



# $H \rightarrow \gamma\gamma$ improvements

Physics benchmarks

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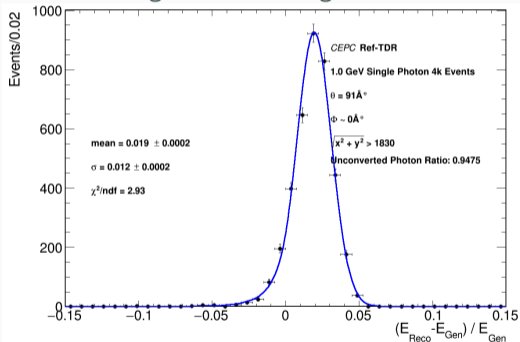
Mohamed Reda Mekouar

December 18, 2024

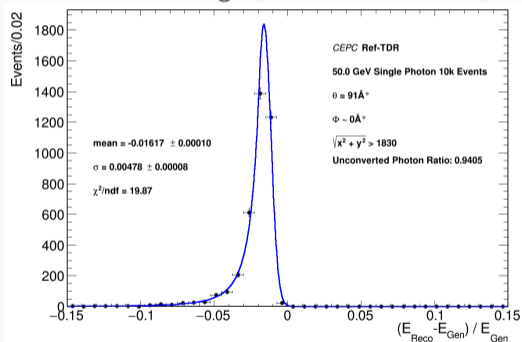
Institute of High Energy Physics, Chinese Academy of Sciences

# Single Photon Gun Response

Lower energies, E Scale still positive, PFA team working on calibrating it

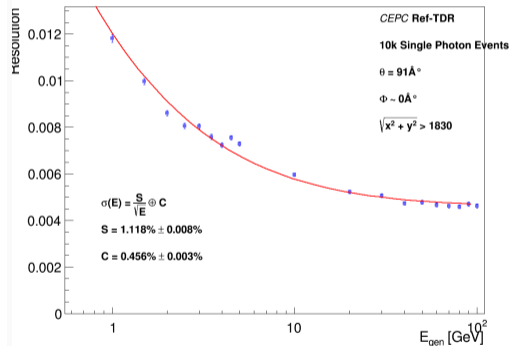
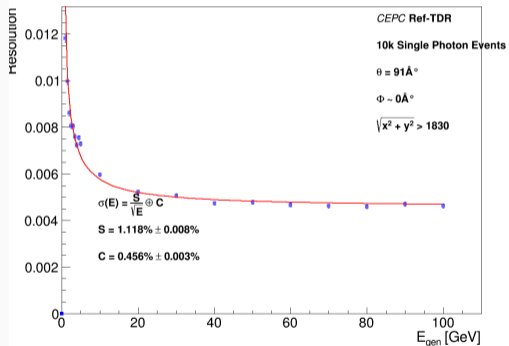


Higher energies: photon energy loss can be due to HCAL leakage (ECAL scale factor 1)



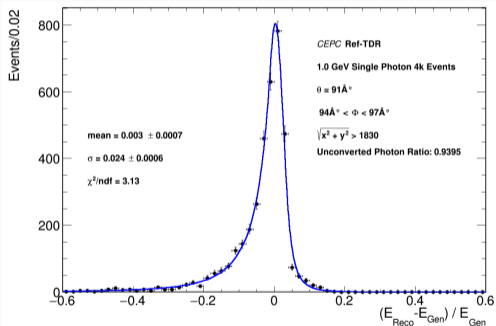
# Differential distribution

Fit fixed, Resolution consistent with expected results from ECAL

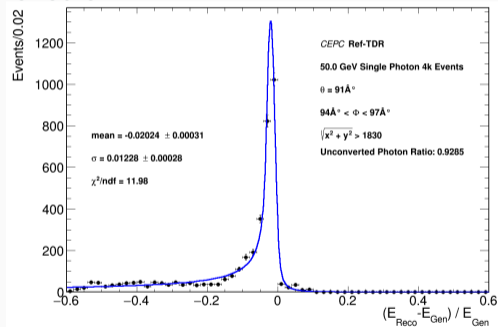


# Crack region study

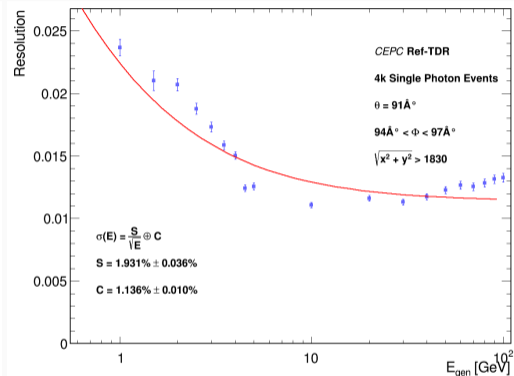
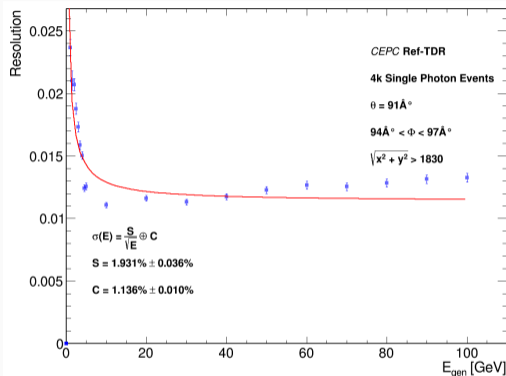
Resolution in crack region higher (2.4% compared to 1.2% for 1 GeV)



1.2 % in the crack region compared to 0.47% for 50 GeV



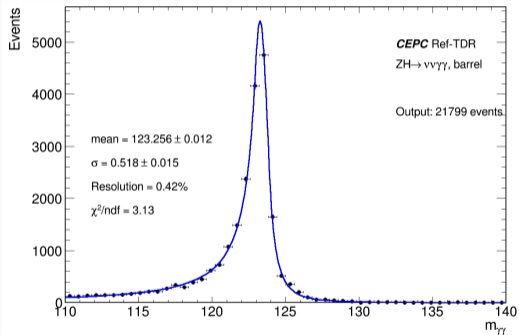
# Resolution fit in dead material region



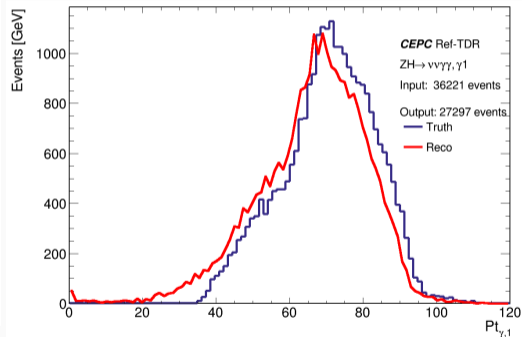
-> Studying the evolution of the resolution over a couple of modules from the crystal ECAL varying the  $\phi$  angle (22.5 variation to study 2 cells) at higher energies

# Diphoton channel study

with CEPCSW24.12, we found a resolution close to what we expect  $0.41\% \approx \frac{1.1\%}{\sqrt{E}} \oplus 0.3\%$

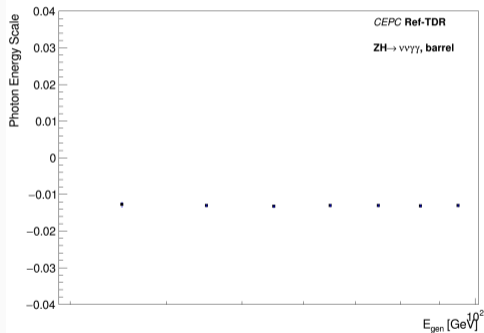


Energy shifted: with  $m_{\gamma\gamma} \approx 1.5\%$ ,  
with  $p_T \approx 3\%$

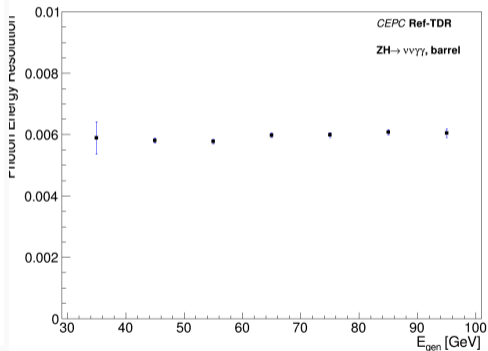


# Differential distributions in the diphoton channel

The Energy scale is somewhat constant around 0.013%



and similar for the Energy resolution which vary slightly



# Conclusion

- Now that we are working with 2 approaches: -Particle Gun -Generated diphoton channel samples, we can compare the results of both -> looking into more distributions (E Resolution & E Scale relative to  $\theta$  and  $\phi$ )
- Studying the impact of crack region and transition between dead material and crystal region
- Study the Energy deposited in the ECAL relative to the total Energy to check for HCAL leakage