$H \rightarrow \gamma\gamma$ improvements

Physics benchmarks

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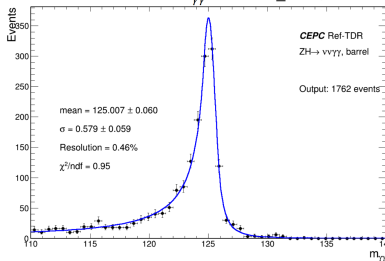
Intro

So far, this is what we have for the diphoton channel (Check Kaili's slides from the RefTDR meeting of 10.28)

Diphoton

$\alpha_{Hi} = 1.2826 \pm 0.1063$
$\alpha_{Lo} = 0.5913 \pm 0.0685$
$n_{Hi} = 3.1292 \pm 0.5072$
$n_{Lo} = 1.4994 \pm 0.1298$
$\sigma_{CB} = 0.5792 \pm 0.0588$
$m_{\gamma\gamma} = 125.01 \pm 0.0598$

CEPC Ref-TDR
ZH→ νγγγ, barrel

Output: 1762 events

mean = 125.007 ± 0.060
σ = 0.579 ± 0.059
Resolution = 0.46%
χ²/ndf = 0.95

• Total	2900	Events
• With 2 PFOs:	2854	98.4%
• $\|\cos\theta_{truth}\| < 0.85$:	2175	75.0%
• $110 < m_{yy_{reco}} < 140$:	1762	60.8%

Reco eff: 1762/2175 = 81.0%

In DSCB fit:
• Sigma: 0.58 GeV
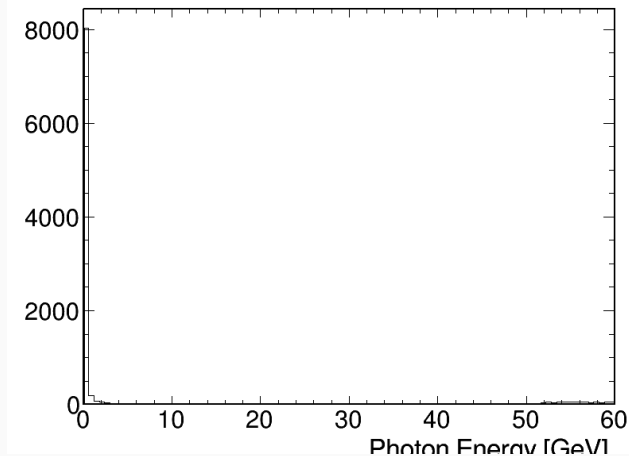• Resolution: 0.46%

2024/10/28   Kaili   2

Fixing lower tail energy loss: Checking the clusters in ECAL and HCAL, and see the energy in both to check for leakage

Using Particle Gun, we generate single photon events at specific energies: 1, 5, 10, 40 GeV... and check the different distributions

Work done so far

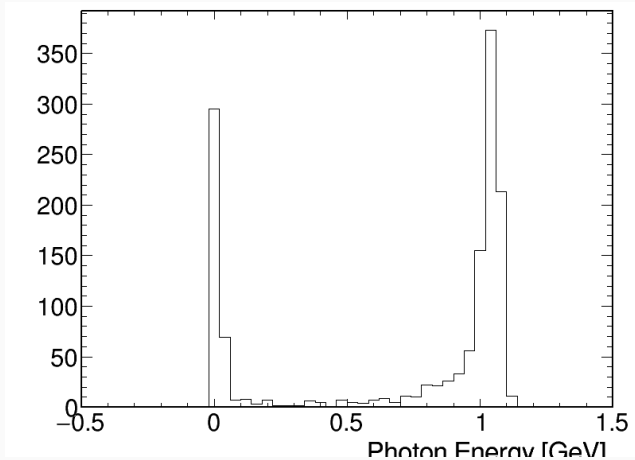Generated events in range of 50-60 GeV
Energy distribution found

Same was done for a specific point of energy 1 GeV

Work done so far

For 1 GeV single photon events:

Next step, checking the events for how many CyberPFOs we have in each then we can proceed with the rest of distributions + Reconstructing for more points of energy and getting the distributions

Main problem for the diphoton channel is lower tail energy loss (good number of events lost for $m_{\gamma\gamma} > 120$ GeV)

Checking the energy deposition at the ECAL/HCAL to check for any leakage

More samples generated in the upcoming days (for specific energy points)

Main distributions to be checked as well

Thank you