

TAURUS The Tau Reconstruction Package For CEPC

Dan YU
Institute of High Energy Physics

Introduction

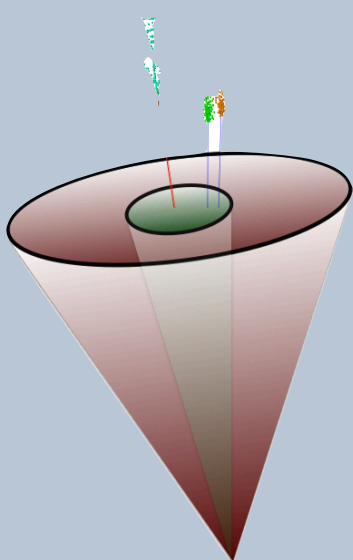
Two different τ finding algorithms are developed corresponding to the leptonic events and hadronic events (corresponding to if the final state includes jets).

The combine accuracy for CEPC τ channel is 0.8%

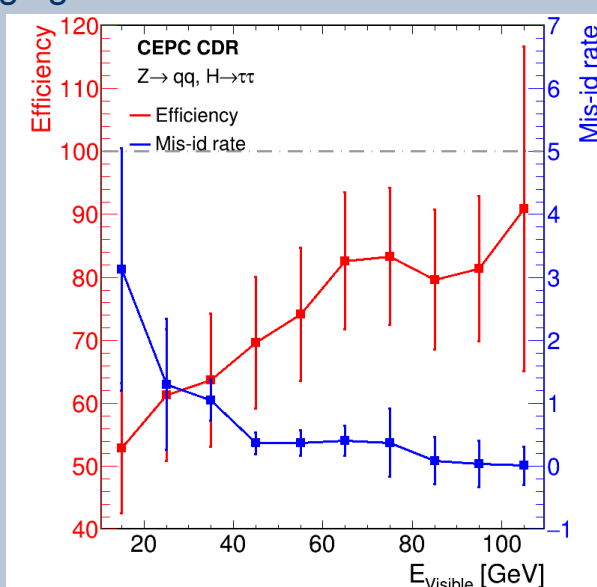
Hadronic Channel (τ reconstruction)

TAURUS (Tau ReconstRuction)

- Find seeds(Tracks with enough energy)
- Collect particle in two cones
- Use the multiplicity, energy ration between two cones, invariant Mass for τ tagging

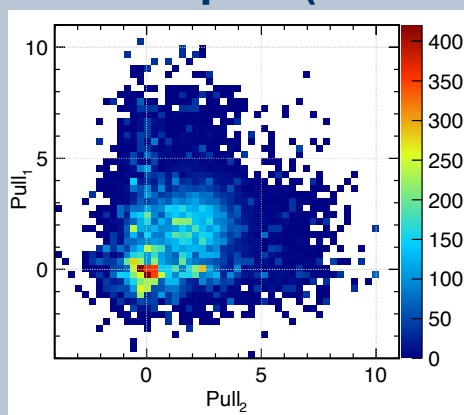


cone-based τ finding

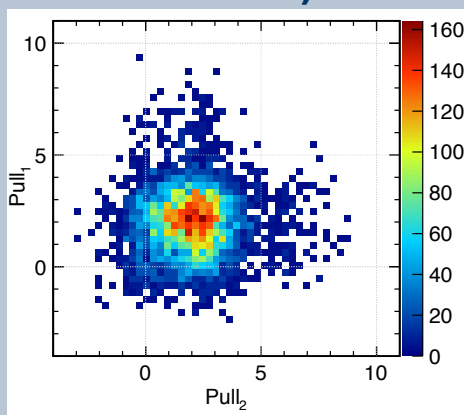


efficiency and mis-identification rate in ZH to $q\bar{q}\tau\tau$ events

Pulls of τ pair (After event selection)



Impact parameter of the leading τ pair (Inclusive background)



Impact parameter of the leading τ pair (signal)

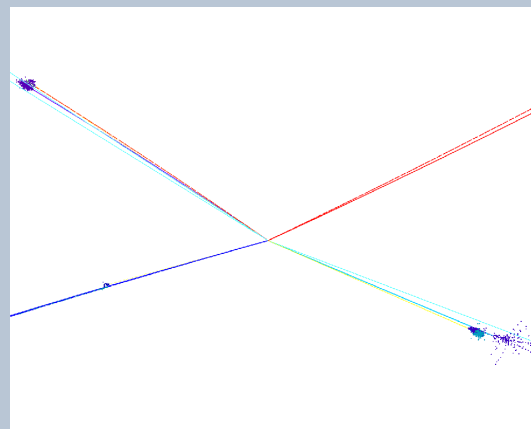
Result

The final accuracy of H to $\tau\tau$ channel is:

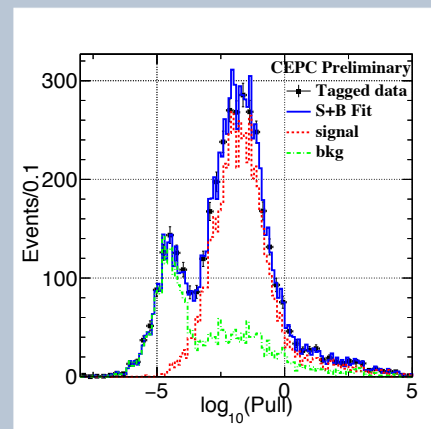
	BR()	$\Delta(\sigma \times BR)/(\sigma \times BR)$
$\mu\mu H$	6.40	2.6
$ee H$	6.37	2.7
$\nu\nu H$	6.26	2.7
$q\bar{q} H$	6.23	0.9
combined	6.28	0.8

Lepton Channel (Event Selection)

- Veto the two isolate lepton
- Divide the whole space into 2 part
- Use the multiplicity and impact parameter for $\pi\pi$ event selection.
- Fit the impact parameter for signal and background statistics



Topology of $\mu\mu H$ with H to $\tau\tau$ event

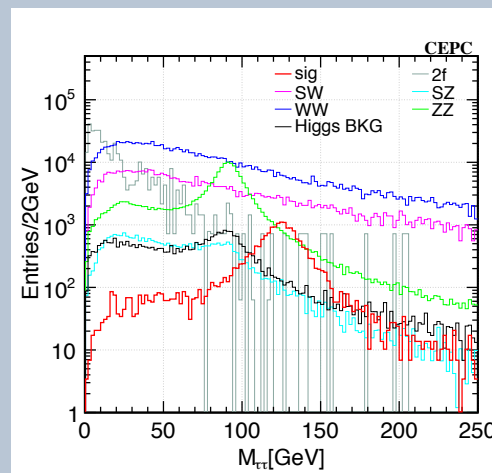


The impact parameter after the $\tau\tau$ event selection (Leptonic)

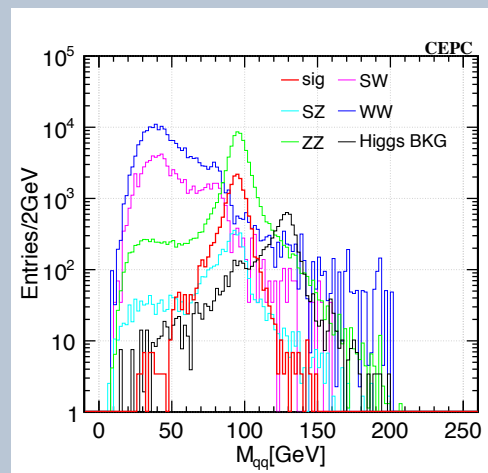
Hadronic Channel (Event Selection)

The leading τ pair with opposite energy are selected as the Higgs decayed τ s, and the rest particle are treated as $q\bar{q}$ pair, to calculate:

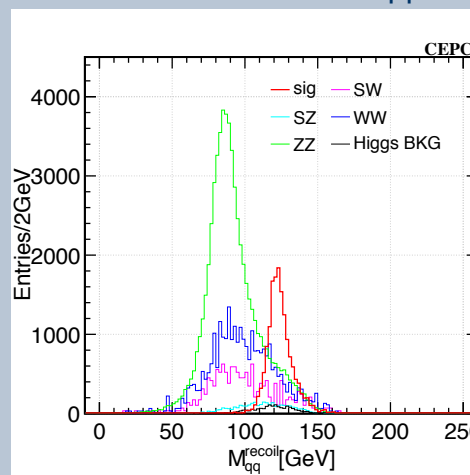
- The τ pair mass using collinear approximation
- The invariant mass of $q\bar{q}$ system
- The recoil mass of $q\bar{q}$ system



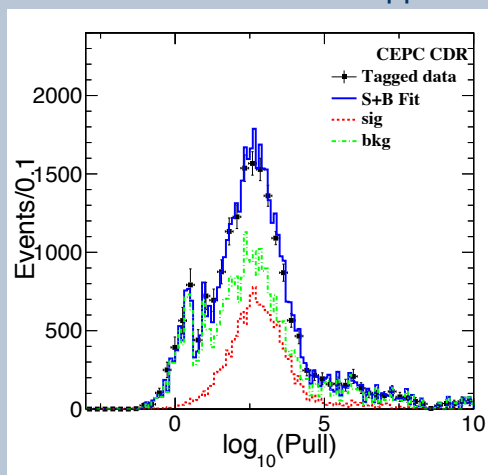
The collinear τ pair mass
a cut of 90-160 GeV is applied



The $q\bar{q}$ system mass
a cut of 70-110 GeV is applied



The $q\bar{q}$ recoil mass
a cut of >100 GeV is applied



The impact parameter after the $\tau\tau$ event selection (hadronic)