

# Loop Tutorial

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- Continue tutorial of yesterday
    - Scan on top pair production
  - Compare loop-induced process with Higgs Effective Theory:
    - Compare the cross-section for  $g g \rightarrow h$ 
      - In “heft” model
      - In sm ( $g g \rightarrow h$  [QCD])
    - Compare the jet transverse momenta for “ $g g \rightarrow h g$ ” in both theory

# Cross-section

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- HEFT:

- Import model heft; generate g g > h;  
output; launch

- 17.62 pb

- SM:

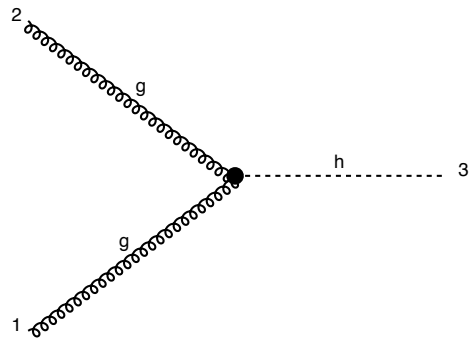
- Import model sm; generate g g > h  
[QCD];output;launch

- 15.69 +- 0.05053 pb

- Why so different?

# Feynman diagram

• HEFT



• SM

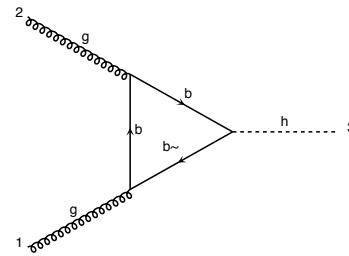


diagram 1 QCD=2, QED=1

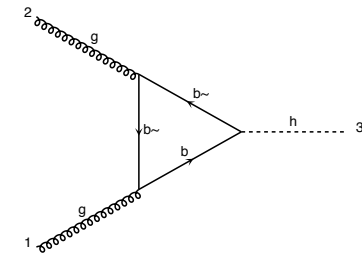


diagram 2 QCD=2, QED=1

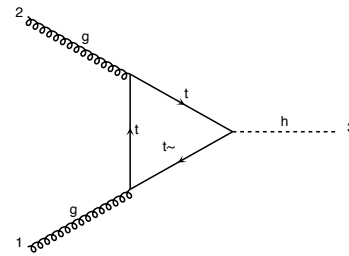


diagram 3 QCD=2, QED=1

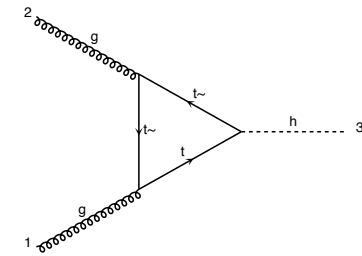


diagram 4 QCD=2, QED=1

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- Remove the “b” loop:

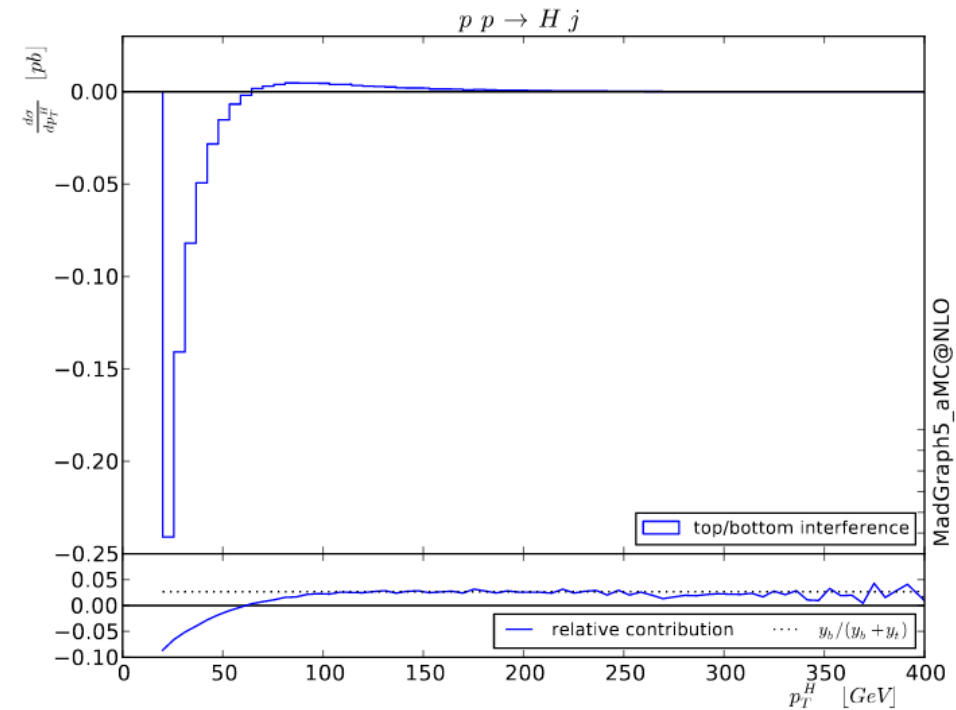
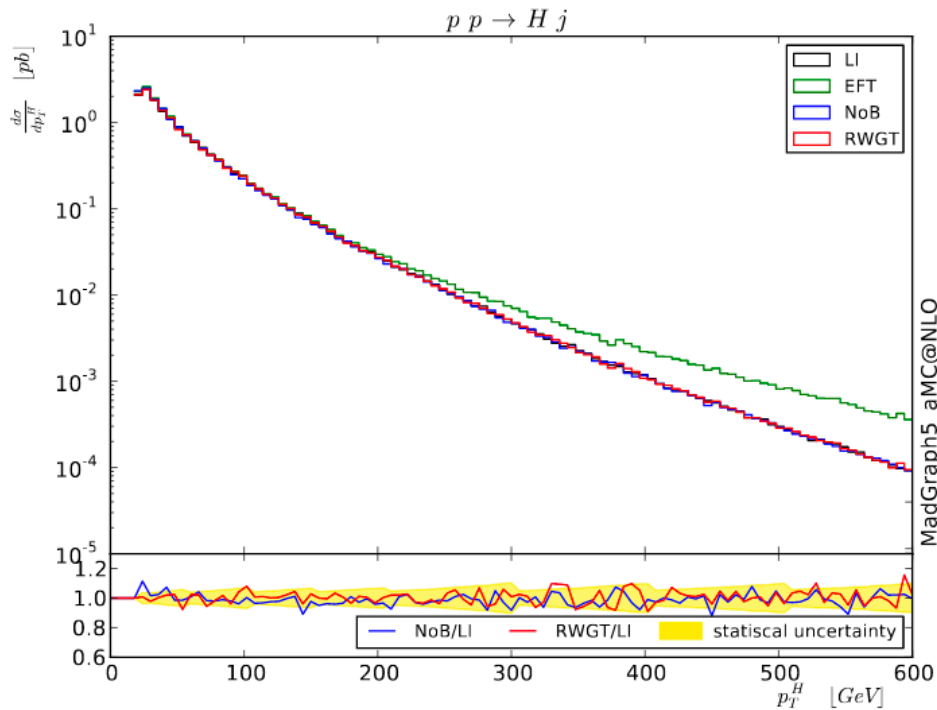
- ➔ Import model sm-no\_b\_mass; generate g  
g > h [QCD];output;launch

- ➔ 17.59 pb

- ➔ The “b” loop itself is negligible, the impact here is 100% the interference term.

- ➔ The lighter quark (mainly c) have the same effect (at the level of the percent)

# PT distribution



- HEFT is working fine at low energy (as expected)
- At low  $p_T$ , the b diagram decrease the cross-section