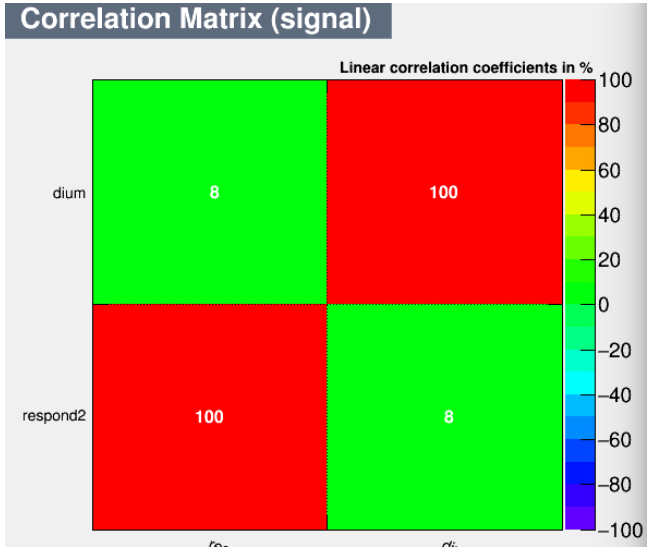
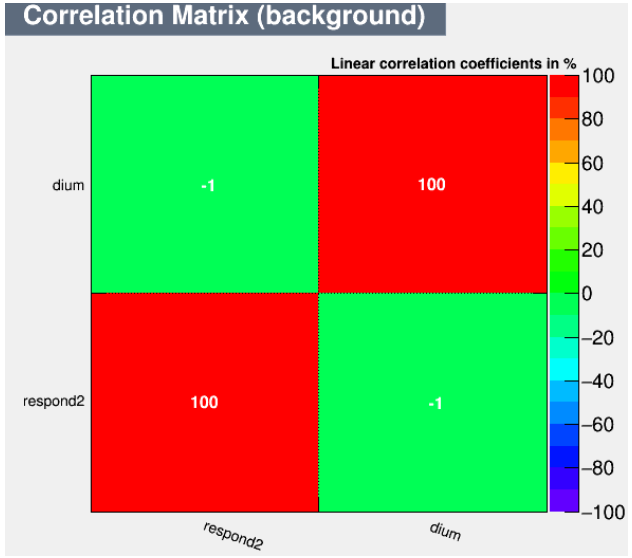
Status report on $H->\mu^{-}+\mu^{+}$ at CEPC

Zhenwei Cui

2017/9/25

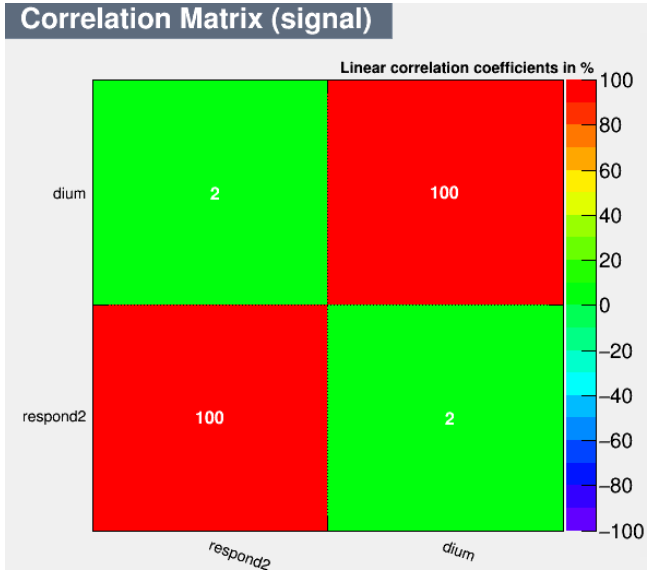
Correlation between BDT respond and invariant mass

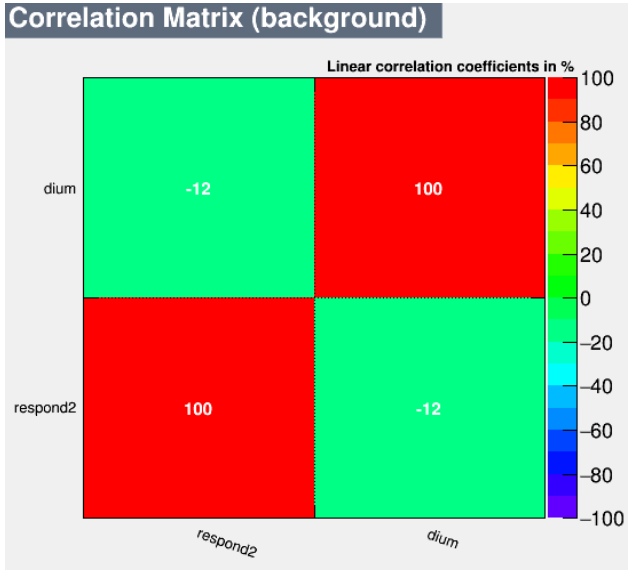




Inclusive analysis

The correlation of background in ZqqHuu analysis is -12, the others are less than 10



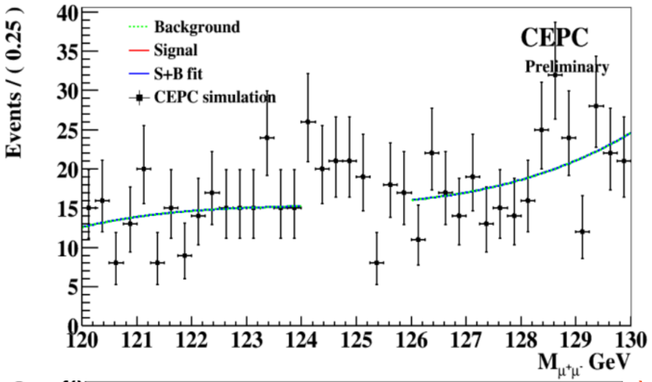


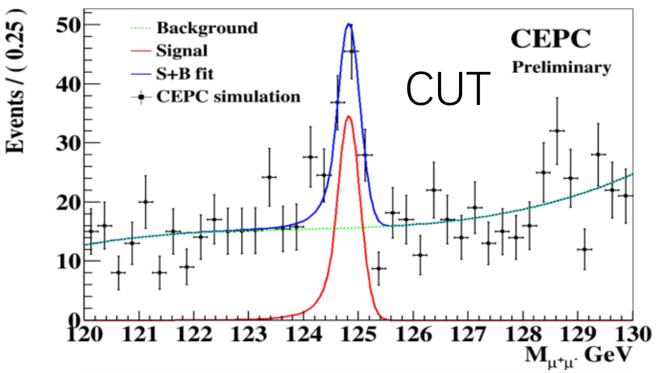
ZqqHuu analysis

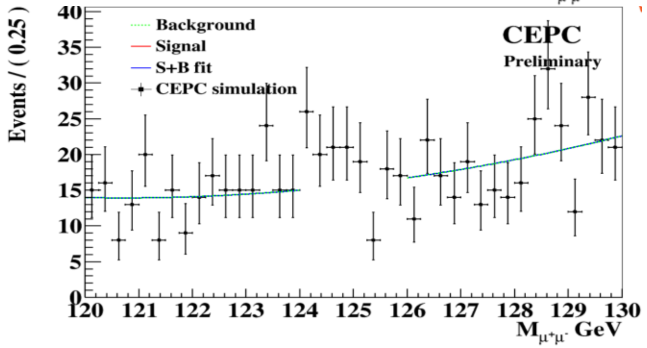
Inclusive analysis

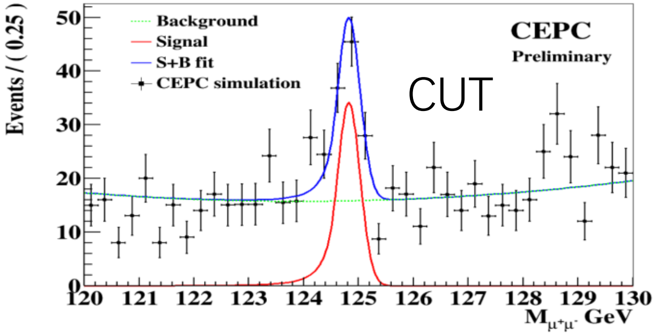
		strength	significance
Side band -only	incl_mva(2)	1.21	8.12
	incl_mva(4)	1.23	8.17
	incl_cut(2)	1.33	8.03
	incl_cut(3)	1.35	8.18
All area	incl_mva(2)	1.16	7.63
	incl_mva(4)	1.31	7.93
	incl_cut(2)	1.30	7.94
	incl_cut(3)	1.31	7.93

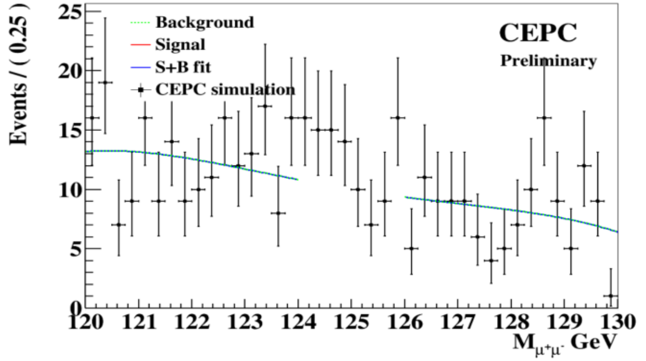
The strength of all area is almost less than sideband-only, because of a obvious hump

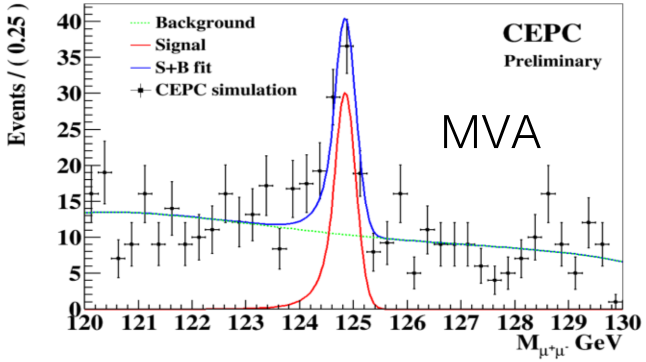


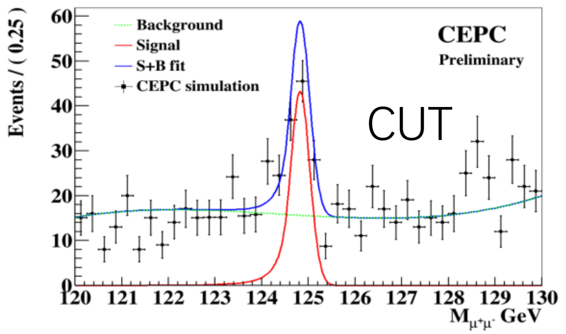


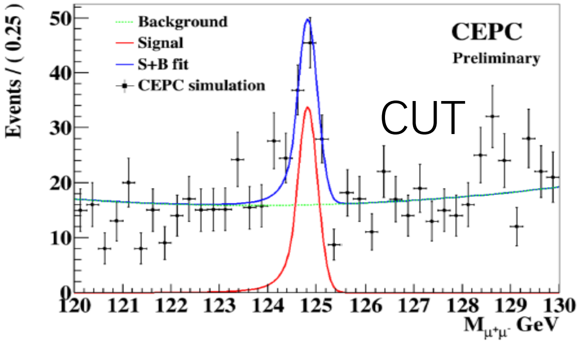


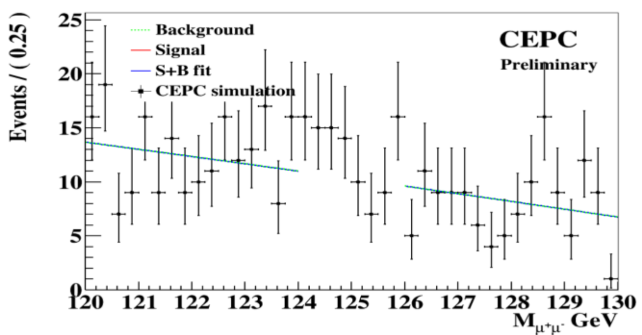


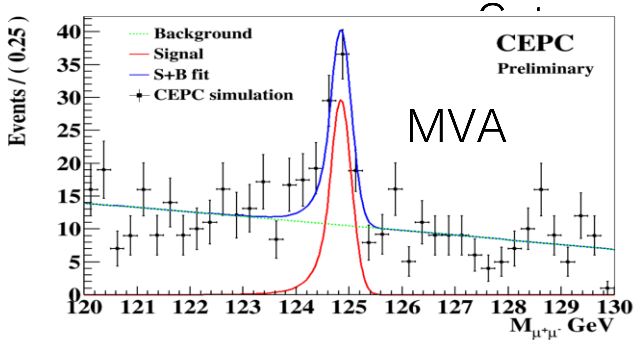


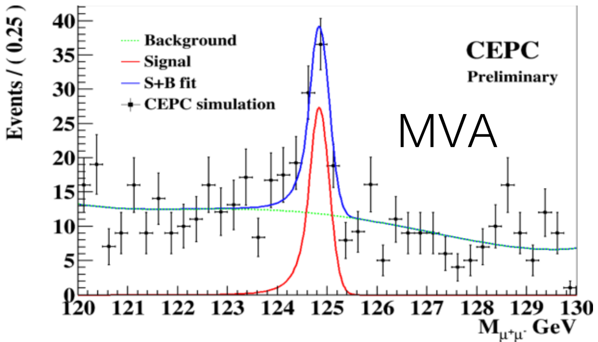


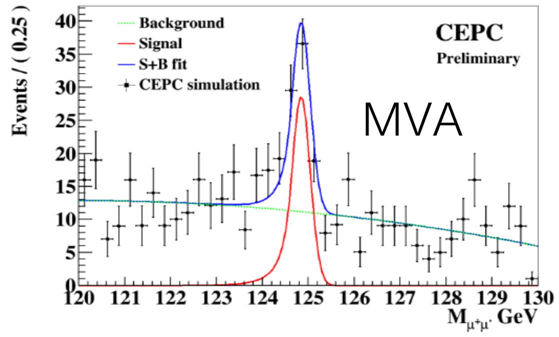








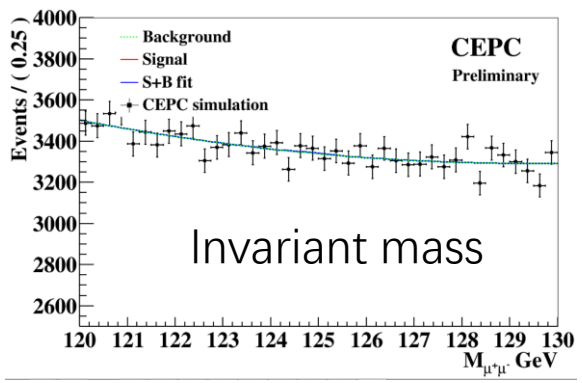


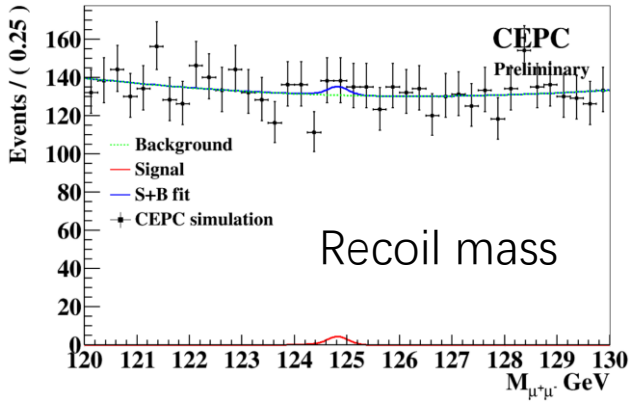


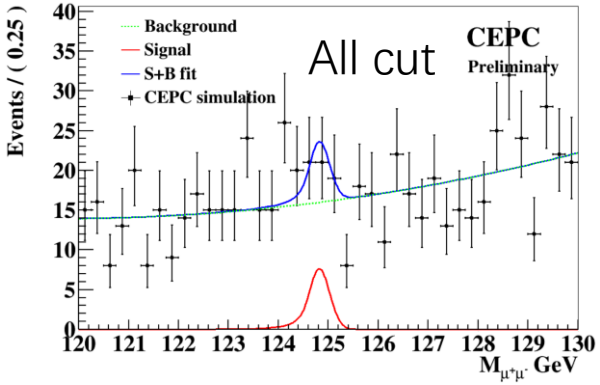
Inclusive analysis (“Add cuts” compare by S+B function fitting background)

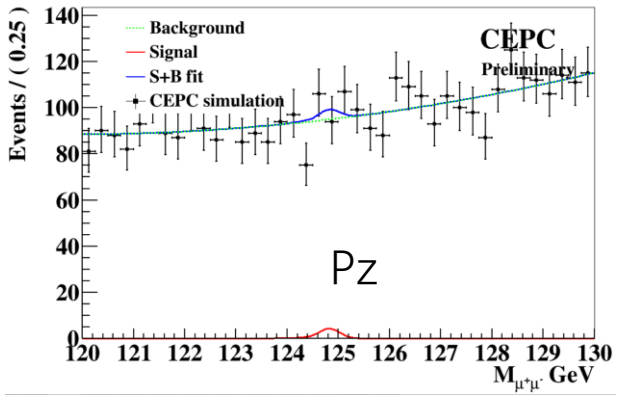
The hump may come from “recoil mass” cut. But, when I loosen the “recoil mass” cut (89,95), nothing happened. So, I suppose the 10 fake signal mainly comes from statistical fluctuation.

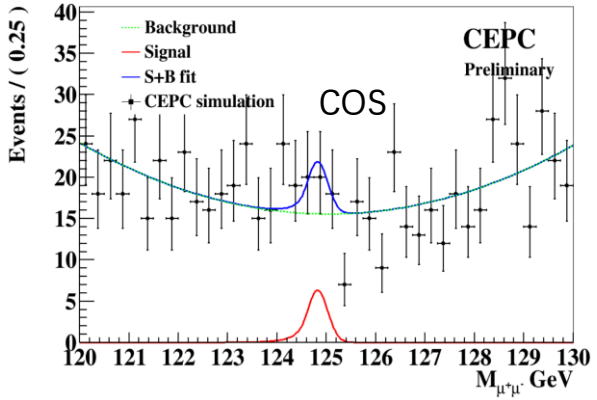
Cut	num
Invariant mass	0
Recoil mass (90,93.5 or 89,95)	9.0
Pz (-55,55)	9.7
$cos\theta_{\mu^+}$ >-0.28, $cos\theta_{\mu^-}$ <0.28	14.4
All cut	9.68

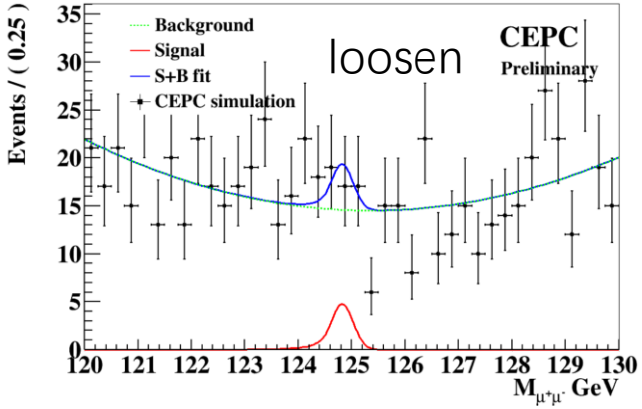












All cut

$120 < M_{\mu^+\mu^-} < 130$

$90.8 < M_{recoil_\mu} < 93.4$

$25 < P_{T_{\mu^+\mu^-}} < 62.4$

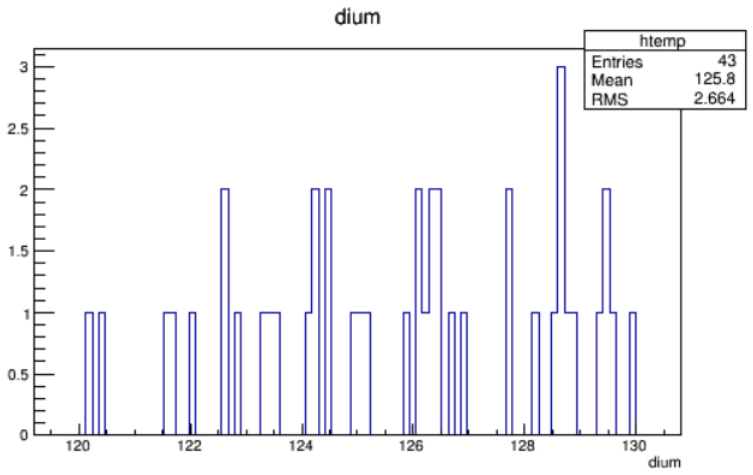
$-55.2 < P_{Z_{\mu^+\mu^-}} < 55.2$

$cos\theta_{\mu^-} < 0.28$

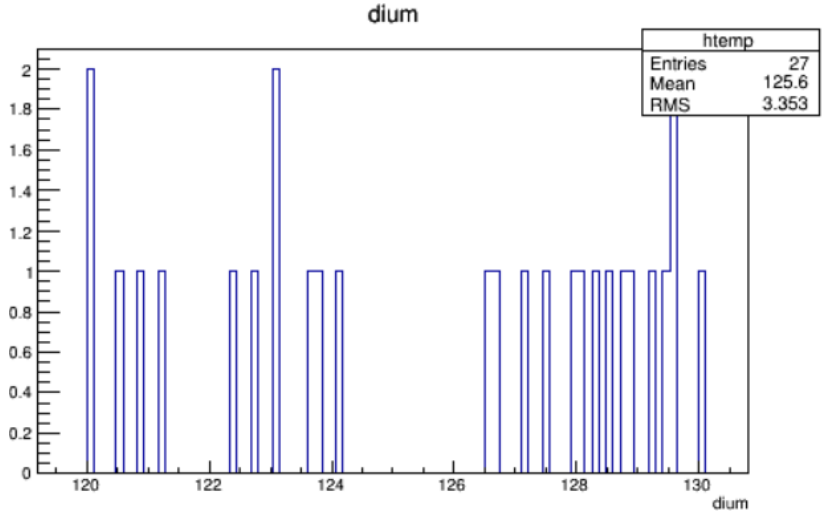
$cos\theta_{\mu^+} > -0.28$

$cos\theta_{\mu^+\mu^-} > -0.996$

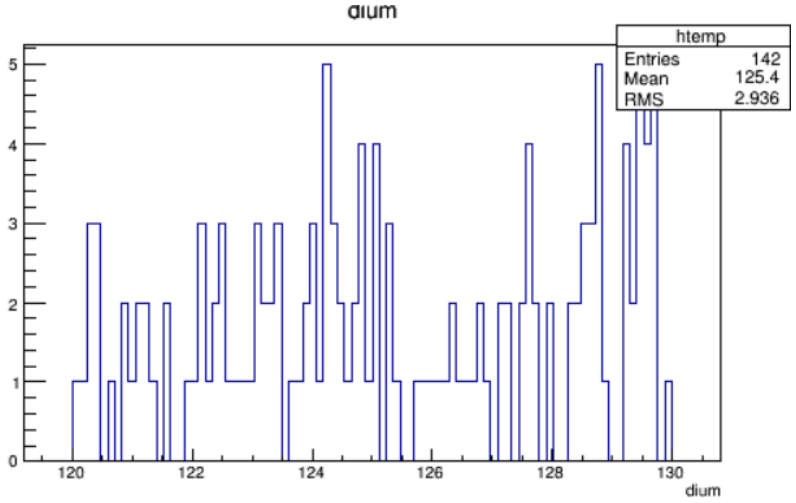
Inclusive analysis background



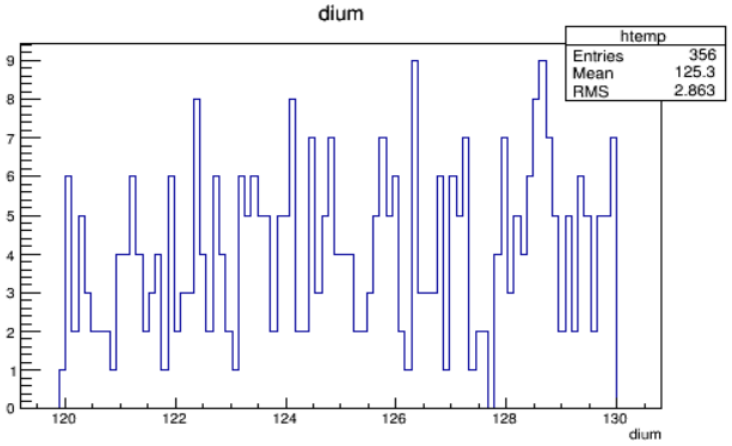
SZ



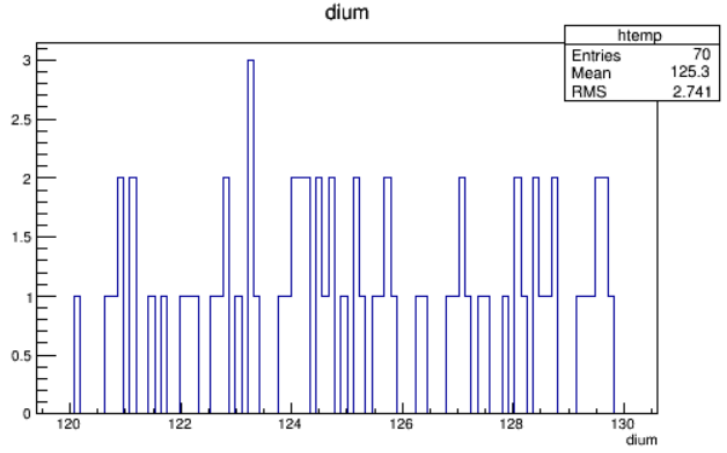
WW



ZZorWW



ZZ



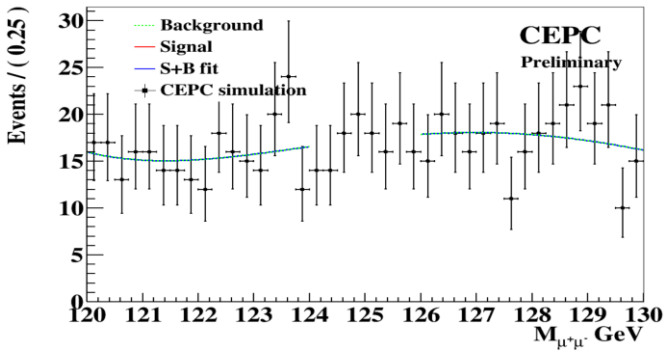
2f

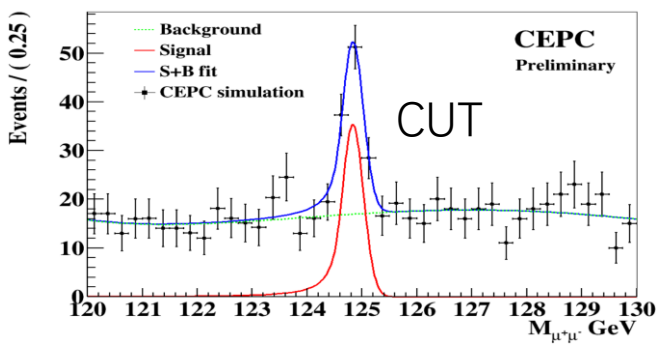
10 types of background are remained.
More background samples are generated,now.

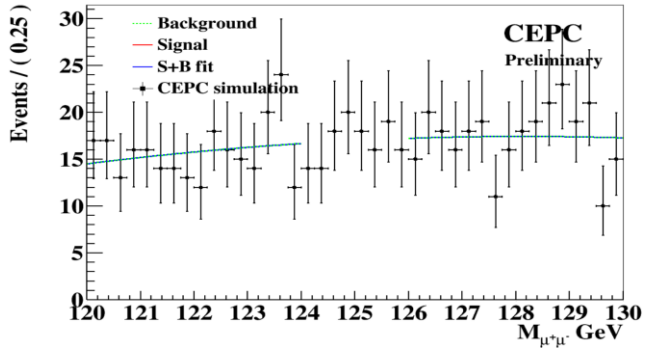
ZqqHuu analysis

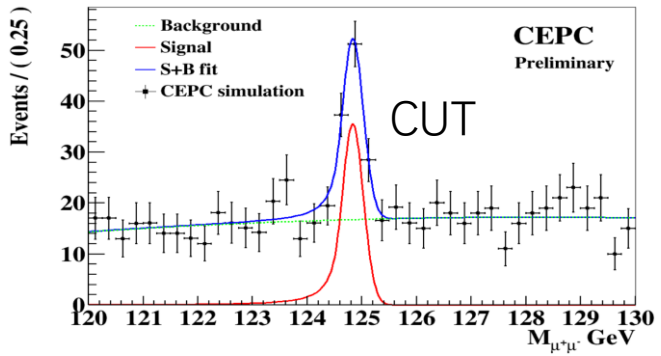
		strength	significance
Side band -only	zqq_mva(2)	1.03	7.96
	zqq_mva(4)	1.00	7.73
	zqq_cut(2)	1.09	8.00
	zqq_cut(4)	1.09	7.87
All area	zqq_mva(2)	1.03	8.01
	zqq_mva(4)	1.04	8.04
	zqq_cut(2)	1.10	8.12
	zqq_cut(4)	1.10	8.00

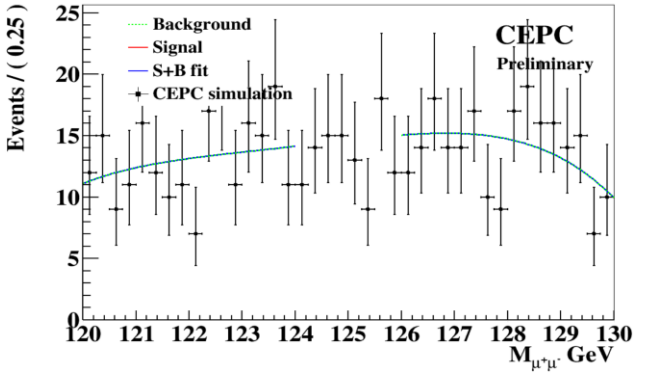
The hump is not obvious, however a little bias exist

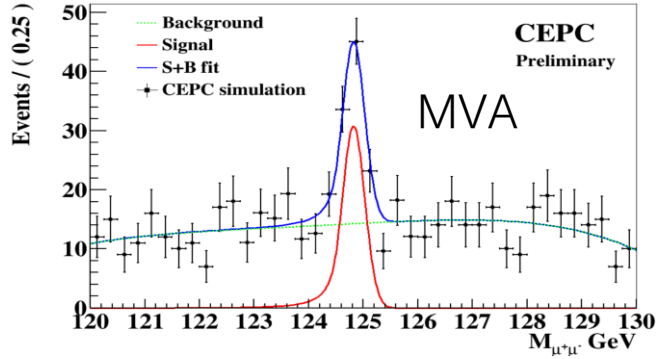


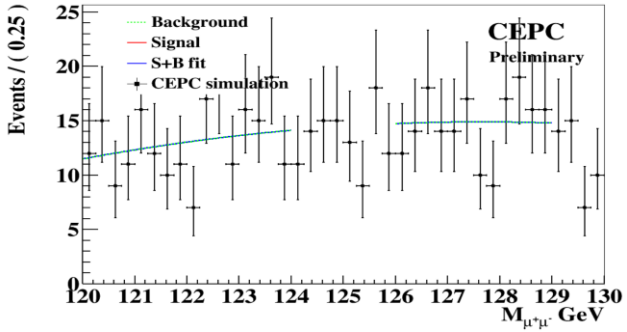


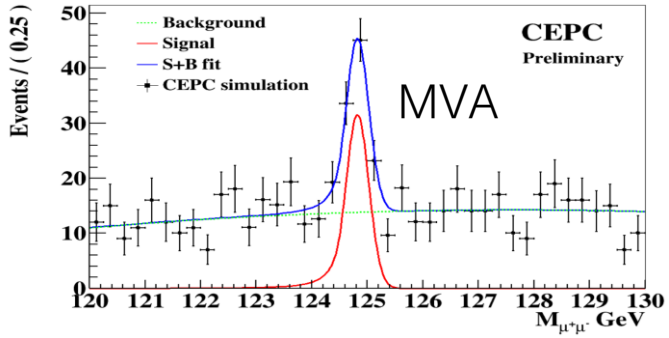


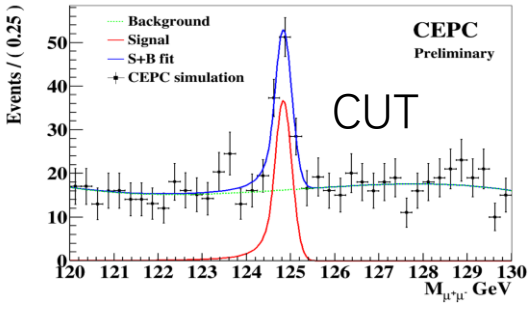


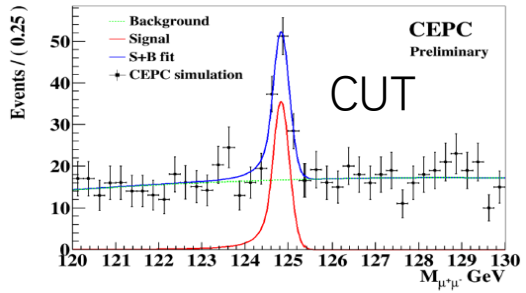


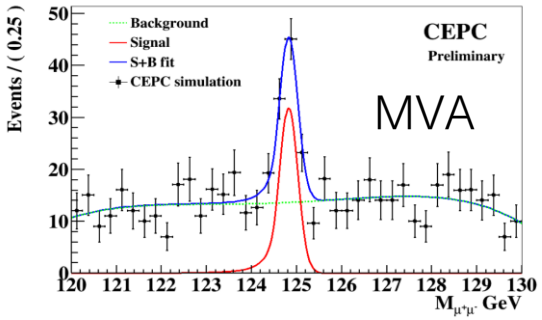


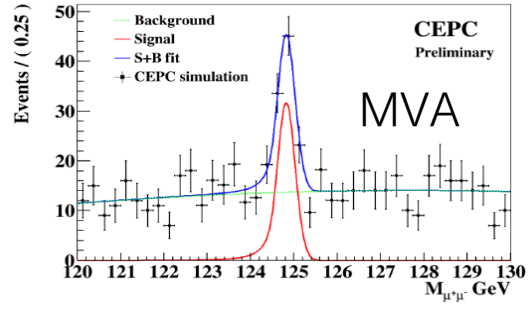






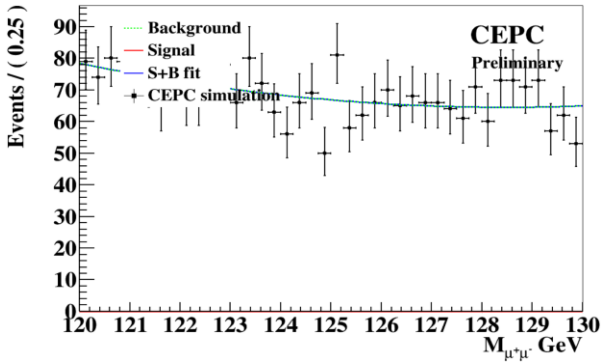




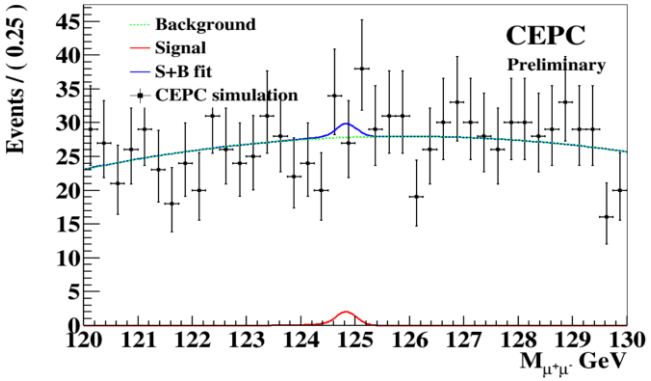


ZqqHuu analysis （ “loosen cuts” compare)

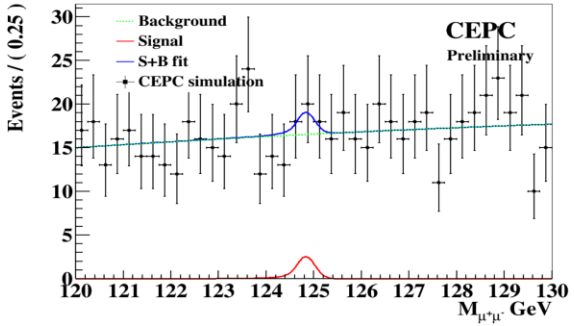
Pt and recoil mass have larger correlation than other variables（over 15）. Finally I use PT(20,64) which the number of fake signal is 2.87.
However, other variables can also decrease fake signal.



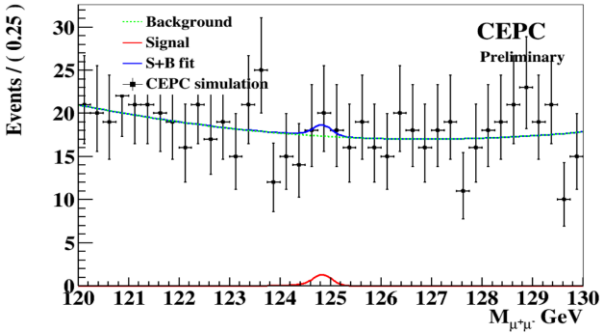
Invariant mass(120,130)



Recoil mass(90,95)



All cuts



PT (20,70)

Preselection

$120 < M_{\mu^+\mu^-} < 130$

$M_{jet1} < 4.2$

$M_{jet2} < 2.8$

$M_{jet12} > 76.0$

$90.9 < M_{recoil_\mu} < 93.5$

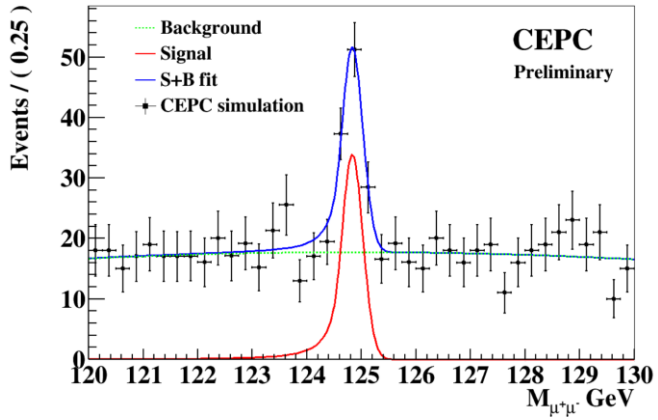
$20 < P_{T_{\mu^+\mu^-}} < 62.3$

$-58 < P_{Z_{\mu^+\mu^-}} < 58$

$cos\theta_{\mu^+} > -0.94$

$cos\theta_{\mu^-} < 0.94$

efficiency



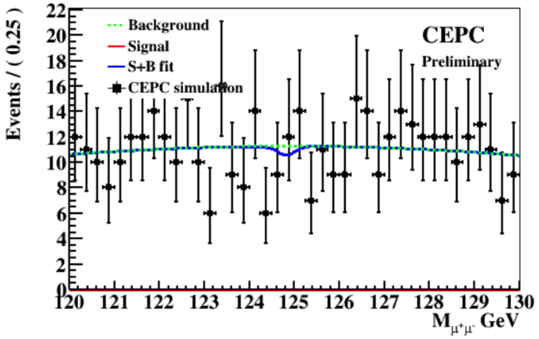
Strength=1.04 < 1.09
Significance= 7.54

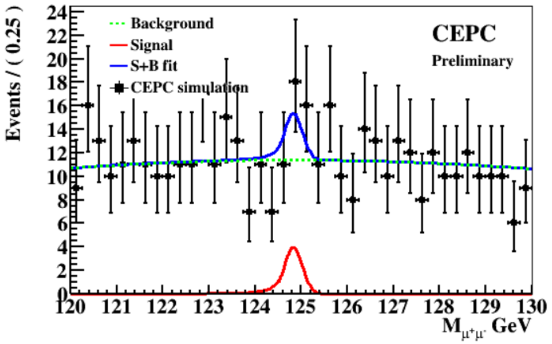
Invariant mass	0
All cut	5.57
PT	2.86
Recoil mass	4.52

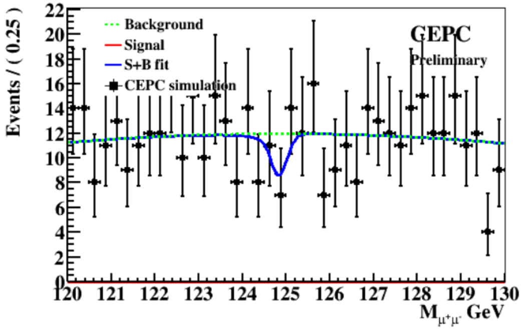
Strength (Recoil mass(90,95)+Pz(-60,60)+PT(20,64)) = 1

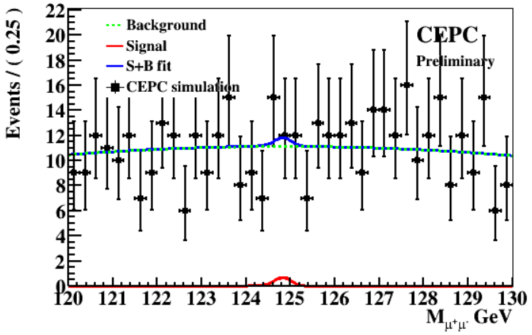
Half Background Check

1. Select half of background samples randomly;
2. Add cuts to background;
3. Find the number of fake signal.

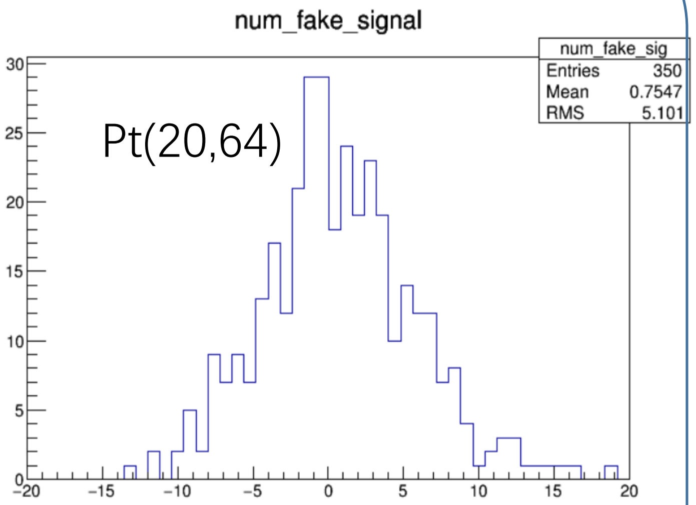


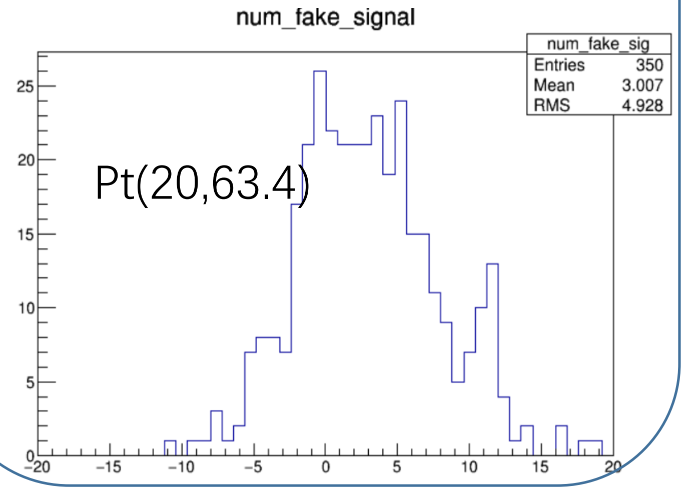




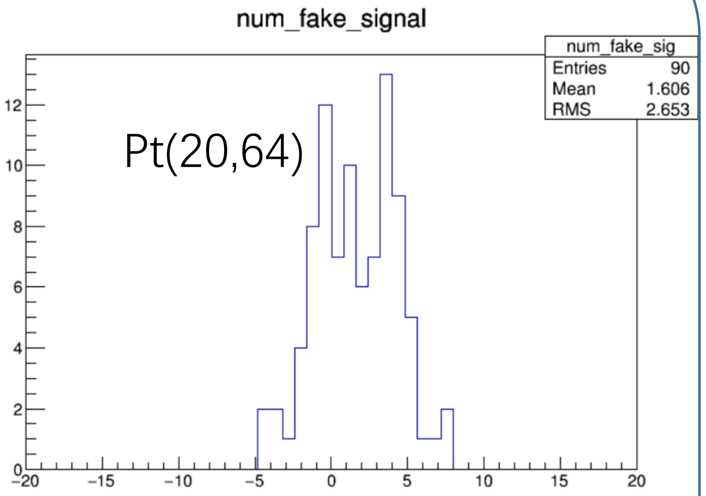


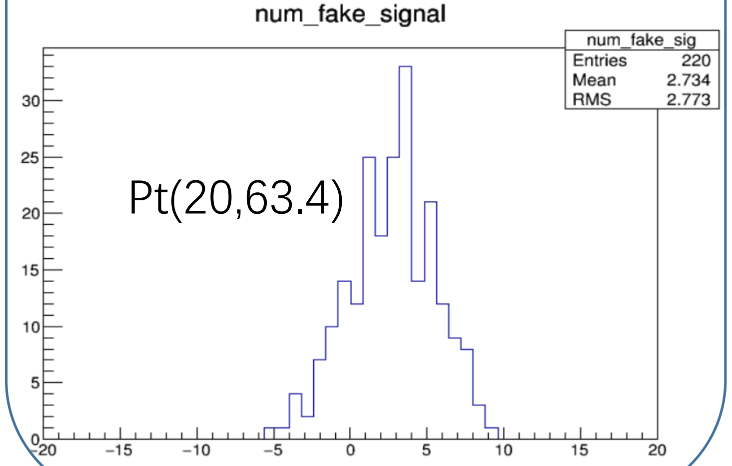
ZqqHuu-cut_base





ZHuu-cut_base





1.The hump is caused by statistical fluctuation mainly.

2.Loosening the cut "Pt" can drop the fake signal from 3 to 0.