

# **Detector Performance and Physics Potential at CEPC** Hao Liang, Manqi Ruan, Xiaoyan Shen (Institute of High Energy Physics) On behalf of the CEPC study group



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## Introduction

The Higgs boson was discovered at LHC in 2012. It is natural to study the Higgs properties as precisely as possible since its importance in particle physics. The precision Higgs and electroweak measurements may also allows us to access new physics indirectly and shed light in unanswered fundamental questions, e.g hierarchy problem. Chinese high energy community proposed the Circular Electron Position Collider, CEPC, as a Z and Higgs boson factory to meet this requirement.<sup>[1]</sup>

## **Circular Electron Position Collider**



## **Detector Performance**

## Key object performance:



► Why is a lepton collider?





- Precisely defined initial state of collision
- Inclusively reconstruction of Higgs (model independent measurement of Higgs exotic decay and coupling to Z)
- Very clean collision environment Well understood backgrounds  $\triangleright$  High signal efficiency O(1)▷ Pile-up free



(a) Light lepton ID efficiency > 99.5% (b) Mass width for  $H \rightarrow \gamma \gamma$  : 1.6%



(c) Mass width for  $H \rightarrow gg$  : 3.8%

(d) *b* tagging performance

Fully established in simulation, reconstruction, and analysis chain. Dedicated reconstruction algorithm that reconstruct every physics objects

## **Physics Potential**





## Event display: CEPC (left) vs. LHC (right)

## Operation plan

Run	$\sqrt{s}$ [GeV]	Luminosity/IP [10 <sup>34</sup> cm <sup>-2</sup> s <sup>-1</sup> ]	IPs	Yield
Z pole	$\sim 91$	$\sim 12$	2	$10^{10} Z s$
Higgs	240 — 250	2	2	$10^{6}Hs \& 10^{8}Ws$

## **Detector Design**





- Percentage level precision measurements of Higgs coupling, significant improvements compared to HL-LHC, and capability of model-independent measurement.
- Improve electroweak measurements by 1 order of magnitude compared to current accuracy.

### Conclusion

- Numerous progresses made with detector optimization, dedicated reconstruction, and analysis studies.
- Accelerator and detector design at CEPC is feasible to achieve the physics goal.

Particle flow algorithm oriented detector with high granularity calorimeter:





### Precision of Higgs and electroweak better than ever before

### References

### [1] CEPC-SPPC study group et al. Cepc-sppc preliminary conceptual design report. 1. physics and detector. Technical report, IHEP-CEPC-DR-2015-01, 2015.