

Updated MC request for extra Higgs search benchmark

Software & Analysis meeting

Yan Wang

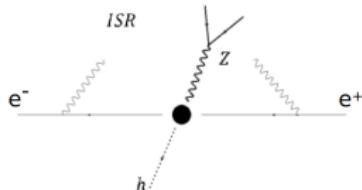
August 8, 2018



HELMHOLTZ
RESEARCH FOR GRAND CHALLENGES



reminder



Currently working on

- ▶ signal mass [10, 120] GeV, when $\sqrt{s} = 250$ GeV.
- ▶ 2000 fb^{-1} , with $(-+, +-, --, ++) = (45\%, 45\%, 5\%, 5\%)$ polarization scenario

- ▶ I requested new samples for 500 GeV,
 - ▶ from 10 GeV to 409 GeV (every 5 GeV), covered all mass regions.
 - ▶ totally about 2,000,000 events.
 - (totally 83 mass points, each has 2 polarizations)
 - ▶ too many events → trying to reduce the number by comparing the background
 - ▶ generate all the background recoil mass distribution at 500 GeV, with cuts

input event samples

using old DBD 500 GeV samples, including

- ▶ $2f - l, sl, h$
- ▶ $4f - l, sl, h$
- ▶ higgs – $\mu\mu h$
- ▶ $\gamma - \gamma$
- ▶ $6f - t\bar{t}, xxxxZ, yyyyZ, eeWW, llWW, \nu\nuWW, xxWW$



missed events in DBD production in DESY

But some files are missing in DESY pnfS, so the following processes are not included in this time.

It will not affect the final conclusion. (no $\mu^+\mu^-$ or the cross section is too small ..)

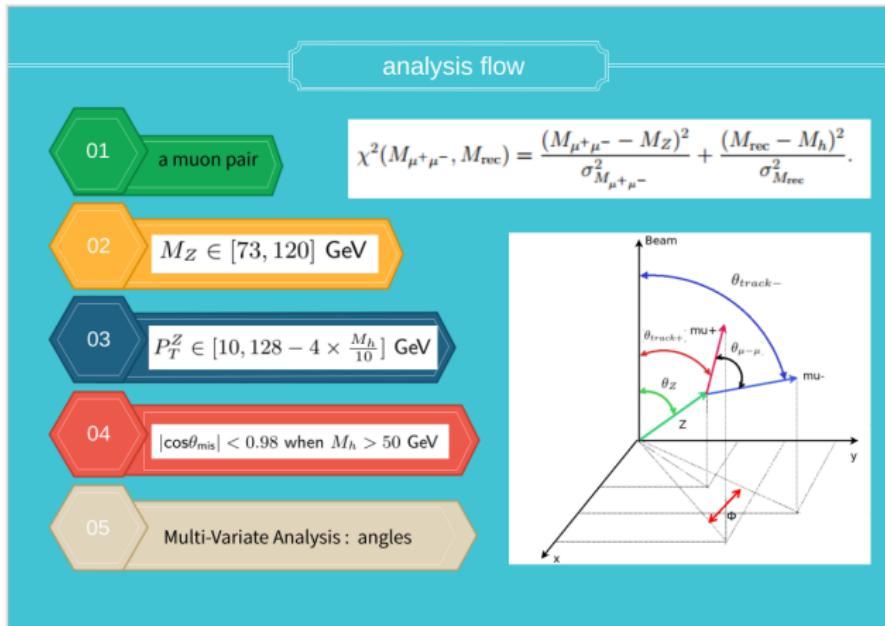
process	final states	pol	production in 2012	in 2016
ttbar	yyvlev	eR. pR	yes	no
ttbar	yycyyu	LR and RL	yes	no
ttbar	yyuyyc	LR and RL	yes	no
ttbar	yyuyyu	LR and RL	yes	no
ttbar	yycyyc	LR and RL	yes	no
xxxxZ	xxxxxx	eR. pL	yes	no
yyyyZ	eeeeee	eR. pR	yes	no
yyyyZ	llllee	eR. pR	no	no

has reported this problem.



event selection

similar with $\sqrt{s} = 250$ GeV analysis, only changing the cut values.



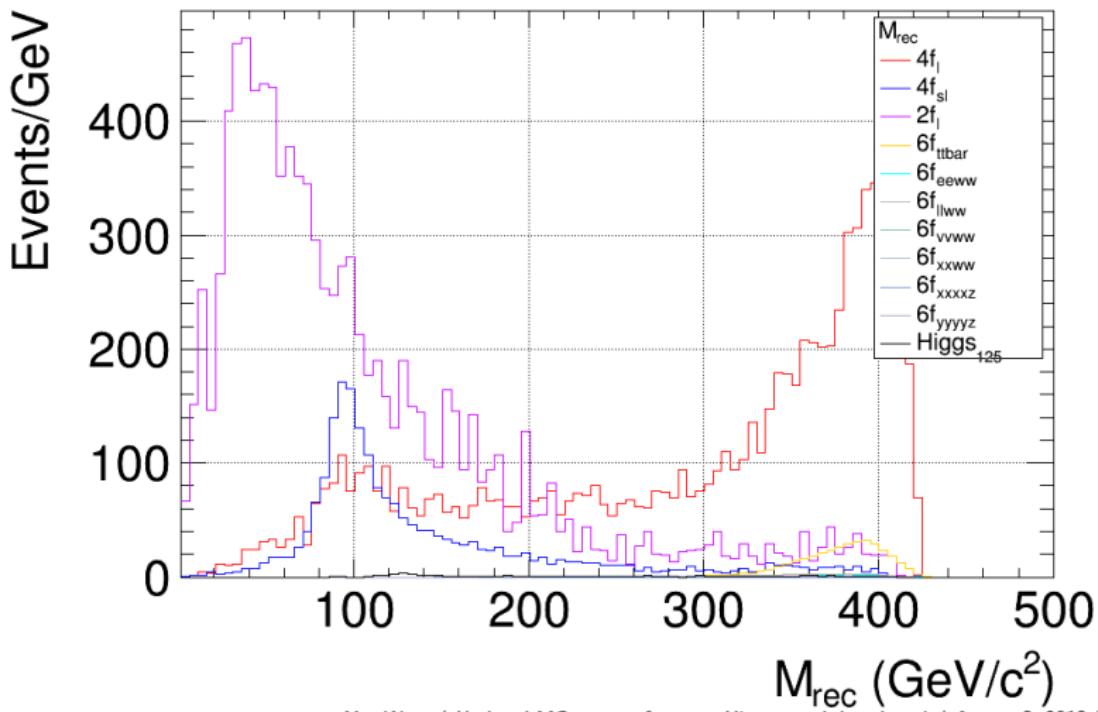
(The SM higgs process is treated as signal, when training the MVA.)

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recoil mass distribution for 500 GeV

after select two opposite-charged muons, before any cuts. The recoil mass distribution is



The difference with 250 GeV case

The signal (as well as SM higgs) cross sections decrease to 1/3 (only LR polarization process is listed):

cross section (fb)	250	500
SM higgs	17	5.7

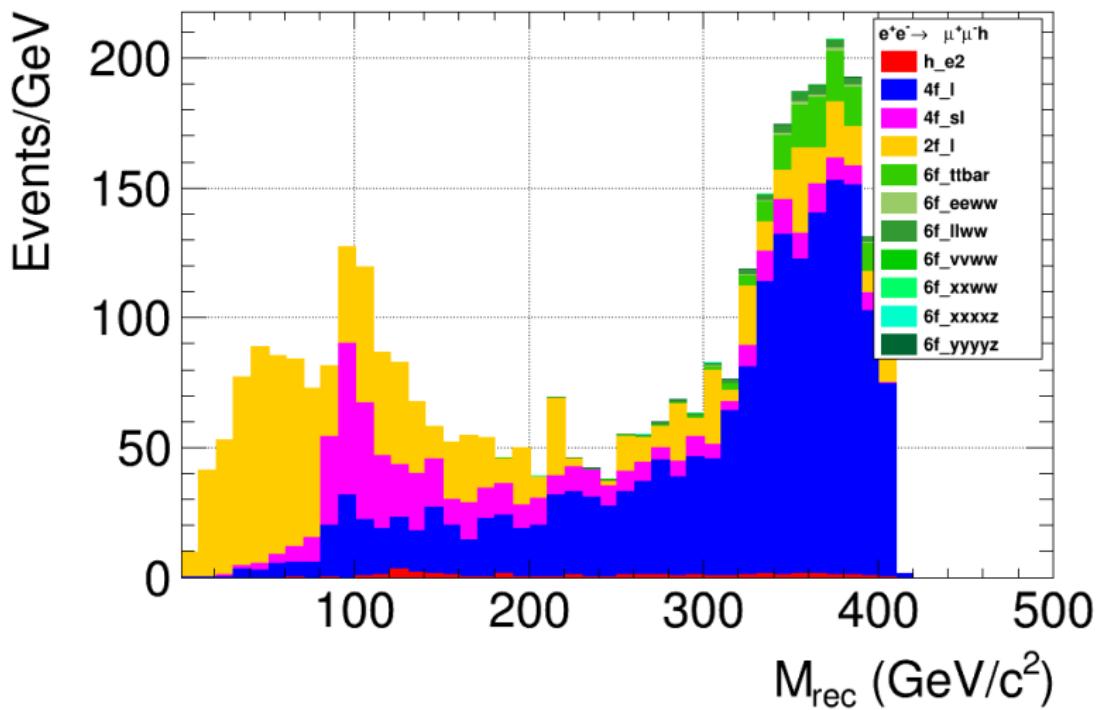
The 2 vector-bosons processes decrease to 1/2; 2f decrease to 1/4; 4f single-Z process cross sections increase a lot:

cross section (fb)	250	500
$4f_{ww}^l$	1564	790
$4f_{zz}^l$	157	60
$4f_{szee}^l$	1019	7107
$4f_{sz\nu\nu}^l$	192	278
$2f^l$	21226	5547



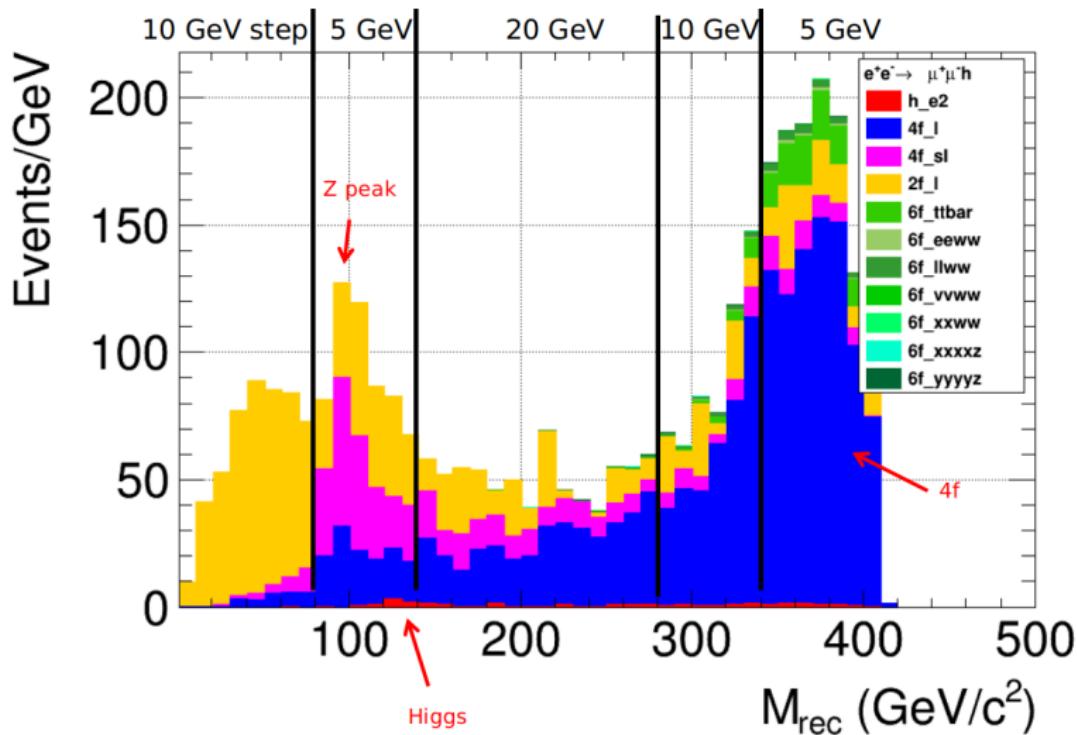
recoil mass distribution for 500 GeV

after all current cuts



request 500 GeV samples

after all current cuts



request 500 GeV samples

- ▶ totally 45 mass benchmark points
- ▶ each benchmark point has LR/RL channels.
- ▶ currently the luminosity is set as 2000 fb^{-1} , the minimal events number is 10000.
- ▶ totally event number is 994074 — a half of the past request.



details of requested 500 GeV samples

mass (GeV)	$\sigma(f b)(LR)$	Num.	$\sigma(f b)(RL)$	Num.	mass (GeV)	$\sigma(f b)(LR)$	Num.	$\sigma(RL)$	Num.
10	14.0349	28070	8.9943	17989					
20	10.7619	21524	6.9011	13802					
30	9.2336	18467	5.9212	11842					
40	8.3348	16670	5.3359	10672					
50	7.7465	15493	4.9630	10000					
60	7.3133	14627	4.6816	10000					
70	6.9528	13906	4.4531	10000					
80	6.6433	13287	4.2532	10000	85	6.4956	12991	4.1612	10000
90	6.3580	12716	4.0708	10000	95	6.2174	12435	3.9837	10000
100	6.0870	12174	3.8983	10000	105	5.9570	11914	3.8151	10000
110	5.8295	11659	3.7341	10000	115	5.7021	11404	3.6533	10000
120	5.5780	11156	3.5729	10000					
130	5.3337	10667	3.4158	10000	135	5.2132	10426	3.3370	10000
140	5.0917	10183	3.2598	10000					
160	4.6147	10000	2.9539	10000					
180	4.1441	10000	2.6530	10000					
200	3.6820	10000	2.3582	10000					
220	3.2309	10000	2.0692	10000					
240	2.7925	10000	1.7894	10000					



details of requested 500 GeV samples

mass (GeV)	$\sigma(fb)(LR)$	Num.	$\sigma(fb)(RL)$	Num.	mass (GeV)	$\sigma(fb)(LR)$	Num.	$\sigma(RL)$	Num.
260	0	10000	0	10000					
280	0	10000	0	10000					
290	0	10000	0	10000					
300	0	10000	0	10000					
310	0	10000	0	10000					
320	0	10000	0	10000					
330	0	10000	0	10000					
340	0	10000	0	10000	345	0	10000	0	10000
350	0	10000	0	10000	355	0	10000	0	10000
360	0	10000	0	10000	365	0	10000	0	10000
370	0	10000	0	10000	375	0	10000	0	10000
380	0	10000	0	10000	385	0	10000	0	100000
390	0	10000	0	10000	400	0	10000	0	10000
400	0	10000	0	10000	408	0	10000	0	10000