

Study of the Higgs Self-coupling at the ILC

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status

- developing the cheated jet clustering algorithm in the Marlin framework

Now

- two new processors are prepared
- ColorSingletTaggerProcessor
- SatoruJetFinderWithCheatProcessor

ColorSingletTaggerProcessor

input (collection):

MCPartilcesSkimmed
RecoMCTruthLink
PandoraPFOs

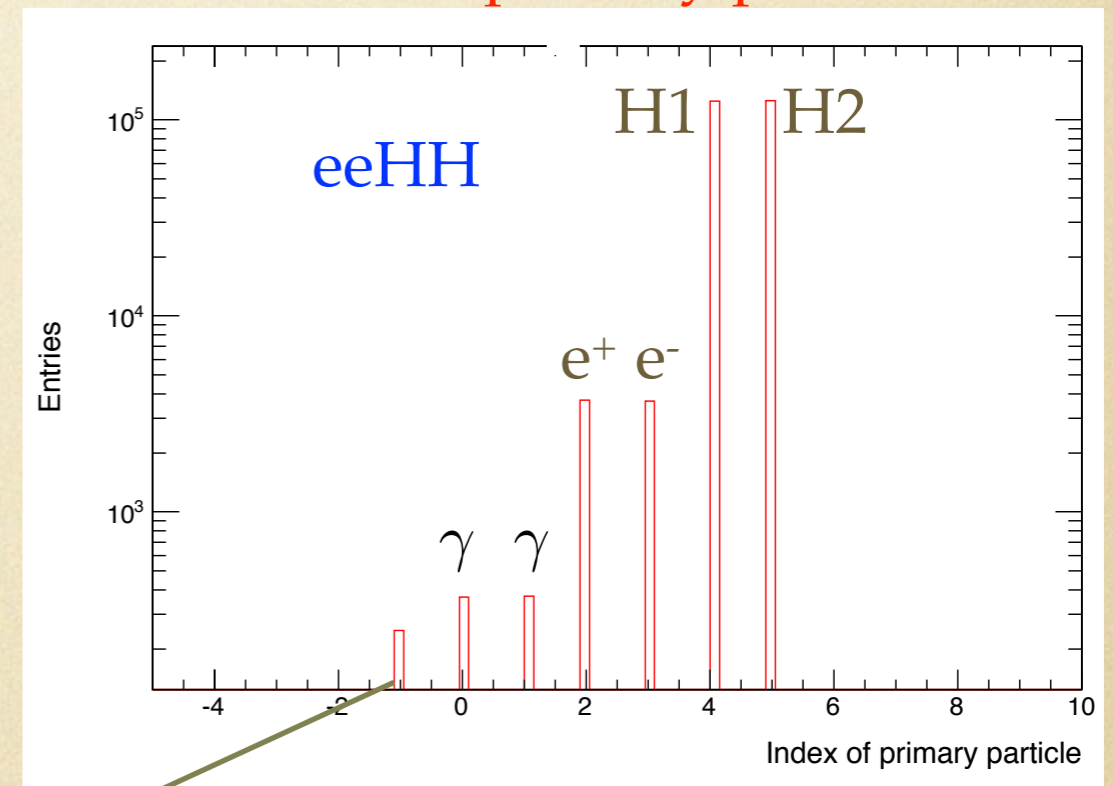
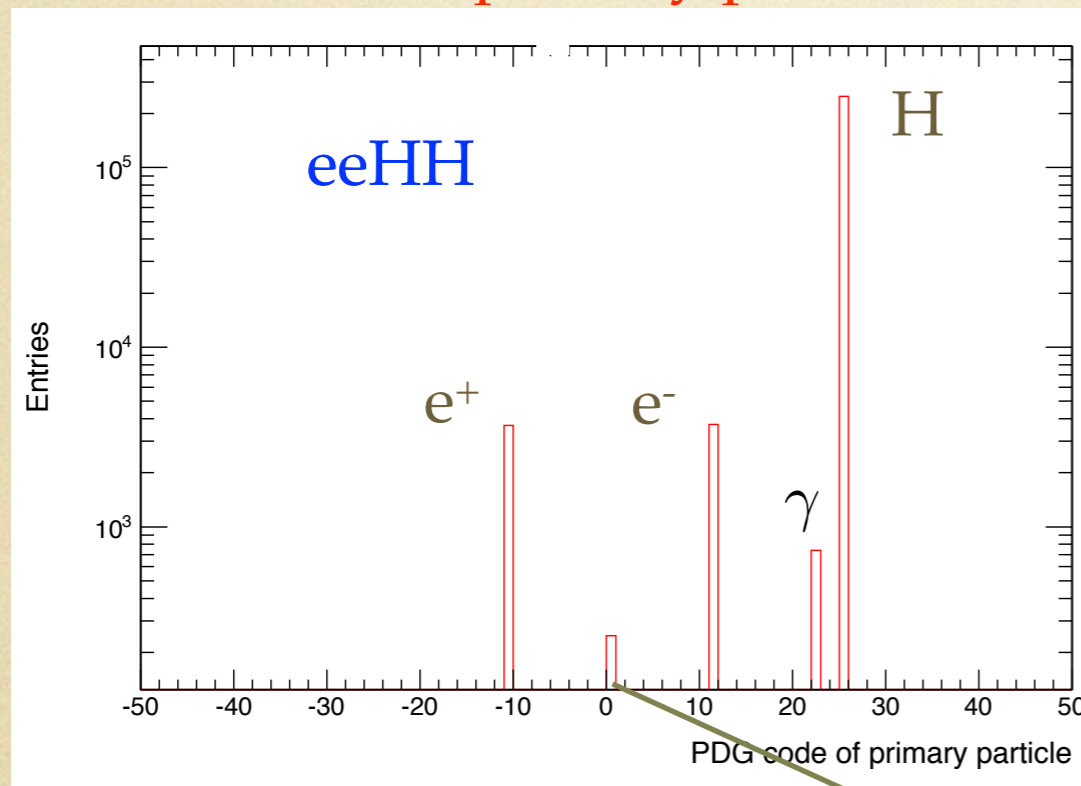
output (collection):

ColorSinglet

including the information of the primary particles which each PFOs originated

PDG code of primary particle

Index of primary particle



PFOs which don't have MCTruthLink

SatoruJetFinderWithCheatProcessor

from SatoruJetFinderProcessor with minor modifications:

- ◆ additional collection as input: **ColorSinglet**
- ◆ for the two PFOs coming from different color singlet: $Y(i,j) = +\infty$
- ◆ for initial photons and PFOs which didn't find their color singlet: **no limitation, can be clustered freely**
- ◆ now only works with **Durham** algorithm

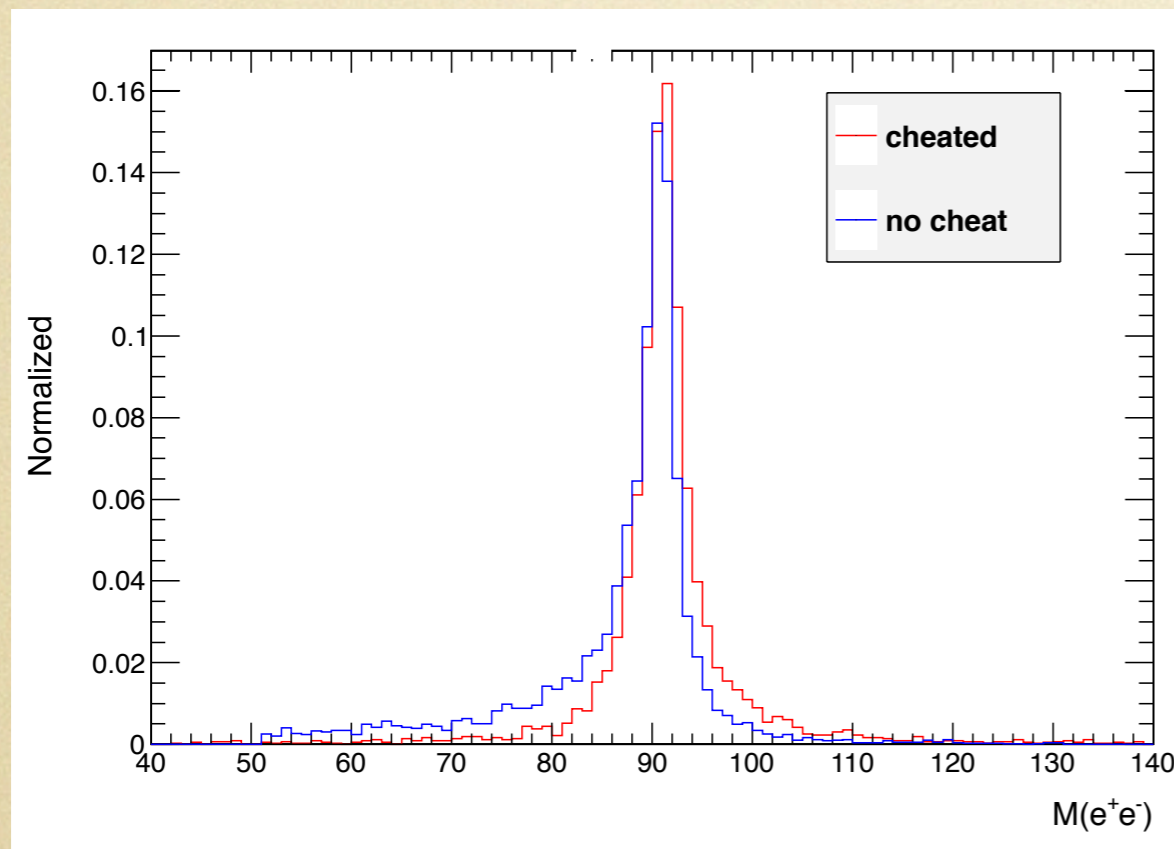
tested for llHH sample with both of these new processors

preliminary comparison (llHH)

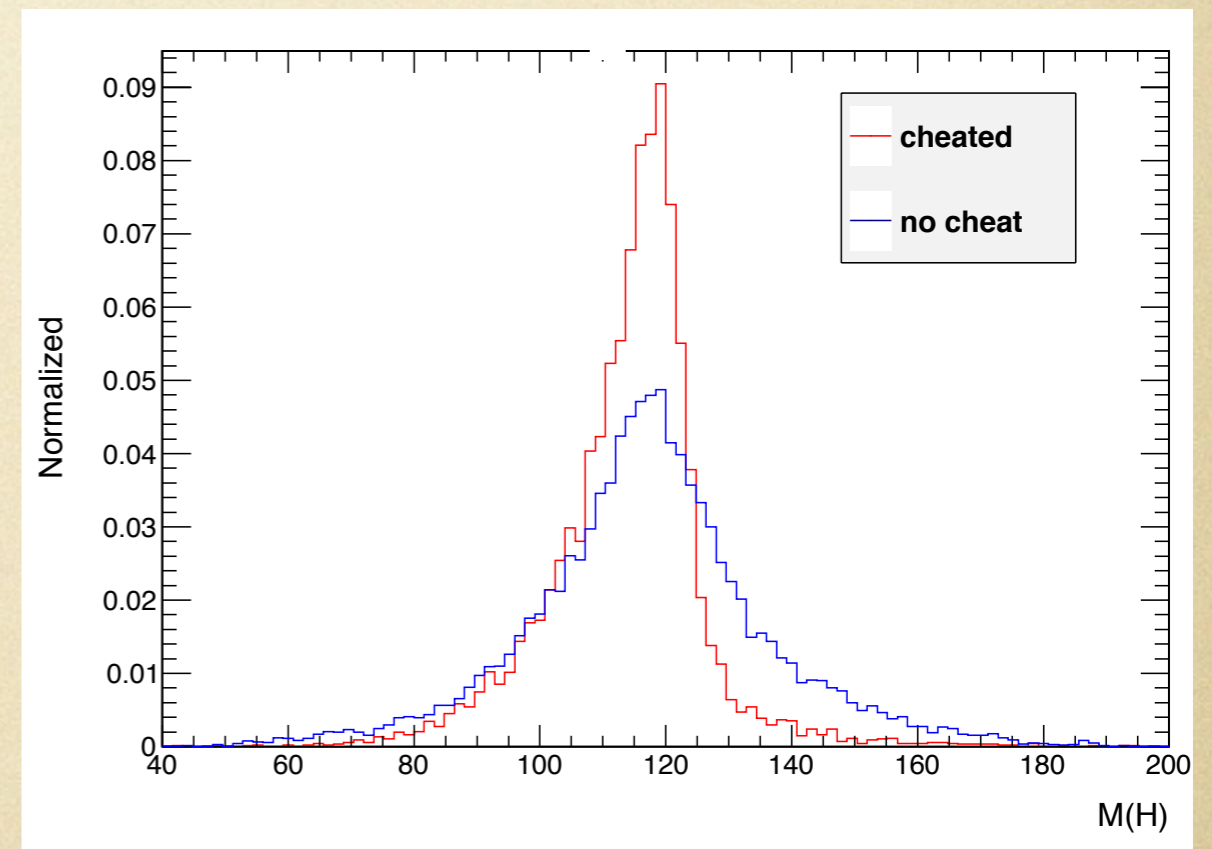
strategy

- ◆ all PFOs are clustered with SatoruJetFinderWithCheatProcessor_6Jet
- ◆ the jets with the smallest and second smallest number of PFOs are assigned as the two charged leptons
- ◆ the other four jets are paired using the realistic pairing algorithm

Invariant mass of Z



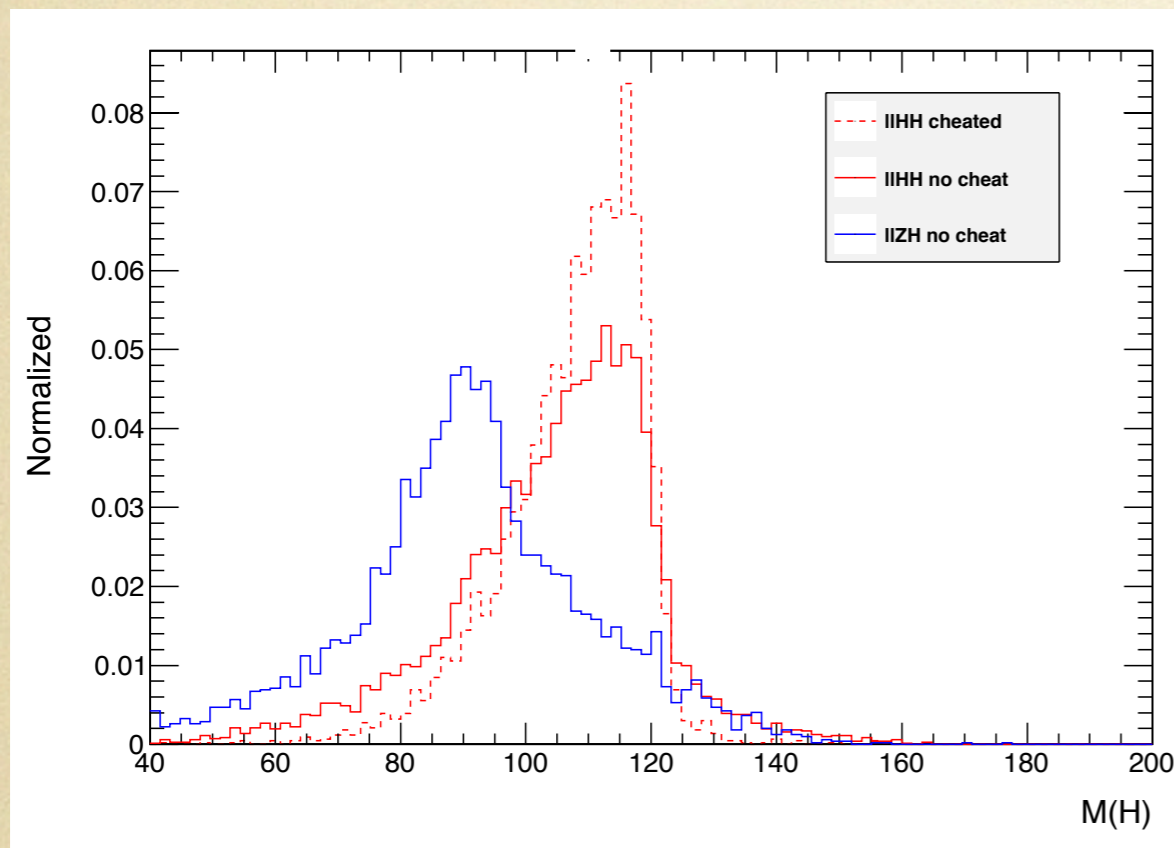
Invariant mass of Higgs



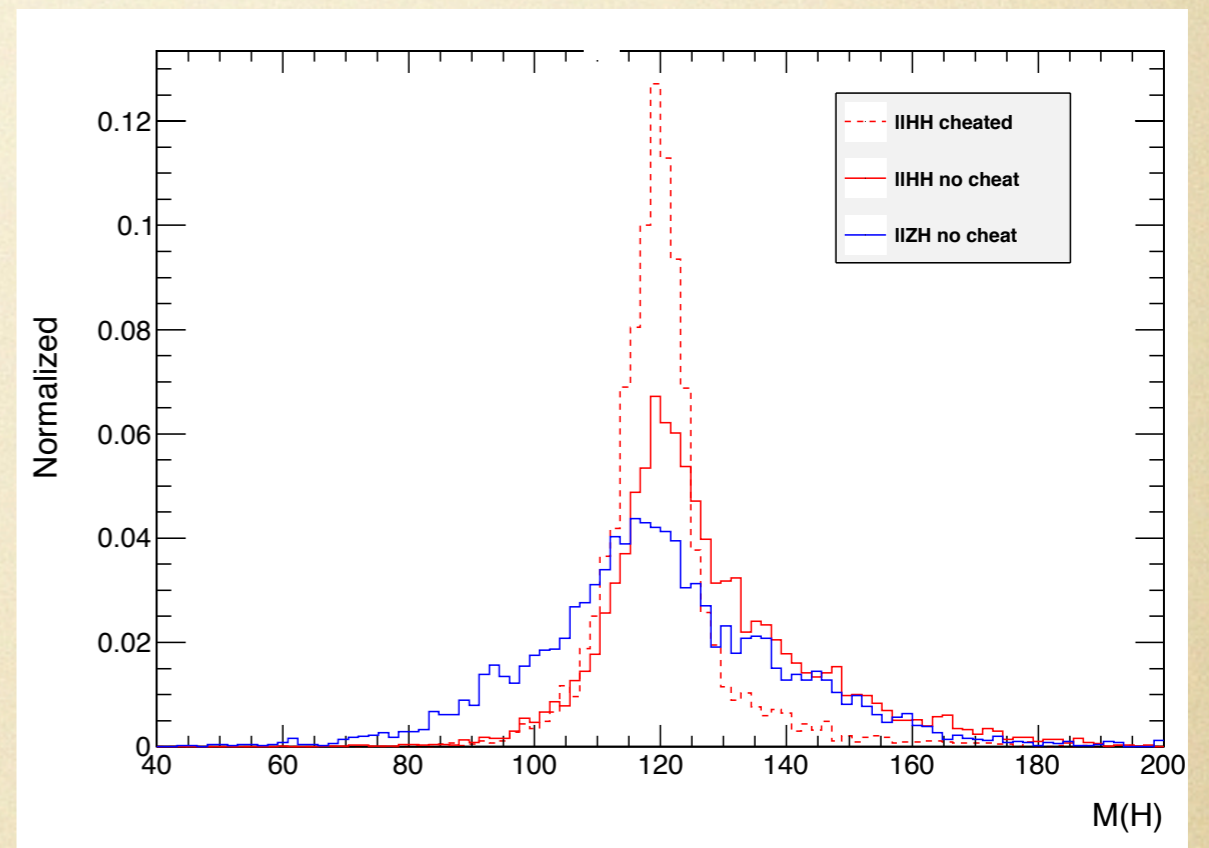
two Higgs are combined

comparison with $llZH(ZZH)$

Invariant mass of Higgs (smaller)



Invariant mass of Higgs (larger)

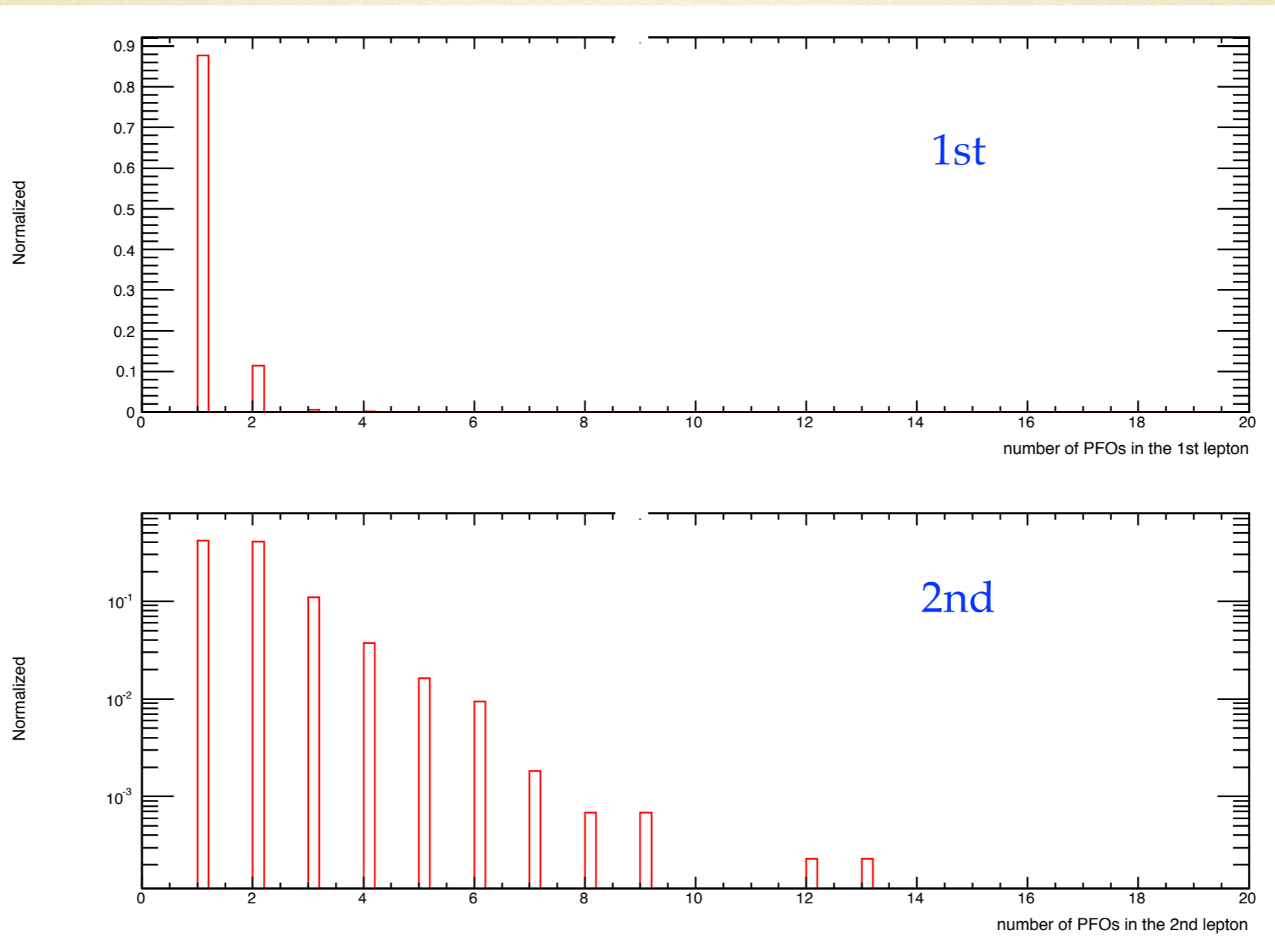


red dashed: $llHH$ cheated
red solid : $llHH$ no cheating
blue solid : $llZH$ no cheating

number of PFOs in a charged lepton jet

(from cheated jet clustering)

eeHH

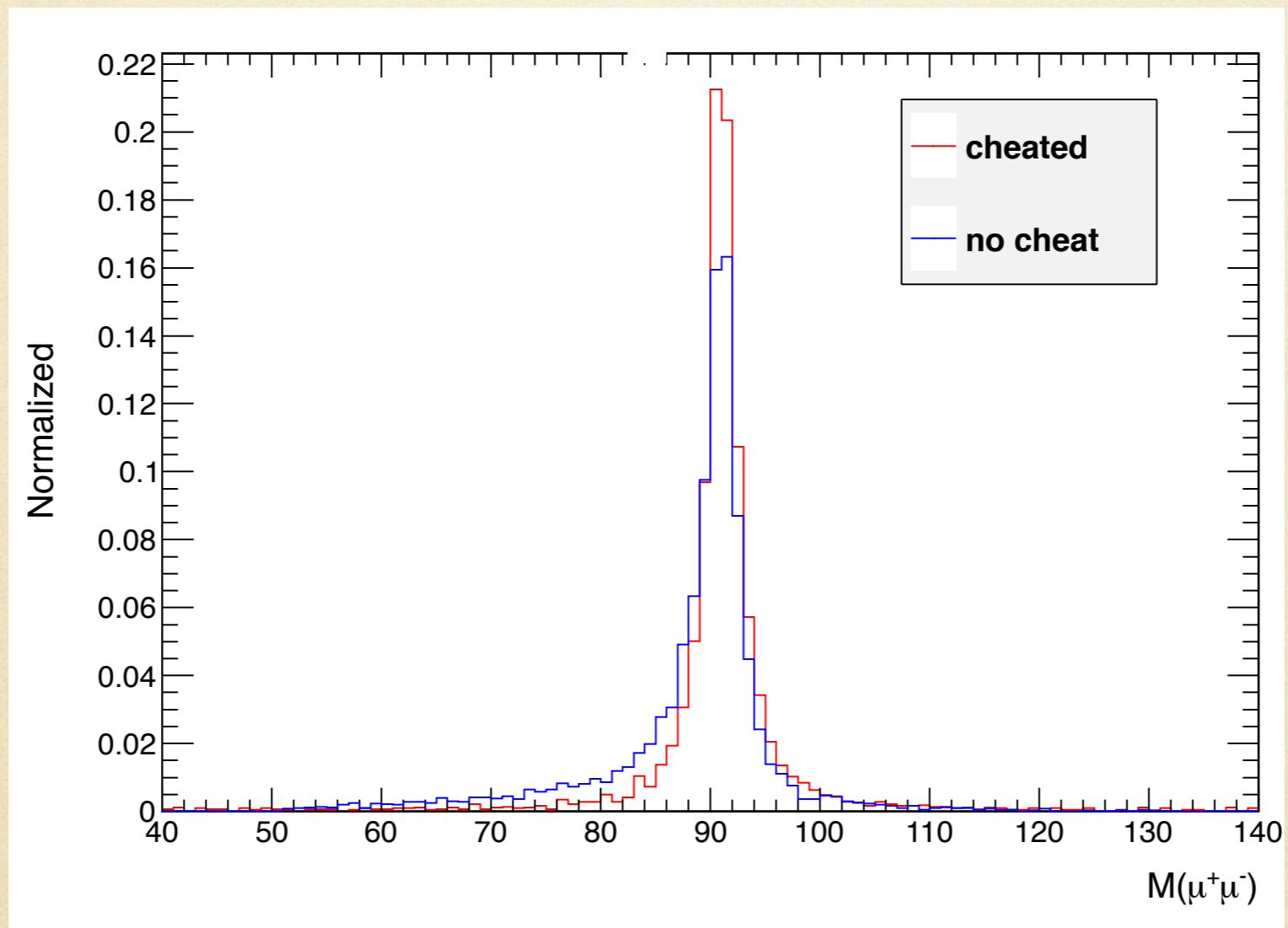


summary and to do

- two processors used for cheated jet clustering are prepared, and tested for the case of llHH samples. It should be straightforward to use for other processes except the pure partonic process (bbbb, bbc_sdu)
- much better Higgs mass resolution in the cheated case.
- number of PFOs in the lepton jet is a useful hint for real analysis.
- flavor part now is not included in the cheating. for the purpose of setting the most optimistic performance, probably one more processor is needed to tag the long life particles (cheating).

backup

muon mode



number of PFOs in a charged lepton jet

(from cheated jet clustering)

uuHH

