Higgs self-coupling analysis with H→WW*

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- **Restart kinematic fitter**
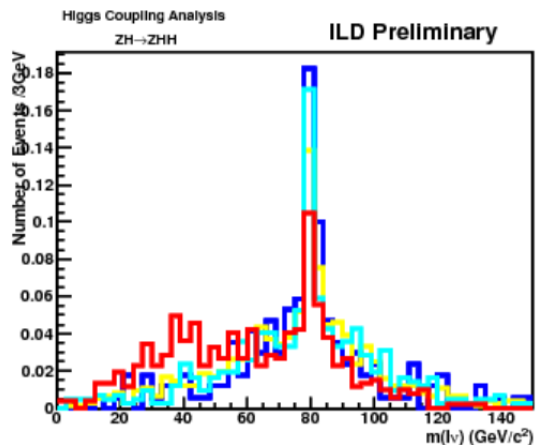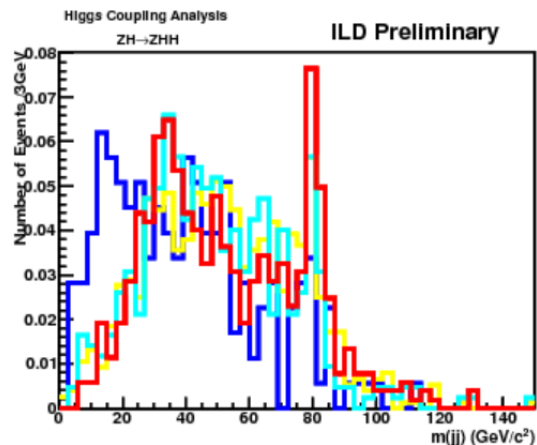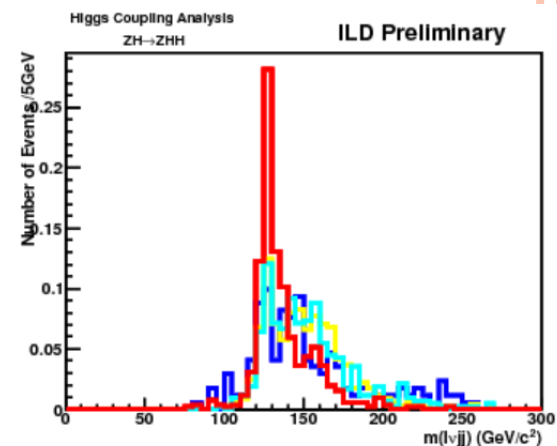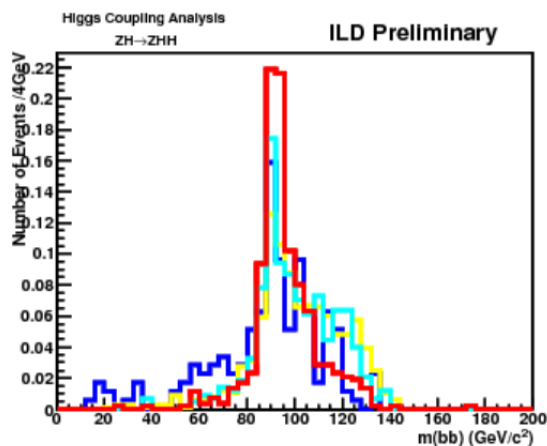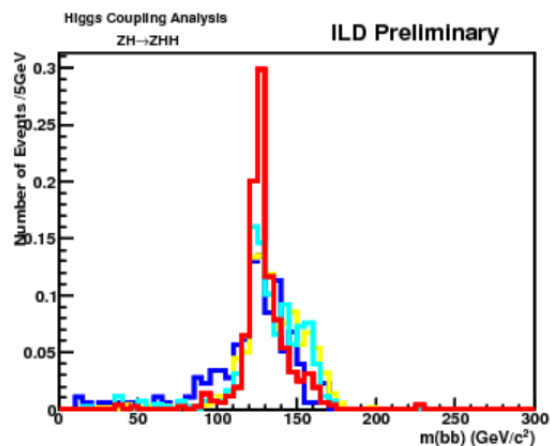 - Compare signal and backgrounds –mass resolution check
  - ZZH kinematic fitter
  - $X2$ check

- **Vertex charge study**
  - Ongoing··· no results can be shown
  - Trying some ideas for vertex finding eff. & vertex charge assignment eff. improvement
  - Results start to become improved(!), but not enough···

- Using ZHH→(bb)(bb)(WW)→(bb)(bb)(lνujj) kinematic fitter
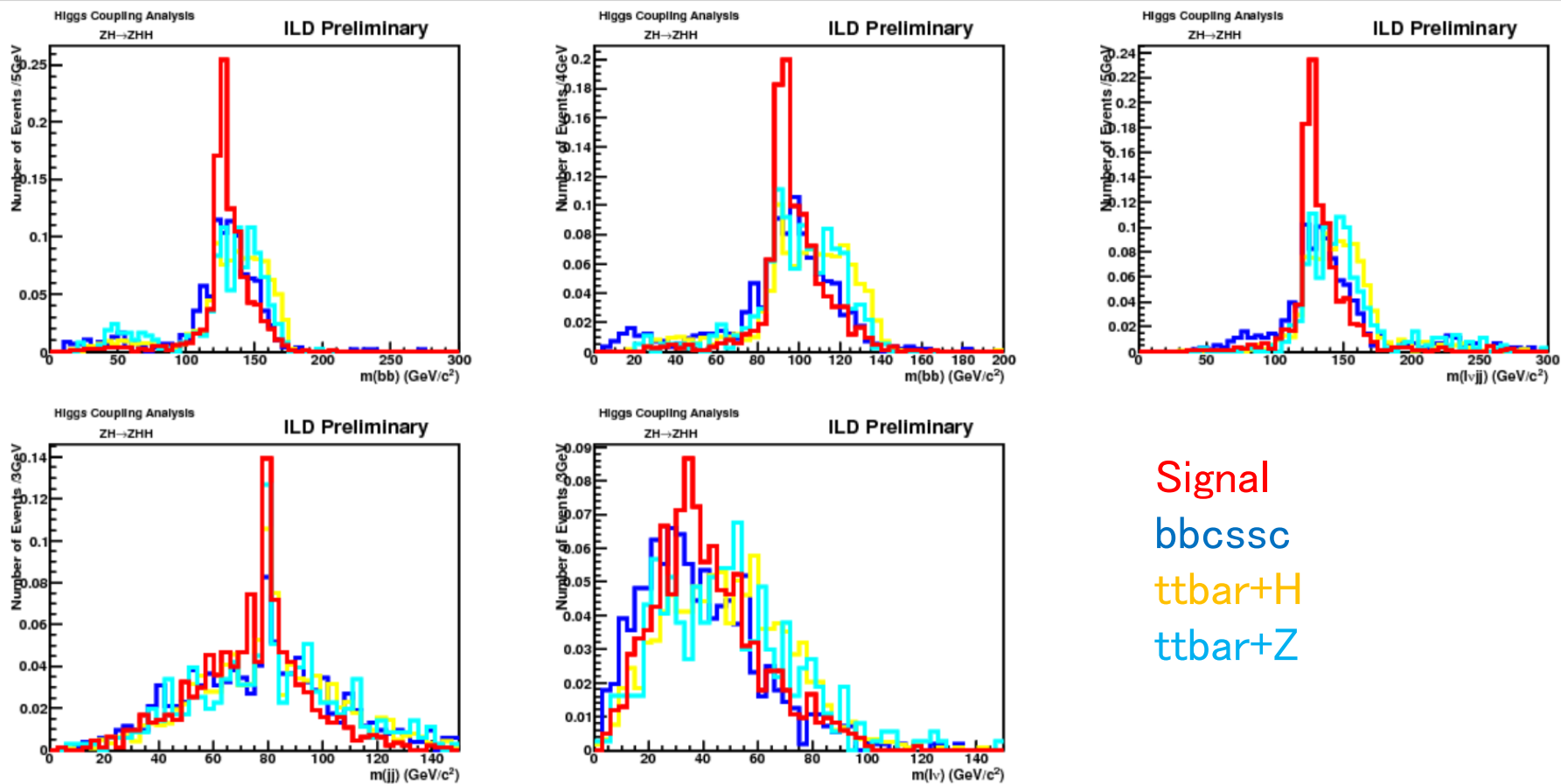 - Signal vs ttbar(bbn1e1sc), ttbar+H, ttbar+Z

Signal
bbn1e1sc
ttbar+H
ttbar+Z

- Backgrounds' mass resolutions are worse –but difference is small?(due to binning?)
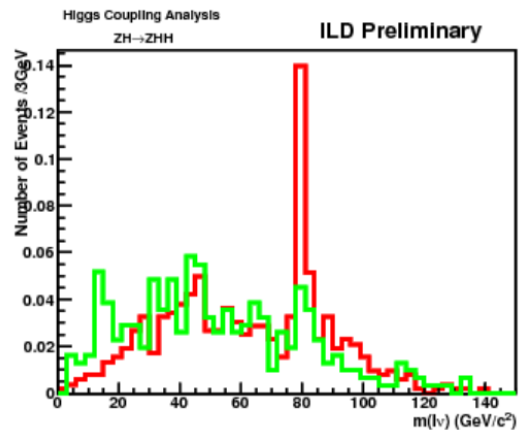
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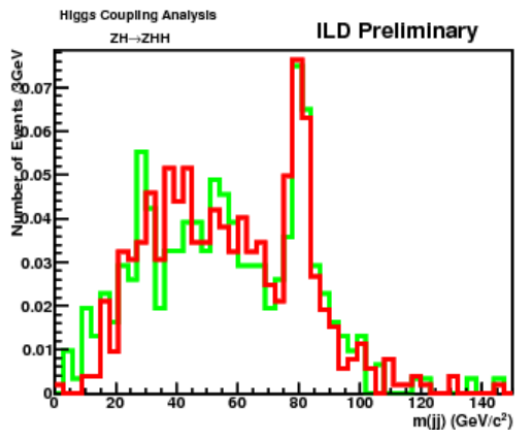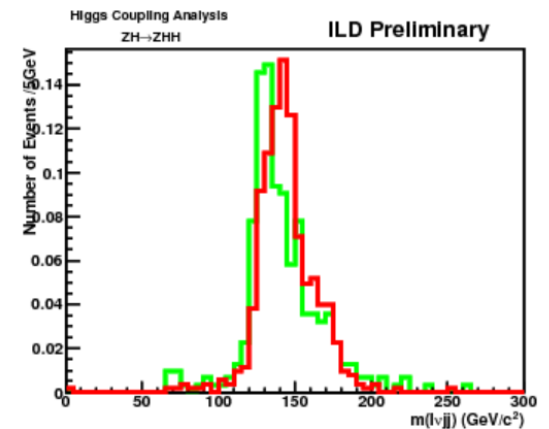# MASS DISTRIBUTIONS FOR SIGNAL AND BACKGROUNDS

- Using ZHH→(bb)(bb)(WW)→(bb)(bb)(jjjj) kinematic fitter
  - Signal vs ttbar(bbcssc), ttbar+H, ttbar+Z

Signal
bbcssc
ttbar+H
ttbar+Z

- Backgrounds' mass resolutions are worse −but difference is small?(due to binning?)

ZZH KINEMATIC FITTER

- Process of ZZH→(bb)(bb)(WW)→(bb)(bb)(lnujj)
- Check mass resolution after kinematic fitter
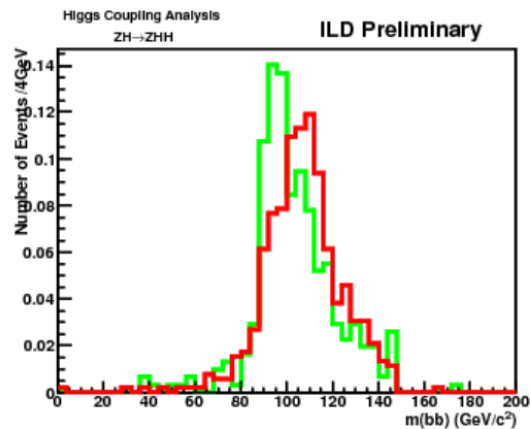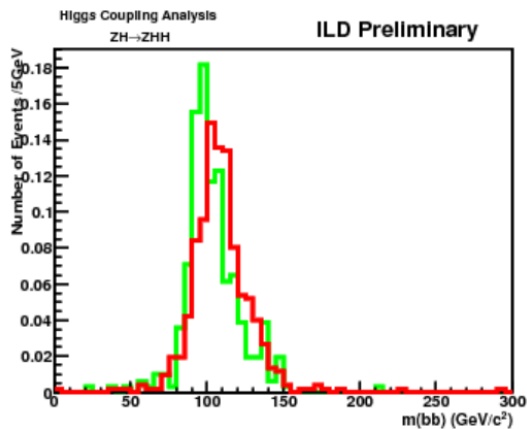
Signal
ZZH

- Distribution is slightly different
  - Useful for ZZH rejection?

ZZH KINEMATIC FITTER FOR ALL HADRONIC

- Process of ZZH→(bb)(bb)(WW)→(bb)(bb)(jjjj)

- Check mass resolution after kinematic fitter
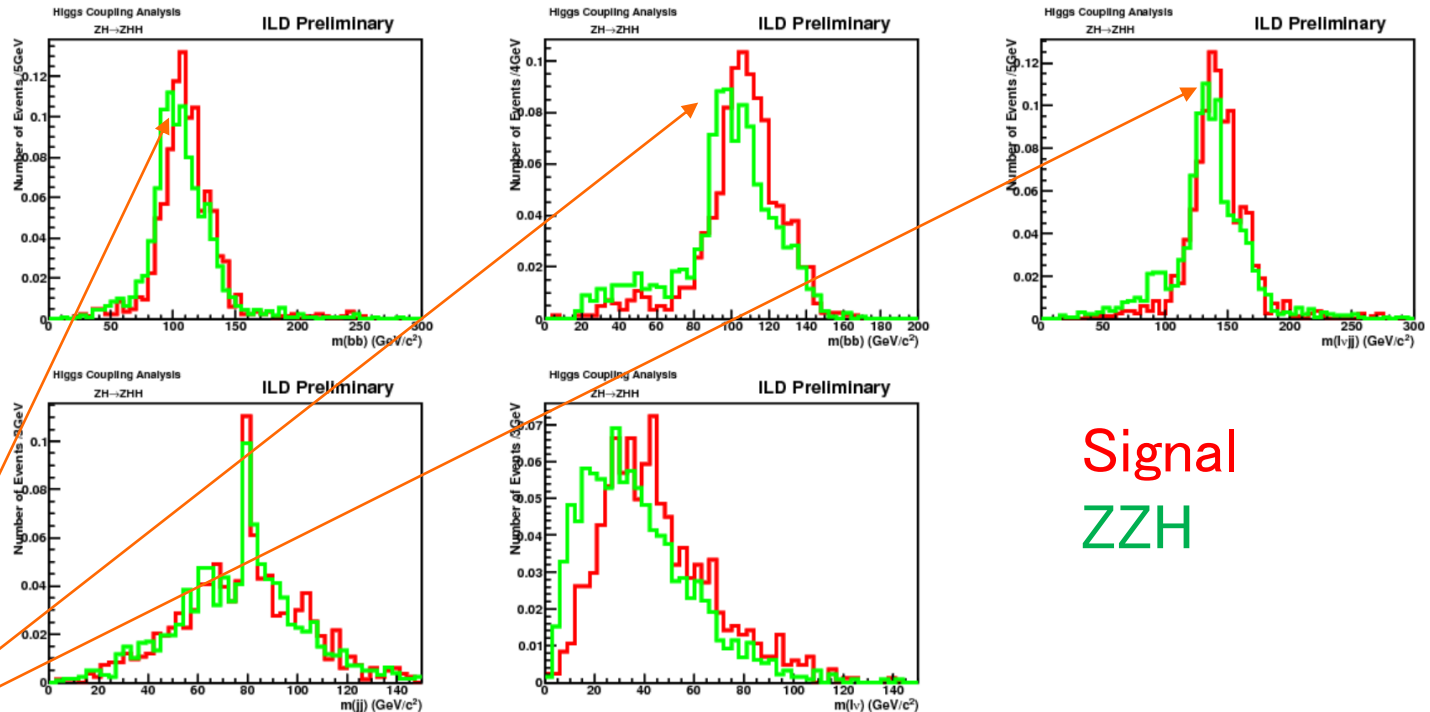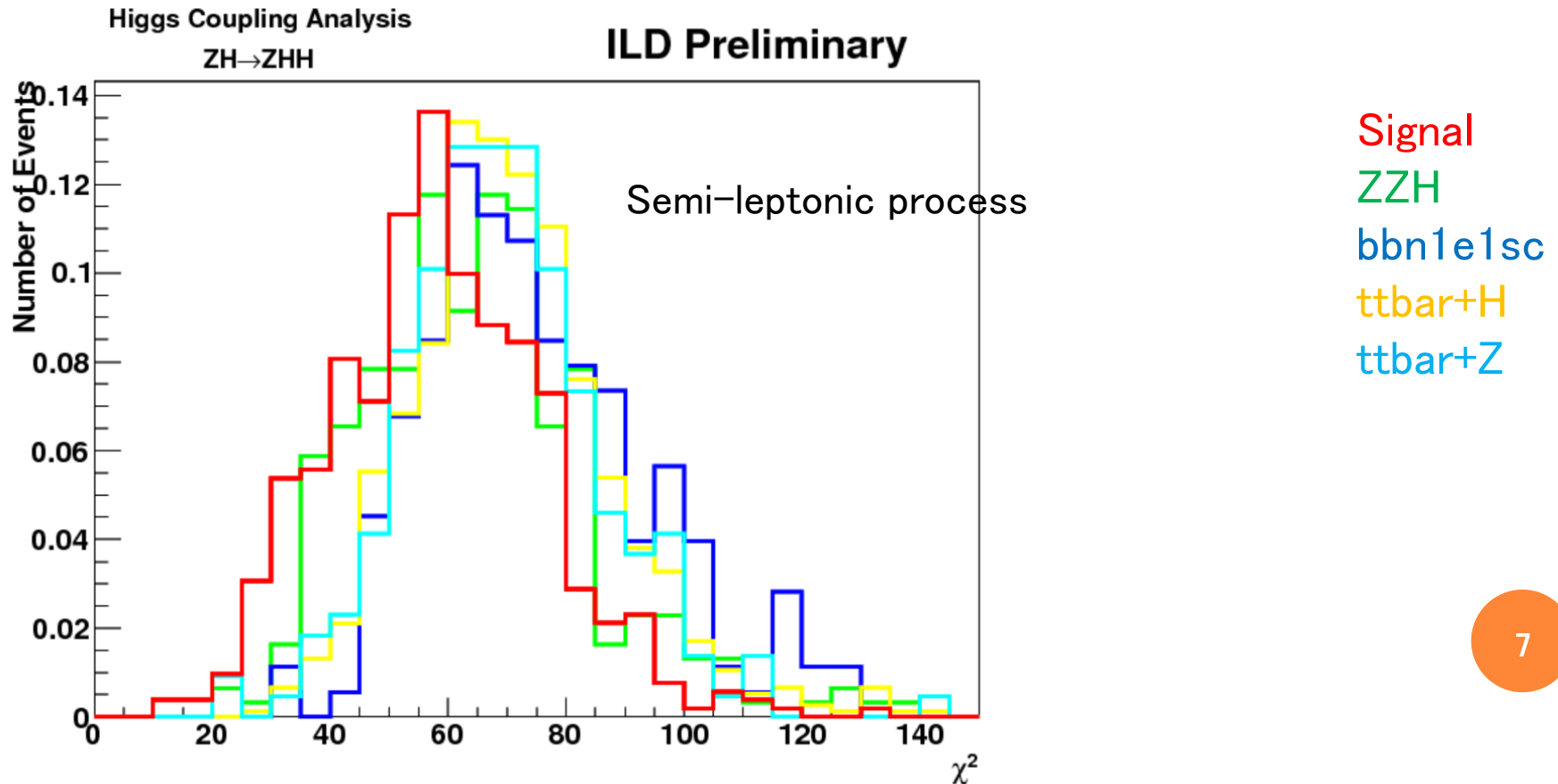

Signal
ZZH

- Why mass peak shifts from Z or Higgs mass?

  - Check the code, but so far no bug found

  - Due to the process of ZZH→(qq)(bb)(bb)?

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Χ2 DISTRIBUTION

○ Χ2 distribution after kinematic fitting of ZHH→(bb)(bb)(lnujj)

- Signal and ZZH difference is small
- Signal and others difference relatively large, but not enough…
- Jet energy resolution improvement is necessary

Signal
ZZH
bbn1e1sc
ttbar+H
ttbar+Z

LIKELIHOOD RATIO

○ Using the results of signal & ZZH Kinematic fitter

- Calculate likelihood ratio Log(L(ZHH)/L(ZZH))
- Signal and ZZH difference is very small···

Signal
ZZH
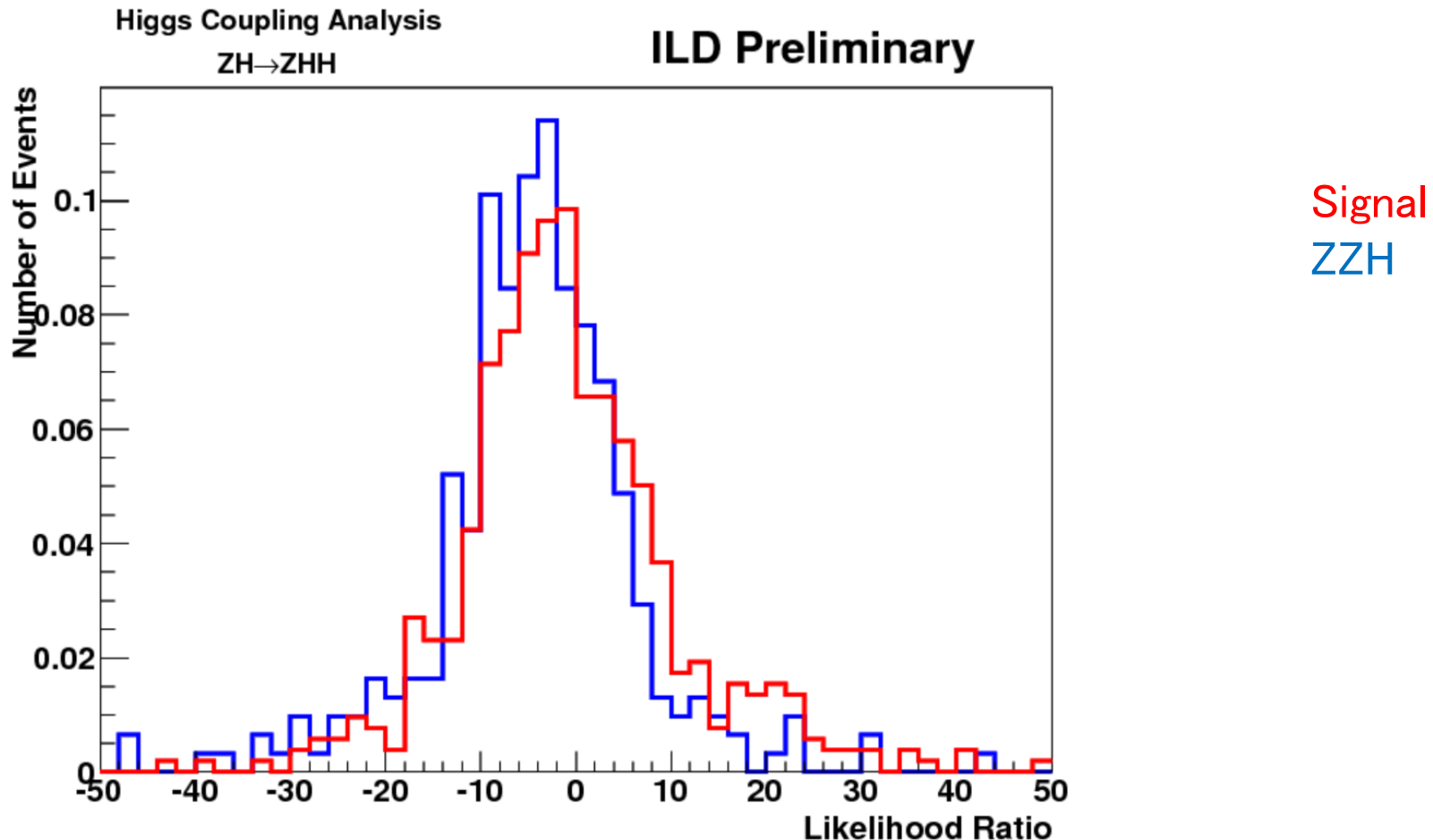
WHATS NEXT?

- In all hadronic case, trying ZZH→(qq)(bb)(bb) kinfit?
  - But 8 jets case··· 6 jets +2softjets, how?

- Other backgrounds?
  - Other? Especially more ttbar&ZWW events?

- How is background rejection? – improvement???
  - From CDF experience, better mass resolution provides better MVA classifier(even if backgrounds come in signal mass region)··· →same in ILC?
    - c.f.) 15% mass resolution improvement→10% improvement of sensitivity for Higgs search

- Jet energy resolution improvement?
  - Of course jet clustering···
  - Neutrino energy correction on heavy flavor jets?
  - Other idea?

- Apply Junping's ISR tag? →correct CMS energy event by event