Higgier Higgs Background/Signal MC

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22 July 2016

Goals

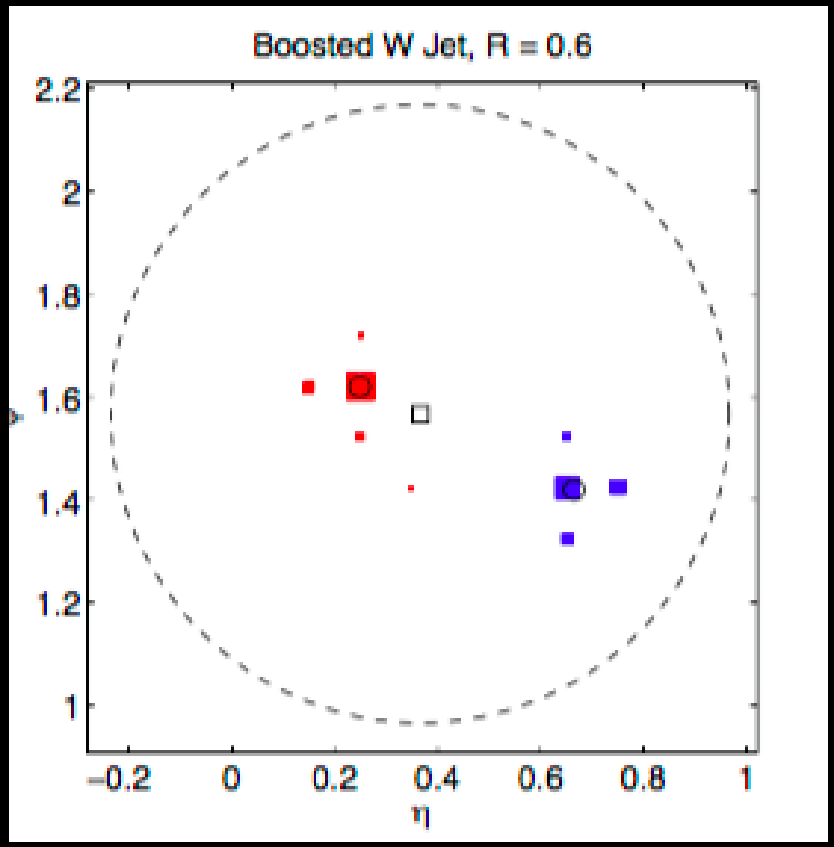
Optimize cuts to bring out WH/ZH signals, specifically on Higgs D2 and Tau21 variables

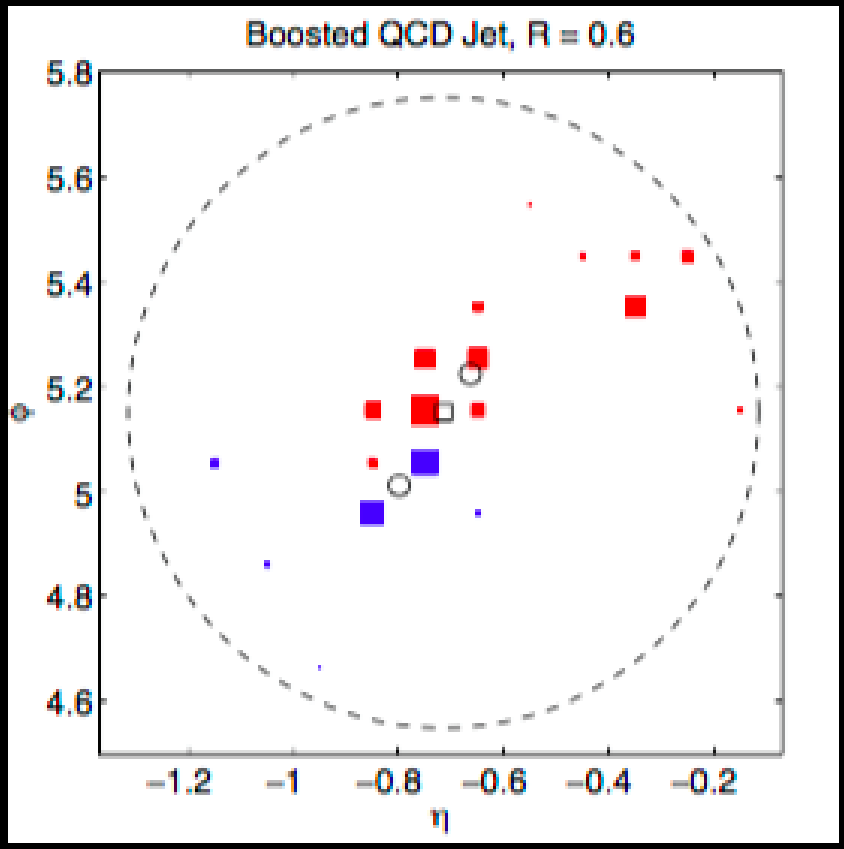
Calculate significance versus mass channel curves

Significance calculation: NS/(1+sqrt(NB))

Jet Substructure Variables: N-subjettiness (Tau21WTA)

$$\tau_N = \frac{1}{d_0} \sum_k p_{T,k} \min \left\{ \Delta R_{1,k}, \Delta R_{2,k}, \cdots, \Delta R_{N,k} \right\}.$$





Jet Substructure Variables: D2

$$D_2^{(\beta)} \equiv \frac{e_3^{(\beta)}}{\left(e_2^{(\beta)}\right)^3}.$$

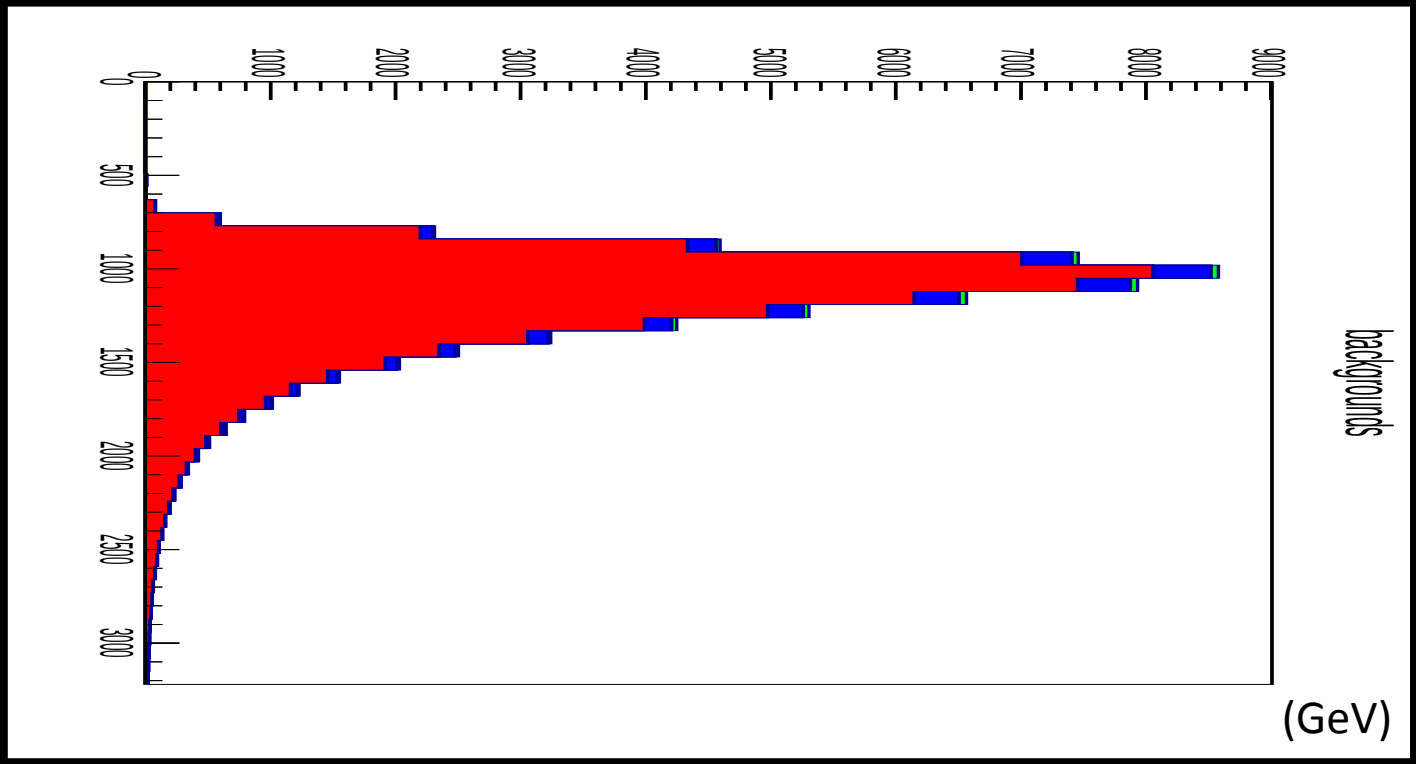
e_2 and e_3 are two and three point energy correlation functions

D2 can differentiate between one and two prong decays

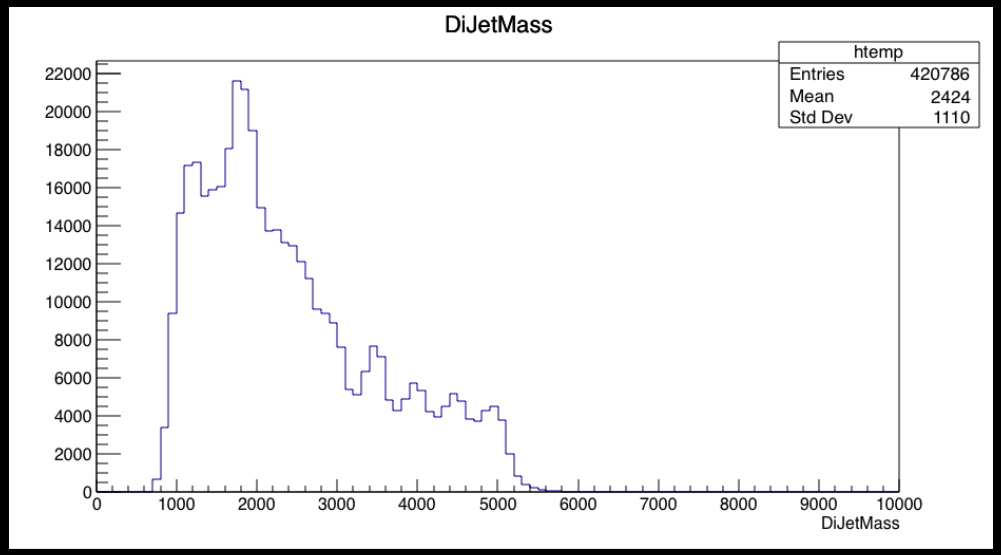
X -> V(W/Z)H -> qqbb

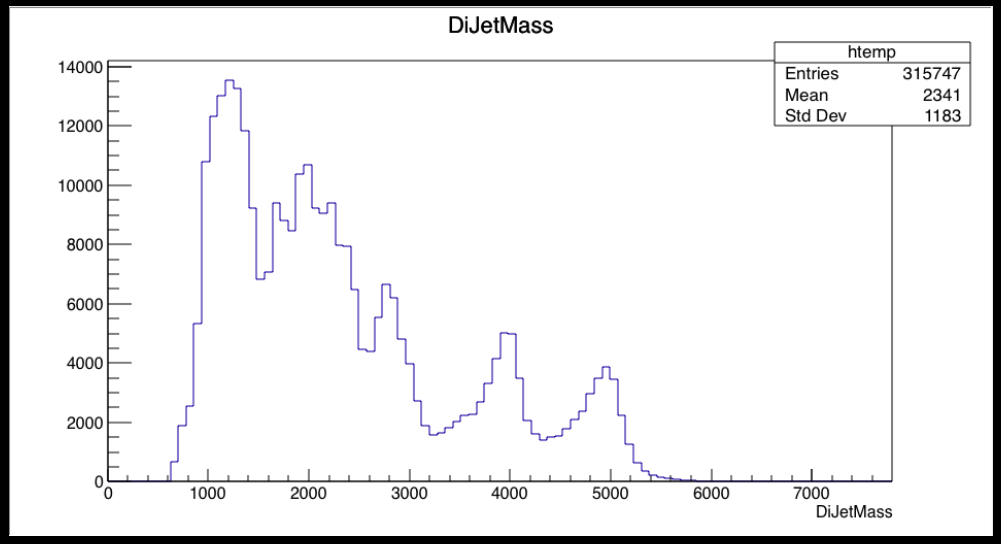
Signal VH -> qqbb

Backgrounds include ttbar, W/Z jets, light quark QCD:



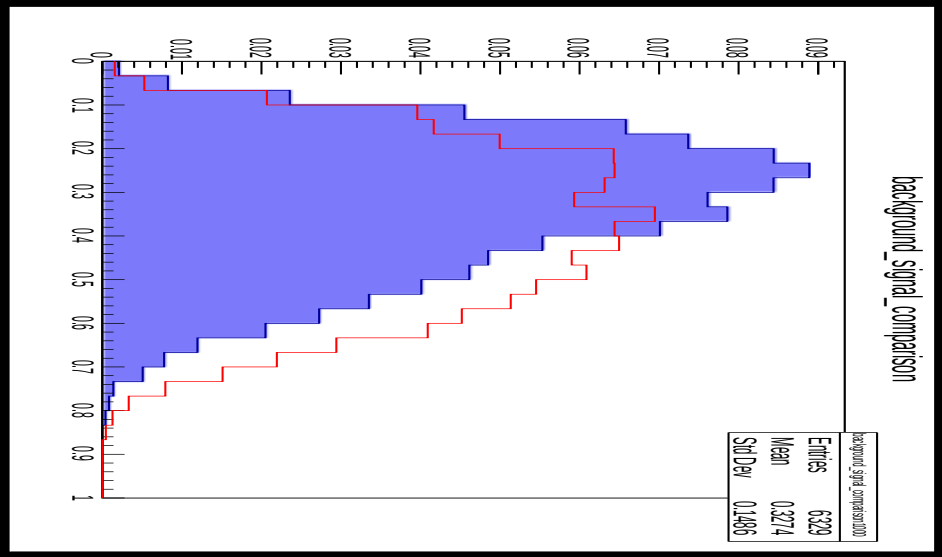
ZH/WH signals (top/bottom)



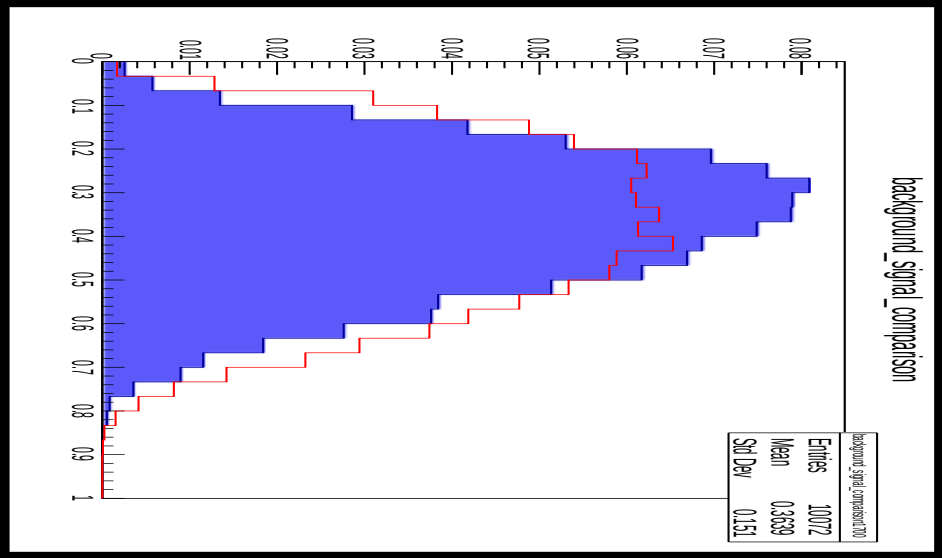


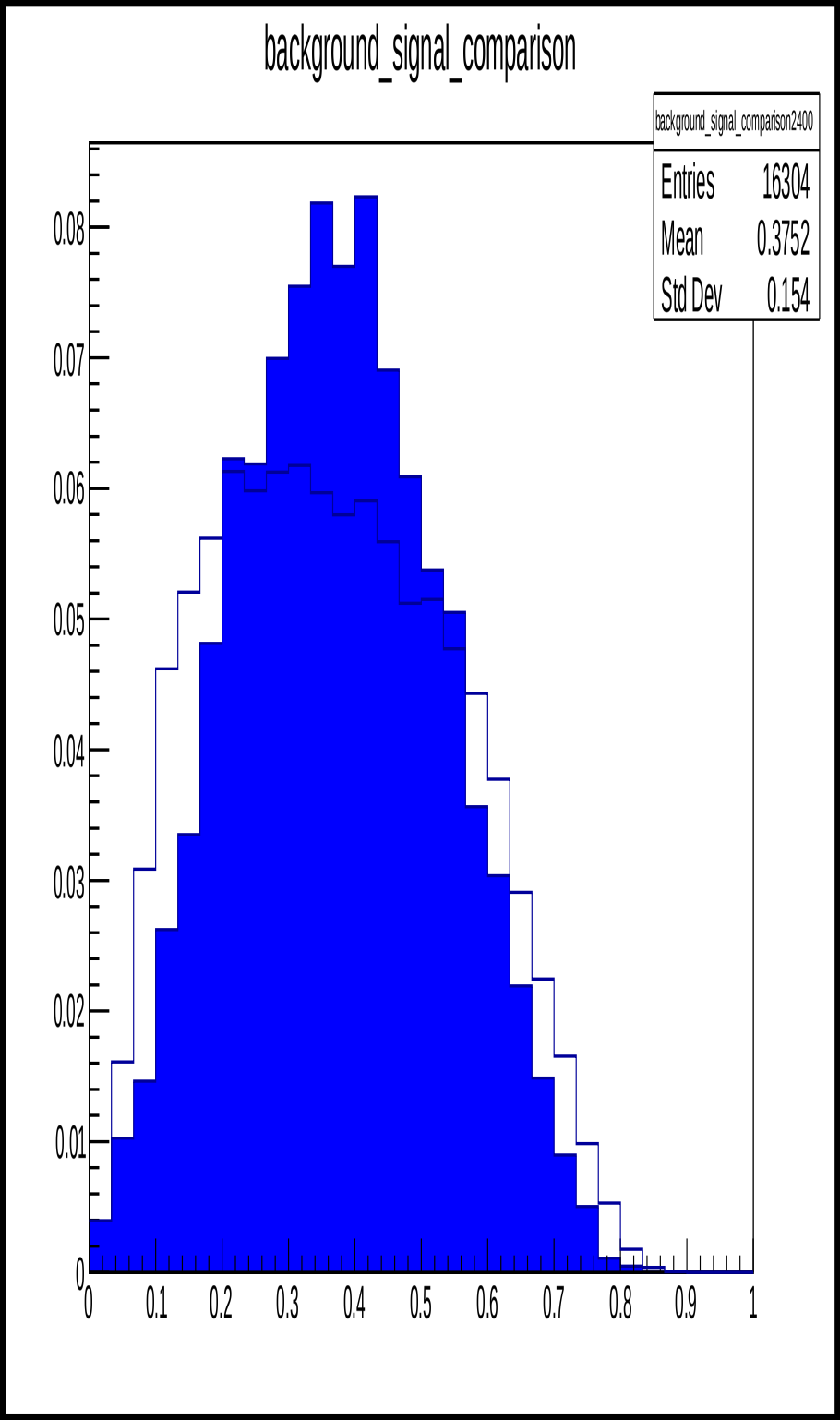
Tau21, different WH mass channels

1000 GeV



1700GeV

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Std Dev 0.154
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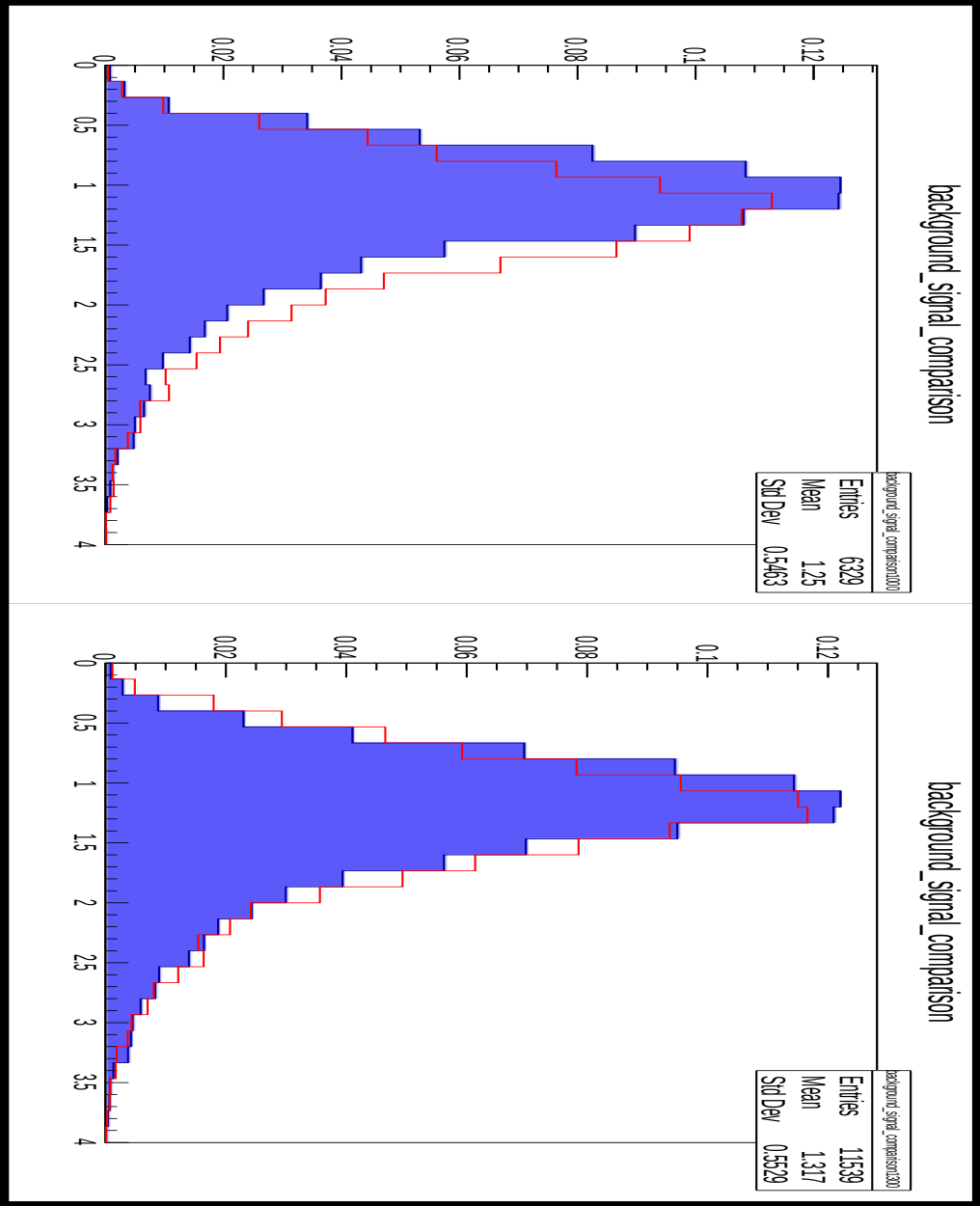
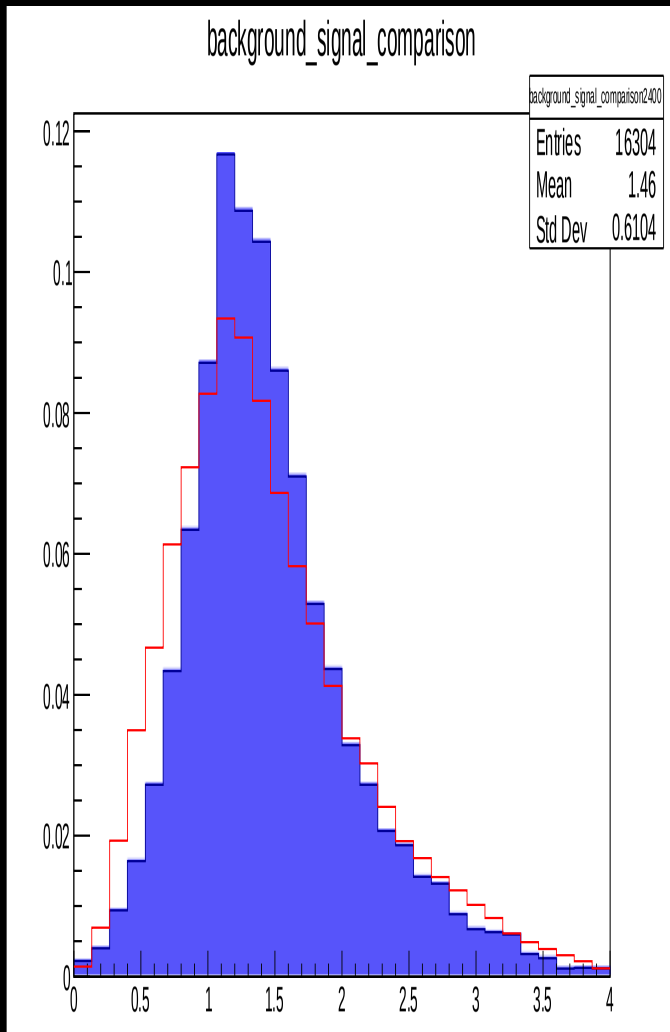
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
2400 GeV

D2 mass channel cuts

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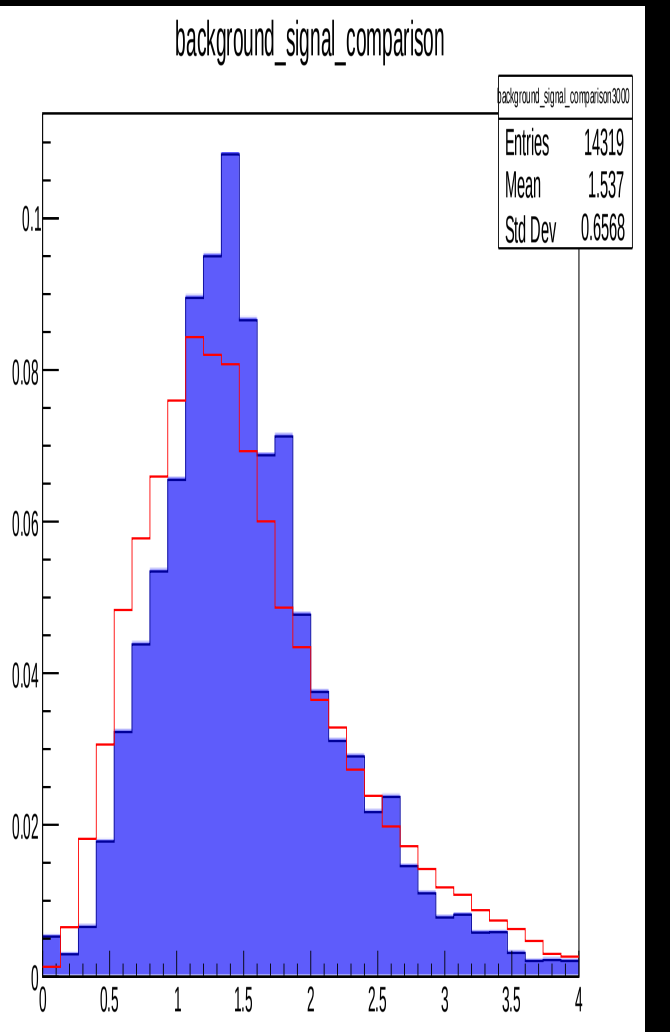
0
0 0.5 1 1.5 2 2.5 3 3.5 4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0.04
0.02
0
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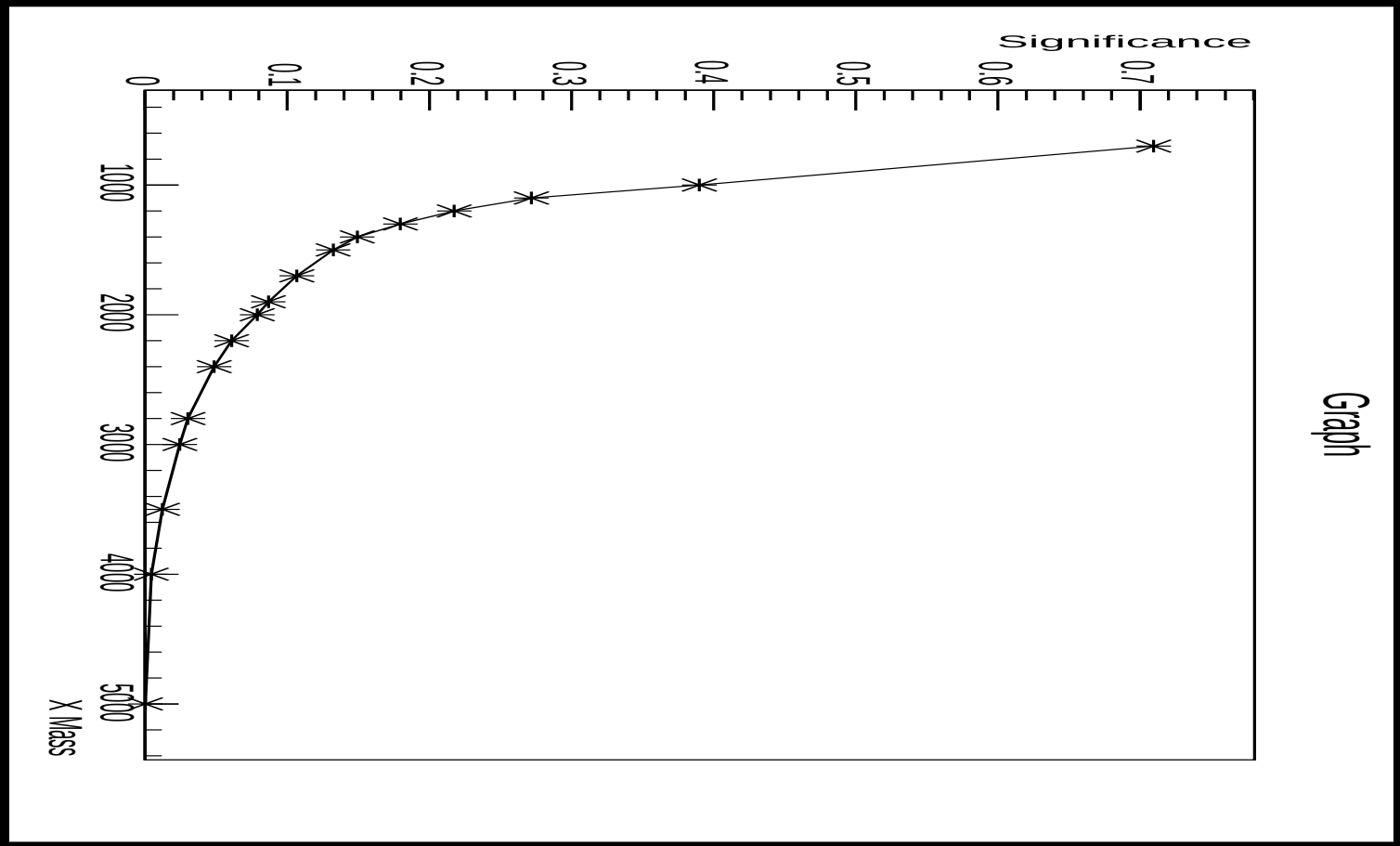
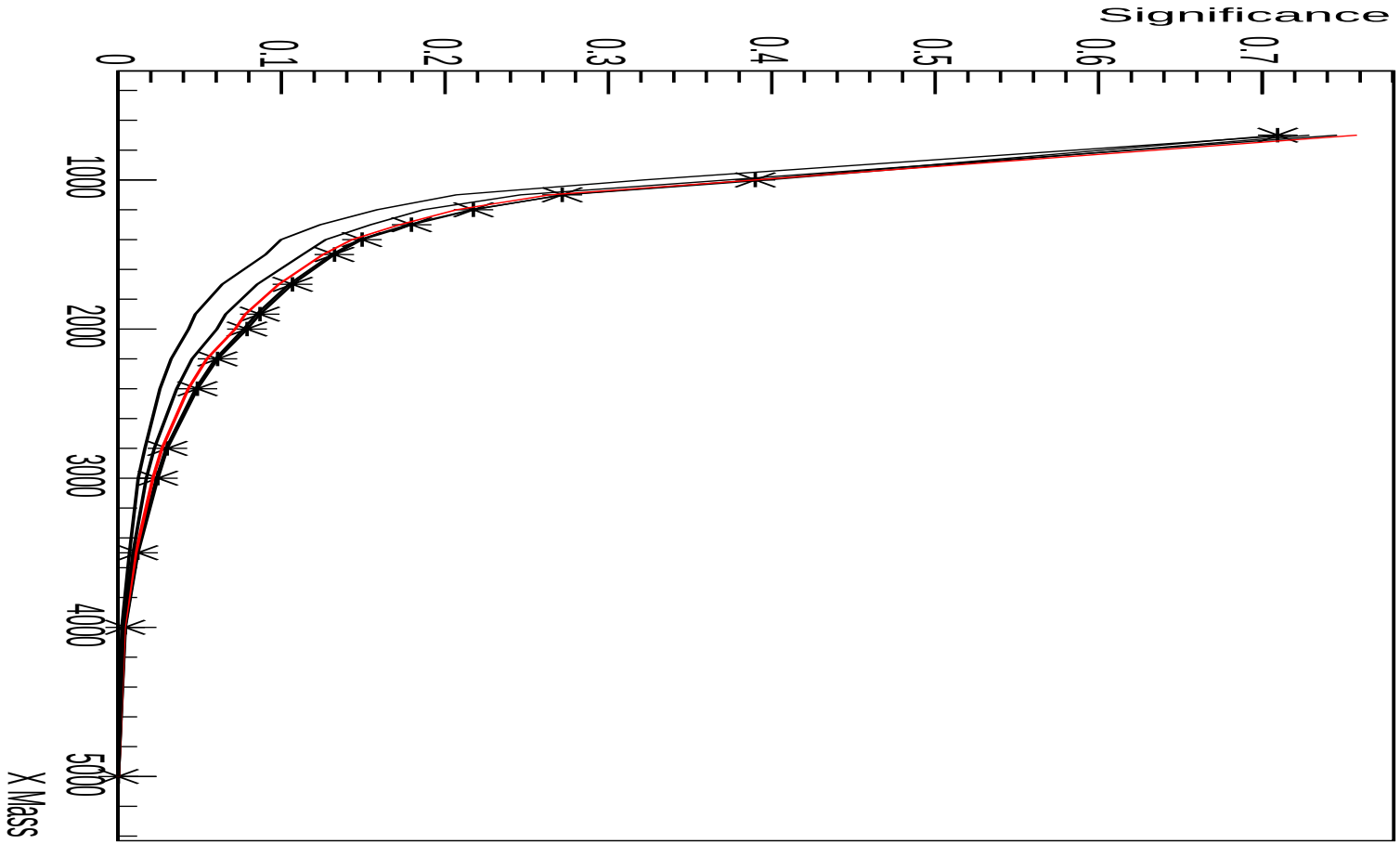
X->WH Significance Curve



With incremental Tau21 cuts



Incremental D2 Cuts