

# Study Plan to $e^+e^- \rightarrow \gamma h$ Process

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# Outline

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1. Motivation

2. Theoretical framework

3. Method

4. Simulation & Analysis Schedule

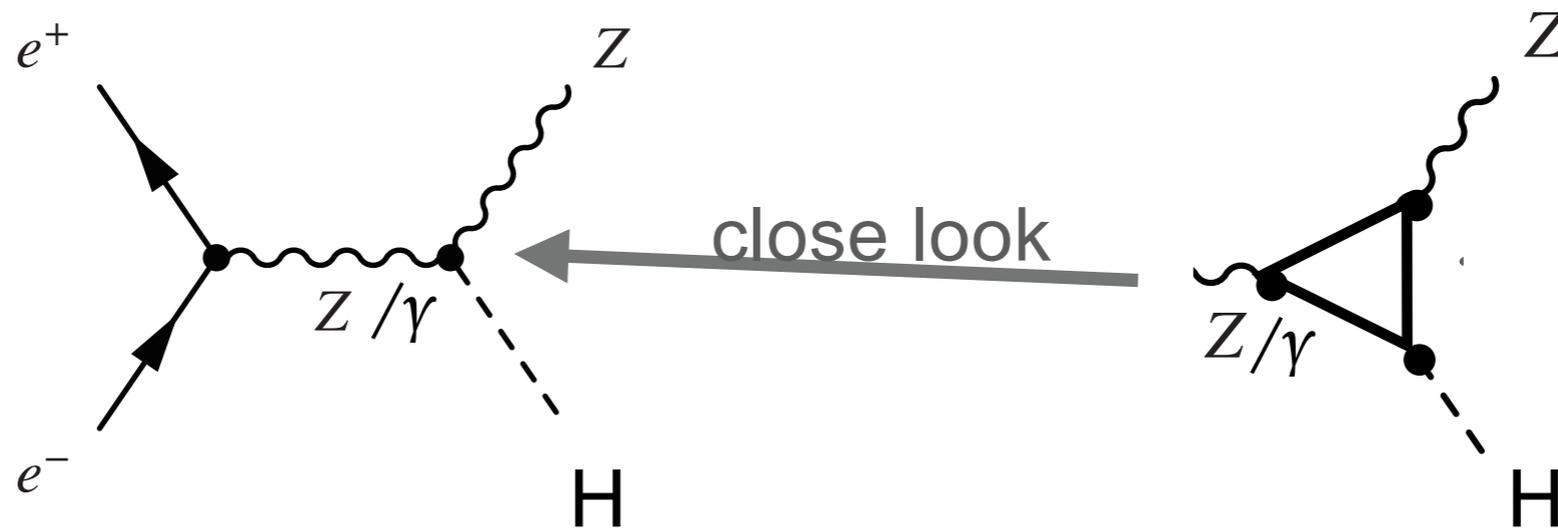
5. Tools

6. Practice

# 1. Motivation

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1. Find new physics via  $H\gamma\gamma$  and  $H\gamma Z$  couplings
2.  $H\gamma Z$  is needed for ZH/ZHH measurements

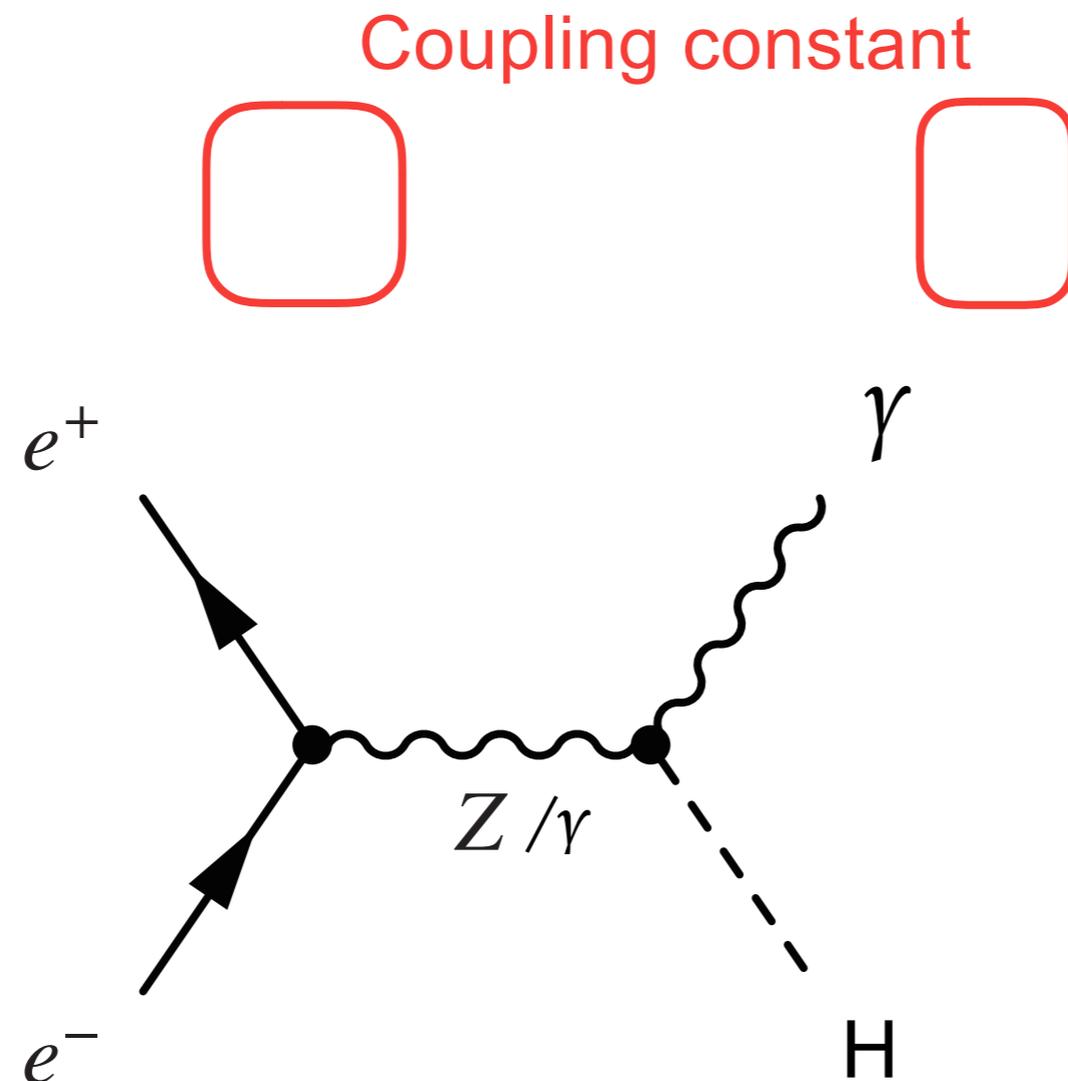


If we get different values of **coupling constants w.r.t. SM**,  
we get the key to new physics.

## 2. Theoretical framework

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effective Lagrangian for  $e^+e^- \rightarrow \gamma H$



- $c_{\gamma Z}$ : effective coupling between Higgs and  $\gamma Z$
- $c_{\gamma}$ : effective coupling between Higgs and  $\gamma\gamma$
- $\Lambda$ : effective new physics scale

## 2. Theoretical framework

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partial decay width:

( $M_H = 125 \text{ GeV}$ )

**arXiv:1101.0593**

SM predication

$$\Gamma_{\gamma Z}: 6.25 \times 10^{-3} \text{ MeV} \longrightarrow c_{\gamma Z} / \Lambda = 1.12 \times 10^{-1} / \text{TeV}$$

$$\Gamma_{\gamma\gamma}: 9.27 \times 10^{-3} \text{ MeV} \longrightarrow c_{\gamma} / \Lambda = 3.09 \times 10^{-2} / \text{TeV}$$

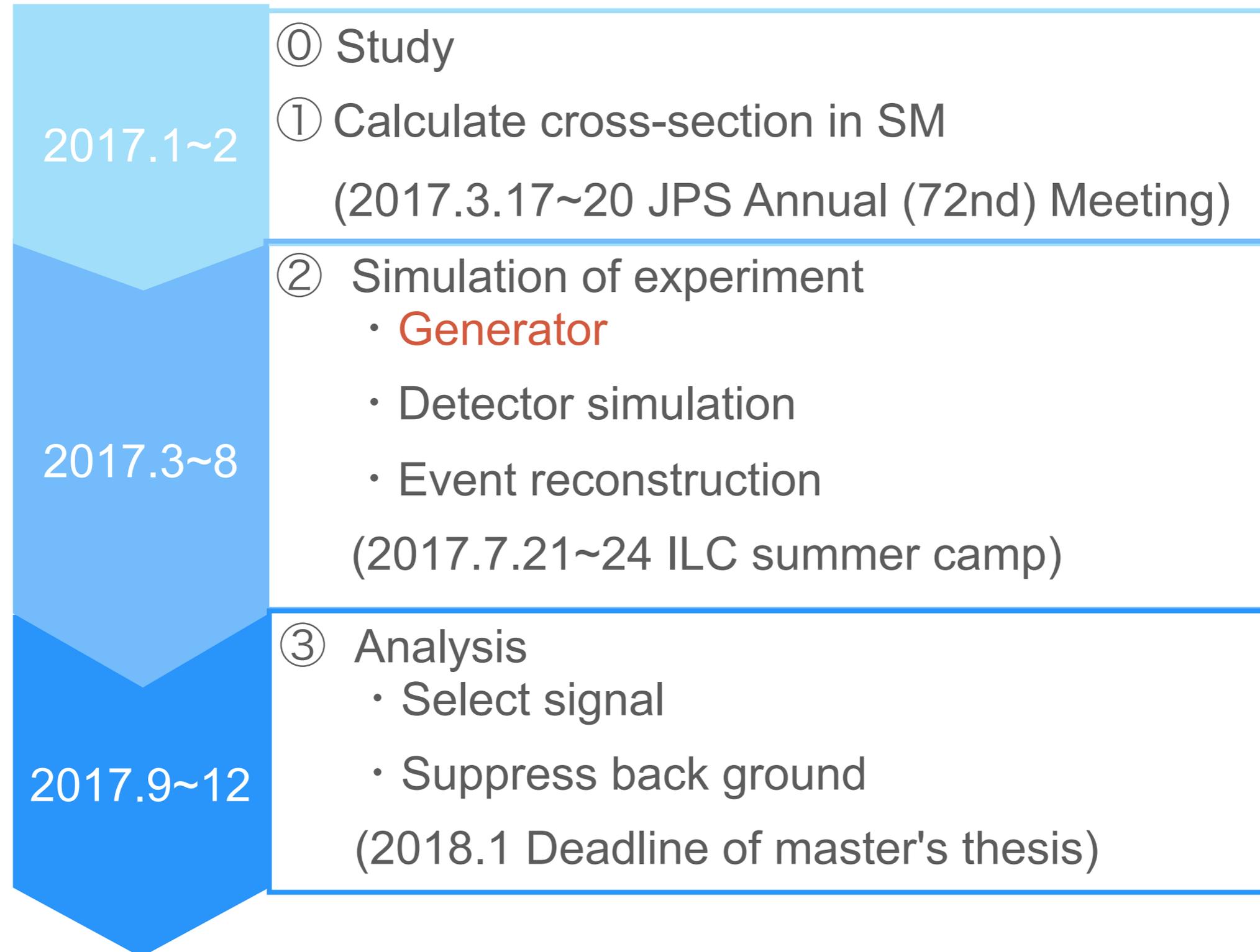
# 3.Method

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- Measure the cross sections of  $e^+e^- \rightarrow \gamma h$  for at least two different beam polarizations
- So that  $c_\gamma$  and  $c_{\gamma Z}$  can be determined separately
- $c_\gamma$  :  $H\gamma\gamma$  measurement in LHC
- Use recoil mass method to measure the cross sections of  $e^+e^- \rightarrow \gamma h$

# 4. Simulation & Analytics Schedule

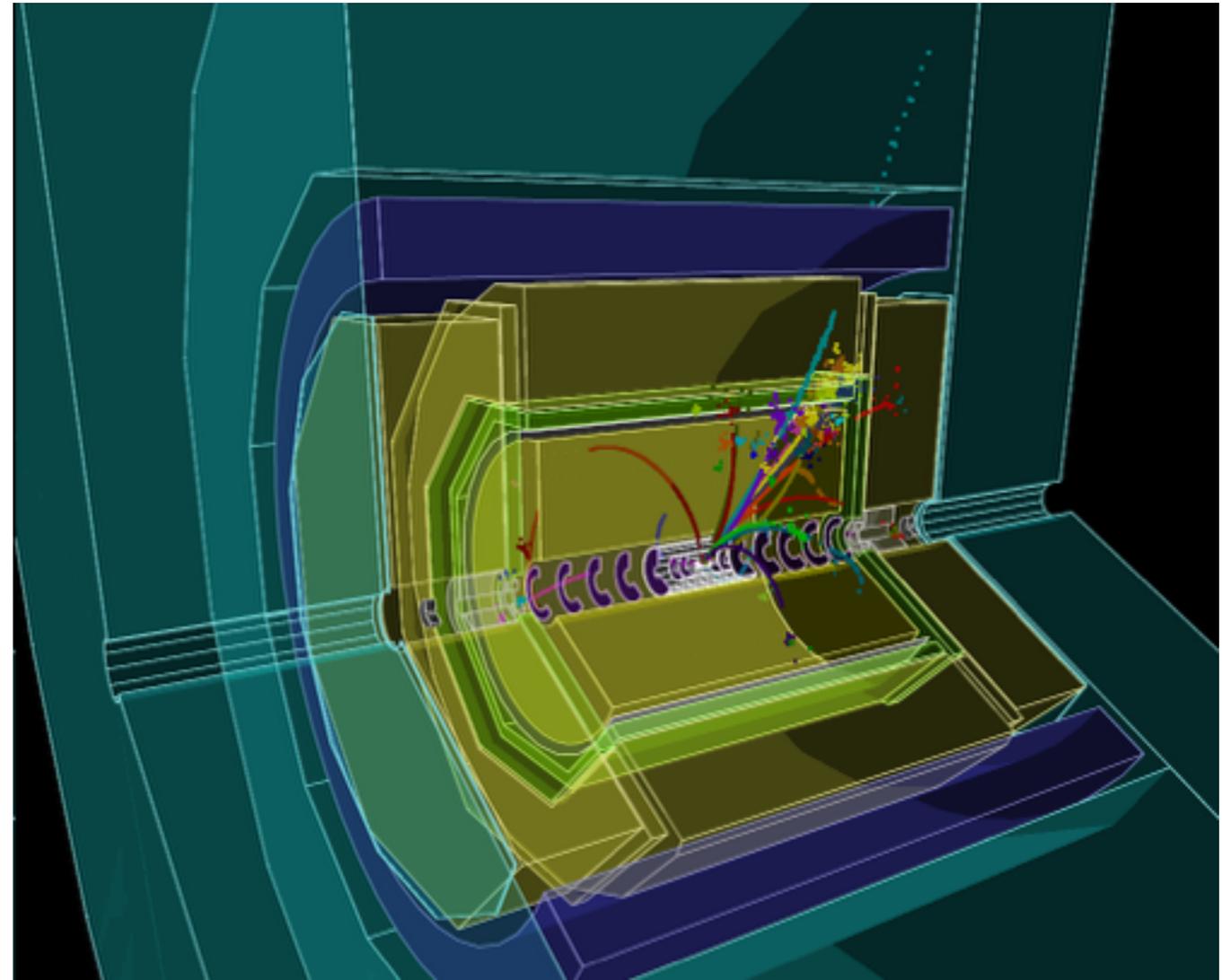
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# 5. Tools

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- signal generator :physsim
- Detector simulation : Mokka
- (Low level)Event reconstruction : MarlinReco, PandoraPFA
- High level Event reconstruction : LCFI+, Isolated photon finder, jet clustering
- back ground : TDR sample



# Practice

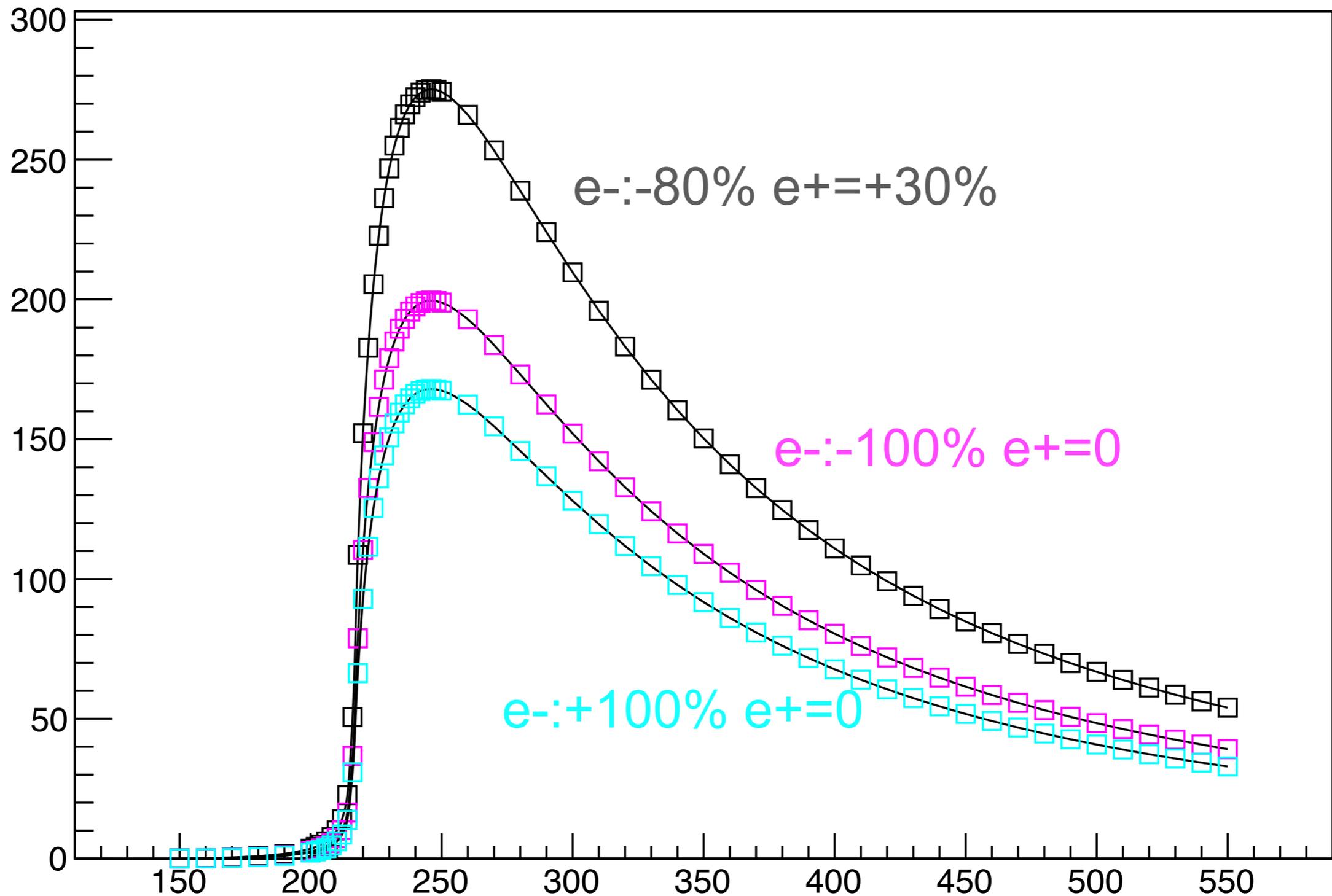
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- Practice using pyhssim(Zh process)
  - Study about physics and simulation
- ① make graph  $\sqrt{s}$  vs  $\sigma_{Zh}$   
-100%, +100%, -80%+30%
  - ② When  $e^-:-100%$ (left-handed),  $e^+=0$  , calculate  $\sigma$   
->calculate  $\sigma(e^-:+100%)$
  - ③ When  $e^-:+100%$ (right-handed),  $e^+=0$  , calculate  $\sigma$   
->  $e^-:+100%$ (right-handed),  $e^+=-100%$  , calculate  $\sigma$
  - ④  $(p_{e^-}, p_{e^+}) \rightarrow \sigma$
  - ⑤ When  $\int \mathcal{L}=500[\text{fb}^{-1}]$  & -100% or +100%, calculate number of event of Zh

# Practice

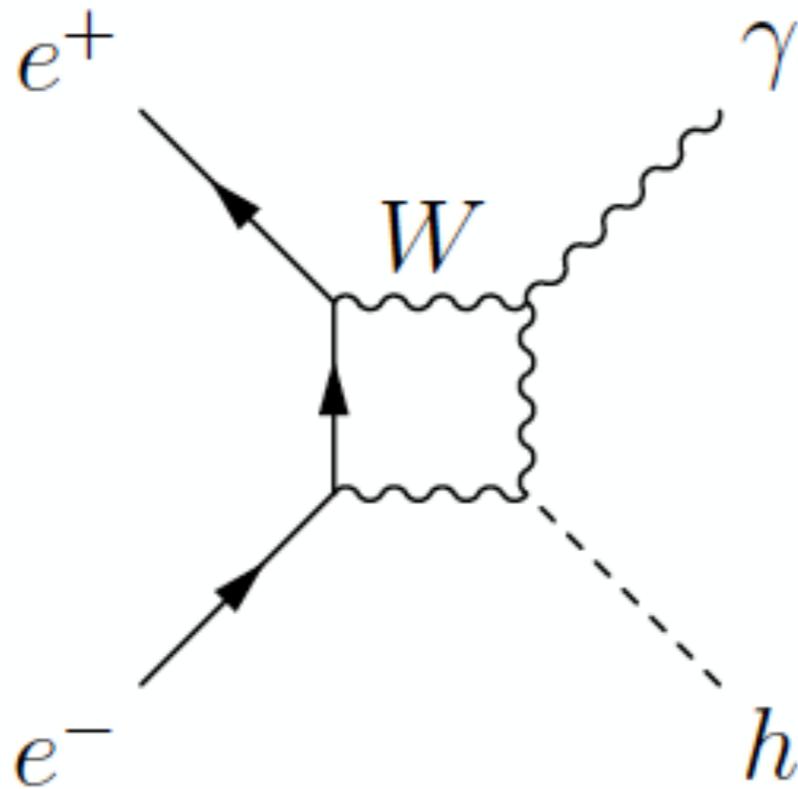
- ① make graph  $\sqrt{s}$  vs  $\sigma Z h$   
-100%, +100%, -80% +30%

Graph



# About Box diagram

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- This diagram is also exist
- We ignore this first, and if calculate of this diagram is finished, we include this.

*Thank you for listening*