$H \to \gamma\gamma$ progress

CEPC Physics Performance Wednesday Working Meeting

Yaquan Fang, Fangyi Guo, Kaili Zhang, Yang Zhang, Han Wang, Mohamed Reda Mekouar

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Institute of High Energy Physics, Chinese Academy of Sciences

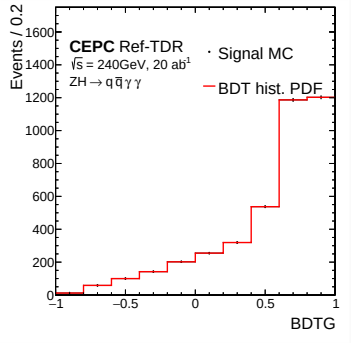
Statistical tool

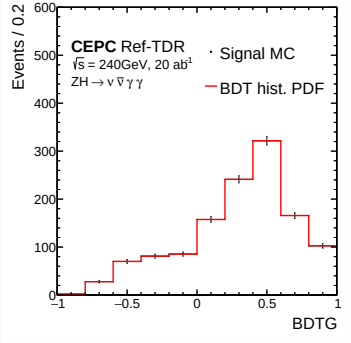
Use of ATLAS official tool for combination to verify our results and improve the study sensitivity:

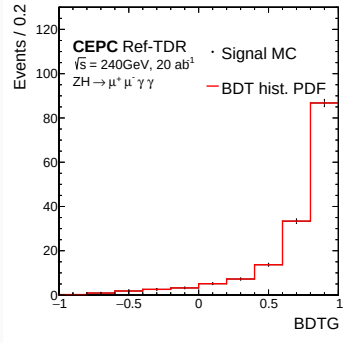
- Considering our BDTG training and from output, fitting for each bin using **quickFit**

BDT output

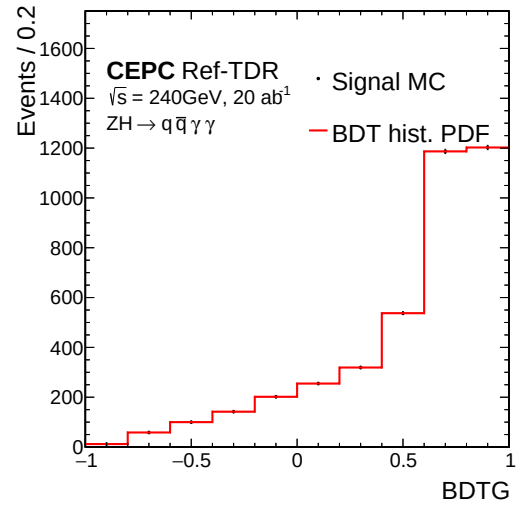
- For signal



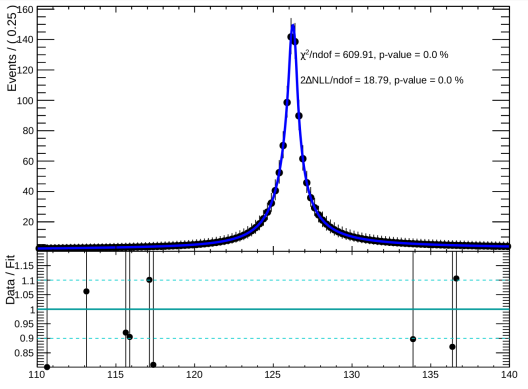




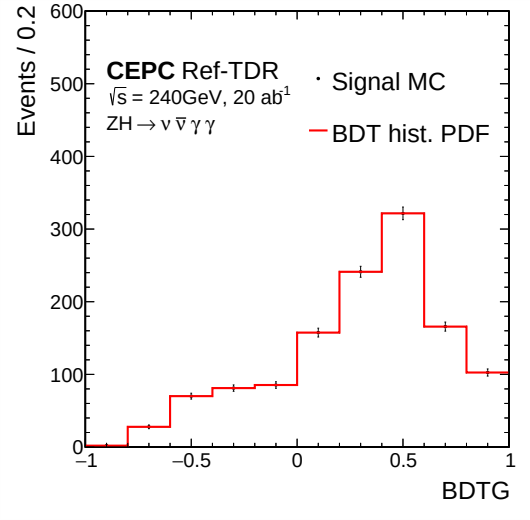
$q\bar{q}\gamma\gamma$ sub-channel



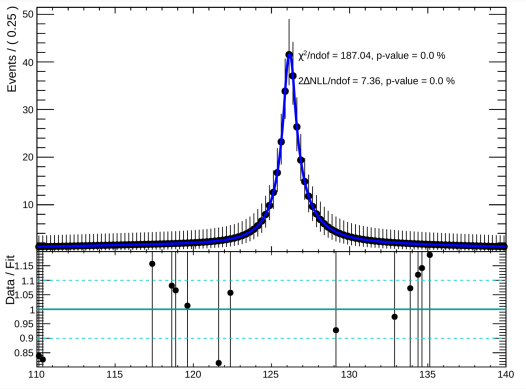
Fit in bin 10:



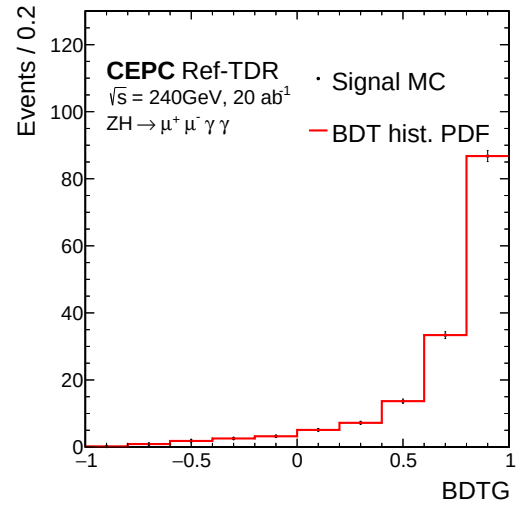
$\nu\bar{\nu}\gamma\gamma$ sub-channel



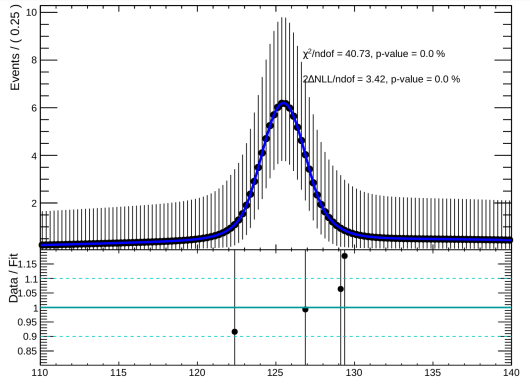
Fit in bin 8:



$\mu^+\mu^-\gamma\gamma$ sub-channel



Fit in bin 10:



Results

Table 1: Expected statistical precision on $\sigma(ZH) \times \text{Br}(\to \gamma\gamma)$ from Asimov data fitting in the three channels and their combination with 20 ab^{-1} data.

	$\boldsymbol{\Delta(\sigma \times \text{Br})/(\sigma \times \text{Br})_{SM}}$
$q\bar{q}\gamma\gamma$	0.022
$\mu^+\mu^-\gamma\gamma$	0.112
$\nu\bar{\nu}\gamma\gamma$	0.037
Combined	0.019

Using this statistical tool gives better results than 2D model previously used (0.019 vs. 0.032)

Trying with dummy/expected values for NPs, we find the precision to worsen to 0.025 due to systematics - investigating more in details

To-do

- Currently smearing the data to evaluate main systematics: PER, PES, γ eff. - by order of priority
- Uniforming the selections for all channels (elimination tracks in $\nu\bar{\nu}\gamma\gamma$ and other selections to improve background rejection and contamination)
- Considering other backgrounds to get full background shape (mainly 4-fermions)

Thank you!

Back-up

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