

CEPC HZZ Analysis Update

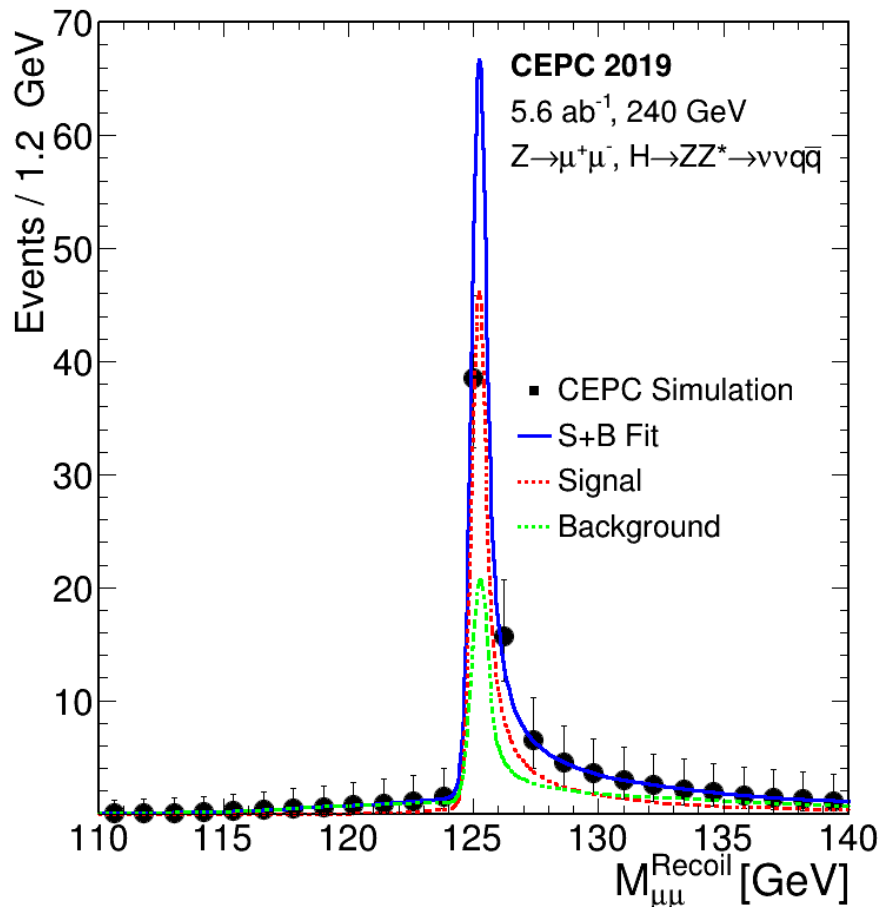
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2020.4.29

Fitting results ($\mu\mu HZZ$ ($\nu\nu jj$))

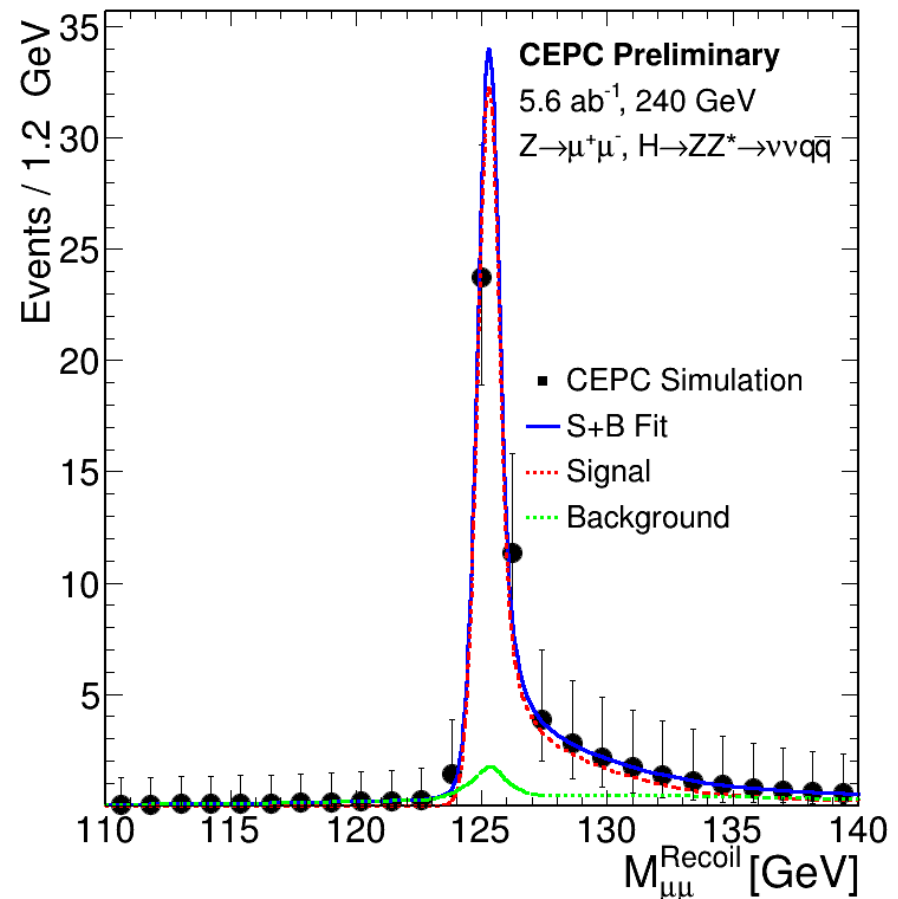
➤ Merely cut-based

$$\frac{\Delta(\sigma(ZH) * BR(H \rightarrow ZZ^*))}{\sigma(ZH) * BR(H \rightarrow ZZ^*)} = 18.15\%$$



➤ BDT

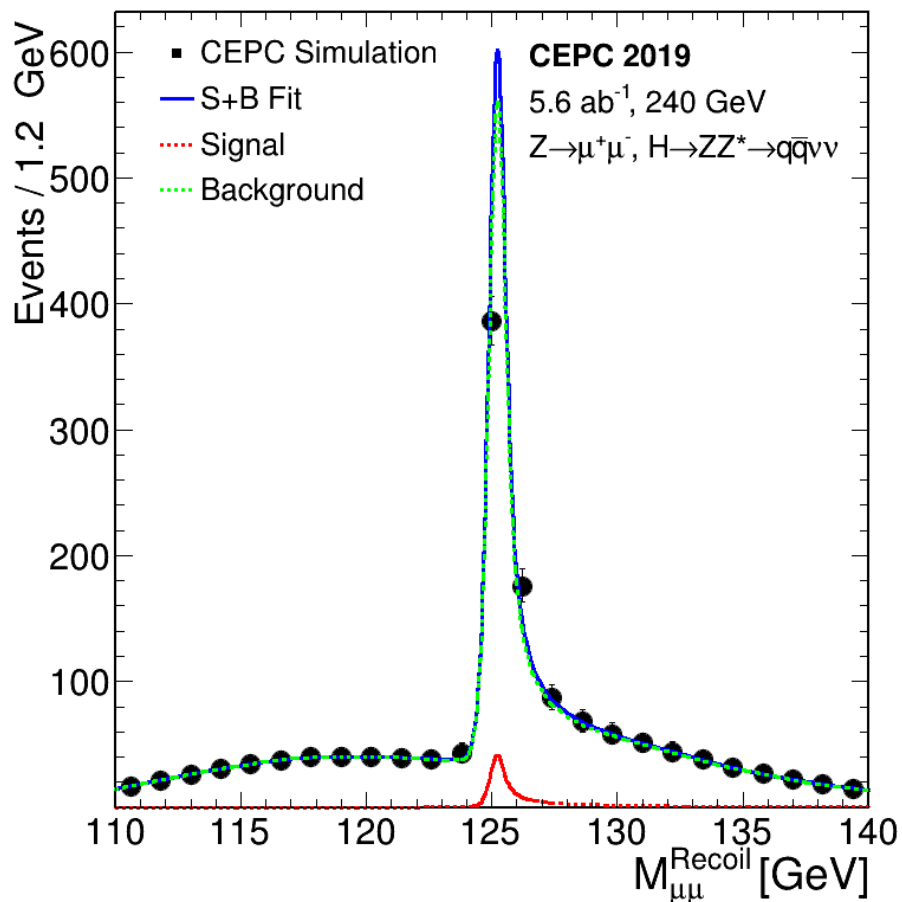
$$\frac{\Delta(\sigma(ZH) * BR(H \rightarrow ZZ^*))}{\sigma(ZH) * BR(H \rightarrow ZZ^*)} = 15.80\%$$



Fitting results ($\mu\mu HZZ$ (jjvv))

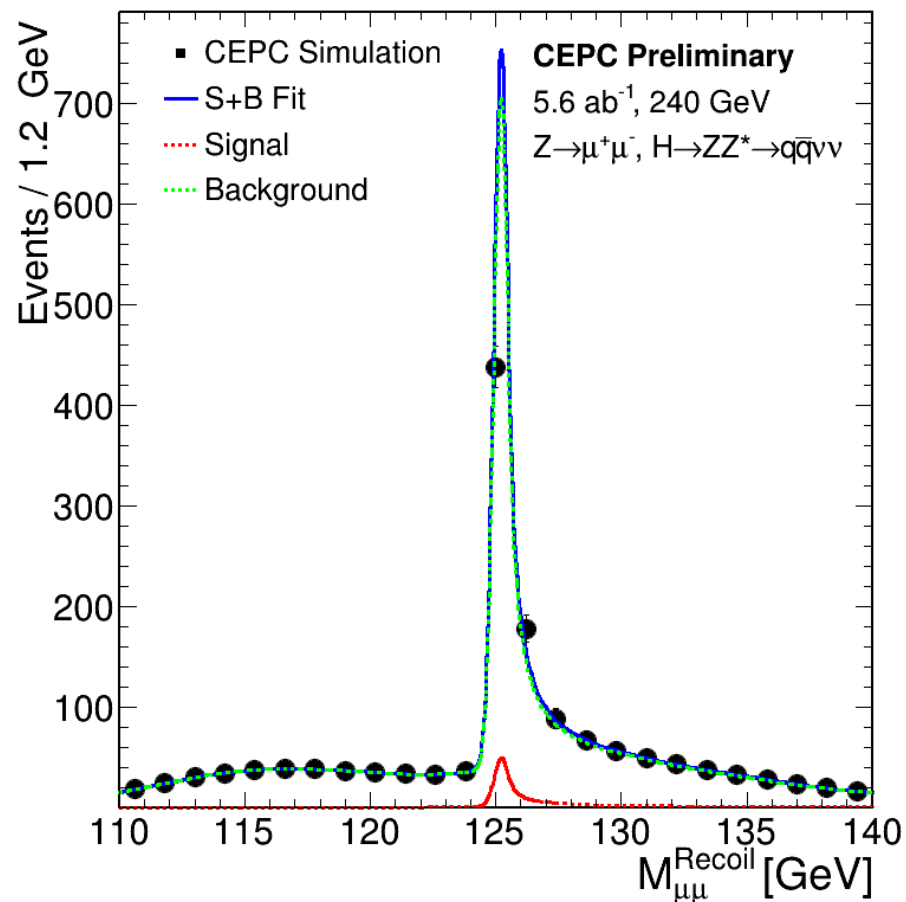
➤ Merely cut-based

$$\frac{\Delta (\sigma (ZH) * BR(H \rightarrow ZZ *))}{\sigma (ZH) * BR(H \rightarrow ZZ *)} = 65.25 \%$$



➤ BDT

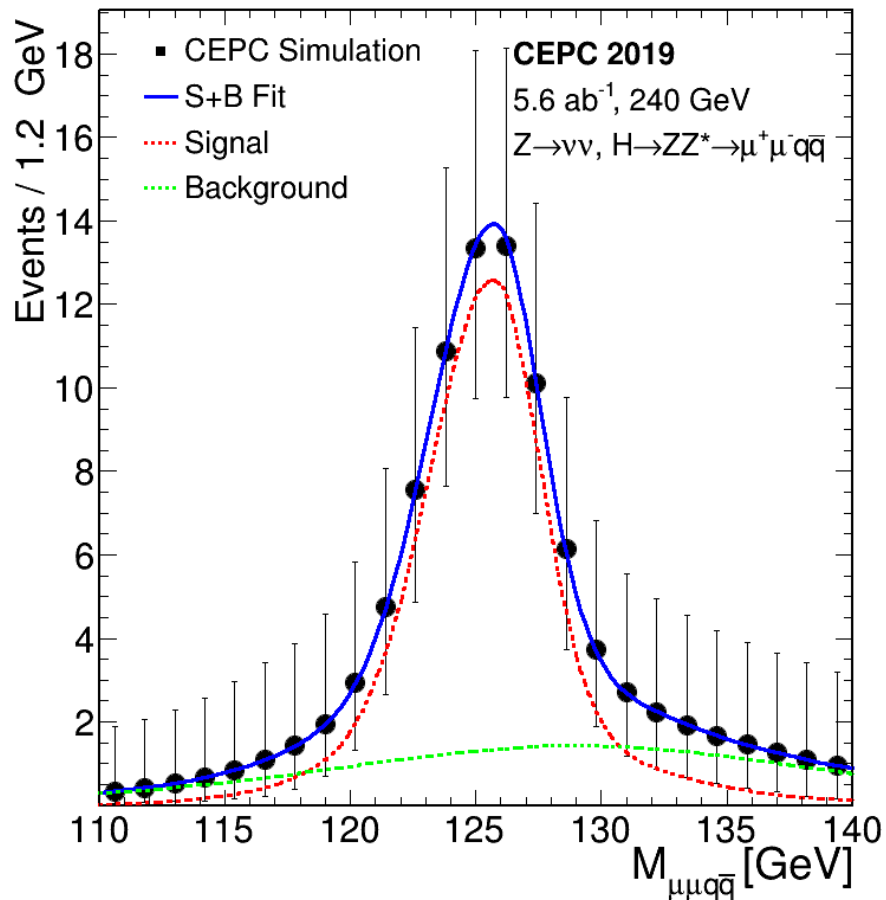
$$\frac{\Delta (\sigma (ZH) * BR(H \rightarrow ZZ *))}{\sigma (ZH) * BR(H \rightarrow ZZ *)} = 58.16 \%$$



Fitting results ($\nu\nu HZZ$ ($\mu\mu jj$))

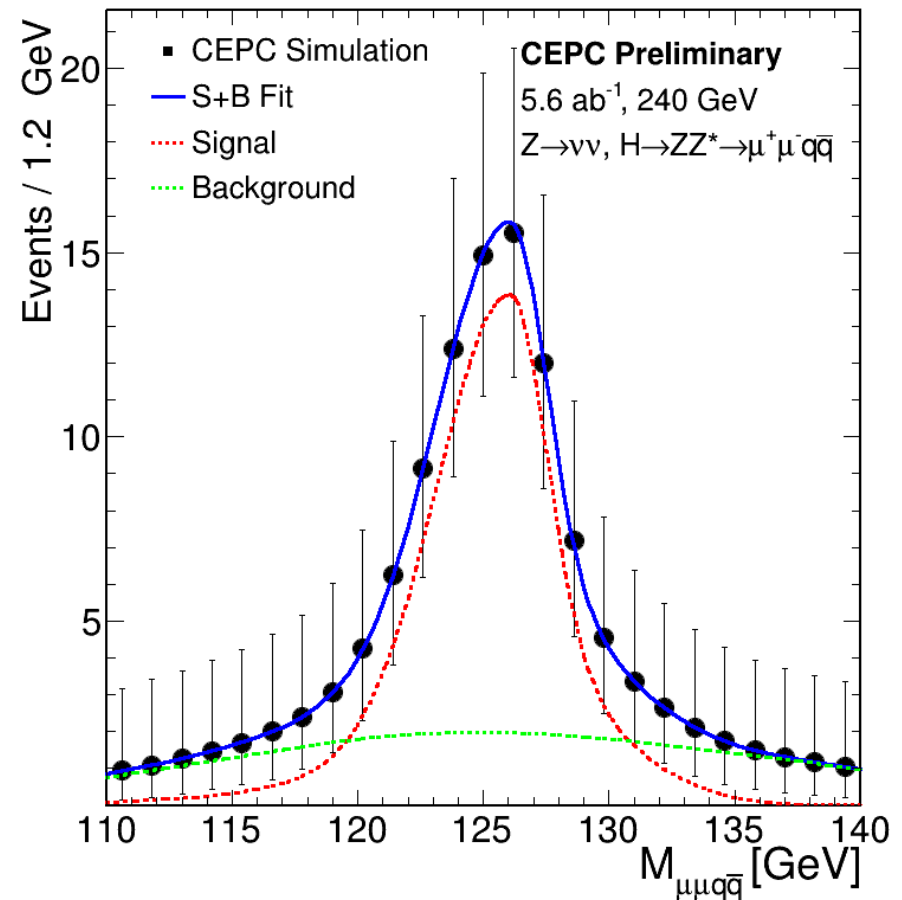
➤ Merely cut-based

$$\frac{\Delta(\sigma(ZH) * BR(H \rightarrow ZZ^*))}{\sigma(ZH) * BR(H \rightarrow ZZ^*)} = 13.45\%$$



➤ BDT

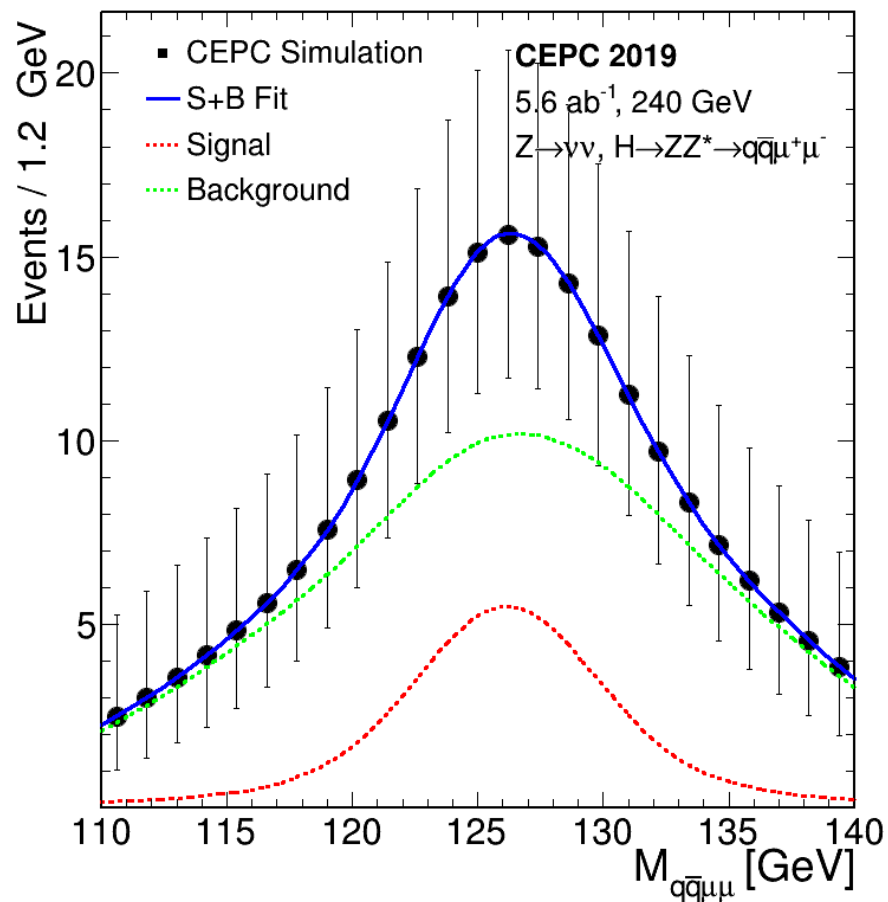
$$\frac{\Delta(\sigma(ZH) * BR(H \rightarrow ZZ^*))}{\sigma(ZH) * BR(H \rightarrow ZZ^*)} = 13.06\%$$



Fitting results ($\nu\nu HZZ$ ($jj\mu\mu$))

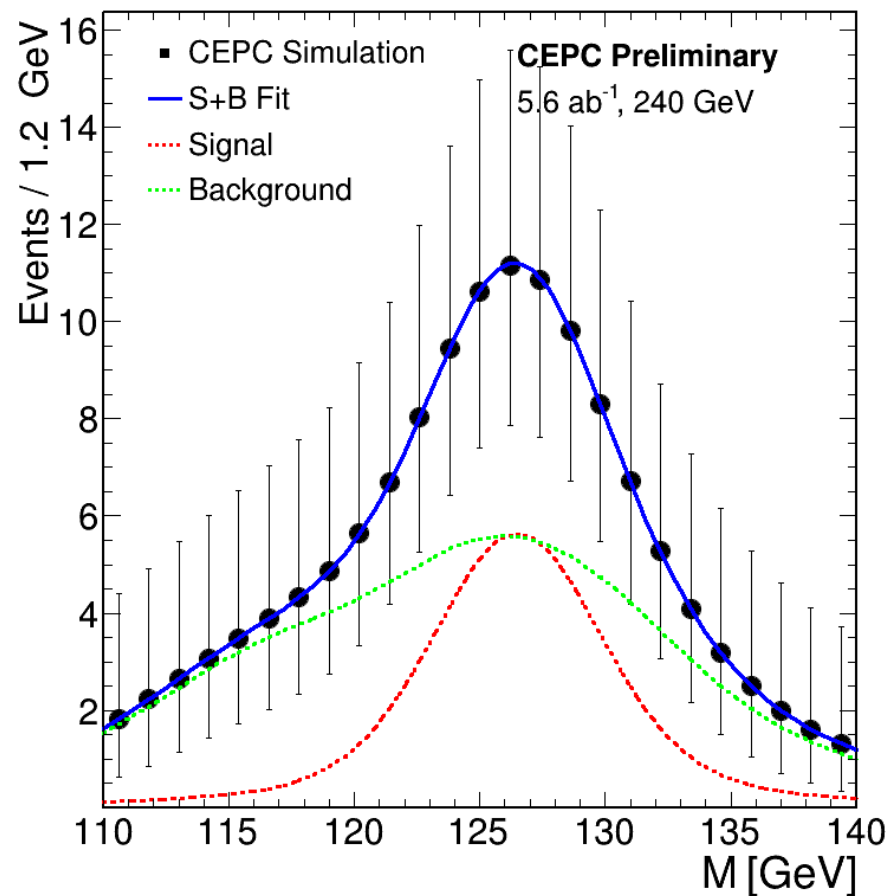
➤ Merely cut-based

$$\frac{\Delta(\sigma(ZH) * BR(H \rightarrow ZZ^*))}{\sigma(ZH) * BR(H \rightarrow ZZ^*)} = 27.83\%$$



➤ BDT

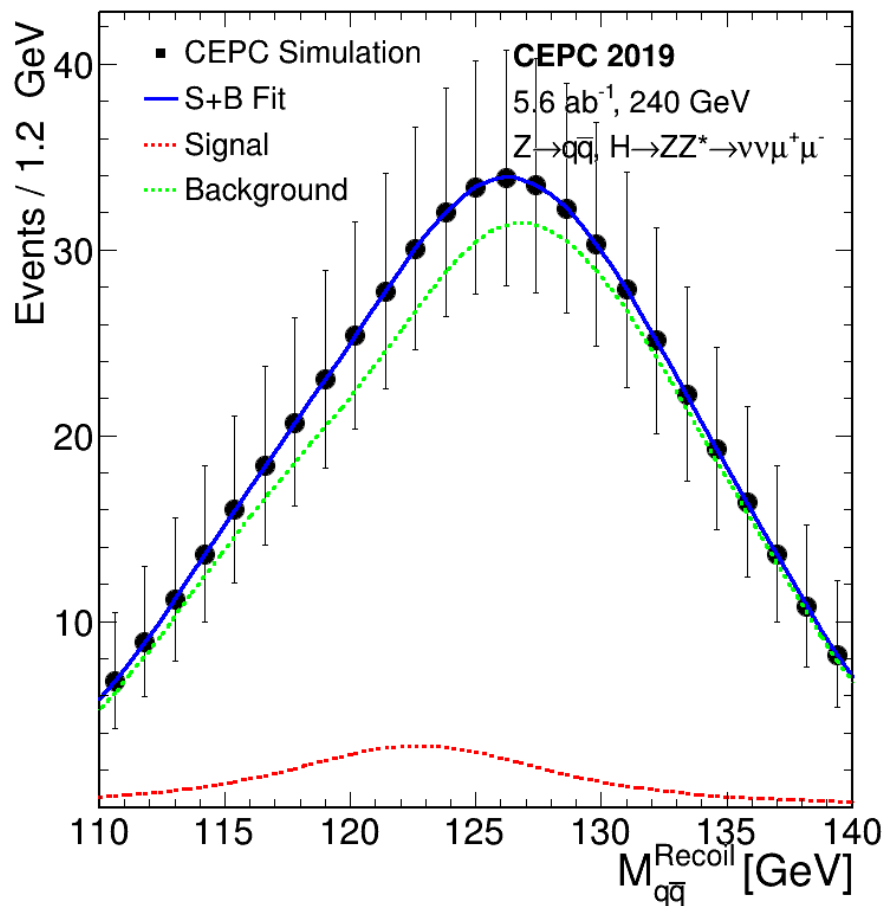
$$\frac{\Delta(\sigma(ZH) * BR(H \rightarrow ZZ^*))}{\sigma(ZH) * BR(H \rightarrow ZZ^*)} = 23.61\%$$



Fitting results (qqHZZ (ννμμ))

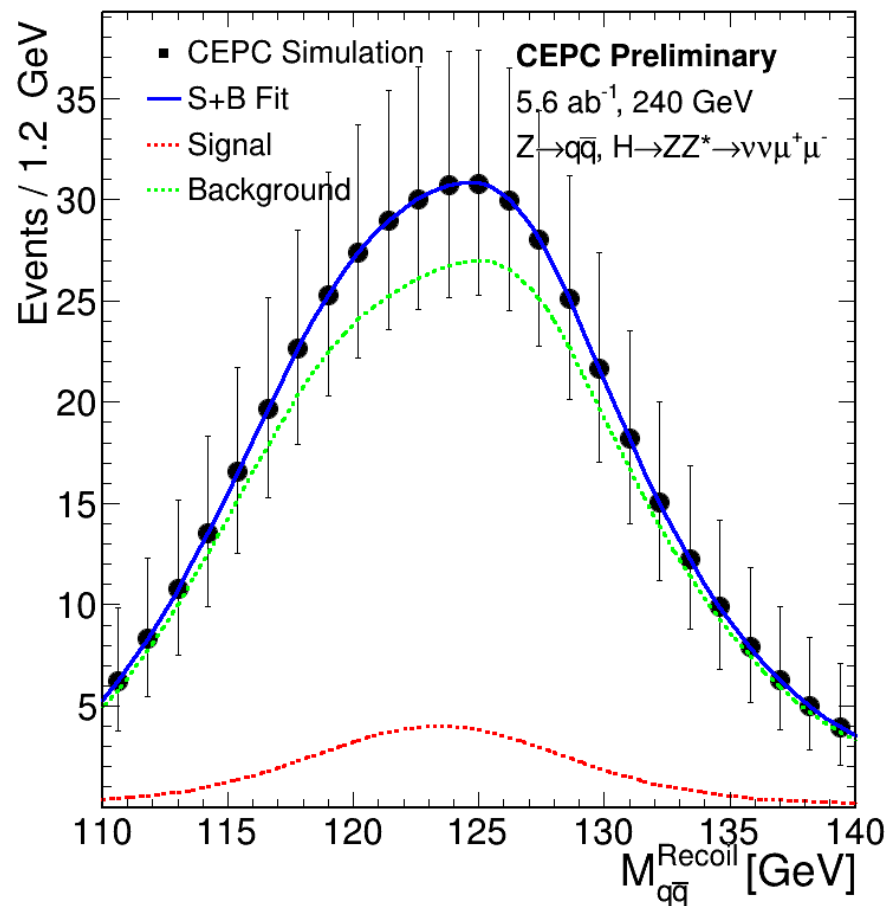
➤ Merely cut-based

$$\frac{\Delta(\sigma(ZH) * BR(H \rightarrow ZZ^*))}{\sigma(ZH) * BR(H \rightarrow ZZ^*)} = 54.26\%$$



➤ BDT

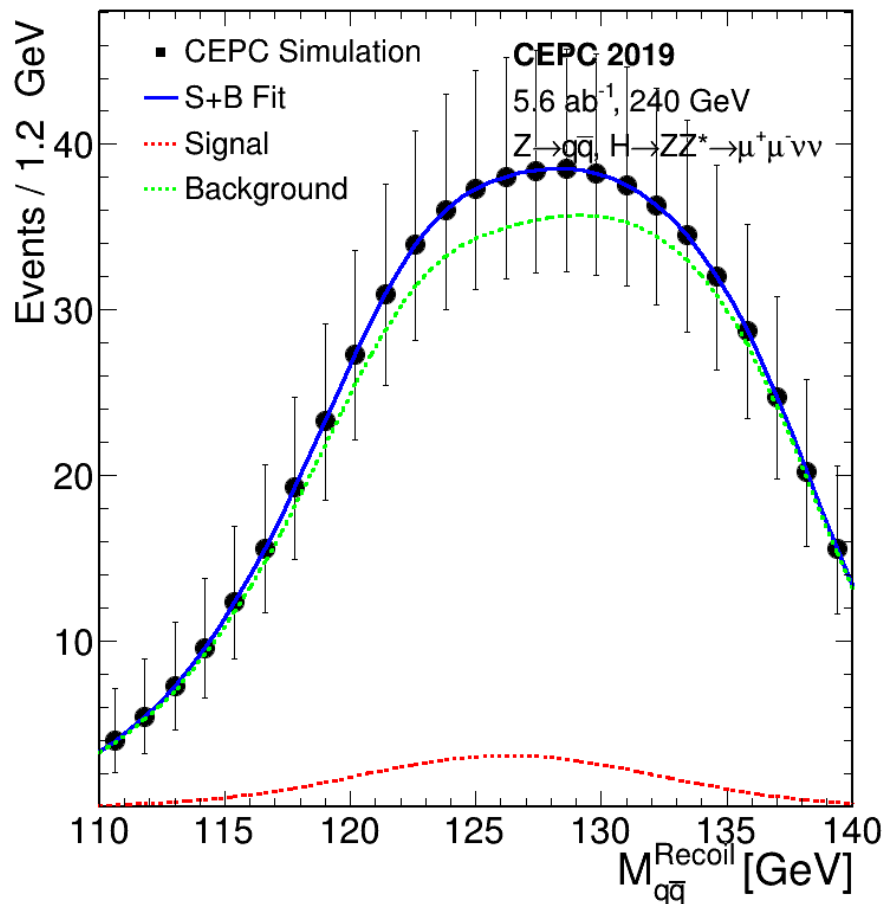
$$\frac{\Delta(\sigma(ZH) * BR(H \rightarrow ZZ^*))}{\sigma(ZH) * BR(H \rightarrow ZZ^*)} = 45.15\%$$



Fitting results (qqHZZ ($\mu\mu\nu\nu$))

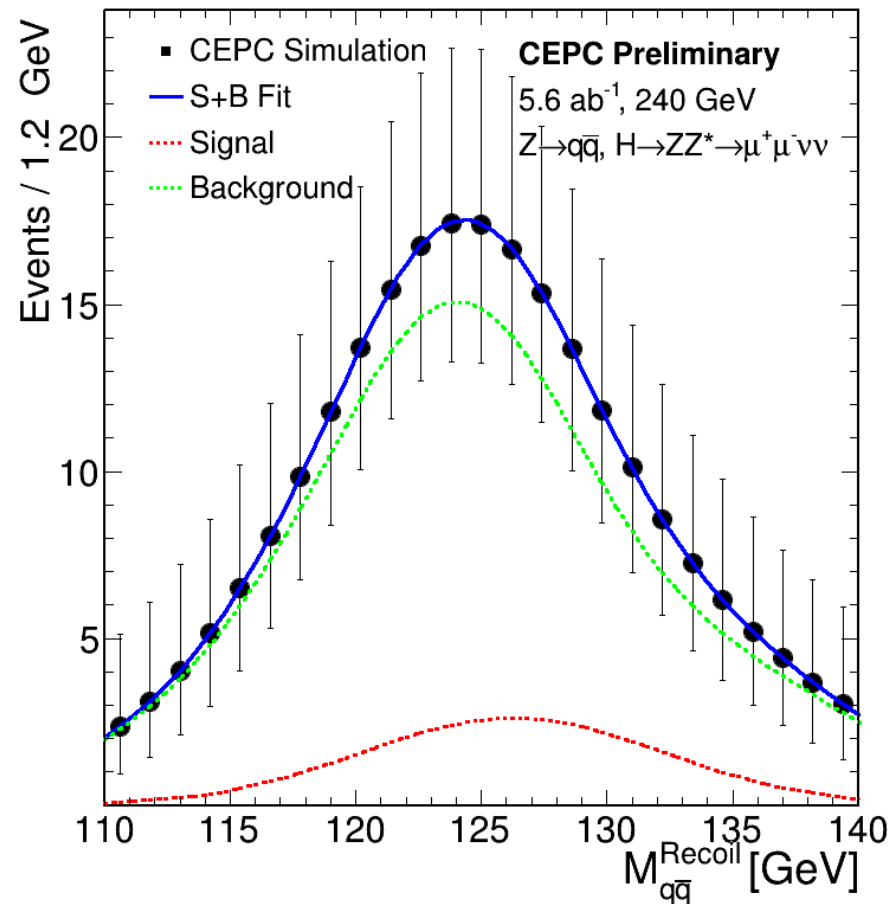
➤ Merely cut-based

$$\frac{\Delta(\sigma(ZH) * BR(H \rightarrow ZZ^*))}{\sigma(ZH) * BR(H \rightarrow ZZ^*)} = 63.93\%$$



➤ BDT

$$\frac{\Delta(\sigma(ZH) * BR(H \rightarrow ZZ^*))}{\sigma(ZH) * BR(H \rightarrow ZZ^*)} = 46.08\%$$



Fitting results

➤ Comparisons

Channel	BDT (previous)	Cut (BDT optimized)	Merely cut-based	BDT
$\mu\mu H\nu\nu jj$	15.10	16.89	18.15	15.80
$\mu\mu H jj\nu\nu$	56.76	71.62	65.25	58.16
$\nu\nu H\mu\mu jj$	13.45	13.22	13.45	13.06
$\nu\nu H jj\mu\mu$			27.83	23.61
$qq H\nu\nu\mu\mu$	50.89	54.19	54.26	45.15
$qq H\mu\mu\nu\nu$	45.60	42.74	63.93	46.08
Combined	9.49	9.85	9.68	9.48

Status

- **Finished six channels' BDT study (including fitting)**
- **CEPC memo v1.0 released**

Next to do

- **To be decided**