# LHT status report on $e^+e^- \rightarrow e_H^+ e_H^-$ @1TeV

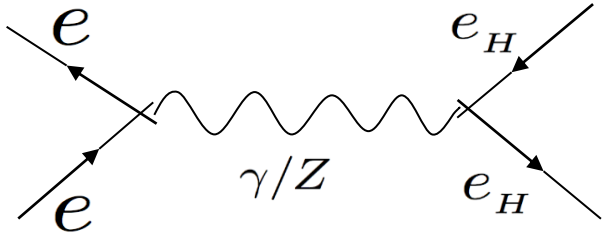
2010.12.17 optimization meeting

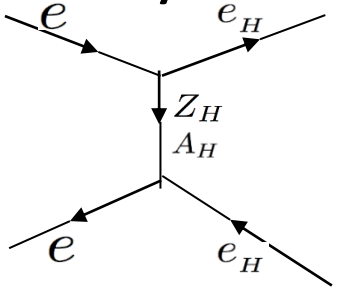
Tohoku Univ. Eriko Kato

# Previous report

## Aim of this study:

Evaluate ILC's sensitivity on κ by measuring the mass of $e_H$ .



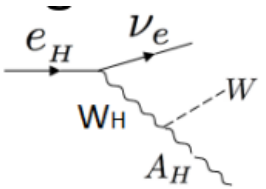




$m_{eH}=\sqrt{2}\kappa f=410GeV$

## Analysis mode

There are 3 ways $e_H$ can decay.

Focus on $e_He_H$ → $eZ_HeZ_H$

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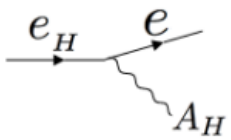


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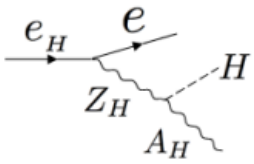


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# Todays topics

- Signal Electron selection
- Selection criteria
- Mass extraction of $e_H$

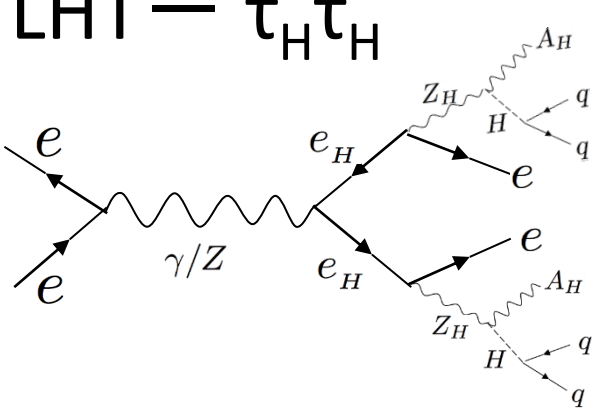
# $e_He_H \rightarrow eZ_HeZ_H$ analysis

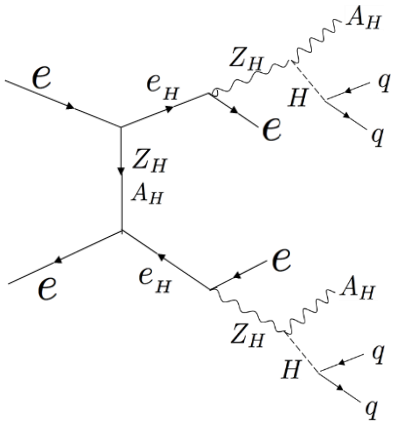
- analysis on $eZ_HeZ_H$
  - Cross section: 3.634 fb (pol. 0)
  - 2e + 2Higgs final state -> characteristic
- Background

  top — tt, ttZ,ttH

  WZ — enWZ, eeWW, eeZZ,WWZ,ZZZ,WWZZ

  LHT — $\tau_H\tau_H$

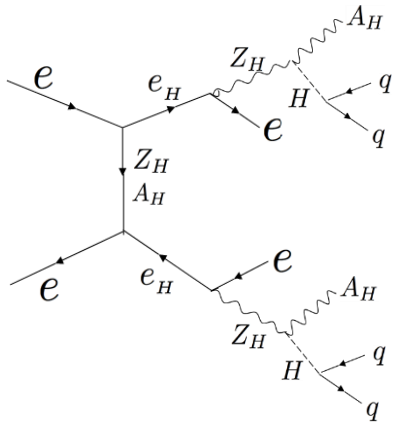


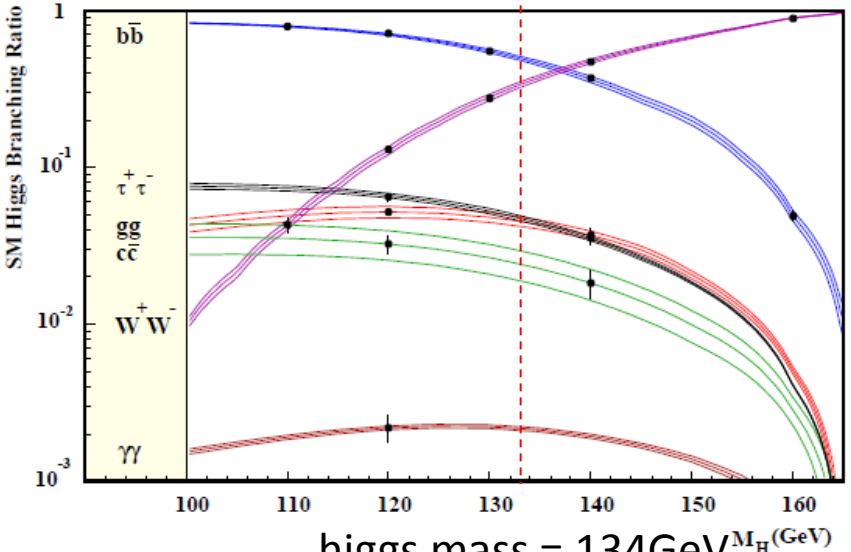
# Signal Electron selection

- $e_He_H \rightarrow eZ_HeZ_H$ analysis: 2e + 4jet
- save full hadronic & lose partial leptonic (electron emitting) events

⇒ optimize isolated electron selection




Higgs branching ratio




Pythia information

Br(h→bb) =42.35%

Br(h→WW)=39.57%

Br(h→ZZ) =5.50%

Br(h→ττ)= 5.21%

Leptonic decaying candidate

Br(h→gg) =4.49%

Br(h→cc)= 2.31%



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# Isolated electron selection

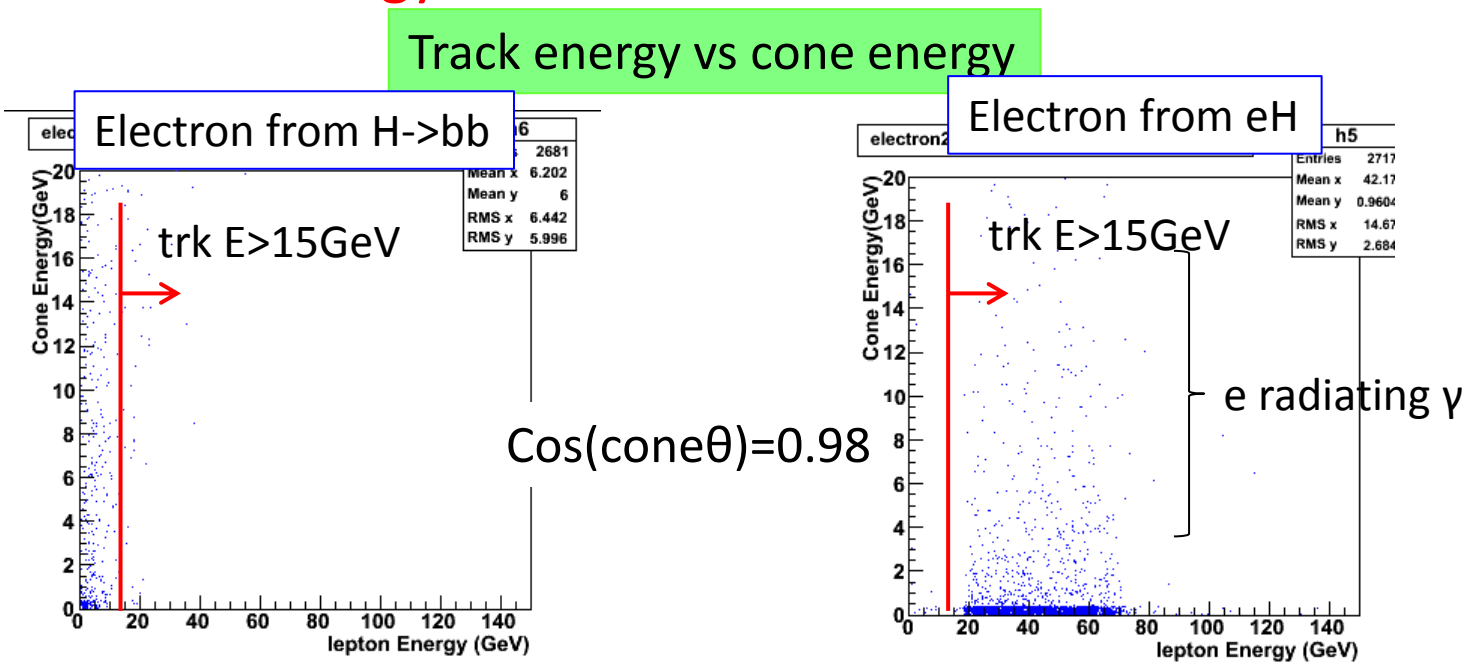
- Signal : 2e(isolated electron from $e_H$) + 4 jet

⇒ optimize using HH→bbbb (from $eZ_HeZ_H$)

Electron features:

- b-jets have large cone Energy
- some e from $e_H$ have large cone Energy due to radiating γ

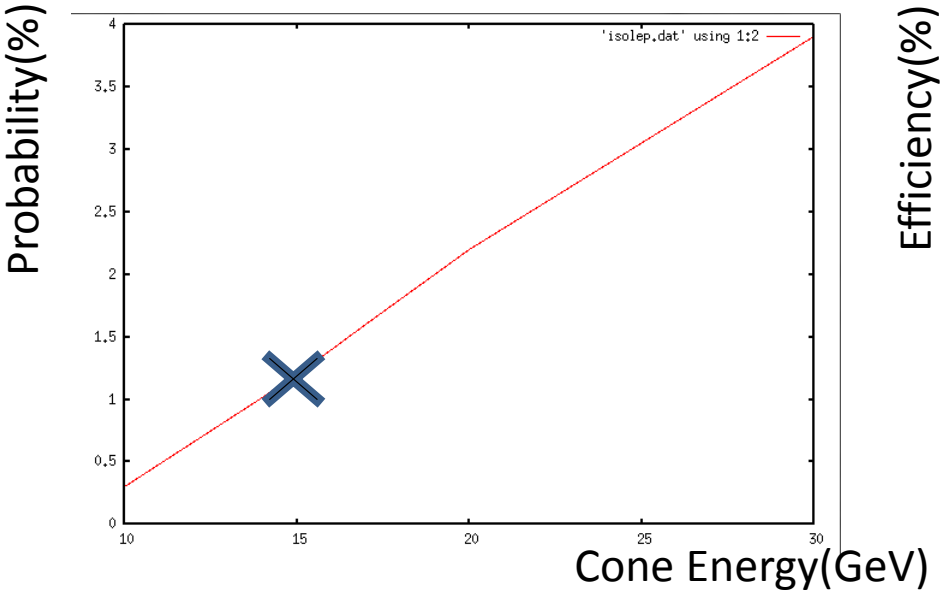
⇒optimize cone energy



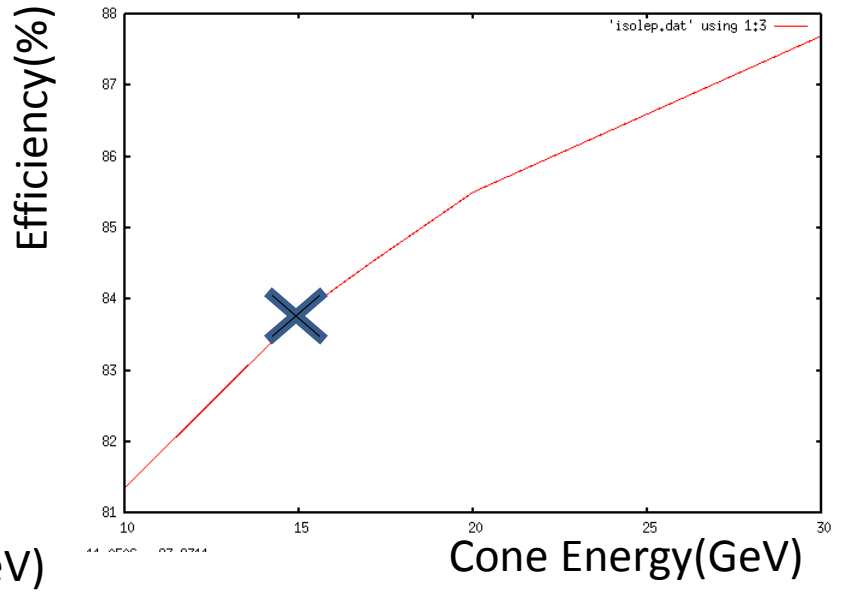
# Cone energy optimization

- Probability of missIDing e from b jet is small.(signal:H→bb)
  ⇒Optimize with selection efficiency of e from $e_H$.
  — Select point right before slope becomes shallow.
- Cone Energy <15GeV ,P(missID)=1.2%,signal efficiency=84%

Probability of miss IDing e from b jet




Selection efficiency of e from eH



# Optimization using $W_H W_H$

- We optimized to maximize 2e + (2H→bb) selection
- Next optimize to maximize 2e + (2H→WW) selection
  :hadronic decaying events

⇒optimize using $W_H W_H$

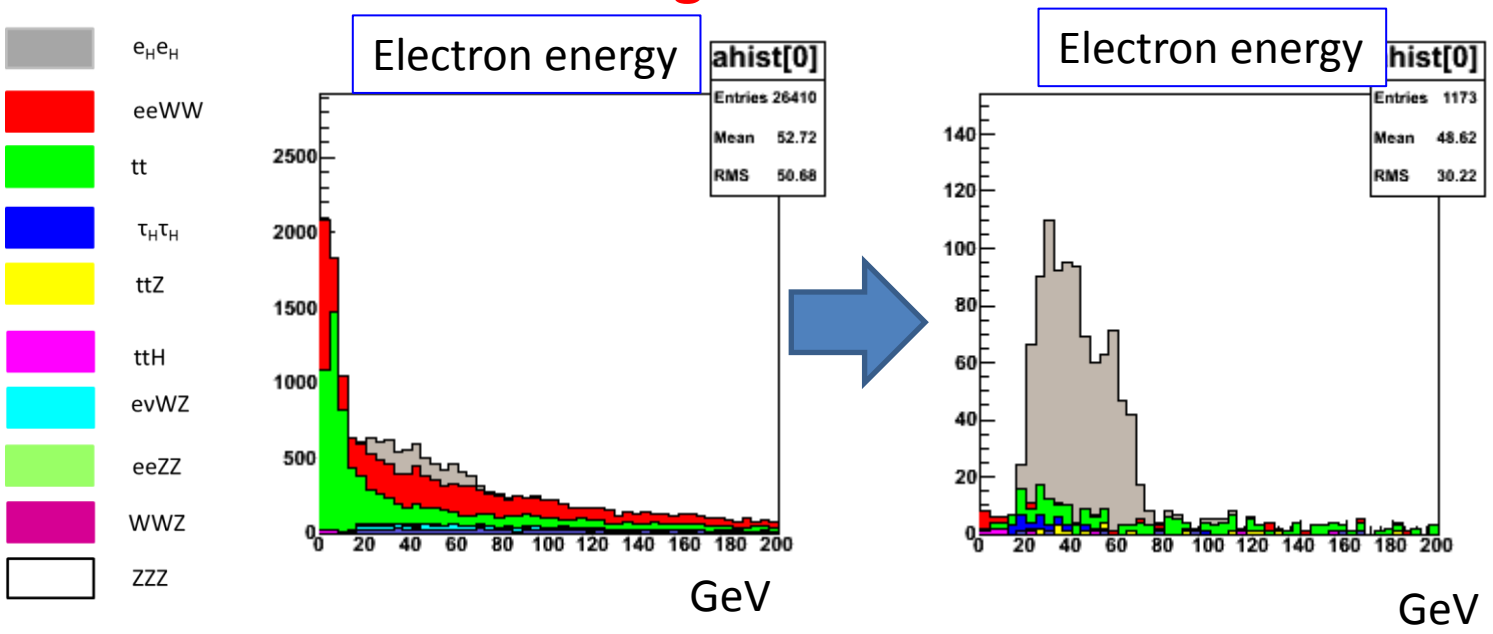
(electron with hadronic decaying origin aren't highly dependent on W energy)

The probability of mistakenly selecting e from W hadronic decay instead of e from $e_H$ is negligible(<0.02%)

# Selection criteria

| Selection criteria |
| --- |
| # isolated electron =2 |
| $m_H$-50<H mass<$m_H$+30(GeV) |
| Miss Pt>50 (GeV) |

**Significance 24.5σ**



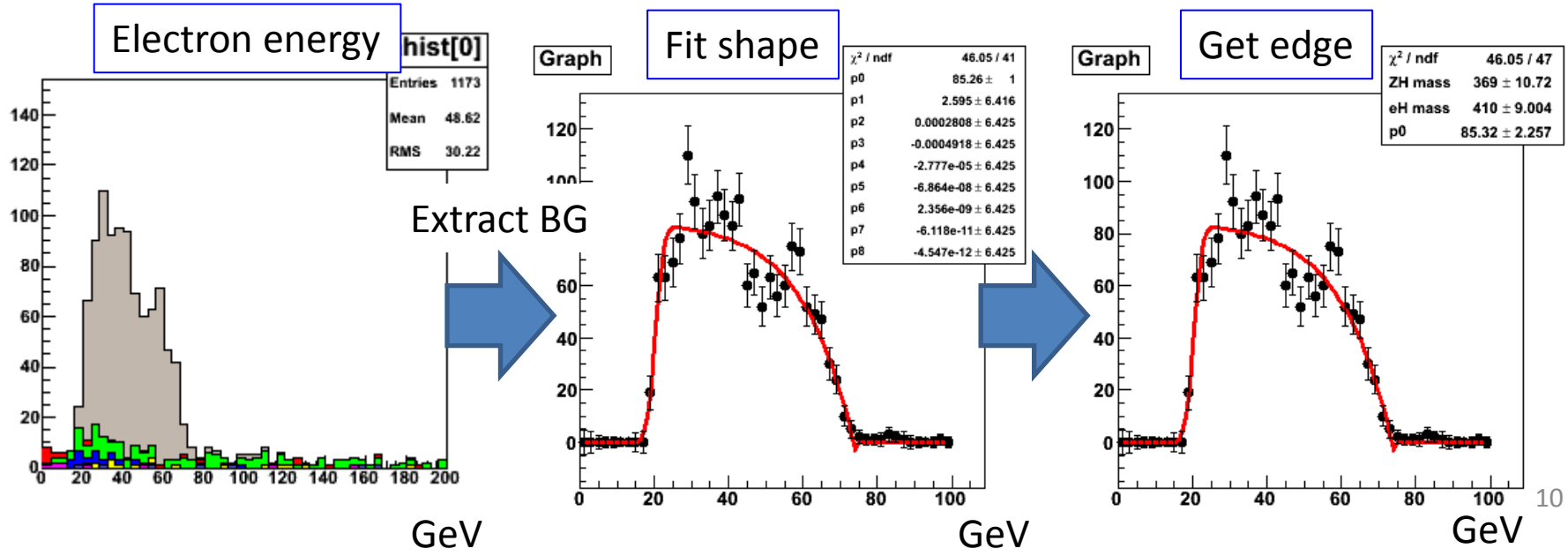
# Mass extraction

- Background contribution small in signal region

⇒extract background preform mass fit.

－eH mass=410±9.0 GeV

- Fitting improvement is needed.



# plan

- Improve fitting for mass extraction.
- Derive parameter κ from $e_H$ mass.
- Consider finding $e_H$ mass by reconstructing $e_H$.