Reweighting gg→H→WW
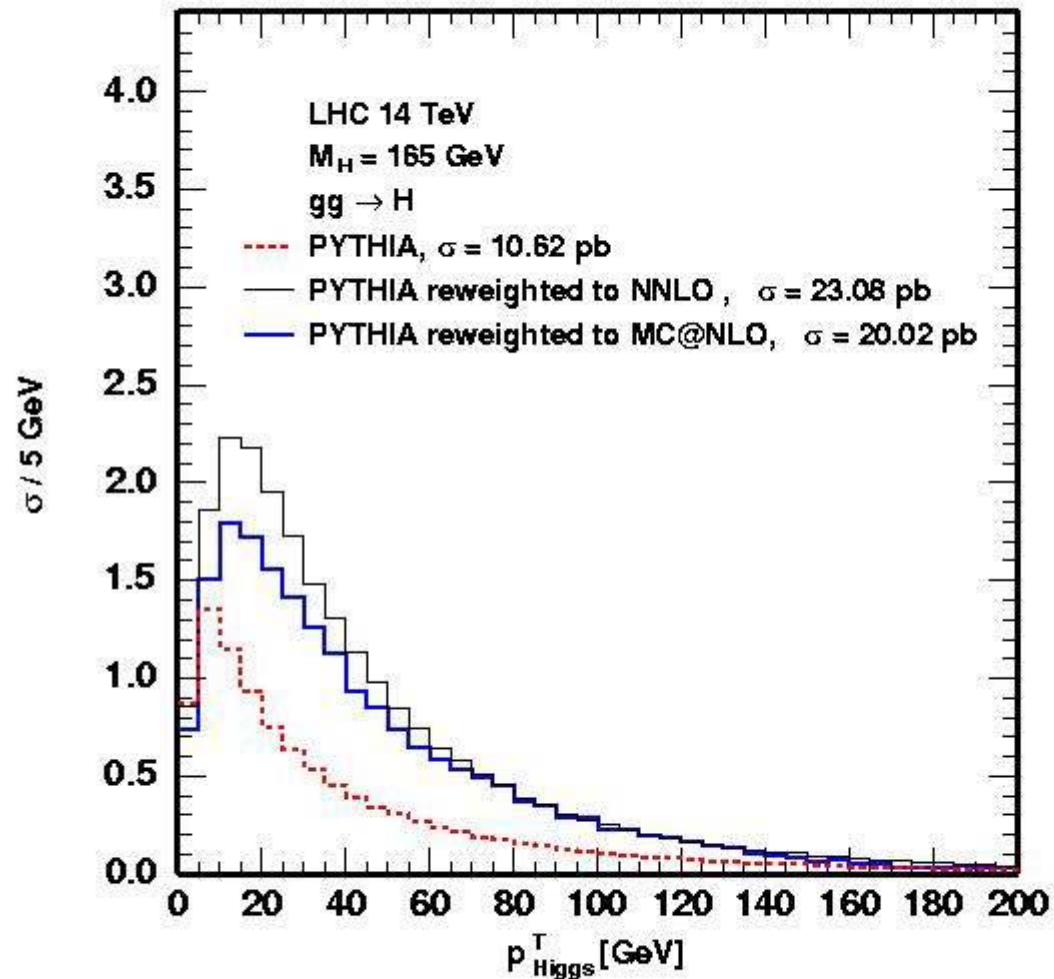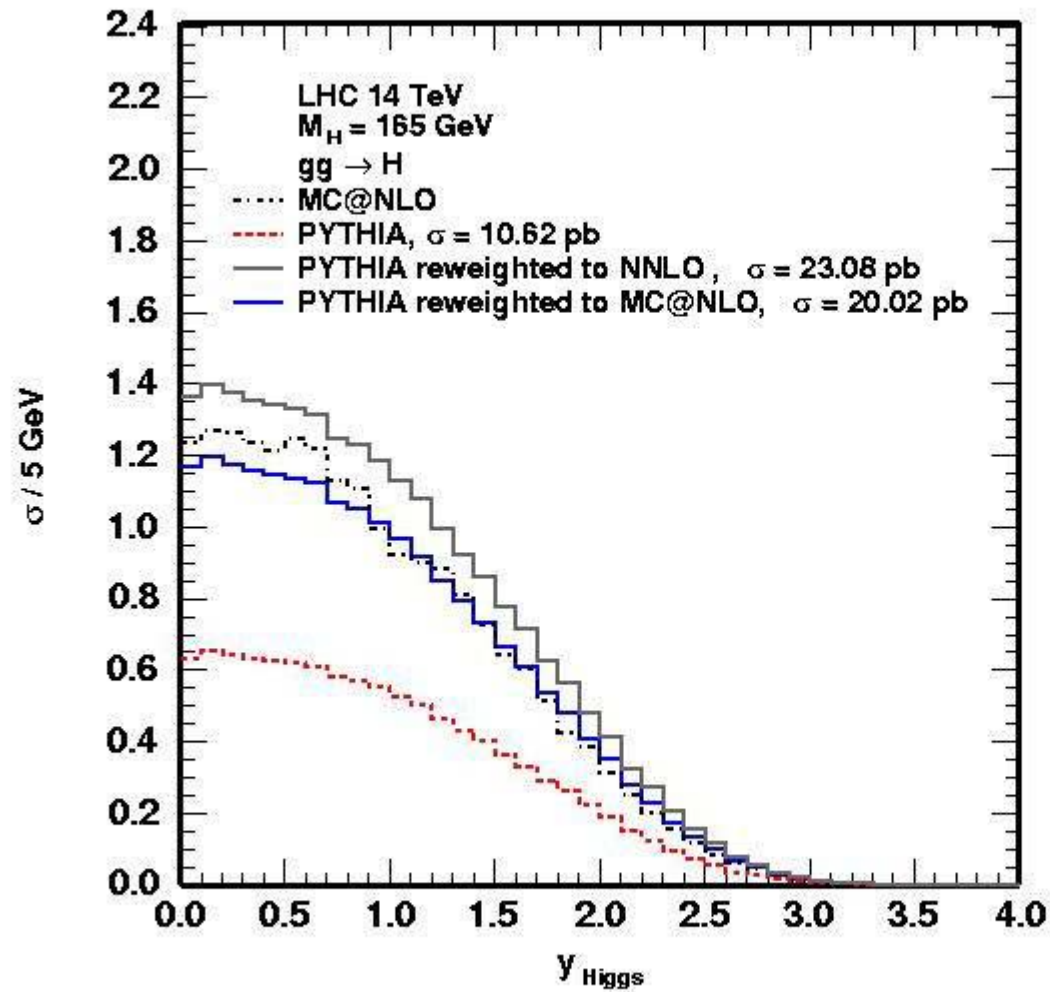
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Want to check if K dependent on y^{Higgs}, or only on p_T^{Higgs}

→reweight Pythia to MC@NLO as a function of p_T^{Higgs},
then compare reweighted Pythia y^{Higgs} with y^{Higgs} from MC@NLO

LHC 14 TeV
$M_H = 165$ GeV
$gg \rightarrow H$
---- MC@NLO
---- PYTHIA, $\sigma = 10.62$ pb
—— PYTHIA reweighted to NNLO, $\sigma = 23.08$ pb
—— PYTHIA reweighted to MC@NLO, $\sigma = 20.02$ pb

y-axis: σ / 5 GeV

x-axis: y_{Higgs}

**No cuts applied, difference in y_{Higgs} between MC@NLO and Pythia reweighted to MC@NLO small. Apply now jet veto:**

$$K = \sigma_{MC@NLO} / \sigma_{PYTHIA}$$

|	K, no selection cuts applied	K, jet veto applied
No cut on p^T_{Higgs}, y_{Higgs}	1.88	1.77
no cut on y_{Higgs} :		
15> pt higgs	1.2	1.2
15 <pt higgs < 30	2.02	2.1
30 < pt higgs <45	2.4	2.9
45 < pt higgs	2.19	3.9
|y_{Higgs}| < 1.5:		
15> pt higgs	0.98	1.2
15 <pt higgs < 30	1.75	2.12
30 <pt higgs < 45	2.08	3
45 < pt higgs	1.88	4.1

For low p_T^{Higgs} region and low y^{Higgs} region difference between $K(p_T)$ and $K(p_T,y)$ very small
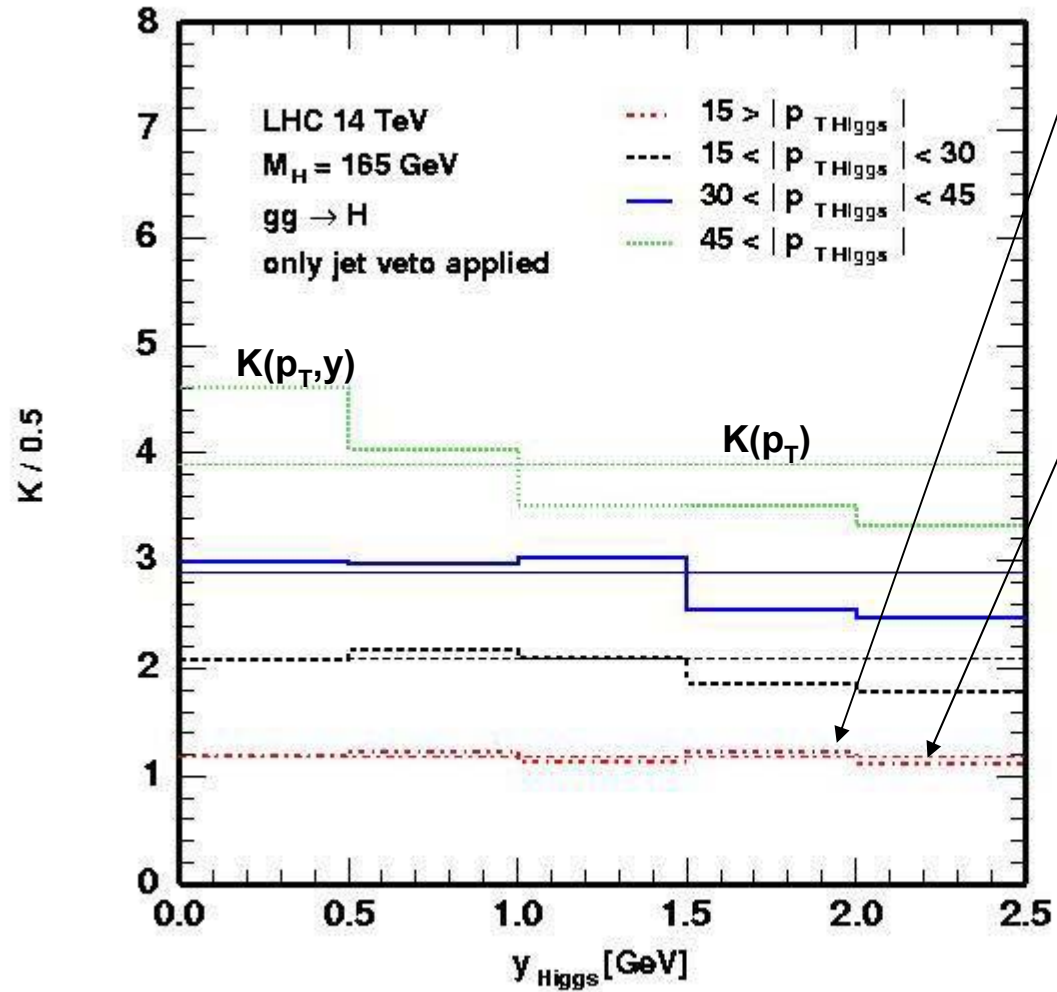
Selection cuts for H$\rightarrow$ WW $\rightarrow$2l favor low p_T^{Higgs} and central y^{Higgs} region (next slide)

Efficiency for Pythia after all selection cuts are applied [jhep05(2004)009]: p_T^{Higgs}, y^{Higgs}
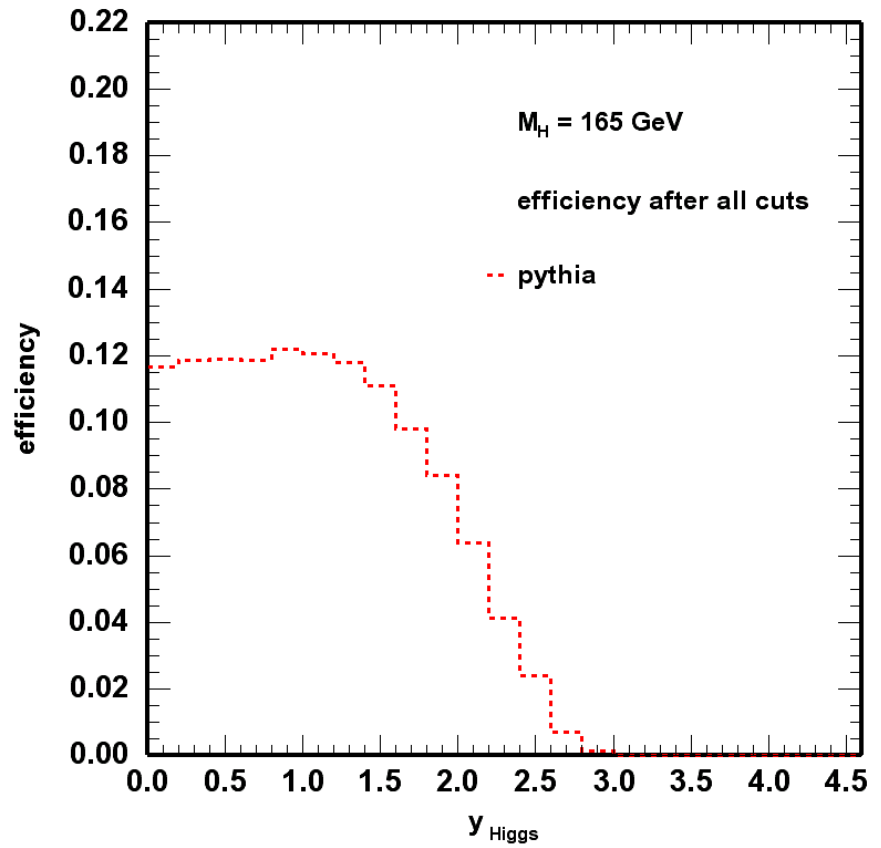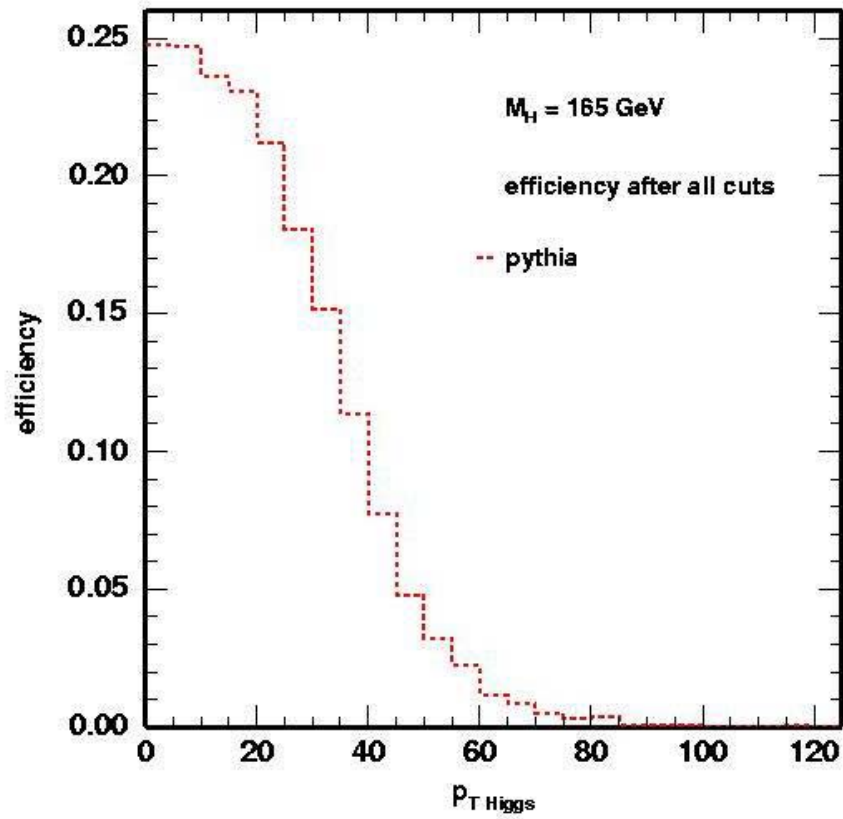
Conclusion

In the region favored by the H→WW→lνlν selection cuts (inclusive jet veto), the difference between $K(p_T)$ and $K(p_T,y)$ is smaller than 2%

[K is defined here as the (p_T respectively y dependent) ratio between σ(MC@NLO) and σ(Pythia)]