Short Status Report of ttH Study

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Updates

- apply K factor related to α_s setting of physsim.
  K=0.843
- change 6f cross section to DBD official number
- for the 6f event shape, use very loose 4 b tagged category instead of 2 b tagged category.
- just tried to use BDT for this analysis

- $\sqrt{s}$ = 500 GeV, M_H = 125 GeV, $(Pe^-, Pe^+)=(-0.8,+0.3)$
- ttH production cross section

  0.485(fb) * K-factor = 0.485(fb) * 0.843 = 0.4088

no K factor, tbW cross section

Process	σ (fb)
$e^-e^+ \rightarrow$ tth	0.485
$e^-e^+ \rightarrow$ ttZ	1.974
$e^-e^+ \rightarrow$ ttg(bb)	1.058
$e^-e^+ \rightarrow$ tbW	979.8

with K factor, 6f cross section

Process	σ (fb)
$e^-e^+ \rightarrow$ tth	0.4088
$e^-e^+ \rightarrow$ ttZ	1.974
$e^-e^+ \rightarrow$ ttg(bb)	1.058
$e^-e^+ \rightarrow$ 6f	912.5

- Expected # of signals and Backgrounds(@500fb^{-1})

ttH(tt→6j, H→bb)	**63.9**
ttH(tt→lv4j,H→bb)	**61.3**
ttH(tt→lvlv2j, H→bb)	**14.6**
ttH(tt→all, H(nobb))	102.6
ttZ	987
ttg(bb)	529
tbW	489902

ttH(tt→6j, H→bb)	**53.9**
ttH(tt→lv4j,H→bb)	**51.6**
ttH(tt→lvlv2j, H→bb)	**12.3**
ttH(tt→all, H(nobb))	86.4
ttZ	987
ttg(bb)	529
6f	456278

Significance

- $\sqrt{s}$ = 500 GeV, L=500 fb^{-1}, (Pe$^-$,Pe$^+$)=(-0.8,+0.3)

	ttH→8jet		ttH→lv6jet		ttH→2l2v4jet	
Process	previous	current	previous	current	previous	current
ttH (not Signal)	0.42	0.426	0.25	0.208	0.06	0.0529
ttZ	7.17	8.45	5.19	5.12	1.41	1.29
ttbb	2.59	3.15	2.04	2.01	0.54	0.489
6f	19.24	19.4	8.39	8.80	1.88	1.72
bkgd total	**29.43**	**31.43**	**15.88**	**16.15**	**3.91**	**3.55**
Signal	**14.37**	**12.86**	**10.26**	**8.55609**	**2.62**	**2.09**
MH rang (GeV)	**(95,160)**	**(90,150)**	**(95,160)**	**(95,155)**	**(100,155)**	**(105,155)**

(Pe,Pe$^+$)	previous	current
Lumi. (fb^{-1})	500	500
8 jets	2.17	1.93
lv + 6 jets	2.00	1.72
2l2v + 4 jets	1.02	0.879

previous: cross section of 6f sample is slightly larger than the current number. without K-factor for ttH.
2b tagged category is used for 6f shape.
current: xsec is dbd official(whizard).
4b tagged category is used for 6f shape with K-factor = 0.843 for the ttH

σ_{ttH}

original directory
/home/ilc/tomohiko/philipp/evtgen/physsim/dbd/TTHStudy/prod

I copied /home/ilc/tomohiko/philipp/evtgen/ in my space and process xsection.sh to calculate the cross section at 500 GeV with M_H=125GeV
(jsf -b -q xsection.C(500)
@ home/ilc/tomohiko/philipp/evtgen/physsim/dbd/TTHStudy/prod/)

(Pe-,Pe+)=(-1,+1)
σ_{ttH} = 0.8090 fb @ M_H = 125 GeV
σ_{ttH} = 1.1257 fb @ M_H = 120 GeV
$\sigma_{ttH}(M_H=120)\times K(=0.843)$ = 0.9489 fb

Ryo's number (physical review D 72, 014007 (2005))
$\sigma_{ttH}(M_H=120)\times K(=0.843)$ = 1.07 fb

What is the difference between them?

- cut based analysis

change 6f event shape to very loose 4 b tagged category from 2 b tagged category

→ sensitivity is decreased a few %

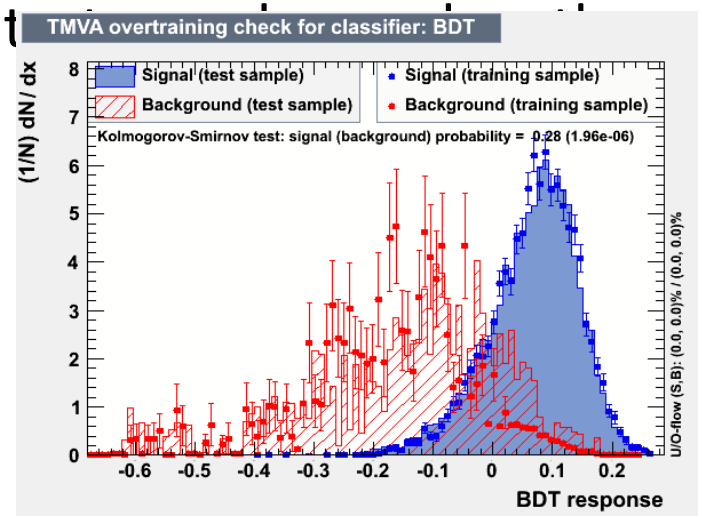
(nominal 4 b tagged(tth→8jets), blikeness=0.85, 0.8, 0.6, 0.2)

(loose 4 b tagged(tth→8jets), blikeness=0.70, 0.70, 0.15, 0.03)

- Just try to use TMVA BDT, BDTG, MLPBNN

Number of events of training samples and t

5,000 for each category.



ttH→8 jets
nominal 4 b tagged
BDT output

- We maybe can get ~20 % analysis gain.

$S/\sqrt{S+B}$: ~2 → ~2.4

(low statistics of 6f samples)

- loose 4 b tagged category:

$S/\sqrt{S+B}$ ~1.4

because of too much background events.