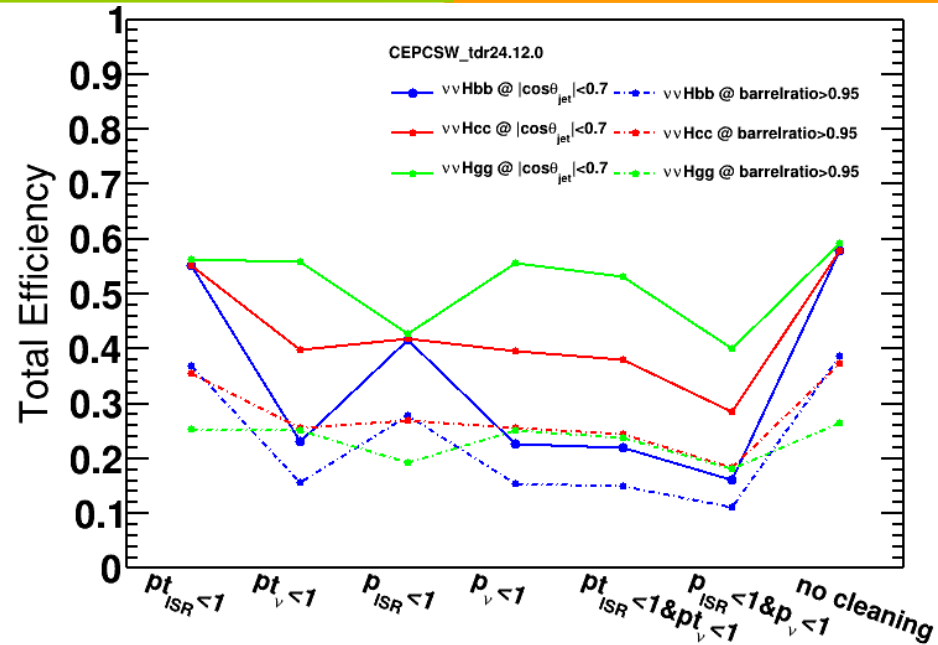
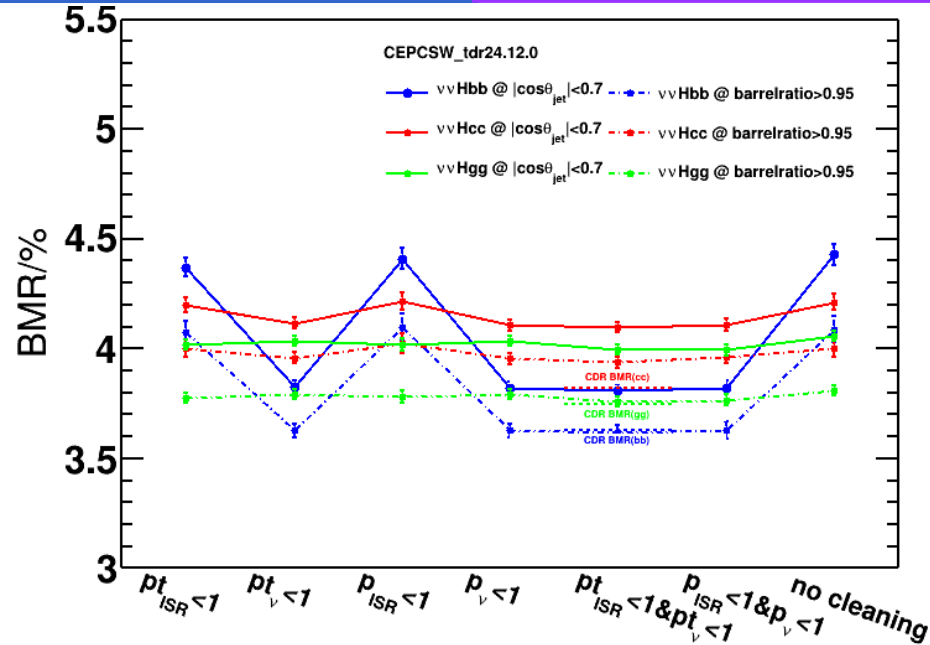


BMR -- Status

- ❖ BMR performance in $ZH \rightarrow \nu\nu + gg/bb/cc$ with $\sqrt{s} = 240\text{GeV}/c^2$
- ❖ Comparison of different fitting methods
- ❖ Distributions of particle number of jets of different flavors
- ❖ Samples generated under CEPCSW_tdr24.12.0 -- master

BMR -- performance



Current result – consistent with CDR

Table 1. Event cumulative efficiency for Higgs boson exclusive decay at the CEPC with $\sqrt{s} = 240$ GeV.

	gg(%)	bb(%)	cc(%)	WW*(%)	ZZ*(%)
Pt_ISR < 1 GeV	95.15	95.37	95.30	95.16	95.24
Pt_neutrino < 1 GeV	89.33	39.04	66.36	37.46	41.39
Cos(Theta_Jet) < 0.85	67.30	28.65	49.31	–	–

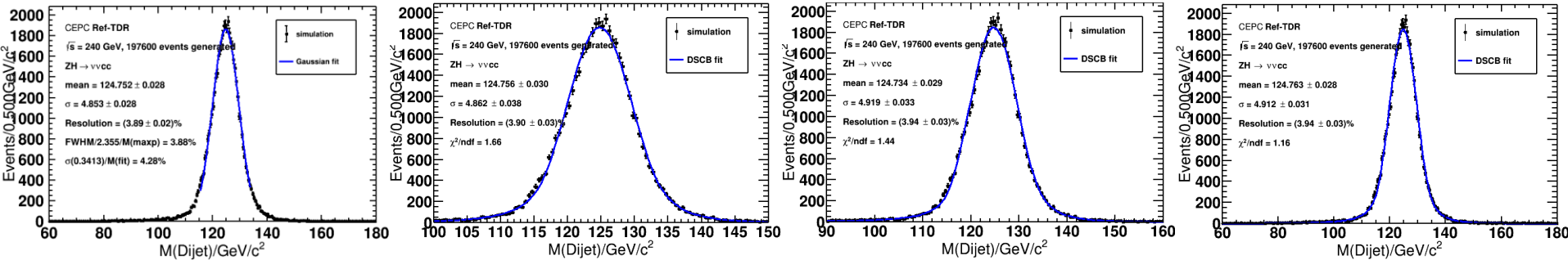
Table 3. Higgs boson mass resolution (sigma/Mean) for different decay modes with jets as final state particles, after event cleaning.

$H \rightarrow bb$	$H \rightarrow cc$	$H \rightarrow gg$	$H \rightarrow WW^*$	$H \rightarrow ZZ^*$
3.63%	3.82%	3.75%	3.81%	3.74%

CDR reference

BMR -- fit with different methods

$ZH \rightarrow \nu cc$ barrelratio > 0.95 With pt event cleaning



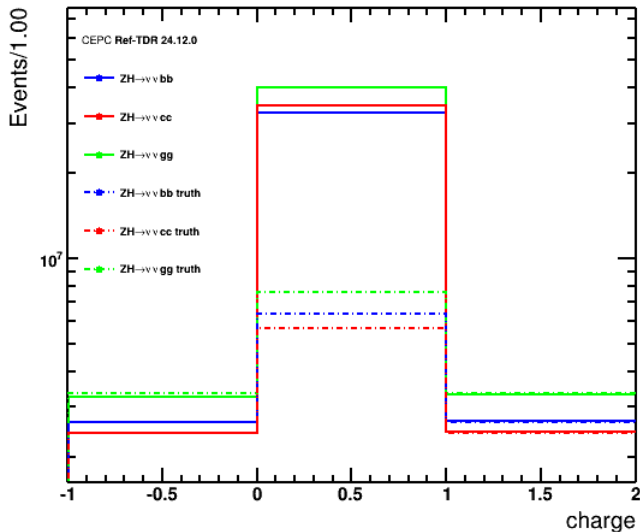
FWHM 0.5GeV/bin
 Unbinned Gaussian fit
 Count 68.26% region

Unbinned DSCB fit -> Shrink fit range
 Efficiency: 24.4% -> 24.3% -> 24.1%

Unbinned DSCB fit
 (now)

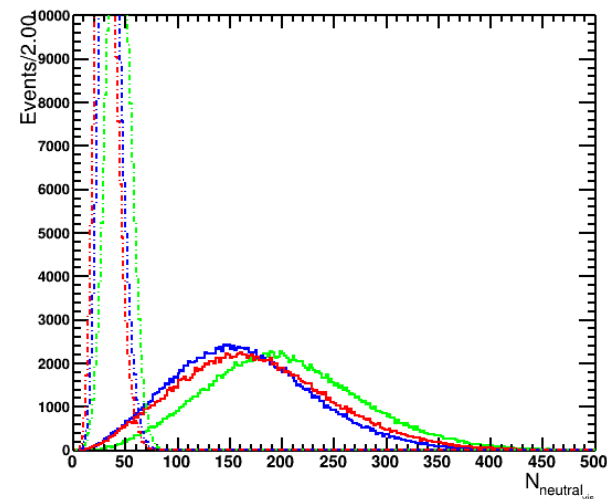
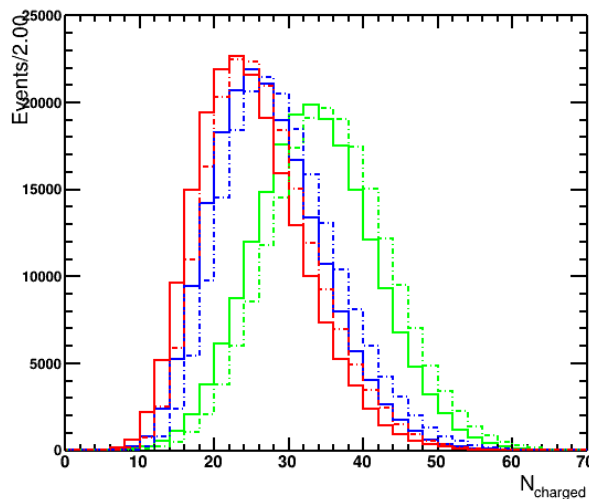
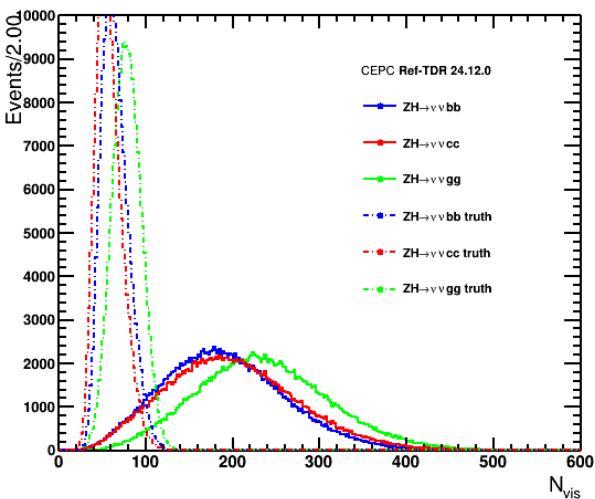
- Now BMR is **3.94%**
- Shrink fit range: lose **~1% event** to improve BMR improves to **3.90%**
- Gaussian to fit peak: BMR improves to **3.89%**
- Binned FWHM: BMR improves to **3.88%**
- Count 68.26% region around fit mass point: full region not gaussian, decreases to **4.28%**

Number of truth/reco particles

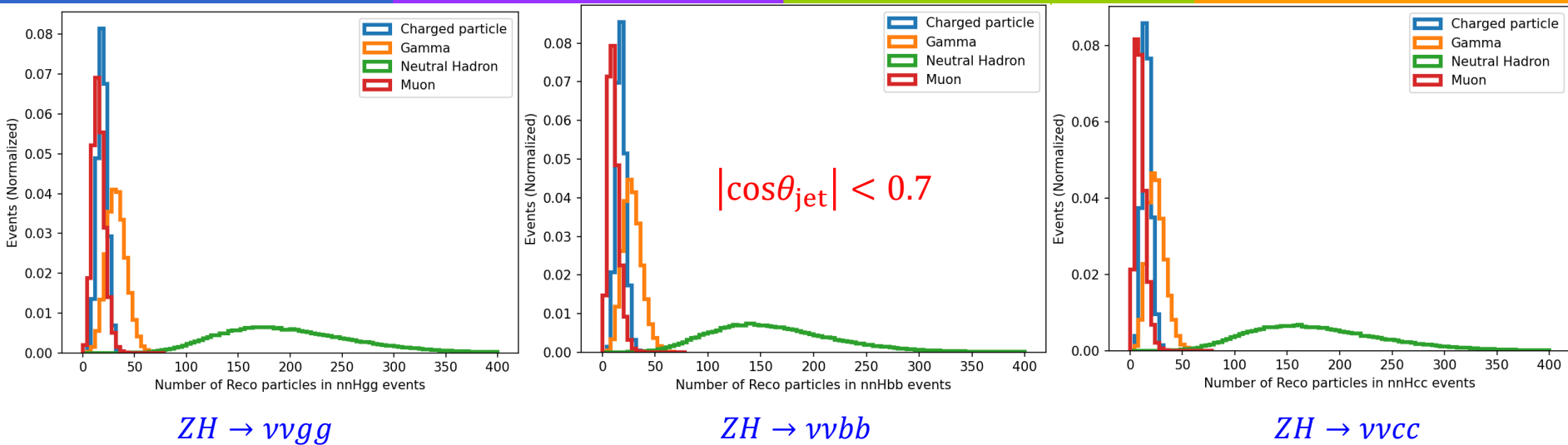


No cut

- Charged particles most reconstructed
- Neutral photons and hadrons reconstructed much more
- MCParticle charged: $gg > bb > cc$
- MCParticle neutral: $gg > bb > cc$
- reco charged: $gg > bb > cc$
- reco neutral: $gg > cc > bb$



Number of reco particles



$ZH \rightarrow vgg$

$ZH \rightarrow vbb$

$ZH \rightarrow vcc$

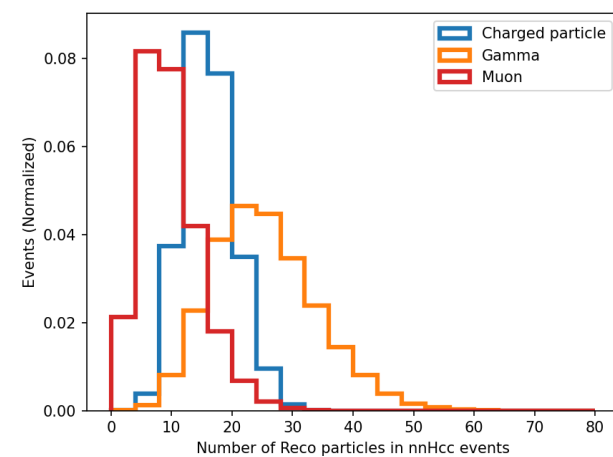
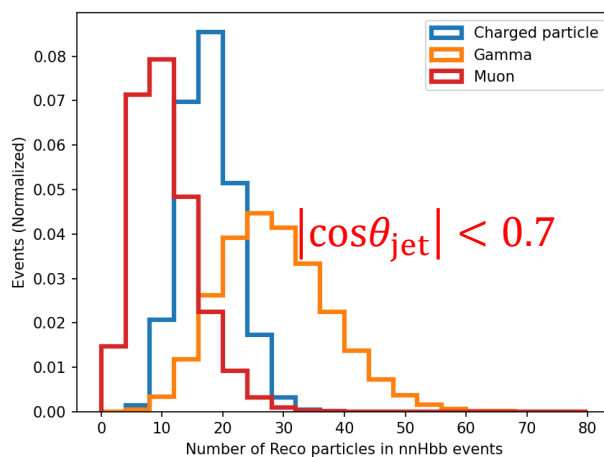
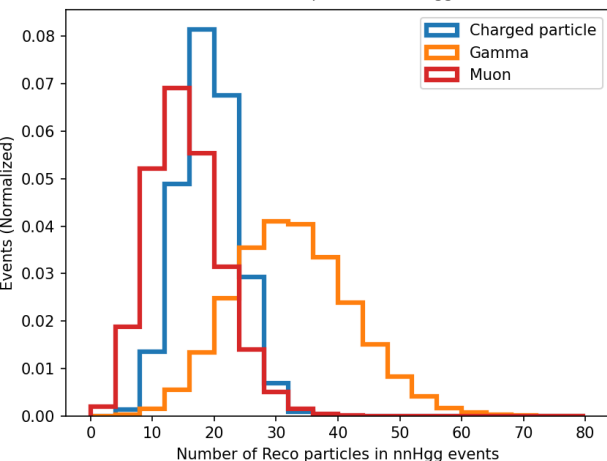
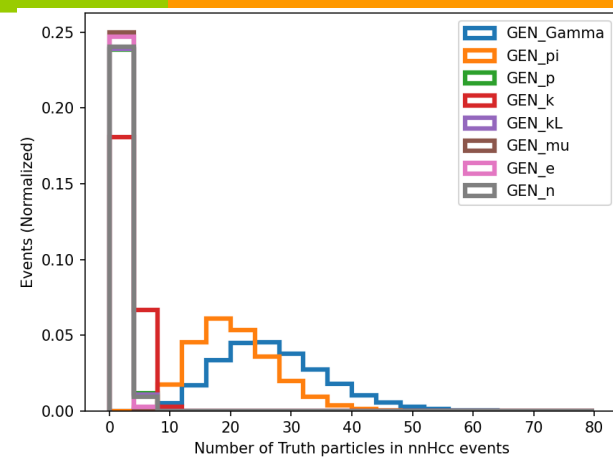
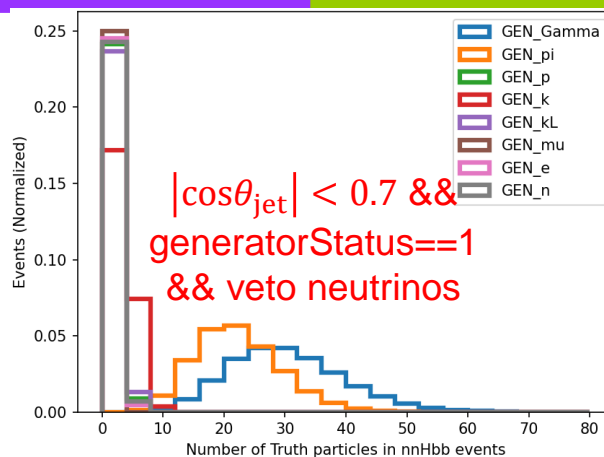
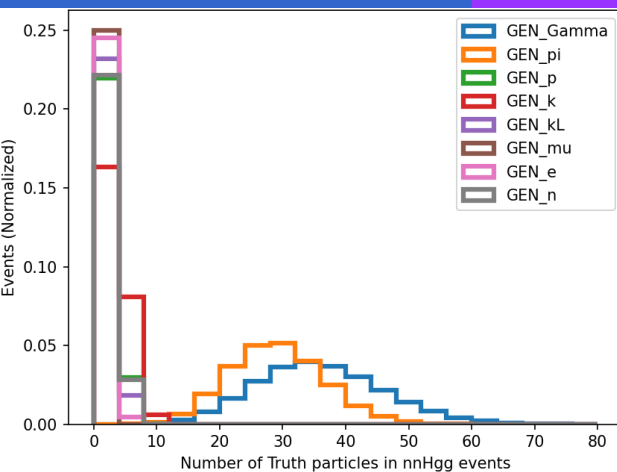
- **Charged particle:** have track and `pfo.clusters_size() > 0`
- **Gamma:** no track and `pfo.clusters_size() == 1` and `cluster_R < 2130`
- **Neutron Hadron:** no track and `pfo.clusters_size() == 1` and `cluster_R > 2130`
 - All larger than 100 averagely
 - $bb < cc < gg$
- **Muon:** have track and `pfo.clusters_size() == 0`

Number of truth/reco particles

$ZH \rightarrow v\bar{v}g$

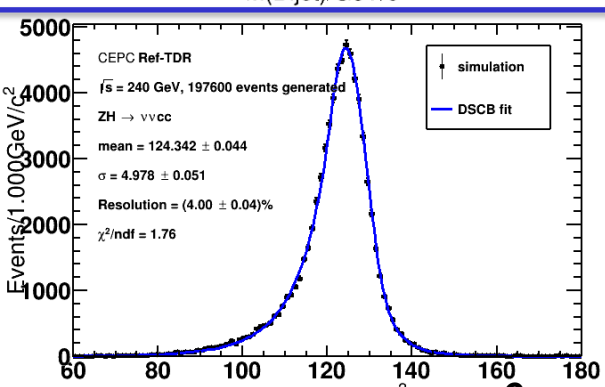
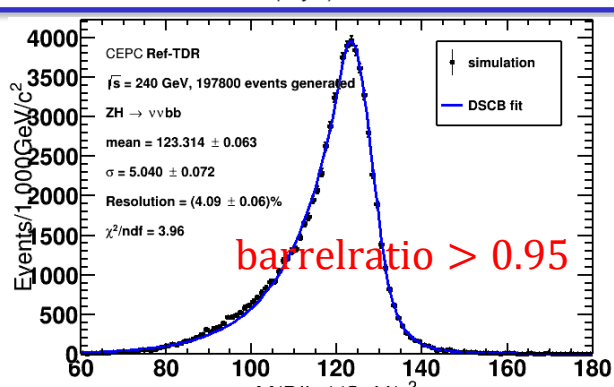
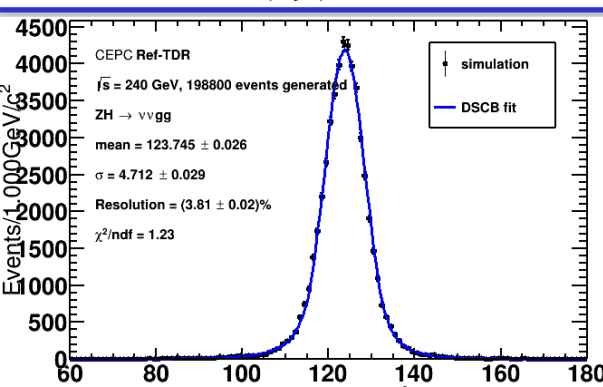
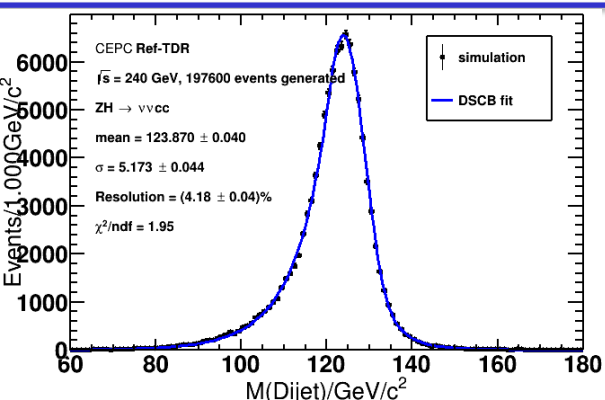
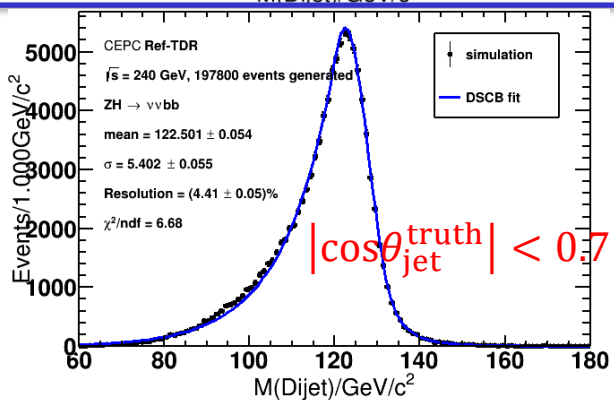
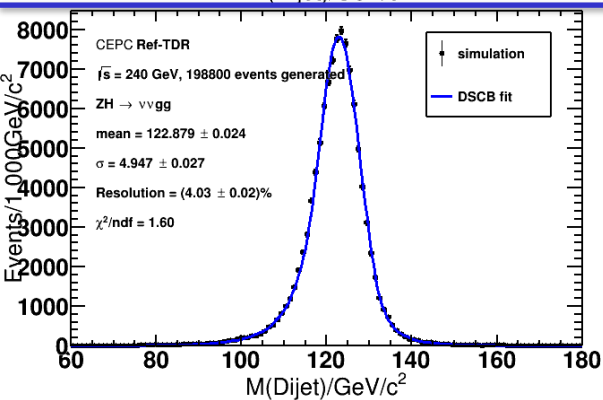
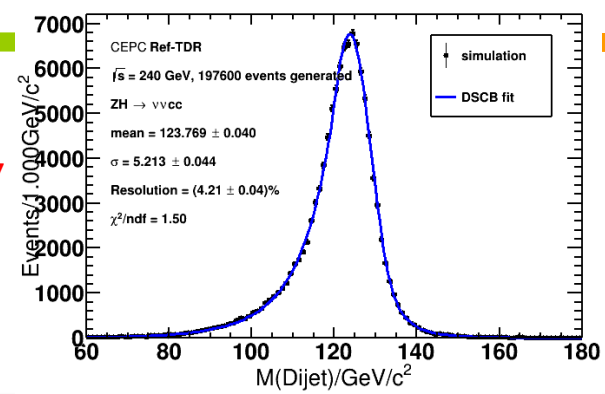
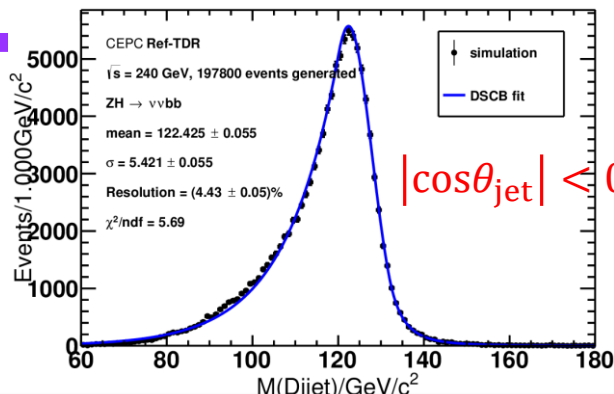
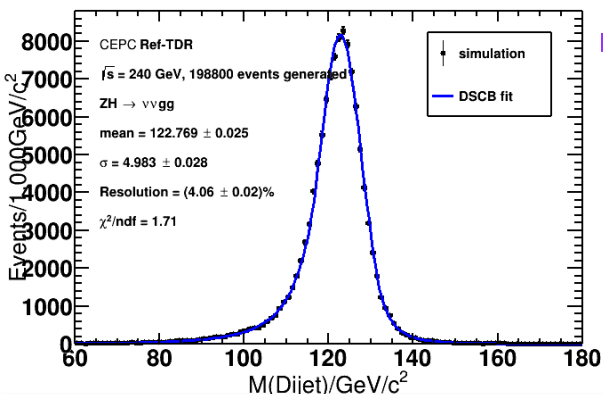
$ZH \rightarrow v\bar{v}b\bar{b}$

$ZH \rightarrow v\bar{v}c\bar{c}$

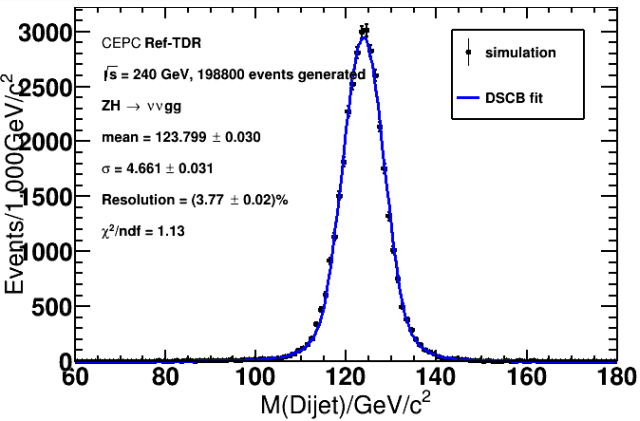


➤ Almost match for gamma and charged track

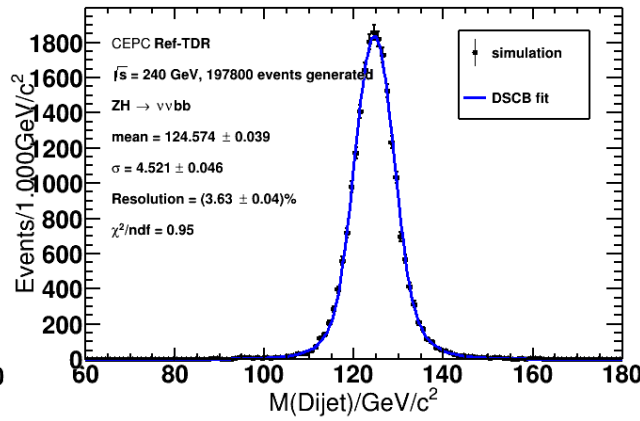
Backup -- BMR fitting results



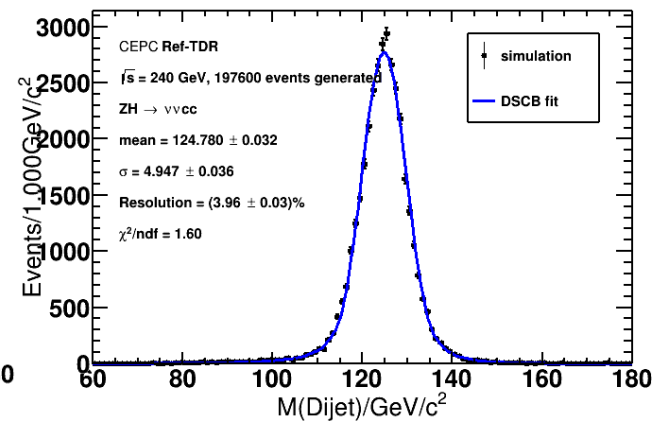
BMR -- fit with p/pt event cleaning



$ZH \rightarrow v\bar{v}gg$

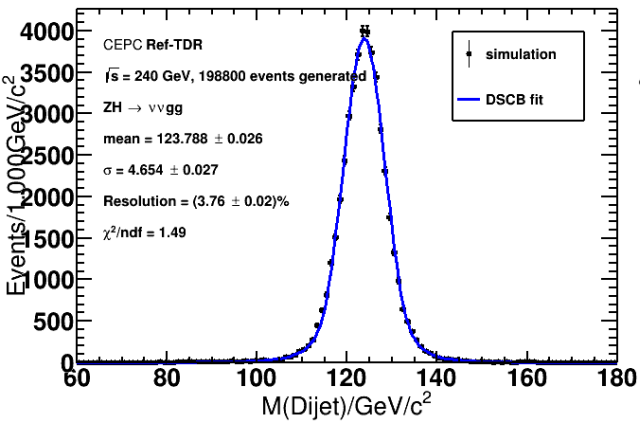


$ZH \rightarrow v\bar{v}bb$

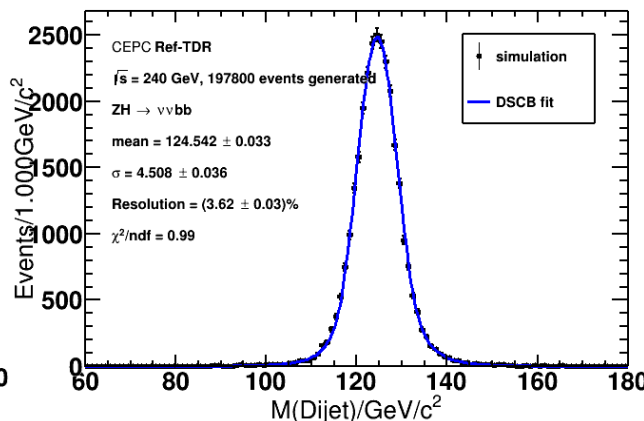


$ZH \rightarrow v\bar{v}cc$

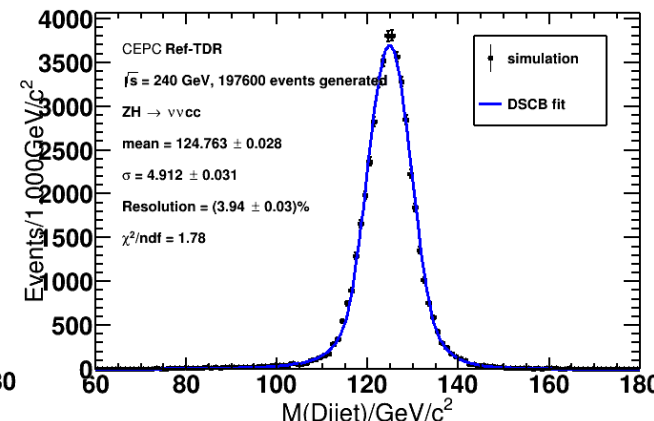
barrelratio > 0.95 With p event cleaning



$ZH \rightarrow v\bar{v}gg$



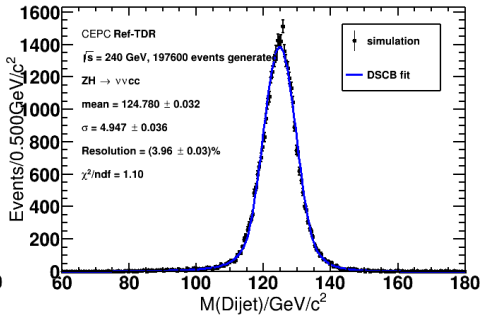
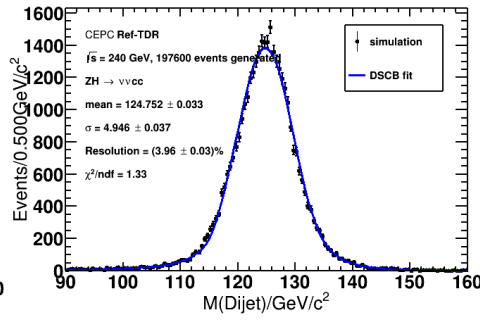
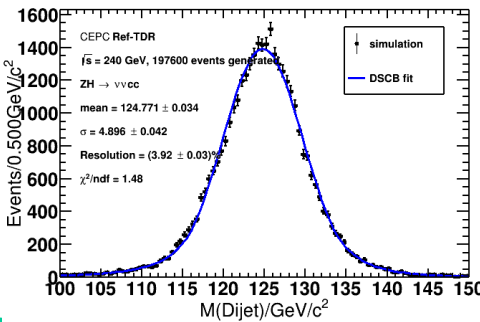
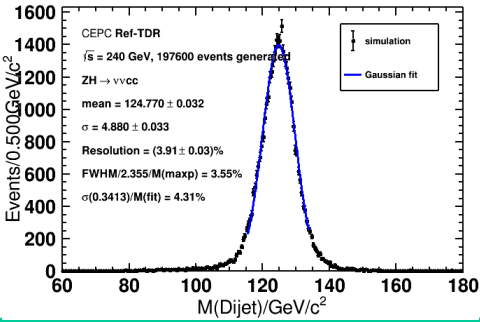
$ZH \rightarrow v\bar{v}bb$



$ZH \rightarrow v\bar{v}cc$

p/pt

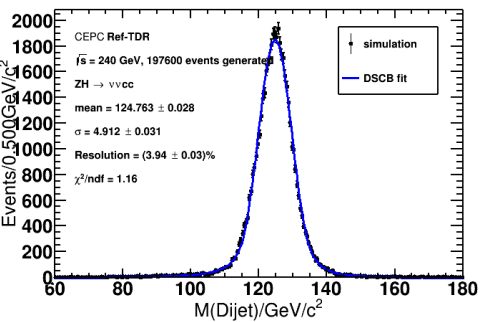
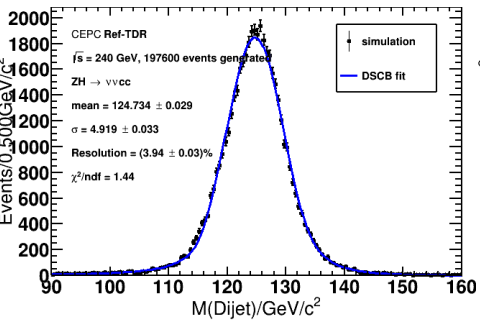
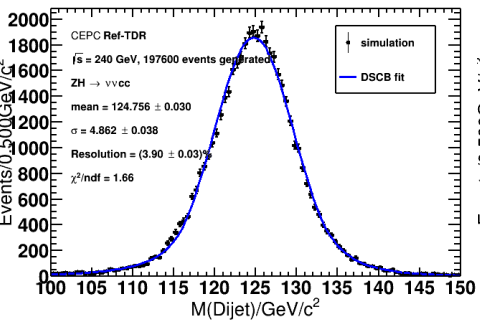
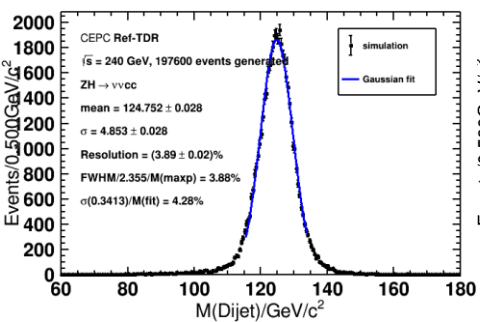
$ZH \rightarrow \nu\bar{\nu}cc$ barrelratio > 0.95 With p event cleaning



FWHM 0.5GeV/bin
 Unbinned Gaussian fit
 Count 68.26%

Unbinned DSCB fit
 Shrink range

Unbinned DSCB fit
 (now)



$ZH \rightarrow \nu\bar{\nu}cc$ barrelratio > 0.95 With pt event cleaning

➤ BMR improves from 3.96%/3.94% to 3.91%/3.89%