

Precision Higgs Physics at the CEPC

F. Irst,^{a,b,1} S. Econd,^c T. Hird^{a,2} and Fourth^{a,2}

^a*One University,
some-street, Country*

^b*Another University,
different-address, Country*

^c*A School for Advanced Studies,
some-location, Country*

E-mail: first@one.univ, second@asas.edu, third@one.univ,
fourth@one.univ

ABSTRACT: **Version 0.8**

The recent discovery of a Higgs boson with its mass around 125 GeV by the ATLAS and CMS Collaborations has provided the first insight into the scalar sector of the Standard Model and beyond. The particle will be the subject of extensive studies of the ongoing LHC program. A lepton collider Higgs factory has been proposed as a logical next step beyond the LHC to measure the properties and study potential new physics associated with the Higgs boson. The Circular Electron Positron Collider (CEPC) is one of such proposed Higgs factories. The CEPC is an e^+e^- circular collider with a center-of-mass energy of $\sim 240 - 250$ GeV in a tunnel of 50 km or longer in circumference proposed by China. It will be followed by a Super Proton-Proton Collider (SPPC) in the same tunnel with an energy 70 – 100 TeV. In this paper, we examine physics cases of and estimate precision achievable at the CEPC as a Higgs factory.

¹Corresponding author.

²Also at Some University.

Contents

1	Higgs Physics	2
1.1	Higgs boson theory	2
2	CEPC Accelerator and Detector Parameters	2
2.1	Accelerator parameters	2
2.2	Detector parameters	2
3	Simulation of Signal and Background Processes	2
3.1	Signal processes	2
3.2	Background processes	2
3.3	Object reconstruction and identification	2
4	Mass measurement cross-section measurement	2
5	Study of each individual channels	2
5.1	Study of $H \rightarrow bb, cc, gg$	2
5.2	Study of $H \rightarrow WW$	2
5.3	Study of $H \rightarrow ZZ$	2
5.4	Study of $H \rightarrow \tau\tau$	2
5.5	$H \rightarrow \gamma\gamma$	2
5.6	$H \rightarrow \mu\mu$	2
5.7	Invisible and exotic	2
6	Measurements of the total width, branching ratios	2
6.1	Description of statistical methods for BR and Mass width measurement	2
6.2	Results	2
6.3	Discussion	2
7	Coupling measurements	2
7.1	Description of fit methods	2
7.2	Fit with different number of parameters	2
7.3	Results	2
7.4	Interplifications	2
8	Conclusion and Discussion	2

1	1	Higgs Physics
2	1.1	Higgs boson theory
3	2	CEPC Accelerator and Detector Parameters
4	2.1	Accelerator parameters
5	2.2	Detector parameters
6	3	Simulation of Signal and Background Processes
7	3.1	Signal processes
8	3.2	Background processes
9	3.3	Object reconstruction and identification
10	4	Mass measurement cross-section measurement
11	5	Study of each individual channels
12	5.1	Study of $H \rightarrow b\bar{b}, c\bar{c}, g\bar{g}$
13	5.2	Study of $H \rightarrow W\bar{W}$
14	5.3	Study of $H \rightarrow Z\bar{Z}$
15	5.4	Study of $H \rightarrow \tau\bar{\tau}$
16	5.5	$H \rightarrow \gamma\gamma$
17	5.6	$H \rightarrow \mu\bar{\mu}$
18	5.7	Invisible and exotic
19	6	Measurements of the total width, branching ratios
20	6.1	Description of statistical methods for BR and Mass width measurement
21	6.2	Results
22	6.3	Discussion
23	7	Coupling measurements
24	7.1	Description of fit methods
25	7.2	Fit with different number of parameters
26	7.3	Results
27	7.4	Interplifications
28	8	Conclusion and Discussion
29		References