

CHARGED HIGGS SEARCH IN WH

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8/8/2014

status

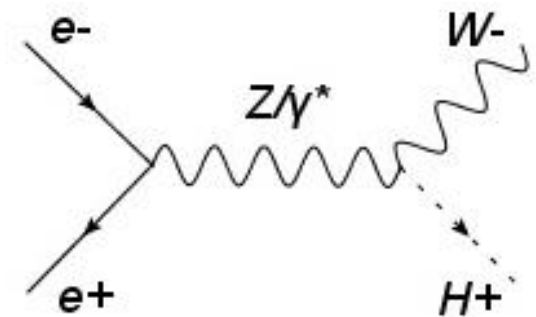
Charged Higgs search

▶ I submitted a talk to BSM(and Higgs joint) session of LCWS14.
- I'm sorry but I haven't sent e-mail to Junping-san...

▶ H to taunu channel
- mostly finished → next slide

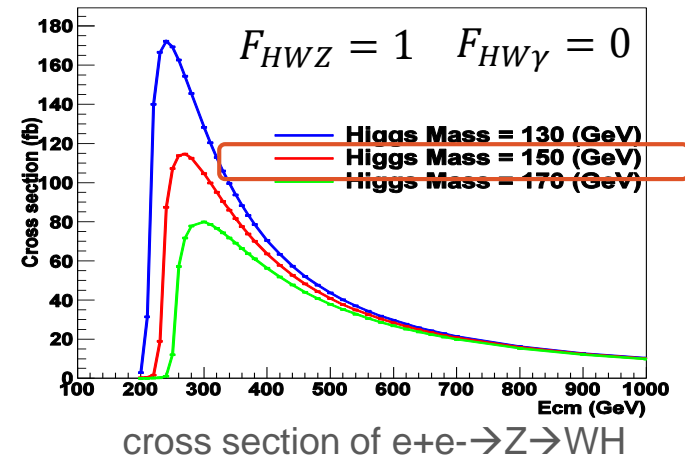
▶ H to WZ channel
- on going
- 6j reconstruction (WWZ → jj jj jj)

...



H → taunu channel

- $E_{cm} = 250$ GeV
- int. luminosity = 250 fb^{-1}
- $P(e^+, e^-) = (-30\%, +80\%)$
- $m_{H^\pm} = 150$ GeV
- ILD_01_v05 (DBD ver.)
- $F_{HWZ} = 1$ (: Georgi-Machacek model)

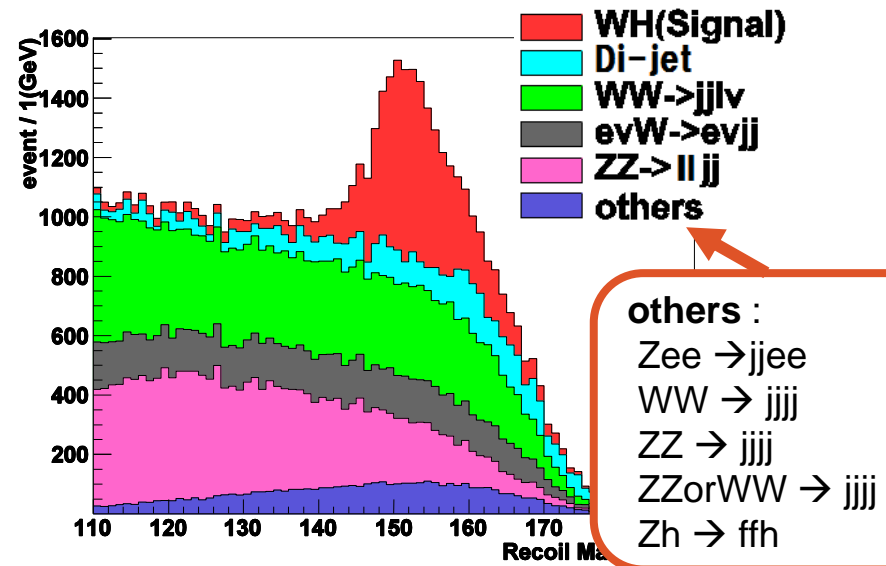


cut condition

- $m_w < 70, 90 < m_w$ (GeV)
- $m_{rec} < 140, 160 < m_{rec}$ (GeV)
- $P_t < 15$ (GeV)
- $E_{vis} > 170$ (GeV)
- $0.95 < |\cos(w \text{ angle})|$

efficiency = 36.5%

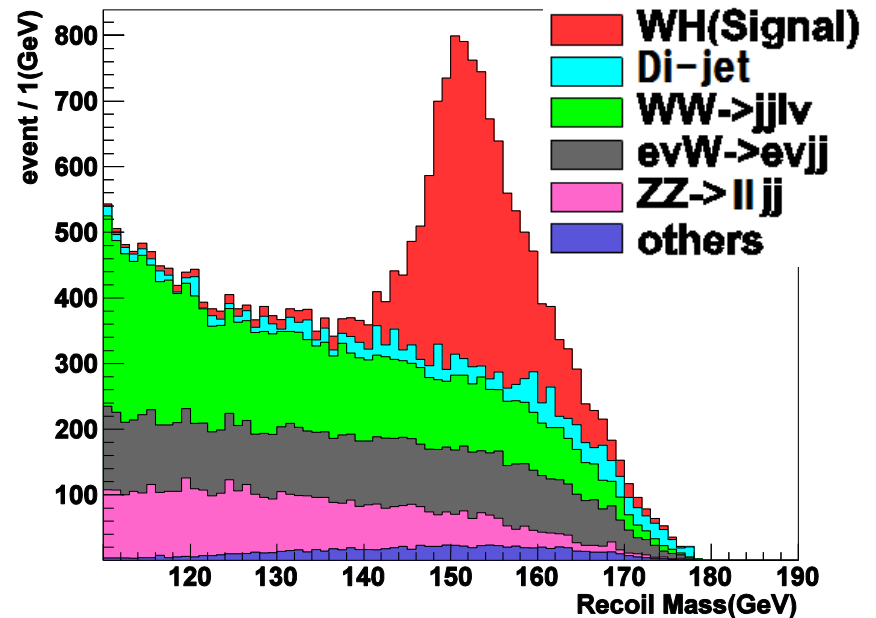
significance = 46.99 → Statistical Error **2.13%**



lepton selection

cut condition

$m_w < 70, 90 < m_w$ (GeV)
 $m_{rec} < 140, 160 < m_{rec}$ (GeV)
 $P_t < 15$ (GeV)
 $E_{vis} > 170$ (GeV)
 $0.95 < |\cos(\omega \text{ angle})|$
 $E_f < 0.5$



| | WH | Di-jet | evW→evjj | WW→jjlv | ZZ→jjll | others |
|-----------|-------|---------|----------|---------|---------|--------|
| no cut | 20366 | 6759925 | 65567 | 150352 | 89793 | 252065 |
| after cut | 5423 | 559 | 1970 | 2159 | 1003 | 414 |

efficiency = 26.6%

significance = 50.51 → Statistical error **1.98%**

($E_{cm} 250$ GeV, 250fb^{-1})

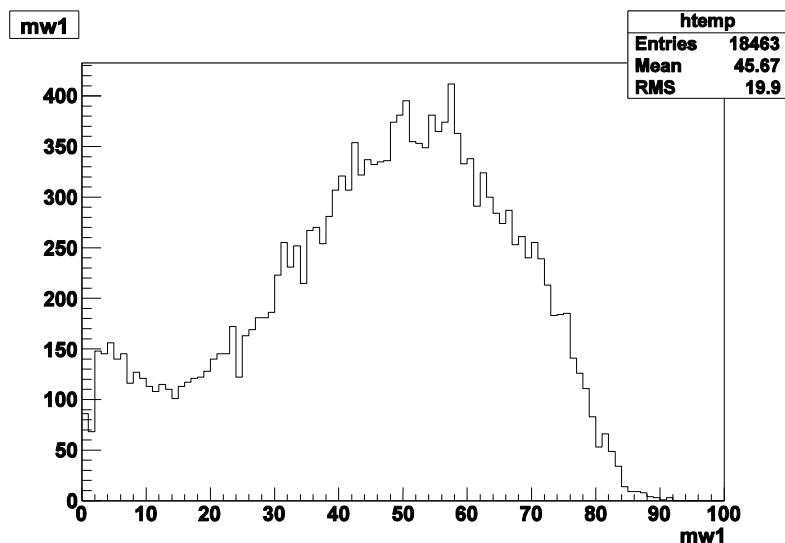
$$E_f = \frac{\max(E_{PFO})}{E_{jet}}$$

H \rightarrow WZ channel

- reconstructing jets to 6j
- (WWZ reconstruction) selecting the jet pairs so that χ^2 is minimized

$$\chi^2 = \left(\frac{M_{j1} - m_W}{\sigma_W}\right)^2 + \left(\frac{M_{j2} - m_W}{\sigma_W}\right)^2 + \left(\frac{M_{j3} - m_Z}{\sigma_Z}\right)^2$$

- (Higgs reconstruction) selecting W-Z pair (from H) to use W-Z angles
...calculate the Ws and Z angles, and larger \cos_{θ} pair
is from H
- getting W mass and H mass (W mass + Z mass)



W mass distribution have entries around low mass region.
Reconstruction is not good..

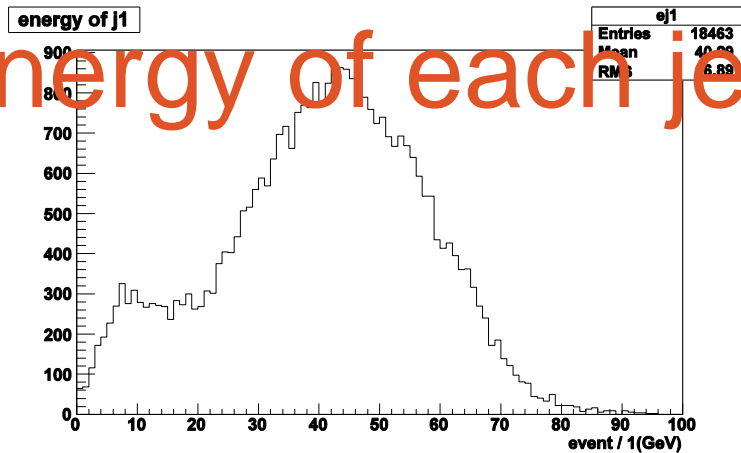
We should change...
 χ^2 , Higgs reconstruction,...

Background

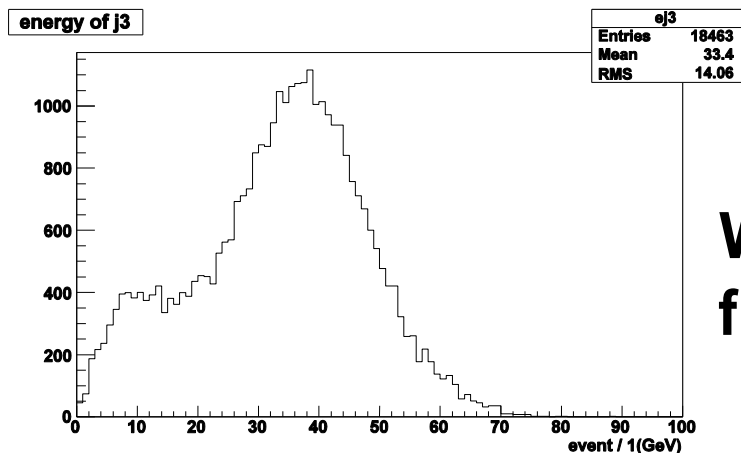
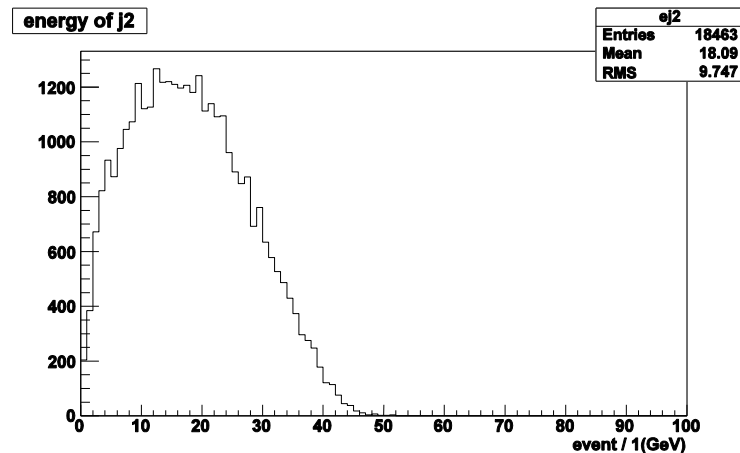
- I'll use same BG from $H \rightarrow taunu$ channel BG.
 - $2j, 3j(jjlv), 4j$
 - SM Higgs
- Jan-san made WWZ BG samples, so I'll use it also.
cross section : $eLp0 \rightarrow 34.1$ (fb), $eRp0 \rightarrow 25.01$ (fb)

| | sample | cross section fb | # of event |
|-------|---------------------------|------------------|------------|
| SM BG | Di-jet | 46.2k | 12M |
| | $evW \rightarrow evjj$ | 445 | 110k |
| | $Zee \rightarrow jjee$ | 300 | 74k |
| | $WW \rightarrow jjlv$ | 758 | 190k |
| | $WW \rightarrow jjjj$ | 600 | 150k |
| | $ZZ \rightarrow jjll$ | 467 | 120k |
| | $ZZ \rightarrow jjjj$ | 402 | 100k |
| | $ZZorWW \rightarrow jjjj$ | 565 | 140k |
| | $Zh \rightarrow ffh$ | 205 | 51k |

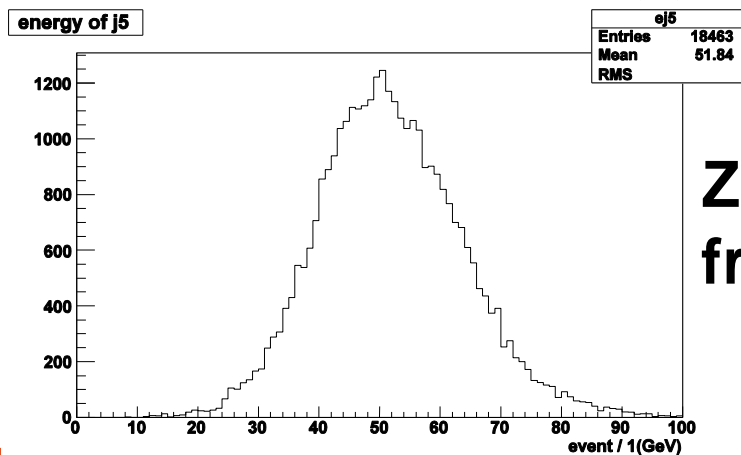
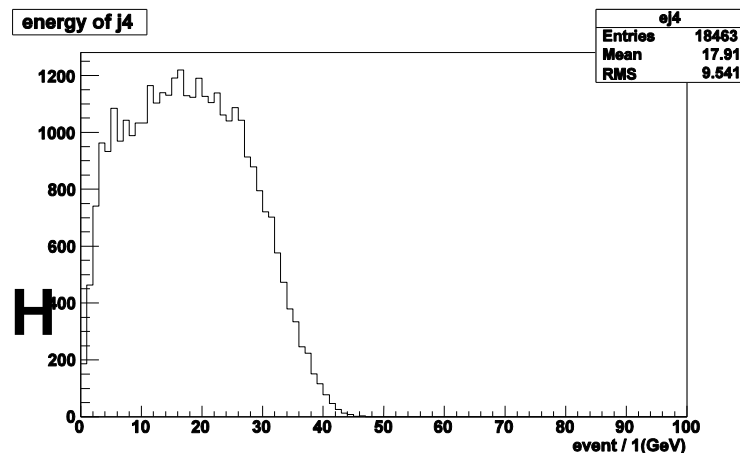
energy of each jet



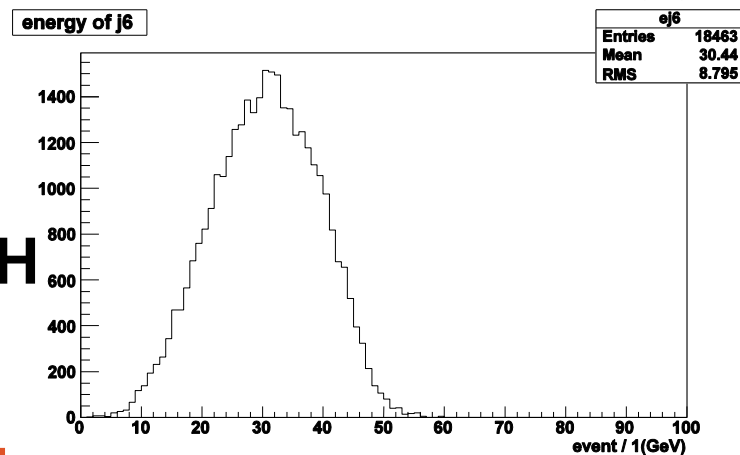
W



W
from H

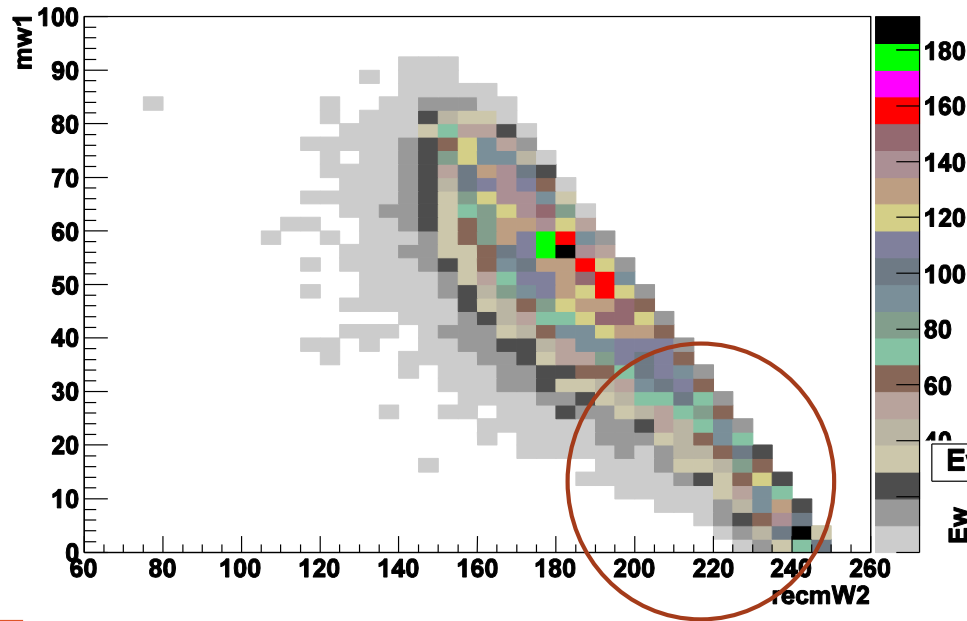


Z
from H

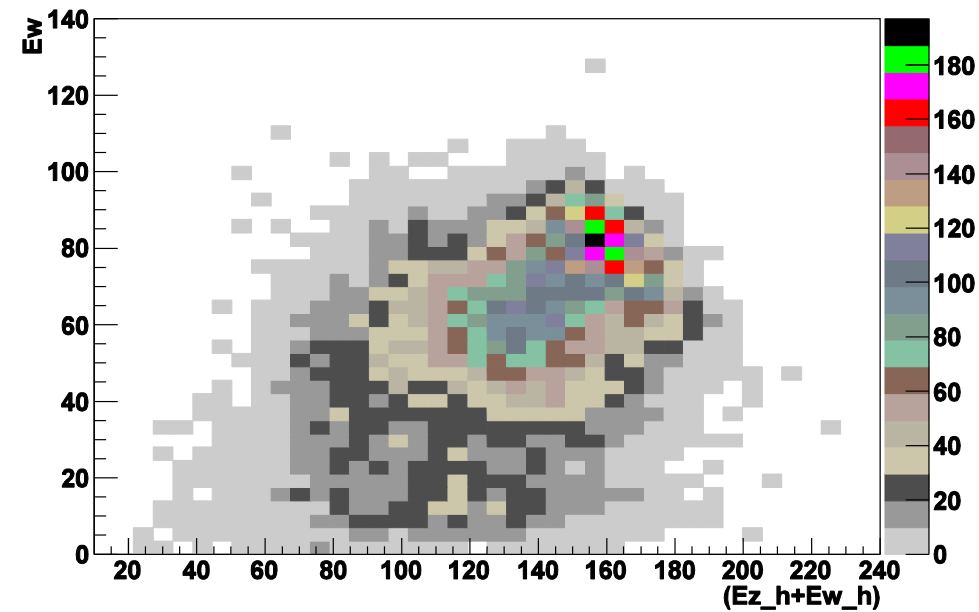


mw vs recm(H mass), Ew vs Eh

mw1:recmW2



Ew:(Ez_h+Ew_h)



2014/9/26