ZH Branching ratio study

ILC physics and software meeting
Sep. 23. 2010

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Status from last week

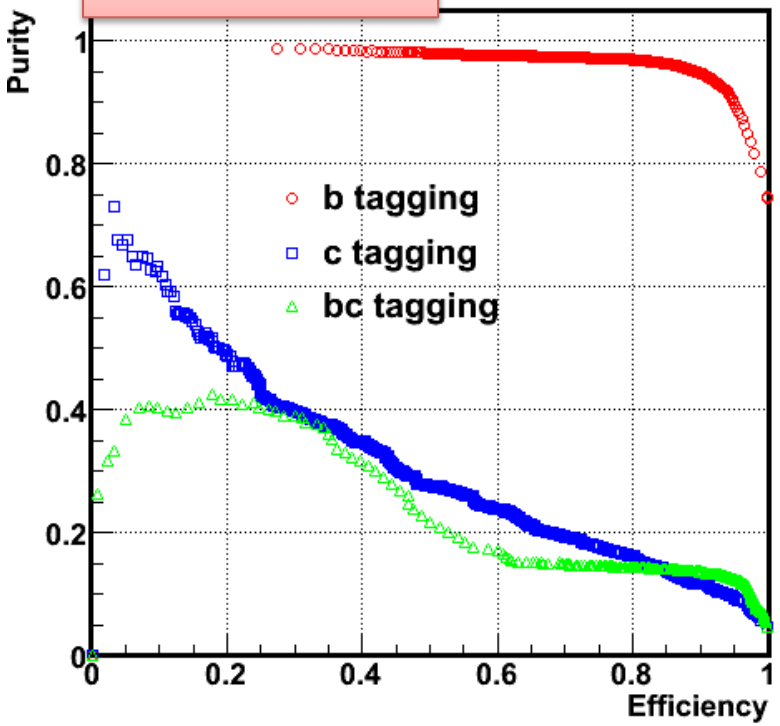
- Comparison of Ecm=250/350 GeV sample
  - Flavor tagging efficiency vs. purity
  - Event shape, mass distribution

- Some preliminary results are shown in ILDOPT meeting
  - H→qq quark component (bb dominant) is different from Z→qq (uds) (LCFIVTX is trained with Z→qq)
  - ZH→qqH includes Z→qq component
    - Check Z candidate jets in ZH→qqH flavor tagging performance
  - Ecm=350 GeV analysis has already disappeared from new benchmark list for DBD?

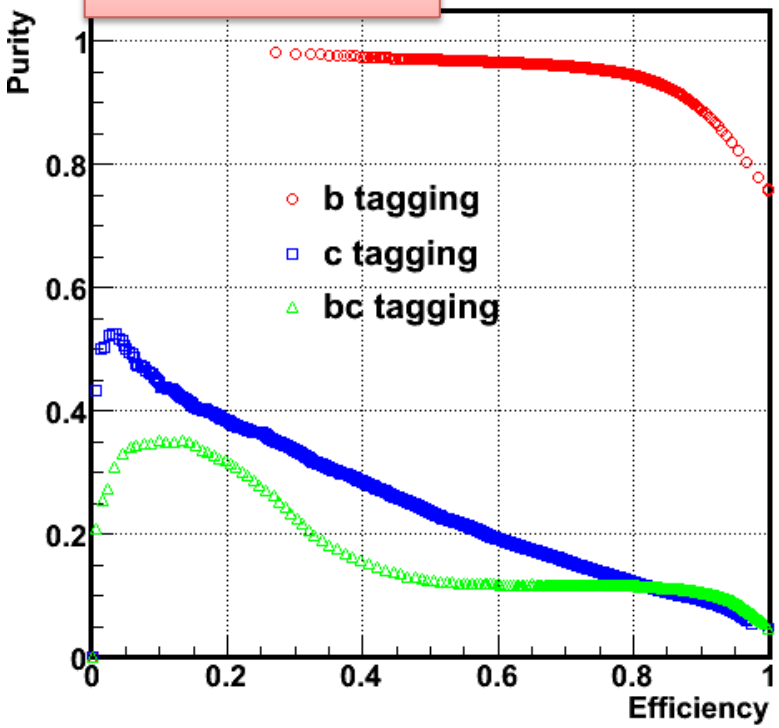
H→qq flavor tagging performance in ZH→qqH 4-jets reconstruction

ZH→qqH (hadronic mode) with $\chi^2 < 10$ cut (better Z/H combination is required)

Ecm=350 GeV



Ecm=250 GeV

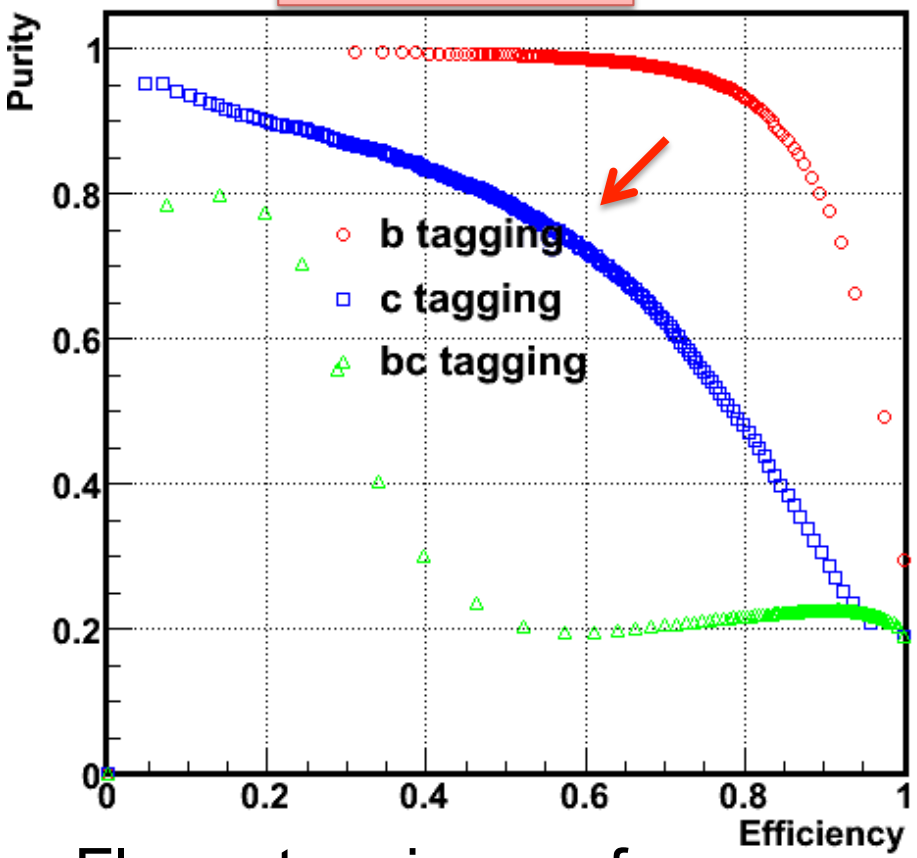


Different quark components from Z→qq makes difference ?

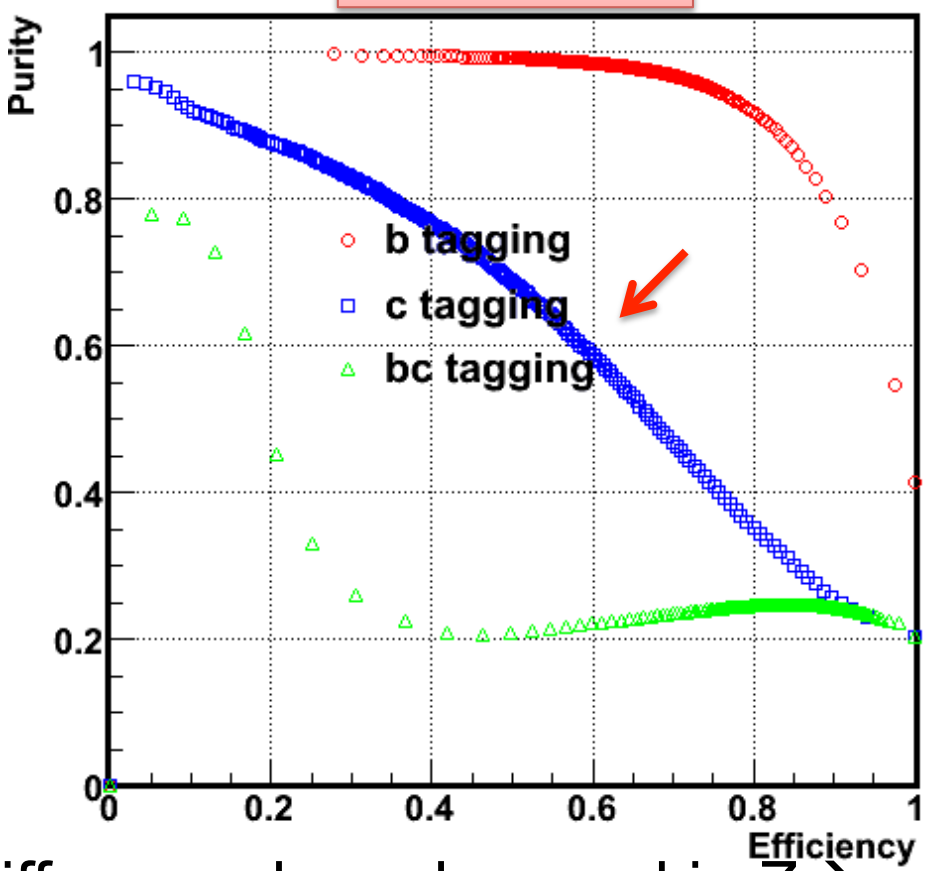
Z→qq flavor tagging performance in ZH→qqH 4-jets reconstruction

ZH→qqH (hadronic mode) with $\chi^2 < 10$ cut (better Z/H combination is required)

Ecm=350 GeV



Ecm=250 GeV



Flavor tagging performance difference has observed in Z→cc

Some mistake in my code for bc-tagging check?

Flavor tagging performance on ILD LOI

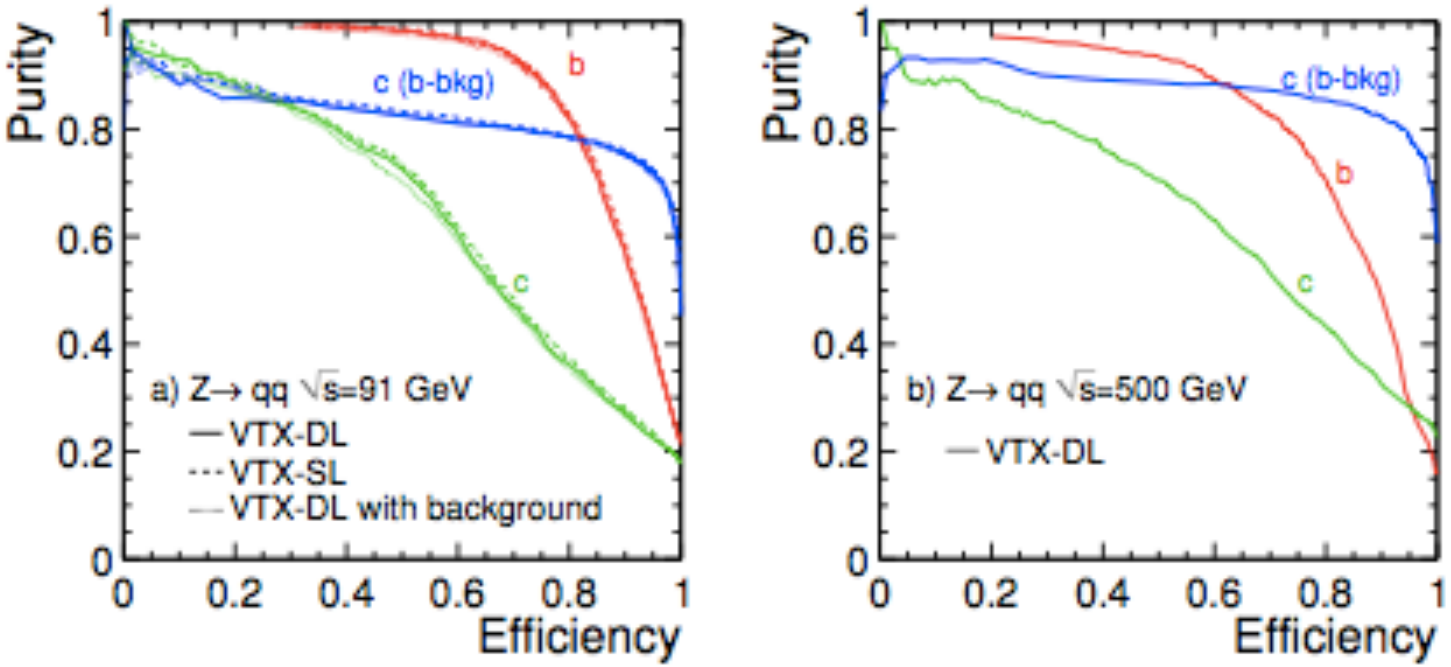
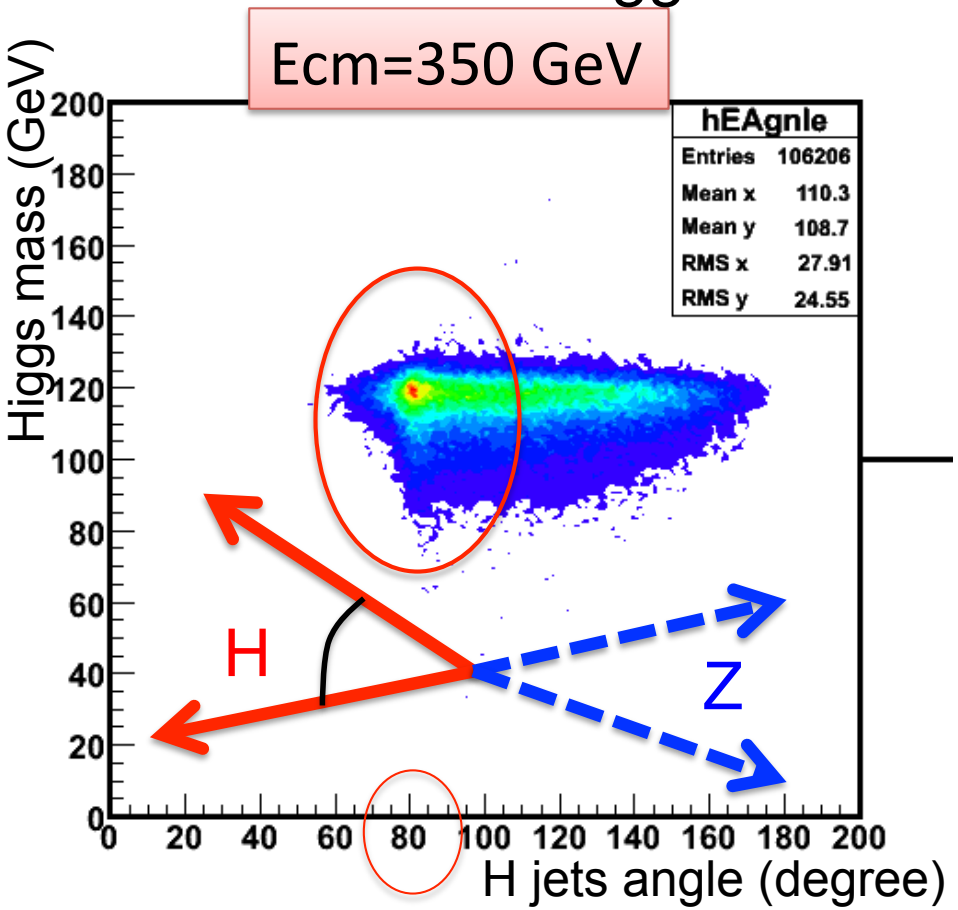
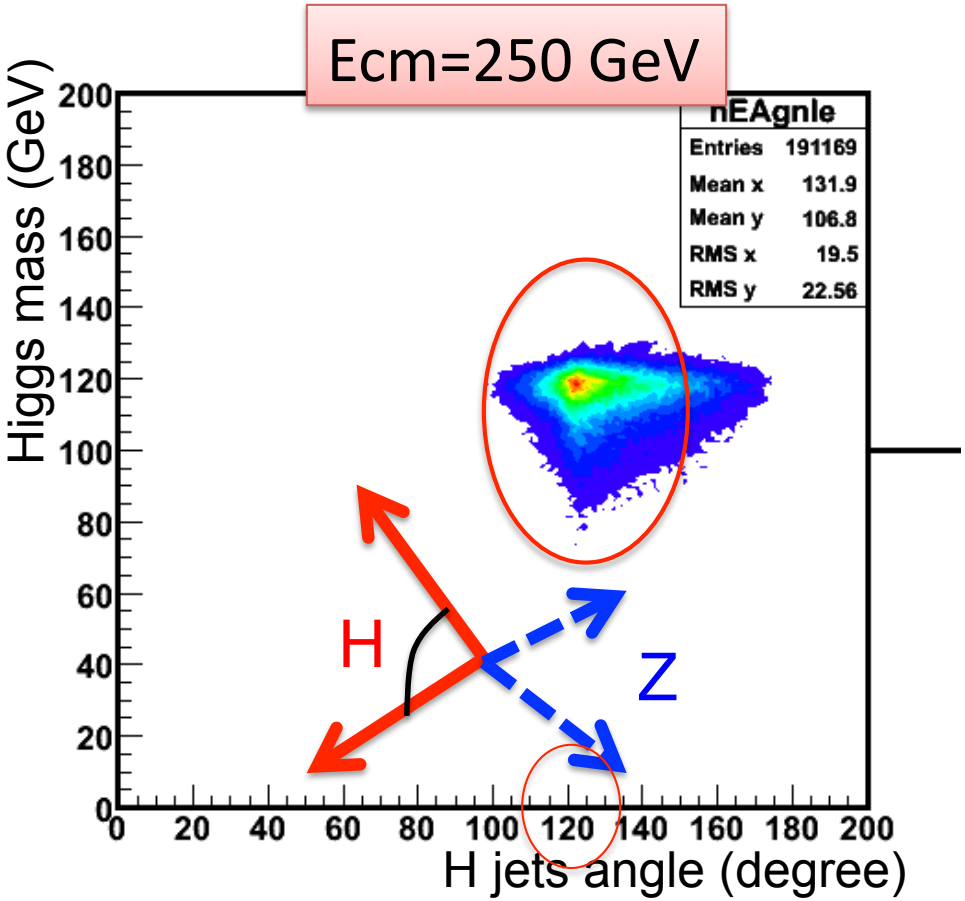


FIGURE 1.2-11. a) Flavour tagging performance of the ILD detector for 91 GeV $Z \rightarrow q\bar{q}$ events for both the three double-sided ladders (VTX-DL) layout and with five single-sided ladder layout (VTX-SL). Also shown for the VTX-DL is the impact of background on the flavour tagging performance. b) Flavour tagging performance of the ILD detector for 91 GeV $Z \rightarrow q\bar{q}$ events for the VTX-DL layout. In all cases the acceptance corresponds to $|\cos\theta_{\text{jet}}| < 0.95$.

Event shape difference in ZH→vvH mode

Reconstructed Higgs mass vs Higgs jets angle





Jets angle becomes narrower at 350 GeV by boost

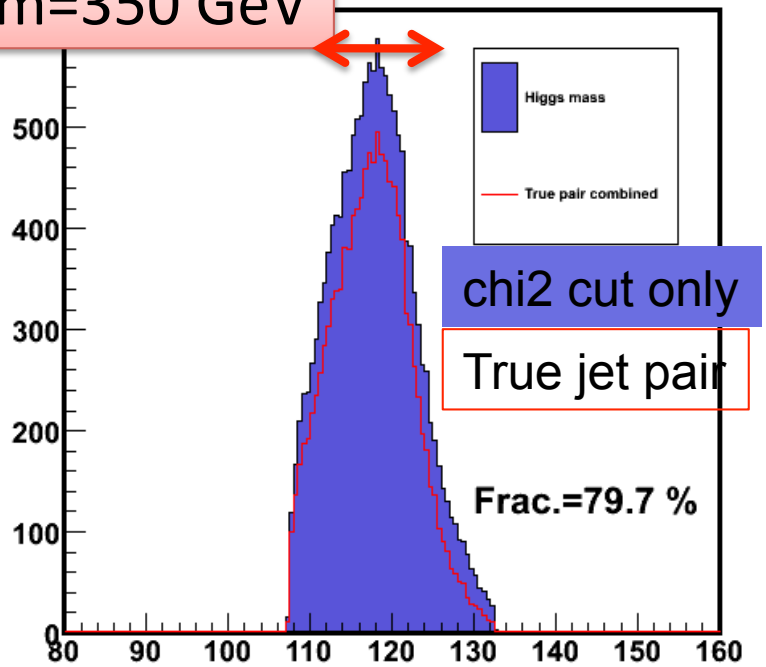
Higgs mass distribution in ZH→qqH

Higgs mass distri
cut, Entries are scaled to be L=250fb-1

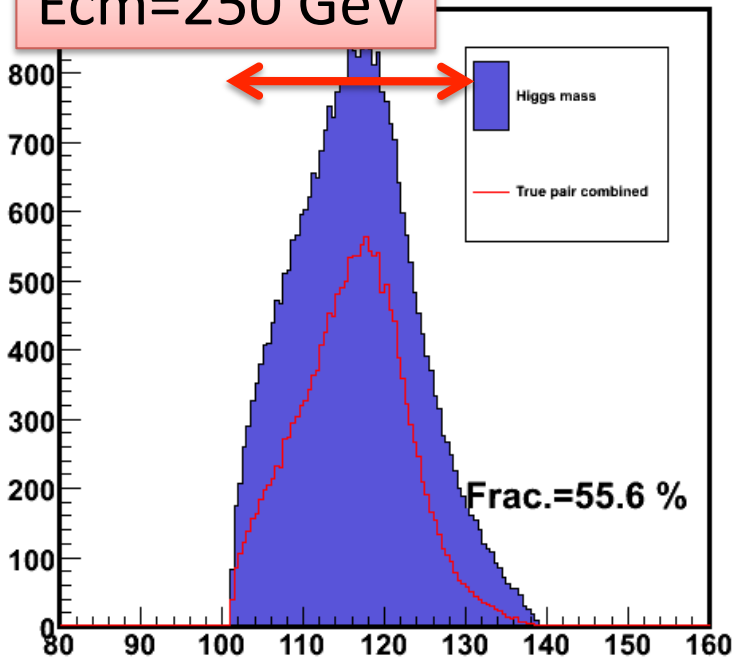
$\sigma_{Z/H}$ is not optimized for Ecm=350 GeV

$$\left(\frac{M_{34}-M_Z}{\sigma_Z}\right)^2+\left(\frac{M_{34}-M_H}{\sigma_H}\right)^2$$

Ecm=350 GeV



Ecm=250 GeV



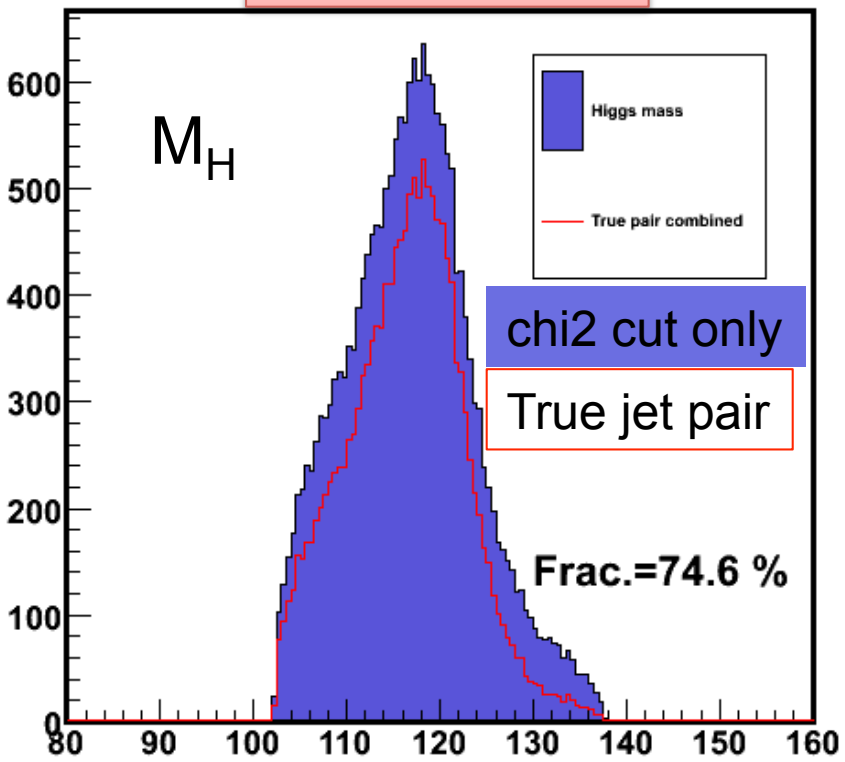
Slightly better mass reconstruction performance in 350 GeV
H/Z mass cut, visible energy cut will improve the Z/H jet paring performance

Higgs mass distribution in ZH→qqH

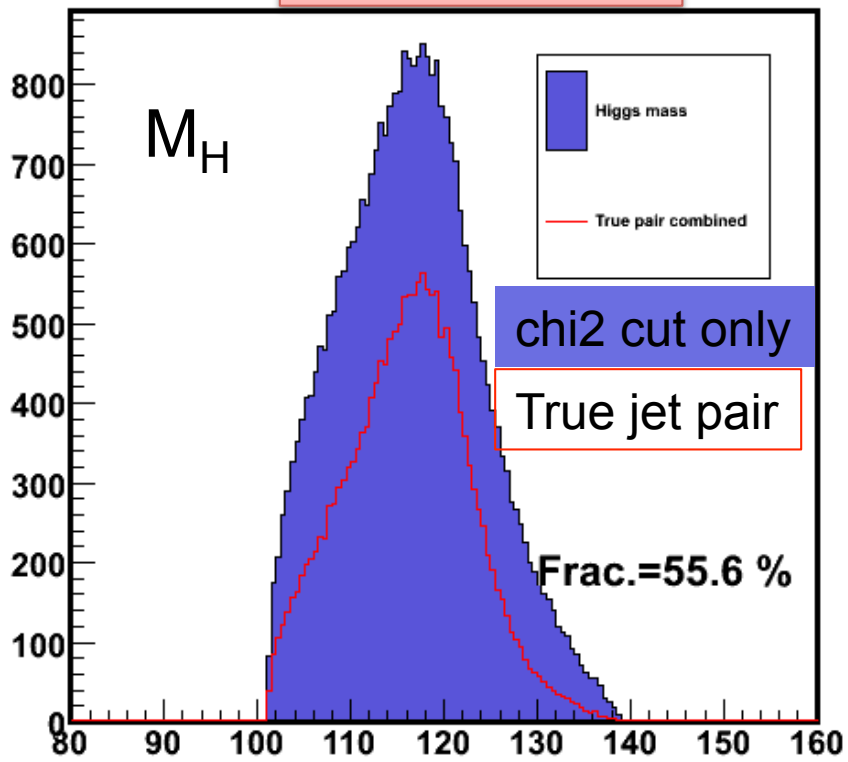
$\sigma_{Z/H}$ is optimized for Ecm=350 GeV

$$\chi^2 = \left(\frac{M_{12} - M_Z}{\sigma_Z}\right)^2 + \left(\frac{M_{34} - M_H}{\sigma_H}\right)^2$$

Ecm=350GeV



Ecm=250GeV



χ^2 cut value is applied as same value : χ^2<10 (Also need to optimize it)
Jet pairing performance becomes better from smaller jet overlapping