INFN
Istituto Nazionale
di Fisica Nucleare

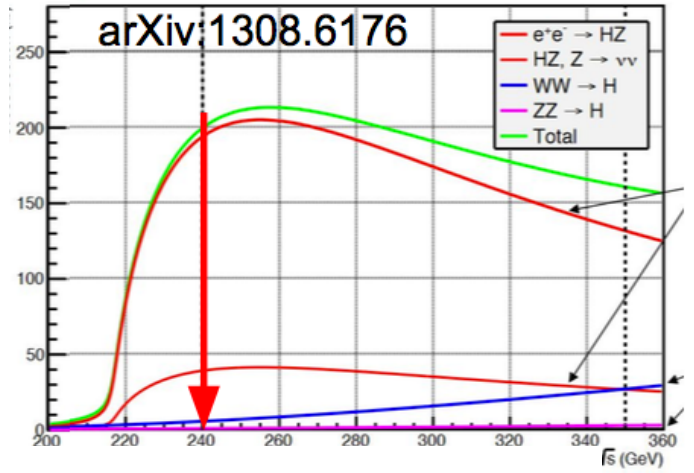
ZH analysis with Higgs to hadron & Z invisible at FCC-ee detector performance studies

IDEA physics and software meeting

Reham Aly

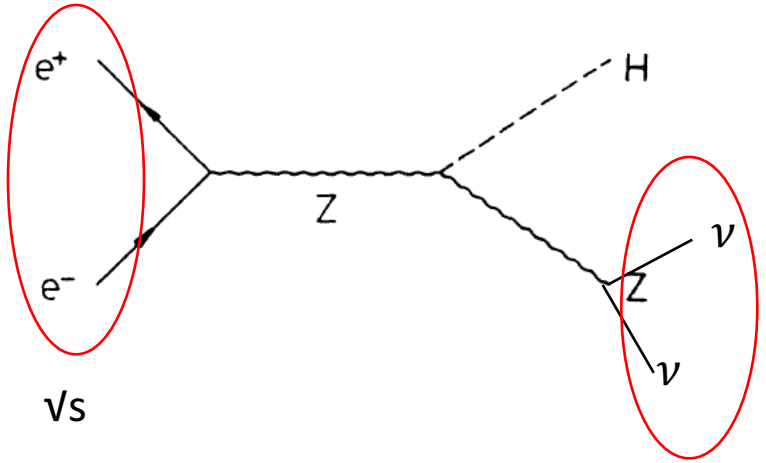
Overview

ZH analysis promising probe for precise Higgs sector measurements:
- Precise Higgs mass measurement



Signal: e+ e- → Z H → $\nu\,\nu$ + Jets

- Higgs–strahlung dominated at 240 GeV center-of-mass energy
- H → bb can be used to enhance precision of mass measurement



Signal extraction: peak at Higgs mass (reconstructed from jets), recoil mass distribution around Z peak . Peak width dominated by detector resolution.

Signal sample

As quick start:

1- FCC startkit prepared examples
2- Reproduce some basic plots from Z(ll)H recoil analysis.
3- Move to Z($\nu\nu$)H(hadronic)

Monte Carlo Campaign:

- Center of mass energy 240 GeV, luminosity 5 /ab
- nominal Higgs mass 125.00 GeV
- IDEA detector response modelled with Delphes.

Produced by Michele & Jan

Signal samples: (Available)

- ZH(bb)
- ZH(cc)
- ZH(gg)
- ZH(qq)

With different IDEA detector configurations:
1- IDEA baseline
2- IDEA + CMS Calorimeter
3- IDEA + CLD Tracker

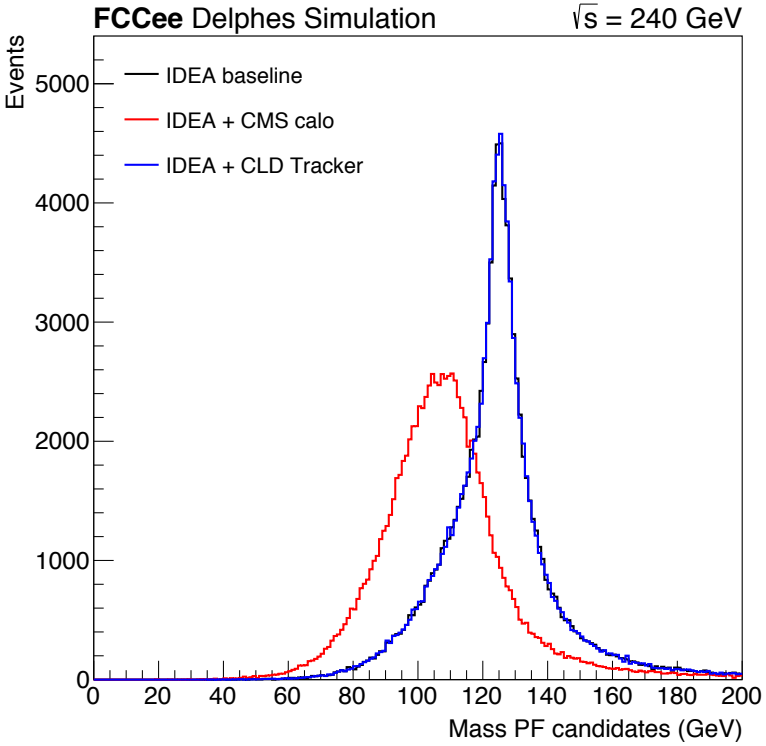
Analysis

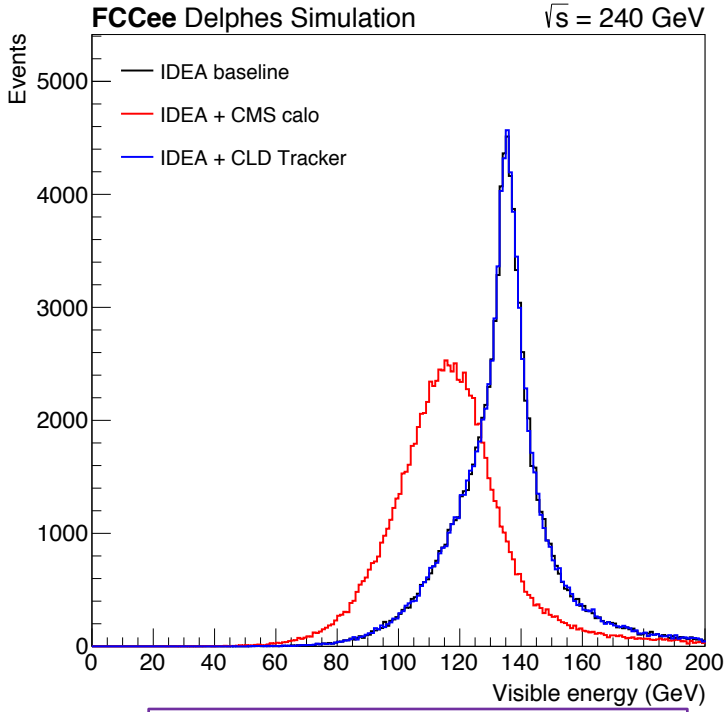
- Started with ZH(bb) signal sample.

1- Producing the PF candidates total mass & visible energy
2- Producing the recoil mass distribution

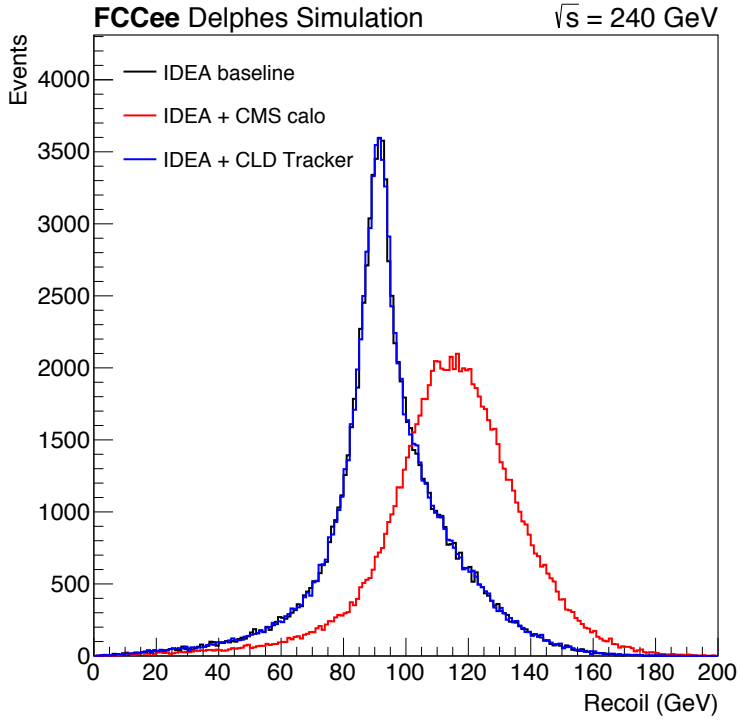
Aim:
- Studying ZH process in order to allow studying/optimization of detector designs

Very Preliminary

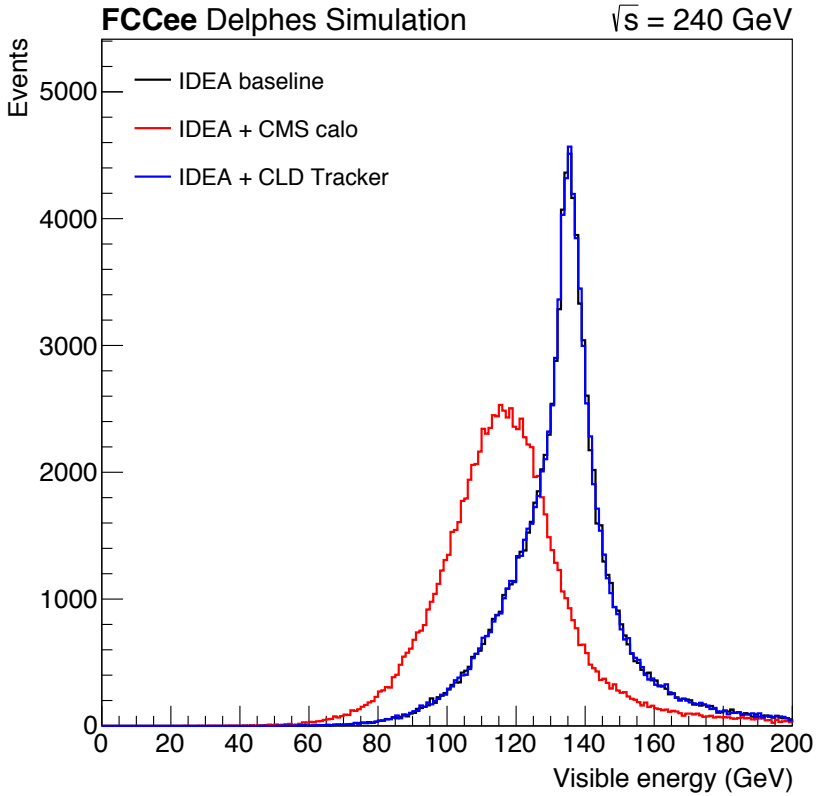




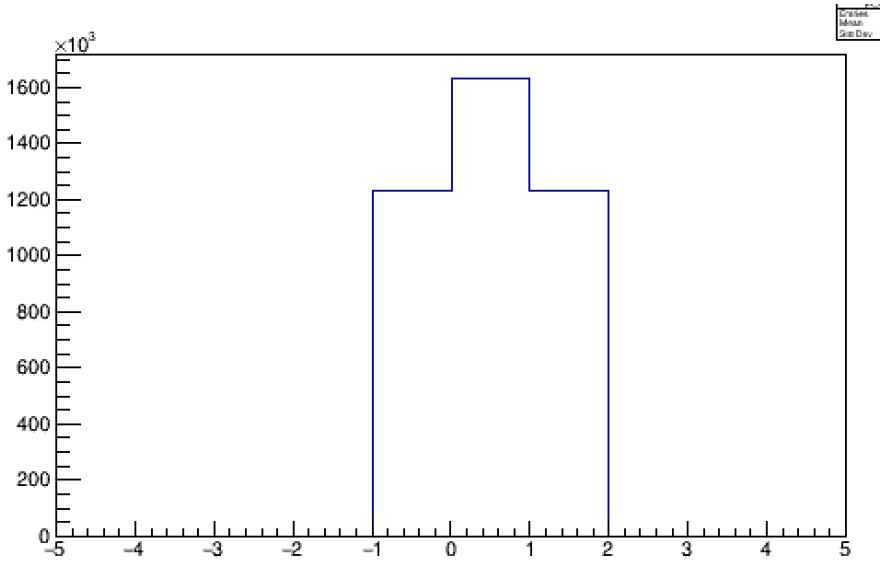
Scalar sum of PF energy



Analysis



Look at charge



Factorize the PF candidates to neutral/charged cndidates

Ongoing /Next step

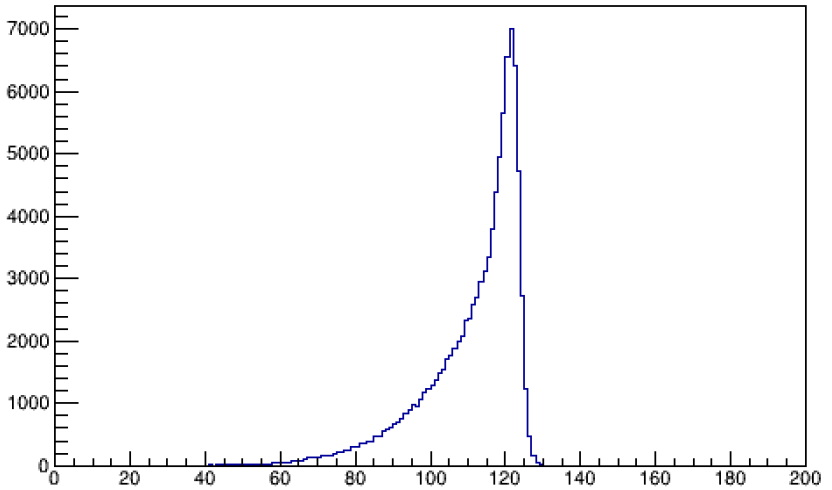
1- Storing Gen Level information & after detector simulation => **DONE : to be circulated/ uploaded**

2- Producing basic distributions => **DONE : to be circulated/ uploaded**

2- Comparing the distributions at Gen level and after detector simulation=> **ongoing**

3- Reconstructing the Higgs mass from highest 2 b-jets => **DONE**

4- Figure out the difference in the distributions obtained between IDEA detector simulation & IDEA+ CMS Calo



Di-bjet mass