

BMR -- Performance of 25.1.0

- ❖ Perform BMR study in $ZH \rightarrow \nu\nu + gg/bb/cc/uu/dd/ss$ with $\sqrt{s} = 240\text{GeV}/c^2$
- ❖ Comparisons without/with event cleaning under $|\cos\theta_{\text{jet}}| < 0.85$

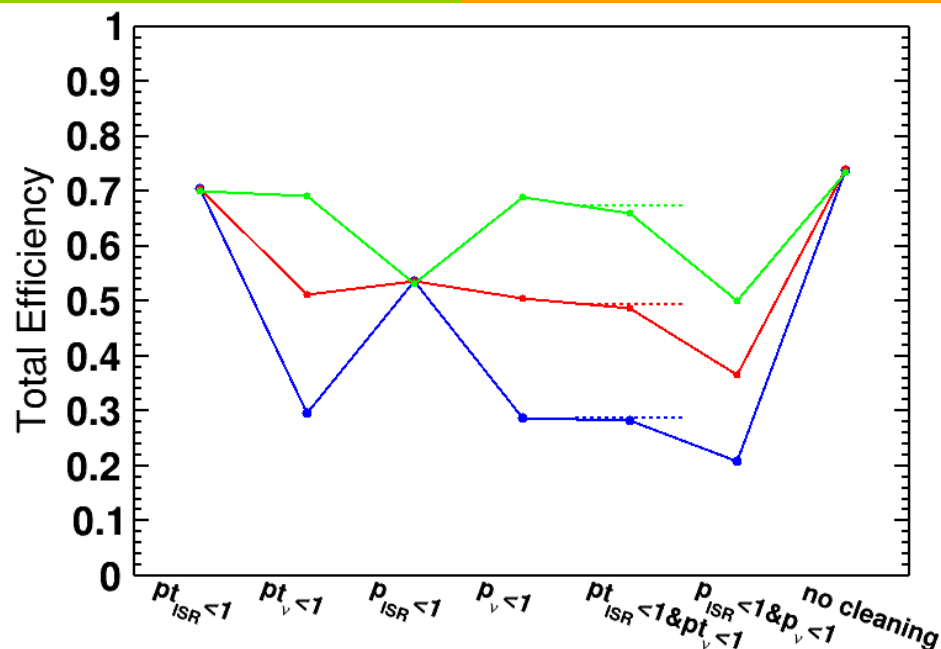
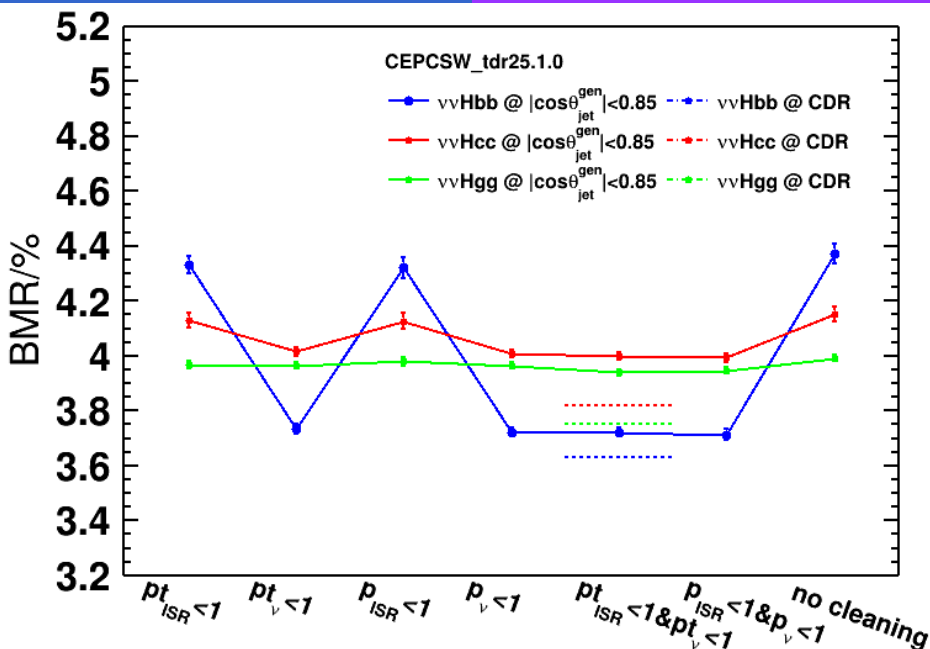
Case	process	$ZH \rightarrow \nu g g$	$ZH \rightarrow \nu b b$	$ZH \rightarrow \nu c c$	$ZH \rightarrow \nu u u$	$ZH \rightarrow \nu d d$	$ZH \rightarrow \nu s s$
Physical level	BMR/%	4.00 ± 0.01	4.36 ± 0.03	4.16 ± 0.03	3.79 ± 0.01	3.97 ± 0.01	4.44 ± 0.01
	Efficiency/%	73.3	73.7	74.0	74.2	74.1	74.1
Detector level	BMR/%	3.95 ± 0.01	3.74 ± 0.02	4.01 ± 0.01	3.77 ± 0.01	3.95 ± 0.01	4.40 ± 0.01
	Efficiency/%	65.7	28.1	48.6	70.3	70.1	70.2

- Event cleaning: $\Sigma|Pt_{\text{ISR}}| < 1\text{GeV}/c \ \& \ \Sigma|Pt_{\nu}| < 1\text{GeV}/c$
- Before event cleaning, BMR ranges from 3.79% to 4.44%
- After event cleaning, BMR ranges from 3.74% to 4.40%

- ❖ Samples generated under CEPCSW_tdr25.1.0

- /cefs/higgs/maxiaotian/25.1.0/CEPCSW/jet/4ML/fit
- /cefs/higgs/zhangkl/Production/2501

BMR -- performance of 25.1.0



Current result – efficiency consistent with CDR, BMR 0.11%/0.19%/0.20% higher

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

backup



- ❖ Performance of 24.12.0 without endcap

BMR performance of 24.12.0

- ❖ Perform BMR study in $ZH \rightarrow \nu\nu + gg/bb/cc/uu/dd/ss$ with $\sqrt{s} = 240\text{GeV}/c^2$
- ❖ Comparisons without/with event cleaning under $|\cos\theta_{\text{jet}}| < 0.7$

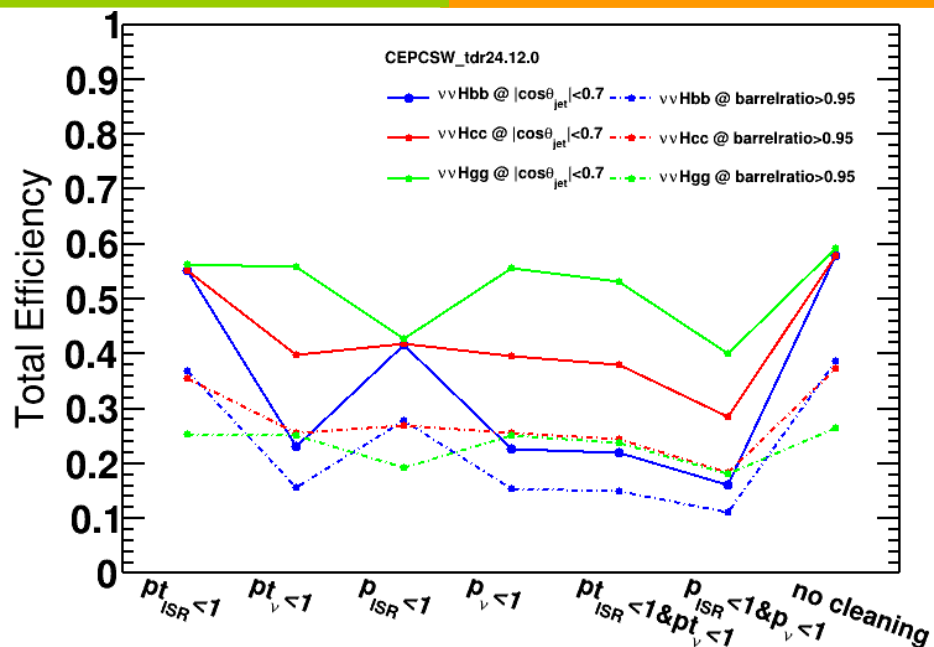
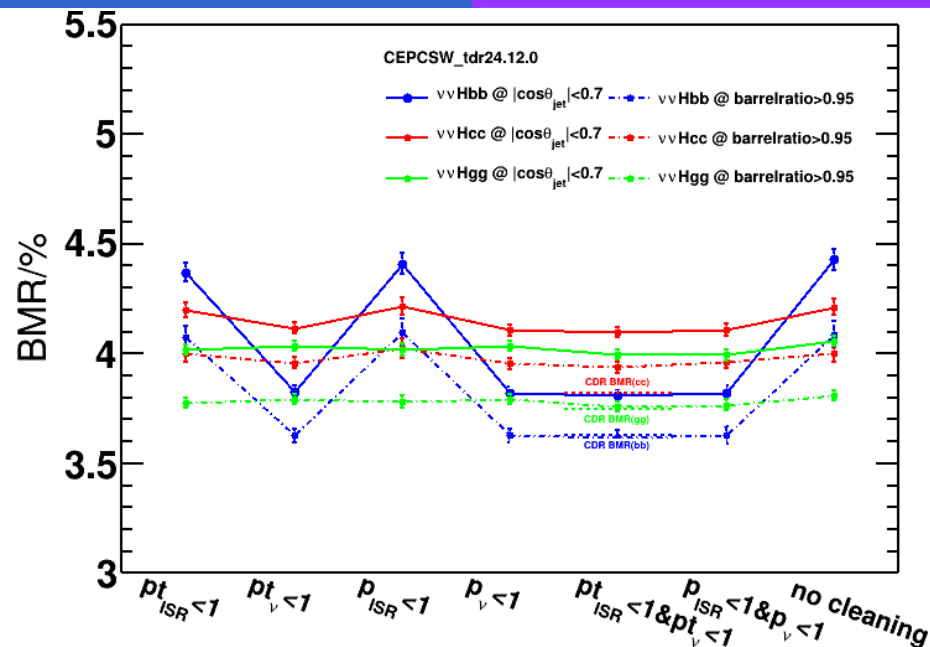
Case	process	$ZH \rightarrow \nu g g$	$ZH \rightarrow \nu b b$	$ZH \rightarrow \nu c c$	$ZH \rightarrow \nu u u$	$ZH \rightarrow \nu d d$	$ZH \rightarrow \nu s s$
Physical level	BMR/%	4.06 ± 0.02	4.43 ± 0.05	4.21 ± 0.04	3.90 ± 0.02	4.08 ± 0.02	4.56 ± 0.02
	Efficiency/%	59.3	58.0	57.9	58.2	58.3	58.2
Detector level	BMR/%	3.99 ± 0.02	3.81 ± 0.03	4.10 ± 0.02	3.90 ± 0.02	4.06 ± 0.02	4.53 ± 0.02
	Efficiency/%	53.1	22.0	38.0	55.1	55.2	55.1

- Event cleaning: $\Sigma|Pt_{\text{ISR}}| < 1\text{GeV}/c \ \& \ \Sigma|Pt_{\nu}| < 1\text{GeV}/c$
- Before event cleaning, BMR ranges from 3.90% to 4.56%
- After event cleaning, BMR ranges from 3.81% to 4.53%

❖ Samples generated under CEPCSW_tdr24.12.0

- /cefs/higgs/maxiaotian/CEPCSW/sample/nogenmatch/24.12.0
- /cefs/higgs/zhangkl/Production/2412/

BMR – performance of 24.12.0



Former result – BMR with barrelratio cut consistent with CDR

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

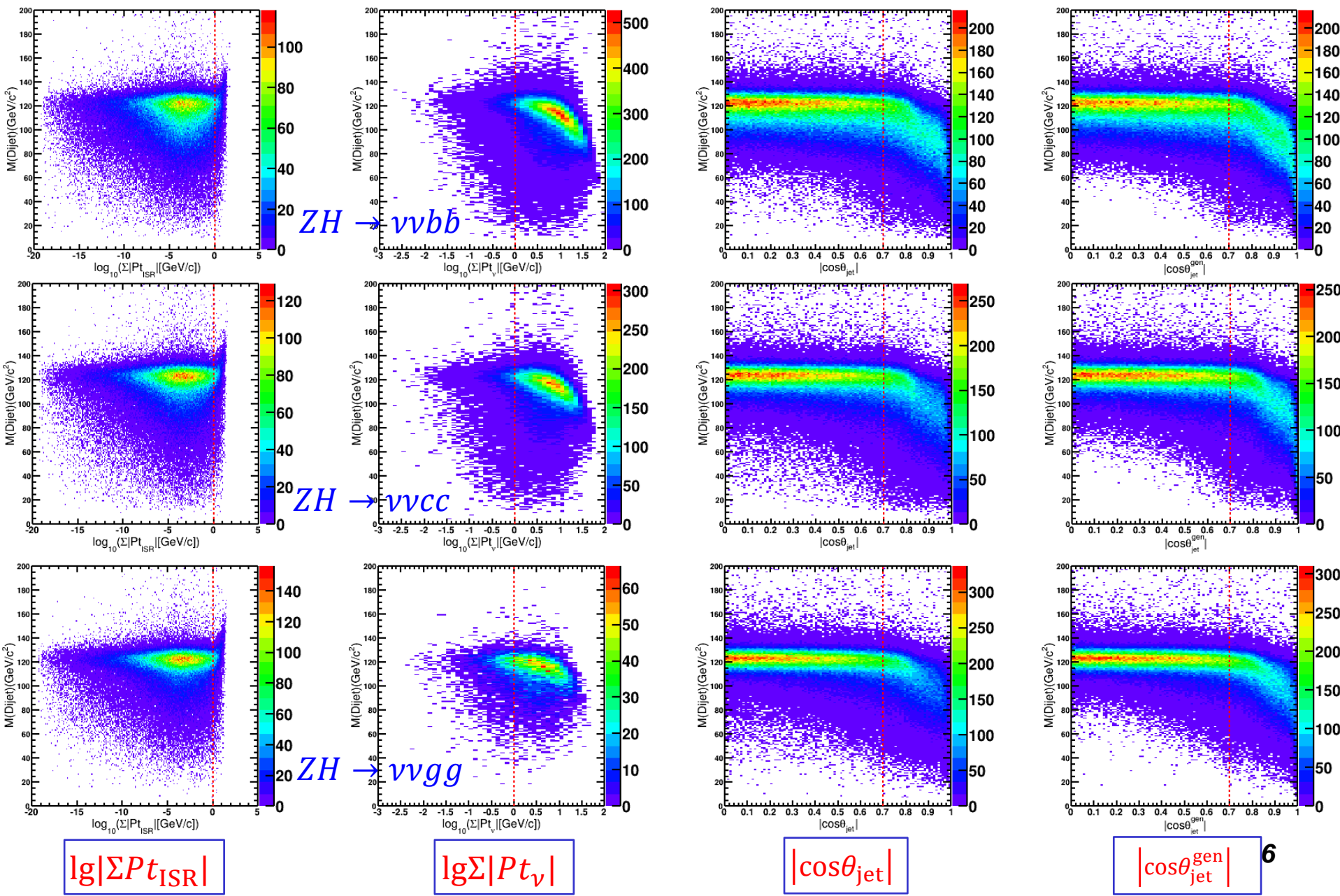
	gg(%)	bb(%)	cc(%)	WW*(%)	ZZ*(%)
Pt_ISR < 1 GeV	95.15	95.37	95.30	95.16	95.24
Pt_neutrino < 1 GeV	89.33	39.04	66.36	37.46	41.39
Cos(Theta_Jet) < 0.85	67.30	28.65	49.31	–	–

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

Distributions of 24.12.0

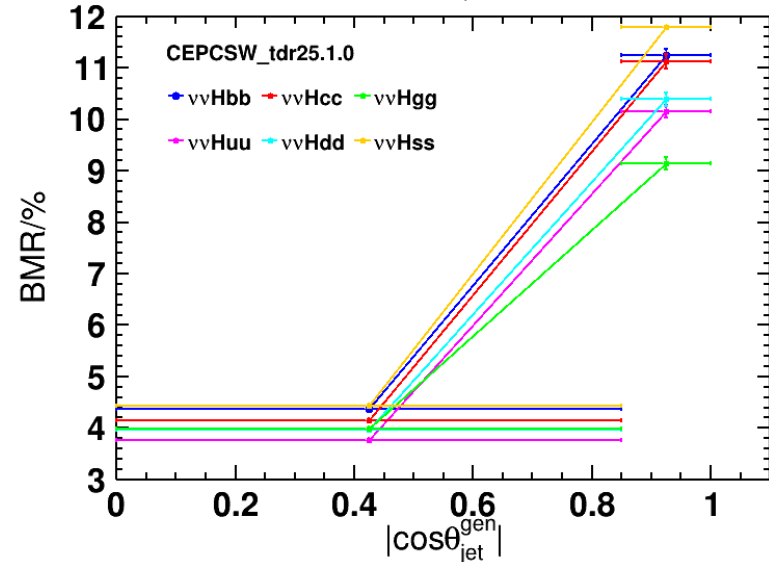
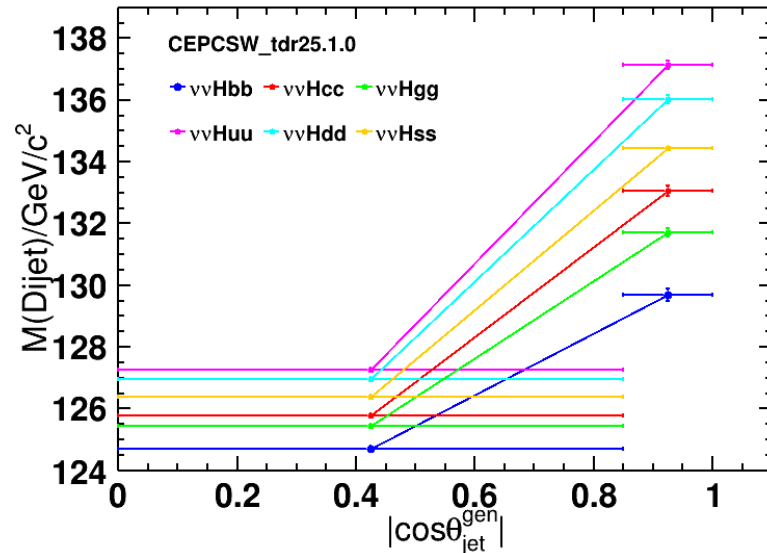
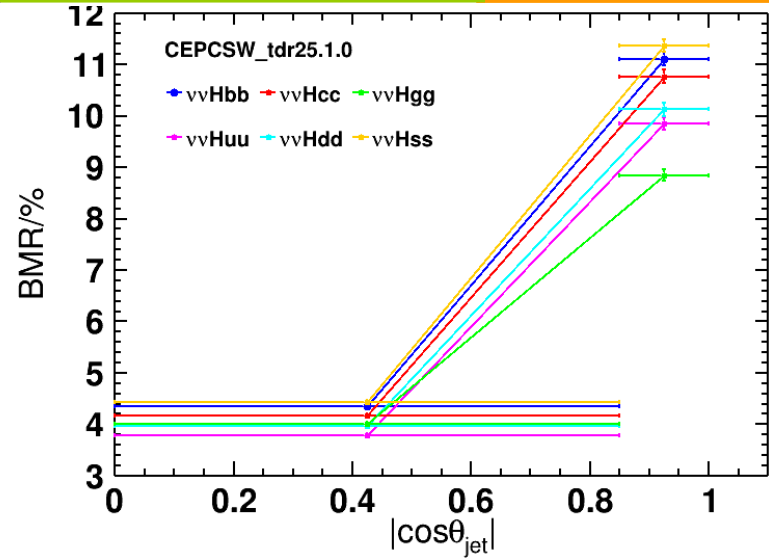
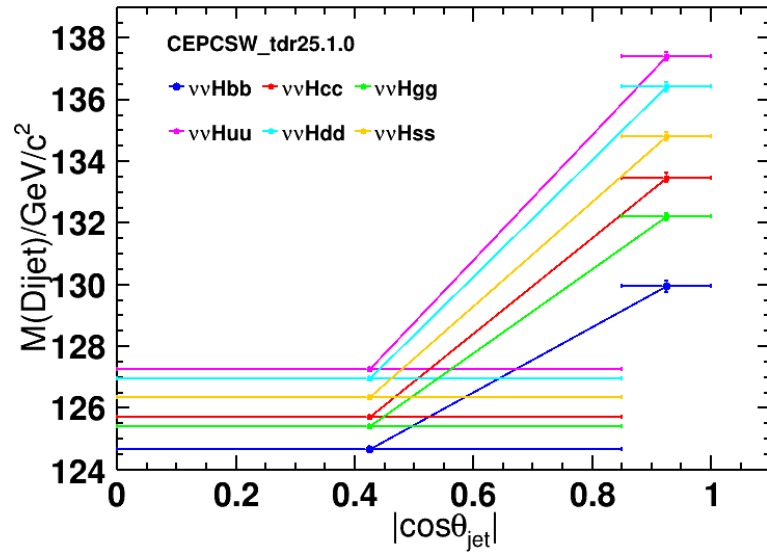


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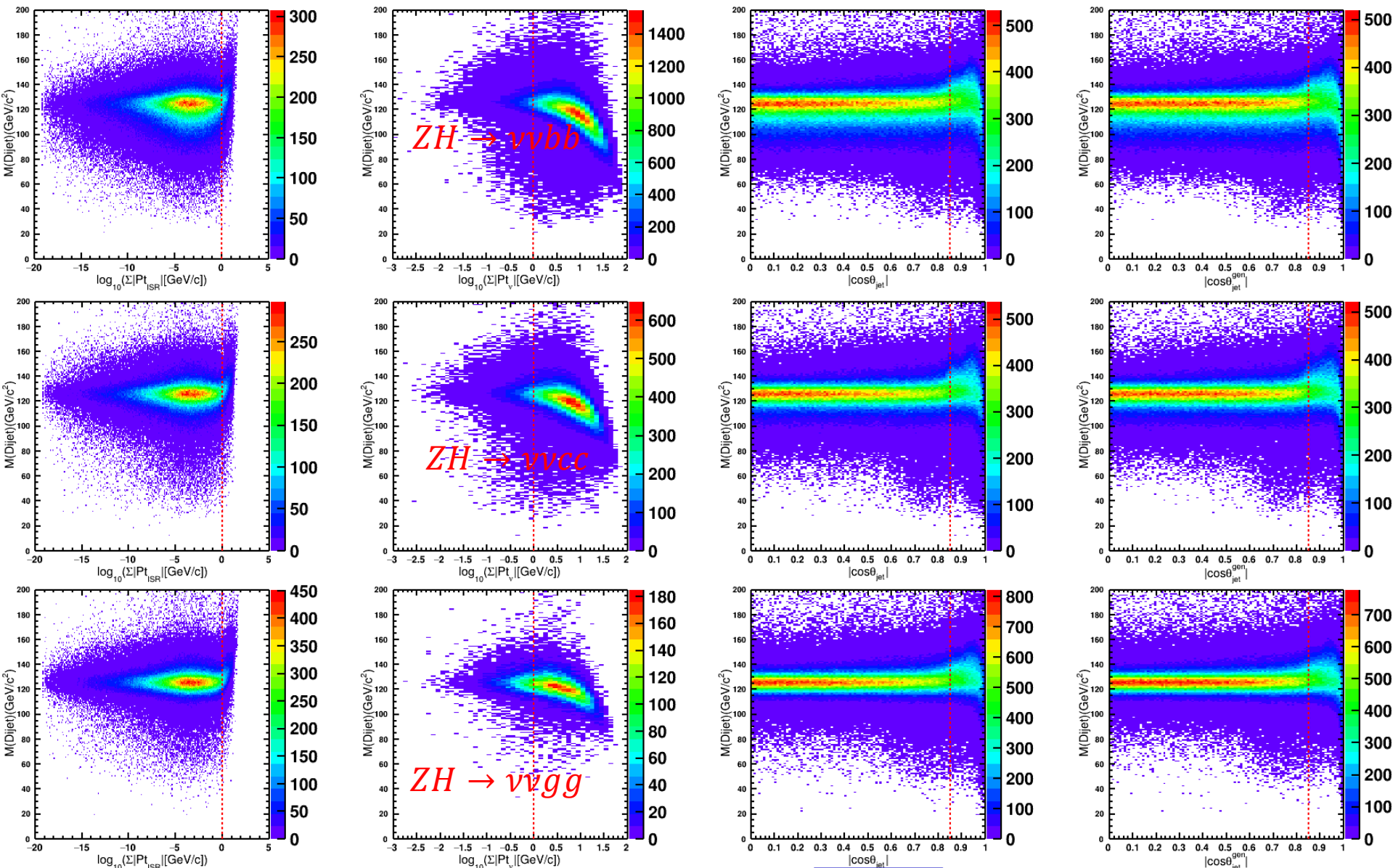


- ❖ Results and fit plots of 25.1.0 with endcap

Dijet mass and BMR of barrel and endcap



Distributions of 25.1.0



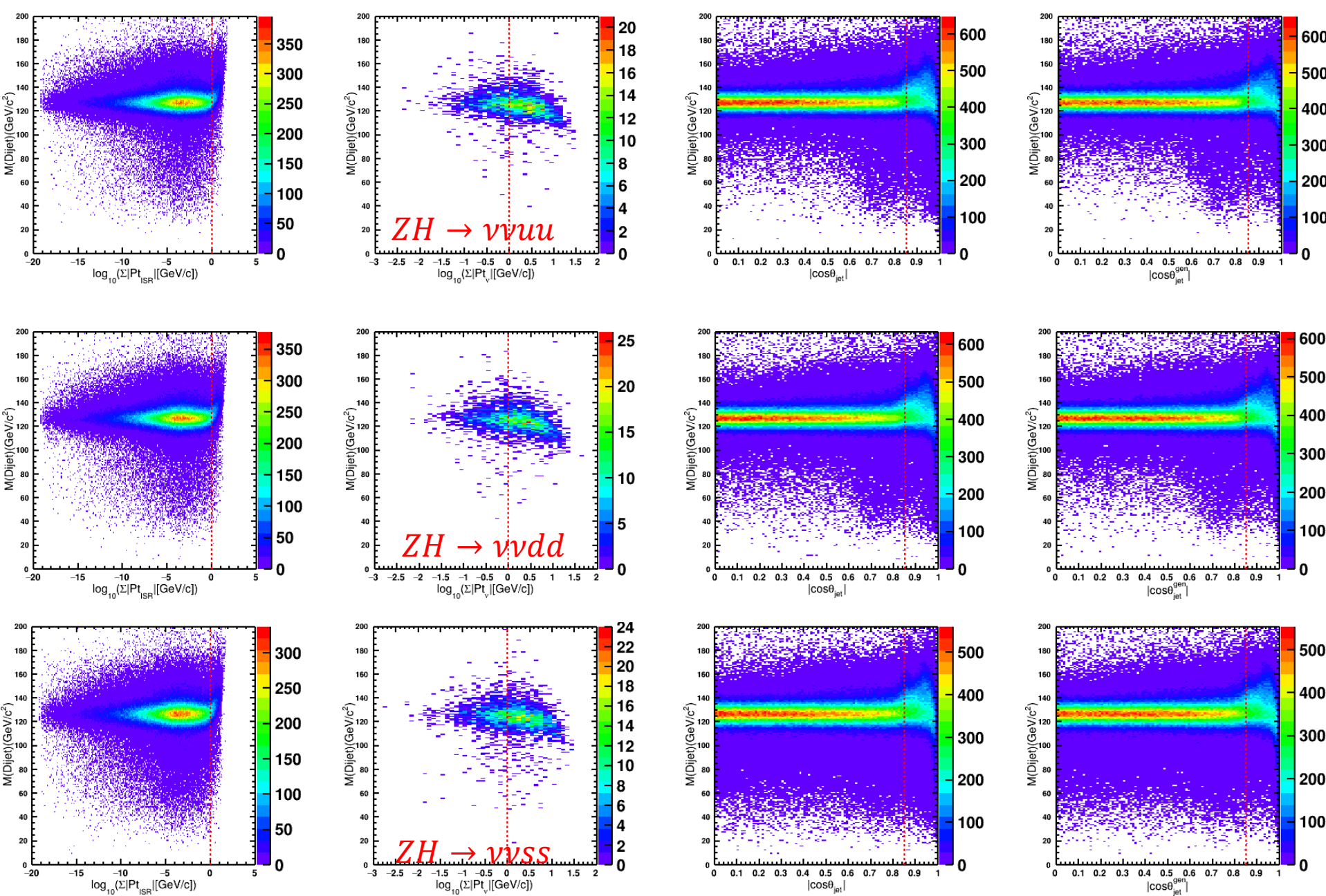
$lg|\Sigma Pt_{ISR}|$

$lg\Sigma|Pt_\nu|$

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$|\cos\theta_{jet}|$

$|\cos\theta_{jet}^{gen}|$



$|\lg|\Sigma Pt_{\text{ISR}}|$

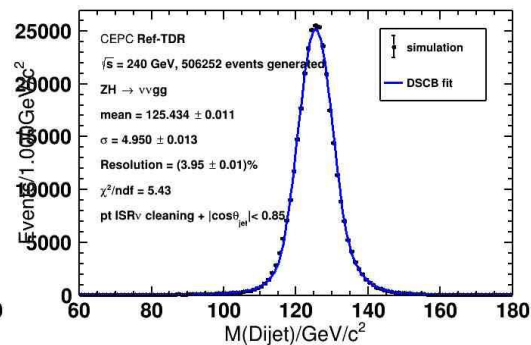
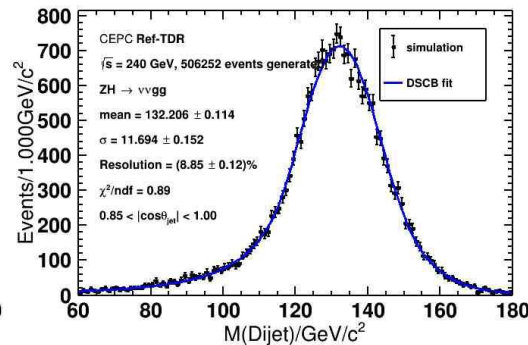
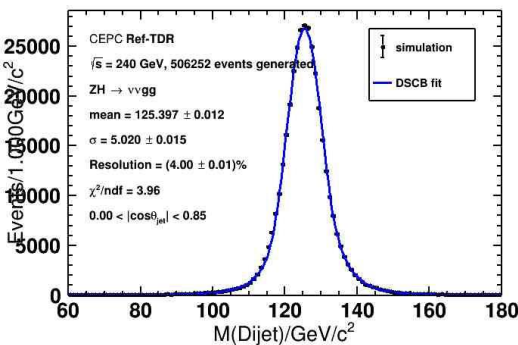
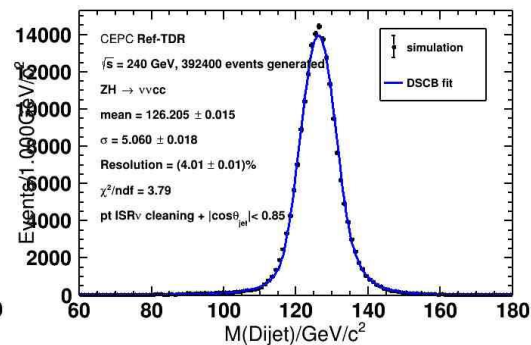
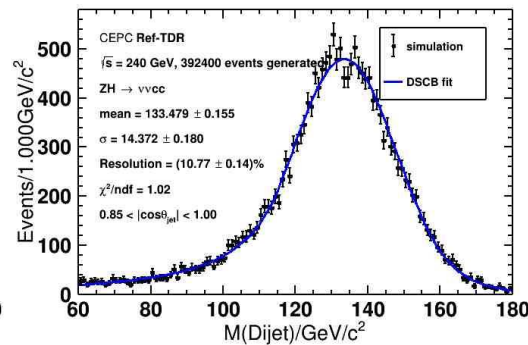
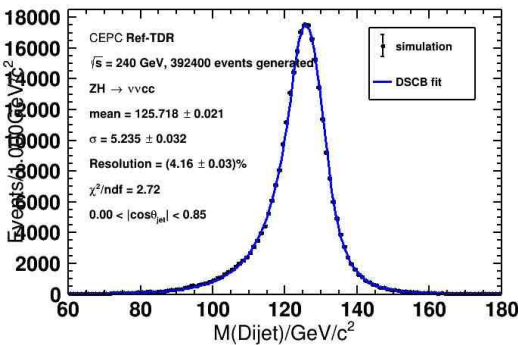
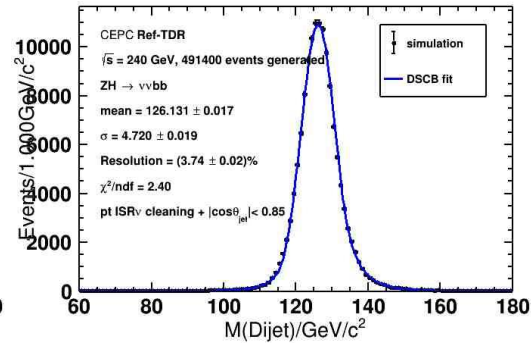
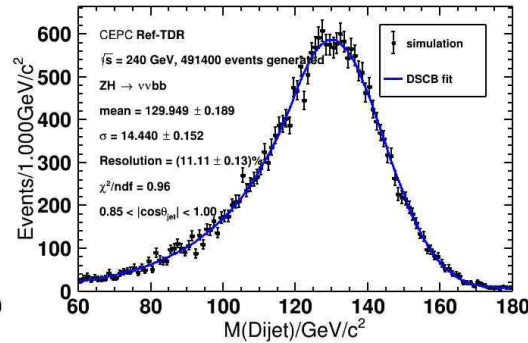
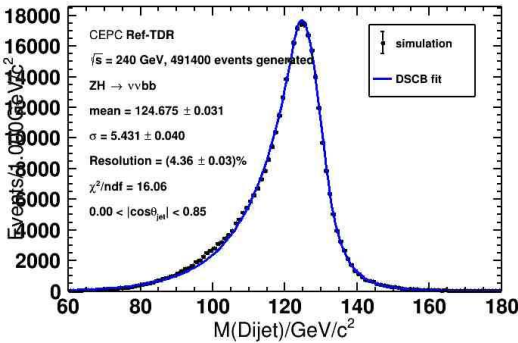
$|\lg|\Sigma|Pt_{\nu}|$

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$|\cos\theta_{\text{jet}}|$

$|\cos\theta_{\text{jet}}^{\text{gen}}|$ 10

Fit result at barrel/endcap/barrel cleaning



Fit result at barrel/endcap/barrel cleaning

