

RECONSTRUCTION OF TAU EVENTS IN CEPC

ILC Annual Meeting

Plan

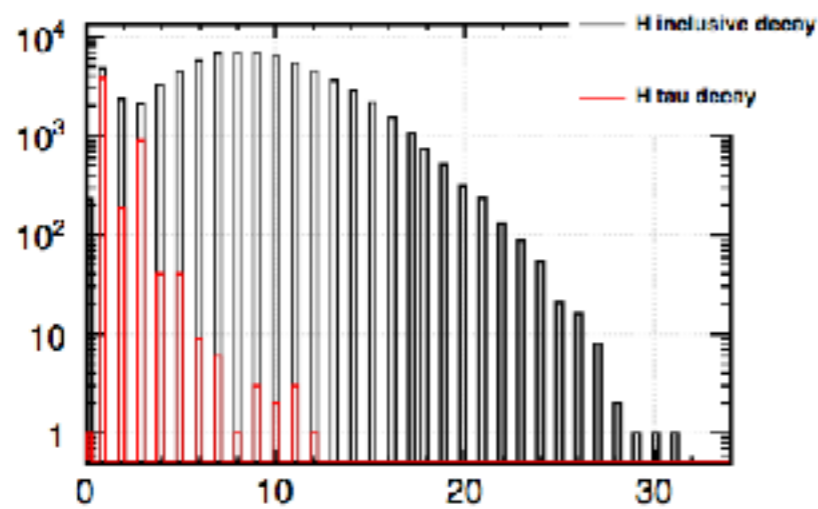
- ❖ Di-Tau recognition
- ❖ Photon reconstruction

Di-Tau Finder ($\mu\mu H$)

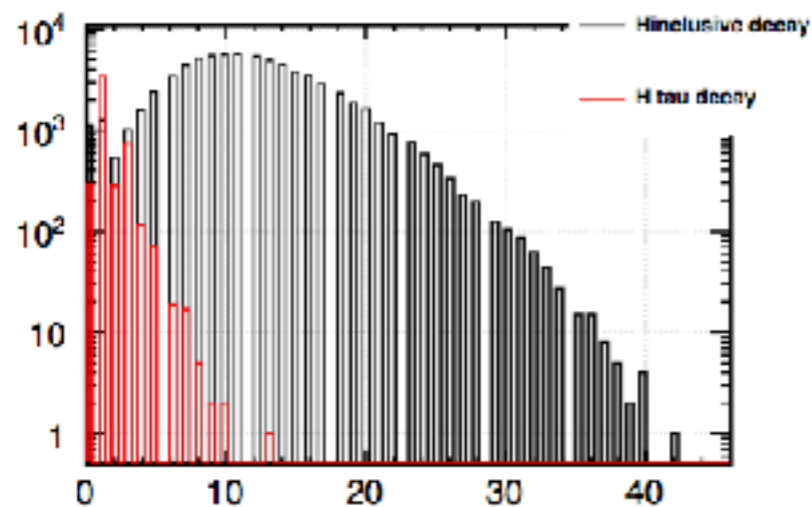
- ❖ Event: $\mu\mu H$
- ❖ Idea: Counting (N_Tracks & N_Photons)
- ❖ Step:
 - ❖ Muon veto (Inv M \sim Z_Mass)
 - ❖ Find leading track (get direction)
 - ❖ Collect particles nearby (cone 1.0)
 - ❖ Collect particles in the other direction
 - ❖ Count number of tracks and photons (in two direction A & B)
 - ❖ Get track-track cones, track-photon cones

Di-Tau Finder

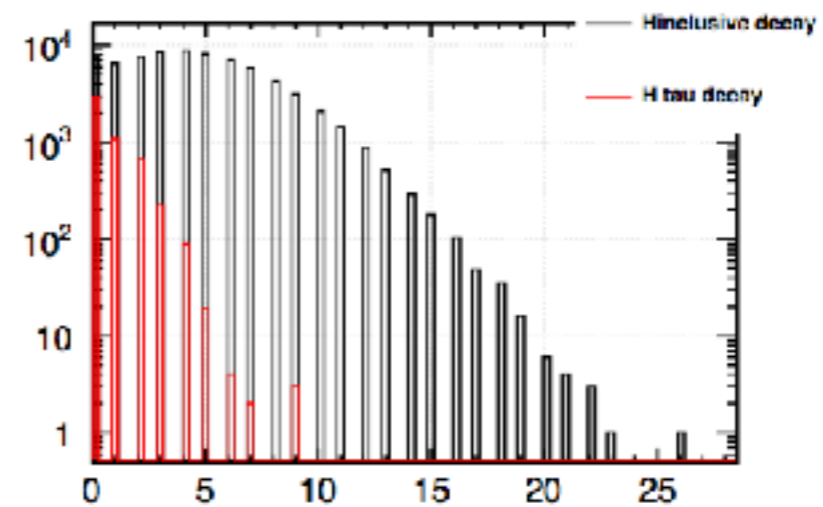
- ❖ Number of tracks and photons in cone A and cone B



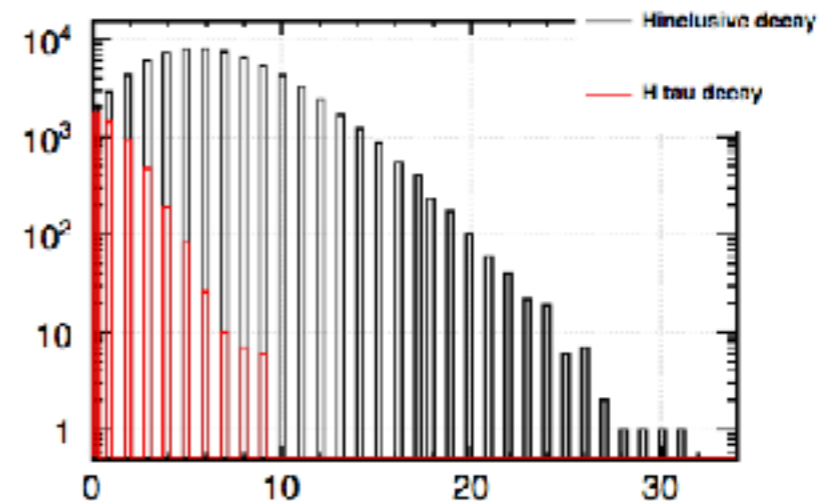
BrecoNch (MCTauNumber!=2)



ArecoNph (MCTauNumber!=2)

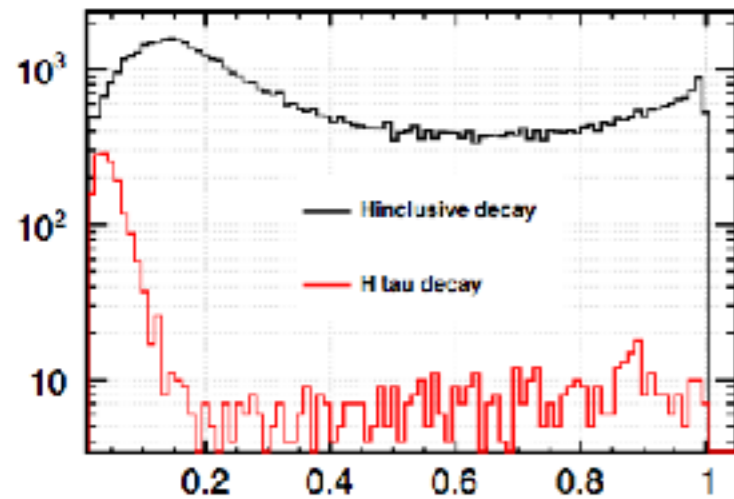


BrecoNph (MCTauNumber!=2)

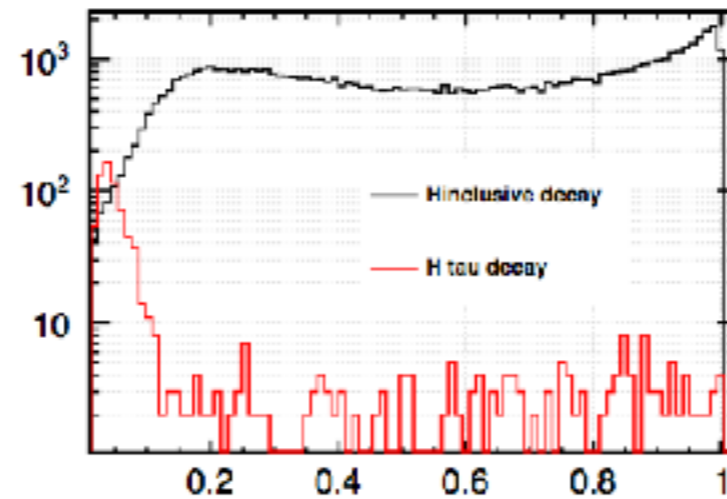


Di-Tau Finder ($\mu\mu H$)

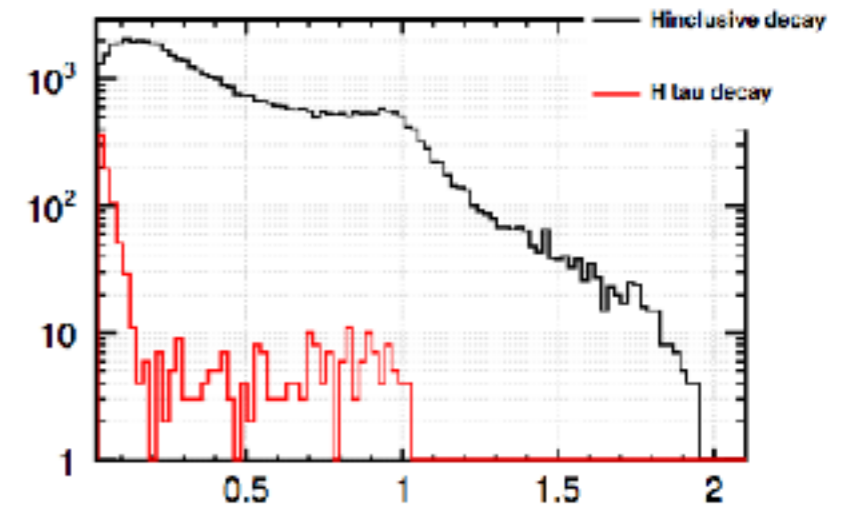
Acone1 {MCTauNumber!=2}



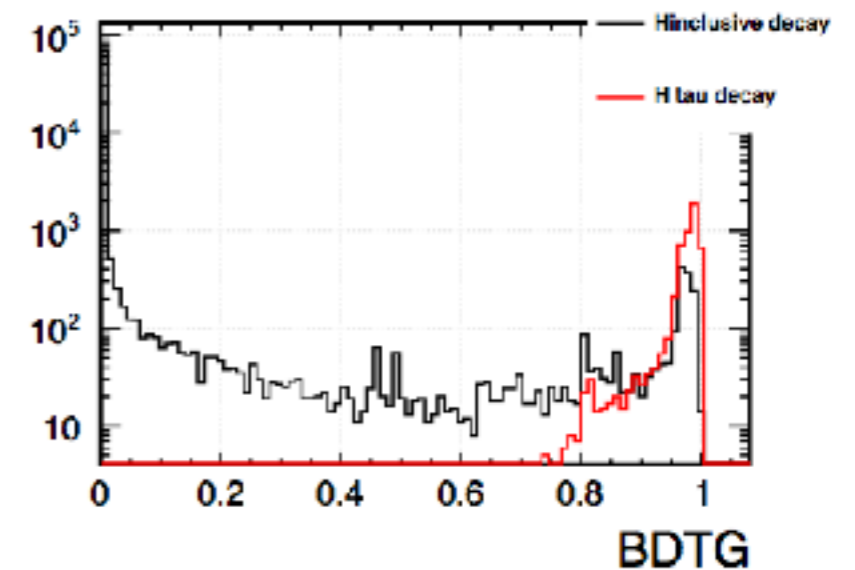
Acone2 {MCTauNumber!=2}



Acone3 {MCTauNumber!=2}

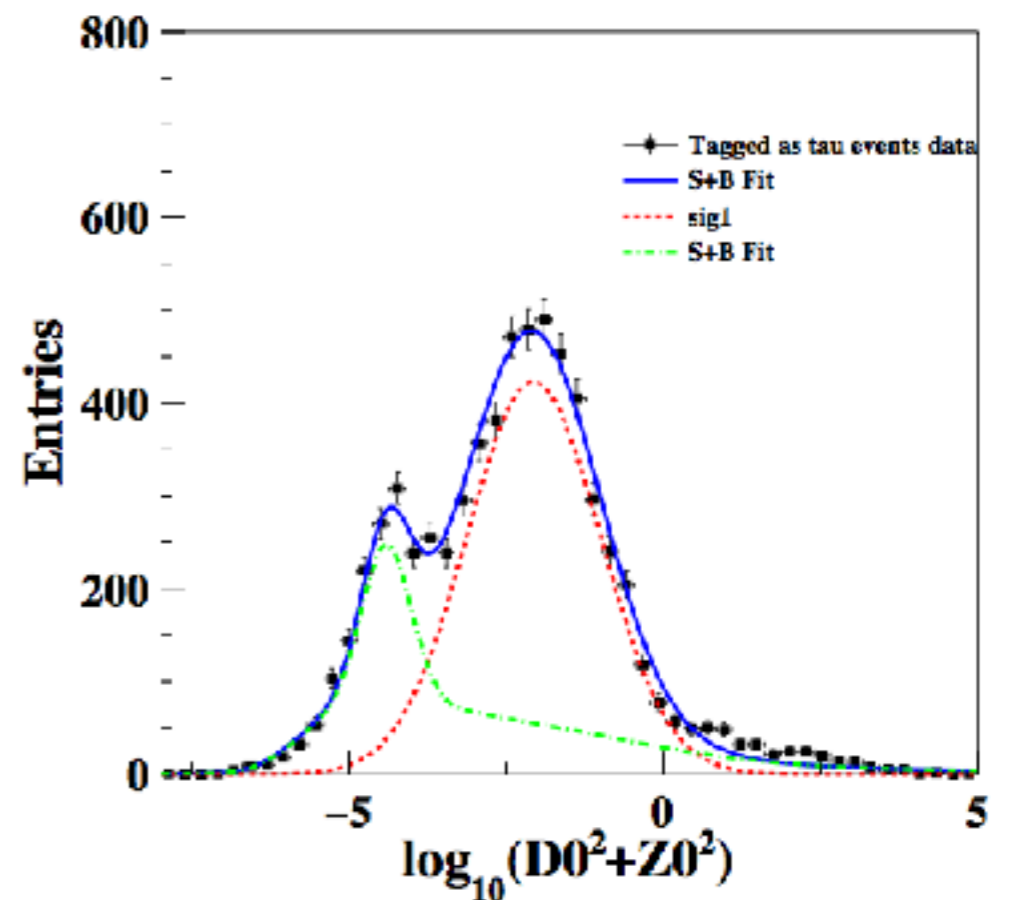
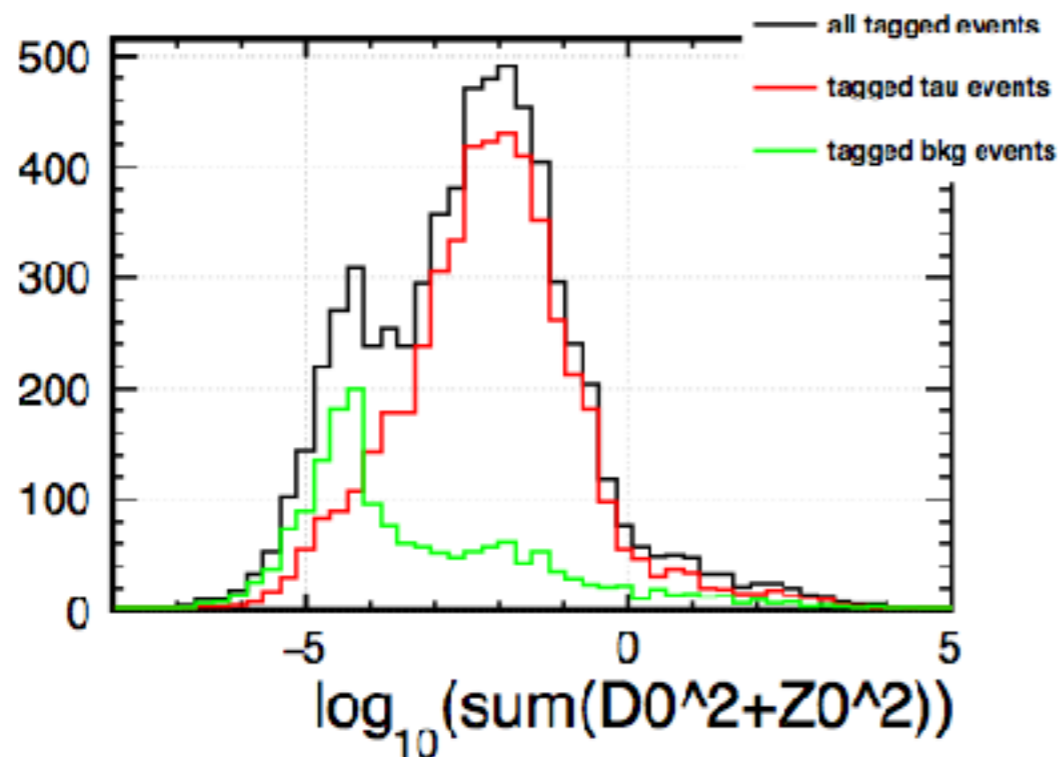


- ❖ TMVA_BDTG: cut 0.78
- ❖ Sample: total events: 78362 Sig: 4966 Bg: 73396
- ❖ after TMVA_BDTG: Sig: 4890 Bg: 1686
 - ❖ sig eff 98.47% purity:74.36%
- ❖ Compared with Kyushu University
 - ❖ eff 58.1%; purity 94.2%



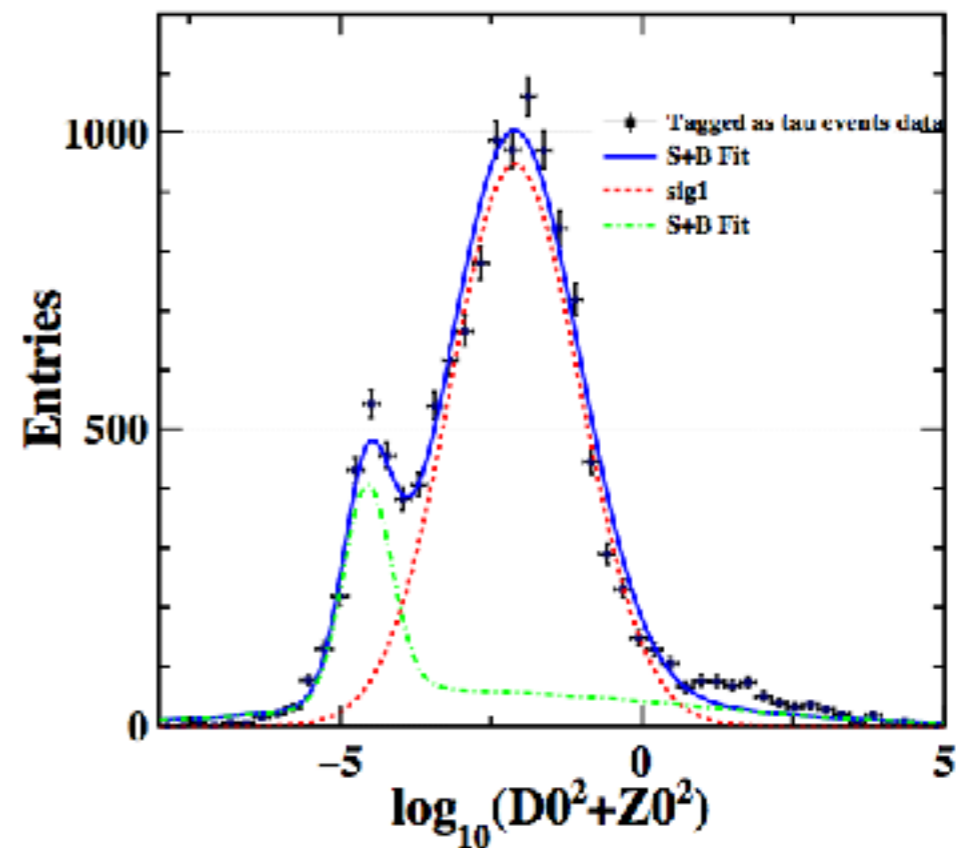
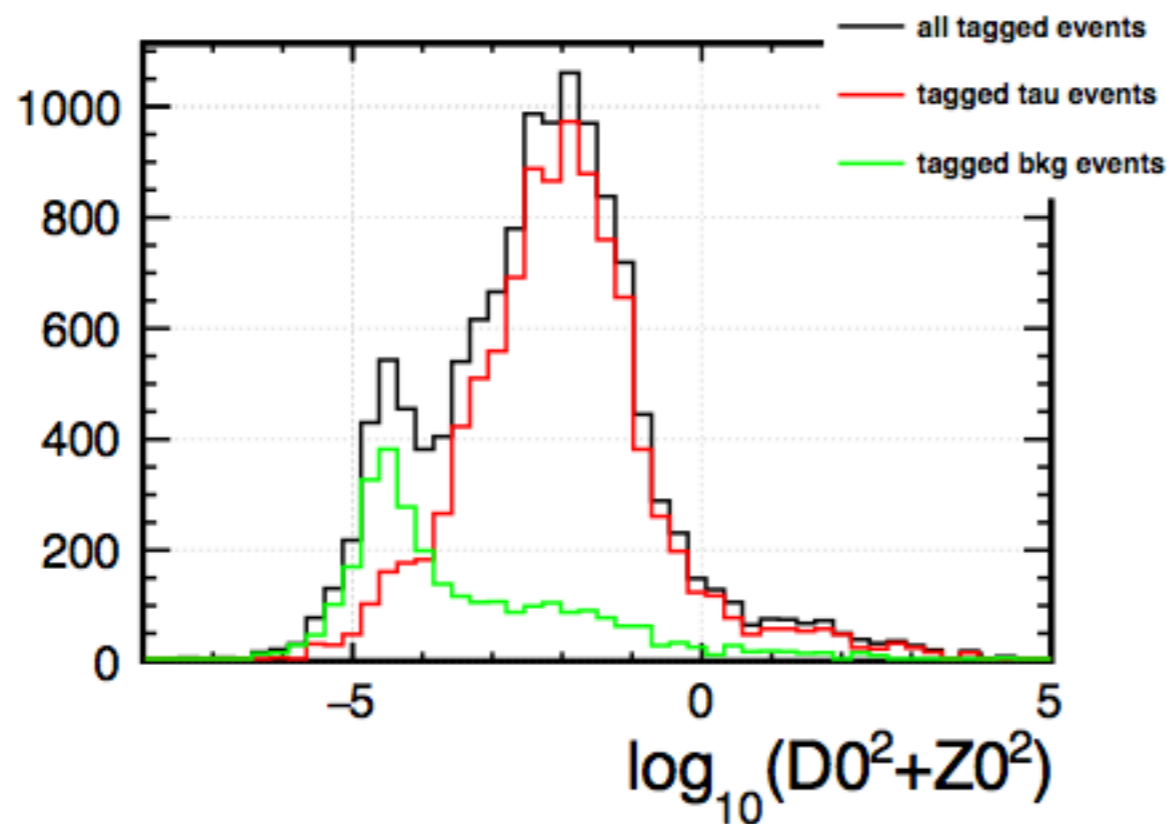
Higgs inclusive Backgrands

- ❖ $H \rightarrow WW^*$ & $W \rightarrow \text{leptons}$ (including taus)
- ❖ Impact parameters: D_0, Z_0 (Sum of leading track in two cone)
- ❖ Fit result:
 - ❖ sig: $4.6582e+03 \pm 8.15e+01$
 - ❖ BR: $6.12 \pm 0.08 \pm 0.10 \%$



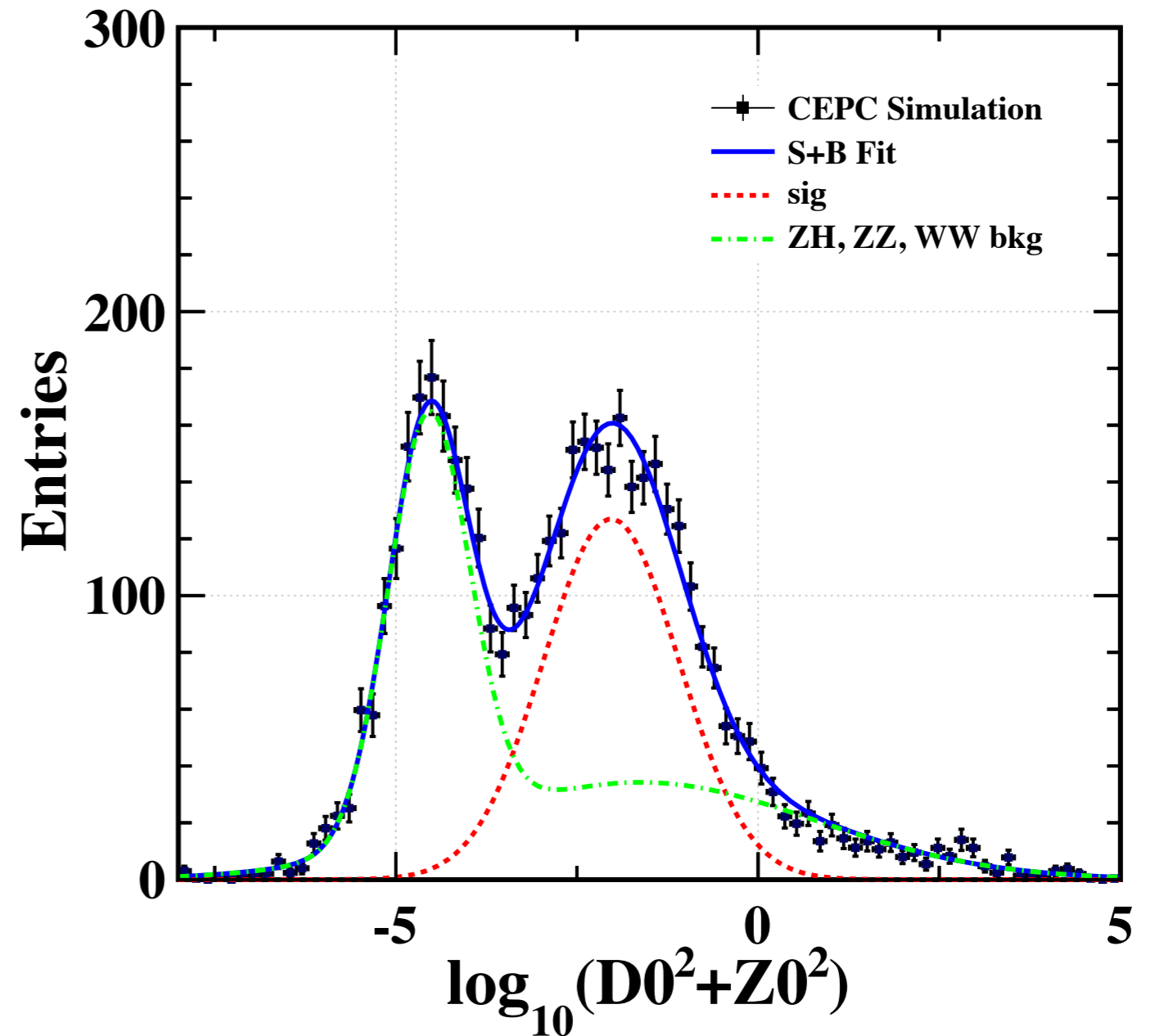
Di-Tau Finder (nnh)

- ❖ Sample: total events: 156488 Sig: 10028 Bg:146460
- ❖ after TMVA_BDTG: Sig: 9852 Bg: 2971
 - ❖ sig eff 96.24% purity:76.83%
- ❖ Fit result:
 - ❖ sig: $9.5930e+03 \pm 1.12e+02$
 - ❖ BR: $6.37 \pm 0.06 \pm 0.07\%$



SM Backgrands

- ❖ ZZ, WW->leptons (including taus)
- ❖ Fit result:
 - ❖ sig: $1.8338e+03 \pm 8.86e+01$
 - ❖ bkg: $2.5558e+03 \pm 9.26e+01$
 - ❖ $\mu\mu$ selection efficiency: 63.9%
 - ❖ 1060000 events:
 - ❖ Br: $3.37\% * 6.32\% \sim 2.13\%$
 - ❖ calculated: 2.75%



Photon Reconstruction (SP)

- ❖ Including time information in photon tagging

particle energy	<1GeV	1~5GeV	>5GeV
photon	99.38	99.34	99.85
neutron	0.01	0.03	4.7
pi+	0	1.15	12.08

Photon Reconstruction (Z-Pole)

Tau decay mode	1 track + 0 photon	1 track + 1 photon	1 track + 2 photon	1 track + 3 photon	1 track + 4 photon	3 track
MC 1 track + 0 photon	86.55	6.49	2.18	0.49	0.33	1.42
MC 1 track + 2 photon	2.24	23.92	65.5	5.45	0.57	0.74
MC 1 track + 4 photon	0	2.15	9.91	33.94	46.77	0.43
MC 3 track	0	0	0	0	0	92.13

Summary

- ❖ Di-tau finder test on SM backgrounds
- ❖ To do
 - ❖ decay modes analysis
 - ❖ reconstruction PFA to be improved: π^0

Thank you
for
your attention!