

$h \rightarrow \tau^+ \tau^-$ BR study

Current status

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Progress

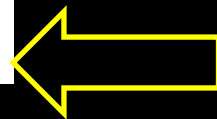
- I included aa_2f samples.
 - /hsm/ilc/grid/storm/users/berggren/mc-dbd/sgv-dst_6/500-TDR_ws/aa_2f
 - Now working on $q\bar{q}h$ @ 500 GeV
- I obtained strange results (reported at 35th General Meeting) ---> need bug fix ---> now fixed

Bug

Process list file (before including aa_2f)

ID / proc / pol / xsec

```
106515 e1e1h eL.pL 5.837461
106516 e1e1h eL.pR 15.001266
106517 e1e1h eR.pL 7.460882
106518 e1e1h eR.pR 5.837683
106519 e2e2h eL.pR 5.679039
106520 e2e2h eR.pL 3.635537
106521 e3e3h eL.pR 5.667049
106522 e3e3h eR.pL 3.628031
106523 nnh eL.pR 289.080872
106524 nnh eR.pL 21.559948
106525 qqh eL.pR 114.699730
106526 qqh eR.pL 73.425552
```



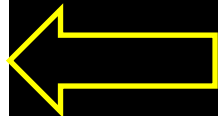
I found that the final line of list file was not included in cut-based analysis!
(No problem for TMVA.)

Bug

Process list file (after including aa_2f)

```
106515 e1e1h eL,pL 5.837461
106516 e1e1h eL,pR 15.001266
106517 e1e1h eR,pL 7.460882
106518 e1e1h eR,pR 5.837683
106519 e2e2h eL,pR 5.679039
106520 e2e2h eR,pL 3.635537
106521 e3e3h eL,pR 5.667049
106522 e3e3h eR,pL 3.628031
106523 nnh eL,pR 289.080872
106524 nnh eR,pL 21.559948
106525 qqh eL,pR 114.699730
106526 qqh eR,pL 73.425552
37485 aa_yy eLl,pLl 3093.29
37486 aa_yy eLl,pB 8730.23
37487 aa_yy eB,pLl 8740.04
37488 aa_yy eB,pB 27174.7
37481 aa_xx eLl,pLl 33021.3
37482 aa_xx eLl,pB 92984.3
37483 aa_xx eB,pLl 93144.5
37484 aa_xx eB,pB 289916.0
37477 aa_ll eLl,pLl 86486.6
37478 aa_ll eLl,pB 242538.0
37479 aa_ll eB,pLl 242784.0
37480 aa_ll eB,pB 831956.0
37473 aa_ee eLl,pLl 41837.0
37474 aa_ee eLl,pB 124298.0
37475 aa_ee eB,pLl 124585.0
37476 aa_ee eB,pB 425807.0
```

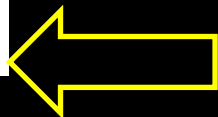
I inserted aa_2f process under the higgs process.



This qqh process included.

---> causes the difference of signal event

---> makes inconsistency



This process was not included properly.

Bug fix

I inserted dummy line!

```
106515 e1e1h eL.pL 5.837461
106516 e1e1h eL.pR 15.001266
106517 e1e1h eR.pL 7.460882
106518 e1e1h eR.pR 5.837683
106519 e2e2h eL.pR 5.679039
106520 e2e2h eR.pL 3.635537
106521 e3e3h eL.pR 5.667049
106522 e3e3h eR.pL 3.628031
106523 nnh eL.pR 289.080872
106524 nnh eR.pL 21.559948
106525 qqh eL.pR 114.699730
106526 qqh eR.pL 73.425552
37485 aa_yy eW.pW 3093.29
37486 aa_yy eW.pB 8730.23
37487 aa_yy eB.pW 8740.04
37488 aa_yy eB.pB 27174.7
37481 aa_xx eW.pW 33021.3
37482 aa_xx eW.pB 92984.3
37483 aa_xx eB.pW 93144.5
37484 aa_xx eB.pB 289916.0
37477 aa_ll eW.pW 86486.6
37478 aa_ll eW.pB 242538.0
37479 aa_ll eB.pW 242784.0
37480 aa_ll eB.pB 831956.0
37473 aa_ee eW.pW 41837.0
37474 aa_ee eW.pB 124298.0
37475 aa_ee eB.pW 124585.0
37476 aa_ee eB.pB 425807.0
100 dummy eL.pL 0.1
```

now this process included in the analysis

dummy line

Effect of this bug

- $q\bar{q}h$
 - # of signal: increase ---> significance improve
 - # of background: increase ---> significance decrease
- $\nu\bar{\nu}h, \ell^+\ell^-h$
 - # of background: increase ---> significance decrease, but not so harmful (I think)

Current results

$q\bar{q}h$ @ 500 GeV significance $\left(\frac{\Delta(\sigma \cdot \text{Br})}{(\sigma \cdot \text{Br})}\right)$	Previous (Tokusui Workshop 2013)	Current
Cut-based	19.7 σ (5.1%)	20.5 σ (4.9%)
TMVA	21.9 σ (4.6%)	21.2 σ (4.7%)

Cut-based: re-optimized the cuts,
significance improved (effect of the bug)
aa_2f processes completely suppressed

TMVA: slightly decreased, effect of aa_2f?
difference of pre-cuts? need check

Next step

- check for TMVA analysis
- $\nu\bar{\nu}h$ @ 500 GeV with aa_2f
- If you are using same/similar method, please check the last line of your process file is really included or not.