WEAK CORRECTIONS TO TOP PRODUCTION

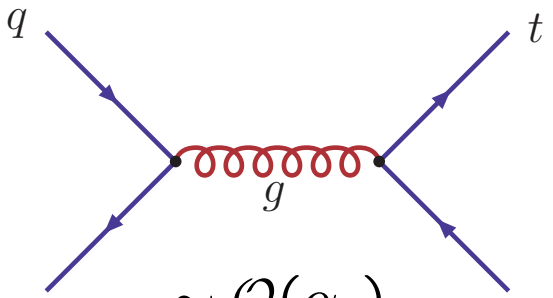
J.K., Scharf, Uwer: Eur. Phys. J. C45(2006) 139
Eur. Phys. J. C51(2007) 37

I. Results at Partonic Level

II. Tevatron and LHC

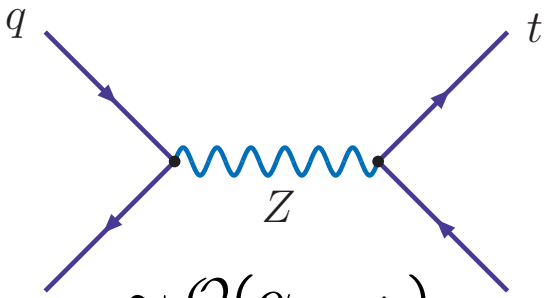
I. Results at Partonic Level

$q\,\bar{q} \to t\,\bar{t}$:



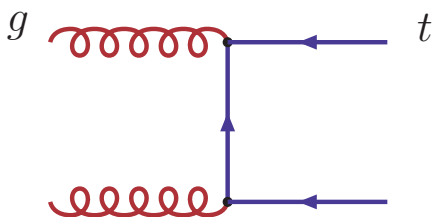
$\sim \mathcal{O}(\alpha_s)$

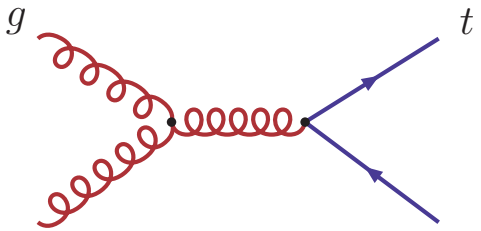
no interference with



$\sim \mathcal{O}(\alpha_{weak})$

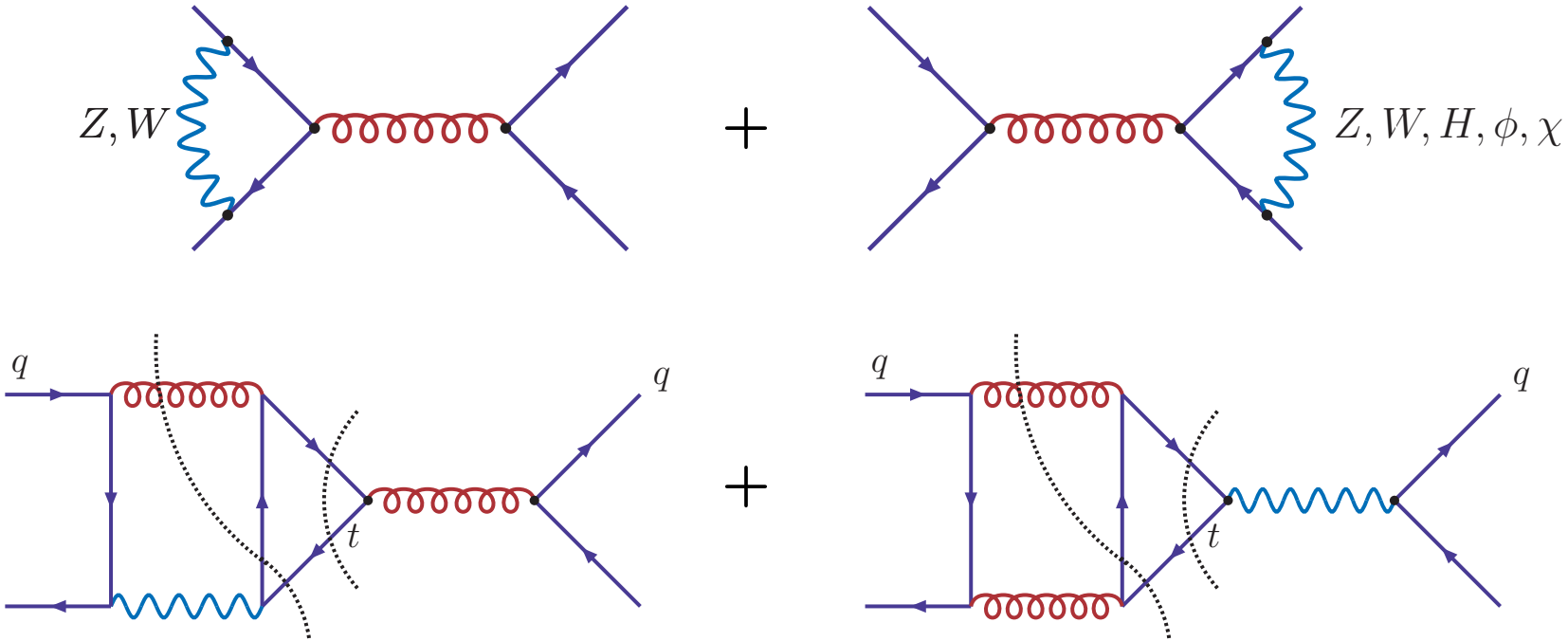
$g\,g \to t\,\bar{t}$:





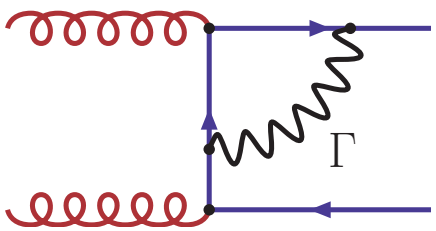
$\sim \mathcal{O}(\alpha_s)$

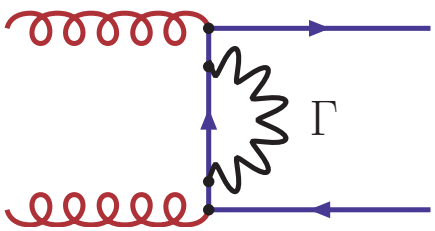
$\mathcal{O}(\alpha_s^2 \alpha_{\text{weak}})$ weak corrections $(q\,\bar{q} \to t\,\bar{t}\,)$

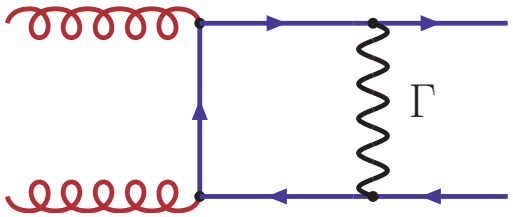


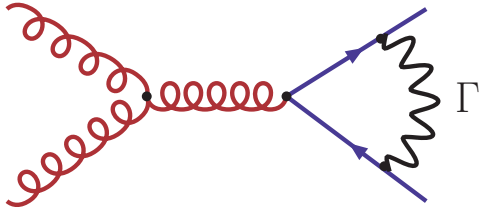
cuts of second group individually IR-divergent

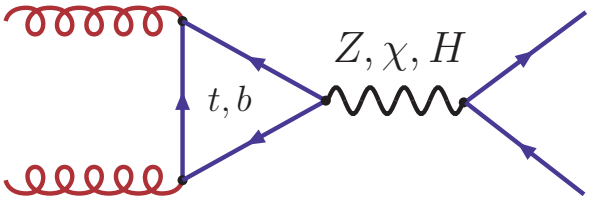
$\mathcal{O}(\alpha_s^2 \alpha_{\text{weak}})$ weak corrections $(g\,g \to t\,\bar{t}\,)$











- analytical & numerical results available
  (earlier partial results by Beenakker *et al.*, some disagreements)
  independent evaluation by Bernreuther & Fücker

- $(\text{box contribution})_{\text{up-quark}} = -(\text{box contribution})_{\text{down-quark}}$
  $\Rightarrow$ suppression

- box contribution moderately $\hat{s}$-dependent

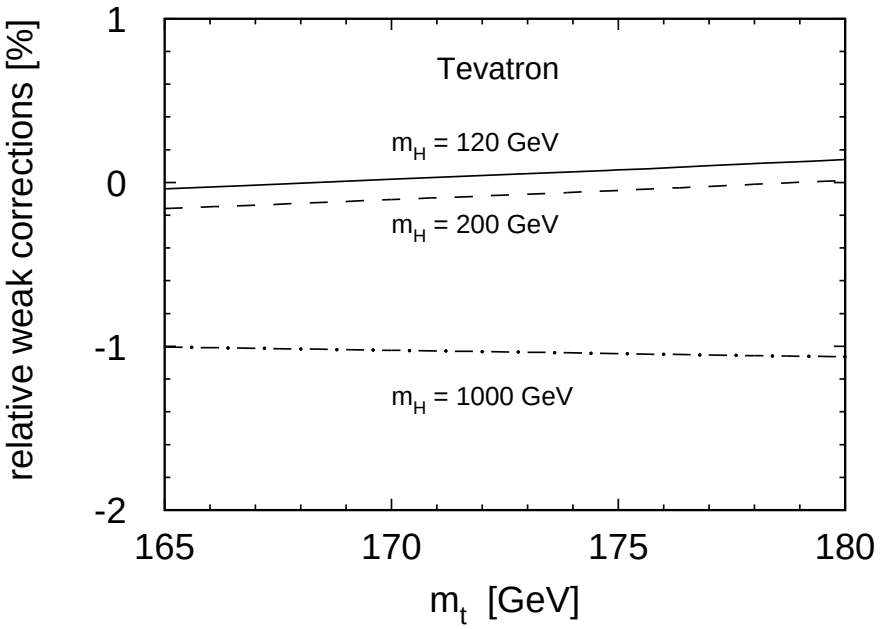
- strong increase with $\hat{s}$

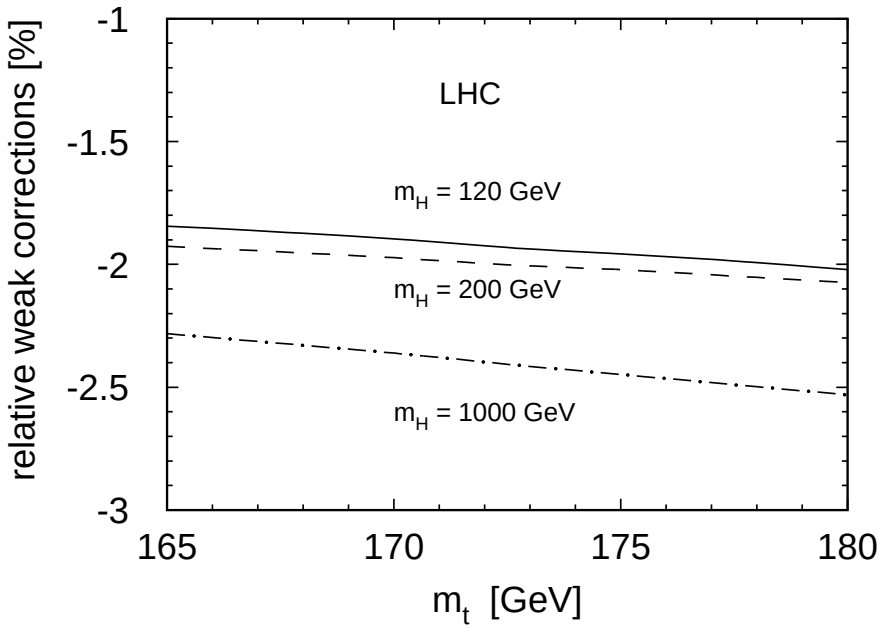
- sizable M_{h}-dependence, large effect close to threshold

II. Tevatron and LHC

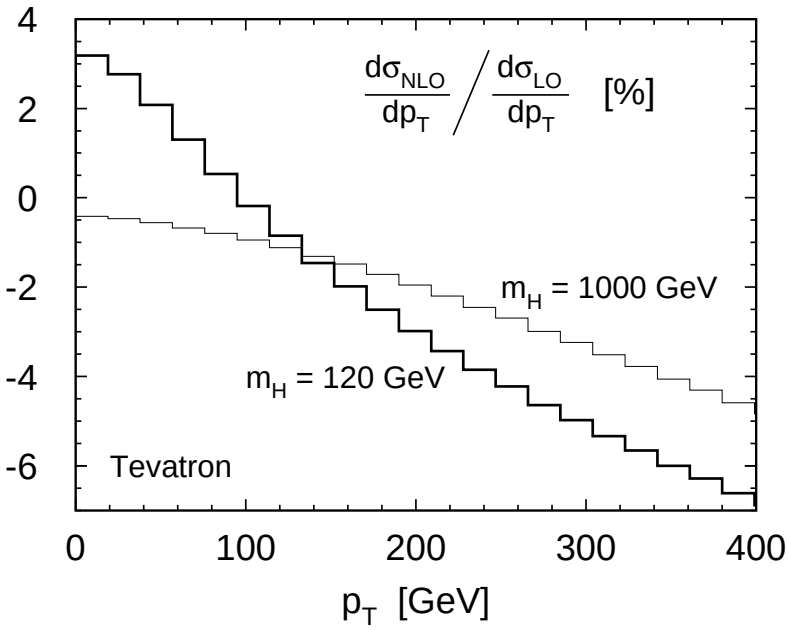
Small effects for total cross section

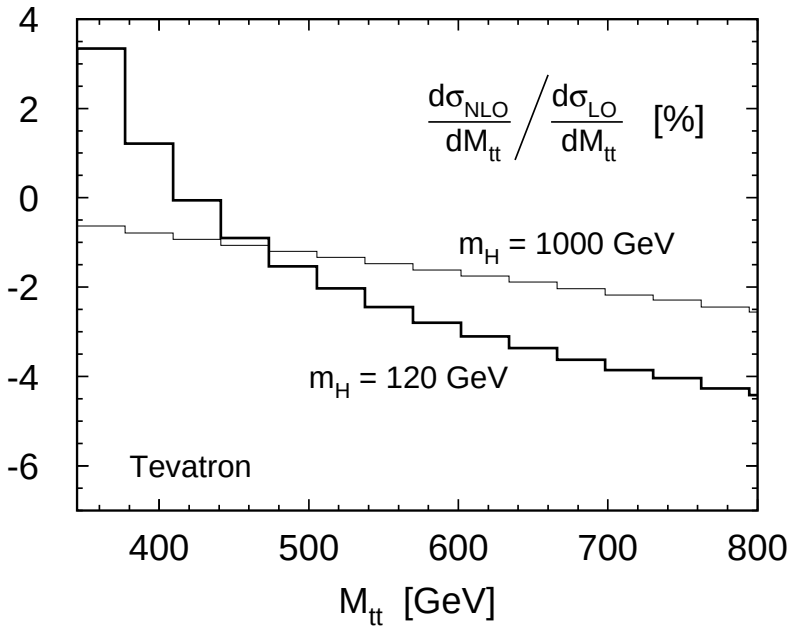
(dominated by $\sqrt{\hat{s}} \sim$ 360-380 GeV)





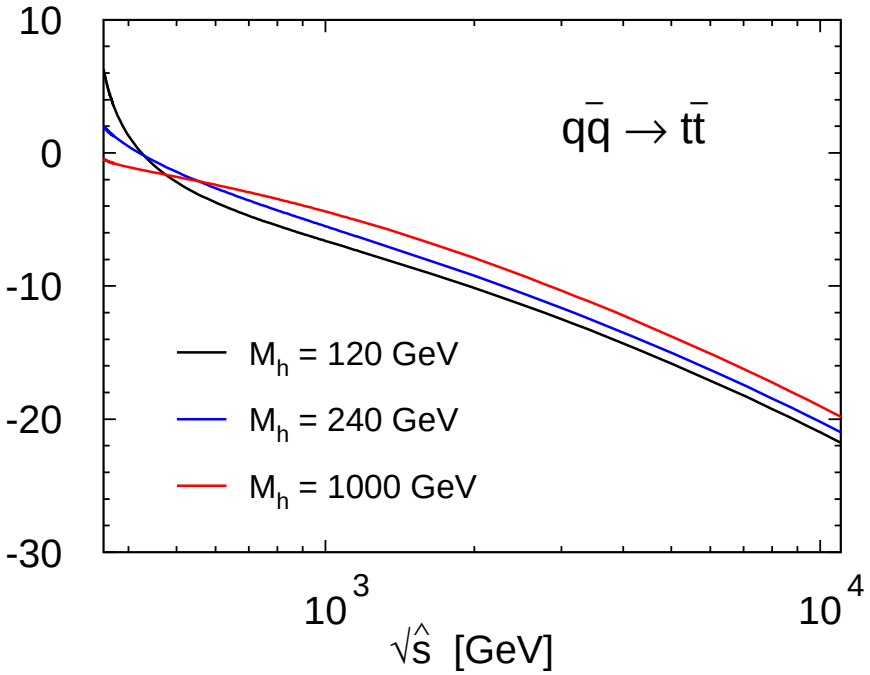
Sizeable effects for differential distribution

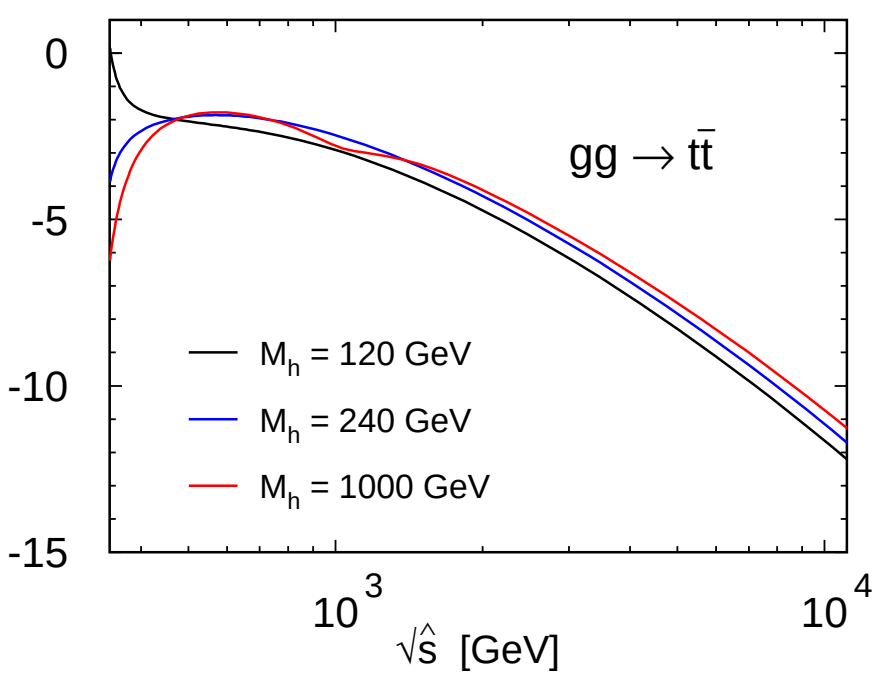




large corrections for large $\sqrt{\hat{s}}$

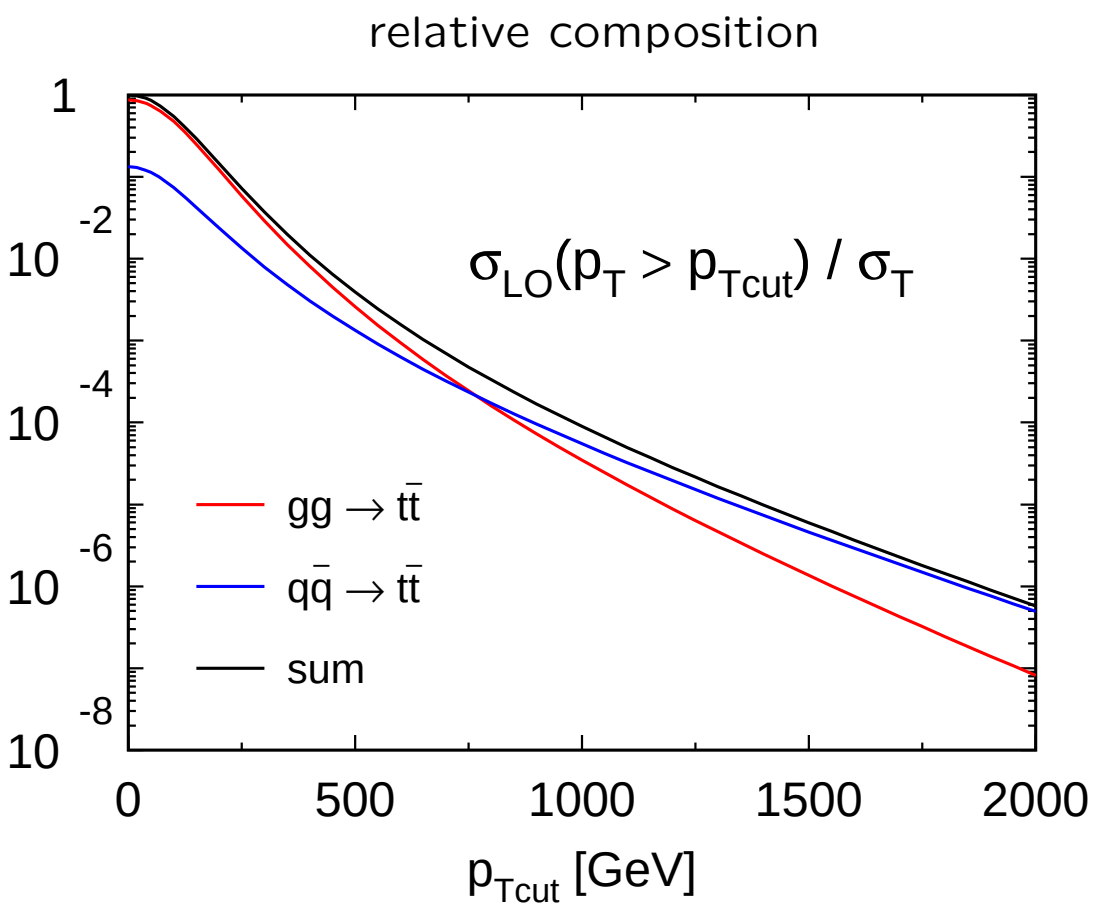
sizable M_h-dependence

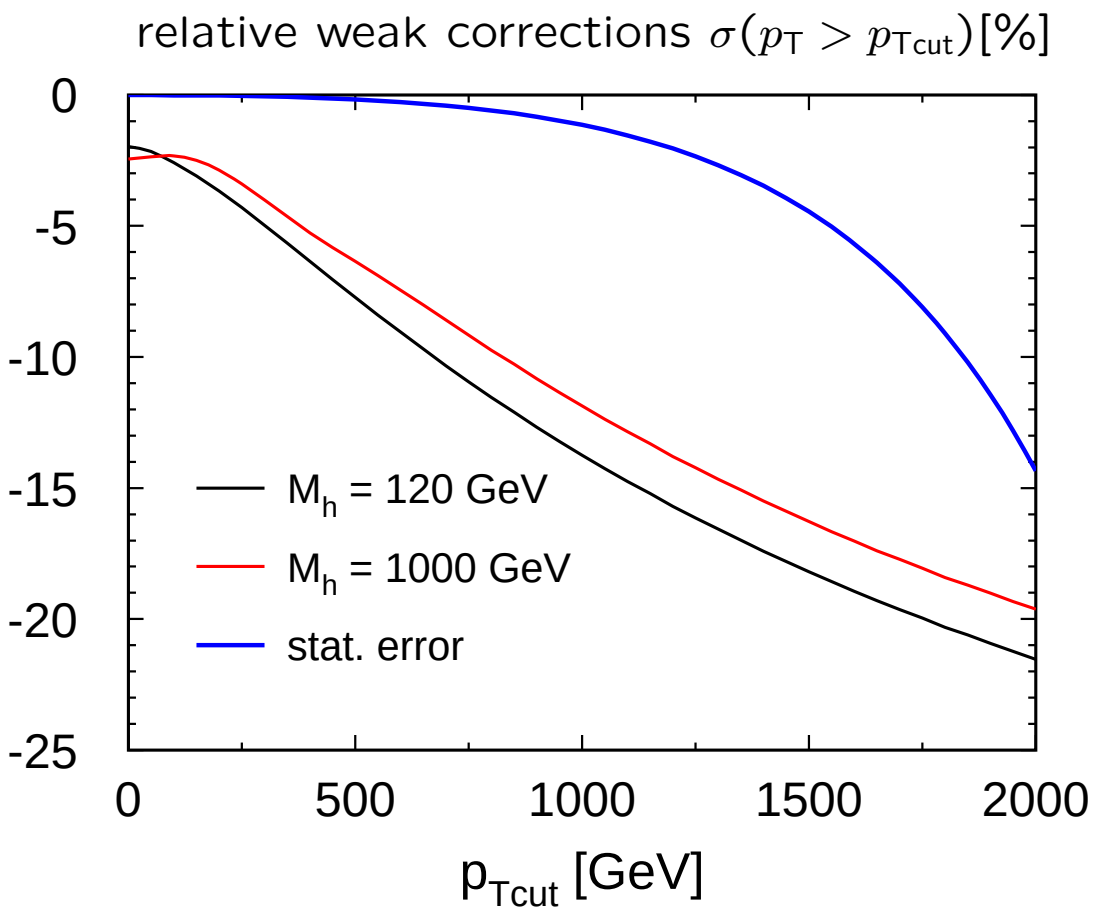




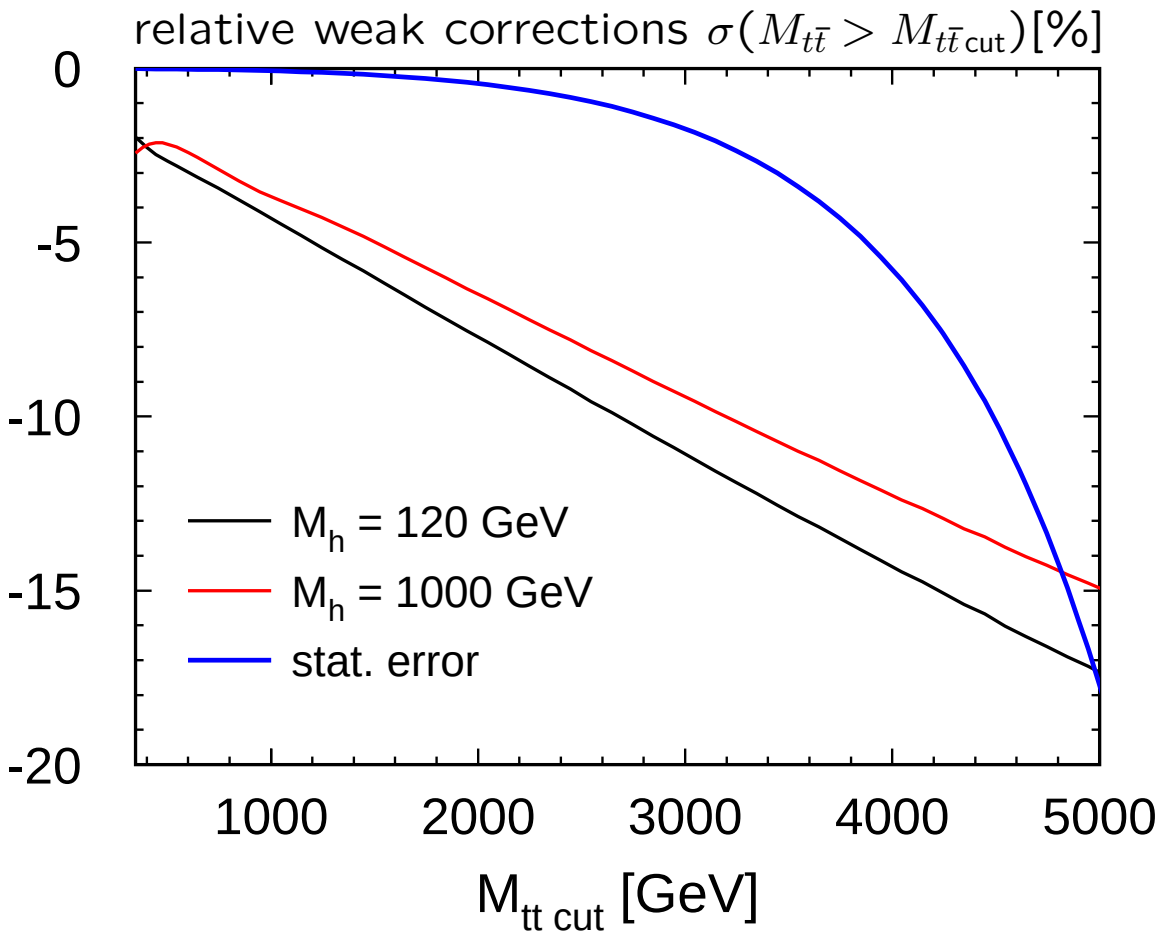
(relative weak corrections [%])

Transverse momentum dependence (LHC)





$M_{t\bar{t}}$ -dependence (LHC)



Conclusions on weak corrections

- LHC will explore the TeV-region: $\hat{s}/M_W^2 \gg 1$
- electroweak corrections amount to $\mathcal{O}(10\% - 20\%)$ in the interesting kinematic region
- top-quark distributions at large $\hat{s}$ are strongly modified
- sizable M_{H}-dependence for small p_{T}