

Status report

June 3, 2022

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HYU / IP2I

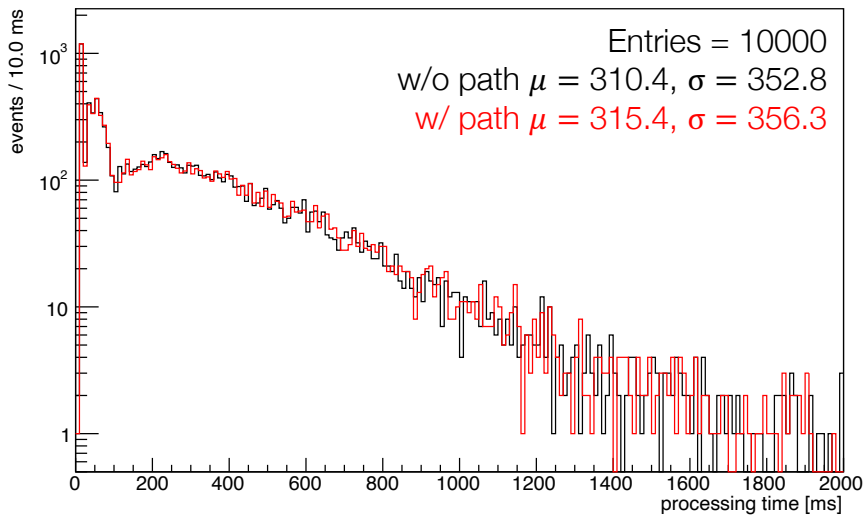
New HLT path for gamma+jet status

HLT_Photon30EB_TightIso_TightID ([JIRA](#))

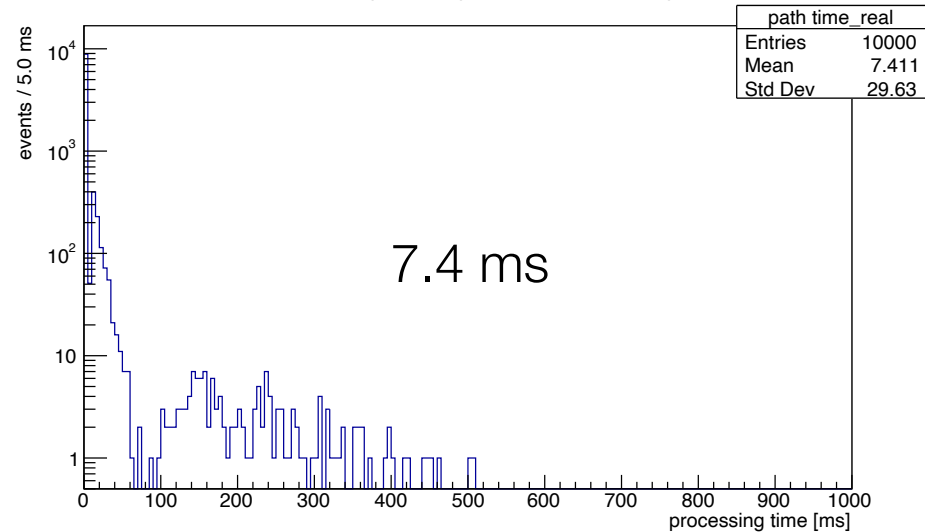
- Timing measurement via cms-hlt-gpu.cern.ch machine is sufficient ([Twiki](#) provided by Finn)
- Integrated in /dev/CMSSW_12_4_0/HLT/V48
- Prescale value is 150 **for all columns** for the moment, need to be specified
- L1T seed is disabled in the latest L1T menu for the highest-luminosity column (?)

Passing through whole menu (reference [twiki](#))

Event processing time (real)



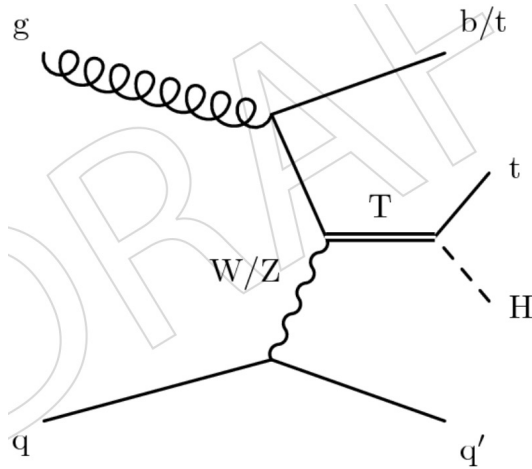
HLT_Photon30EB_TightID_TightIso_v2 processing time (real)



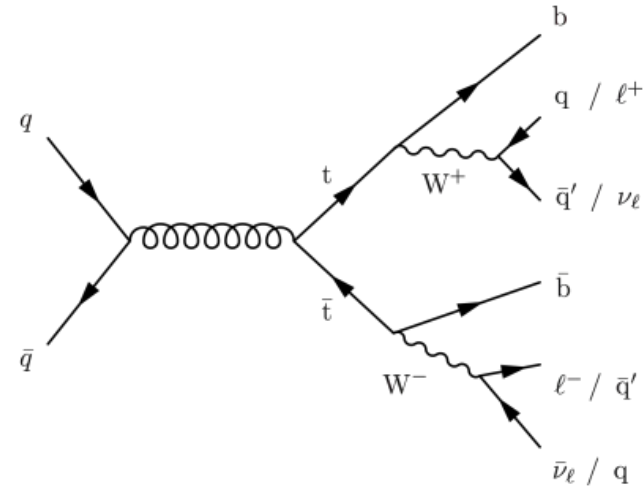
Measurements	w/ path (ms)	w/o path (ms)	Diff (ms)	Processing time (ms)
1	315.5	311.4	4.1	7.405
2	315.4	310.4	5	7.411
3	315.9	311.9	4	7.419
Average	315.6	311.2	4.37	7.408

NN From Scratch

Samples



TprimeBToTH_M-700



TTToHadronic

Selections

- $\text{HLT} + n_{\text{jets}} \geq 6 + n_{\text{bjets}} (\text{DeepJet Medium}) \geq 3$

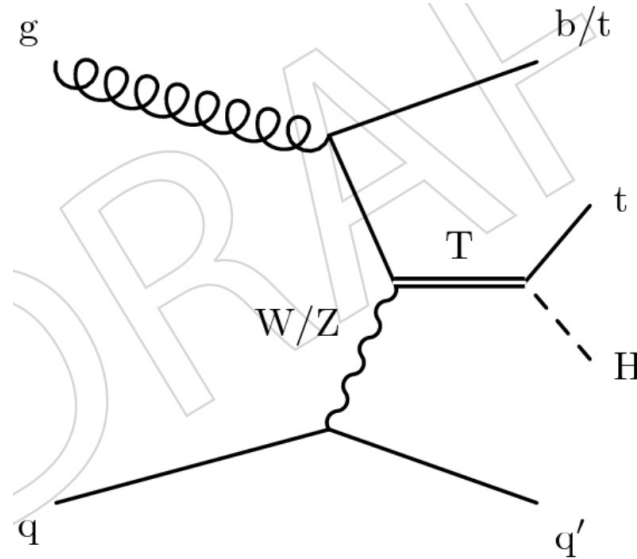
Strategy

- Train on Tprime700 Hadronic + TTToHadronic (1:1 training)
- Compare ROC curves with cutBased (signal efficiency vs background rejection)

Tprime to Hadronic decay

Track down decay chain

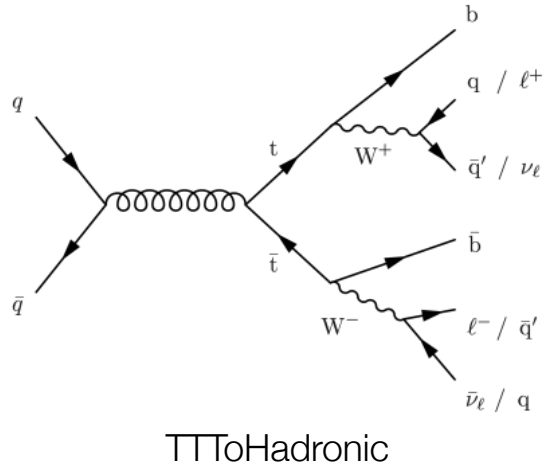
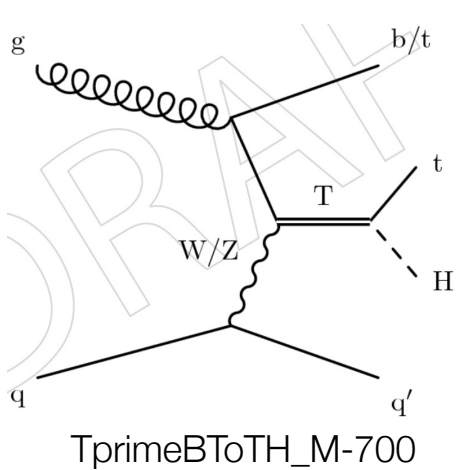
- Sample: one file from TprimeBToTH_M-700_LH_2018



- Strategy
 - Track any W decays into qq
 - Track any H decays into bb
 - If an event contains hadronic W & Hbb : Hadronic T'
- Expected BR for T' hadronic($t \rightarrow Wb \sim 1$, $W \rightarrow qq \sim 0.66$, $H \rightarrow bb \sim 0.6$) : ~ 0.396
- Tested with one file: $27300 \rightarrow 10754 \sim 0.394$ 😊

Ana From Scratch

Samples

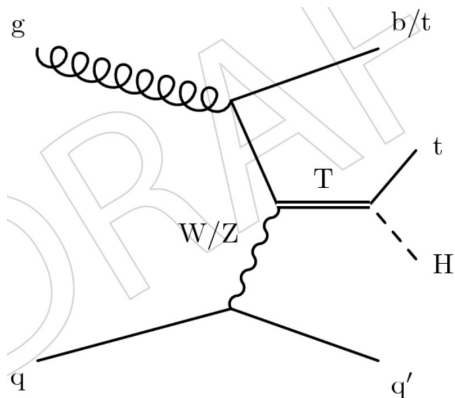


Recovering cut-based method

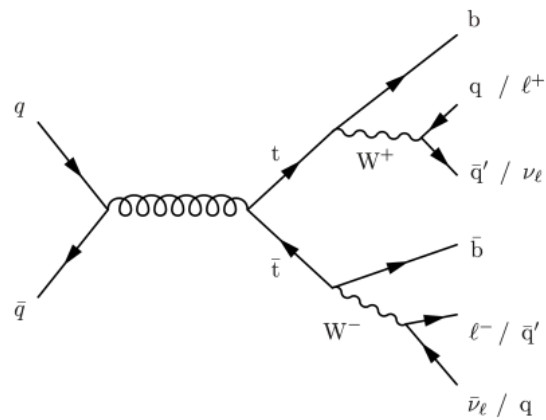
Basic Selection Criteria	Signal (M=700 GeV/c ²)	QCD_HT_700_1000	t $\bar{t}$
Trigger and p_T, η and $n_b^{DeepCSV T} \geq 3$	4242	3326	83816
$j_{p_T}^1 > 170 \text{ GeV}/c, j_{p_T}^2 > 130 \text{ GeV}/c, j_{p_T}^3 > 80 \text{ GeV}/c$ and $H_T > 500 \text{ GeV}/c$	2577	1964	28779
$\chi^2 < 15$	933	407	10251
2nd Top Mass > 250 GeV/c ²	855	390	8617
Higgs Mass > 100 GeV/c ²	795	328	7492

year	2018UL						
Label	Cuts	Data	Signal M=600 GeV/c ²	Signal M=700 GeV/c ²	Signal M=900 GeV/c ²	Signal M=1100 GeV/c ²	t $\bar{t}$
Cut 0	Basic selection	23518	50.6 $\pm$ 1.1	41.8 $\pm$ 0.7	16.4 $\pm$ 0.2	5.0 $\pm$ 0.1	4459.0 $\pm$ 31.1
Cut 1	Relative $H_T > 0.4$	11505	38.5 $\pm$ 0.9	35.7 $\pm$ 0.7	14.7 $\pm$ 0.2	4.5 $\pm$ 0.1	2396.4 $\pm$ 23.0
Cut 2	Max(χ^2) < 3	4444	23.1 $\pm$ 0.7	23.8 $\pm$ 0.5	9.9 $\pm$ 0.2	3.0 $\pm$ 0.1	1234.9 $\pm$ 16.3
Cut 3	$\Delta R(b_{Higgs}, b_{Higgs}) < 1.1$	2328	15.5 $\pm$ 0.6	19.8 $\pm$ 0.5	9.1 $\pm$ 0.2	2.8 $\pm$ 0.1	595.0 $\pm$ 11.5
Cut 4	$\chi^2_{Higgs} < 1.5$	1961	13.6 $\pm$ 0.6	17.6 $\pm$ 0.5	8.2 $\pm$ 0.2	2.5 $\pm$ 0.1	492.8 $\pm$ 10.5
Cut 5	$\Delta R(j_W, j_W) < 1.75$	1315	10.6 $\pm$ 0.5	15.2 $\pm$ 0.4	7.3 $\pm$ 0.2	2.3 $\pm$ 0.1	389.9 $\pm$ 9.3
Cut 6	$\Delta R(b_{Top}, W) < 1.2$	593	6.1 $\pm$ 0.4	11.4 $\pm$ 0.4	6.4 $\pm$ 0.1	2.0 $\pm$ 0.1	250.8 $\pm$ 7.5

Yield table (without normalization)



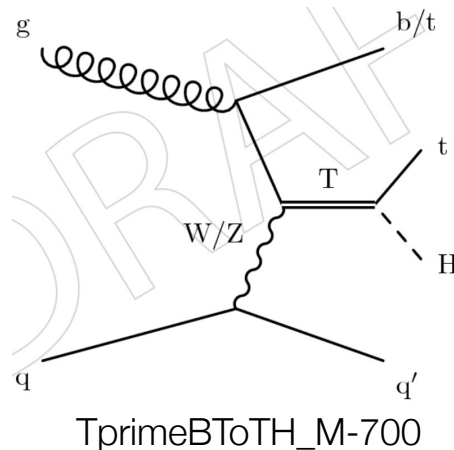
TprimeBToTH_M-700



TToHadronic

Seletion steps	Signal (M=700 GeV)	TToHadronic
No Cut	389500	334206000
Cut 0	9358	325148
Cut 1	8277	231586
Cut 2	5477	231443
Cut 3	1351	55830
Cut 4	1213	37310
Cht 5	984	31900
Cut 6	714	19411

Yield table (without normalization)



Selelction steps	Inclusive	After gen Hadronic
No Cut	389500	152099
Cut 0	9358	7847
Cut 1	8277	7081
Cut 2	5477	4960
Cut 3	1351	1215
Cut 4	1213	1090
Cht 5	984	902
Cut 6	714	657