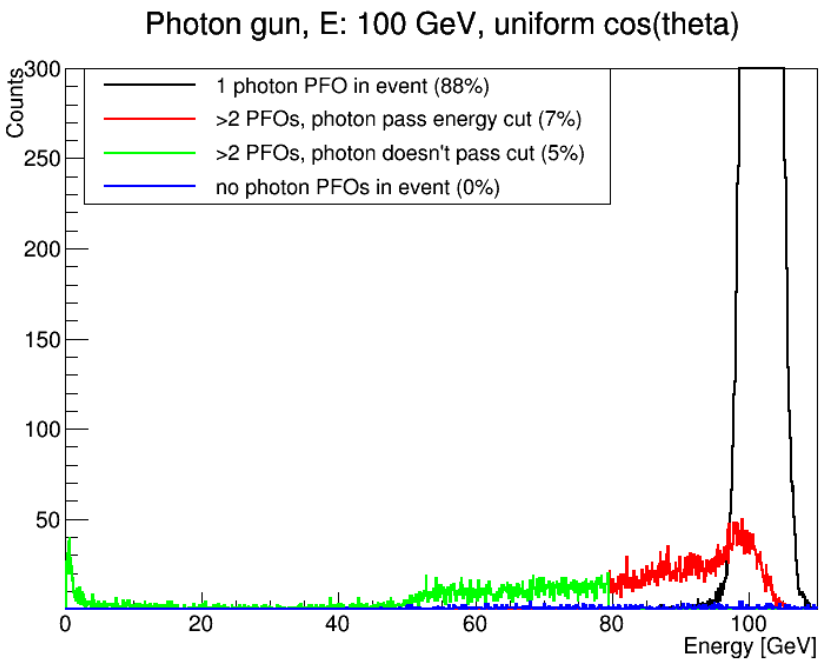
Photon PID efficiency

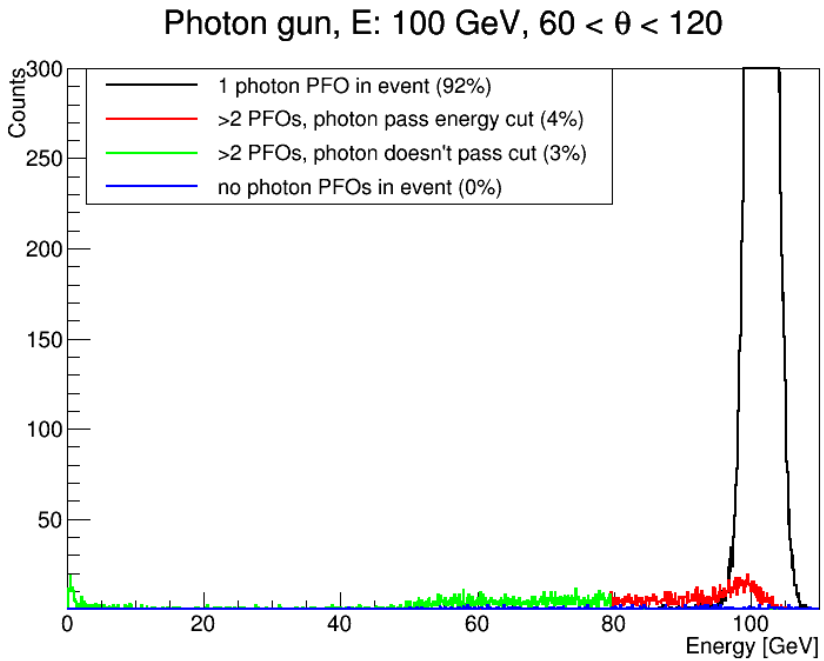
- Samples: photon gun with isotrop $cos(\theta)$ and ϕ distribution: 1, 2, 5, 10, 20, 50, 100 GeV
- Efficiency definition:
  - correct reconstruction PFO type (pick most energetic PFO of correct type)
  - energy matching: $|E_{MC} - E_{PFO}| < 200\% \times \sqrt{E_{MC}} + 0.5\text{GeV}$



Energy [GeV]	N_{total}	fail energy matching	fail type reconstruction
100	87249	3964	434
50	91116	3462	450
20	91121	1569	431
10	96993	652	576
5	99003	0	692
2	89121	0	2656
1	99027	0	7260

Photon PID efficiency





- Photon PFO reconstructed energy
- In $\simeq$10% of events two or more PFOs are found $\rightarrow$ 4-5% effect of photon efficiency loss
- Effect is smaller in only barrel region ($60 < \theta < 120$)

- Is there a way to tune clustering algorithm?