Study Plan to e+e- -> γ h Process

Yumi Aoki(SOKENDAI)

Outline

1.Motivation

2. Theoretical framework

3.Method

4.Simulation & Analysis Schedule

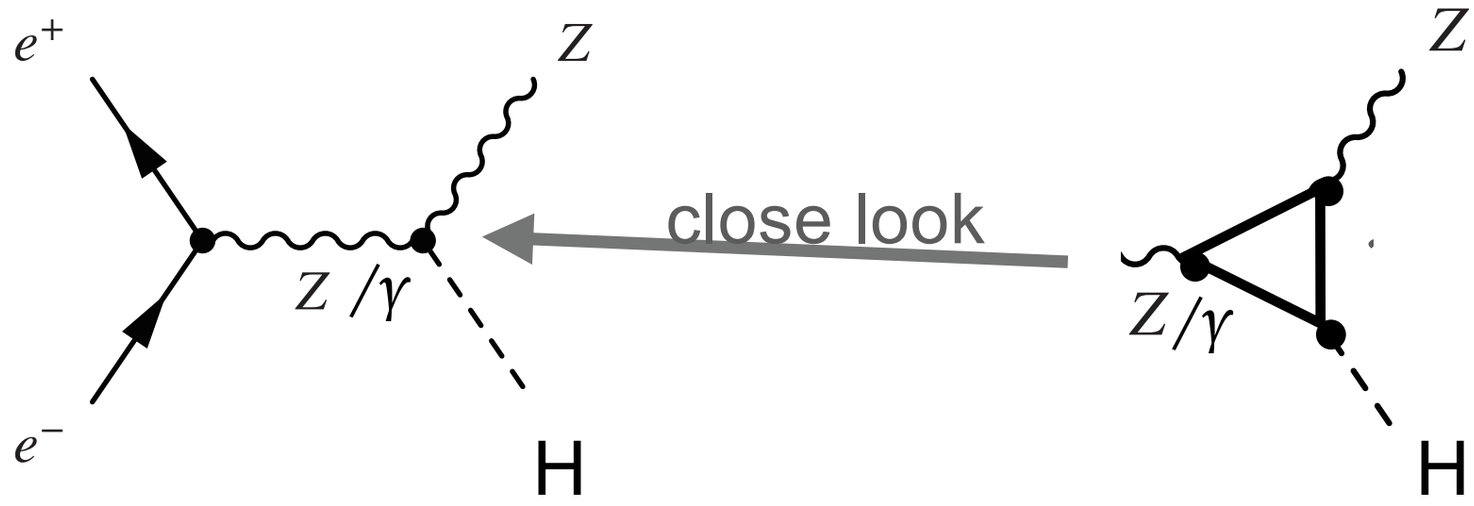
5.Tools

6.Practice

1.Motivation

1. Find new physics via Hγγ and HγZ couplings

2. HγZ is needed for ZH/ZHH measurements



If we get different values of coupling constants w.r.t. SM,

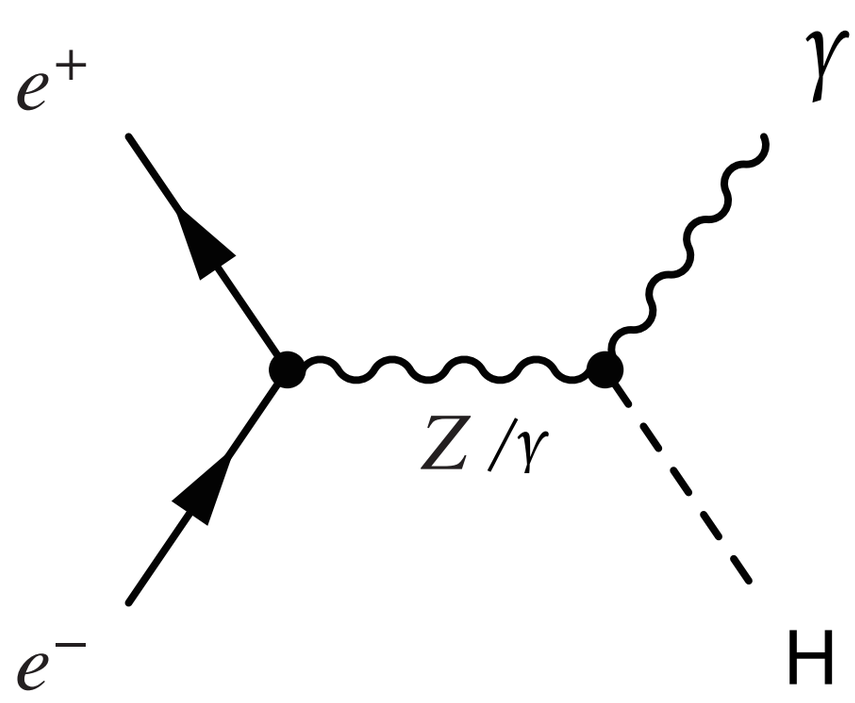
we get the key to new physics.

2. Theoretical framework

effective Lagrangian for e+e- —> γH

Coupling constant

$$L_{\gamma H} = \frac{c_{\gamma Z}}{4\Lambda} A_{\mu\nu} Z^{\mu\nu} H + \frac{c_{\gamma}}{4\Lambda} A_{\mu\nu} A^{\mu\nu} H$$



$c_{\gamma Z}$: effective coupling between Higgs and γZ
c_{γ} : effective coupling between Higgs and γγ
Λ : effective new physics scale

2. Theoretical framework

partial decay width:

$$\Gamma_{\gamma\gamma} = \frac{M_H^3}{64\pi}(\frac{c_\gamma}{\Lambda})^2$$

$$\Gamma_{\gamma Z} = \frac{M_H^3}{128\pi}(\frac{c_{\gamma Z}}{\Lambda})^2(1-\frac{M_Z^2}{M_H^2})^3$$

SM predication

$\Gamma_{\gamma Z}$: 6.25 x 10^{-3} MeV —> $c_{\gamma Z} / \Lambda$ = 1.26 x 10^{-2} / TeV

$\Gamma_{\gamma\gamma}$: 9.27 x 10^{-3} MeV —> c_γ / Λ = 9.54 x 10^{-4} / TeV

3.Method

- Measure the cross sections of e+e- ->γh for at least two different beam polarizations
- So that c_{γ} and $c_{\gamma Z}$ can be determined separately
- Use recoil mass method to measure the cross sections of e+e- ->γh

4.Simulation & Analytics Schedule

2017.1~4

⓪ Study

① Calculate cross-section in SM

(2017.3.17~20 JPS Annual (72nd) Meeting)

2017.5~6

② Simulation of experiment

- Generator
- Detector simulation
- Event reconstruction

(2017.7? ILC summer camp)

2017.7~12

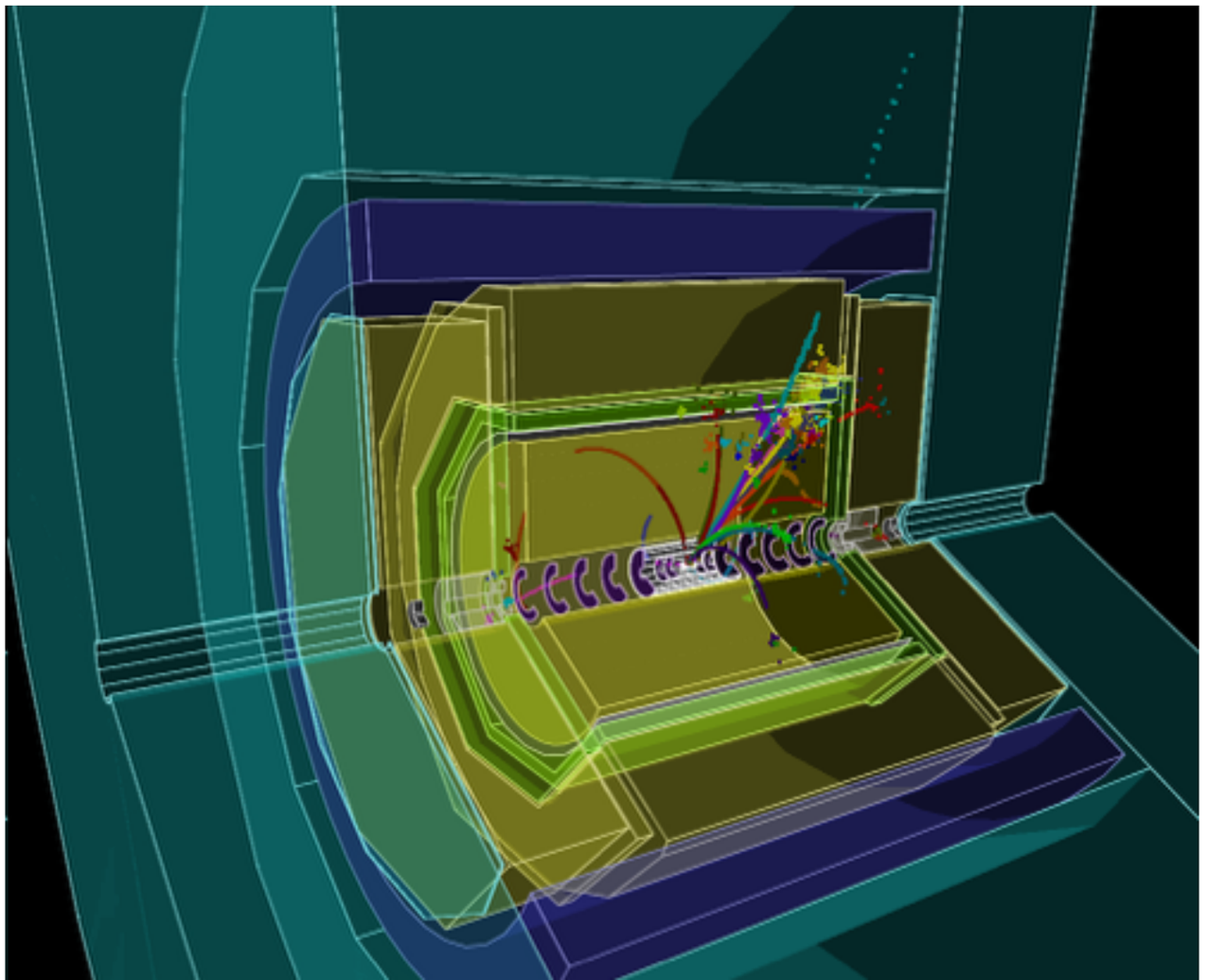
③ Analysis

- Select signal
- Suppress back ground

(2018.1 Deadline of master's thesis)

5.Tools

- 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

- Practice using physsim(Zh process)
- Study about physics and simulation

① make graph √s vs σZh ←Now
-100%,+100%,-80%+30%

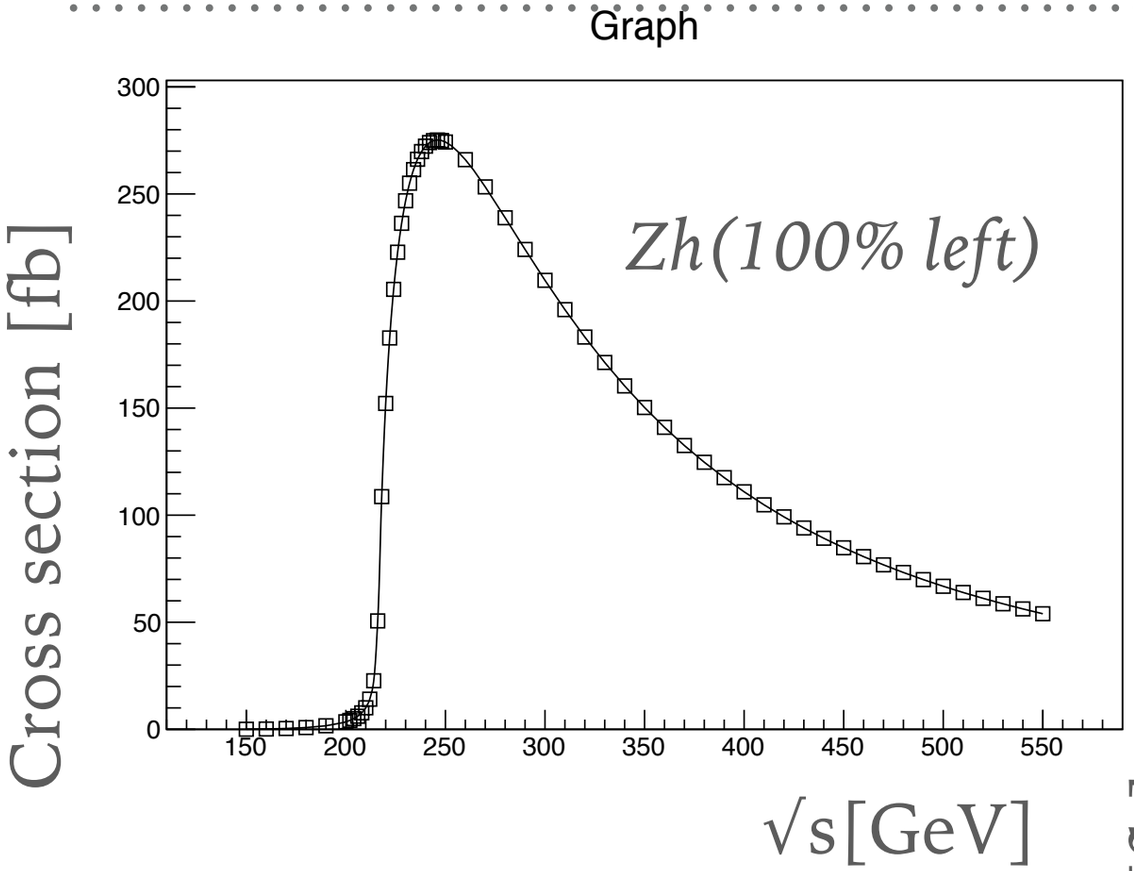
② When e-:-100%(left-handed), e+=0 , calculate σ
->calculate σ(e-:+100%)

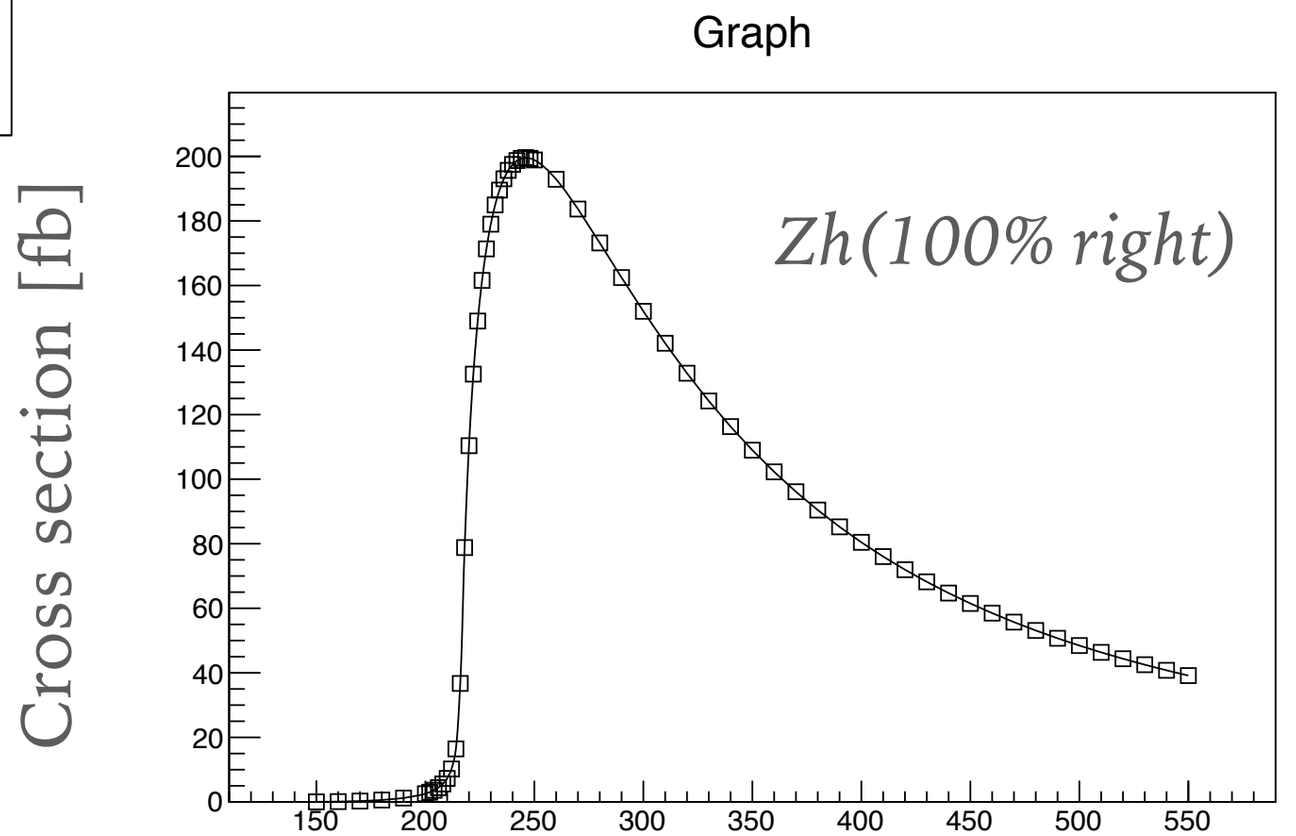
③ When e-:+100%(right-handed), e+=0 , calculate σ
-> e-:+100%(right-handed), e+=-100% , calculate σ

④ (pe-,pe+) -> σ

⑤ When $\int\mathcal{L}$=500[fb-1] & -100% or +100%, calculate number of event of Zh

6.Practice


Graph
Zh(100% left)
Cross section [fb]
√s[GeV]
0
50
100
150
200
250
300
150
200
250
300
350
400
450
500
550


Graph
Zh(100% right)
Cross section [fb]
√s[GeV]
0
20
40
60
80
100
120
140
160
180
200
150
200
250
300
350
400
450
500
550

Thank you for listening