H->WW Analysis*

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Contents

1 Introduction

Target:

1 Measurement of Br(H->WW*).
2 Measurement of width of Higgs.
3 Test the performance of CEPC detector.
4 Update the prior analysis.
5 Test the performance of LICH.

Current:

W boson decay \ Z boson decay	ee	$\mu\mu$	$\tau\tau$	$\nu\nu$	qq
$WW^* \to e\nu e\nu$	95	89	89	612	1791
$WW^* \to \mu\nu\mu\nu$	94	87	87	601	1758
$WW^* \to e\nu\mu\nu$	188	176	176	1212	3548
$WW^* \to e\nu\tau\nu$	201	188	187	1292	3783
$WW^* \to \mu\nu\tau\nu$	109	186	186	1280	3747
$WW^* \to \tau\nu\tau\nu$	156	99	99	683	1998
$WW^* \to e\nu qq$	1195	1117	1115	7704	22560
$WW^* \to \mu\nu qq$	1184	1106	1104	7632	22349
$WW^* \to \tau\nu qq$	1263	1180	1177	8136	23825
$WW^* \to qqqq$	3764	3518	3510	24264	71051

2 Monte Carlo Sample

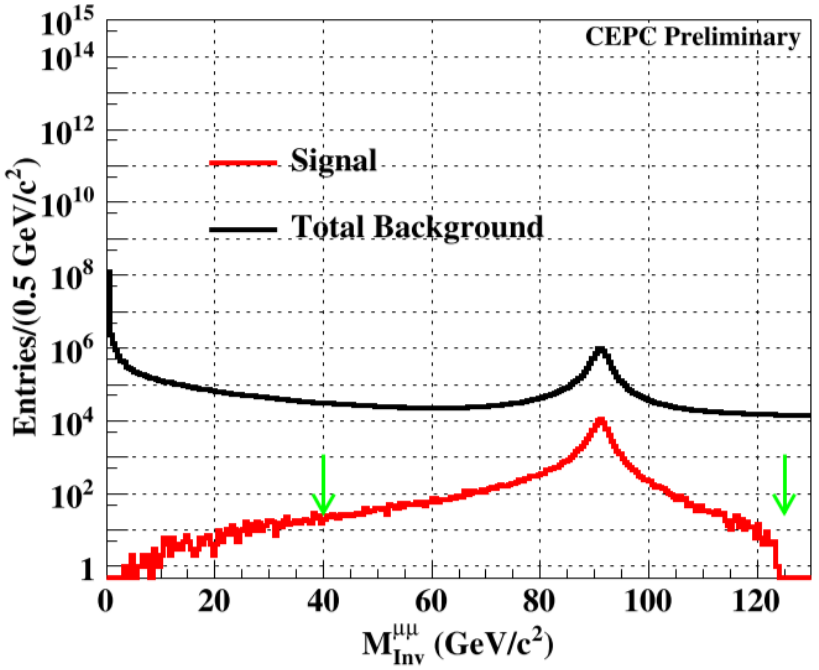
Generator: Whizard 1.95 (with ISR, Luminosity: 5ab-1, MH=125 GeV)

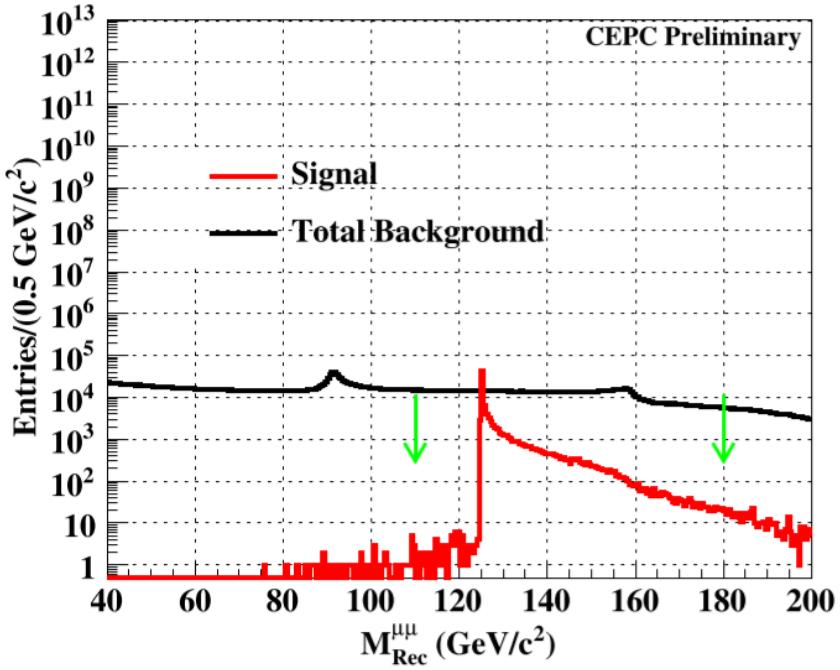
SM Background: 2-fermion (lepton or quark pairs)
4-fermion (WW, ZZ, Single W and Single Z)

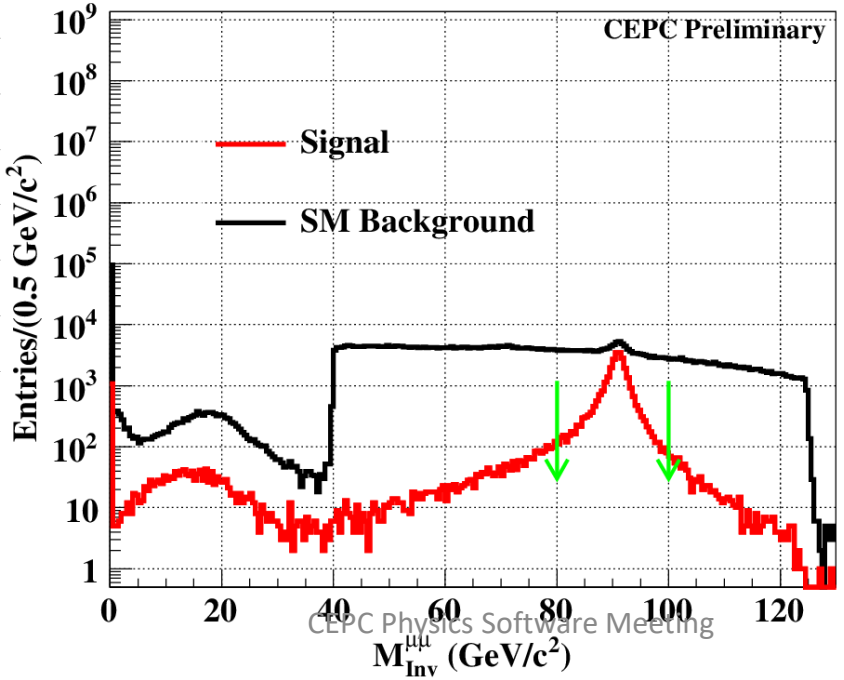
Simulation: Mokka (CEPC_V1)
Reconstruction: Arbor (V3.3)

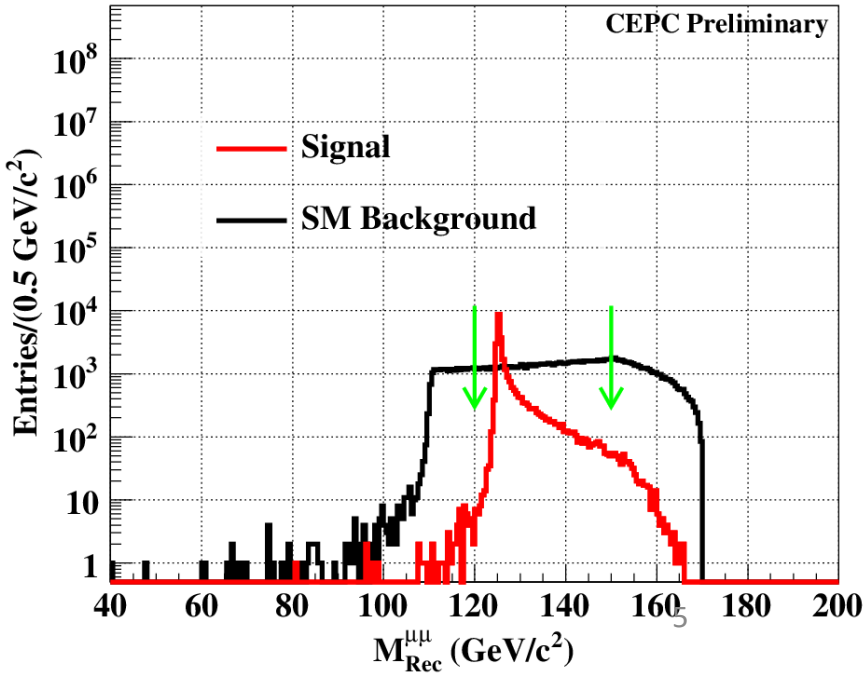
3 Pre-selection

uuhbkg	total	Inv[40 - 125]	Rec[110 - 180]
ZZ	5711445	499918	122674
ZZorWW	17977941	384538	195121
WW	44794678	347224	223691
SW	15361538	0	0
SZe	7267644	154404	73511
SZeorSW	1259165	0	0
SZnu	1063039	37749	13057
bhabha	126210654	0	0
e2e2	25086255	9979371	880661
e3e3	22093445	251855	176682
nn	269751848	0	0
qq	250283662	59245	18543
total	786861314	11714304	1703940









3 Pre-selection

Truth level:

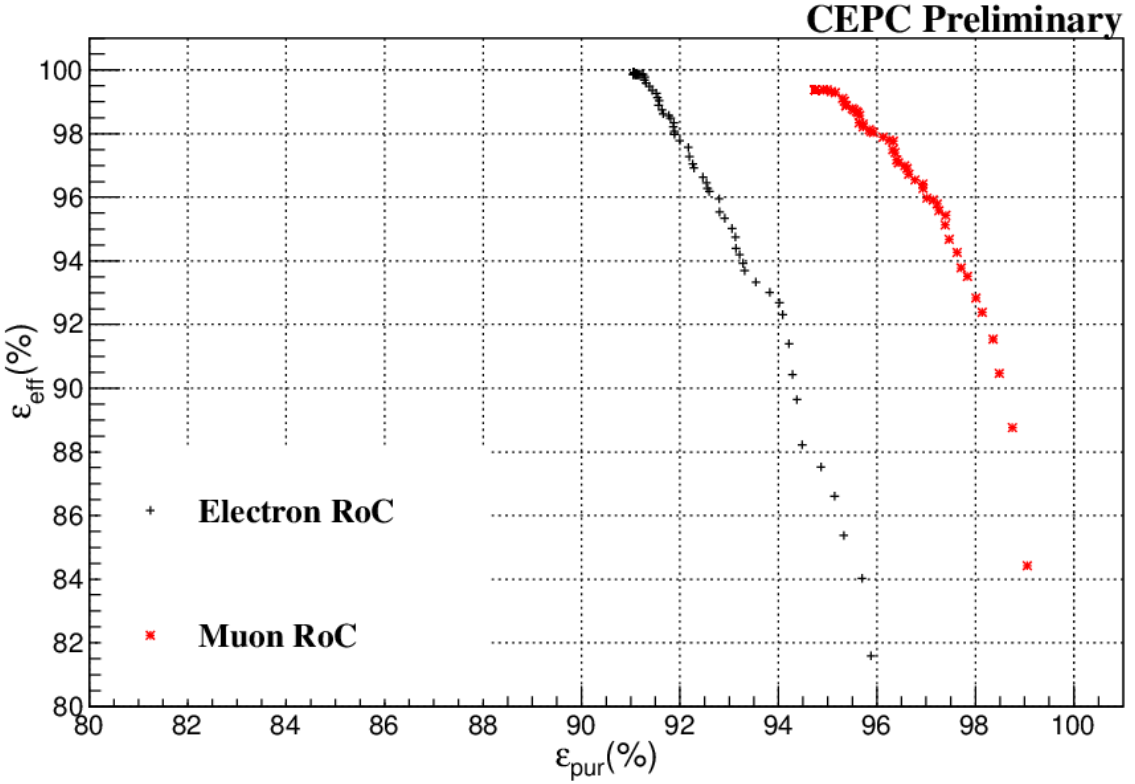
$$40\,GeV/c^2 < M_{Inv}^{\mu\mu} < 130\,GeV/c^2$$
$$110\,GeV/c^2 < M_{\mathrm{Rec}}^{\mu\mu} < 180\,GeV/c^2$$

Reconstructed level:

$$80\,GeV/c^2 < M_{Inv}^{\mu\mu} < 100\,GeV/c^2$$
$$120\,GeV/c^2 < M_{\mathrm{Rec}}^{\mu\mu} < 150\,GeV/c^2$$

4 Performance of LICH

$\mu\mu H$ Channel	Yield	Objects
$WW^* \rightarrow e\nu e\nu$	89	78(88%) → 60(68%)
$WW^* \rightarrow \mu\nu\mu\nu$	87	80(92%) → 71(82%)
$WW^* \rightarrow e\nu\mu\nu$	172	152(88%) → 131(77%)
eeH Channel	Yield	Objects
$WW^* \rightarrow e\nu e\nu$	80	63(88%) → 49(69%)
$WW^* \rightarrow \mu\nu\mu\nu$	102	97(92%) → 86(89%)
$WW^* \rightarrow e\nu\mu\nu$	192	164(88%) → 127(80%)



Electron

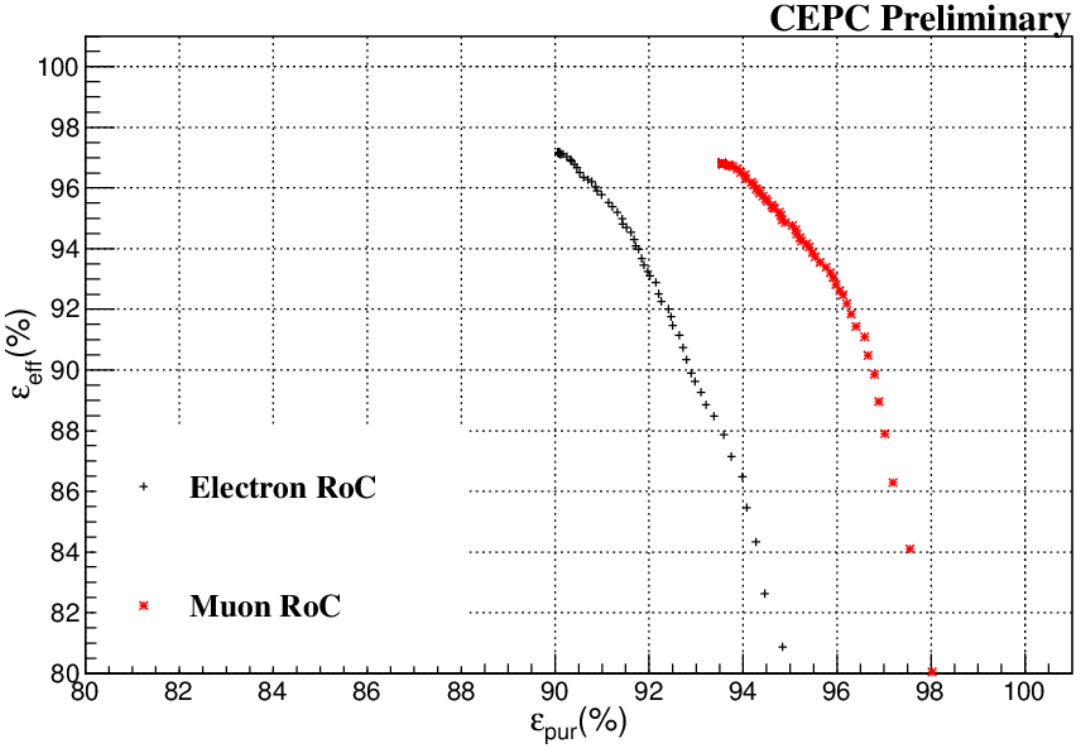
```
Efficiency == 98.0672 ;  Purity == 91.8931 ;  LH == 0.66
Efficiency == 97.9751 ;  Purity == 91.8861 ;  LH == 0.67
Efficiency == 97.7911 ;  Purity == 91.9913 ;  LH == 0.68
Efficiency == 97.561 ;  Purity == 92.1739 ;  LH == 0.69
Efficiency == 97.2849 ;  Purity == 92.1936 ;  LH == 0.7
Efficiency == 97.0548 ;  Purity == 92.2572 ;  LH == 0.71
Efficiency == 96.9167 ;  Purity == 92.2875 ;  LH == 0.72
Efficiency == 96.6406 ;  Purity == 92.4703 ;  LH == 0.73
```

Muon

```
Efficiency == 98.0752 ;  Purity == 95.8862 ;  LH == 0.69
Efficiency == 98.0304 ;  Purity == 95.9264 ;  LH == 0.7
Efficiency == 97.8962 ;  Purity == 96.1319 ;  LH == 0.71
Efficiency == 97.8066 ;  Purity == 96.2555 ;  LH == 0.72
Efficiency == 97.7619 ;  Purity == 96.3388 ;  LH == 0.73
Efficiency == 97.4933 ;  Purity == 96.3291 ;  LH == 0.74
Efficiency == 97.4038 ;  Purity == 96.3685 ;  LH == 0.75
```

4 Performance of LICH

$\mu\mu H$ Channel	Yield	Objects
$WW^* \rightarrow e\nu qq$	1108	1053(95%) → 968(88%)
$WW^* \rightarrow \mu\nu qq$	1105	1026(93%) → 983(89%)
eeH Channel	Yield	Objects
$WW^* \rightarrow e\nu qq$	1177	1076(92%) → 913(78%)
$WW^* \rightarrow \mu\nu qq$	1149	1119(98%) → 1077(94%)



Electron

```
Efficiency == 95.7754 ;  Purity == 90.9914 ;  LH == 0.62
Efficiency == 95.5238 ;  Purity == 91.1423 ;  LH == 0.63
Efficiency == 95.3781 ;  Purity == 91.2223 ;  LH == 0.64
Efficiency == 95.2059 ;  Purity == 91.3237 ;  LH == 0.65
Efficiency == 94.9808 ;  Purity == 91.4329 ;  LH == 0.66
Efficiency == 94.8086 ;  Purity == 91.4421 ;  LH == 0.67
Efficiency == 94.7027 ;  Purity == 91.5152 ;  LH == 0.68
```

Muon

```
Efficiency == 96.6389 ;  Purity == 93.8868 ;  LH == 0.54
Efficiency == 96.5086 ;  Purity == 93.9505 ;  LH == 0.55
Efficiency == 96.4304 ;  Purity == 94.0414 ;  LH == 0.56
Efficiency == 96.1829 ;  Purity == 94.1829 ;  LH == 0.58
Efficiency == 96.1047 ;  Purity == 94.2266 ;  LH == 0.59
```

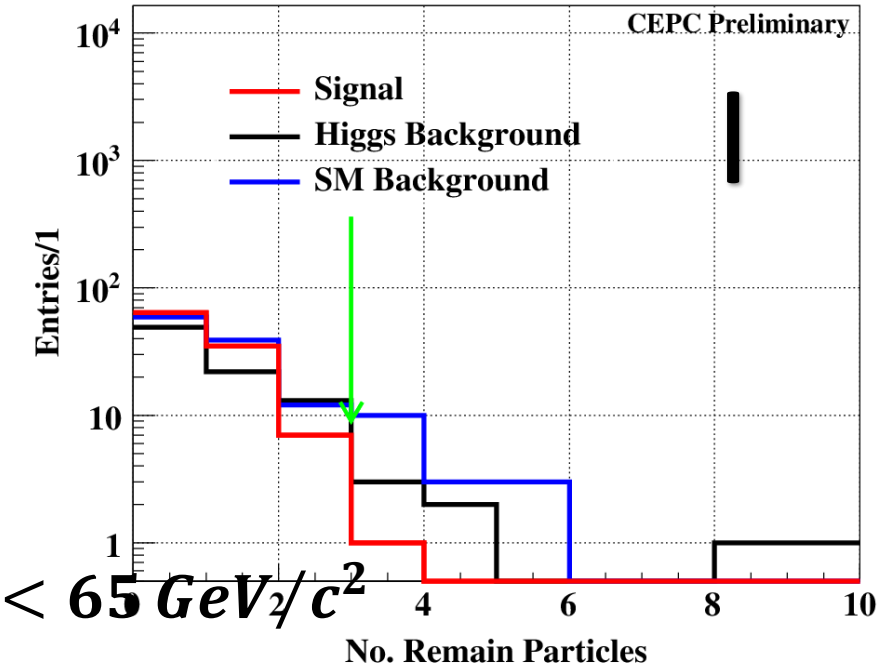
5 Analysis

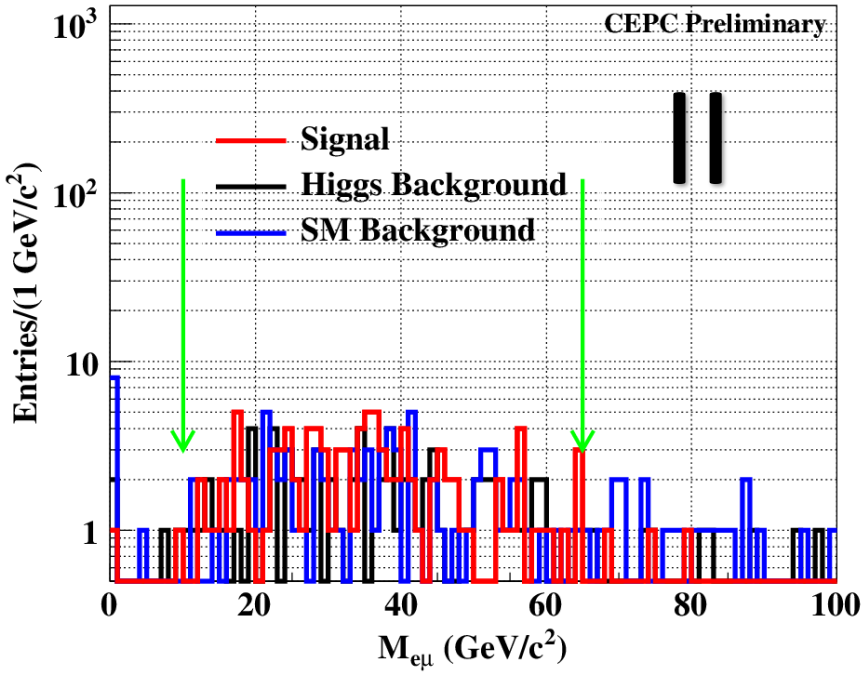
$1) nRem < 3$

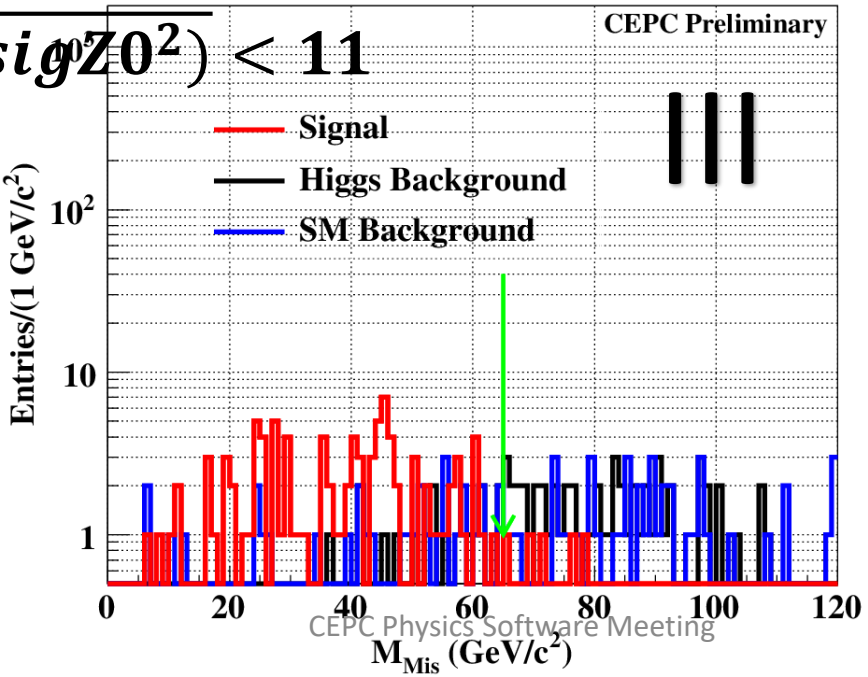
$2) 10\,GeV/c^2 < Mass^{e\mu}_{Inv} < 65\,GeV/c^2$

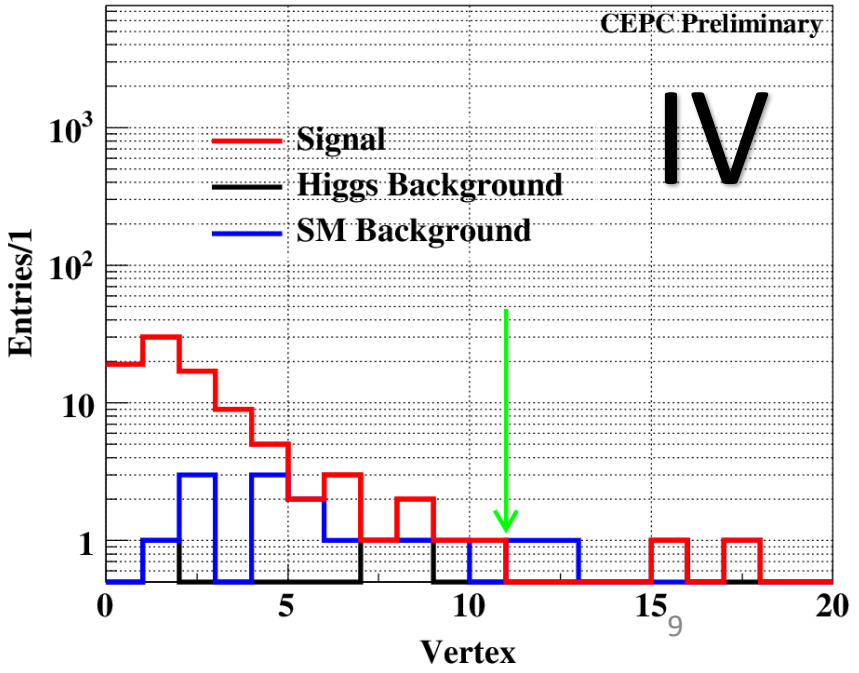
$3) M_{Mis} < 65 \mathrm{GeV/c^2}$

$4) \sqrt{(D0^2/sigD0^2 + Z0^2/sigZ0^2)} < 11$





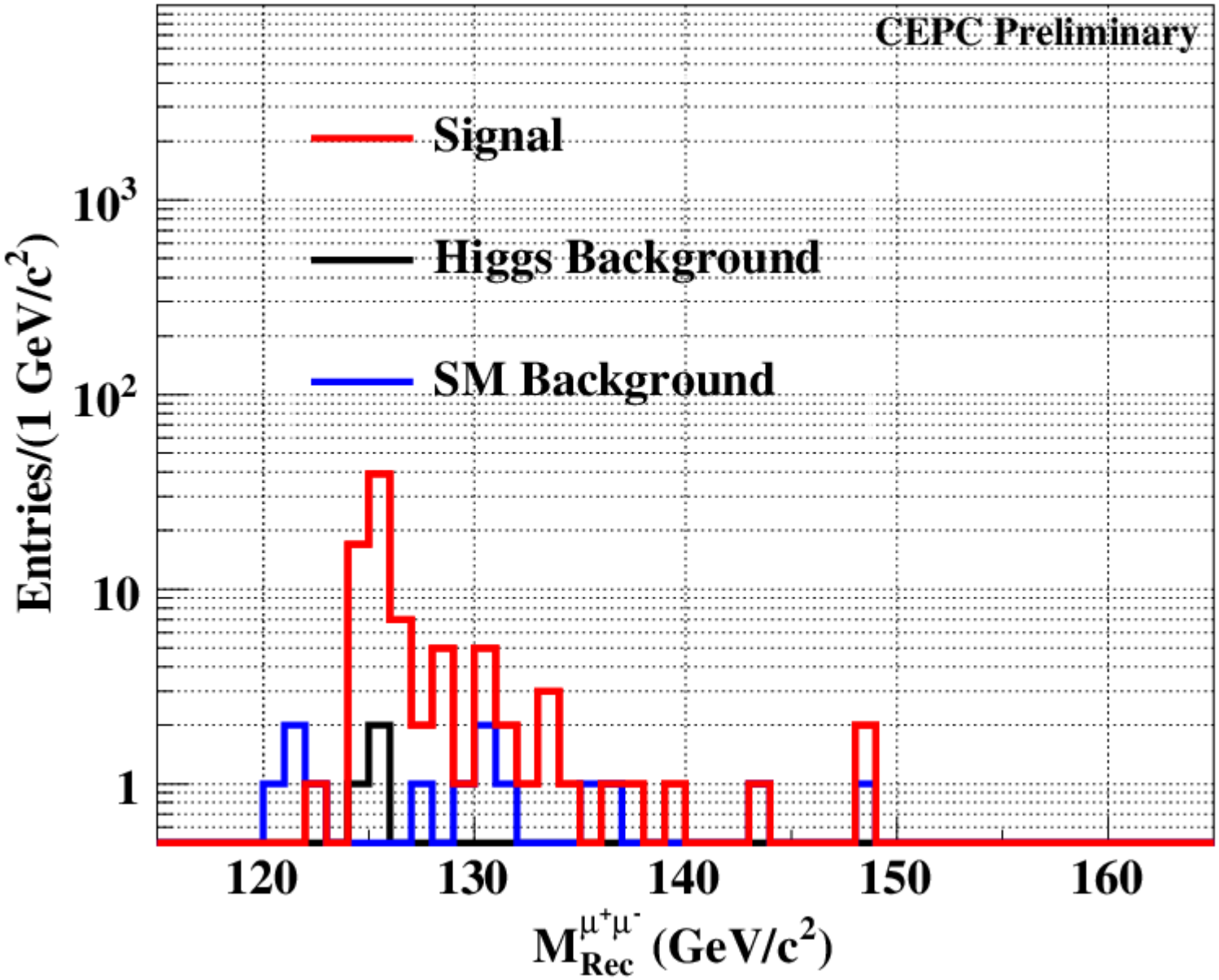




5 Analysis

After counting,

$$N_{sig} = 90$$



5 Analysis

Accu. = 11.4%(9.8%)

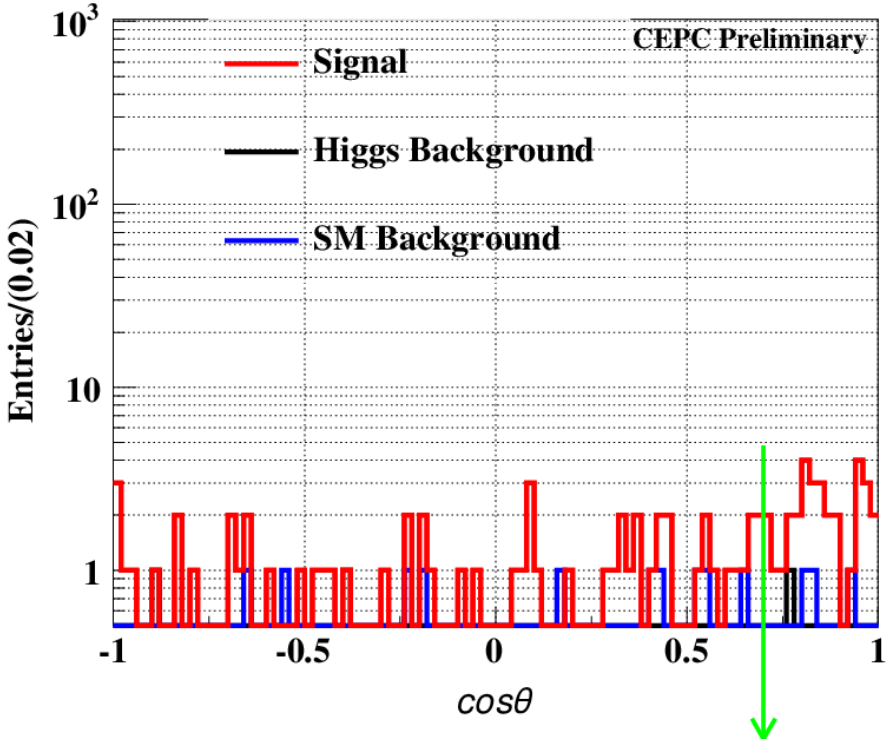
Cutchain	Signal(No Tau)	ZH Background	SM Background
Total	348	34624	700311
Validation of Pre-selection	290	28712	117395
nZpole=2,nIsL=2($l = e, \mu$)	107	104	137
No. Remain Particle < 3	107	87	120
10GeV $< Mass_{Inv}^{e\mu} <$ 65GeV	102	74	83
$M_{Mis} < 65\mathrm{GeV/c^2}$	96	18	32
$\sqrt{(D0^2/sigD0^2 + Z0^2/sigZ0^2)} < 11$	90	3	13

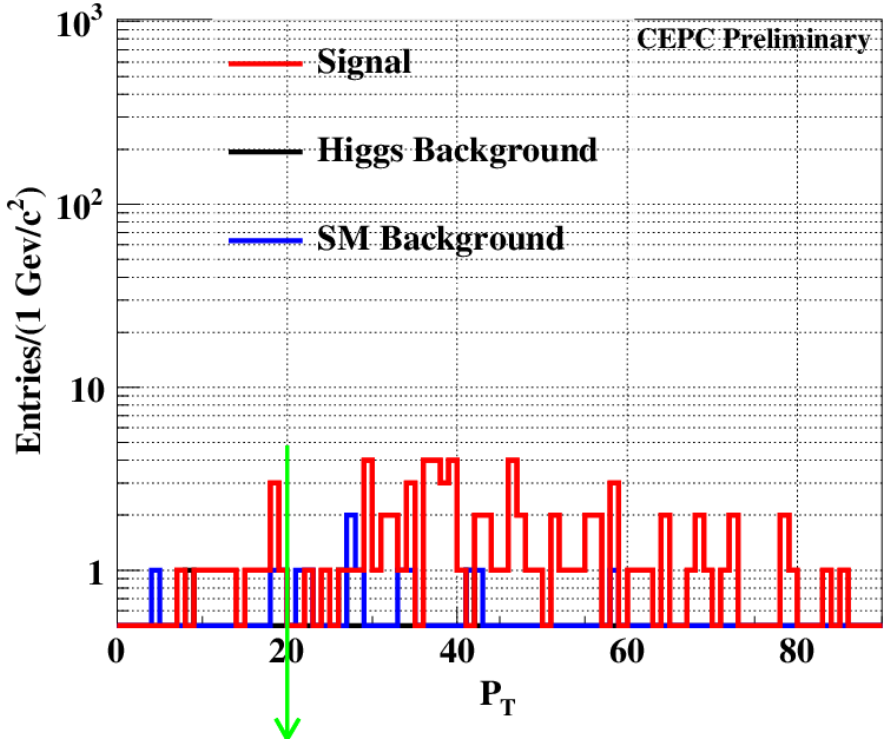
6 Plan

To do:

1)Update the analysis by new reconstruction;
2)Understand the LICH deeply;
3)Write the note.

Thanks


CEPC Preliminary
Signal
Higgs Background
SM Background
Entries/(0.02)
cosθ


CEPC Preliminary
Signal
Higgs Background
SM Background
Entries/(1 Gev/c²)
P_T