

# Status report

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# Analysis ( $E_e = 60\text{GeV}$ , $E_p = 7\text{TeV}$ , $R = 0.7$ )

We changed the parameter  $R$  ( $0.9 \rightarrow 0.7$ ) in the jet reconstruction algorithm (anti-Kt).

Event	cut0	cut1	cut2	cut3	cut4	cut5	cut6	cut7
Signal (Br=100%)	15096	10752	7190	4144	3572	3369	2807	1808
$Wj\nu$	419978	291286	152157	5739	4687	4102	1063	673
$Zje$	38067	25355	11371	1912	1525	1226	764	433
$W^+je$	382916	233862	90166	33036	20247	17260	13389	784
$W^-je$	391167	209738	40245	12164	7868	6622	5282	324
...								
Total background	1873260	1174315	409245	56122	36825	31600	20628	2245

The number of events of the signal and the main backgrounds after application of each cut, assuming an integrated luminosity of  $1\text{ab}^{-1}$

Branching ratio calculated by  $S/\sqrt{S + 2B}$  :

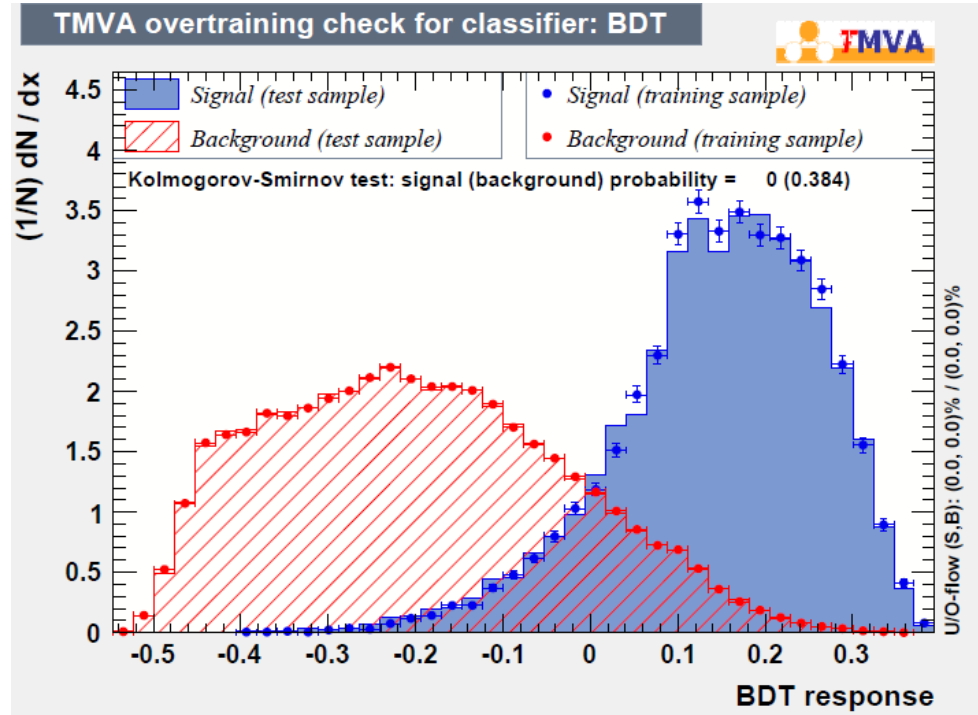
$$Z = \frac{1808 \times \text{Br}(h \rightarrow \cancel{E}_T)}{\sqrt{1808 \times \text{Br}(h \rightarrow \cancel{E}_T) + 2 \times 2245}} \quad \text{In the case of } 2\sigma \quad \Rightarrow \quad \text{Br}(h \rightarrow \cancel{E}_T) \sim 7.52\%$$

※ $\text{Br}(h \rightarrow \cancel{E}_T) \sim 8.50\%$  ( $R = 0.9$ )

# Analysis ( $E_e = 60\text{GeV}$ , $E_p = 7\text{TeV}$ , $R = 0.7$ )

We analyzed the signal and the backgrounds by MVA.

Score >	$N_s$	$N_B$	Br[%]
0	7046	66828	10.4
0.05	6453	41811	8.99
0.1	5511	23493	7.90
0.15	4155	10582	7.05
<b>0.2</b>	<b>2800</b>	<b>4169</b>	<b>6.59</b>
0.25	1544	1381	6.94
0.3	549	292	9.18
0.35	71	24	22.5



Branching ratio calculated by  $S/\sqrt{S + 2B}$  :

$$Z = \frac{2800 \times \text{Br}(h \rightarrow \cancel{E}_T)}{\sqrt{2800 \times \text{Br}(h \rightarrow \cancel{E}_T) + 2 \times 4169}}$$

In the case of  $2\sigma$   $\Rightarrow$   $\text{Br}(h \rightarrow \cancel{E}_T) \sim 6.59\%$

※  $\text{Br}(h \rightarrow \cancel{E}_T) \sim 7.52\%$  (cut-based)

# Analysis ( $E_e = 60\text{GeV}$ , $E_p = 14\text{TeV}$ , $R = 0.7$ )

We analyzed the signal and the backgrounds by the cut-based analysis.

Event	cut0	cut1	cut2	cut3	cut4	cut5	cut6	cut7
Signal (Br=100%)	30765	21284	15054	10241	8545	8257	6864	4227
$Wj\nu$	900438	606524	326421	14707	10929	9981	2225	1340
$Zje$	61458	39442	18565	4130	3094	2611	1581	860
$W^+je$	695475	405159	166039	75646	43390	39029	29668	1708
$W^-je$	726024	374459	85527	32571	19947	17787	13822	912
...								
Total background	3624728	2222888	854231	135554	83443	75265	47518	4889

The number of events of the signal and the main backgrounds after application of each cut, assuming an integrated luminosity of  $1\text{ab}^{-1}$

Branching ratio calculated by  $S/\sqrt{S + 2B}$  :

$$Z = \frac{4227 \times \text{Br}(h \rightarrow \cancel{E}_T)}{\sqrt{4227 \times \text{Br}(h \rightarrow \cancel{E}_T) + 2 \times 4889}} \quad \text{In the case of } 2\sigma \quad \Rightarrow \quad \text{Br}(h \rightarrow \cancel{E}_T) \sim 4.73\%$$

※ $\text{Br}(h \rightarrow \cancel{E}_T) \sim 7.52\%$  ( $E_p = 7\text{TeV}$ )

# Summary

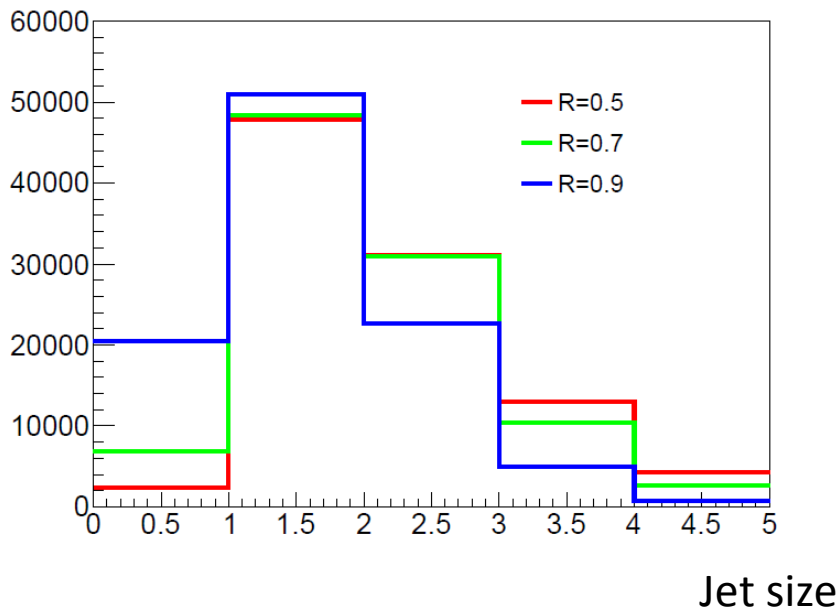
- When we changed the parameter  $R$  ( $0.9 \rightarrow 0.7$ ) in the jet reconstruction algorithm (anti-Kt),  $\text{Br}(h \rightarrow \cancel{E}_T) = 7.52\%$  (cut-base) and  $\text{Br}(h \rightarrow \cancel{E}_T) = 6.59\%$  (MVA) at  $2\sigma$  level.
- When we changed the proton energy ( $7\text{TeV} \rightarrow 14\text{TeV}$ ),  $\text{Br}(h \rightarrow \cancel{E}_T) = 4.73\%$  (cut-base) at  $2\sigma$  level.

Back up

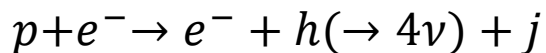
# Change the parameter $R$

We changed the parameter  $R$  in the jet reconstruction algorithm (0.5, 0.7, 0.9)

Events



Signal



- Jet size tends to be **smaller** ( $N_j \rightarrow 1$ ) with the increase of the parameter  $R$ .
  - ✓ Signal has one jet in the final state.
- The number of events ( $N_j = 0$ ) tends to be **larger** with the increase of the parameter  $R$ .
  - ✓ Jet Pt tends to be smaller than Pt threshold (=5GeV) because Jet includes the forward particles.

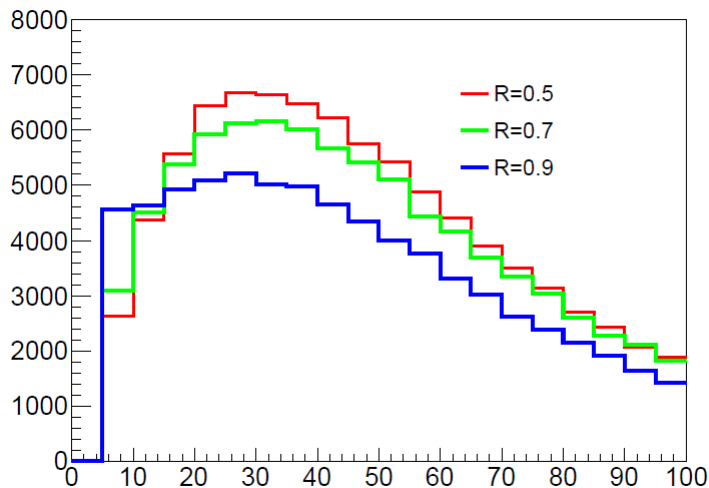


# Change the parameter $R$

We changed the parameter  $R$  in the jet reconstruction algorithm (0.5, 0.7, 0.9)

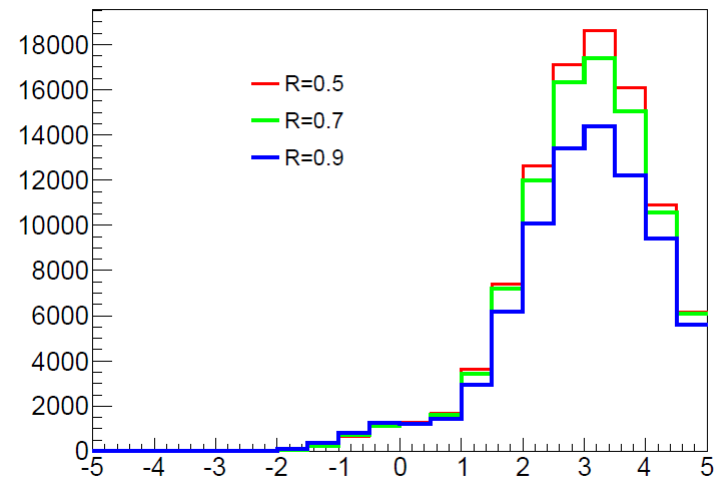
Signal ( $p + e^- \rightarrow e^- + h(\rightarrow 4\nu) + j$ )

Events



Jet Pt (GeV)

Events



Jet Eta

Jet Pt tends to be smaller because jet includes the forward particles.

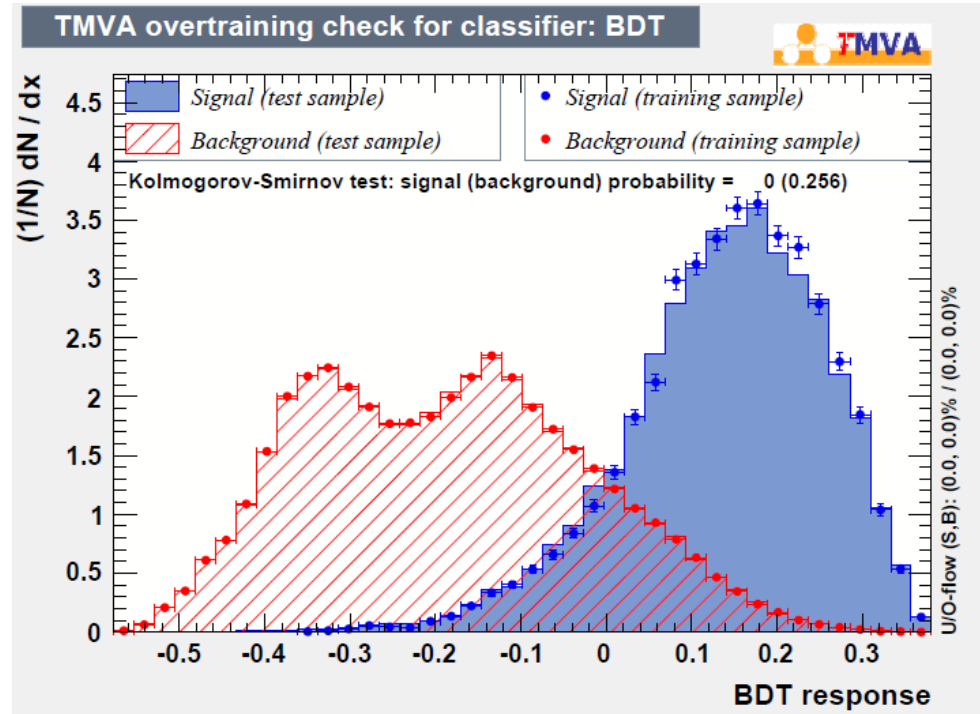
# Cross section (e beam polarization = -0.9)

Event	Cross section[fb] (Ep=7TeV)
Signal(Br( $h \rightarrow \cancel{E}_T$ ) = 100%)	46.4 (22.7)
$Wj\nu$	1400 (657)
$Zje$	118 (76.0)
$W^+je$	1066 (597)
$W^-je$	1070 (590)
single-top	966 (417)
$e + 2jet (out)$	68.6 (16.5)
NC: $H \rightarrow \ell^+ \ell^- \nu \bar{\nu}$	0.669 (0.326)
NC: $H \rightarrow jj\nu \bar{\nu}$	0.203
NC: $H \rightarrow jj\ell^+ \nu$	1.30 (0.635)
NC: $H \rightarrow jj\ell^- \bar{\nu}$	1.29 (0.631)
CC: $H \rightarrow \ell^+ \ell^- \nu \bar{\nu}$	5.33 (2.79)
CC: $H \rightarrow jj\ell^- \bar{\nu}$	10.4 (5.42)
Photon-	1150 (675)

# Analysis ( $E_e = 60\text{GeV}$ , $E_p = 7\text{TeV}$ , $R = 0.9$ )

We analyzed the signal and the backgrounds by MVA.

Score >	$N_s$	$N_B$	Br[%]
0	6767	71080	11.2
0.05	6143	43048	9.59
0.1	5084	22122	8.31
0.15	3828	9932	7.42
<b>0.2</b>	<b>2469</b>	<b>3735</b>	<b>7.08</b>
0.25	1271	1150	7.71
0.3	421	237	10.8
0.35	47	8	21.8



Branching ratio calculated by  $S/\sqrt{S + 2B}$  :

$$Z = \frac{2469 \times \text{Br}(h \rightarrow \cancel{E}_T)}{\sqrt{2469 \times \text{Br}(h \rightarrow \cancel{E}_T) + 2 \times 3735}}$$

In the case of  $2\sigma$

➔

$\text{Br}(h \rightarrow \cancel{E}_T) \sim 7.08\%$

※ $\text{Br}(h \rightarrow \cancel{E}_T) \sim 6.59\%$  ( $R = 110.7$ )