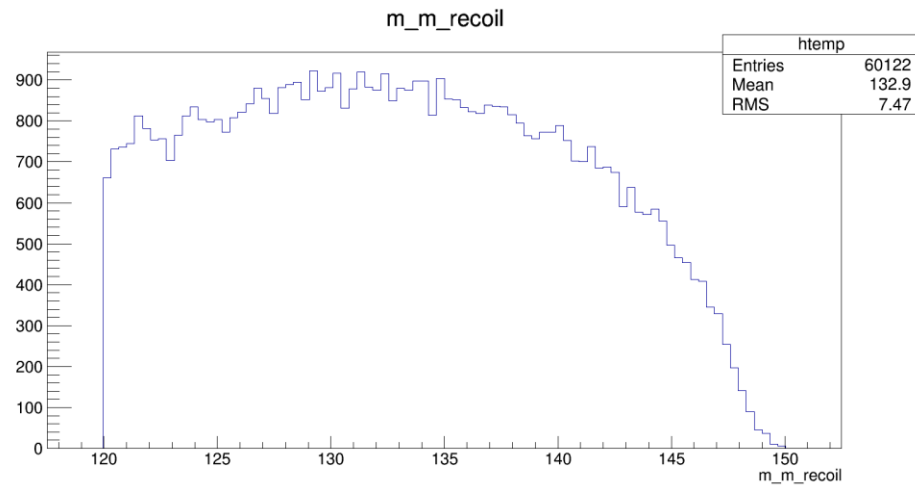


Hig2inv progress work

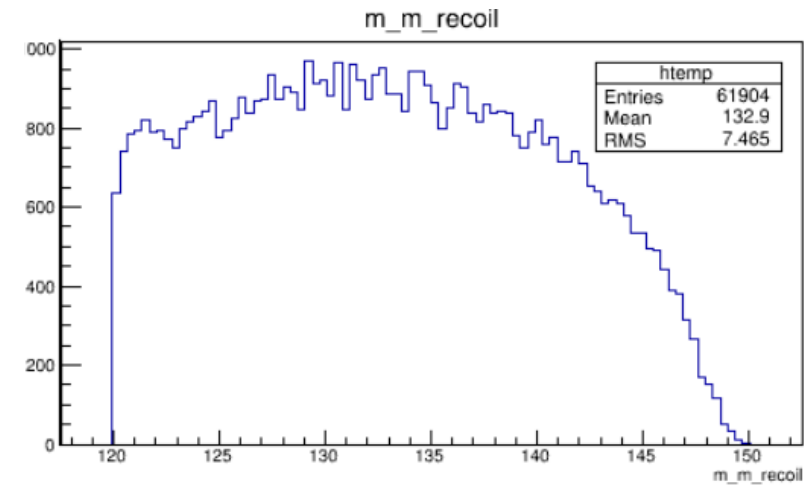
Tanyh
2018/11/01

Compare: 4 fermions background

My result: 4 fermions background



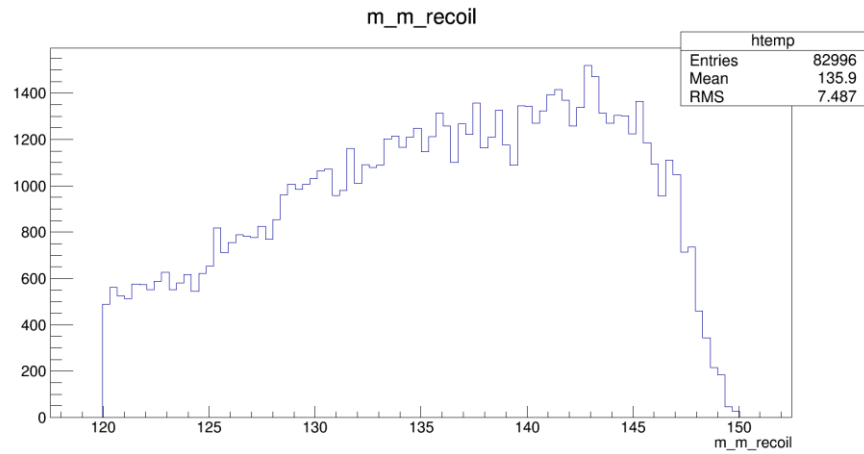
Maoqiang's result: 4 fermions background



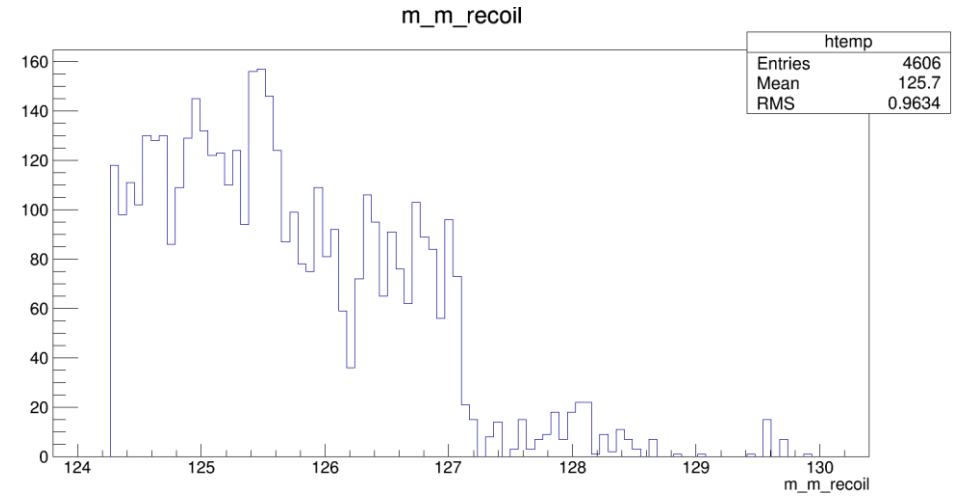
The source data of 4 fermions background has no changed, and I only changed some scales.

Compare: 2 fermions background

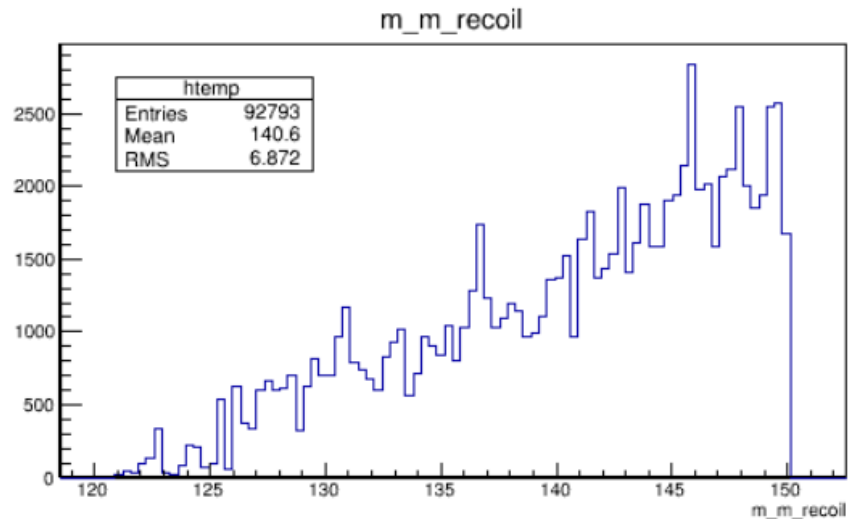
My result: 2 fermions background



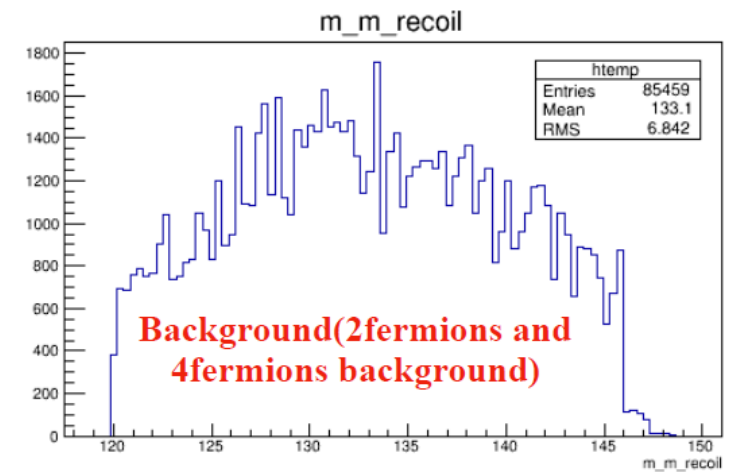
My result: all background distribution after BDT.



Maoqiang's result: 2 fermions background

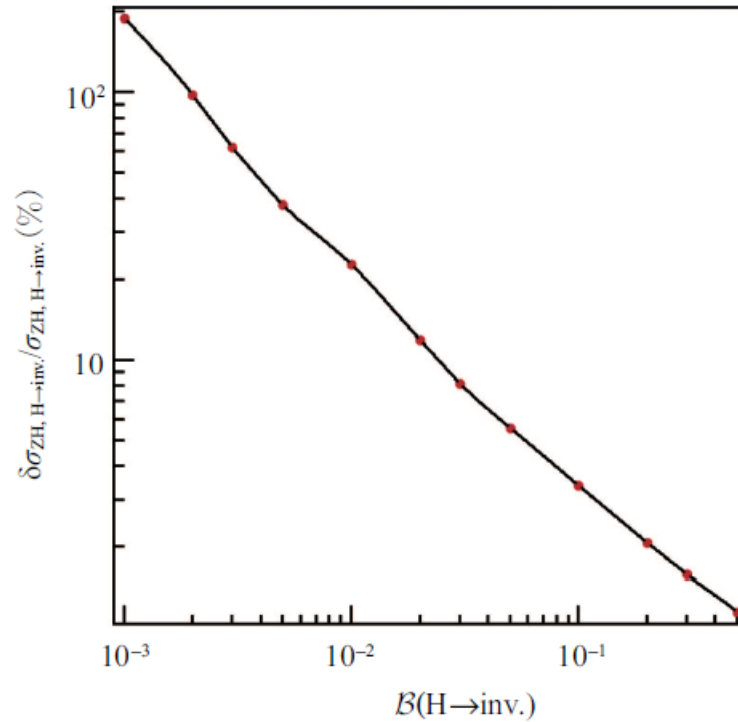


Maoqiang's result: after BDT



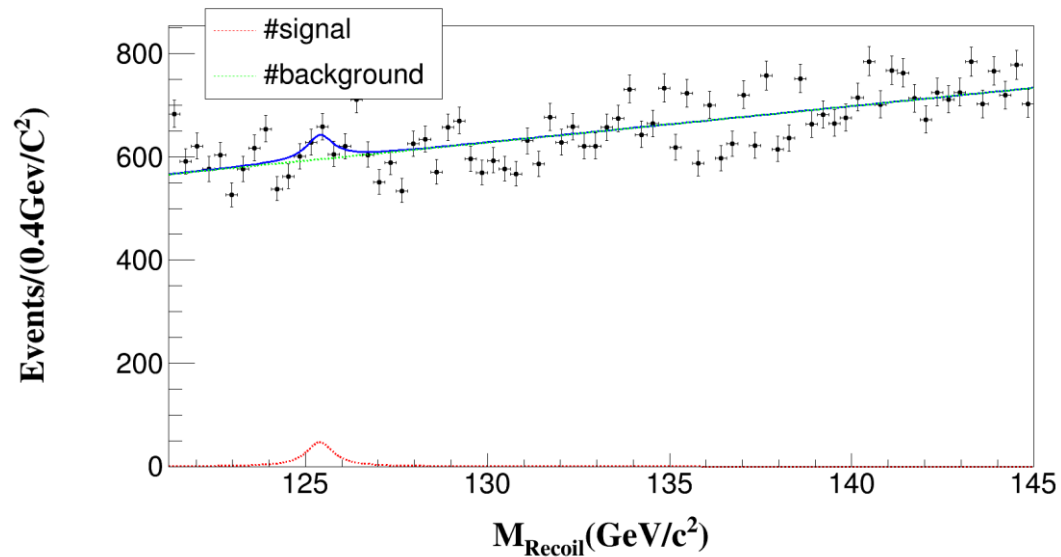
Because our source data is different, our results are different.

The understanding of Branch ratio. (This image is from Zhen-Xing Chen's paper)



We use ffH_inv as our signal data, So we can set the Br(H_inv) to any value. In our analysis, our background data lack the channel of $\mu^+ \mu^- H_{\text{others}}$.

The result before BDT: (I use $\text{Br}(\text{H}_{\text{inv}})=1.961\%$)



COVARIANCE MATRIX CALCULATED SUCCESSFULLY
 FCN=-329630 FROM HESSE STATUS=OK 35 CALLS 270 TOTAL
 EDM=0.000266788 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT NO.	PARAMETER NAME	VALUE	ERROR	INTERNAL STEP SIZE	INTERNAL VALUE
1	co1	1.28956e-01	8.37997e-03	1.23367e-04	1.29316e-01
2	mean1	1.25400e+02	4.83550e-02	5.00000e-01	1.57275e+00
3	nbkg	4.93908e+04	2.36681e+02	1.62761e-04	7.42356e-01
4	nsig	2.04325e+02	8.27720e+01	3.28829e-04	-1.68862e+00
5	sigma1	8.99985e-01	2.47010e-01	1.00000e-01	1.55844e+00

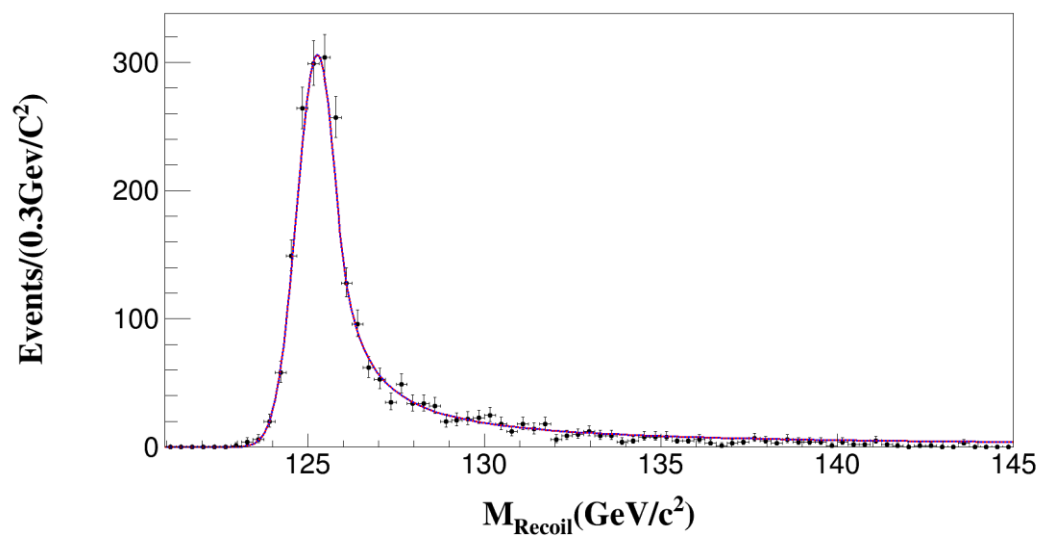
RooRealVar::nsig = 204.325 +/- 82.772 L(0 - 58938)
 RooRealVar::nbkg = 49390.8 +/- 236.681 L(0 - 58938)

Branch ratio= $1.495\% \pm 0.608\%$

95%Confidence level upper limit=1.919%

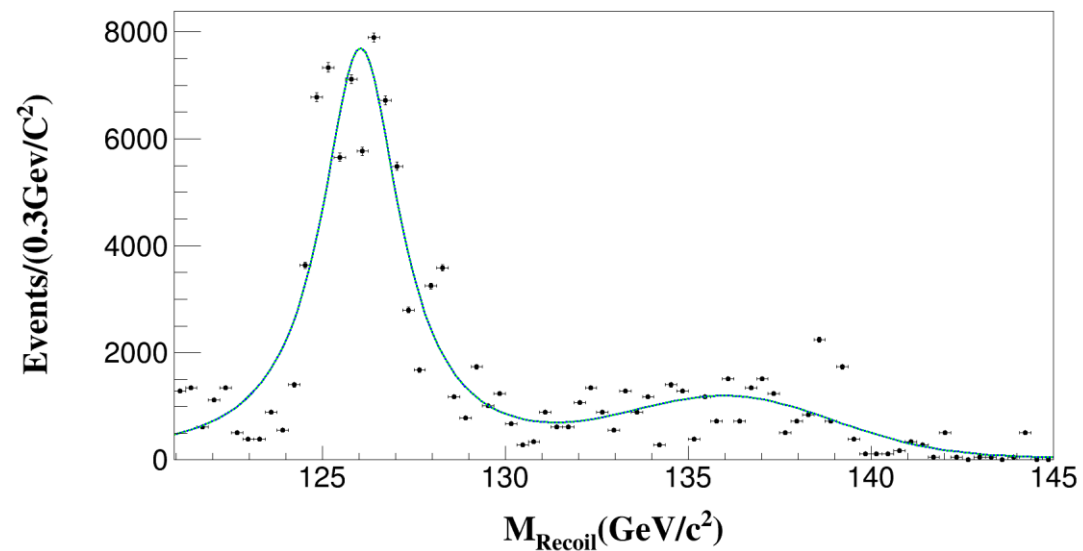
The result after BDT(I use the e3e3 background as BDT background input file)

Signal distribution



RooRealVar::nsig = 2246.09 +/- 26.2023 L(0 - 2247)

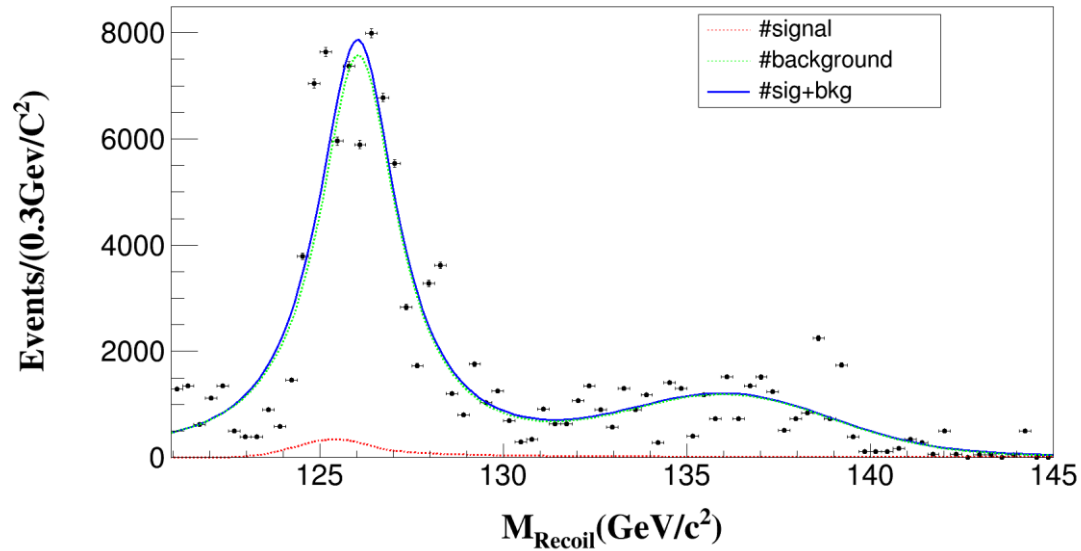
Background distribution



RooRealVar::nbkg = 115307 +/- 339.651 L(0 - 117992)

Fit:

Signal + background



This value is a bit large

COVARIANCE MATRIX CALCULATED SUCCESSFULLY
FCN=-941073 FROM HESSE STATUS=OK 50 CALLS 432 TOTAL
EDM=0.000366993 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT	PARAMETER	VALUE	ERROR	INTERNAL	INTERNAL
NO.	NAME			STEP SIZE	VALUE
1	fira	7.86714e-01	1.69469e-03	4.65424e-04	6.10683e-01
2	mean0	1.26042e+02	7.89357e-03	1.67985e-04	2.10018e-01
3	mean2	1.36163e+02	2.70974e-02	1.31036e-04	2.34687e-01
4	nbkg	1.13270e+05	1.00416e+03	3.28132e-04	1.08454e+00
5	nsig	4.27595e+03	9.48545e+02	3.65990e-04	-1.19137e+00
6	sigma0	2.60337e+00	1.58629e-02	7.73414e-04	2.08236e-01
7	sigma2	2.82272e+00	2.80489e-02	5.75221e-04	-3.47019e+00

RooRealVar::nsig = 4275.95 +/- 948.545 L(0 - 120239)
RooRealVar::nbkg = 113270 +/- 1004.16 L(0 - 120239)

I fixed the mean value and sigma of signal distribution, so the fitting may have some questions.

Branch ratio

$$\begin{aligned} &= \frac{N_{sig}/eff}{N_{total}} \\ &= \frac{(4276 \pm 949)/0.34}{5000 \times 6.77 \times 56} \\ &= 0.663\% \pm 0.147\% \end{aligned}$$

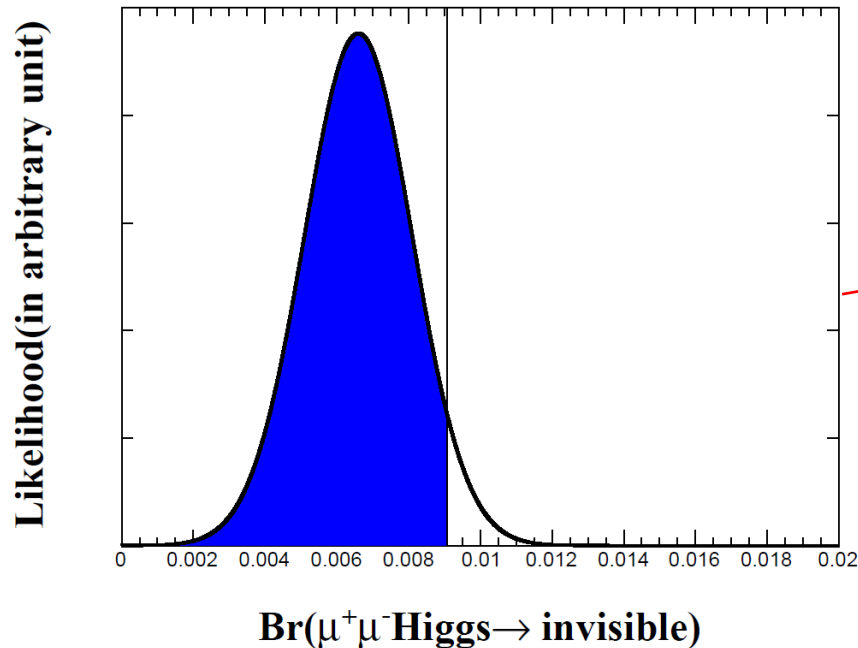
The calculation of this value:

I choose $Br(H_{inv}) = 0.350\%$.(I used to use $Br(H_{inv}) = 0.106\%$)

So my signal scale will change from $\frac{1}{185}$ to $\frac{1}{56}$.

I choose to expand background 56 times.

The value of $5000 \times 6.77 \times 56$ is the amount of $\mu^+ \mu^- H$.



95% Confidence level upper limit
=0.905%

Thank you