Updates on Higgs Combination

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Channels Table

Done/Almost Done:

Signal		Precision
Z	H	
H->qq		
ee	bb	1.7%
	cc	28.4%
	gg	24.2%
μμ	bb	1.2%
	cc	20.3%
	gg	16.9%
qq	bb	0.8%
	cc	21.4%
	gg	10.0%
vv	bb	0.5%
	cc	4.9%
	gg	2.7%
H→ττ		
ee	ττ	3.0%
μμ		2.8%
qq		1.9%
vv		3.7%
H→γγ		
μμ+ττ	γγ	24.8%
vv		11.7%
qq		12.8%

Signal		Precision
Z	H	
H->WW		
μμ	μνμν	7.3%
	evev	
	evμν	
	evqq	4.0%
	μνqq	4.0%
ee	μνμν	9.2%
	evev	
	evμν	
	evqq	4.6%
	μνqq	3.9%
vv	qqqq	2.0%
	evqq	4.7%
	μνqq	4.2%
ZH bkg contribution		3.0%
H->ZZ		
vv	μμqq	8.2%
vv	eeqq	35.2%
μμ	vvqq	7.3%
ee	eeqq	35.1%
ee	μμqq	23.0%
ZH bkg contribution		19.4%

Signal		Precision
Z	H	
vvH(WW fusion)		
vv	bb	3.1%
Rare Decays		
H→μμ		
qq	μμ	15.4%
ee		
μμ		
vv		
H->Invisible		Br, Upper
qq	ZZ(vvvv)	0.3%
ee		1.1%
μμ		0.7%
H→Zγ		
vv	Zγ(qqγ)	21.2%

Need to be done:	
ττ	Anything
qq	WW
	ZZ
ee	γγ
ee	ττ

For WW and ZZ:
green are studied.

	Z	ee	μμ	vv	ττ	qq
WW	ev+ev					
	μv+μv					
	ev+μv					
	ev+τv					
	μv+τv					
	τv+τv					
	ev+qq					
	μv+qq					
	τv+qq					
	qq+qq					
	Z	ee	μμ	vv	ττ	qq
ZZ	ee+qq					
	μμ+qq					
	vv+qq					
	ll+ll					
(Invi)	vv+vv					
	qq+qq					
	ll+vv					

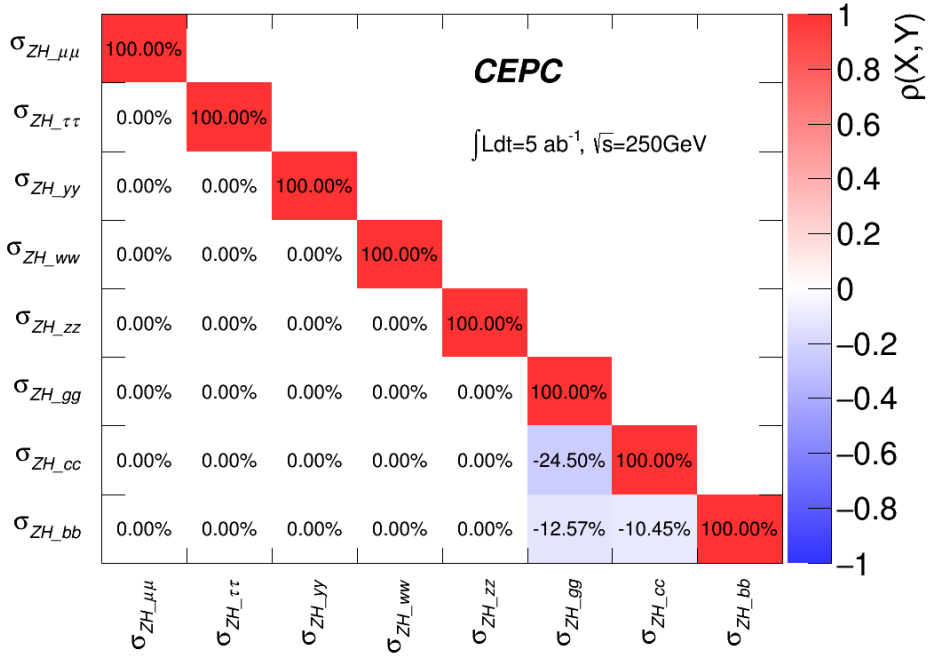
Fit results

Standalone: Regardless any ZH bkg contribution;
Different impact on w/z and b/c/g/τ.

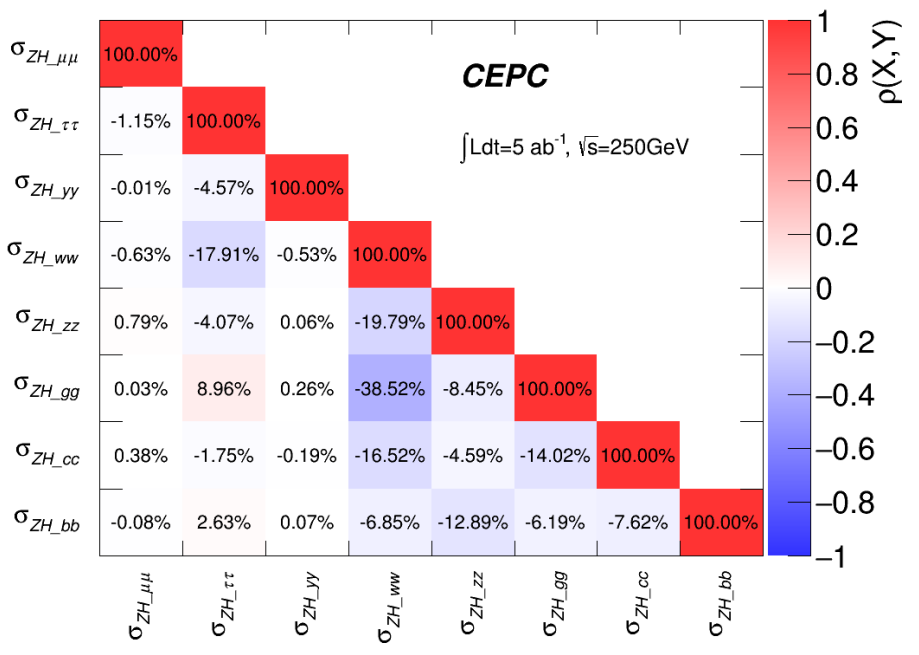
($5ab^{-1}$)	Pre_CDR	Combined	Standalone
$\sigma(ZH)$	0.51%	0.50%	
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \mathrm{bb})$	0.28%	0.29%	0.28%
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \mathrm{cc})$	2.20%	3.53%	3.52%
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \mathrm{gg})$	1.60%	1.47%	1.36%
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \mathrm{WW})$	1.50%	1.17%	1.28%
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \mathrm{ZZ})$	4.30%	5.03%	5.20%
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \tau\tau)$	1.20%	1.35%	1.32%
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \gamma\gamma)$	9.00%	8.08%	8.15%
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \mu\mu)$	17%	15.40%	15.40%
$\sigma(\mathrm{vv}H) * \mathrm{Br}(\mathrm{H} \to \mathrm{bb})$	2.80%	3.11%	3.11%
$\mathrm{Br}_{\mathrm{upper}}(\mathrm{H} \to \mathrm{inv.})$	0.28%	0.24%	0.24%
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to Z\gamma)$	\	4σ(21.2%)	4σ(21.2%)

Correlations in channel

Standalone Measurement



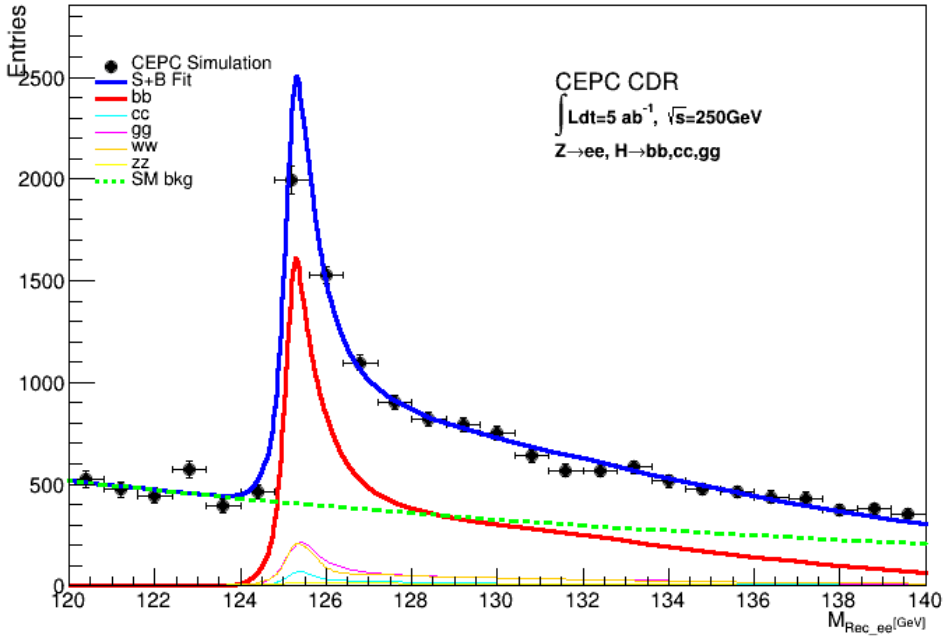
Combined measurement



eeqq

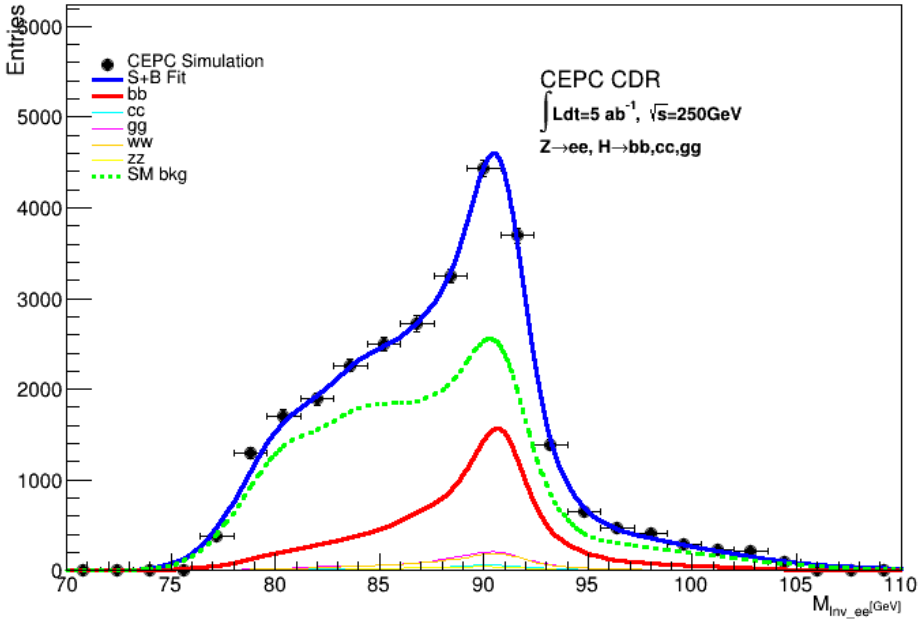
6 parts: bb/cc/gg/ww/zz/SM bkg.

M_H



bb Width:4.16GeV

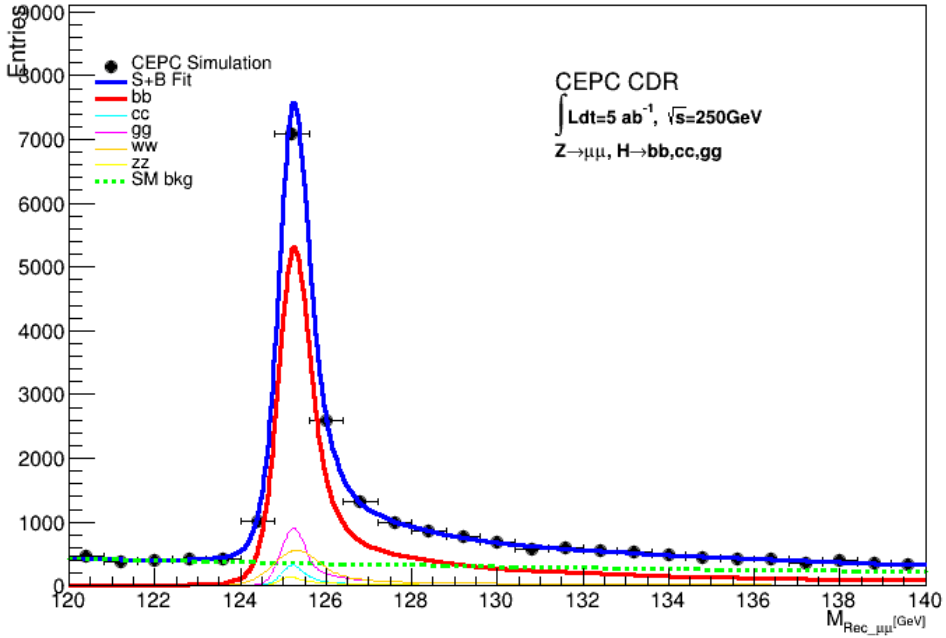
M_Z



bb Width:4.39GeV

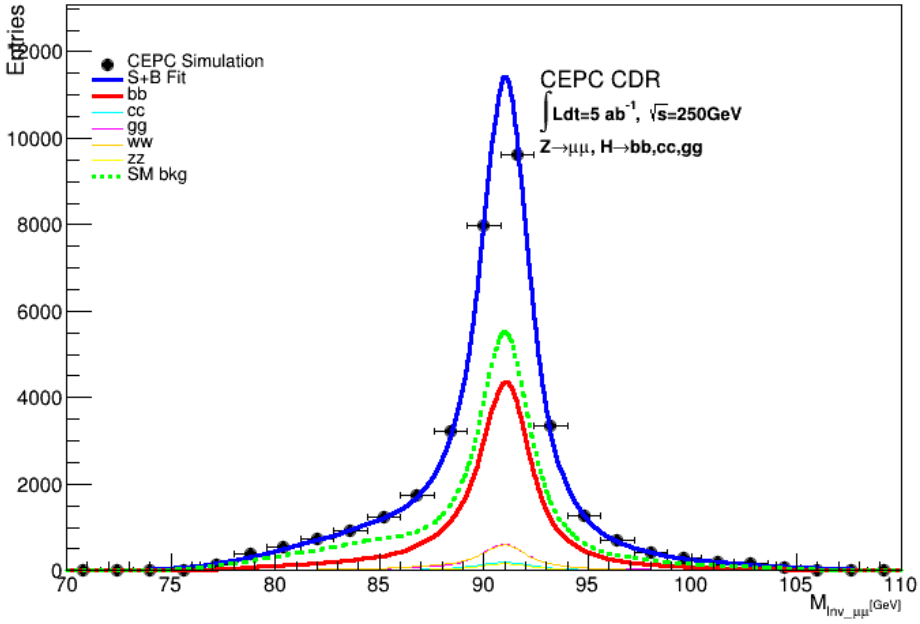
mmqq

M_H



bb Width:3.43GeV

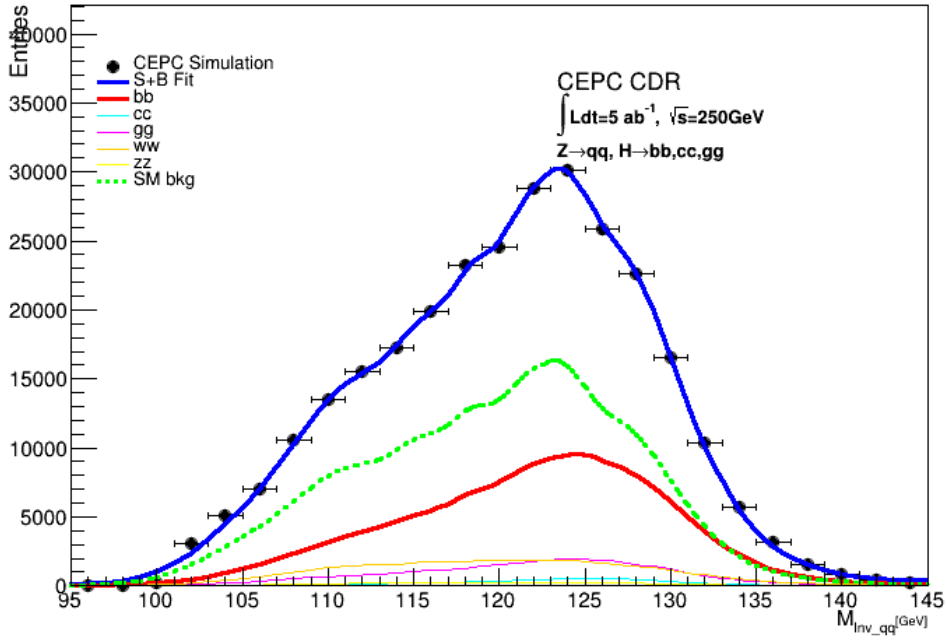
M_Z



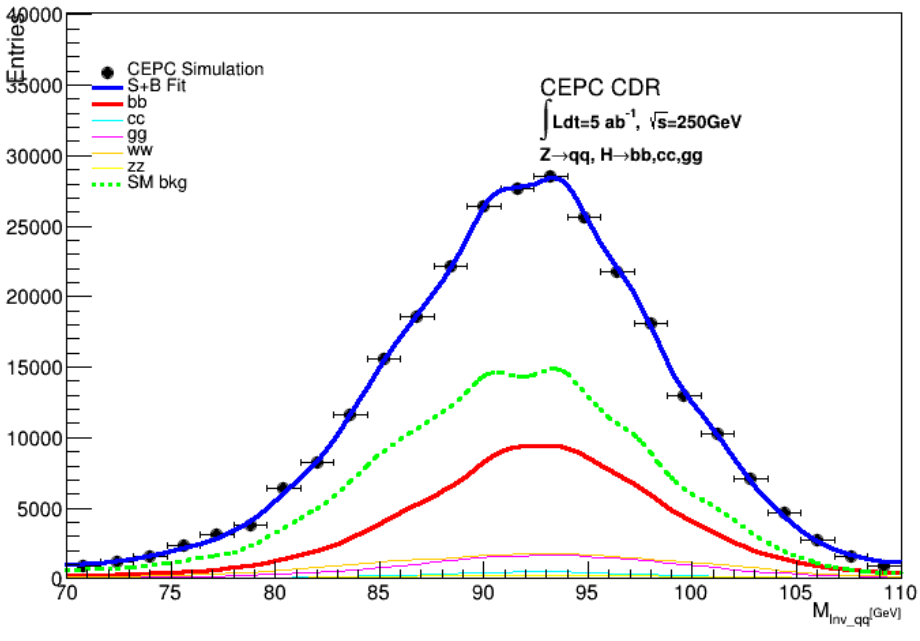
bb Width:3.47GeV

qqqq

M_H

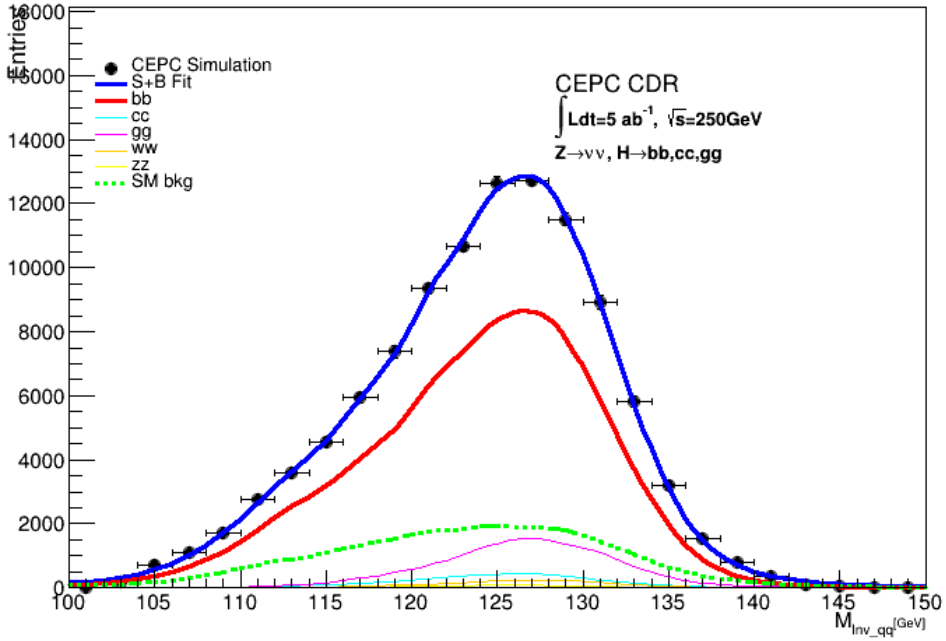

Entries
CEPC Simulation
S+B Fit
bb
cc
gg
ww
zz
SM bkg
CEPC CDR
∫Ldt=5 ab-1, √s=250GeV
Z→qq, H→bb,cc,gg
M_Inv_qq [GeV]

M_Z

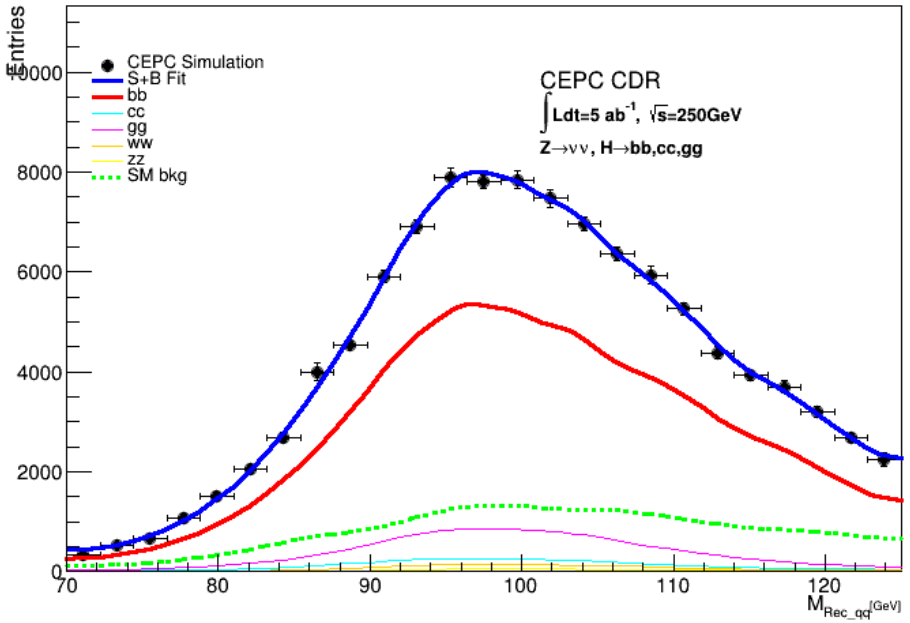

Entries
CEPC Simulation
S+B Fit
bb
cc
gg
ww
zz
SM bkg
CEPC CDR
∫Ldt=5 ab-1, √s=250GeV
Z→qq, H→bb,cc,gg
M_Inv_qq [GeV]

vvqq

M_H

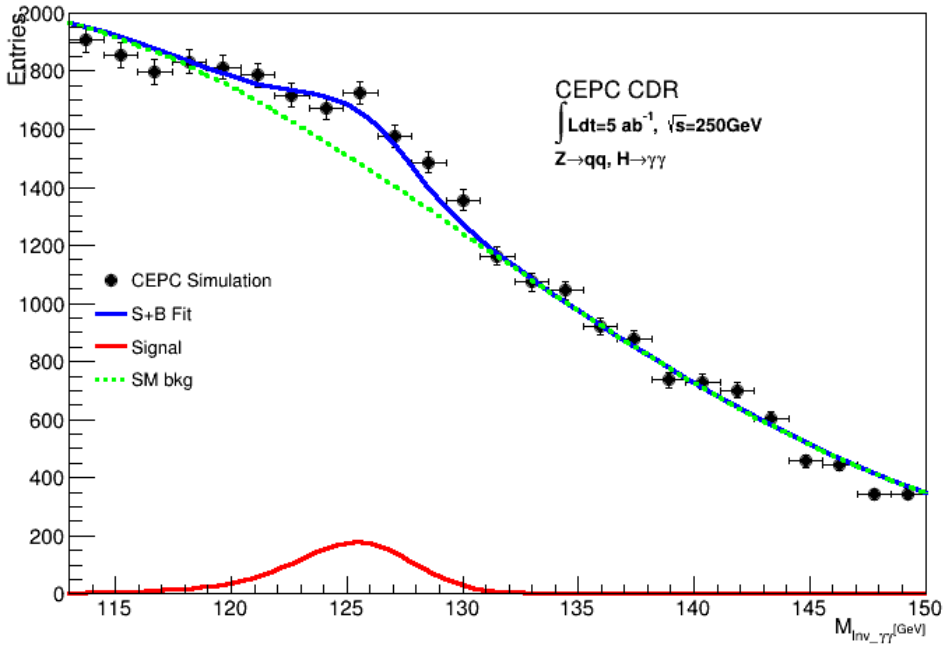

Entries
CEPC Simulation
S+B Fit
bb
cc
gg
ww
zz
SM bkg
CEPC CDR
∫Ldt=5 ab-1, √s=250GeV
Z→νν, H→bb,cc,gg
M_Inv_qq [GeV]

M_Z


Entries
CEPC Simulation
S+B Fit
bb
cc
gg
ww
zz
SM bkg
CEPC CDR
∫Ldt=5 ab-1, √s=250GeV
Z→νν, H→bb,cc,gg
M_Rec_qq [GeV]

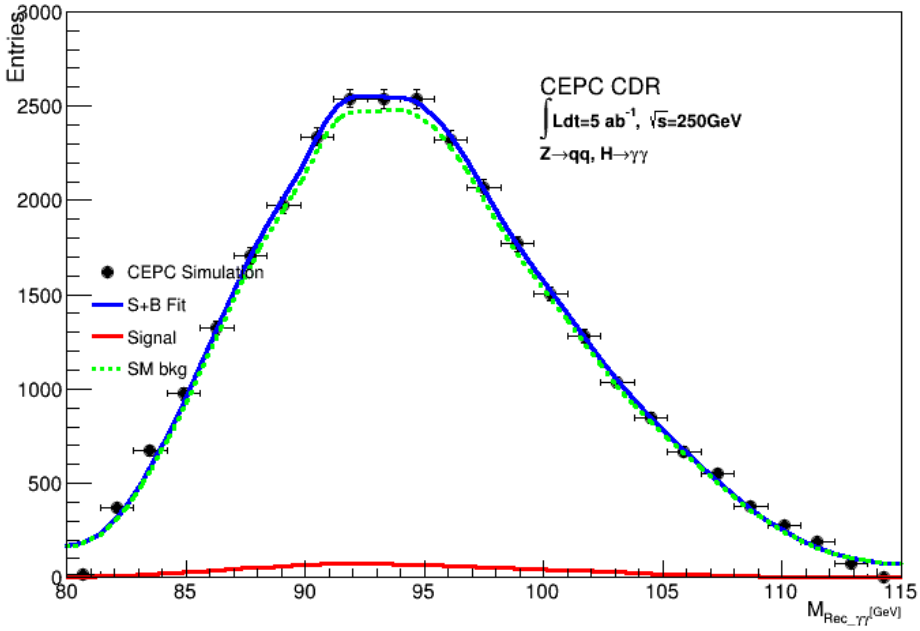
qqyy

M_H



Width:3.15GeV

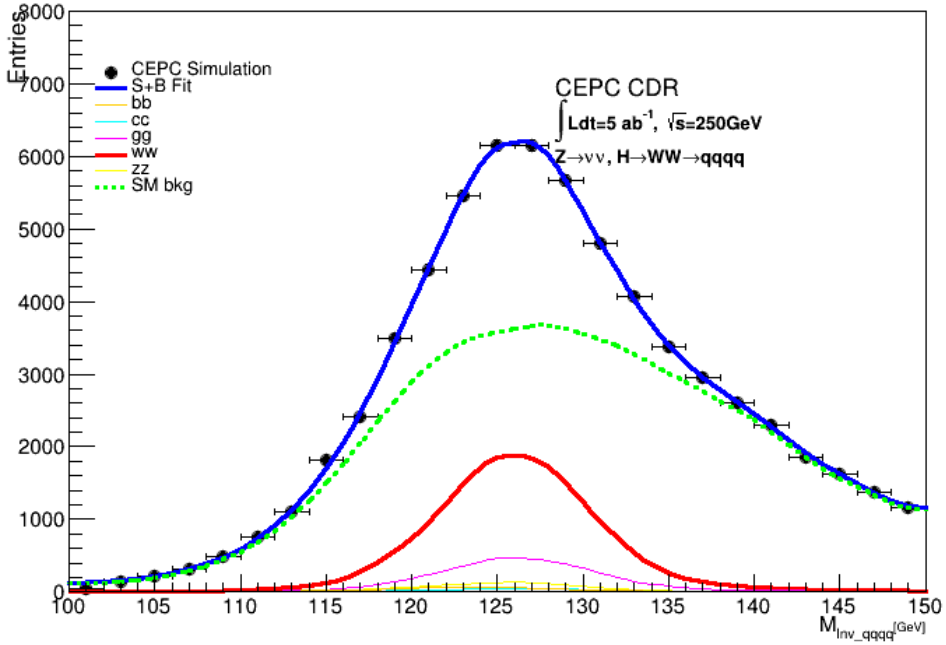
M_Z



Width:6.15GeV

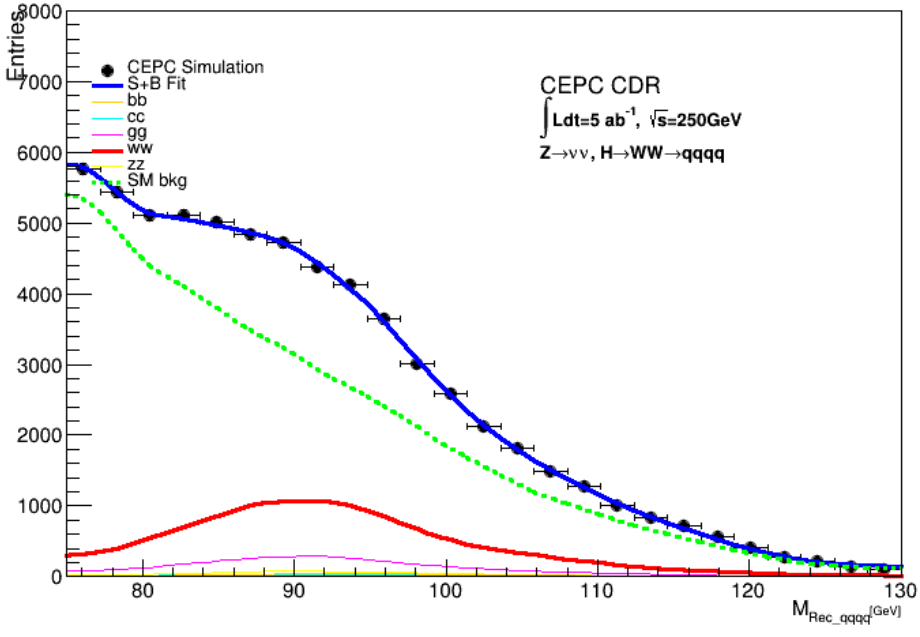
Z->vv, H->WW->qqqq

M_H



Width:5.09GeV

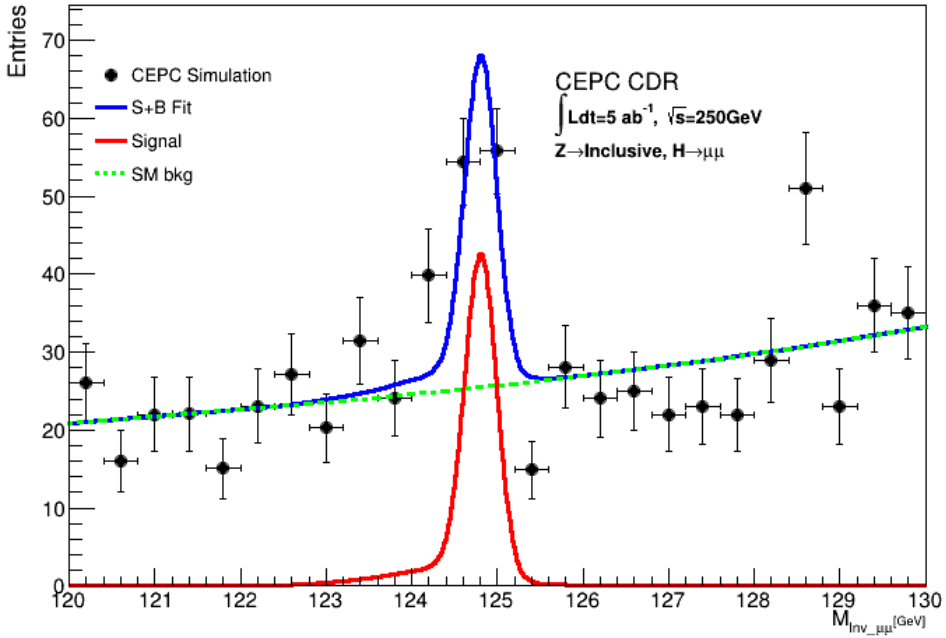
M_Z



Width:9.58GeV

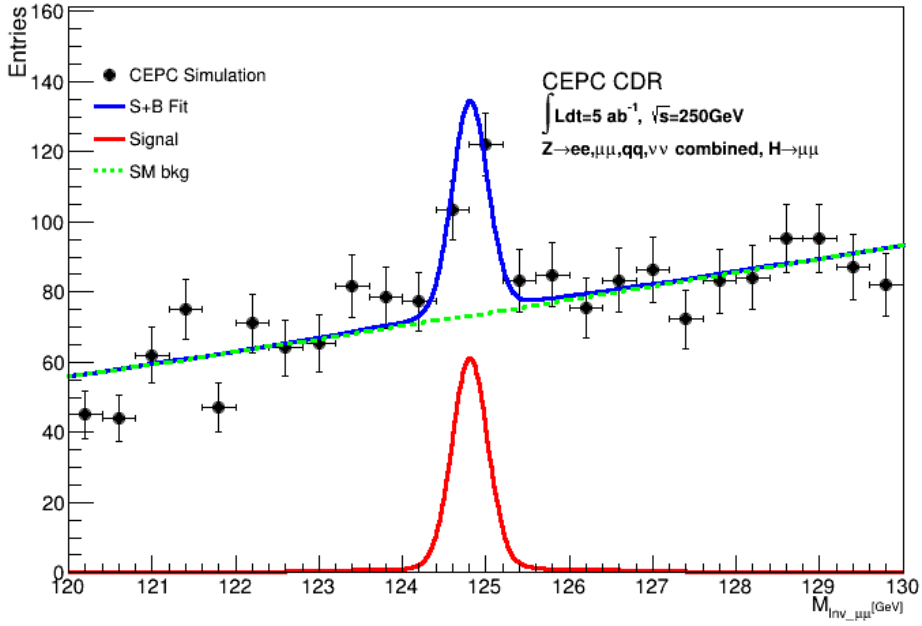
H→$\mu\mu$

Inclusive
（~20%）



Width:0.38GeV

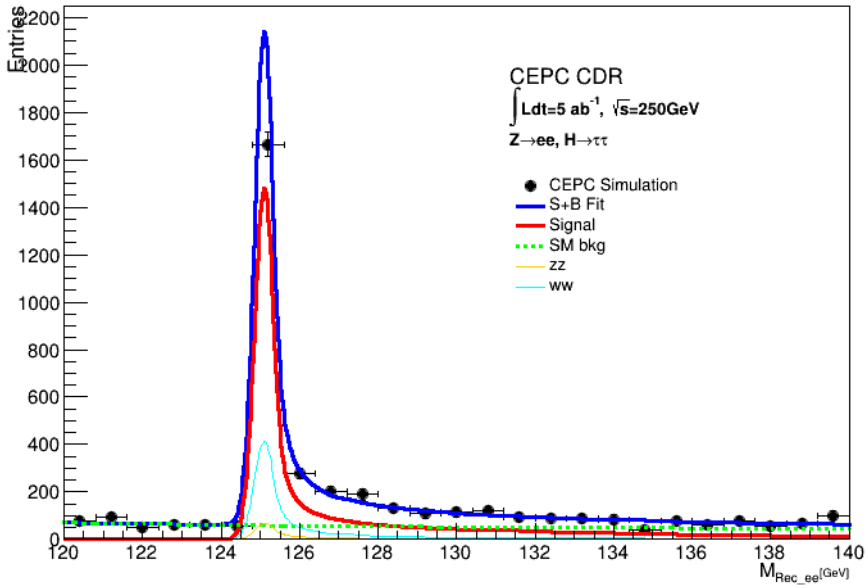
Z->ee, $\mu\mu$,qq,vv Combined
（15.4%）

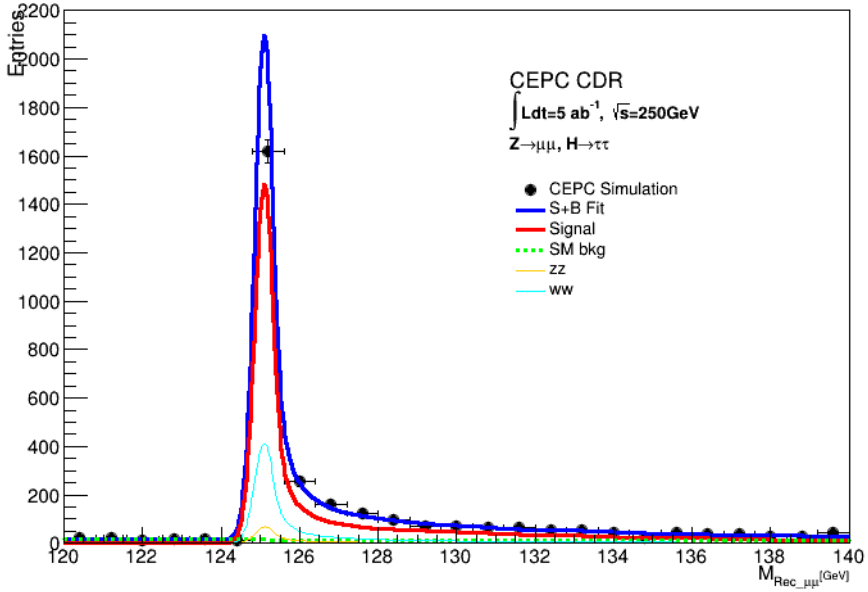


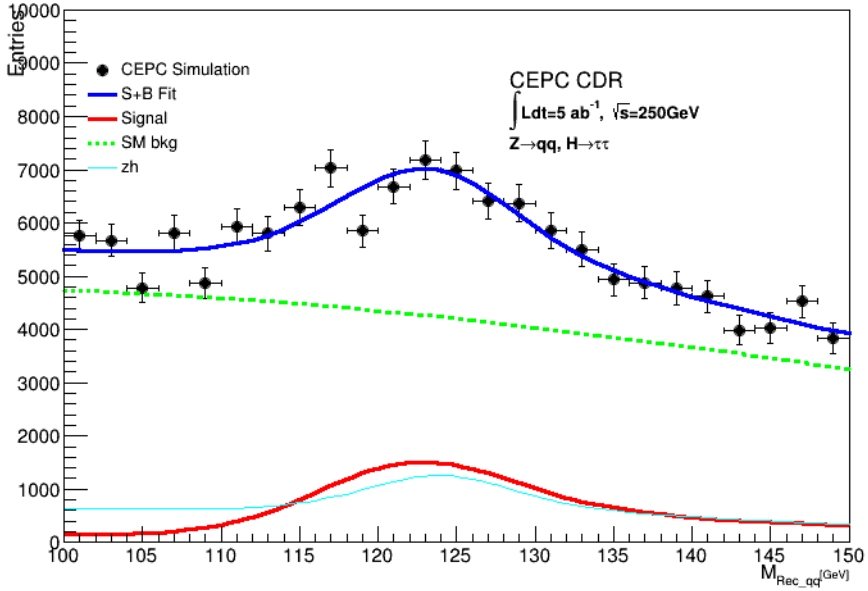
Width in Z->qq: 0.30GeV

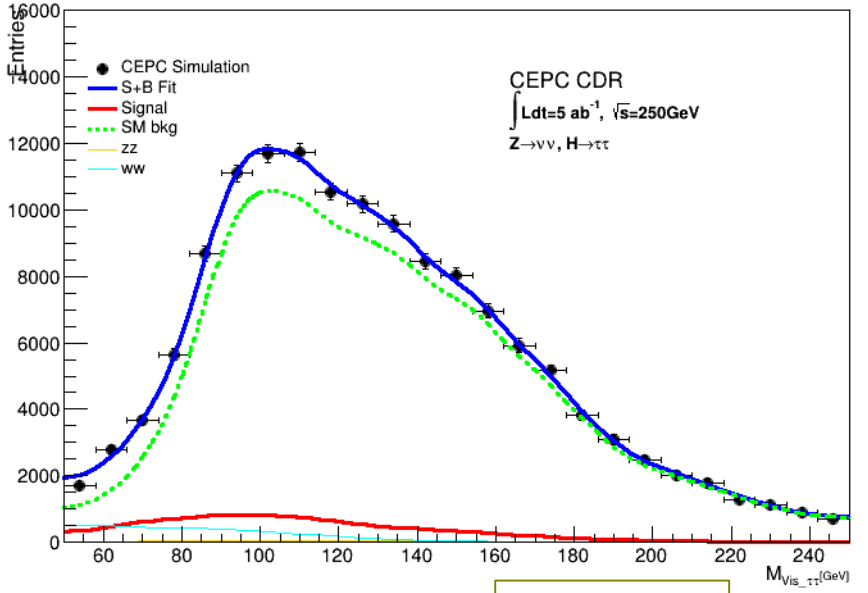
H→ $\tau\tau$

Main ZH bkg is WW.
ee$\tau\tau$ is extrapolated from $\mu\mu\tau\tau$ with 4 times SM bkg.



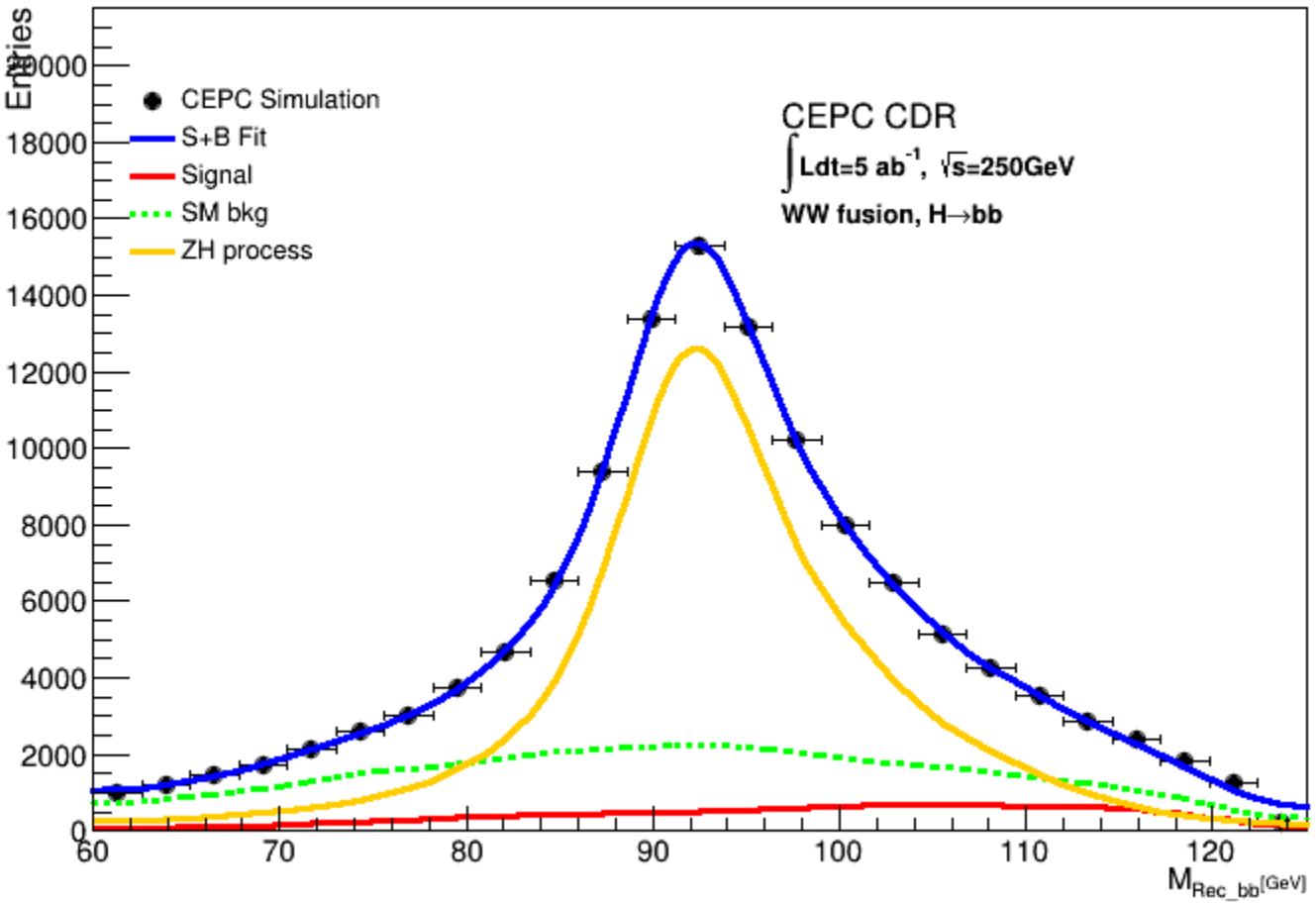






Visible τ mass

vvH, H->bb:


Entries
CEPC Simulation
S+B Fit
Signal
SM bkg
ZH process
CEPC CDR
∫Ldt=5 ab-1, √s=250GeV
WW fusion, H→bb
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
60
70
80
90
100
110
120
MRec_bb[GeV]