



CEPC samples updates

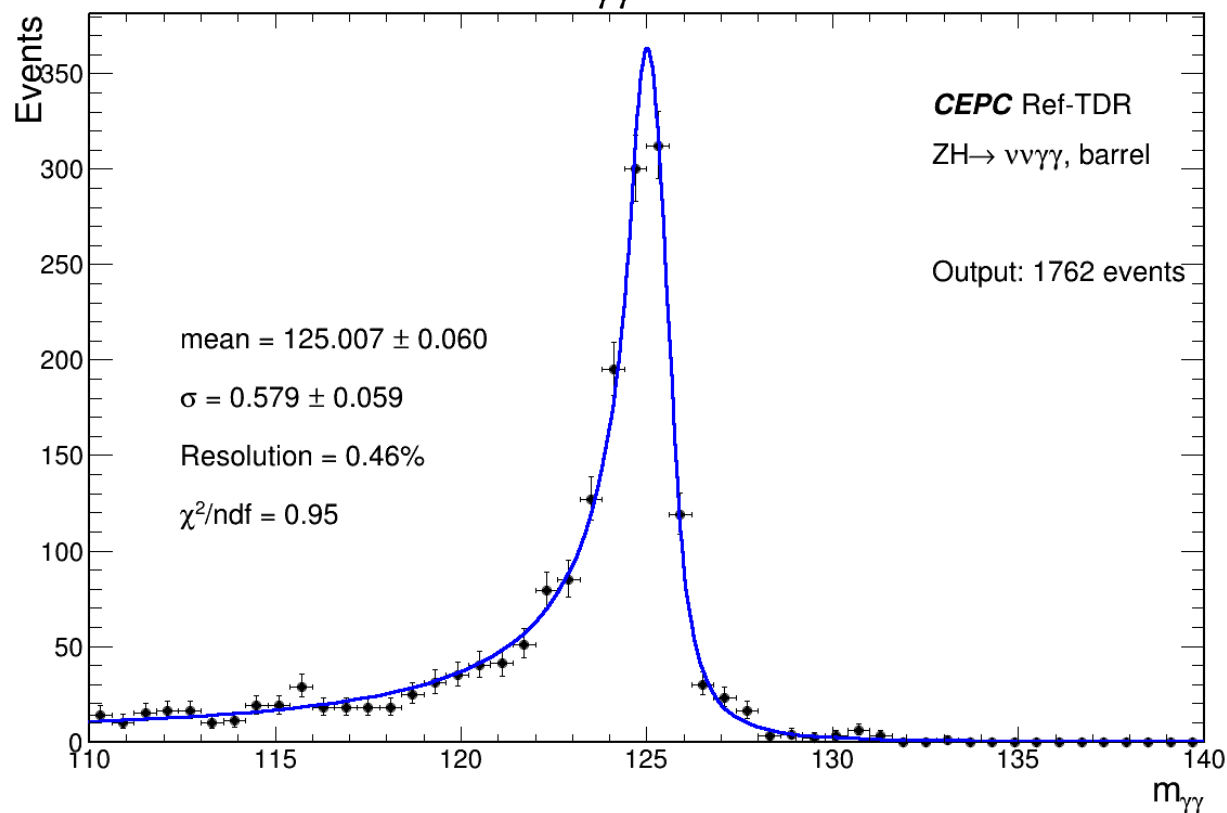
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Diphoton

$$\begin{aligned} \alpha_{Hi} &= 1.2826 \pm 0.1063 \\ \alpha_{Lo} &= 0.5913 \pm 0.0685 \\ n_{Hi} &= 3.1292 \pm 0.5072 \\ n_{Lo} &= 1.4994 \pm 0.1298 \\ \sigma_{CB} &= 0.5792 \pm 0.0588 \\ m_{\gamma\gamma} &= 125.01 \pm 0.0598 \end{aligned}$$



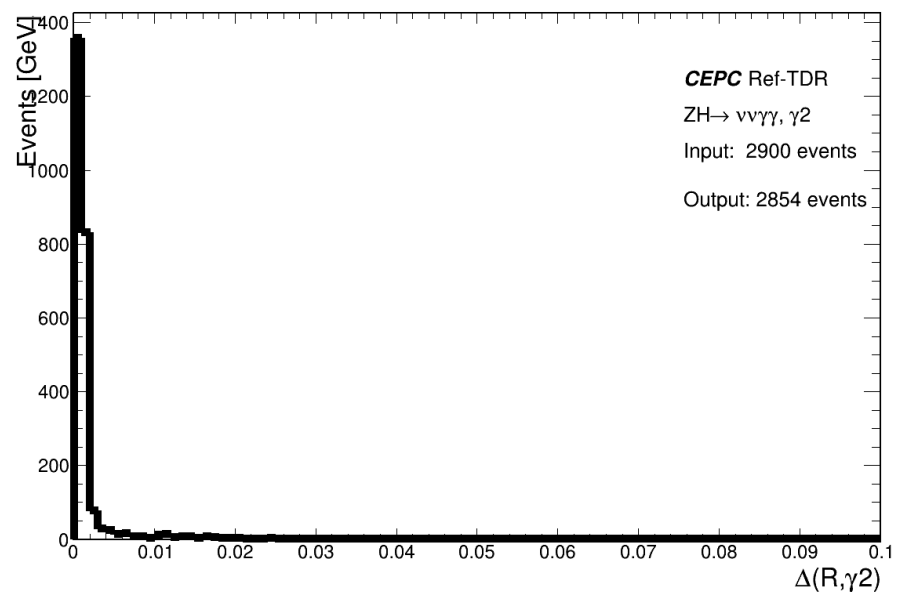
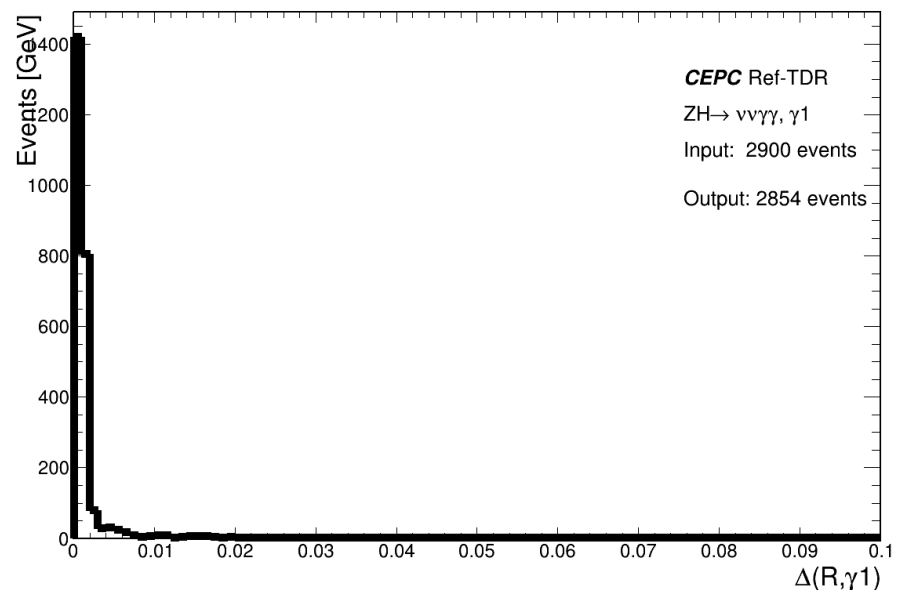
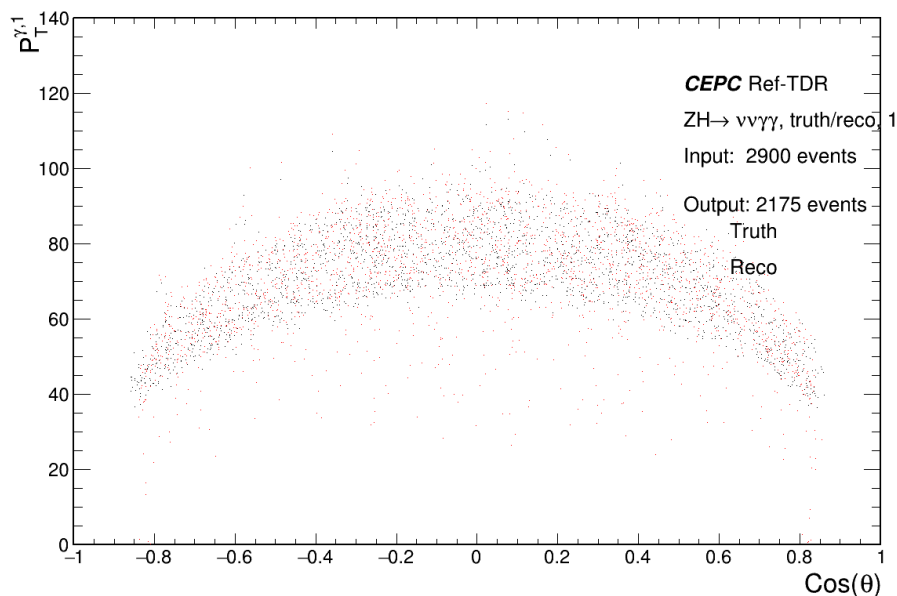
- Total 2900 Events
- With 2 PFOs: 2854 98.4%
- $|\cos \theta_{truth}| < 0.85$: 2175 75.0%
- $110 < m_{yy\text{reco}} < 140$: 1762 60.8%

Reco eff: $1762/2175 = 81.0\%$

In DSCB fit:

- Sigma: 0.58 GeV
- Resolution: 0.46%

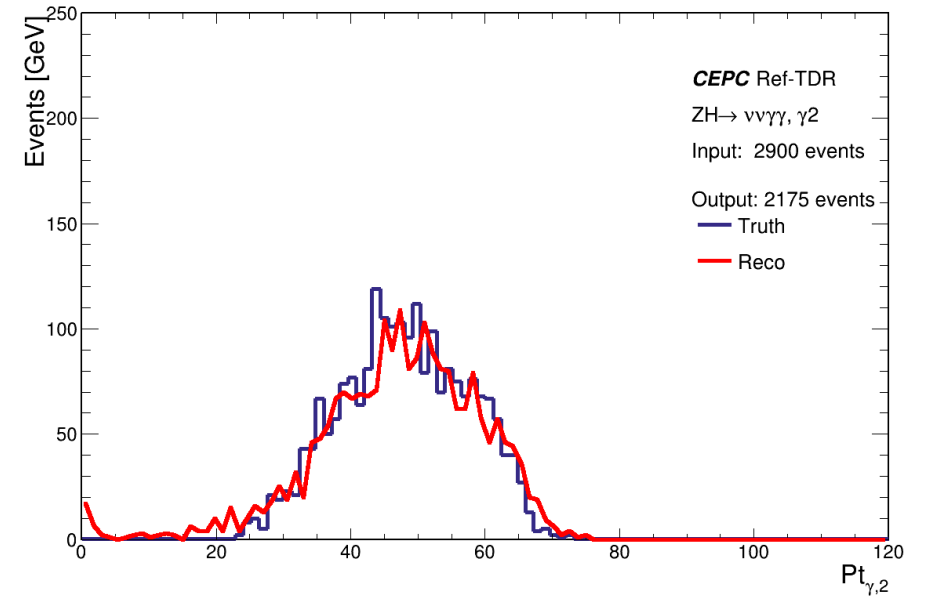
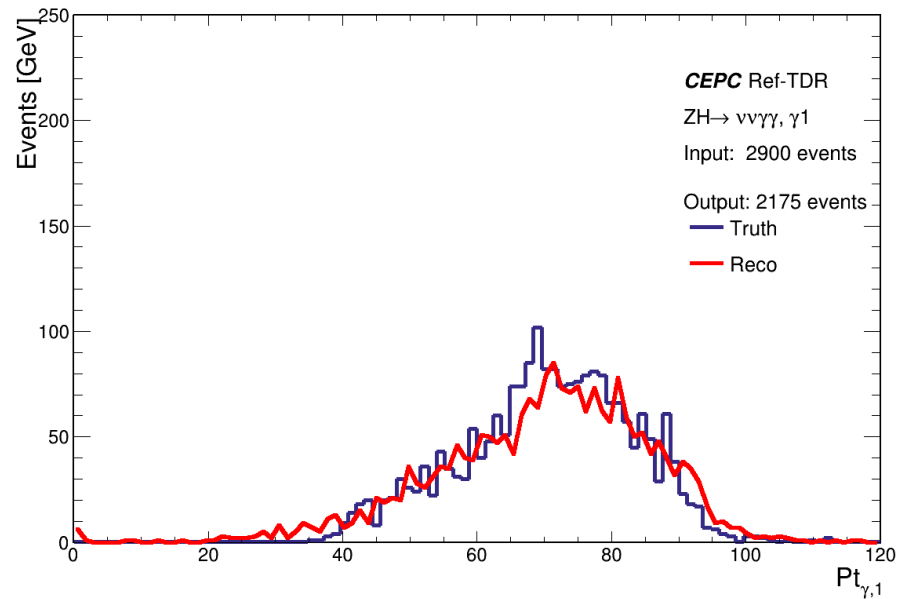
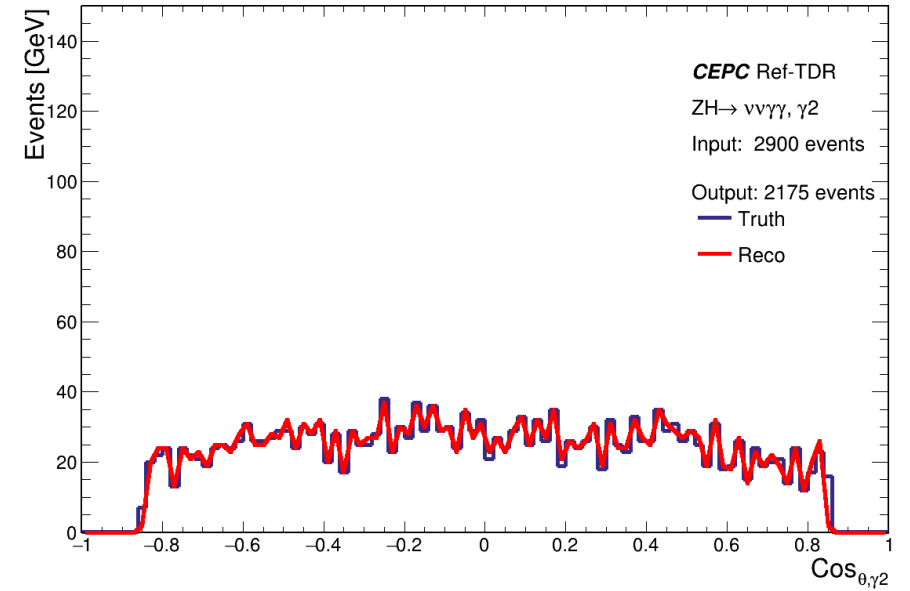
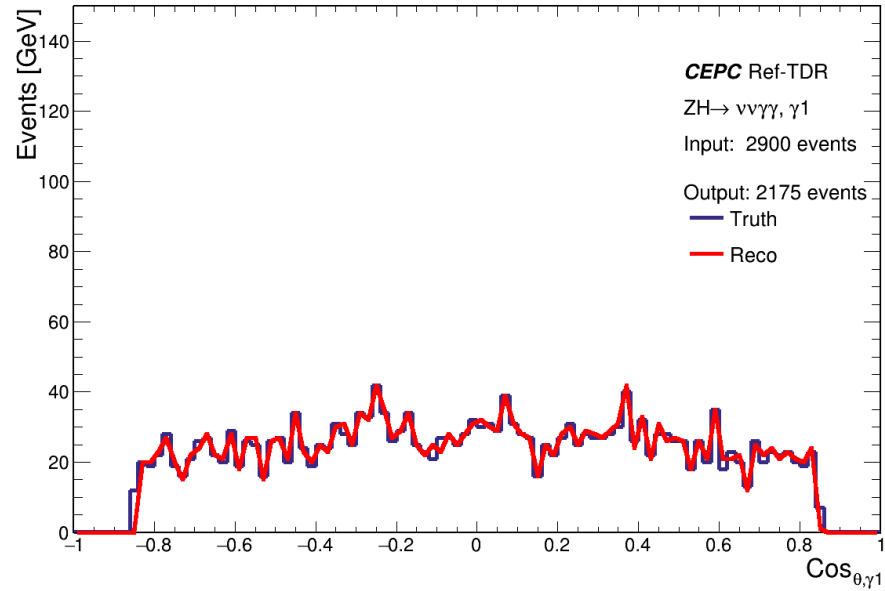
yy DeltaR match



- With $|\cos \theta_{truth}| < 0.85$
Delta R(0.1) match mismatch ratio: 1.3%

DeltaR use Rapidity(not eta!) and Phi.

Diphoton Genmatch



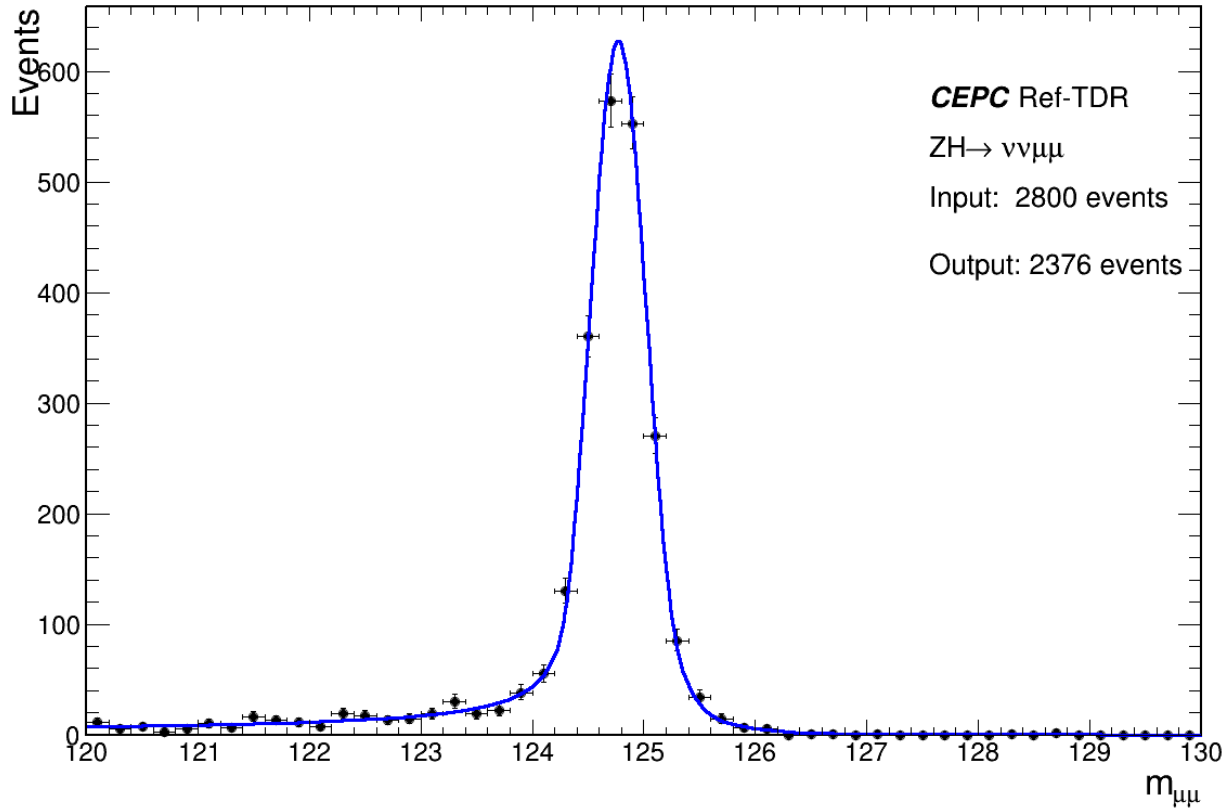
Note for diphoton:

- Mass calibration factor **0.959** Raw mean value: 130.309, shift to 125.0;
- PFO selection: 2 PFOs with largest E.
 - Current PFOs are not sorted with energy. Manual sorting needed.
 - Average PFOs in one event: 13.8. Now all PFOs with nonzero energy.(Hcal energy included)
- Truth selection: the final 2 truth photons
 - `PDG==22 && GeneratorStatus==1`
- Long tail energy loss need better treatment.

Dimuon

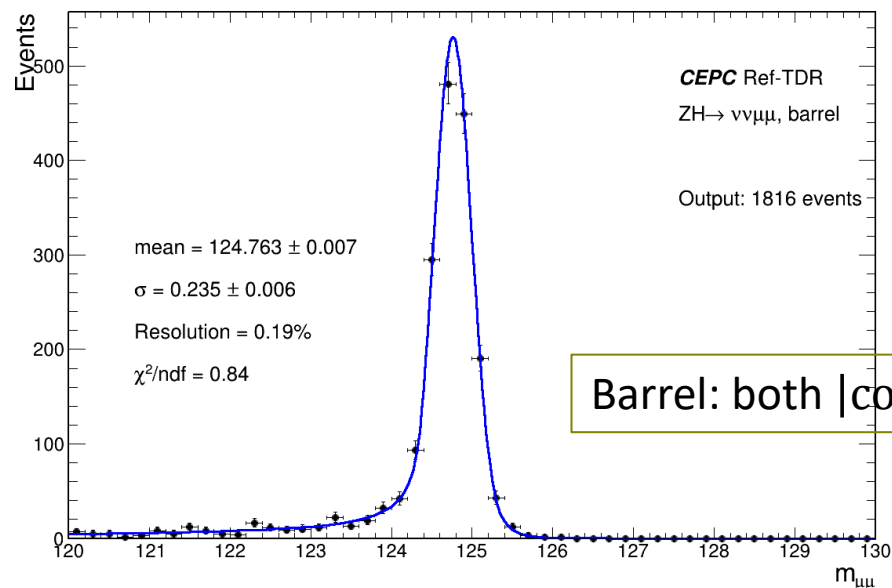


$$\begin{aligned}\alpha_{Hi} &= 1.7791 \pm 0.1346 \\ \alpha_{Lo} &= 1.7998 \pm 0.0829 \\ n_{Hi} &= 3.3505 \pm 0.7035 \\ n_{Lo} &= 0.7735 \pm 0.0937 \\ \sigma_{CB} &= 0.2543 \pm 0.0066 \\ m_{\mu\mu} &= 124.77 \pm 0.0066\end{aligned}$$

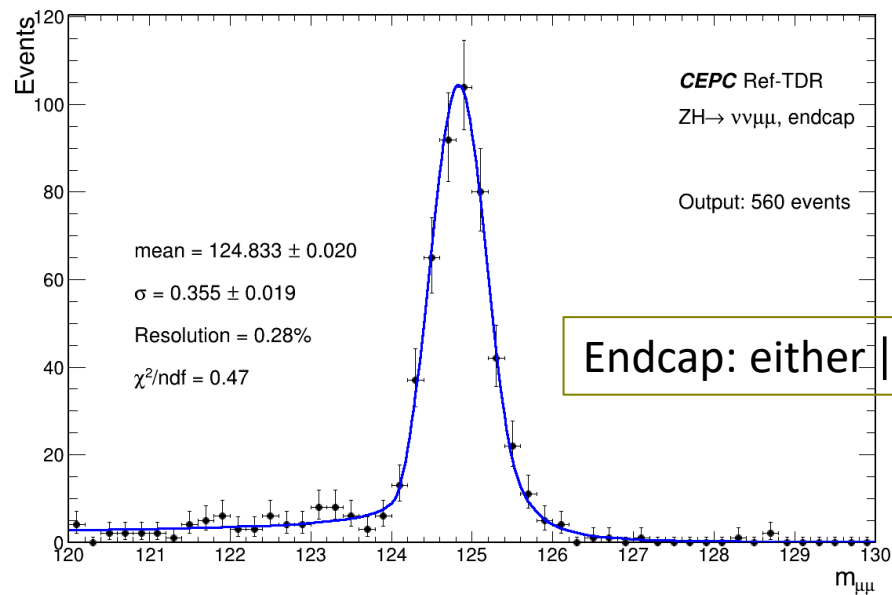


• Total	2800	Events
With 2 opposite PFOs:	2731	97.5%
$120 < m_{\mu\mu_{reco}} < 130$:	2376	84.9%
Reco eff:	$2839/3269 = 87.0\%$	
DSCB fit:		
Sigma:	0.25 GeV	
Resolution:	0.2%	

Barrel/Endcap:

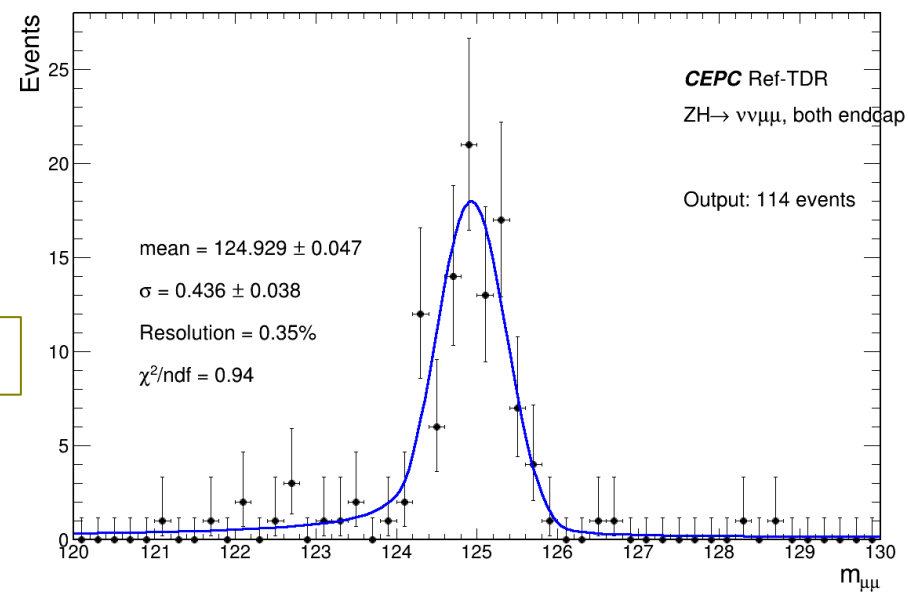


Barrel: both $|\cos \theta_{truth}| < 0.85$



Endcap: either $|\cos \theta_{truth}| > 0.85$

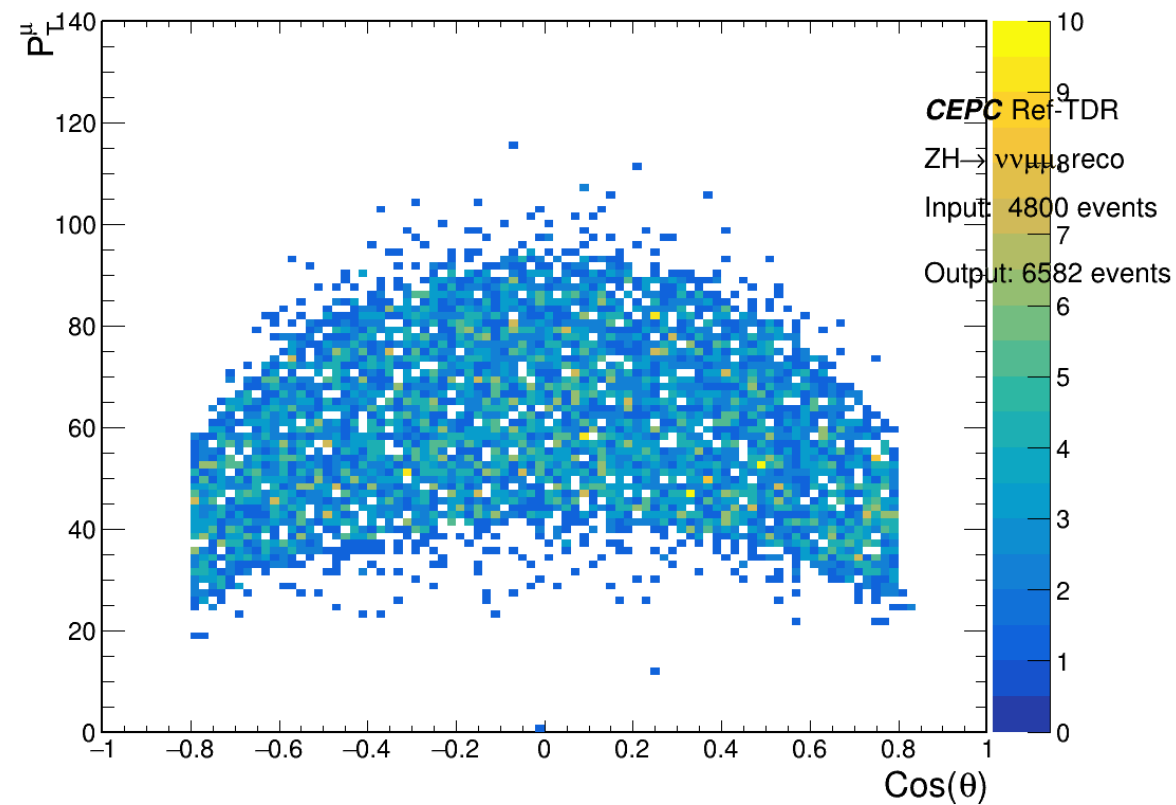
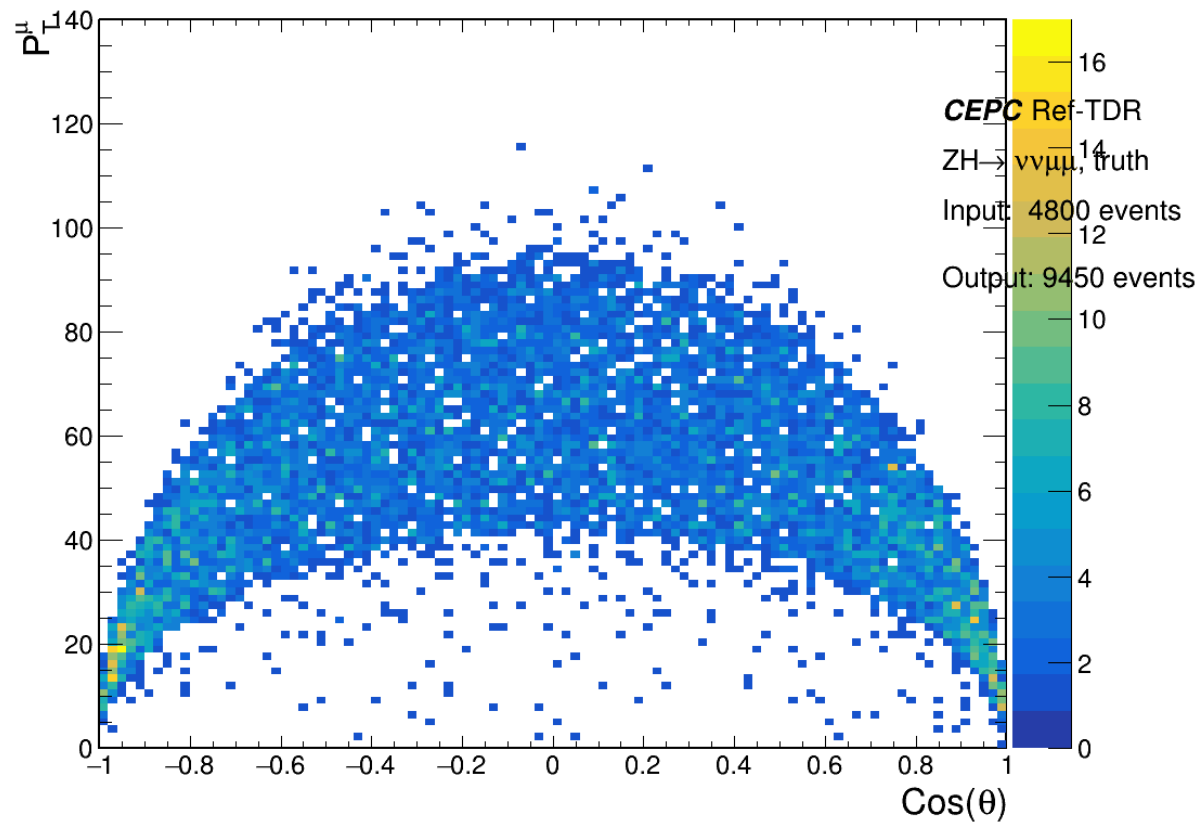
Endcap: both $|\cos \theta_{truth}| > 0.85$



2D scattering:



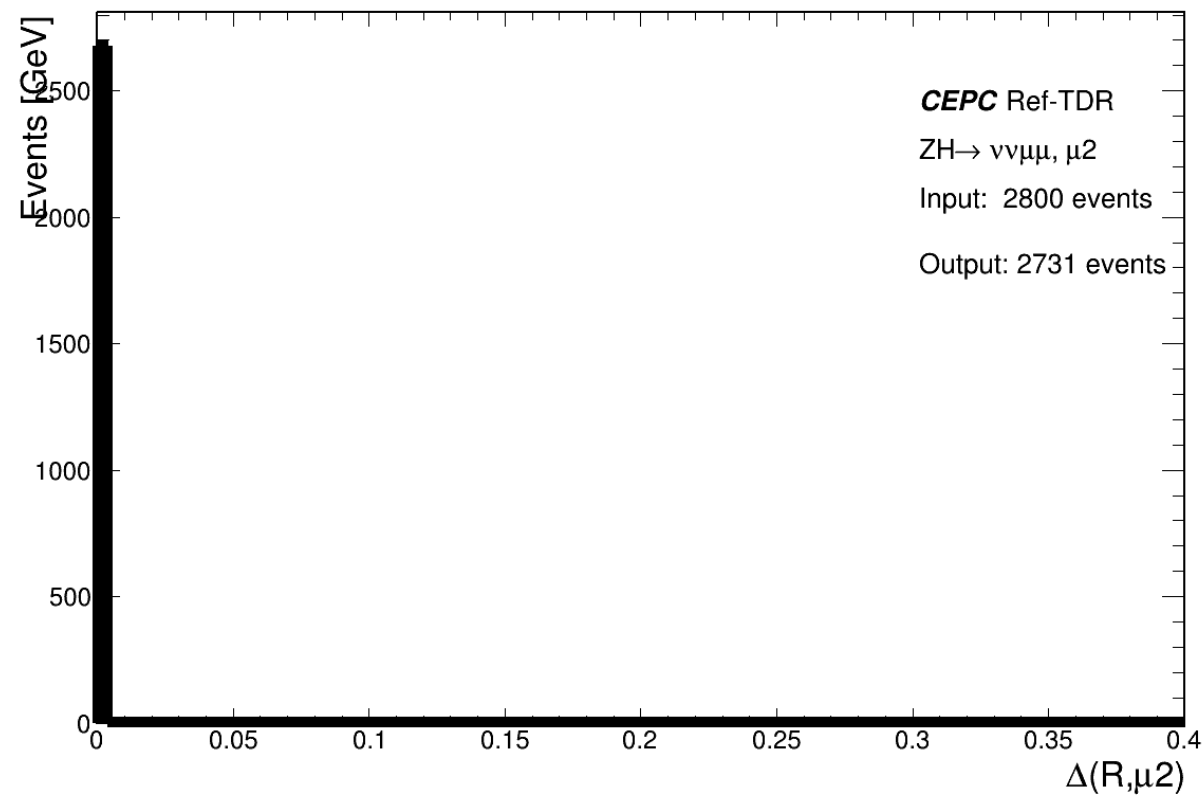
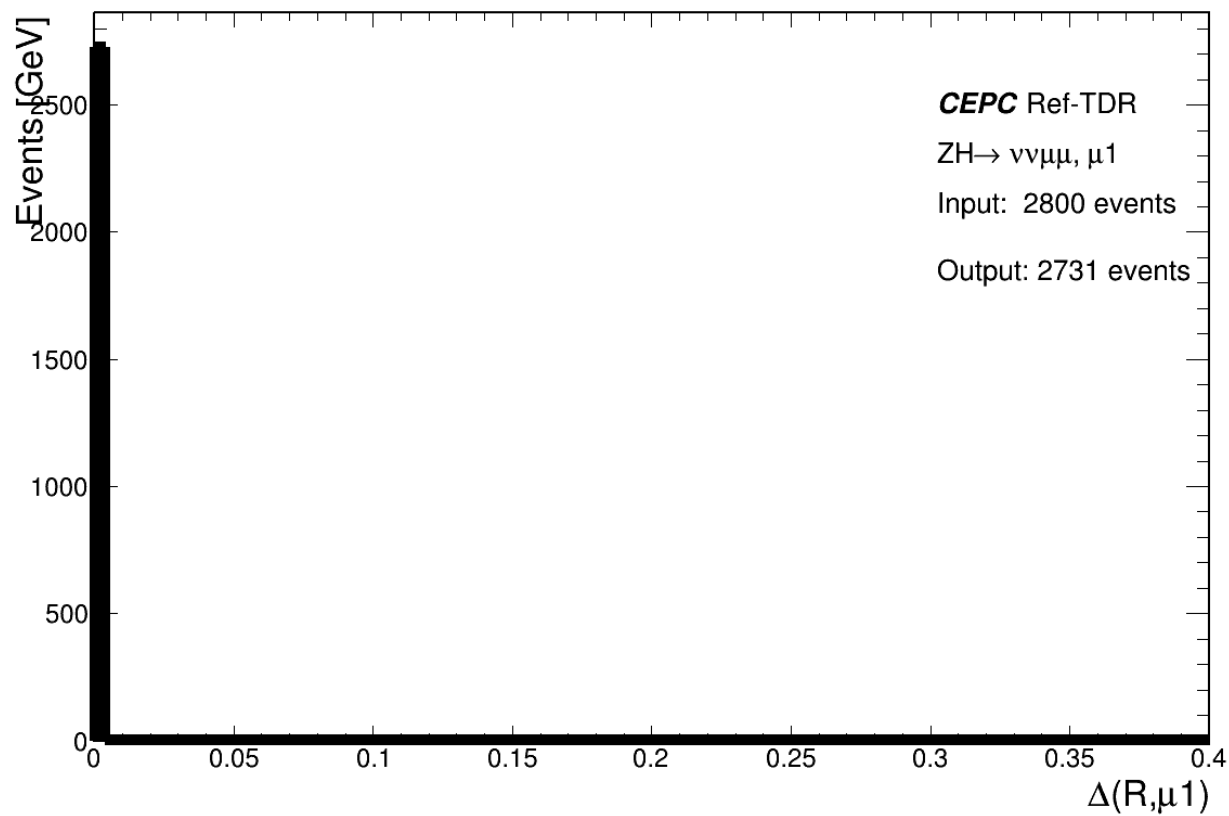
If drop $|\cos \theta_{truth}| < 0.8$ selection, Reco eff= 4072/4686= 86.9%. $\sim 86.8\%$
Dimuon reco do not rely on angular distribution.



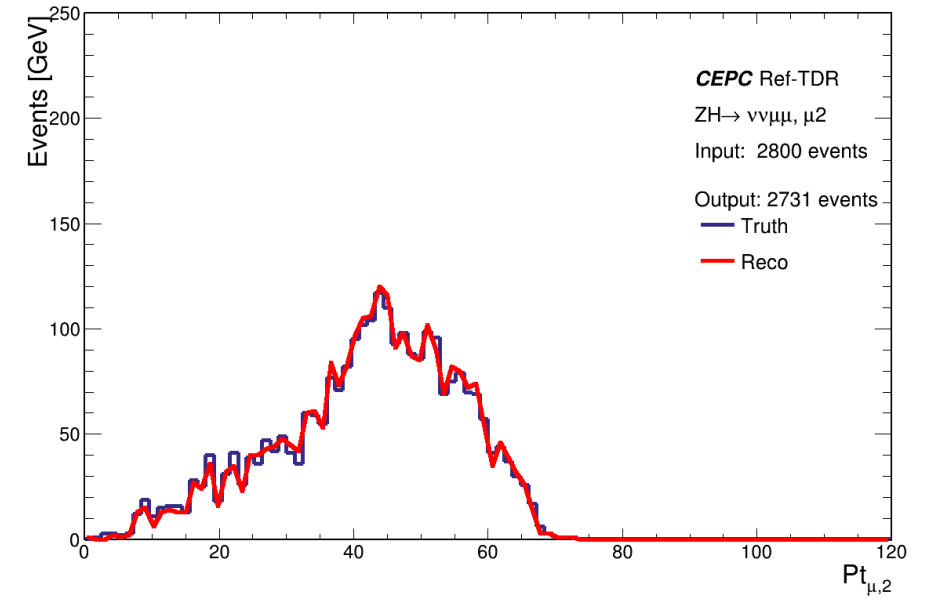
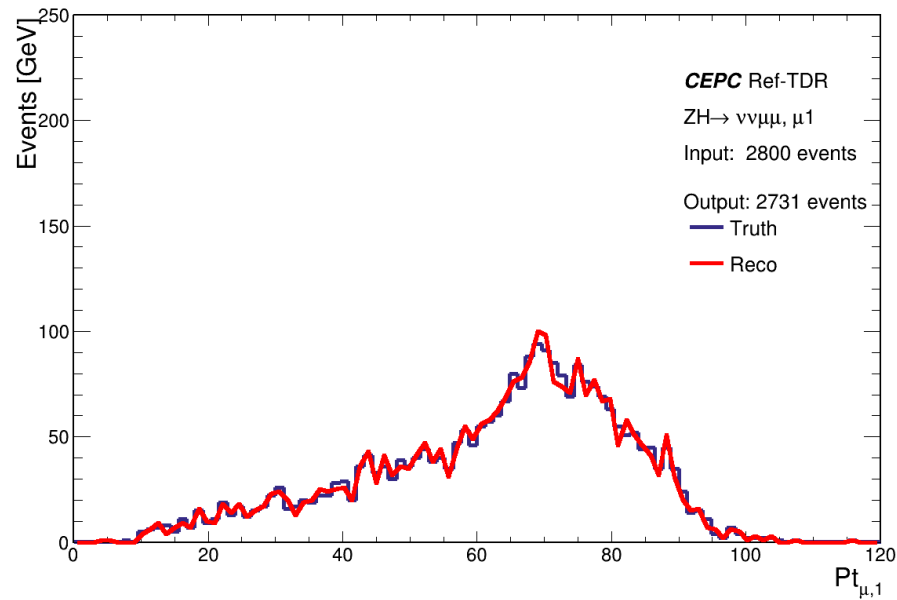
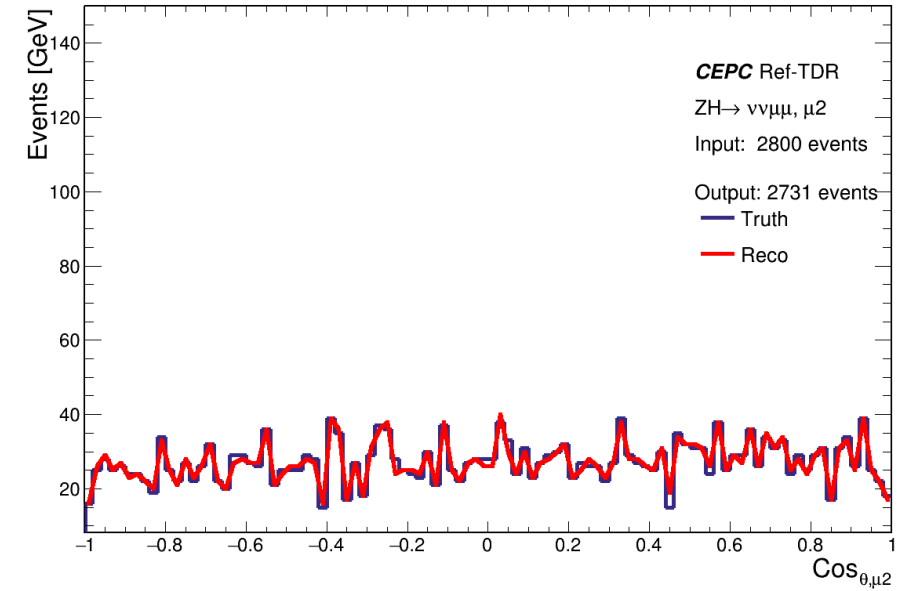
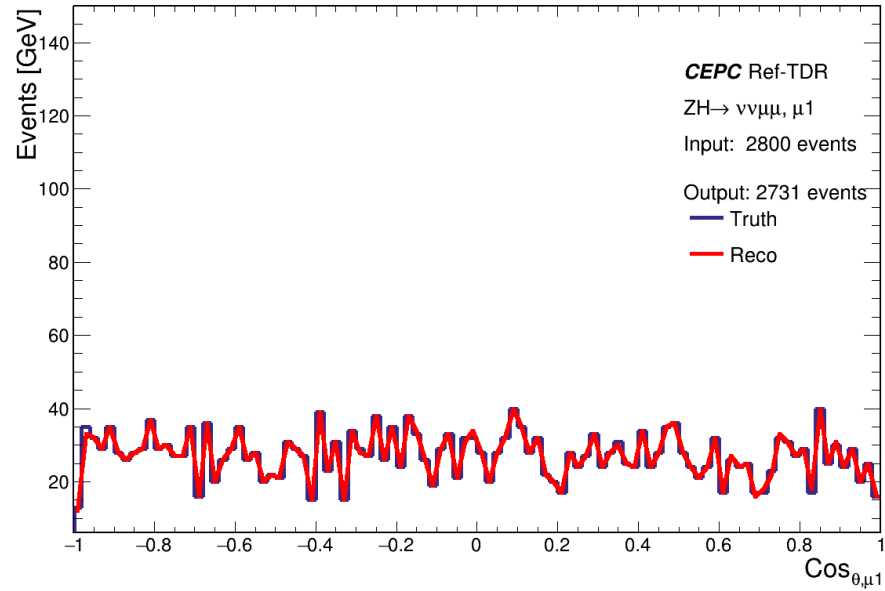
Dimuon Genmatch



Dr 0.4 perfectly matched(no glitching.);
0.7% events mismatched(both Dr>0.4)



Dimuon Genmatch



Notes for dimuon

- Resolution expect 0.1% but current 0.2%
- Use correct momentums to build mass shape
- Long tail for $m_{\mu\mu_{reco}} < 120$ (~12%)
- Mis charge ratio: 0.8%
- Mis Dr0.4 match ratio: 0.7%

Resource consuming



Use `hep_sub -mem 6000` to submit.

- 100 events, dimuon:
 - Time: 10 mins
 - Disk: 1MB per event. (sim+digi+tracking+rec)
- 100 events, diphoton:
 - Time: 40 mins
 - Disk: 20MB per event.

Tasks



- Isolated lepton/photon PID
 - Then use left PFOs for jet clustering.
 - Ntuple level, or CEPCSW level;
- Jet performance further
 - Flavor tagging
- Key Physics benchmarks
- Your contributions are welcome!

	Process @ c.m.e	Domain	Sensitivities using CDR det. + TDR lumi., with JOI	@Ref-TDR
$H \rightarrow cc$	$\nu\nu H$ @ 240 GeV	Higgs	1.7%	1.6%
$H \rightarrow ss$ [1]			95% UL of 0.75E-3	95% UL of 0.70E-3
$H \rightarrow sb$ [1]			95% UL of 0.22E-3	95% UL of 0.20E-3
$H \rightarrow inv$ [2]	qqH	Higgs/BSM	95% UL of 0.13%	Same
Vcb [3]	$WW \rightarrow \ell\nu qq$ @ 240/160 GeV	Flavor	0.4%	0.36%
W fusion Xsec [2]	$\nu\nu H$ @ 360 GeV	Higgs	1.1%	Same
α_s	$Z \rightarrow \tau\tau$ @ 91.2 GeV	QCD	NAN	Theory Unc. Dominant
CKM angle $\gamma - 2\beta$	$Z \rightarrow bb, B \rightarrow DK$ @ 91.2 GeV	Flavor	NAN	$\sim 0.1-1$ degree
Weak mixing angle [4]	Z @ 91.2 GeV	EW	2.4E-6 using 1 month of Z data	tiny improvement due to VTX
Higgs recoil [5]	$\ell\ell H$	Higgs	$\delta m = 2.5$ MeV; $\delta\sigma/\sigma = 0.25\%/0.4\%$ (wi/wo qqH)	Same
$H \rightarrow bb, gg$ [2]	$\nu\nu H + qqH$	Higgs	bb: 0.13%; gg: 0.65%	bb: 0.12%; gg: 0.62%
$H \rightarrow \mu\mu$ [2]	qqH	Higgs	6.4%	Same
$H \rightarrow \gamma\gamma$ [2]	qqH	Higgs	3%	1.8%
W mass & width [6]	Threshold scan @ 160 GeV	EW	0.7 MeV & 2.4 MeV @ 6 iab	Same
Top mass & width [7]	Threshold scan @ 360 GeV	EW	9 MeV & 26 MeV @ 100 ifb	Same
$B_s \rightarrow \nu\nu\phi$ [8]	91.2 GeV	Flavor	0.9% (1.8%@Tera-Z)	Same, if object recon. \sim CDR
$B_c \rightarrow \tau\nu$ [9]	91.2 GeV	Flavor	0.35% (0.7%@Tera-Z)	Same, if object recon. \sim CDR
$B_0 \rightarrow 2\pi^0$ [10]	91.2 GeV	Flavor	NAN	0.3% (need to validate photons finding)
$H \rightarrow LLP$	qqH	BSM	NAN	Work in progress
$H \rightarrow aa \rightarrow 4\gamma$	qqH	BSM	NAN	Work in progress