

# Get Started with CEPC Software

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# Day 1

## Subjects:

- Setup the software
- Try to simulate a particle in the detector, and reconstruct it
- Display the particle

## Optional:

- Modify the detector model and visualize it
- Know how to read the database
- Simulate and reconstruct a ZH event using generator



# Day 2

Subjects:

1. Know how to extract information from LCIO files
2. Read root files

Optional:

1. Try to make a processor reading information you are interested in



# Day 3

Subjects:

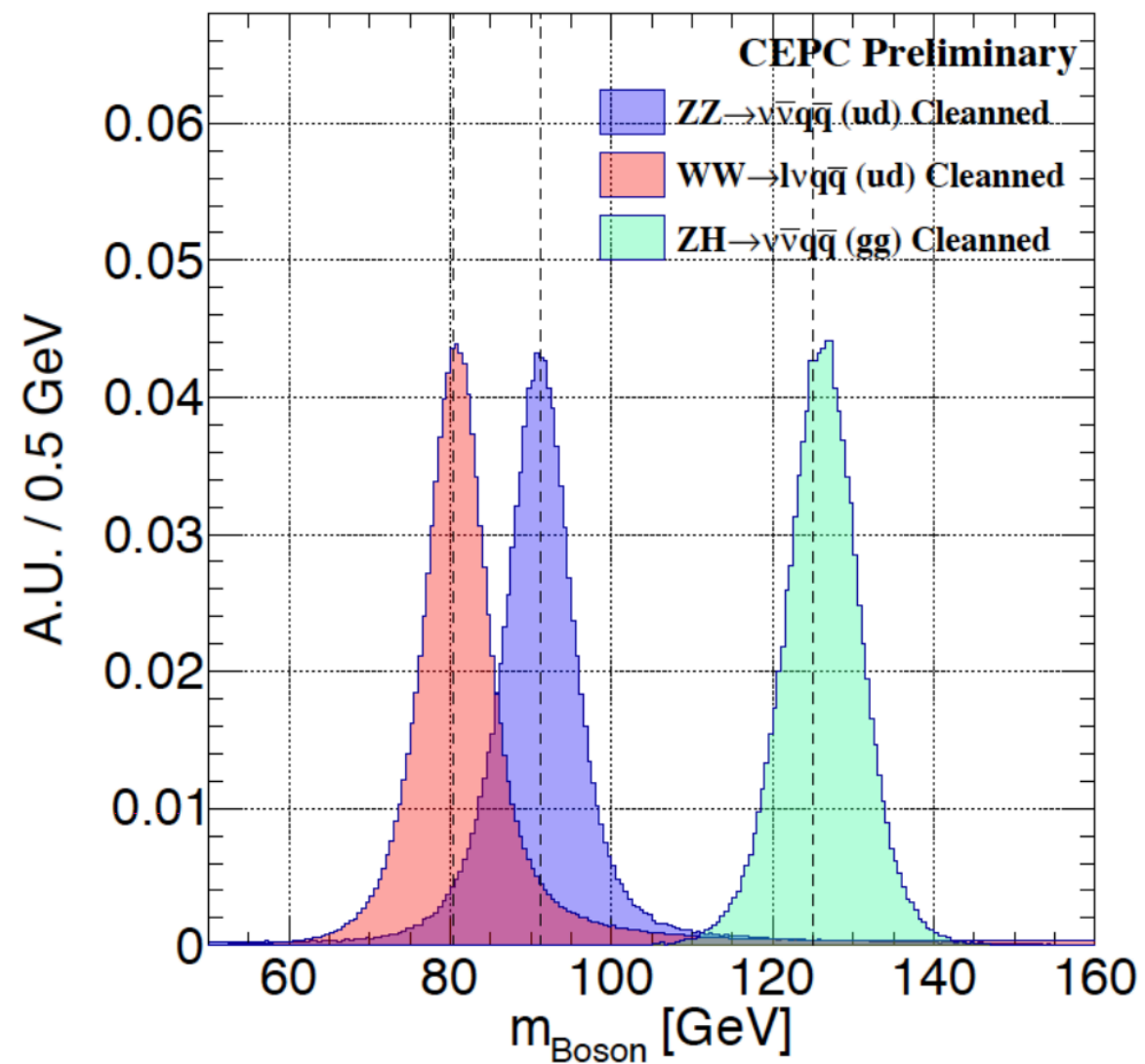
1. Calculate the recoil mass of  $\mu\mu$  in  $\mu\mu H$  events
2. Calculate the invariant mass of di-jets in  $vvH(H \text{ to } gg)$  events

Optional:

1. Calculate the recoil mass of  $ee$  in  $eeH$  events
2. Calculate the invariant mass of di-jets in  $ZZ/WW$  events

# Analysis – BMR

- BMR-boson mass resolution (separation of Z/W/H)
- Processor: TotalInvMass

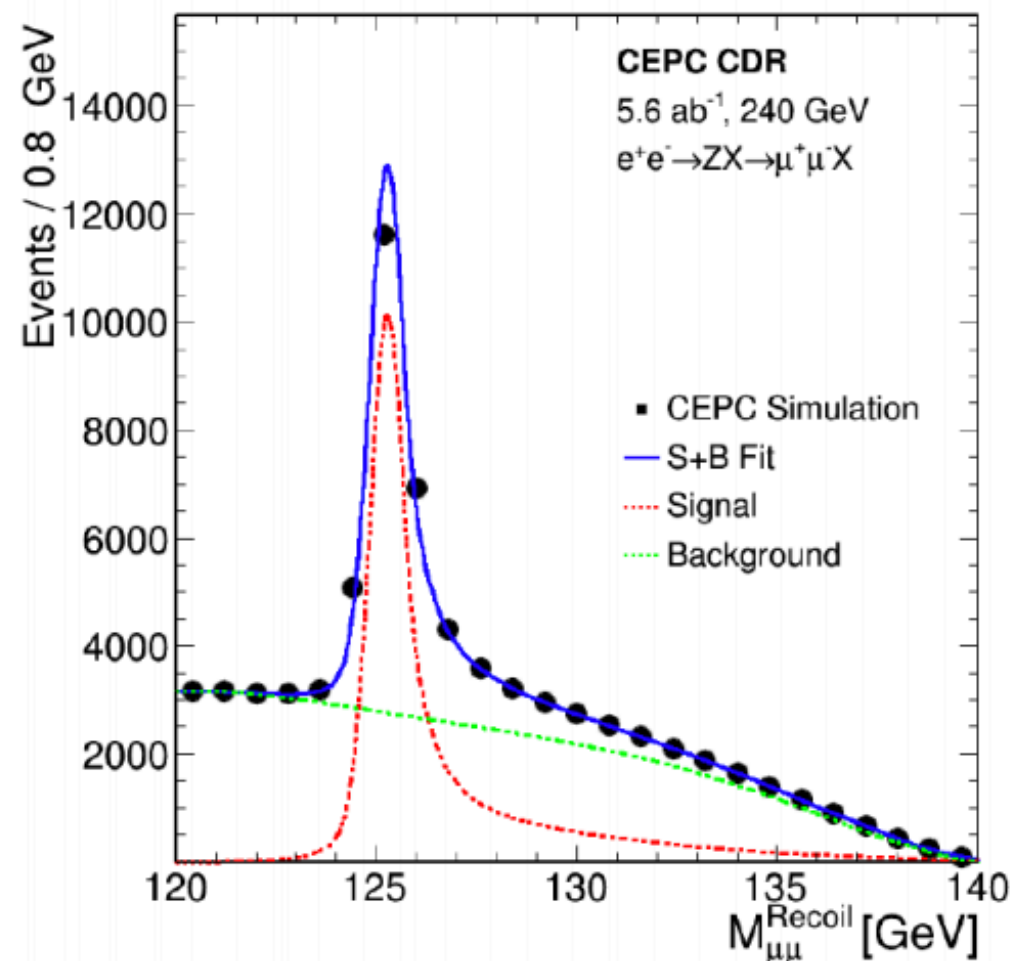


# Analysis – BMR

- Signal:  $vvH, H \rightarrow gg$ 
  - Mass: visible invariant mass
- What matters:
  - PFA
  - Detector
- Other effects:
  - ISR photons
  - neutrinos from Higgs
  - jets shooting to the endcaps

# Analysis – RecoilM

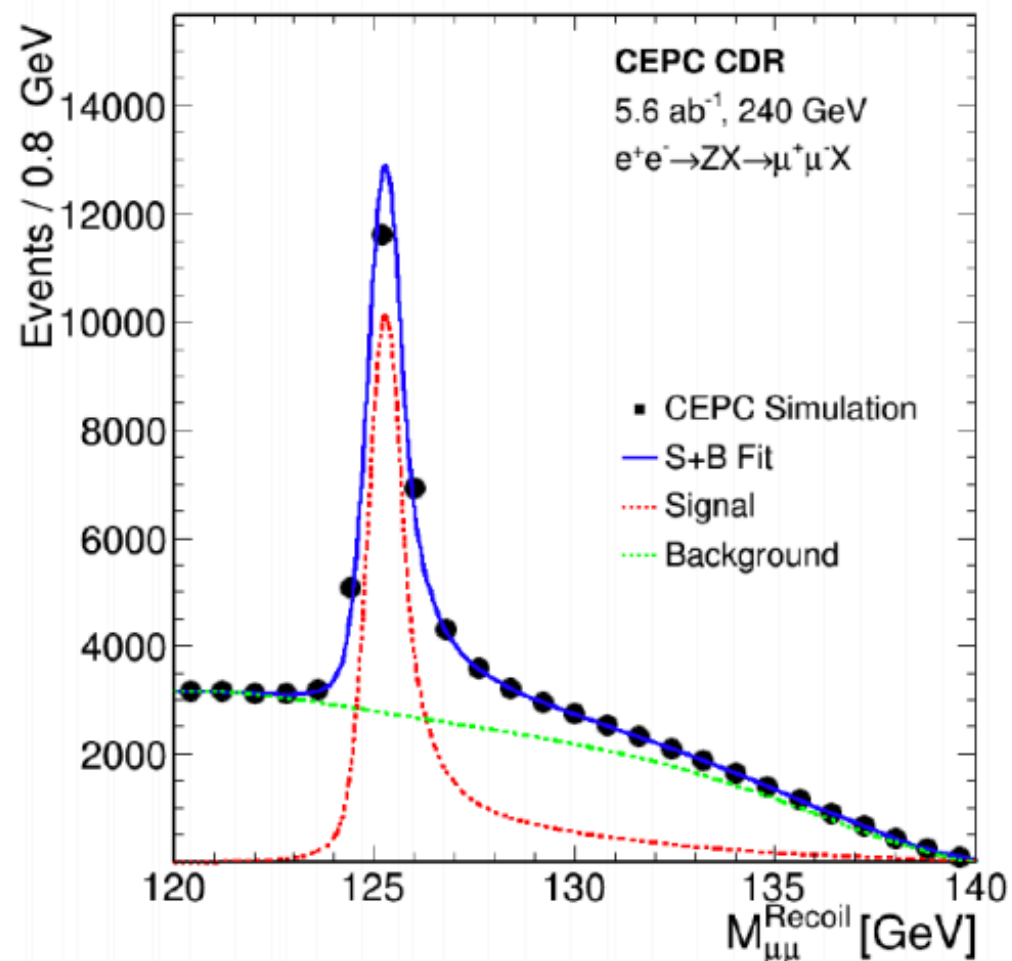
- Independent measurement
- Processor: HiggsRecoil





# Analysis – RecoilM

- Signal:  $\mu\mu H$
- Recoil mass: model independent measurement





# RooFit

- Data Modeling
- Design
  - Variable: RooRealVar
  - Function: RooAbsRead
  - PDF: RooAbsPdf
  - Space point: RooArgSet
  - list of space point: RooAbsData

- Optimal utilization of variables
- Method: BDTG (Boost Decision Tree with Gradient boosting)
- Classification -> weight file -> application

# Working Time

- Reconstruct 100 event of  $zz$  semi-lepton decay, and draw the BMR
- Train the signal/background of  $e\bar{e}h$
- Get the recoil mass plot of  $e\bar{e}h$



# Analysis-PID

- If interested

**Backup**

# backup

- <http://cepcsoft.ihep.ac.cn/guides/scratch/docs/local/#install-cepcenv>
- `apt-get install libtool*`
- `find / -name "libstdc++.so.6"`
- `cp /*/libstdc++.so.6 $CEPCSOFT/GCC/lib64/.`



# Database

- `mysql -h 202.122.37.75 -uconsult -pconsult`
- `>show databases;`
- `>use models03;`
- `show tables;`
- `describe model;`
- `select * from model where name="CEPC_v4";`
- `select * from sub_detector where name="SEcal05";`
- `select * from sharing where driver="SEcal05";`
- <https://indico.ihep.ac.cn/event/4287/contribution/24/material/slides/0.pdf>

File Camera

Style | Guides | Clipping | Extras

Name \_\_\_\_\_

GLViewer::TGLSAViewer

Update behaviour \_\_\_\_\_

Ignore sizes

Reset on update

Update Scene

Camera Home

Max HQ draw time:

Max LQ draw time:

Clear Color

Light sources:

Top

Bottom

Left

Right

Front

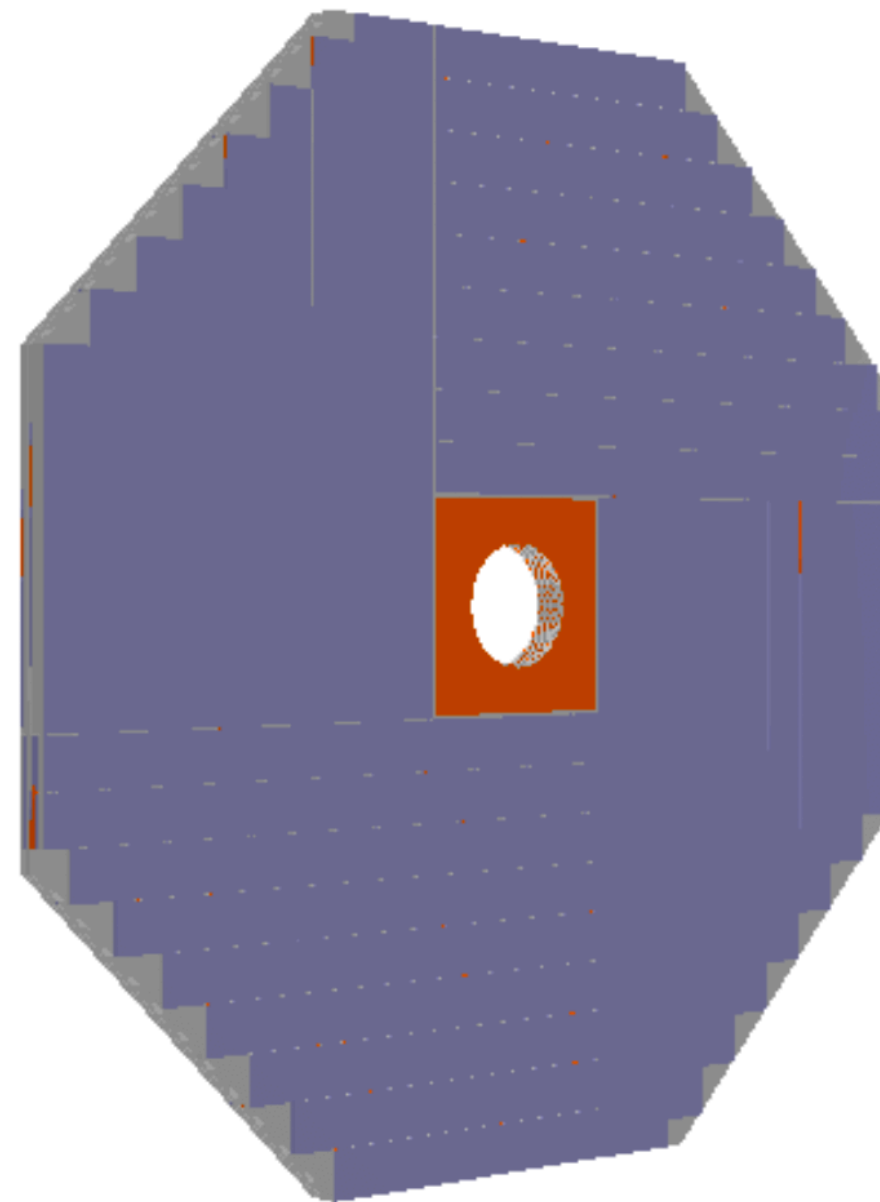
Specular

Point-size scale:

Line-width scale:

Wireframe line-width:

Outline line-width:



```
cepc@cepc-virtualbox:~/CEPC/Fatting/STMS$ root -l
root [0] TGeoManager::Import("EndCapLog.gdml")
Info in <TGeoManager::Import>: Reading geometry from file: EndCapLog.gdml
Info in <TGeoManager::TGeoManager>: Geometry GDMLImport, Geometry imported from
GDML created
Info in <TGeoManager::SetTopVolume>: Top volume is EndCapLog. Master volume is E
ndCapLog
Info in <TGeoNavigator::BuildCache>: --- Maximum geometry depth set to 100
Info in <TGeoManager::CheckGeometry>: Fixing runtime shapes...
Info in <TGeoManager::CheckGeometry>: ...Nothing to fix
Info in <TGeoManager::CloseGeometry>: Counting nodes...
Info in <TGeoManager::Voxelize>: Voxelizing...
Info in <TGeoManager::CloseGeometry>: Building cache...
Info in <TGeoManager::CountLevels>: max level = 3, max placements = 1119
Info in <TGeoManager::CloseGeometry>: 34320 nodes/ 10 volume UID's in Geometry i
mported from GDML
Info in <TGeoManager::CloseGeometry>: -----modeler ready-----
---
(class TGeoManager*)0x1608f10
root [1] gGeoManager->GetTopVolume()->Draw("ogl")
Info in <TCanvas::MakeDefCanvas>: created default TCanvas with name c1
root [2] TFile *f=new TFile("EndCap","recreate")
root [3] gGeoManager->Write()
(Int_t)35409
root [4] f->Close()
root [5]
```



# ROOT—In Case

- <https://root.cern/>
- [https://docs.google.com/presentation/d/189f0qsDEnMSk2R5KWLRPz2TdEV5kTfXH1VcuAra4cnU/edit#slide=id.g2a150e6c26\\_0\\_0](https://docs.google.com/presentation/d/189f0qsDEnMSk2R5KWLRPz2TdEV5kTfXH1VcuAra4cnU/edit#slide=id.g2a150e6c26_0_0)