H→μμ Decay

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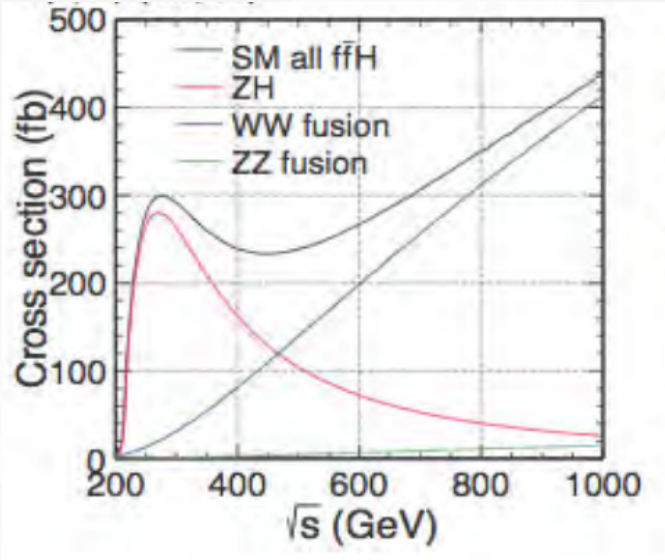
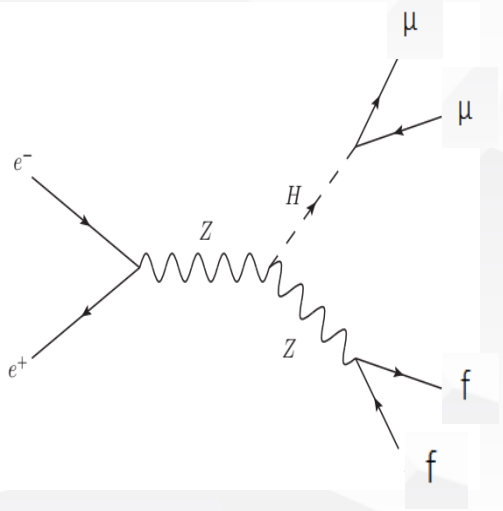
Signal Processes

In the CEPC with the energy about 240GeV,the Higgs-strhlung is the dominant production,and the ZZ&WW fusions' cross sections are much smaller than the Higgs-strhlung ,so the impact of the ZZ&WW fusions to the H to uu was ignored.



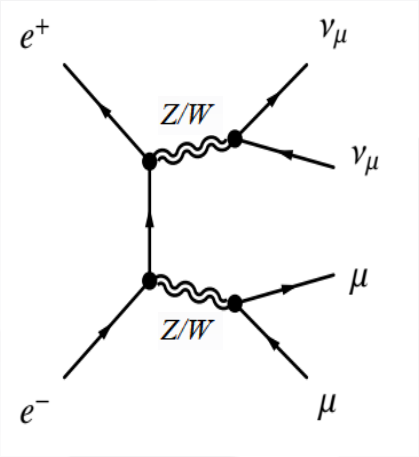
cross scetion



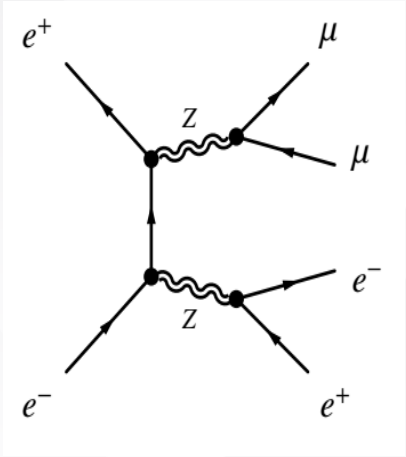
channels for final states μμff
f is the quark,lepton or the neutrino

Background Processes

channels	final state
ZZ(sl)mu up	$\mu-, \mu+, up, \overline{up}$
ZZ(sl)mu down	$\mu-, \mu+, d, \overline{d}$
ZZ(sl)tau up	$\tau-, \tau+, up, \overline{up}$
ZZ(sl)tau down	$\tau-, \tau+, d, \overline{d}$
ZZ(l)4tau	$\tau-, \tau+, \tau-, \tau+$
ZZ(l)4mu	$\mu-, \mu+, \mu-, \mu+$
ZZ(l)taumu	$\tau-, \tau+, \mu-, \mu+$
ZZ(l)mumu	$\nu\tau, \overline{\nu}\tau, \mu-, \mu+$
ZZ(l)tautau	$\nu\mu, \overline{\nu}\mu, \tau-, \tau+$
ZZorWW(l)mumu	$\mu-, \mu+, \nu\mu, \overline{\nu}\mu$
ZZorWW(l)tautau	$\tau-, \tau+, \nu\tau, \overline{\nu}\tau$
sZe(l)etau	$e-, e+, \tau-, \tau+$
sZe(l)emu	$e-, e+, \mu-, \mu+$
sZe(l)numu	$\nu e, \overline{\nu}e, \mu-, \mu+$



ZZorWW channel



sZe channel

Event Selection

There are five factors that may effect the events numbers and the signifacance,and calculate the range of these factors by the approximate fomula $\sigma = \frac{s}{\sqrt{s+b}}$ to make the significance higher.

$m_{\mu\mu}$(Higgs mass 120——130GeV)

m_{jj}(Z boson mass 87——95GeV)

$p_T^{\mu\mu}$(transverse momentum of the two muon 26.95——52.69)

$p_Z^{\mu\mu}$(momentum of the two muon in z direction -54——0)

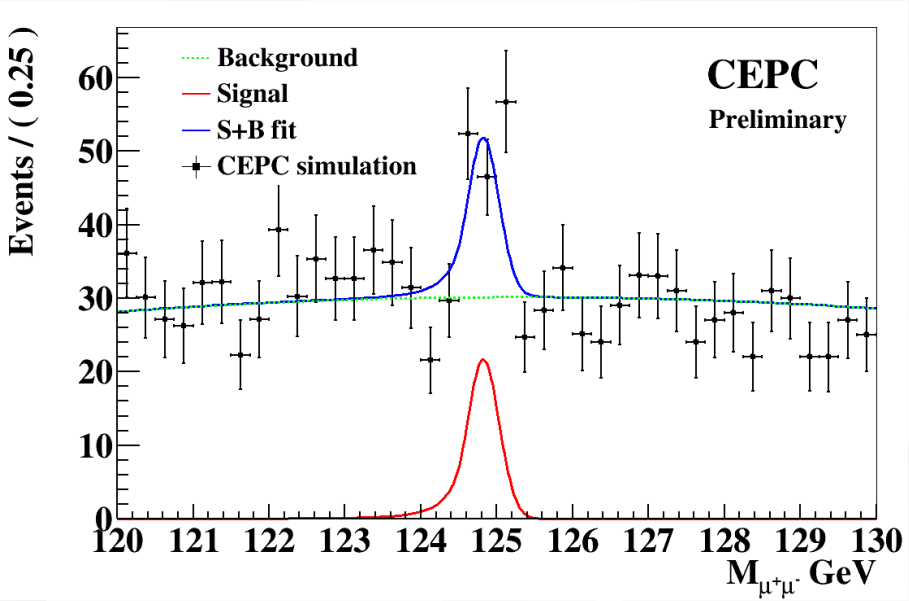
p_T^{jj}(transverse momentum of the two jets 26——52)

Under this range,we can get the maximum value of the significance under this data file. However, given the randomness of the signal and the background, in order to make the selection of the cut more reasonable, we should widen the range on this basis.

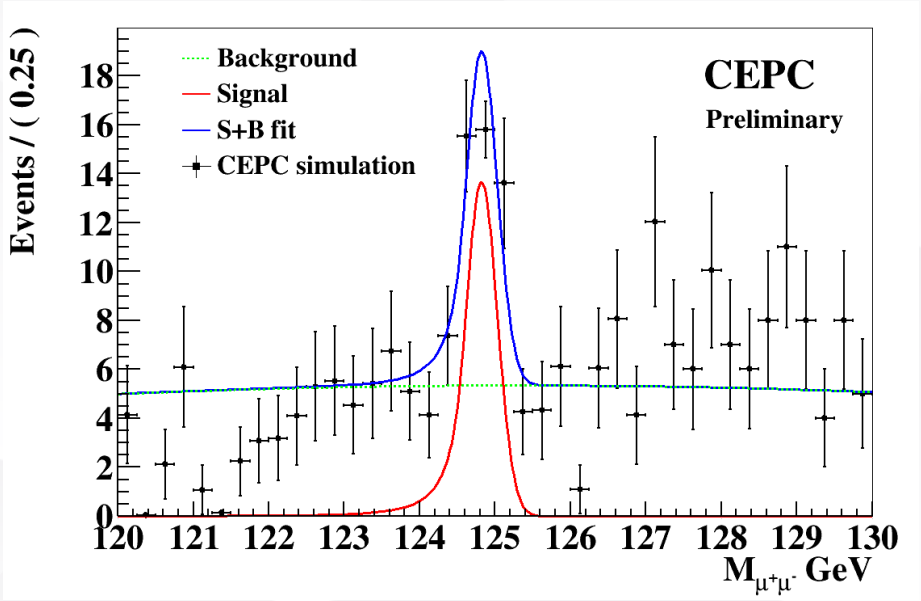
Event Selection

Cut	Signal	ZZ	WW	ZZorWW	SingleZ	Bkg	significance $\sigma=\sqrt{2(s+b)\ln(1+s/b)-s}$
Initial conditions	219.351	251561	5793	285	7909	265548	/
120< $M_{\mu^+\mu^-}$ <130	149.155	3641	131	41	405	4218	/
87<$M_{\mu\ \mu}$ <95	68.563	1422	0	0	29	1451	/
25< P_{Tu}<*64*	58.765	1155	0	0	20	1175	7.8522
-60< P_{Zu}<*20*	43.562	288	0	0	5	293	7.0526
20<ptj<60	27.186	195	0	0	3	198	5.5461

I widen the range on this basis and the cut I give and the significance is shown in the table



after P_T^{μ} cut
σ=7.8522



final cut
σ=5.5461

Thanks