



中国科学院高能物理研究所  
*Institute of High Energy Physics*  
*Chinese Academy of Sciences*



# Measurements of decay branching fractions of the Higgs boson to $s\bar{s}$ at the CEPC

Hss research groups

# Outline

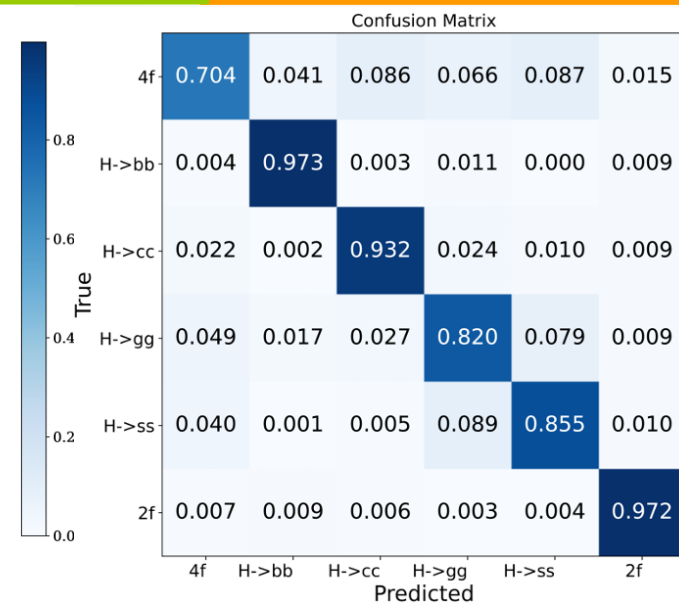
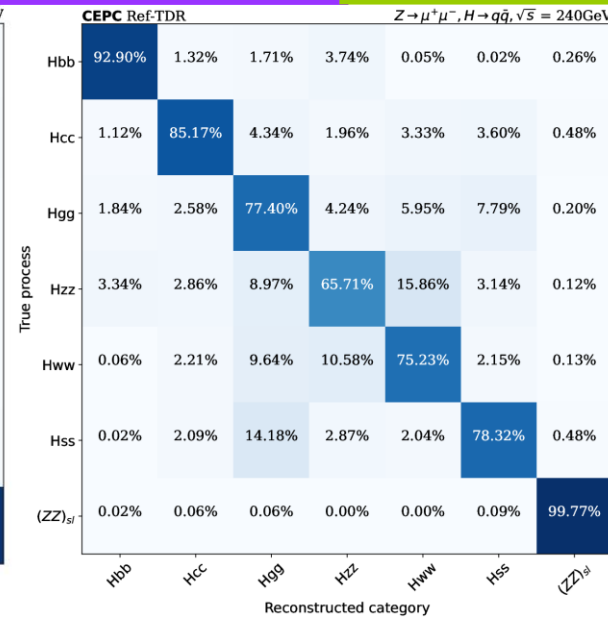
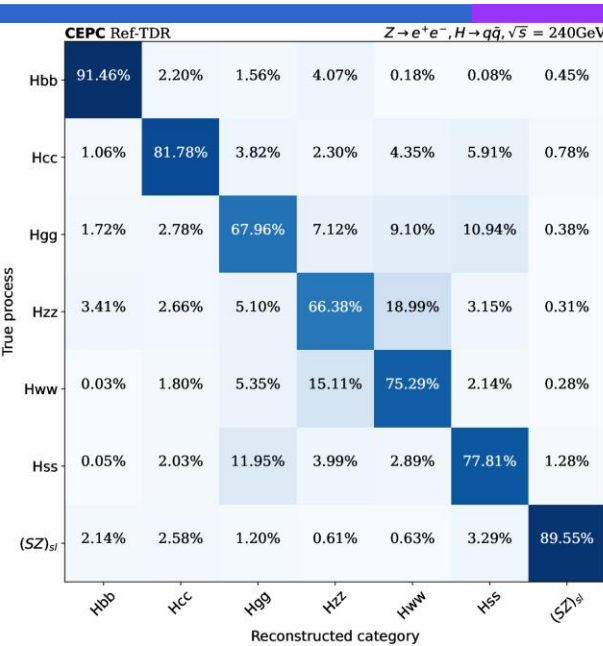


- ❖ Sample and training status of eeH/mumuH/vvH channel
- ❖ Measurements strategy
- ❖ Results of single channel
- ❖ Combined results of 3 channels
- ❖ Summary of Hss measurement

# Simulation samples

- Samples for  $eeH$ : full sim (Whizard 1.95 and Pythia6), 120k for each category
  - Signal:  $H \rightarrow b\bar{b}$ ,  $H \rightarrow c\bar{c}$ ,  $H \rightarrow gg$ ,  $H \rightarrow ZZ^*$ ,  $H \rightarrow WW^*$ ,  $H \rightarrow s\bar{s}$
  - Background:  $(SZ)_{sl}$
  - Apply Particle Transformer at event level using particles info
- Samples for  $\mu\mu H$ : full sim (Whizard 1.95 and Pythia6), 300k for each category
  - Signal:  $H \rightarrow b\bar{b}$ ,  $H \rightarrow c\bar{c}$ ,  $H \rightarrow gg$ ,  $H \rightarrow ZZ^*$ ,  $H \rightarrow WW^*$ ,  $H \rightarrow s\bar{s}$
  - Background:  $(ZZ)_{sl}$
  - Apply Particle Transformer at event level using particles info
- Samples for  $\nu\nu H$ : fast sim, 10M for each category [arxiv.org/pdf/2512.21558](https://arxiv.org/pdf/2512.21558)
  - Signal:  $H \rightarrow b\bar{b}$ ,  $H \rightarrow c\bar{c}$ ,  $H \rightarrow gg$ ,  $H \rightarrow s\bar{s}$
  - Background:  $HZZ$ ,  $2fbkg$ ,  $4fbkg$
  - Jet-tagging using three networks and then combined by XGB
  - Full sim (signal only) results ongoing

# Model Performance



## The migration matrix eeH channel

- Reconstructed category refers to one with maximum score
- Average accuracy: **78.6%**

## The migration matrix $\mu\mu$ H channel

- Reconstructed category refers to one with maximum score
- Average accuracy: **82.1%**

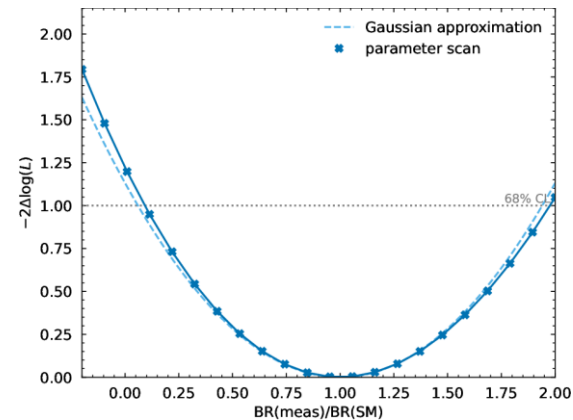
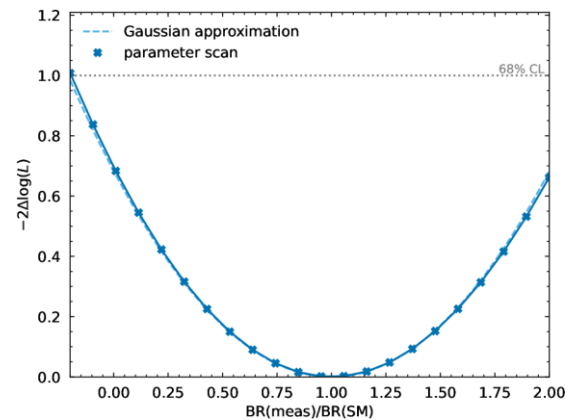
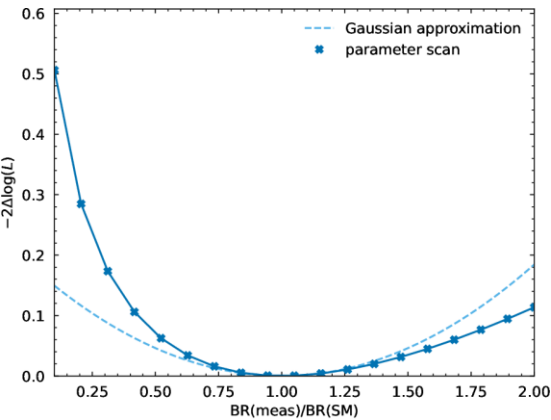
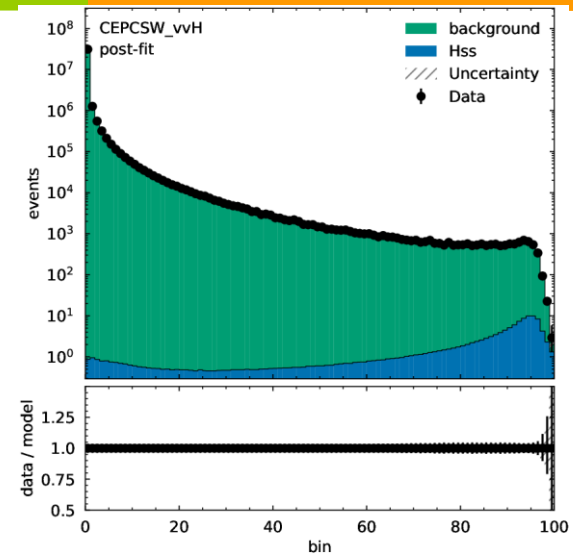
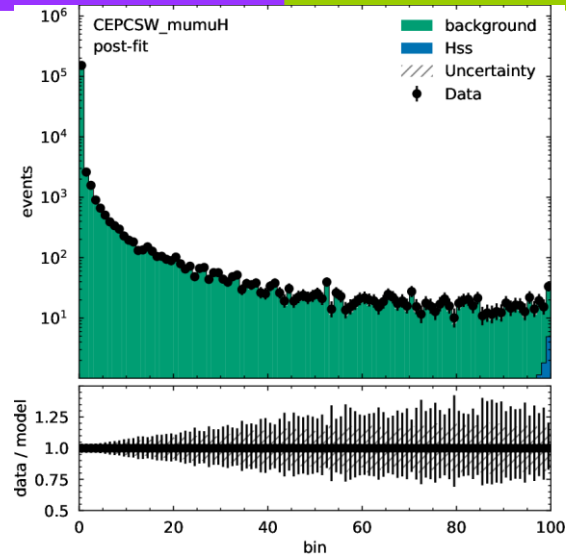
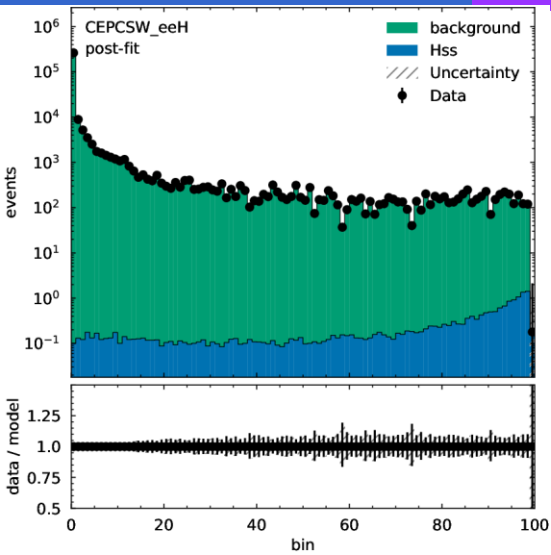
## The migration matrix $\nu\nu$ H channel

- Reconstructed category refers to one with maximum score
- Average accuracy: **87.6%**

# Fitting strategy

- ❖ Use Hist PDF to perform a maximum  $\mu$ S+B likelihood fit
- ❖ Variable: Hss score of the model's outputs
- ❖ Data: MC simulation of all scaled processes according to lumi ( $20\text{ab}^{-1}$ )
- ❖ Signal shape: Hss score of scaled Hss MC simulation
- ❖ Background shape: Hss score of other scaled remaining MC simulation

# Single channel fitting results



eeH channel

$$\text{BR(meas)/BR(SM)} =$$

$$2026/6/1 \quad 1.00 \pm 2.33$$

$$\text{Significance} \approx 0.43 \sigma$$

$\mu\mu$ H channel

$$\text{BR(meas)/BR(SM)}$$

$$= 1.00 \pm 1.21$$

$$\text{Significance} = 0.83 \sigma$$

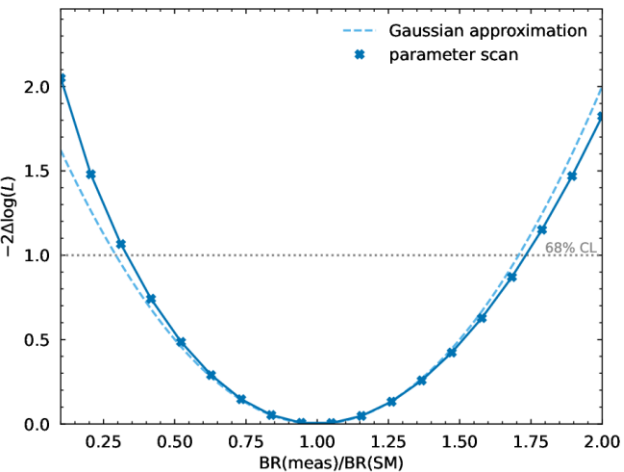
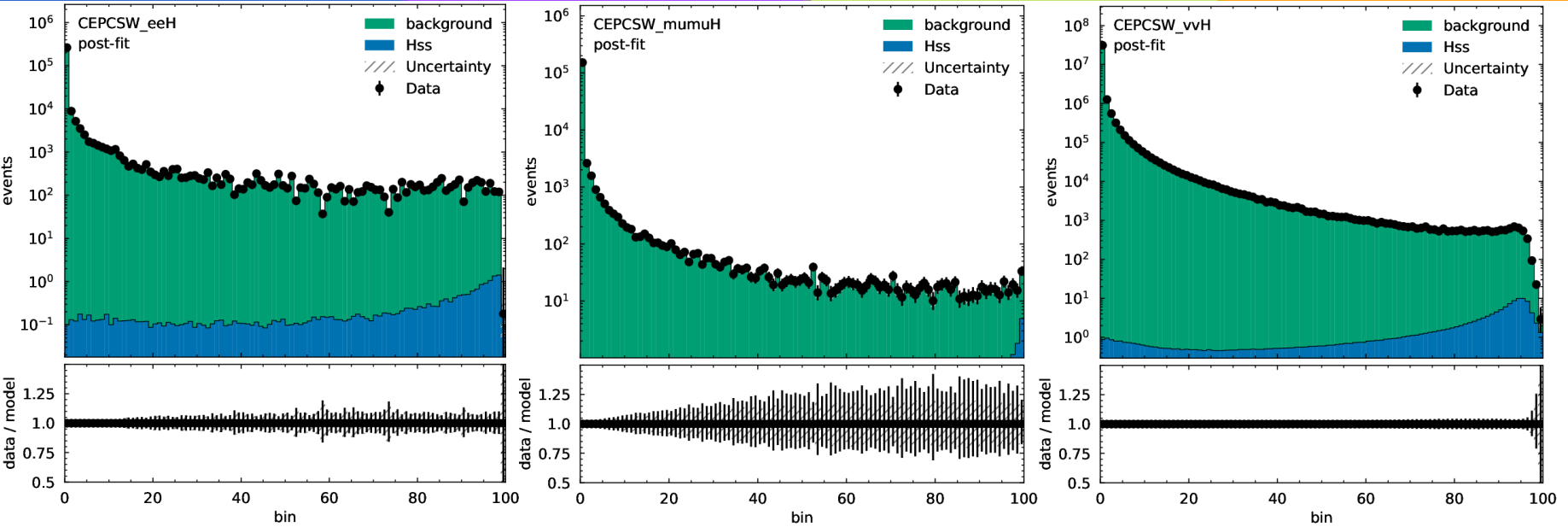
vvH channel

$$\text{BR(meas)/BR(SM)}$$

$$= 1.00 \pm 0.94$$

$$\text{Significance} = 1.11 \sigma$$

# Combined fitting results



Combined eeH/ $\mu\mu$ H/ $\nu\nu$ H channel  
 $BR(\text{meas})/BR(\text{SM}) = 1.00 \pm 0.71$   
 Significance  $\approx 1.41 \sigma$

# Summary

❖ Results of the measured branching fraction of Higgs to  $s\bar{s}$  of combined  $eeH/\mu\mu H/vvH$  channel under luminosity of  $20\text{ab}^{-1}$  and  $\sqrt{s} = 240\text{GeV}$  at CEPC:

- $\text{BR}(\text{meas})/\text{BR}(\text{SM}) = 1.00 \pm 0.71(\text{stat.})$

$$\text{BR}(\text{SM}) = 2.119 \times 10^{-4}$$

[arxiv.org/pdf/2510.24658](https://arxiv.org/pdf/2510.24658)

- Significance  $\approx 1.41\sigma$

❖ To do:

- Update results with full sim  $vvH$  channel
- Optimize models
- Consider systematic uncertainties