

# Precision Higgs Physics at the CEPC

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ABSTRACT: **Version 0.101**

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.

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## Contents

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

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# **1 Higgs Physics**

## **1.1 Higgs boson theory**

The historic discovery of a Higgs boson in 2012 by the ATLAS and CMS collaborations [[1](#), [2](#)] at the Large Hadron Collider (LHC) has opened a new era in particle physics.

## 5 **2 CEPC Accelerator and Detector Parameters**

### 6 **2.1 Accelerator parameters**



- 8 3 Simulation of Signal and Background Processes
- 9 3.1 Signal processes



### <sup>11</sup> 3.3 Object reconstruction and identification





<sup>13</sup> **5 Study of each individual channels**

<sup>14</sup> **5.1 Study of  $H \rightarrow b\bar{b}, c\bar{c}, g\bar{g}$**















<sup>21</sup> **6**    Measurements of the total width, branching ratios

<sup>22</sup> **6.1**   Description of statistical methods for BR and Mass width measurement





## <sup>25</sup> 7 Coupling measurements

### <sup>26</sup> 7.1 Description of fit methods











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