

Update for Combination Measurement of CEPC

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IHEP

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Subchannels Table

Dilepton channel like ee and emu have no specific Br so not included

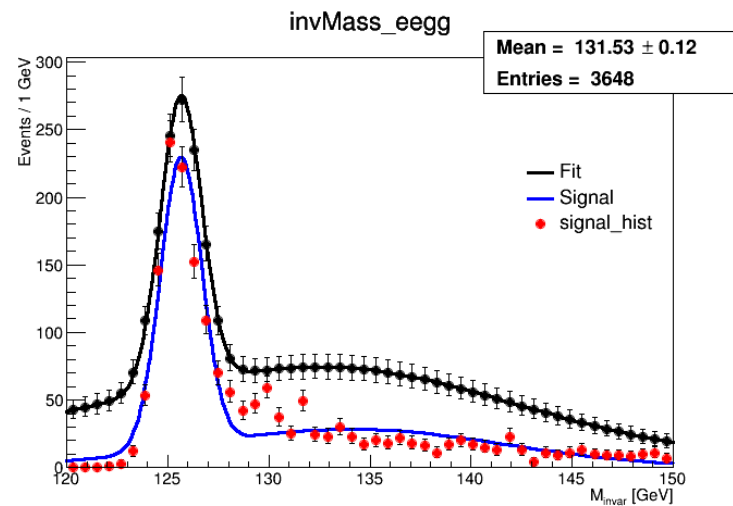
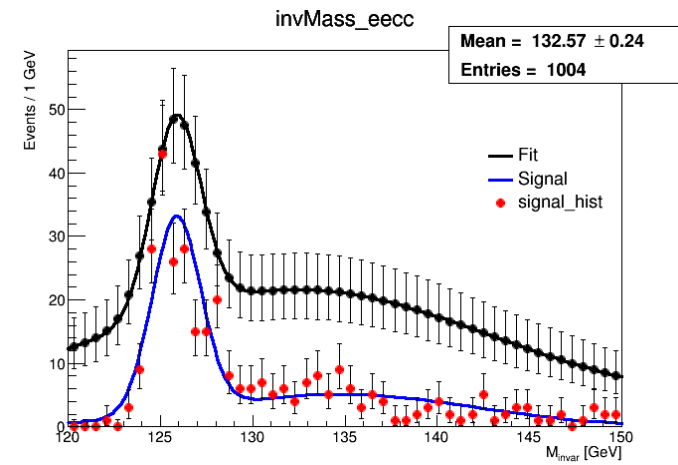
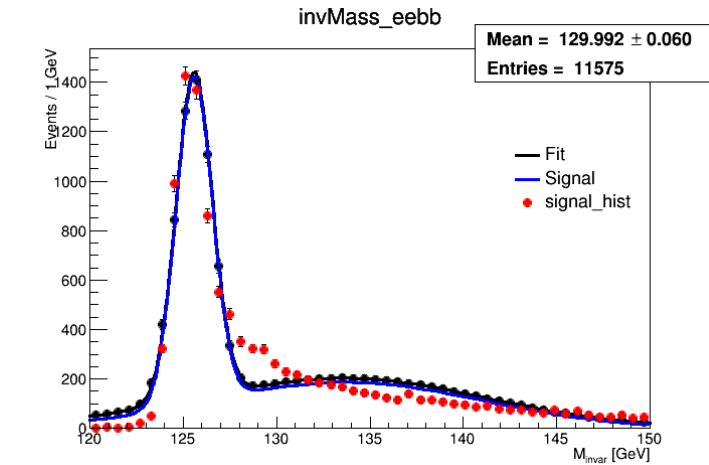
Signal		abbr.	Who takes charge	Status	Signal		abbr.	Who takes charge	Status
Z	H				Z	H			
ee	bb	eebb	ZhenXing	Considering Algorithm method.	vv	ZZ(lljj)	vvzz	Yuqian	need rescale
	cc	eecc			μμ	ZZ(vvjj)	μμZZ		
	gg	eegg			ee	ZZ(vvjj)	eeZZ		
μμ	bb	mmbb			μμ	WW(μνμν)		Libo	need rescale
	cc	mmcc				WW(even)			
	gg	mmgg				WW(eνμν)			
qq	bb	qqbb	Bai Yu		ee	WW(μνμν)		Libo	Undergoing
	cc	qqcc				WW(even)			
	gg	qqgg				WW(eνμν)			
ll	γγ	llaa	Feng		μμ	ττ	μμττ	Dan	
vv		nnaa			Inclusive	μμ		Cui	July
qq		qqaa			qq	ZZ(vvvv)		Mo Xin	July

No new data updates since 7.25

Shape examination

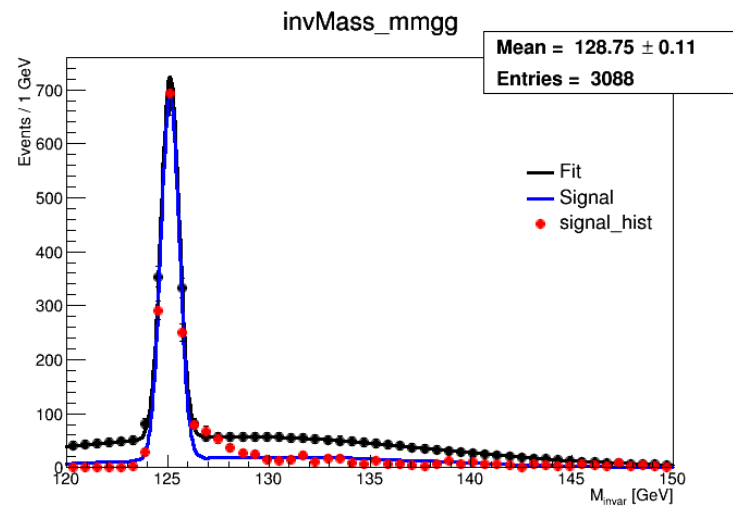
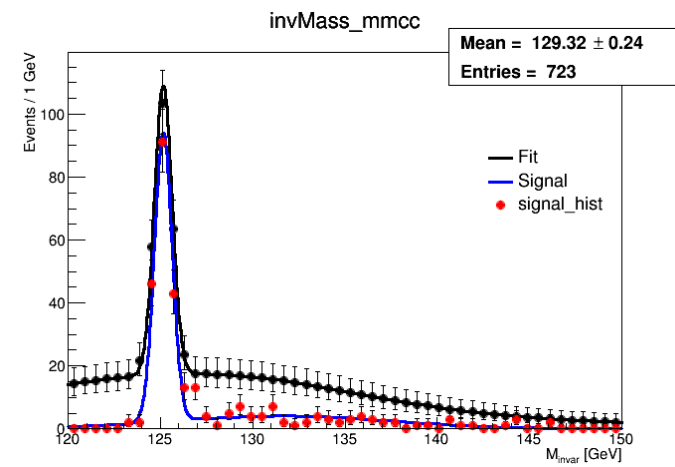
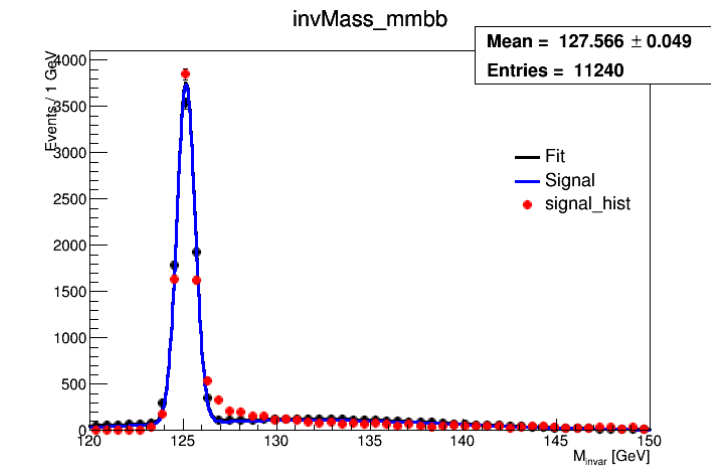
In code we use cb pdf to describe signal shape, check the accuracy;
Plot the signal histogram to compare

ee+bb/cc/gg



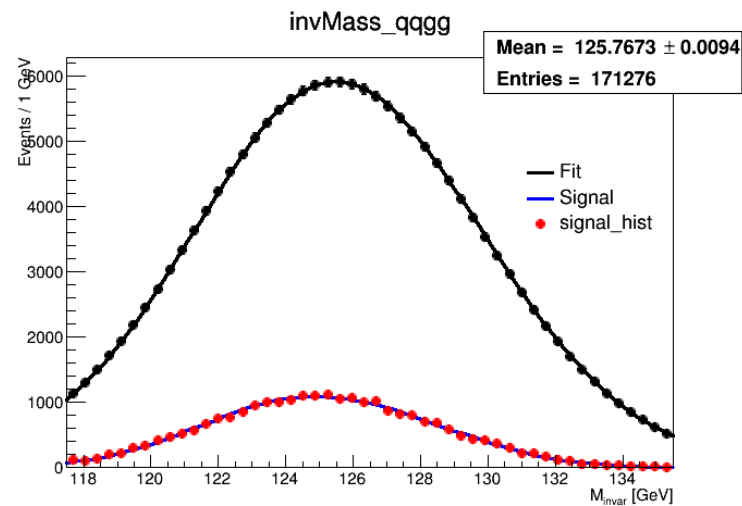
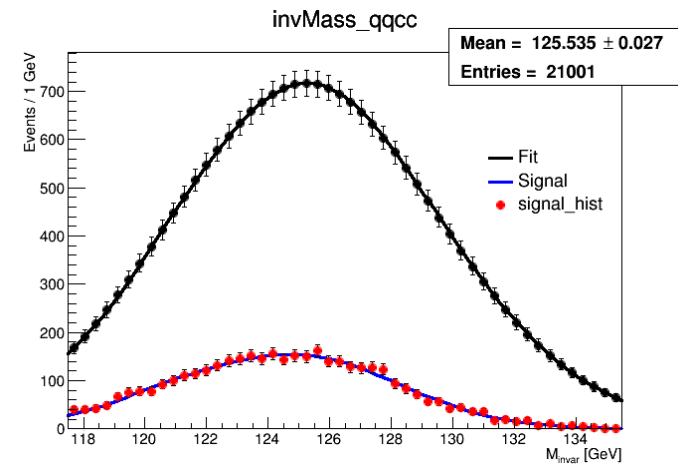
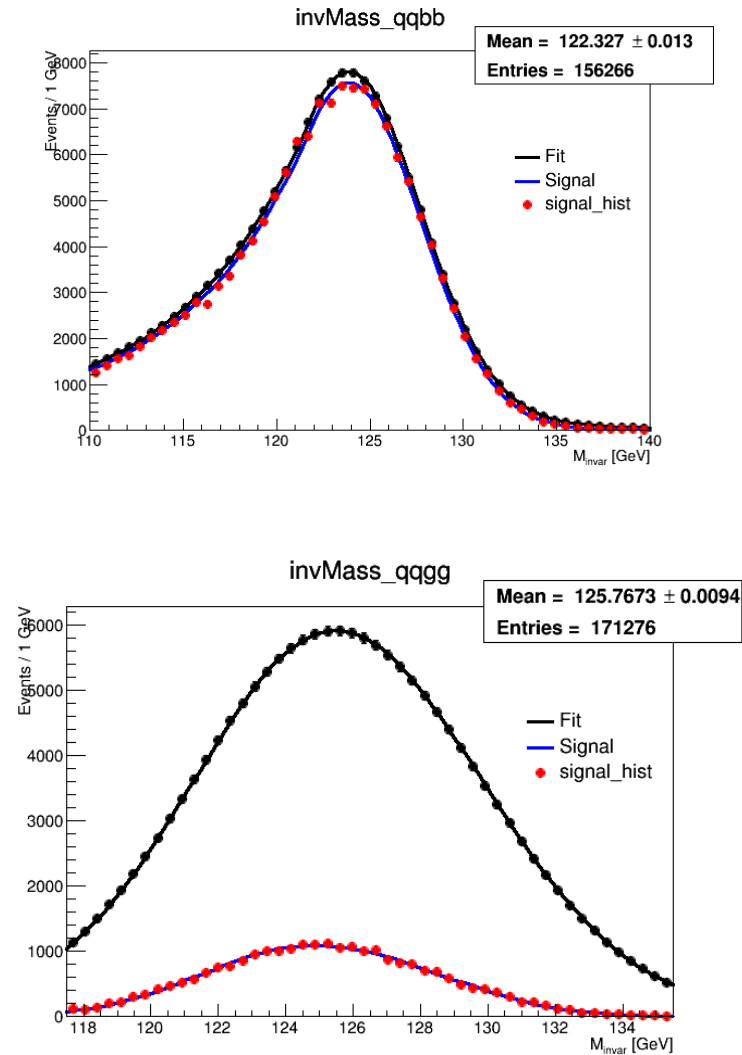
Shape examination

$\mu\mu+bb/cc/gg$



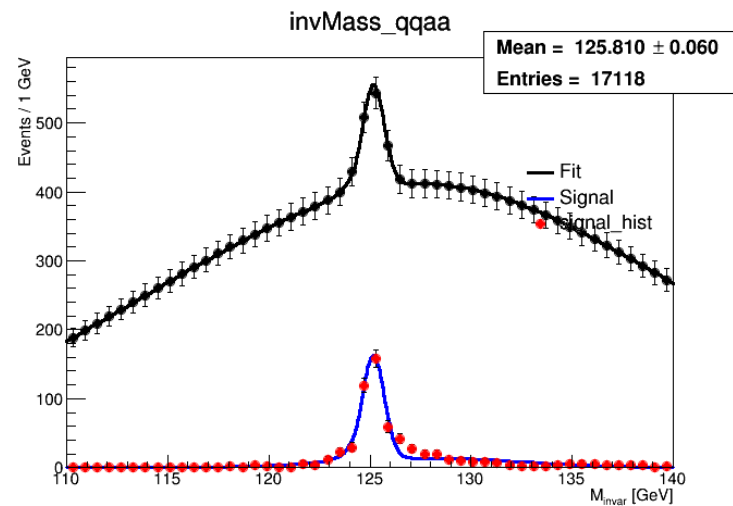
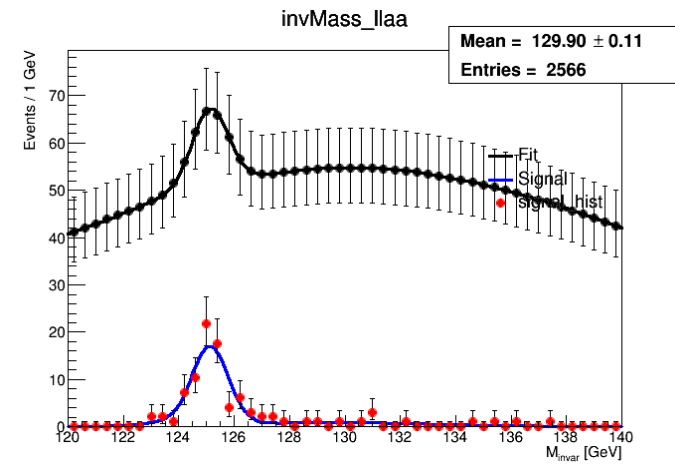
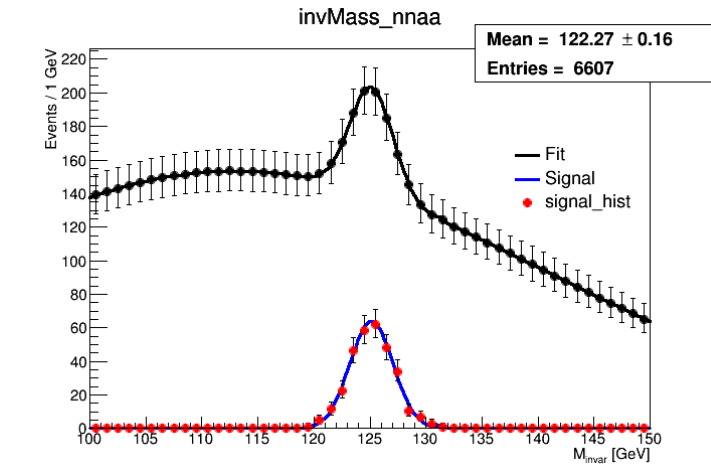
Shape examination

qq+bb/cc/gg



Shape examination

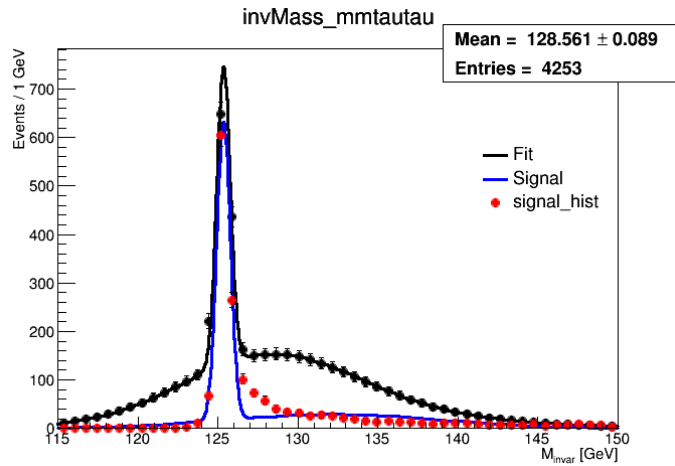
ll/vv/qq+gammagamma



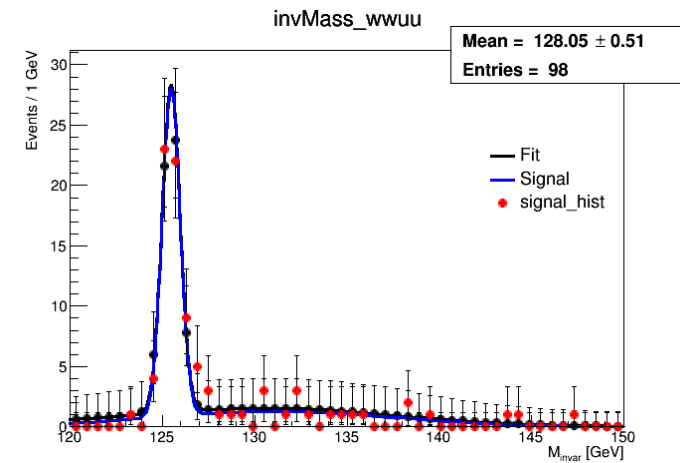
Shape examination

Ww channel seems
bkg no pdf;
(only 6 events)
Need rescale;

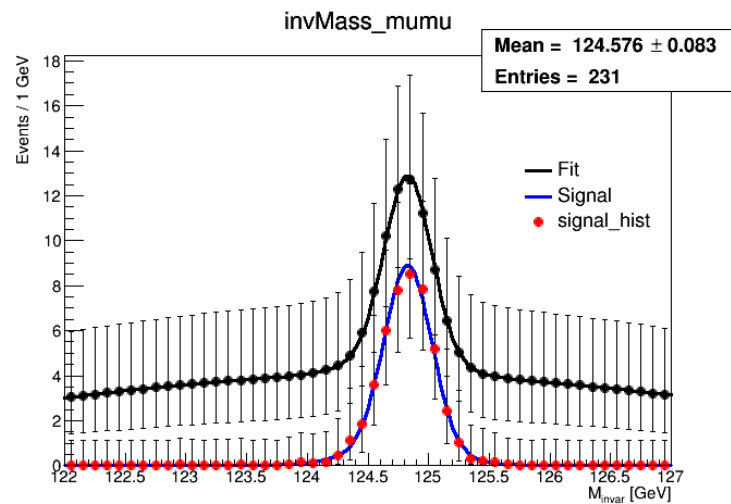
$\mu\mu+\tau\tau$



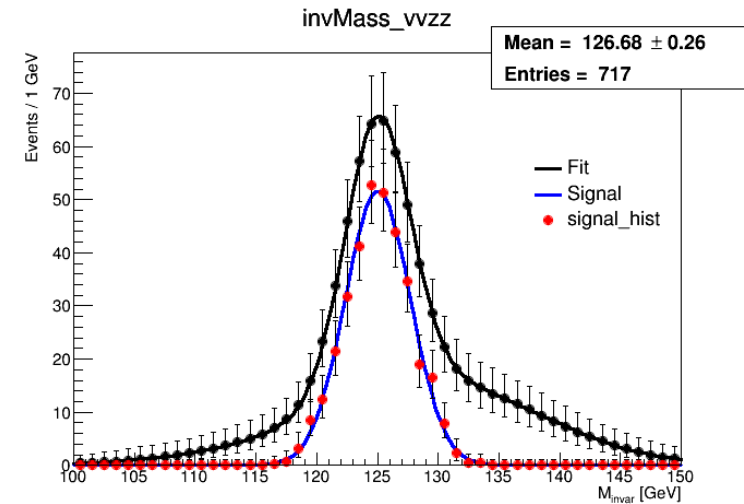
WW combined



Inclusive+ $\mu\mu$



vv+ZZ

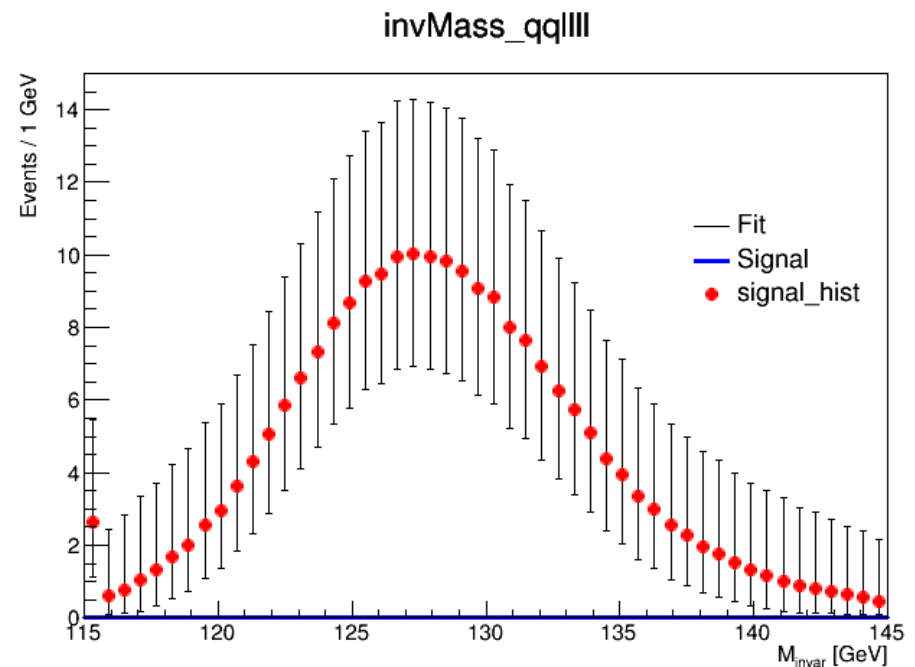
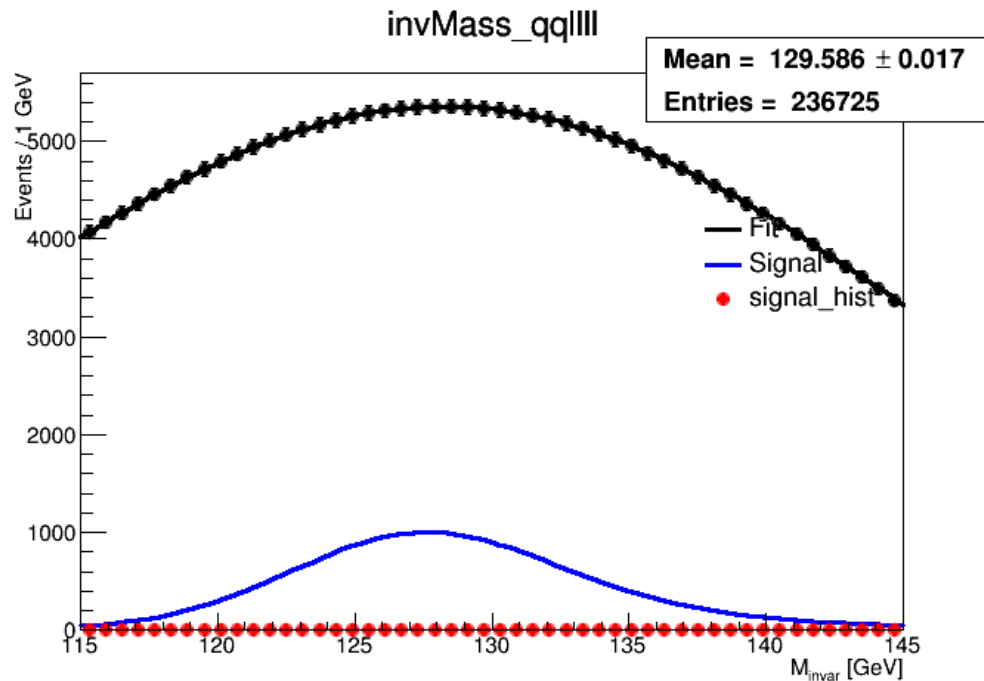


Shape examination

For qqllll channel, it contains lots bkg
with Z peak $\sim 90\text{GeV}$, to exclude this,
choose signal window $>115\text{GeV}$
(precision from 255% to 160%)

For signal pdf, most of them fit well
Need better description?

For bkg pdf, meet a problem about
scaling.
Show next week.



~ 230000 bkg and 225 signal,
Amplify signal 100 times for demonstration;

bb/cc/gg fit method

ZhenXing and Yu used
template fit, in $\mu\mu$ channel

Will repeat 2000 times

Nsig1: Bb
Nsig2: Cc
Nsig3: Gg

```
COVARIANCE MATRIX CALCULATED SUCCESSFULLY-
FCN=-238312 FROM HESSE      STATUS=OK      35 CALLS      192 TOTAL-
... EDM=0.000185611      STRATEGY= 1      ERROR MATRIX ACCURATE-
EXT PARAMETER      INTERNAL      INTERNAL-
NO.  NAME      VALUE      ERROR      STEP SIZE      VALUE-
1  nbkg1      2.16588e+03      4.76443e+01      5.00000e-01      -1.61065e+00-
2  nbkg2      2.12553e+03      1.71672e+02      1.19328e-03      1.53428e-01-
3  nsig1      1.23162e+04      1.18378e+02      1.25816e-03      -8.18957e-03-
4  nsig2      5.57837e+02      5.66060e+01      2.19926e-03      -1.53002e-01-
5  nsig3      1.80757e+03      1.42506e+02      1.10861e-03      -1.16318e-02-
... ERR DEF= 0.5-
EXTERNAL ERROR MATRIX.      NDIM= 25      NPAR= 5      ERR DEF=0.5-
9.994e+01  9.536e+01 -2.771e+01 -1.143e+02 -4.269e+02-
9.536e+01  2.978e+04 -4.184e+03 -4.414e+03 -1.990e+04-
-2.771e+01 -4.184e+03 1.401e+04 2.188e+02 2.514e+03-
-1.143e+02 -4.414e+03 2.188e+02 3.243e+03 2.529e+03-
-4.269e+02 -1.990e+04 2.514e+03 2.529e+03 2.048e+04-
PARAMETER CORRELATION COEFFICIENTS-
... NO.  GLOBAL      1      2      3      4      5-
1  0.49632  1.000  0.055 -0.023 -0.201 -0.298-
2  0.86566  0.055  1.000 -0.205 -0.449 -0.806-
3  0.22314 -0.023 -0.205 1.000 0.032 0.148-
4  0.51981 -0.201 -0.449 0.032 1.000 0.310-
5  0.85280 -0.298 -0.806 0.148 0.310 1.000-
```

bb/cc :3.2%?
Cc/gg :31%?
Bb/gg :14.8%?

bb/cc/gg fit method

Another fit

Nsig1: Bb
Nsig2: Cc
Nsig3: Gg

```

COVARIANCE MATRIX CALCULATED SUCCESSFULLY
FCN=-235743 FROM HESSE      STATUS=OK      41 CALLS      308 TOTAL
EDM=0.00033392      STRATEGY= 1      ERROR MATRIX ACCURATE
EXT  PARAMETER      INTERNAL      INTERNAL
NO.  NAME      VALUE      ERROR      STEP SIZE      VALUE
1  nbkg1      2.20908e+03  4.70116e+01  2.00000e-01  4.13434e+00
2  nbkg2      1.73041e+03  1.69403e+02  3.03572e-02  -2.18784e-01
3  nsig1      1.21641e+04  1.17684e+02  2.52624e-03  1.37713e-03
4  nsig2      5.99942e+02  5.93700e+01  5.15570e-02  -1.02559e-01
5  nsig3      2.08108e+03  1.58169e+02  1.16489e-02  3.01938e-01
ERR DEF= 0.5
EXTERNAL ERROR MATRIX.      NDIM= 25      NPAR= 5      ERR DEF=0.5
1.492e+04 -2.088e+03  6.798e+02  2.728e+03  1.014e+04
-2.088e+03  2.901e+04 -4.284e+03 -4.584e+03 -2.039e+04
6.798e+02 -4.284e+03  1.385e+04  3.339e+02  2.905e+03
2.728e+03 -4.584e+03  3.339e+02  3.567e+03  3.866e+03
1.014e+04 -2.039e+04  2.905e+03  3.866e+03  2.530e+04
PARAMETER CORRELATION COEFFICIENTS
NO.  GLOBAL      1      2      3      4      5
1  0.74674  1.000 -0.100  0.047  0.374  0.522
2  0.86409 -0.100  1.000 -0.214 -0.451 -0.753
3  0.23181  0.047 -0.214  1.000  0.047  0.155
4  0.58674  0.374 -0.451  0.047  1.000  0.407
5  0.88208  0.522 -0.753  0.155  0.407  1.000

```

bb/cc :4.7%?

Cc/gg :40.7%?

Bb/gg :15.5%?

Currently I didn't use this.

Discussion

- Checklist
 - Examine the pdf shape used in fit Crystal ball(seems OK), exp2, other form.....
 - Nuisance parameter, and their effect on event yields.
 - Next step will try to introduce the NP ATLAS used in CEPC's analysis.
 - The template fit
 - Next step will import the mH distribution from their fit
- Coupling Constant

Signal events check

H	Z	Ntuple	Theory (before cut)	Newer version
bb	ee	10853	20586	
cc		319	961	
gg		1176	3062	
bb	$\mu\mu$	10773	20586	12326
cc		283	961	615
gg		1815	3062	1755
bb	qq	148749	428876	
cc		3887	20034	
gg		25564	63812	
$\gamma\gamma$	ll	90	164	
	$\nu\nu$	328	488	
	qq	630	1707	
ZZ(lljj)	$\nu\nu$	563	548+54.8*	
WW($\mu\nu\mu\nu$)	$\mu\mu$	52	77	
WW(even)		36	77	
WW($e\nu\mu\nu$)		105	154	
$\tau\tau$	$\mu\mu$	1658	2257	
ZZ($\nu\nu\nu\nu$)	qq	225	784	
$\mu\mu$	Inclusive	47	233	

Theoretic number
calculated by
 $1.06e6(5000\text{fb})^*\text{Br}$
Which recorded in
PDG or Pre_CDR.

*WW fusion contributes ~10%.

Current $\frac{\Delta(Br * CrossX)}{Br * CrossX}$ Fit result

CrossSection Precision set to 0.5%;
For 5000ifb;

	Fit type	μ	μ_{bb}	μ_{cc}	μ_{gg}	μ_{zz}	μ_{aa}	μ_{tt}	μ_{ww}	invisible	$\mu\mu$
My	$\frac{\Delta Br}{Br}$	0.554%	0.558%	3.083%	1.339%	6.472%	7.475%	1.790%	11.161%	160%	19.4%
	$\frac{\Delta(Br * CrossX)}{Br * CrossX}$	0.239%	0.248%	3.042%	1.242%	6.452%	7.458%	1.719%	11.151%	160%	19.4%
CDR's	$\frac{\Delta Br}{Br}$	\	0.57%	2.30%	1.70%	6.90%	9.00%	1.3%	1.60%*	0.28%	17%
	$\frac{\Delta(Br * CrossX)}{Br * CrossX}$	0.28%	0.28%	2.20%	1.60%	6.90%	9.00%	1.2%	1.50%*	/	17%

*All WW channels included.