



H- \rightarrow WW branch ratio measurement with
 $e^+e^- \rightarrow ZH \rightarrow \nu\nu qqqq$

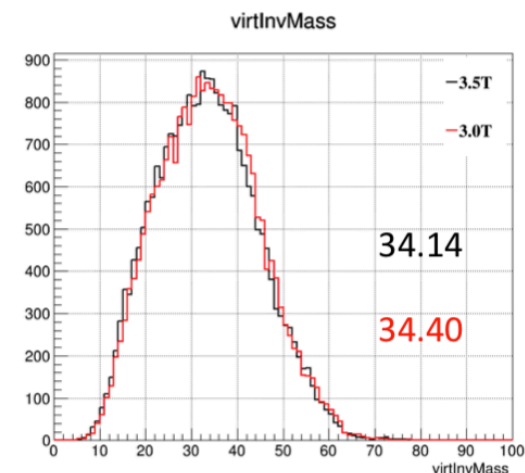
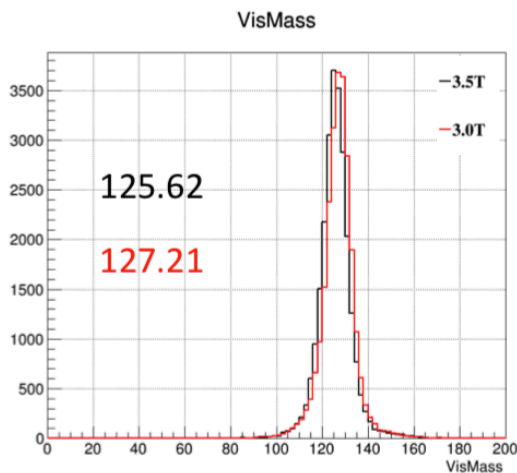
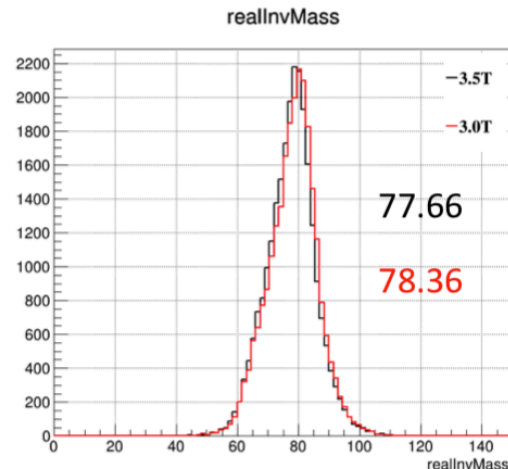
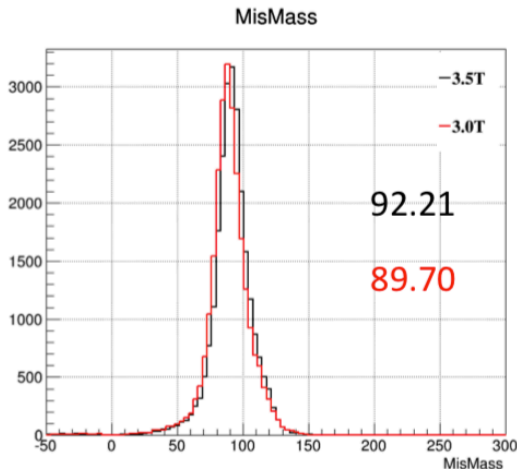
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Introduction

Comparisons of variable distributions between 3.5T and 3.0T were presented in my previous talk. All of the variables are well consistent.



<https://indico.ihep.ac.cn/event/7847/contribution/3/material/slides/0.pdf>

Updates


- Cut flow tables of 3.5T and 3.0T samples.
- Distributions of variables after all cuts applied previous than the corresponding variables.
- Total efficiency of signal and background, expected accuracy.

Cut flow table in Note (3.5T)

$$75 \text{ GeV}/c^2 < M_{Mis} < 150 \text{ GeV}/c^2$$

$$100 \text{ GeV}/c^2 < M_{Tot} < 150 \text{ GeV}/c^2$$

$$20 \text{ GeV}/c < p_T < 80 \text{ GeV}/c$$



Category	Signal	ZH background	SM background
Total	23938	208200	21314314
Validation of pre-selection	20405	143765	3166923
$N_{Particle}^{Tot} > 20$	19681	124112	537839
$B_{tag} < 0.9$	19349	28857	477099
$\text{Cos}\theta_{2jets} > 0.87$	19298	28673	433563
$\Sigma M_{Inv}^{2jet} > 50 \text{ GeV}$	18621	14793	309919
$Y_{34} > 0.005$	15183	6919	122866
Combined Variable	9022	3075	38226

- $65 \text{ GeV}/c^2 < M_{Inv}^{Real4jet} < 85 \text{ GeV}/c^2,$
- $15 \text{ GeV}/c^2 < M_{Inv}^{Virt4jet} < 50 \text{ GeV}/c^2,$
- $M_{Inv}^{Virt4jet} > -7/3 M_{Inv}^{Real4jet} + \frac{605}{3} \text{ GeV}/c^2,$

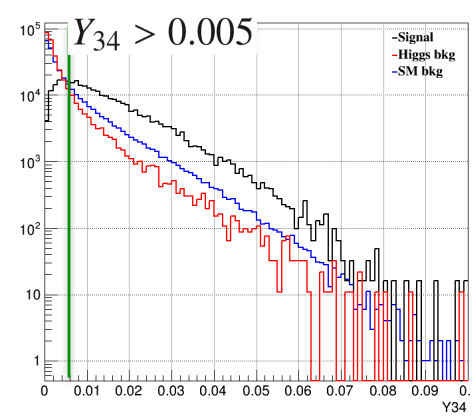
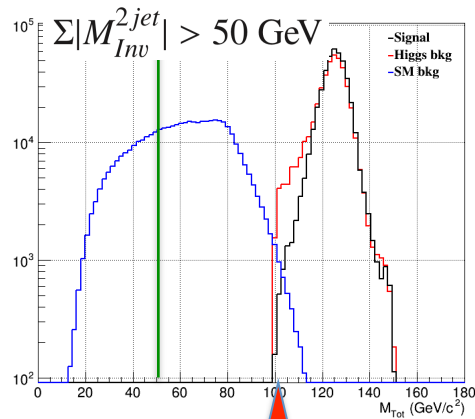
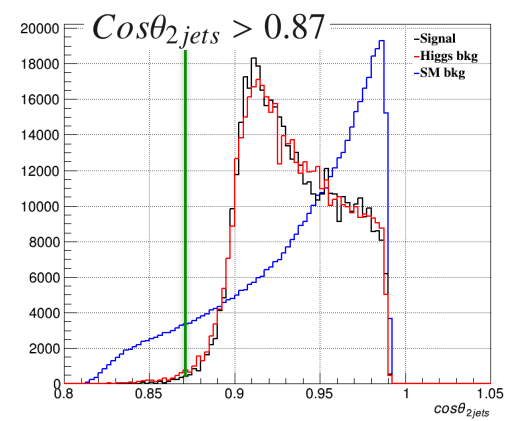
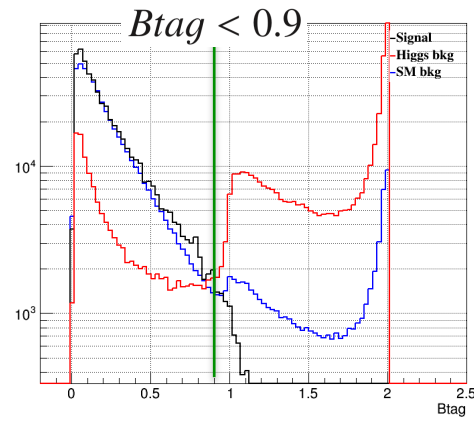
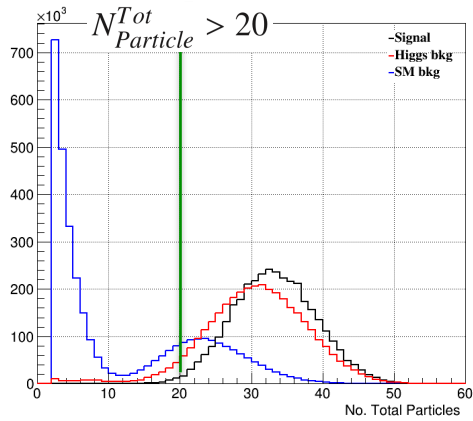
Results in Note (3.5T) and my results (3.5T)

Relative efficiencies showed differences (in red) but they will be consistent when we combined these 2 steps. Efficiencies of SM bkg (in blue) are the same.

	Note							
	Signal	efficiency	Higgs bkg	efficiency	SM bkg	efficiency		
Total	23938		208200		21314314			
Validation of pre-selection	20405	0.852	143765	0.691	3166923	0.149		
$N_{Particle}^{Tot} > 20$	19681	0.965	124112	0.863	537839	0.170		
$B_{tag} < 0.9$	19349	0.983	28857	0.233	477099	0.887		
$\cos\theta_{2jets} > 0.87$	19289	0.997	28673	0.994	433563	0.909		
$\Sigma M_{Inv}^{2jet} > 50 \text{ GeV}$	18621	0.965	14793	0.516	309919	0.715		
$Y_{34} > 0.005$	15183	0.815	0.787	6919	0.468	0.241	122866	0.396
Combined Variable	9022	0.594	3075	0.444	38226	0.311		

	My 3.5T					
	Signal	efficiency	Higgs bkg	efficiency	SM bkg	efficiency
Total	24889		222278		22687012	
Validation of pre-selection	20454	0.822	144169	0.649	3528746	0.156
$N_{Particle}^{Tot} > 20$	19729	0.965	124341	0.862	537839	0.152
$B_{tag} < 0.9$	19390	0.983	28954	0.233	477099	0.887
$\cos\theta_{2jets} > 0.87$	19336	0.997	28761	0.993	433563	0.909
$\Sigma M_{Inv}^{2jet} > 50 \text{ GeV}$	19336	1.000	28761	1.000	309919	0.715
$Y_{34} > 0.005$	15399	0.796	7344	0.255	122866	0.396
Combined Variable	9151	0.594	4025	0.548	38226	0.311

Variable distributions after all previous cuts (3.5T)



Cut flow table of 3.0T samples

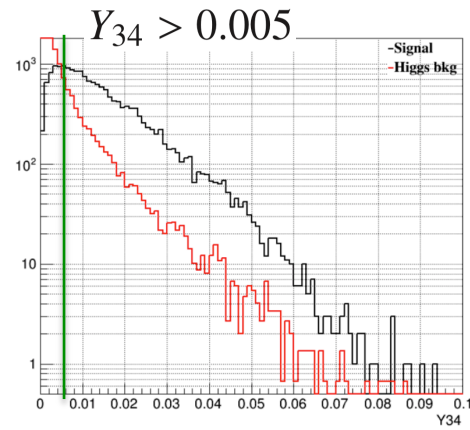
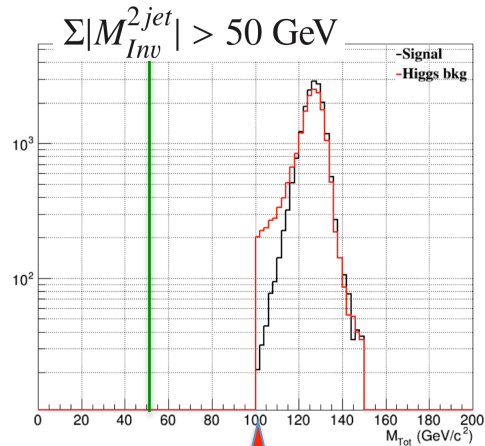
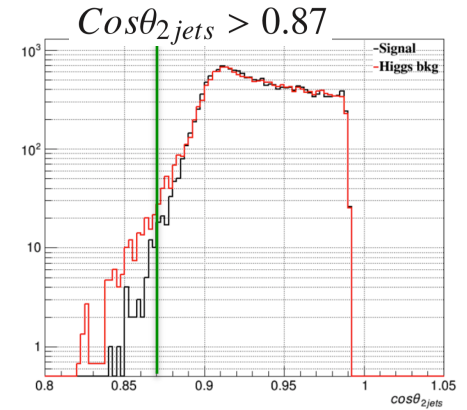
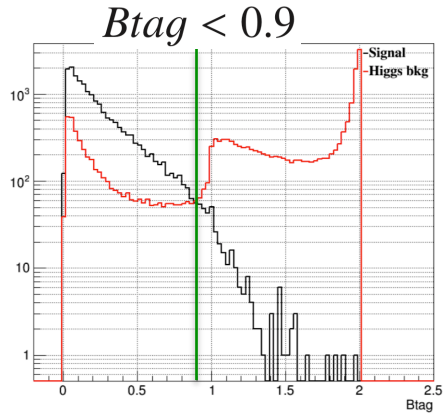
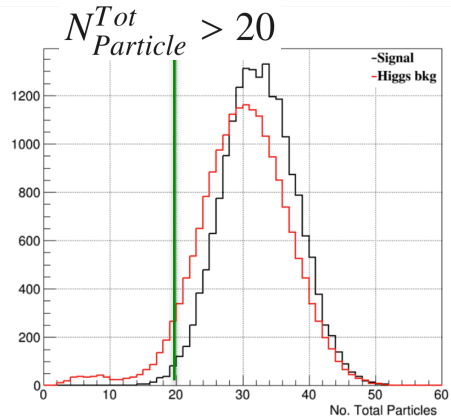
	3.0T			
	Signal	efficiency	Higgs bkg	efficiency
Total	23675		211307	
Validation of pre-selection	18894	0.798	134785	0.638
$N_{Particle}^{Tot} > 20$	18404	0.974	118963	0.883
$Btag < 0.9$	18048	0.981	26928	0.226
$Cos\theta_{2jets} > 0.87$	18006	0.998	26710	0.992
$\Sigma M_{Inv}^{2jet} > 50 \text{ GeV}$	18006	1.000	26710	1.000
$Y_{34} > 0.005$	14426	0.801	6834	0.256
Combined Variable	8607	0.597	2999	0.439

The SM bkg is still 3.5T.

Efficiencies in 2 tables are well consistent.

	My 3.5T				
	Signal	efficiency	Higgs bkg	efficiency	SM bkg
Total	24889		222278		22687012
Validation of pre-selection	20454	0.822	144169	0.649	3528746
$N_{Particle}^{Tot} > 20$	19729	0.965	124341	0.862	537839
$Btag < 0.9$	19390	0.983	28954	0.233	477099
$Cos\theta_{2jets} > 0.87$	19336	0.997	28761	0.993	433563
$\Sigma M_{Inv}^{2jet} > 50 \text{ GeV}$	19336	1.000	28761	1.000	309919
$Y_{34} > 0.005$	15399	0.796	7344	0.255	122866
Combined Variable	9151	0.594	4025	0.548	38226

Variable distributions after all previous cuts (3.0T)



Results

- Note:

$$N_{\text{Sig}} = 9022 \pm 224$$

$$\text{Signal efficiency} = 37.7\%$$

$$\text{ZH bkg efficiency} = 1.48\%$$

$$\text{Accu.} = \sqrt{(S+B)/S} = 2.5\%$$

- My 3.5T:

$$N_{\text{Sig}} = 9151 \pm 227$$

$$\text{Signal efficiency} = 36.8\%$$

$$\text{ZH bkg efficiency} = 1.81\%$$

$$\text{Accu.} = \sqrt{(S+B)/S} = 2.5\%$$

- 3.0T:

$$N_{\text{Sig}} = 8607 \pm \text{----}$$

$$\text{Signal efficiency} = 36.4\%$$

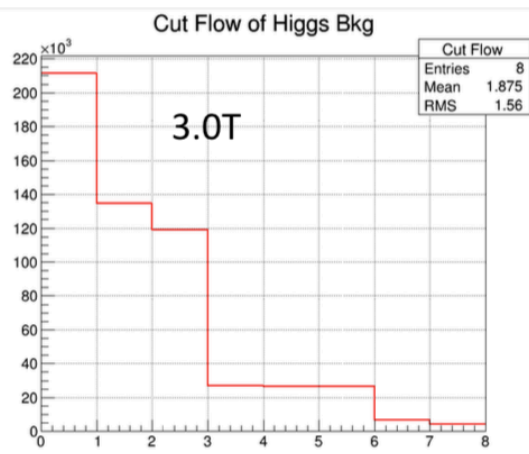
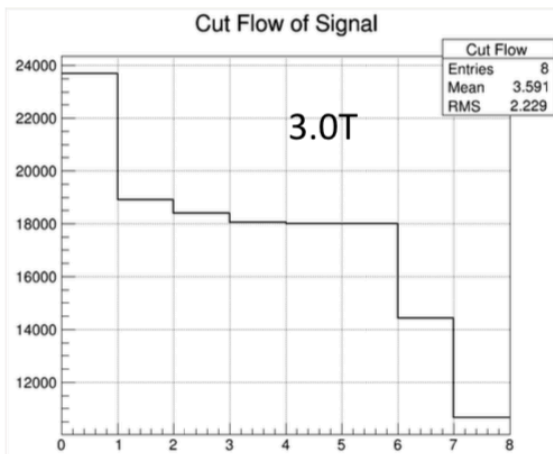
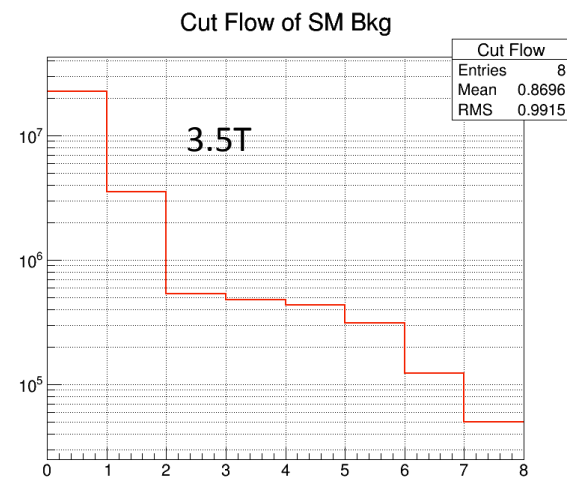
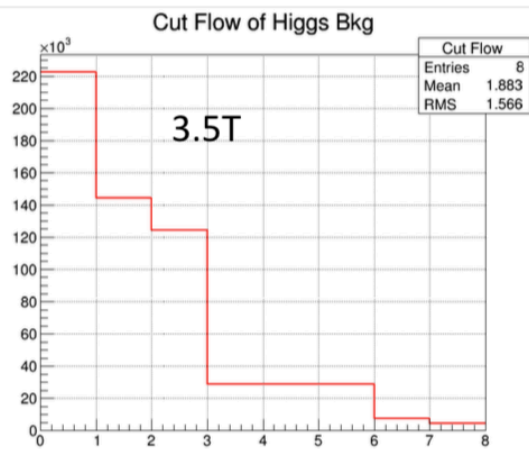
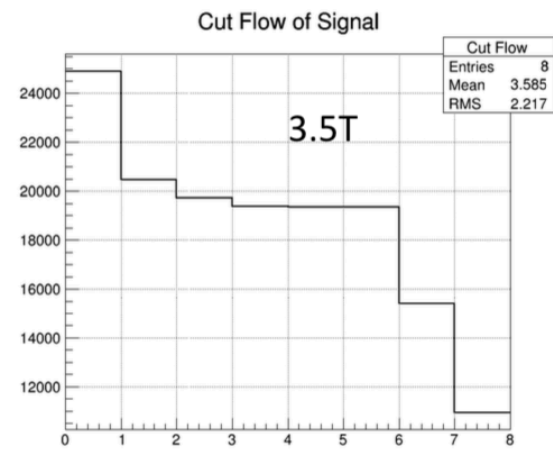
$$\text{ZH bkg efficiency} = 1.42\%$$

$$\text{Accu.} = \sqrt{(S+B)/S} = \text{----}$$

Now we have 2 new students who will join the effort.

backup

Cut flow plots



Results in Note (3.5T) and my results (3.5T)

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