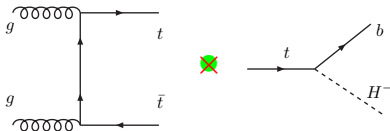


# Charged Higgs cross section calculations

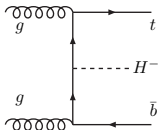
Michael Krämer (RWTH Aachen & IFAE Barcelona)

# Charged Higgs production at the LHC

- ▶  $pp \rightarrow t\bar{t}$  with  $t \rightarrow bH^\pm$  for  $M_{H^\pm} \lesssim m_{\text{top}}$



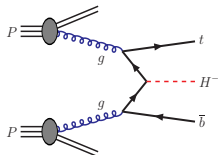
- ▶  $pp \rightarrow tbH^\pm$  for  $M_{H^\pm} \gtrsim m_{\text{top}}$



alternative production mechanisms like  $q\bar{q}' \rightarrow H^\pm$ ,  $pp \rightarrow H^\pm + \text{jet}$ ,  
 $pp \rightarrow H^\pm W^\mp$ , or Higgs pair production are suppressed...

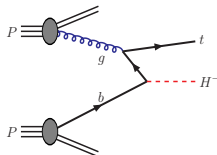
# Associate $tbH^\pm$ production: two calculational schemes

## 4-flavour scheme



- + exact  $g \rightarrow b\bar{b}$  splitting & mass effects
- no summation of  $\ln(M_H/M_b)$  terms

## 5-flavour scheme



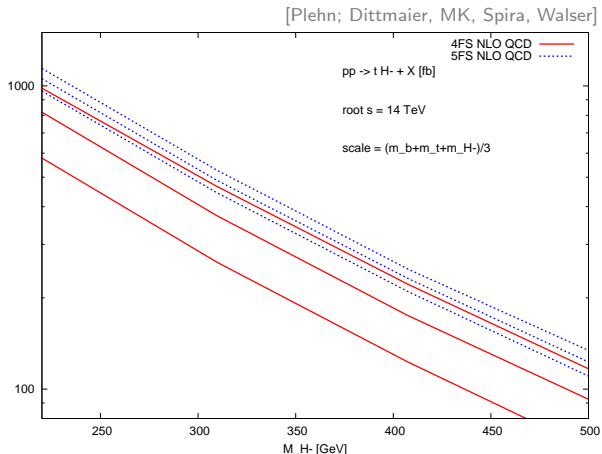
- + summation of  $\ln(M_H/M_b)$  terms
- LL approximation to  $g \rightarrow b\bar{b}$  splitting

## The 4- and 5-flavour schemes

- are both theoretically consistent & well-defined
- represent different ways of ordering perturbation theory
- should agree at sufficiently high order
- do not match exactly at finite order

# Comparison of 4 and 5FS calculations at NLO

## ► total cross section (MSTW08)



→ better agreement than with MRST04, needs still more study...

- ▶ NLO (SUSY) QCD corrections available in 4FS and 5FS  
[private codes by MK, Spira; Plehn]
- ▶ EWK corrections may be significant for light MSSM spectrum  
[Jin et al., Belyaev et al., Beccaria et al.]
- ▶ implementation in MC@NLO of 5FS NLO calculation available  
[C. Weydert et al. arXiv:0912.3430]

### Random thoughts on open issues (theory):

- ▶ systematic NLO comparison of 4FS and 5FS calculations
  - quality of various approximations
  - comparison of differential distributions
- ▶ extend calculation to  $pp \rightarrow tH^\pm + b\text{-jet}$ 
  - reduction of large QCD corrections to  $p_{T,b}$  distribution
- ▶ matching of 4FS and 5FS? (cf. Borzumati, Kneur, Polonsky; Alwall, Rathsmann)