Hig2inv progress work

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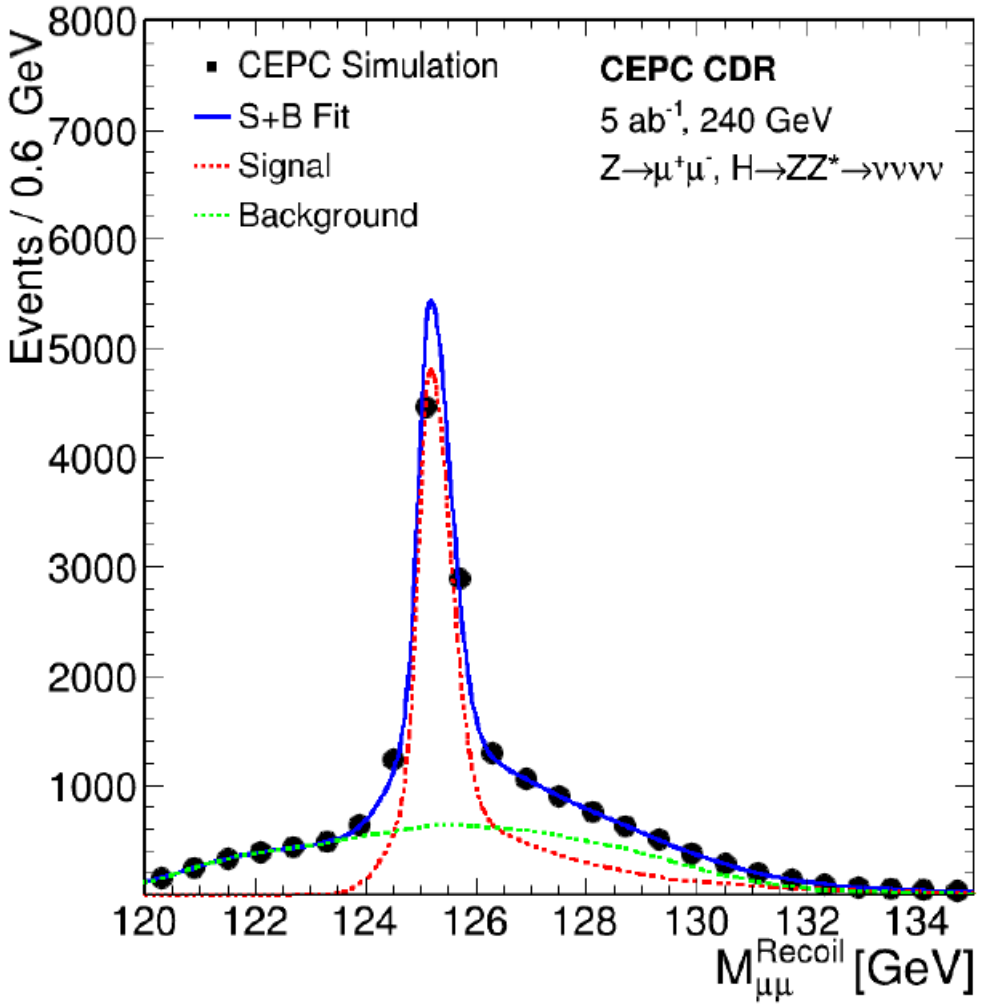
Preliminary optimization result:($\mu^+\mu^-H$)

Process	ffH_inv	zorw	zzorww	WW	single_w	ZZ	single_z	2f	total_bkg	$\frac{\sqrt{S+B}}{S}$
Total generate	509150	1247400	18250750	44763316	17426250	5704399	8955800	444816800	540438939	
$N_{\mu^+} = 1, N_{\mu^-} = 1$	15781	0	838355	428542	1571	647631	586912	7914830	10417841	20.468 %
$120GeV < M_{Recoil} < 150GeV$	14938	0	99905	109695	10	70411	87912	579686	947619	6.568 %
$85GeV < M_{\mu^+\mu^-} < 97GeV$	12689	0	21801	15077	0	21888	9585	340309	408660	5.116 %
$12GeV < P_t^{\mu^+\mu^-}$	12294	0	18805	14343	0	19176	8465	82401	143190	3.207 %
$\Delta\phi < 175°$	11810	0	18062	13323	0	17848	7938	64514	121685	3.094 %
$\lvert P_z^{\mu^+\mu^-} \rvert < 50GeV$	11705	0	17700	13025	0	17371	7711	61299	117106	3.066 %
$102GeV < VisibleEnergy < 107GeV$	10230	0	4638	3759	0	419	1251	42	10109	1.394 %
$\frac{E_\mu}{P_\mu} < 2.4$	10095	0	3437	2976	0	379	1151	11	7954	1.331 %

Memo 0.4.1 -> Add fit result.

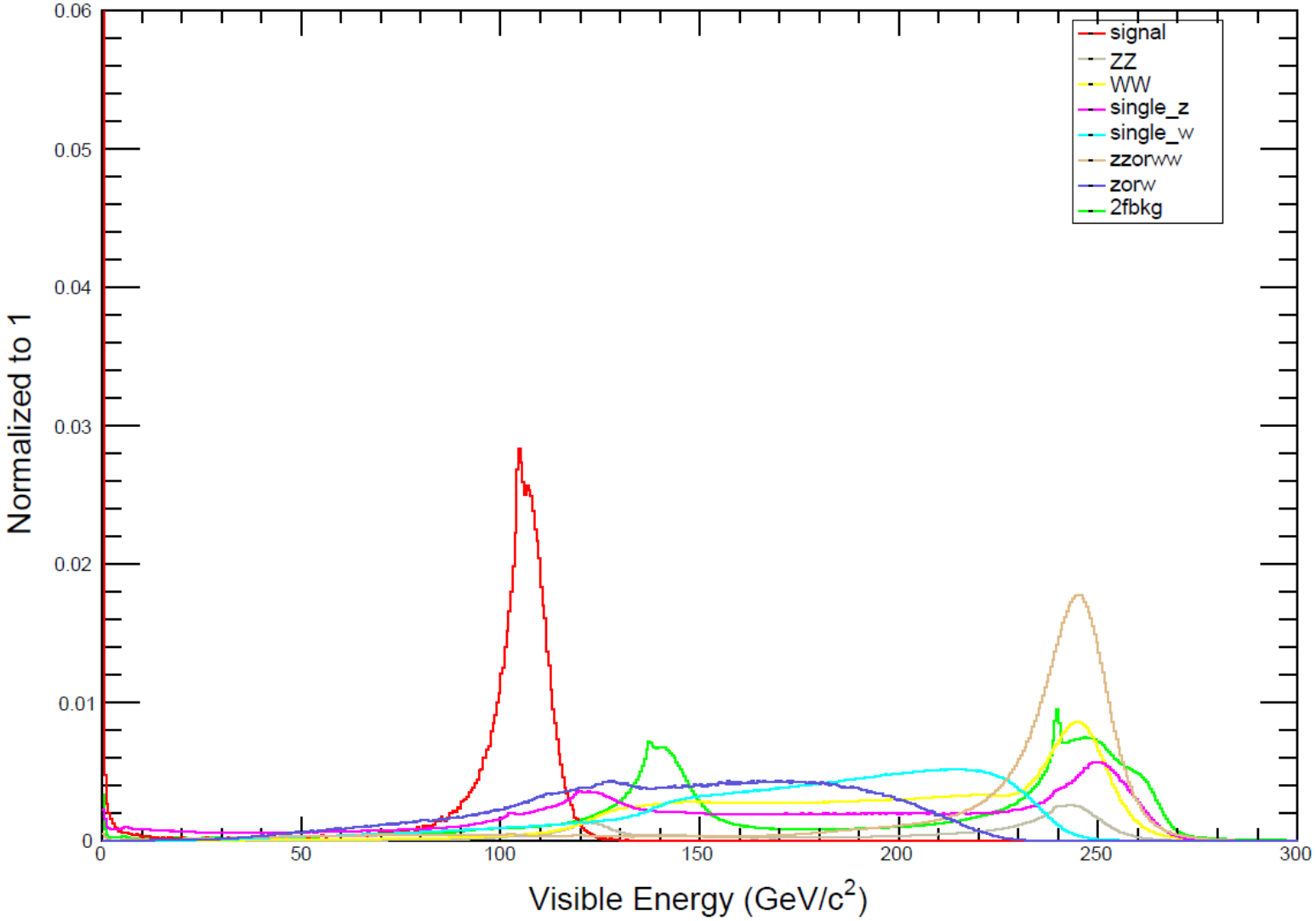
Memo 0.4.2 -> Change first cut $N_{\mu^+} \geq 1, N_{\mu^-} \geq 1 \rightarrow N_{\mu^+} = 1, N_{\mu^-} = 1$. Does not affect the final result.

Fit result:


CEPC Simulation
S+B Fit
Signal
Background
CEPC CDR
5 ab-1, 240 GeV
Z→μ+μ-, H→ZZ*→νννν
Events / 0.6 GeV
8000
7000
6000
5000
4000
3000
2000
1000
120
122
124
126
128
130
132
134
M_μμ^Recoil [GeV]

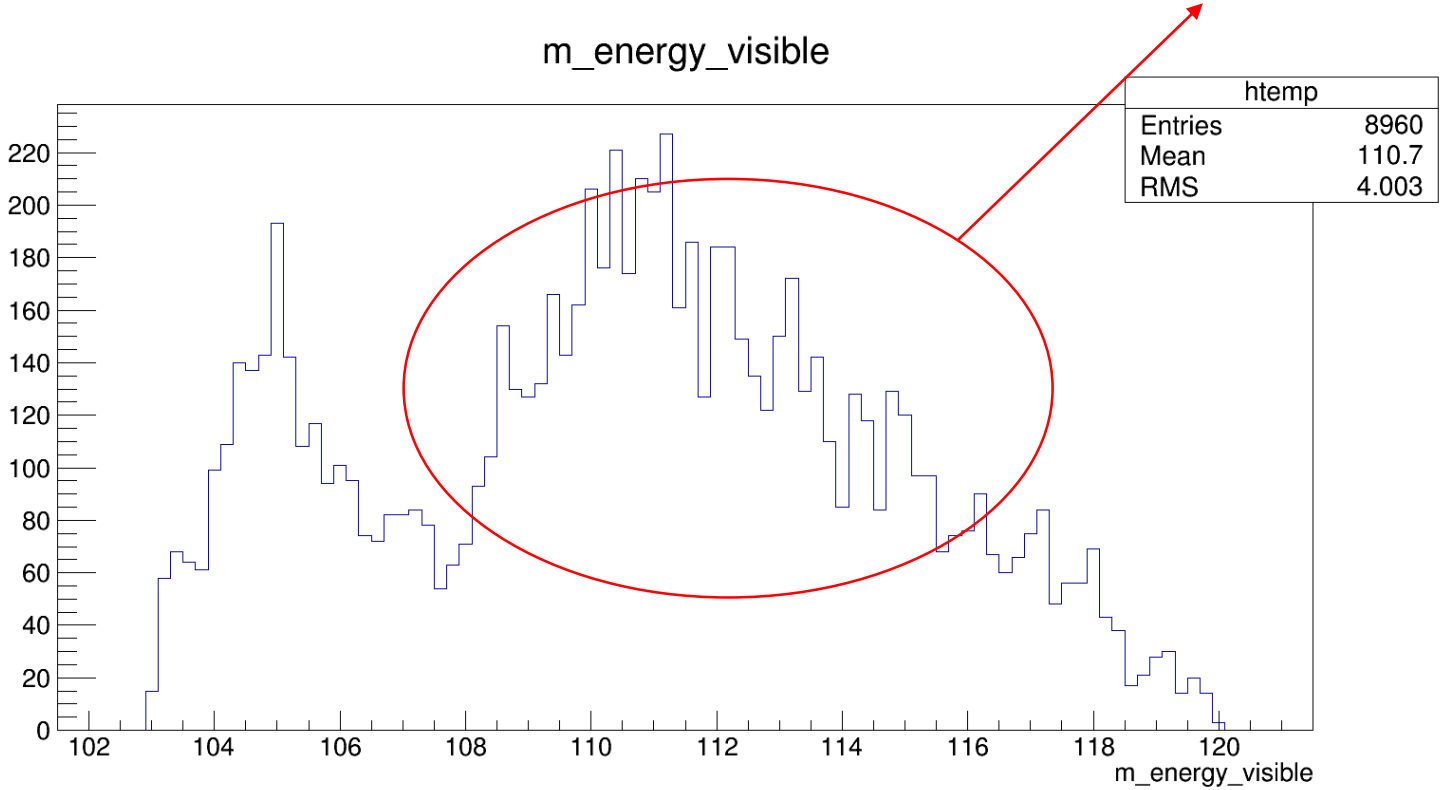
Start analyzing the channel of e+e-H_inv:

Question:1: Visible energy > center-of-mass energy 240GeV.



Question 2: Two peak

Neutral energy.



The neutral partical's PID is 21120. Don't know what this is ?

Try to print Mc truth information.

Preliminary results:

Table 10: Yields for backgrounds and signals at the CEPC(Assume BR($H \rightarrow inv.$)=50%)

Process	ffH_inv	zorw	zzorww	WW	single_w	ZZ	single_z	2f	total_bkg	$\frac{\sqrt{S+B}}{S}$
Total generate	509150	1247400	18250750	44763316	17426250	5704399	8955800	444816800	540438939	
$N_{e^+}=1, N_{e^-}=1$	53005	961982	2286421	5635763	3116603	676361	2068673	39723096	54468899	
$\lvert P_z^{e^+e^-}\rvert < 60GeV$	52975	856138	2285079	5629316	2663787	675264	1631992	35256100	48997676	
$71GeV < M_{e^+e^-} < 99GeV$	12625	167048	25206	51115	449615	3624	344127	2883387	3924122	15.716 %
$10GeV < P_t^{e^+e^-} < 55GeV$	12115	106860	21397	43437	305372	2880	205527	1615989	2301462	12.555 %
$\Delta\phi < 176°$	11575	102798	19309	39461	283725	2341	189887	575447	1212968	9.560 %
$103GeV < VisibleEnergy < 120GeV$	10719	28241	2725	118	30215	43	31999	3817	97158	3.064 %
$1.8 < \frac{E_e}{P_e} < 2.4$	8934	12269	951	34	13517	6	13911	1008	41696	2.519 %
$115GeV < M_{recoil} < 170GeV$	8934	10801	920	34	12198	6	12277	965	37201	2.404 %

The first cut can't choose the signal we need.

In $\mu^+\mu^- H$, this isn't our signal. So the select efficiency is too low.

Table 5: $e^+e^- \to ffH\_inv$ cuts information (Assume BR($H \to inv.$)=50%)

	The number of $\mu^+\mu^- H\_inv$	Effectiveness
Total generate	509150	100.000 %
$N_{\mu^+} = 1, N_{\mu^-} = 1$	15781	3.100 %
$120GeV < M_{Recoil} < 150GeV$	14938	2.934 %
$85GeV < M_{\mu^+\mu^-} < 97GeV$	12689	2.492 %
$12GeV < P_t^{\mu^+\mu^-}$	12294	2.415 %
$\Delta\phi < 175°$	11810	2.320 %
$\lvert P_t^{\mu^+\mu^-} \rvert < 50GeV$	11705	2.299 %
$102GeV < VisibleEnergy < 107GeV$	10230	2.009 %
$\frac{E_\mu}{P_\mu} < 2.4$	10095	1.983 %

Next Plan

1.Try to print Mc truth information.

2. Write eeH memo.

3.Learn how to calculate upper limit.