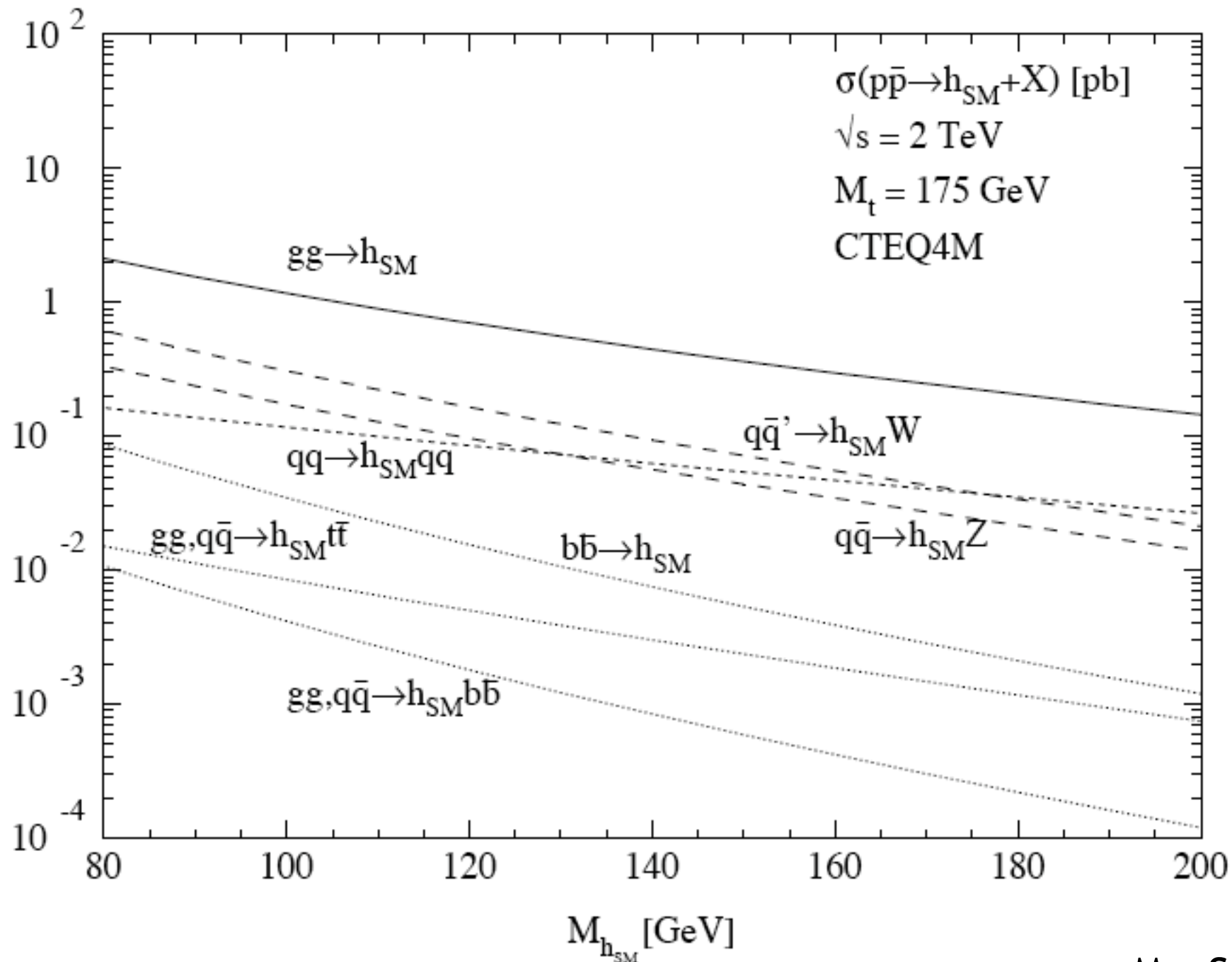


Physics 450:
Particle Physics at the Large
Hadron Collider

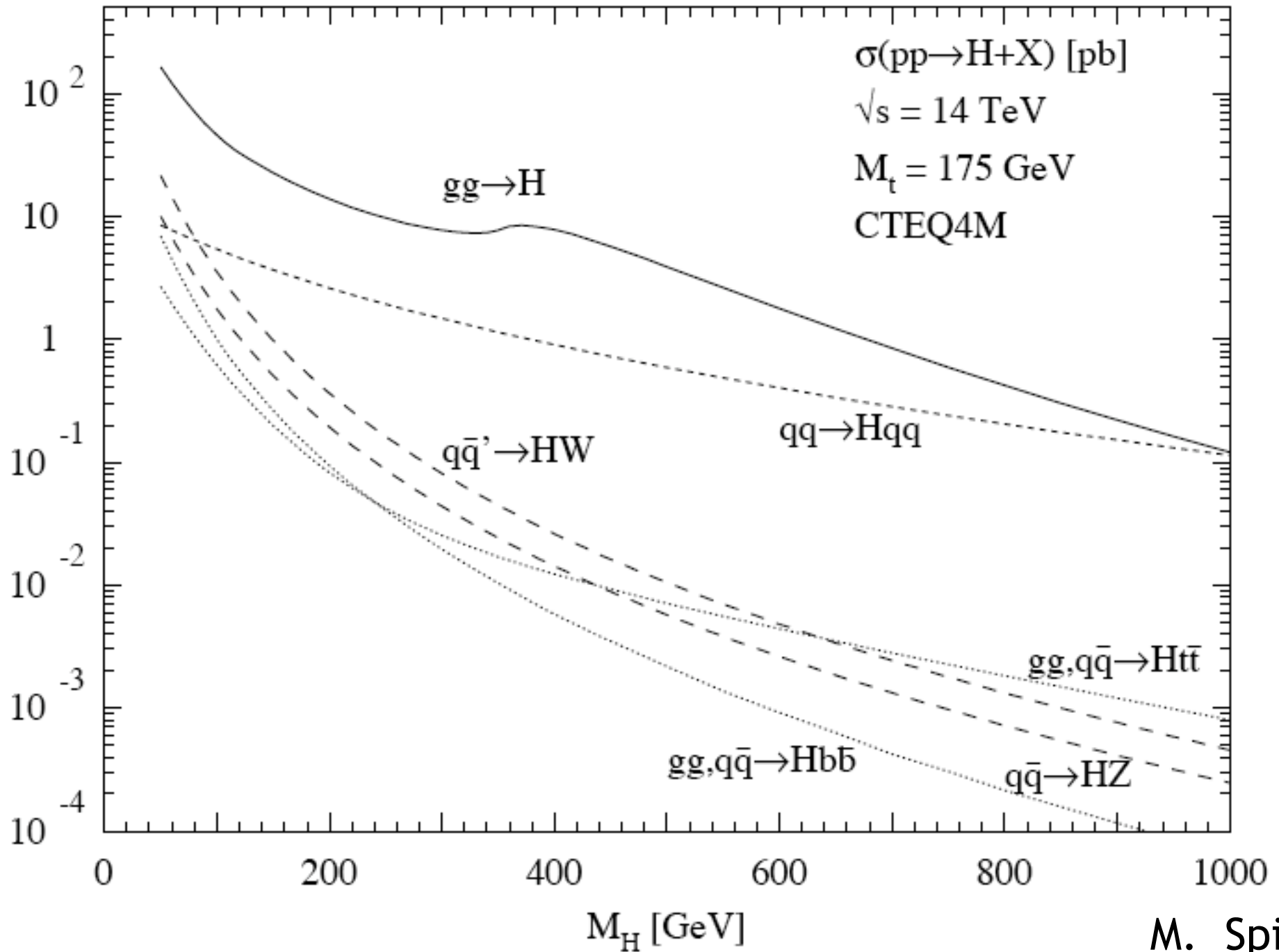
Dec. 11 lecture: figures

M. E. Peskin
Fall Term 2008

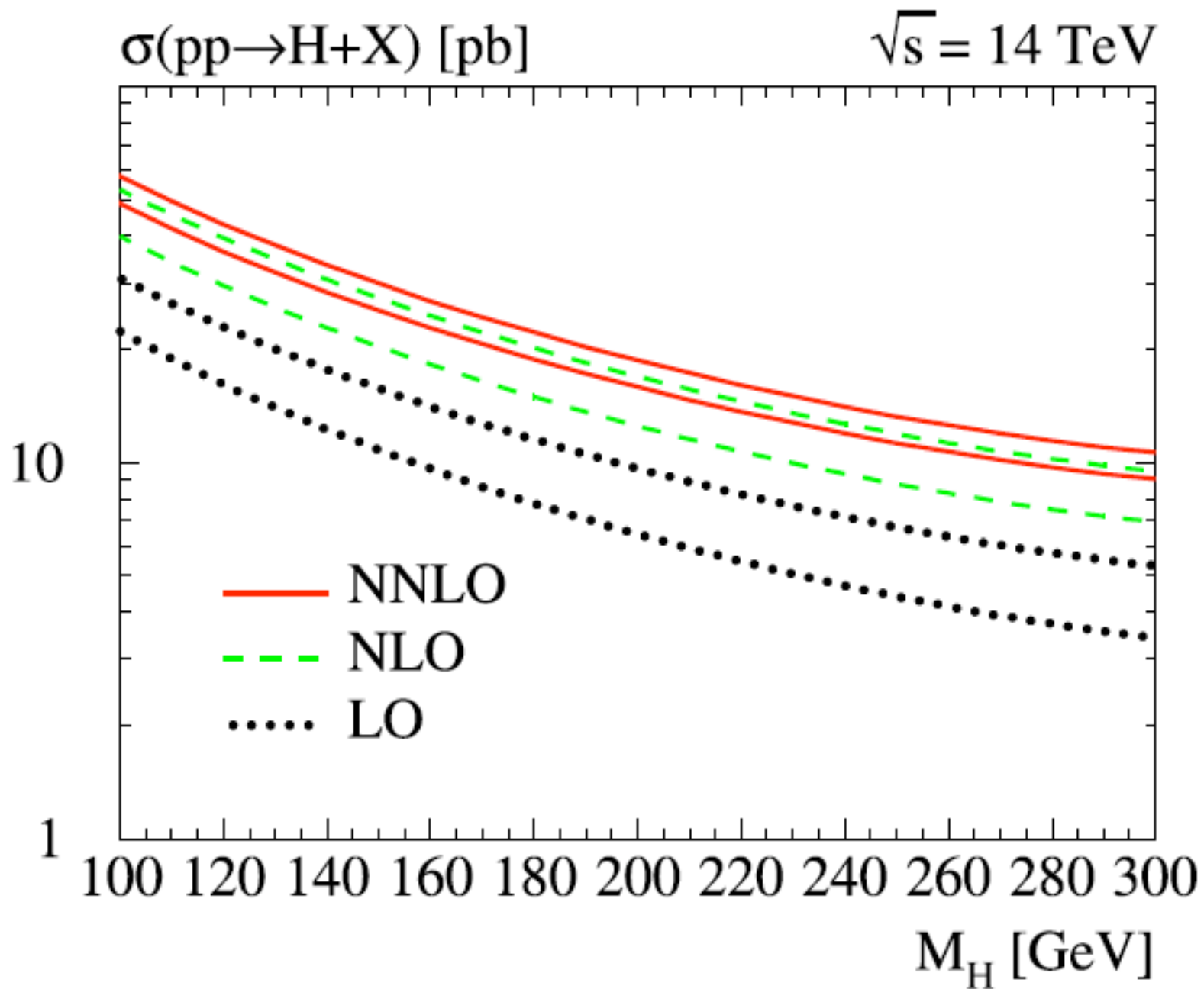
Higgs boson production cross sections (pb) at the Tevatron



Higgs boson production cross sections (pb) at the LHC

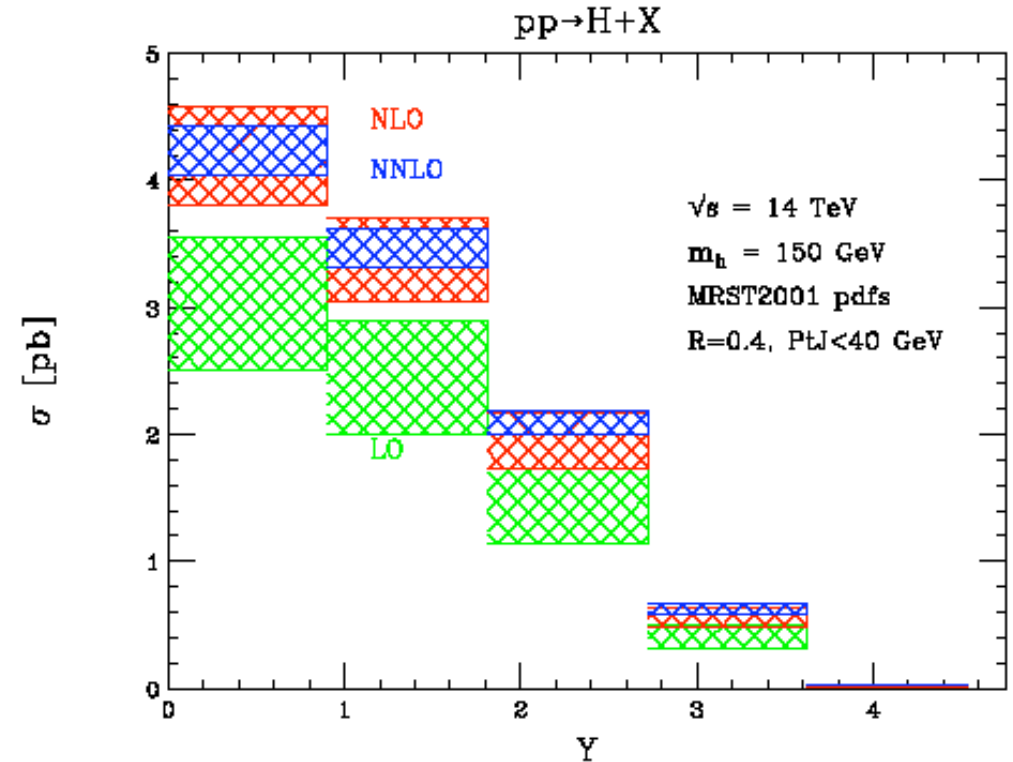
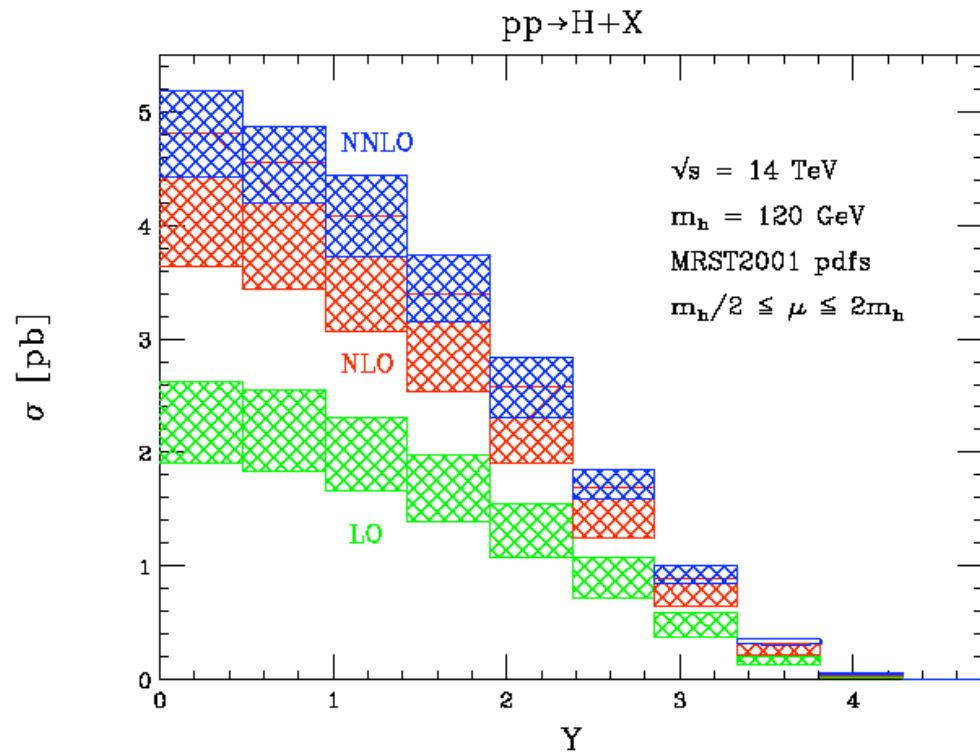


gluon fusion cross section (pb)



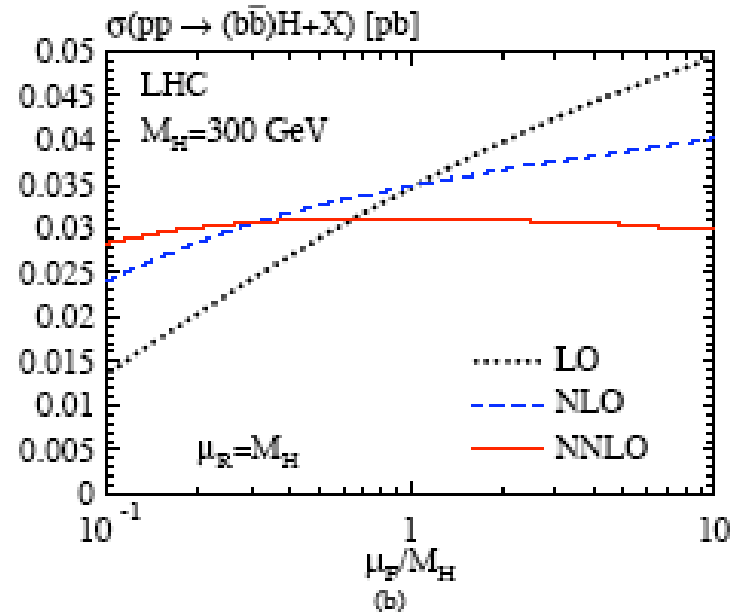
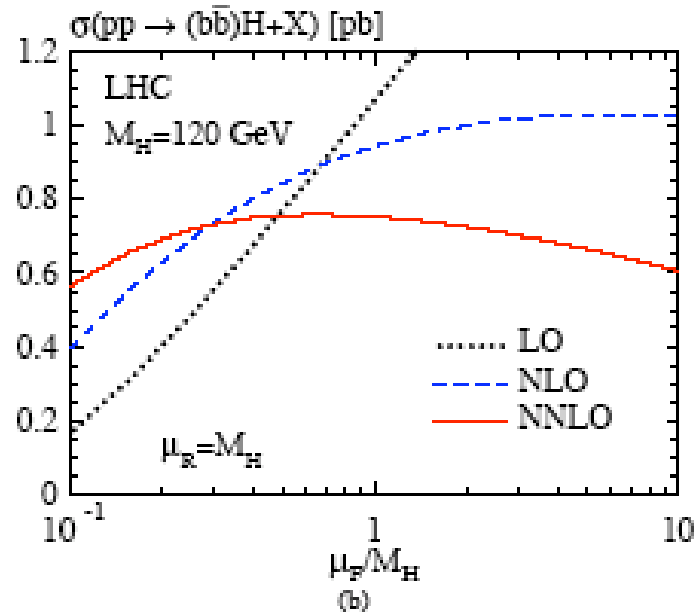
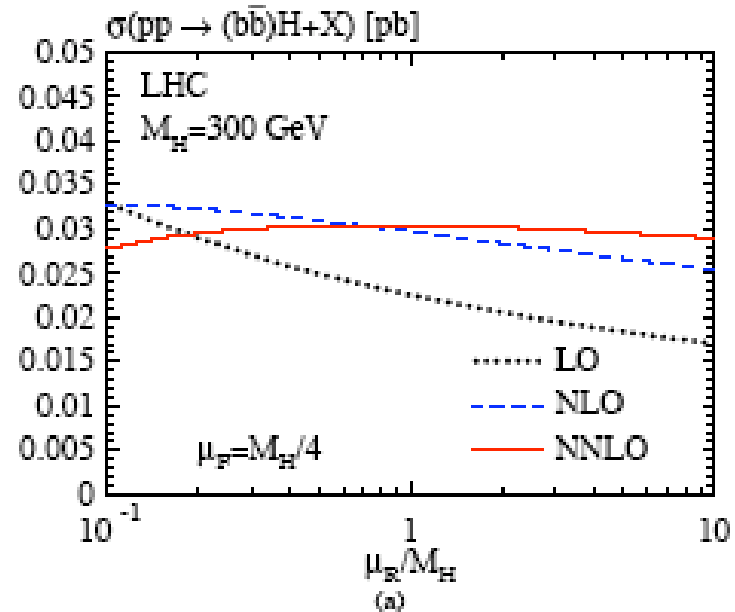
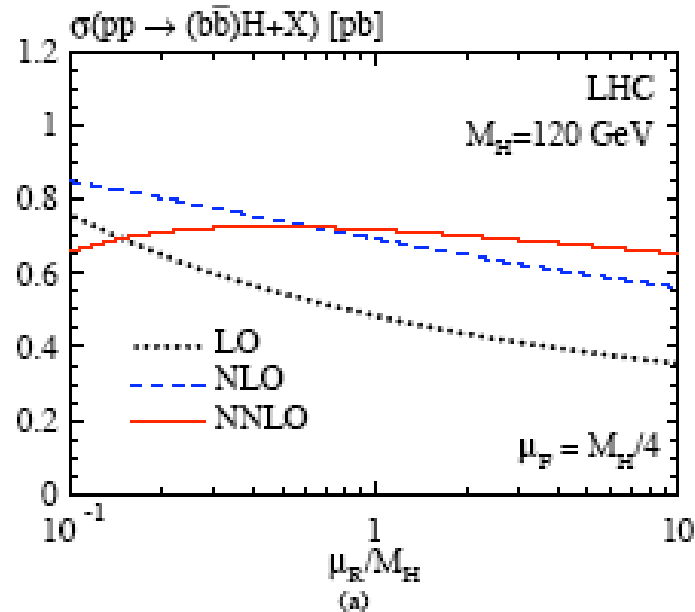
Harlander and Kilgore

rapidity distribution of $gg \rightarrow$ Higgs, without and with a jet veto

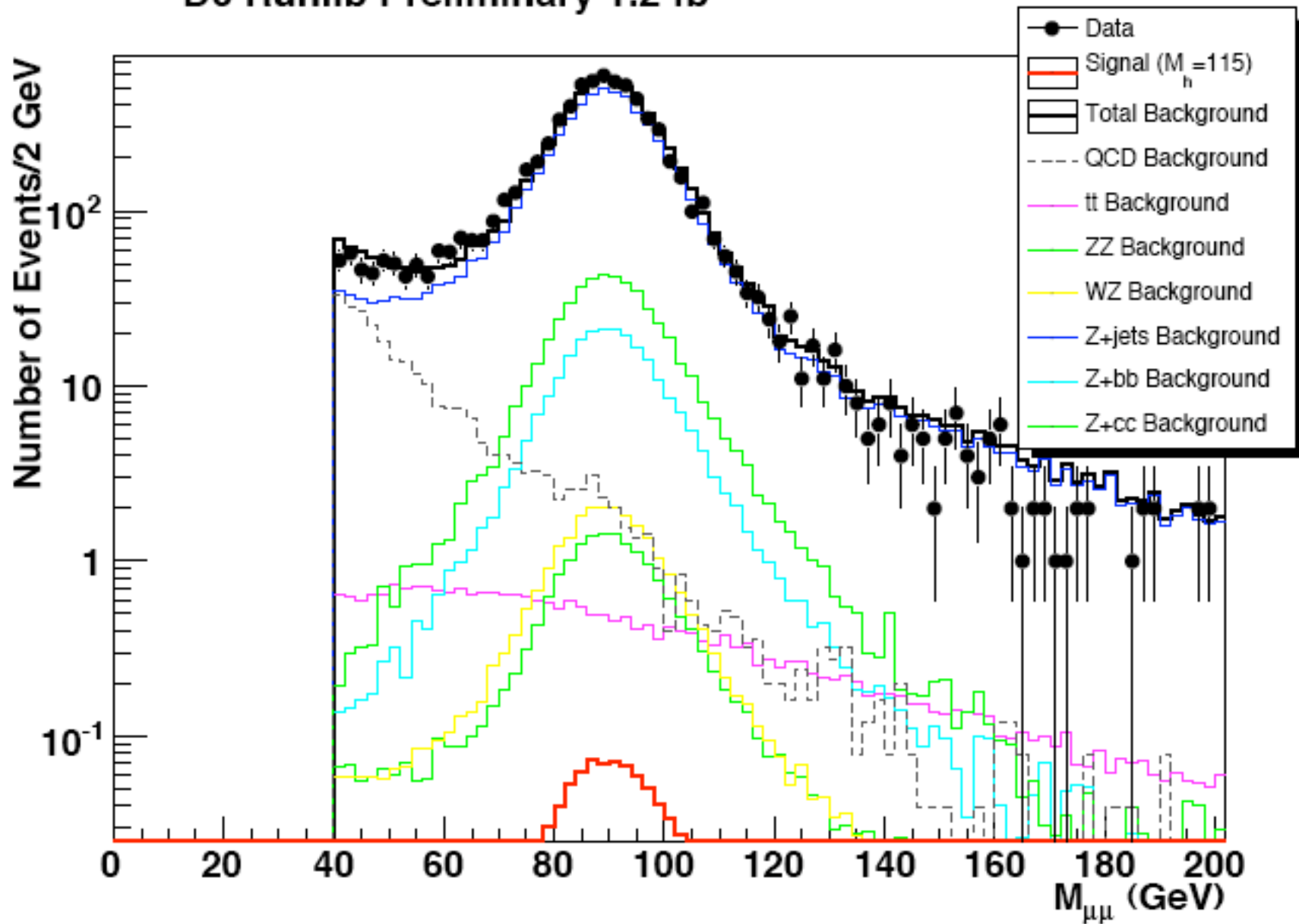


Anastasiou, Melnikov, Petriello

$b\bar{b} \rightarrow h^0$ annihilation cross section

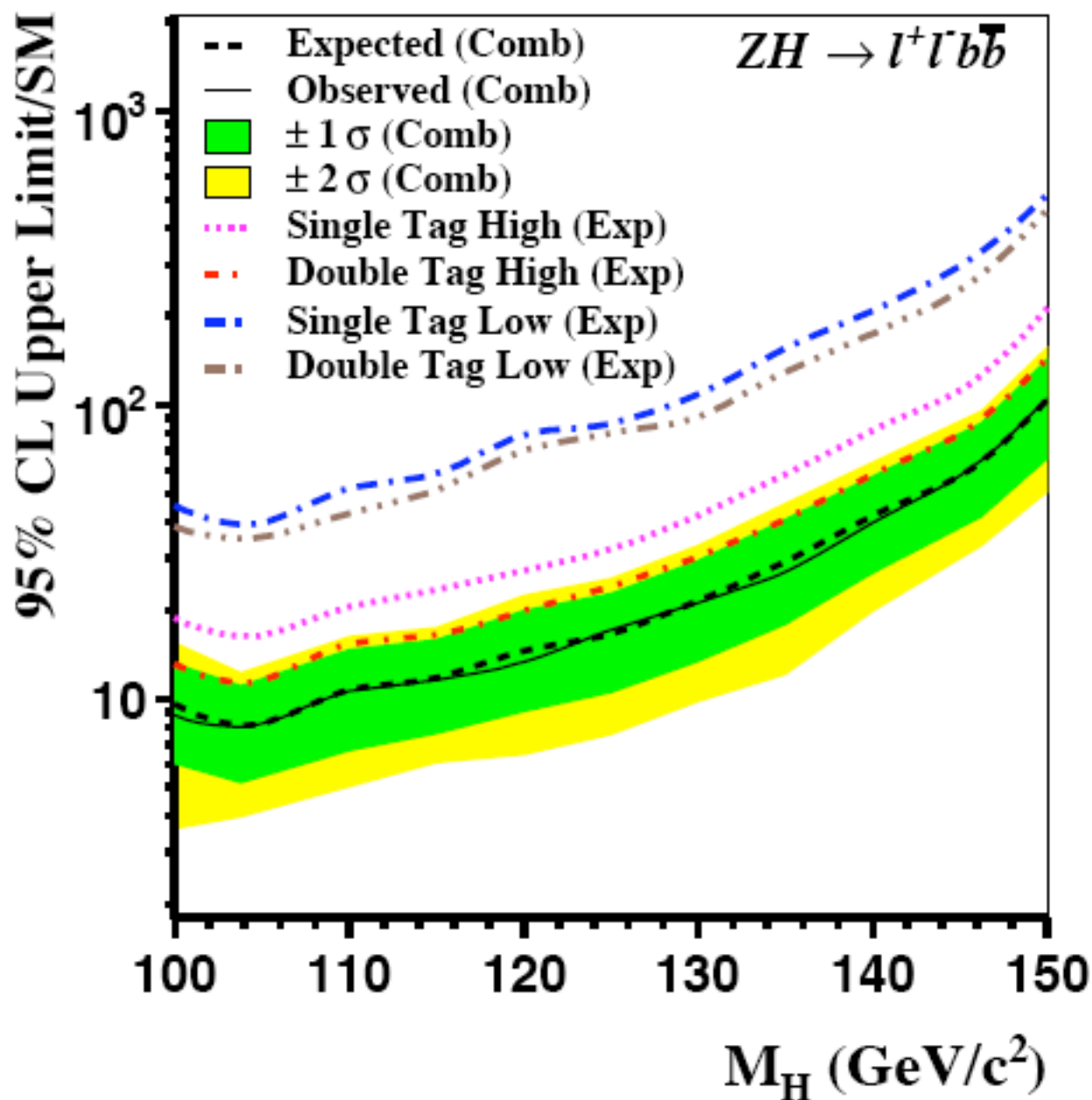


D0 RunIIb Preliminary 1.2 fb⁻¹

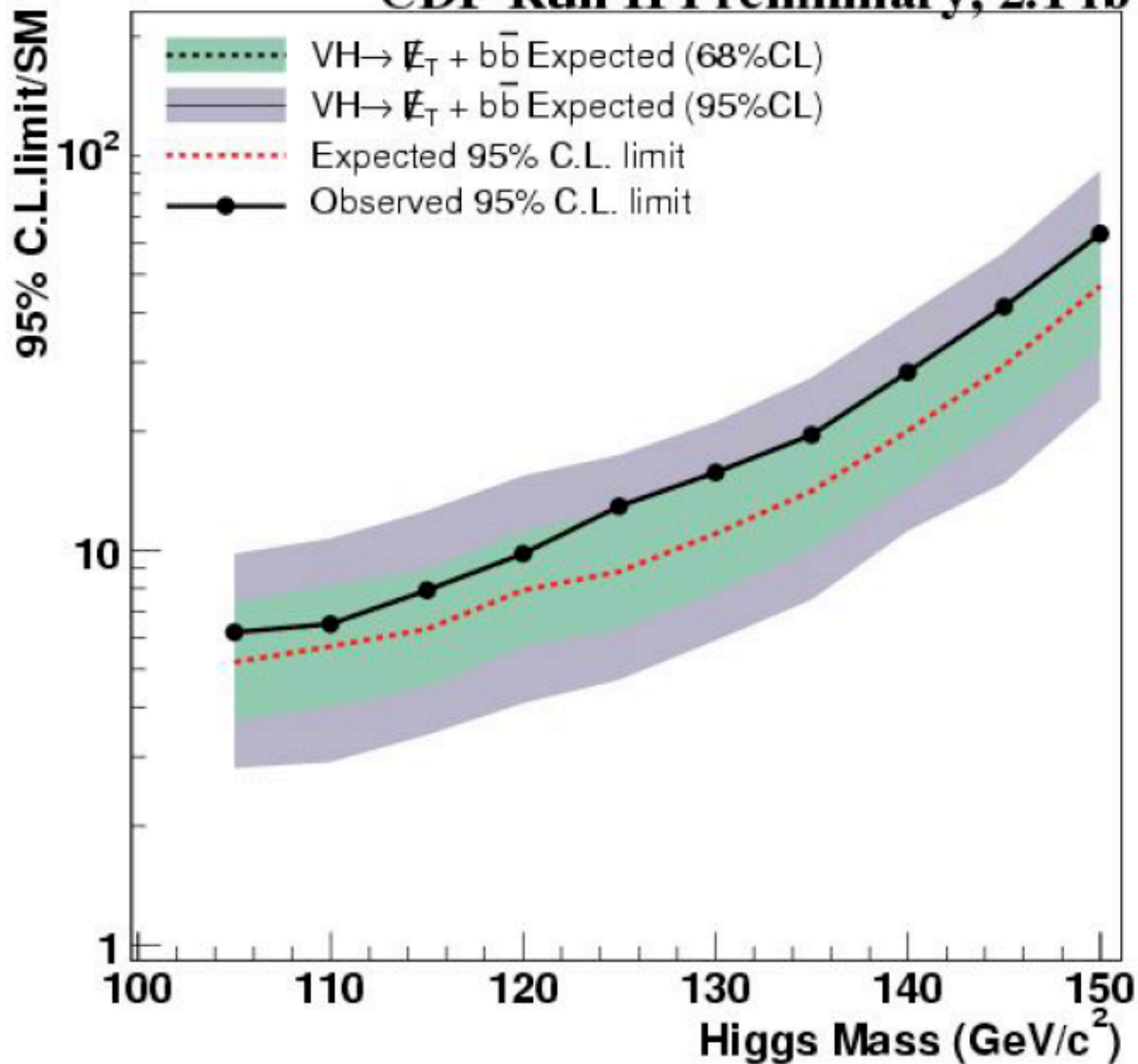


D0 $p\bar{p} \rightarrow Z(\mu^+\mu^-)h(b\bar{b})$ analysis

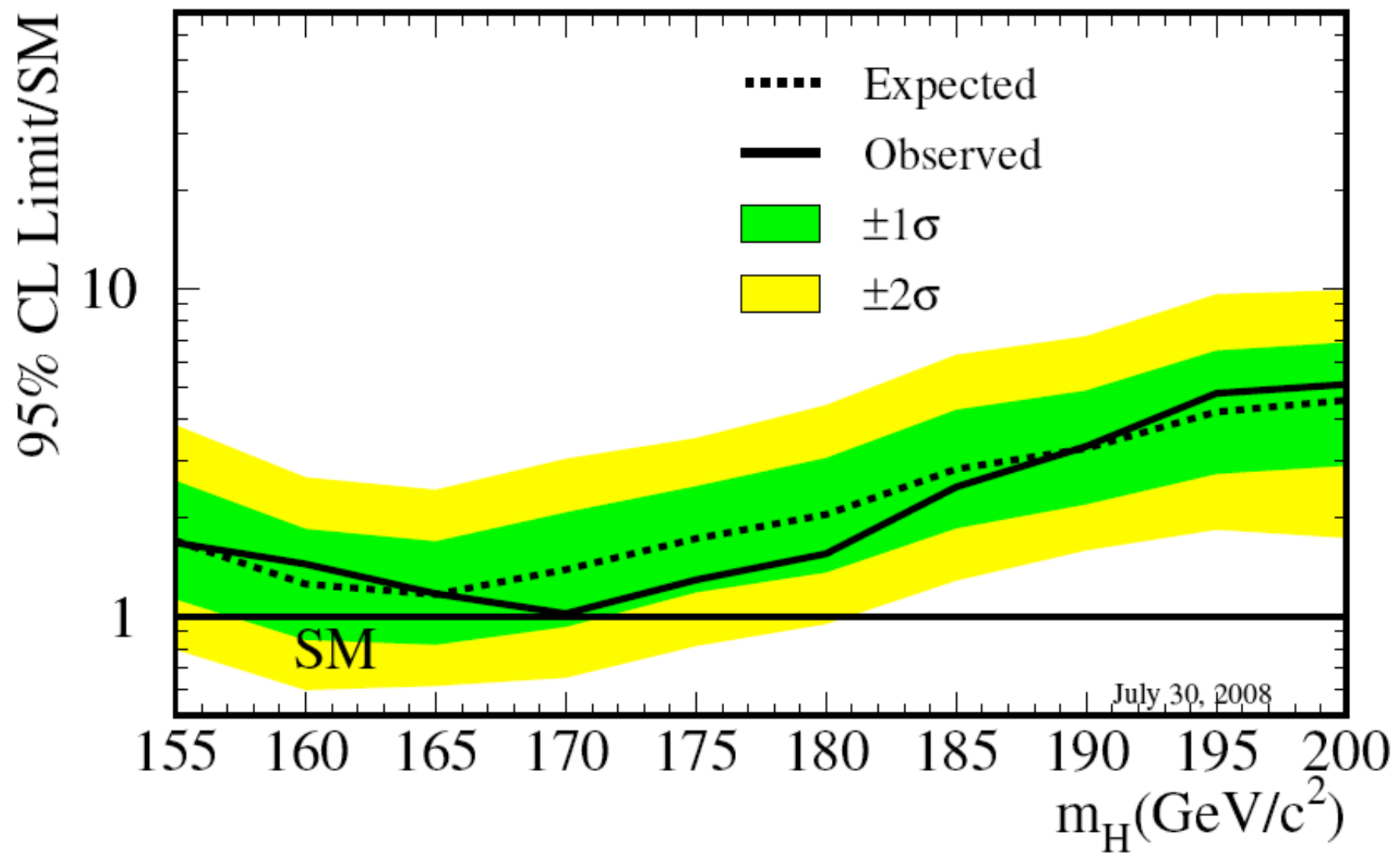
CDF Run II Preliminary (2.4 fb^{-1})



CDF Run II Preliminary, 2.1 fb⁻¹

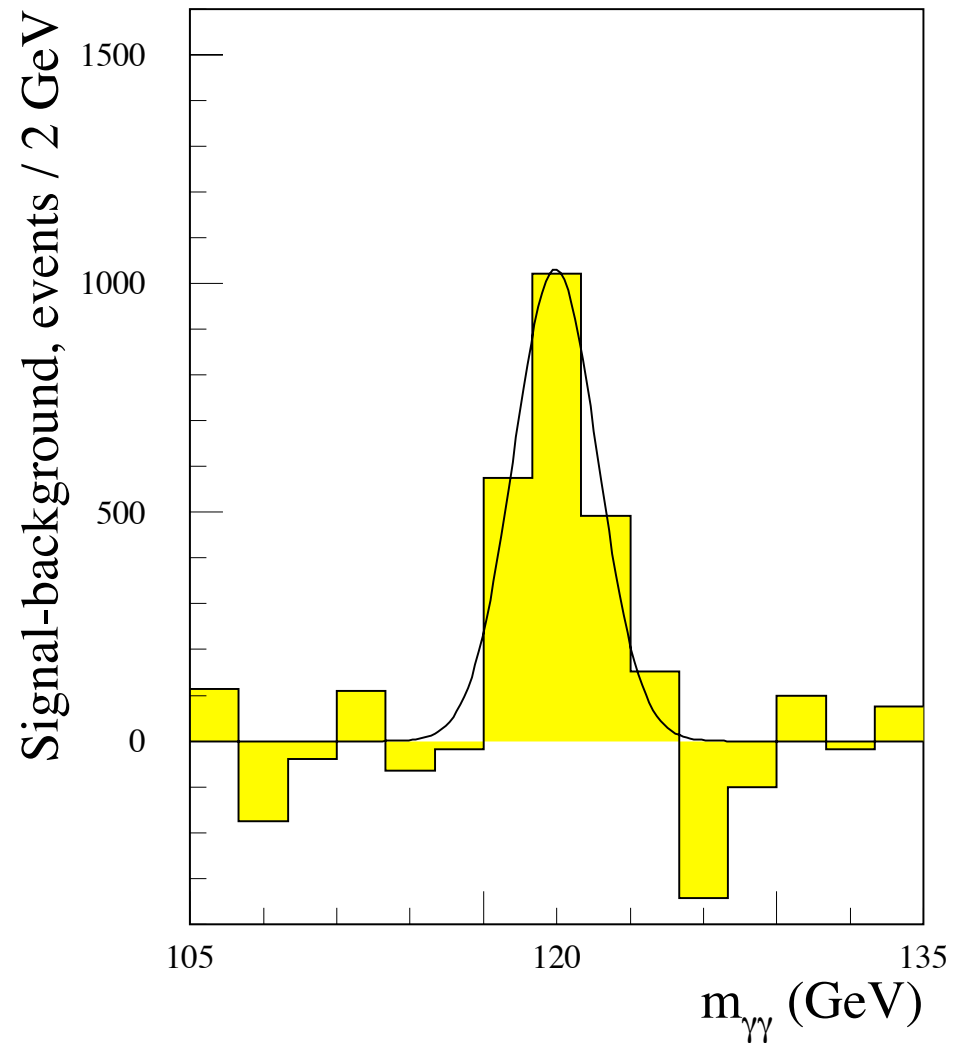
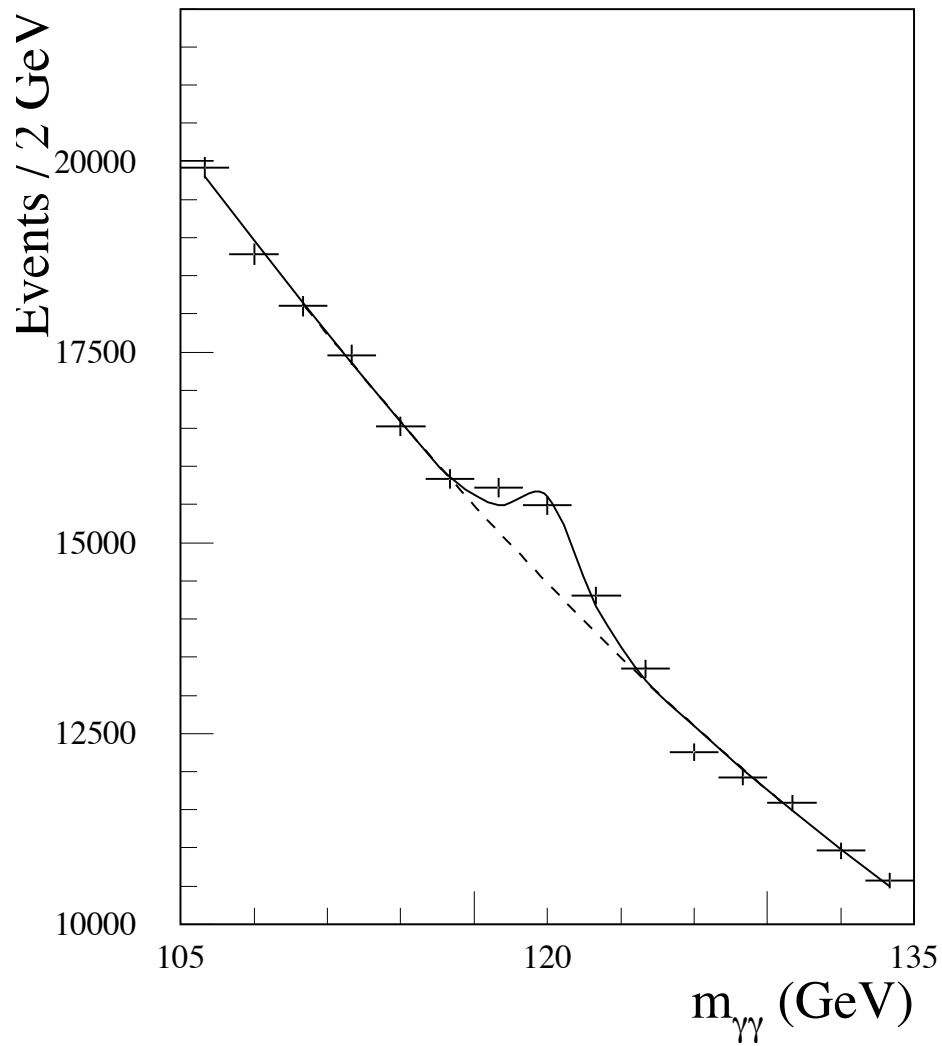


Tevatron Run II Preliminary, L=3 fb⁻¹



CDF + D0

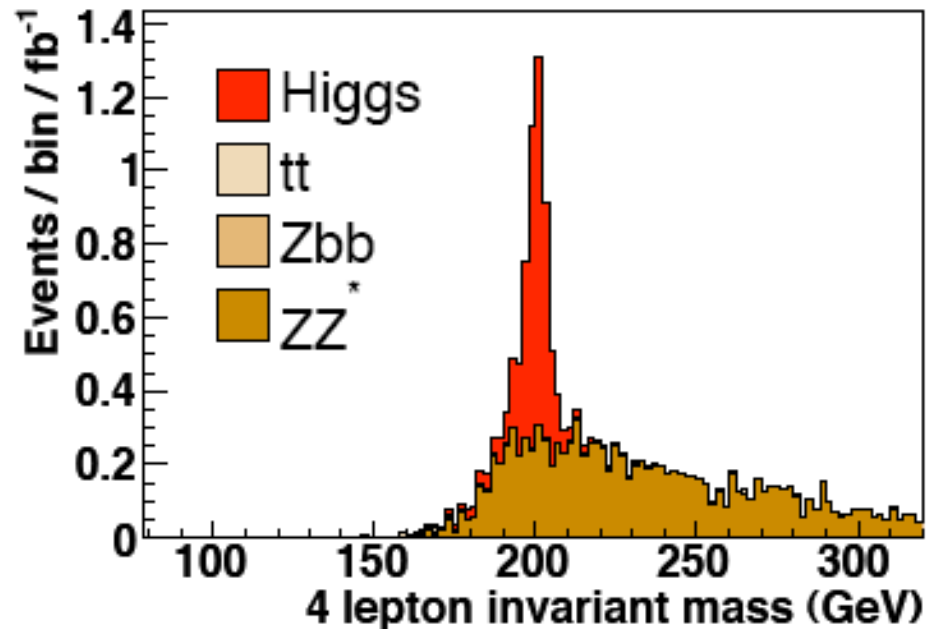
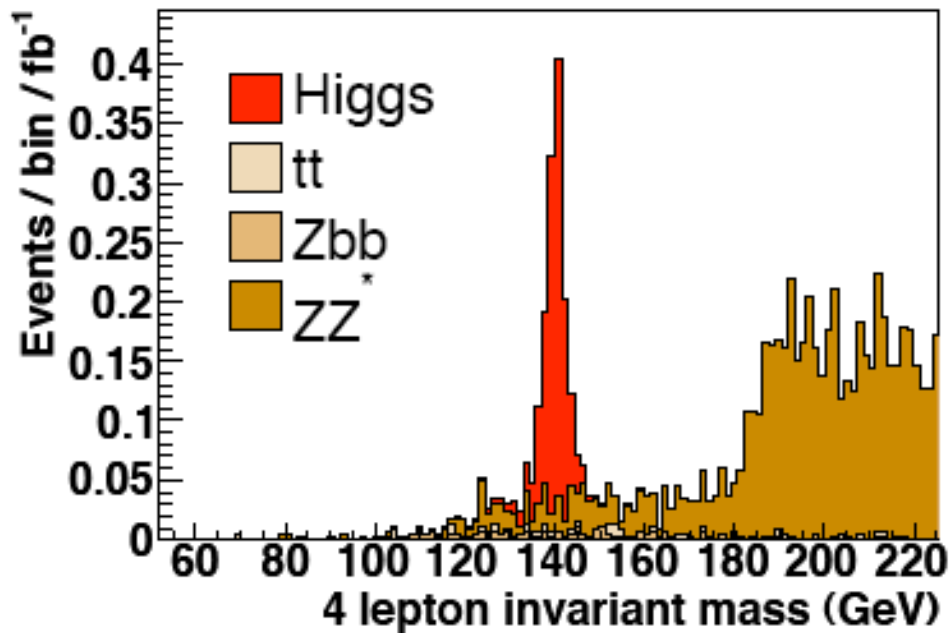
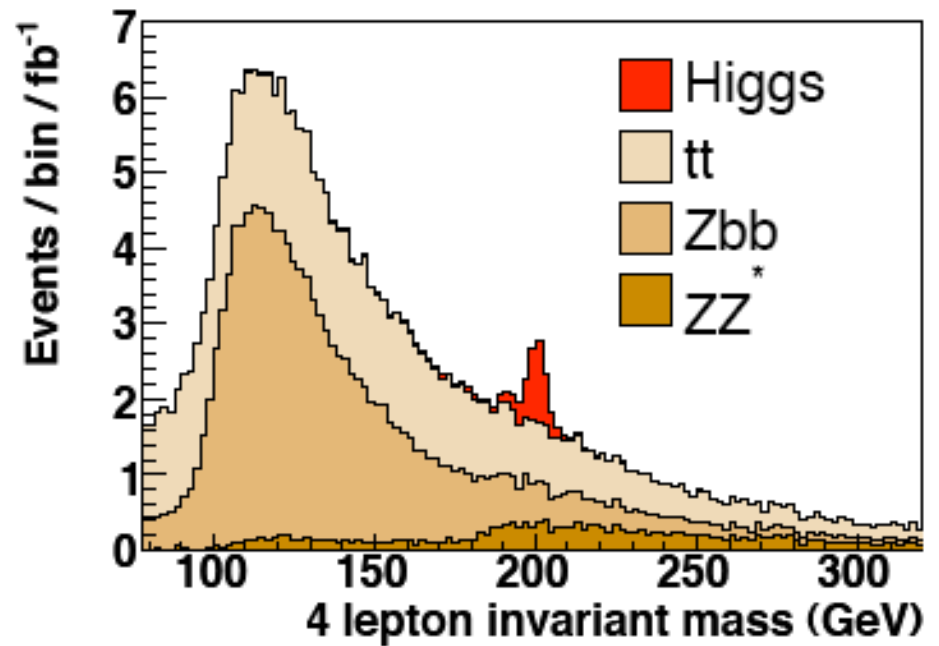
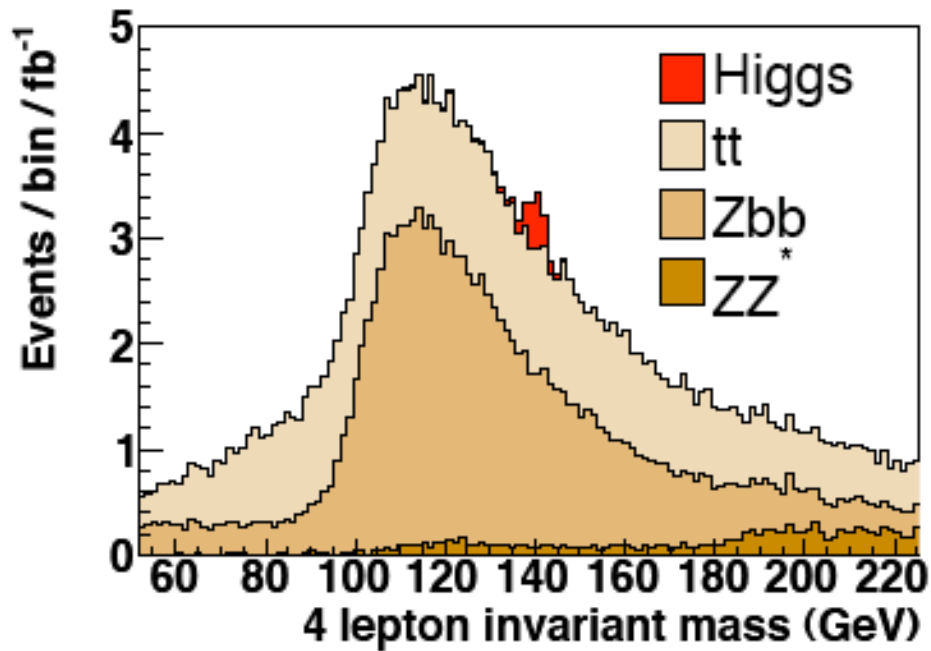
$$h^0 \rightarrow \gamma\gamma \quad m_h = 120 \text{ GeV}$$



ATLAS

$$h^0 \rightarrow ZZ \rightarrow 4\ell$$

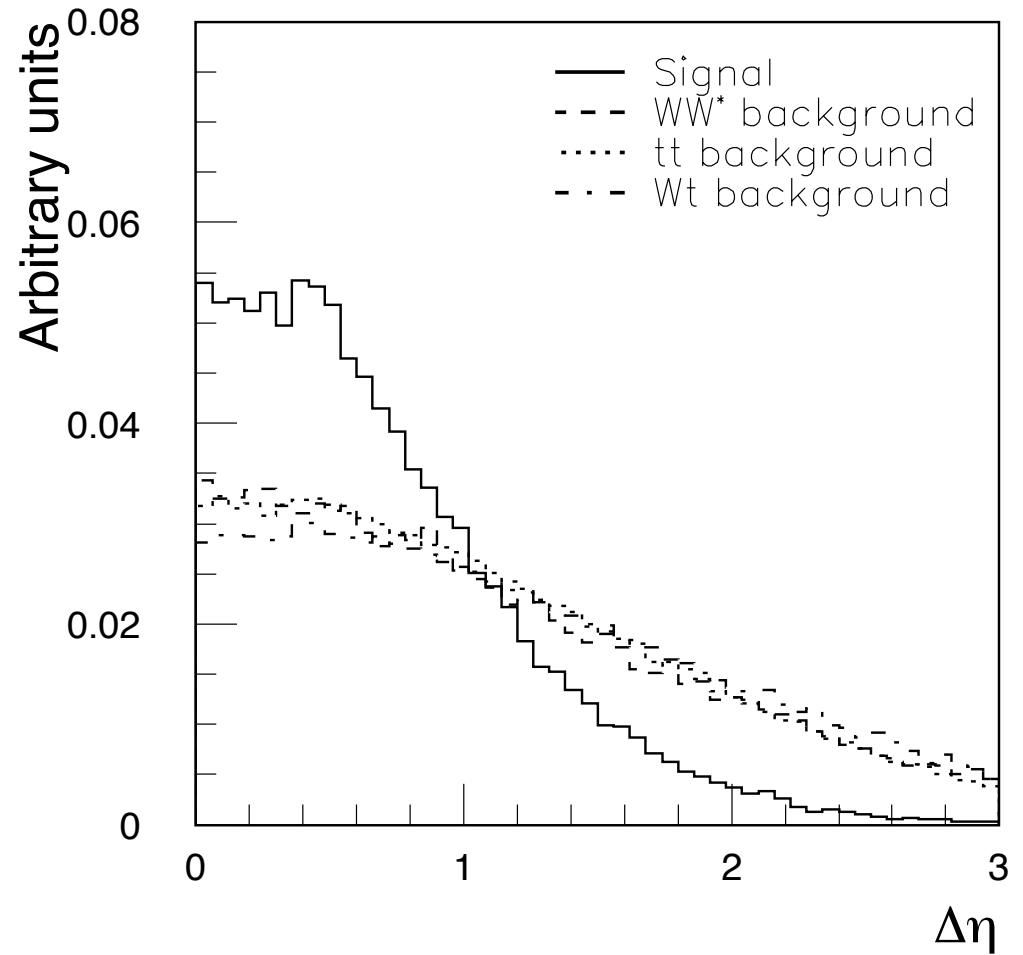
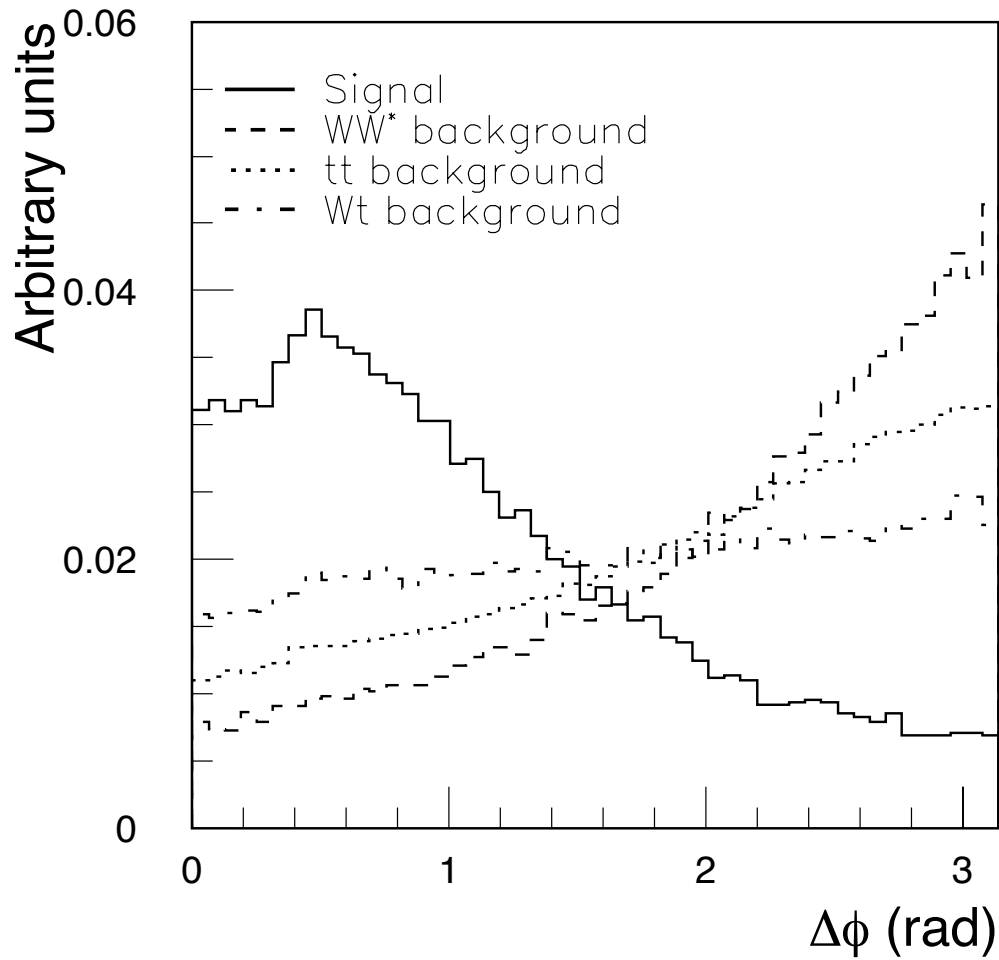
$$m_h = 140, 200 \text{ GeV}$$



CMS

$$h^0 \rightarrow WW \rightarrow l\nu l\nu$$

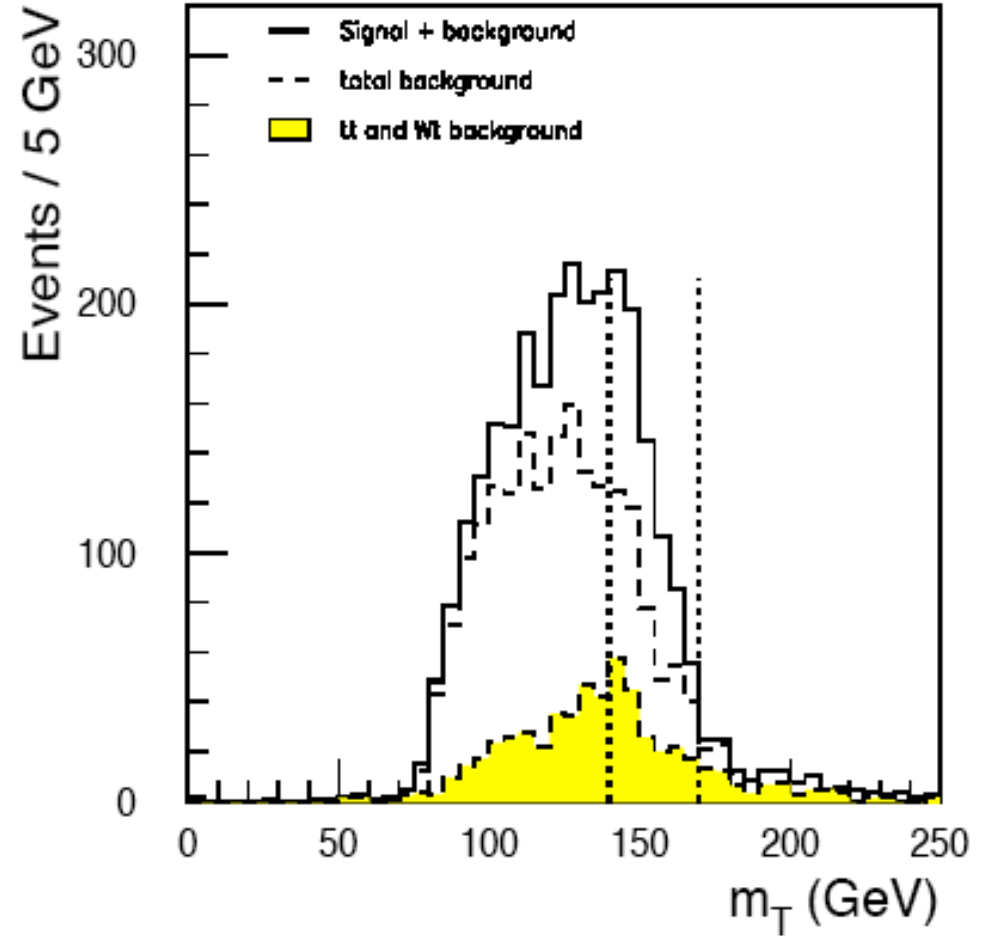
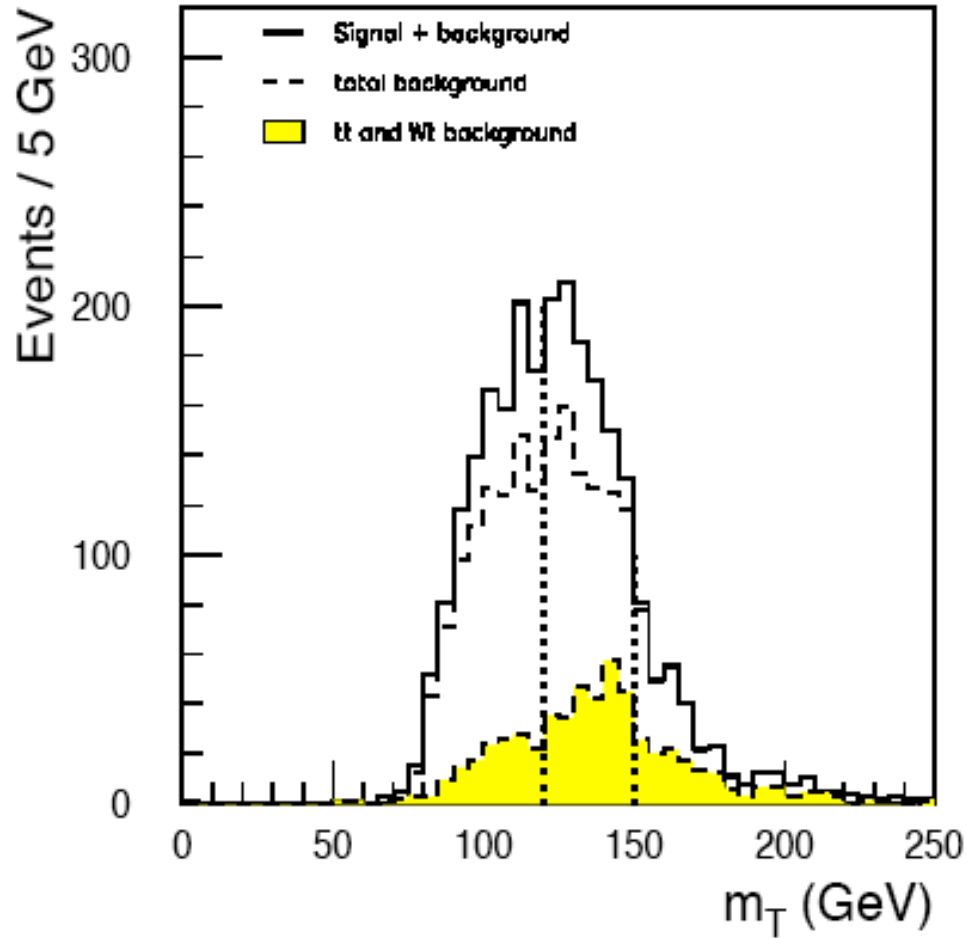
$$m_h = 170 \text{ GeV}$$



ATLAS

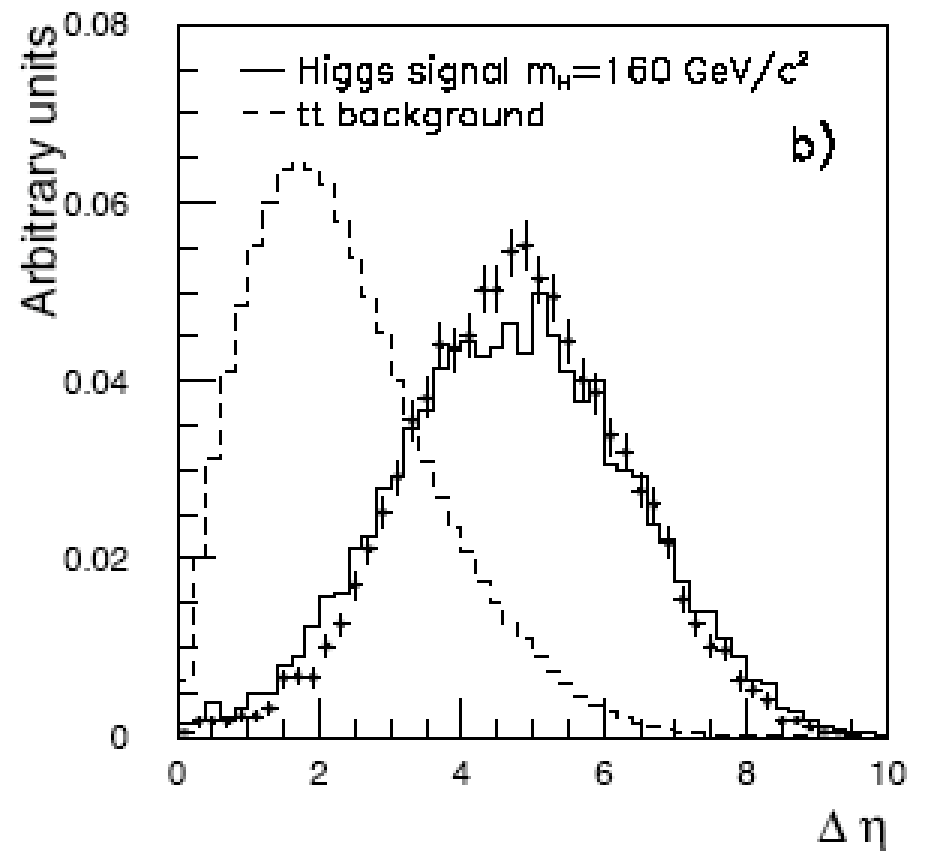
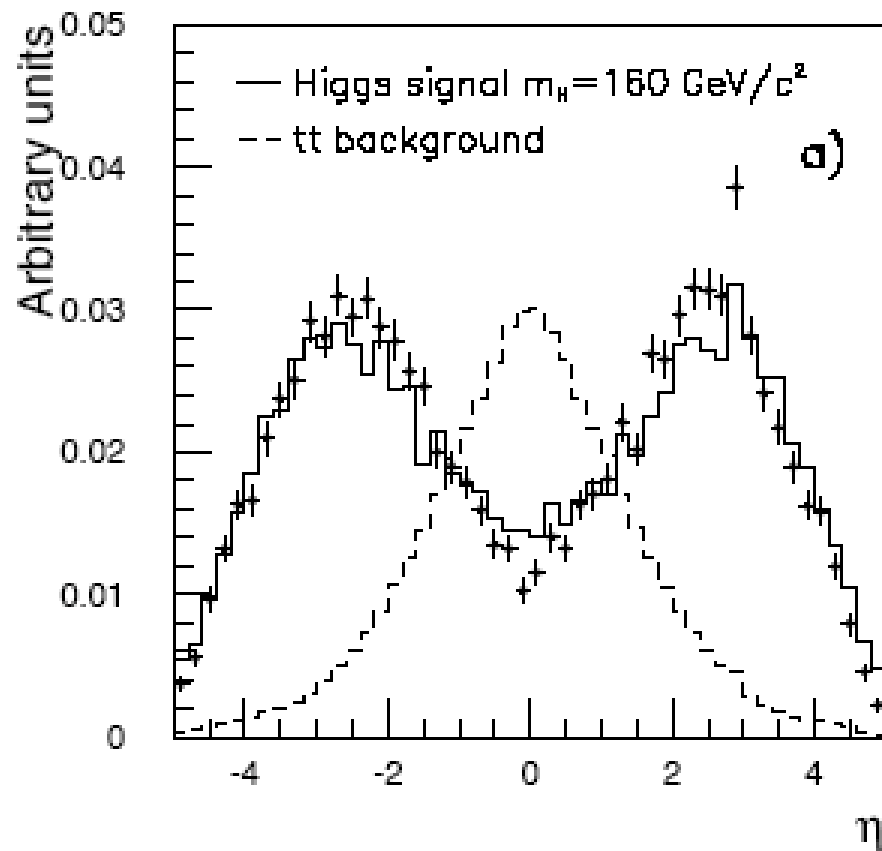
$$h^0 \rightarrow WW \rightarrow \ell\nu\ell\nu$$

$$m_h = 150, 170 \text{ GeV}$$



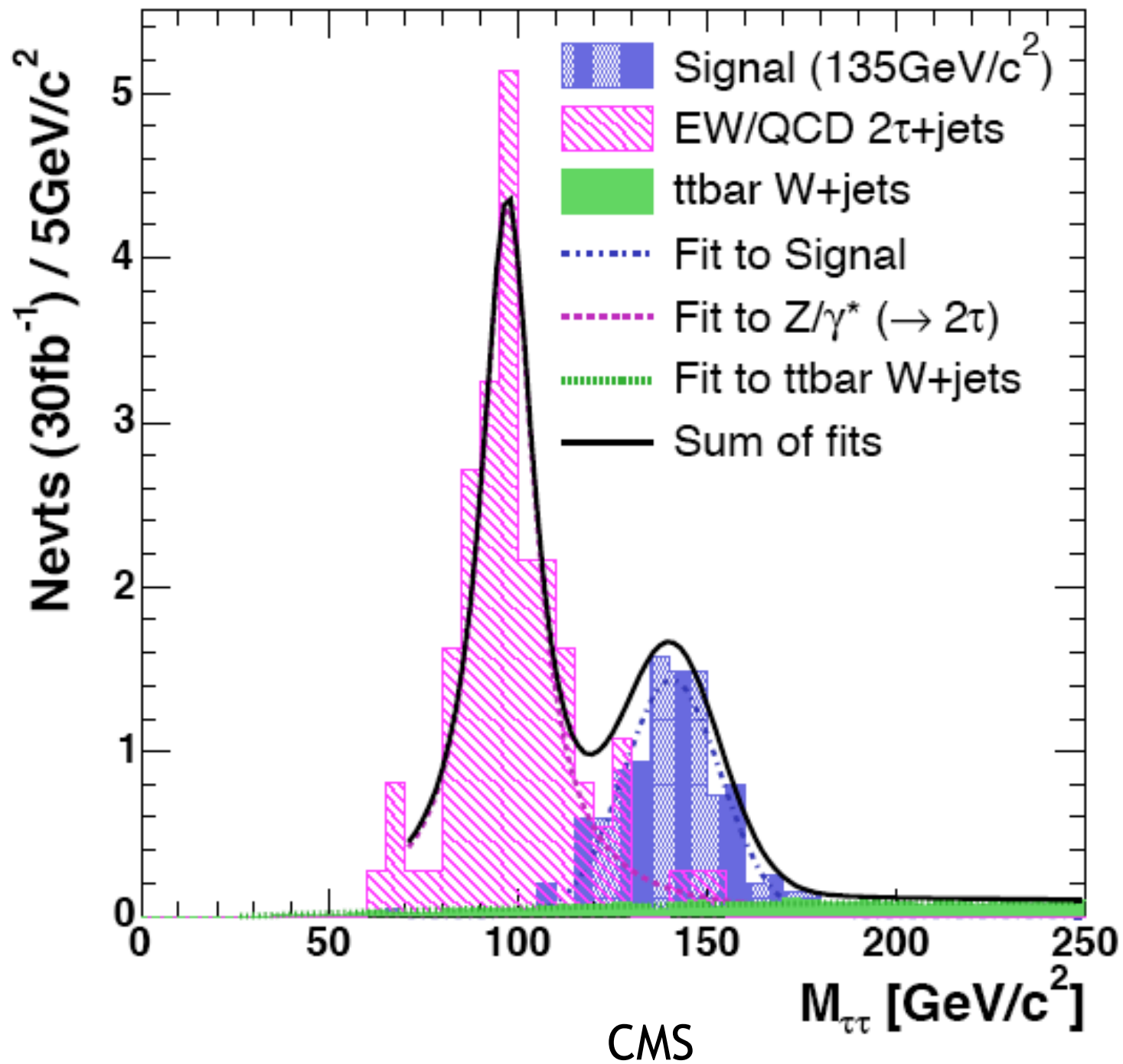
ATLAS

kinematics of tagging jets in W fusion -> Higgs



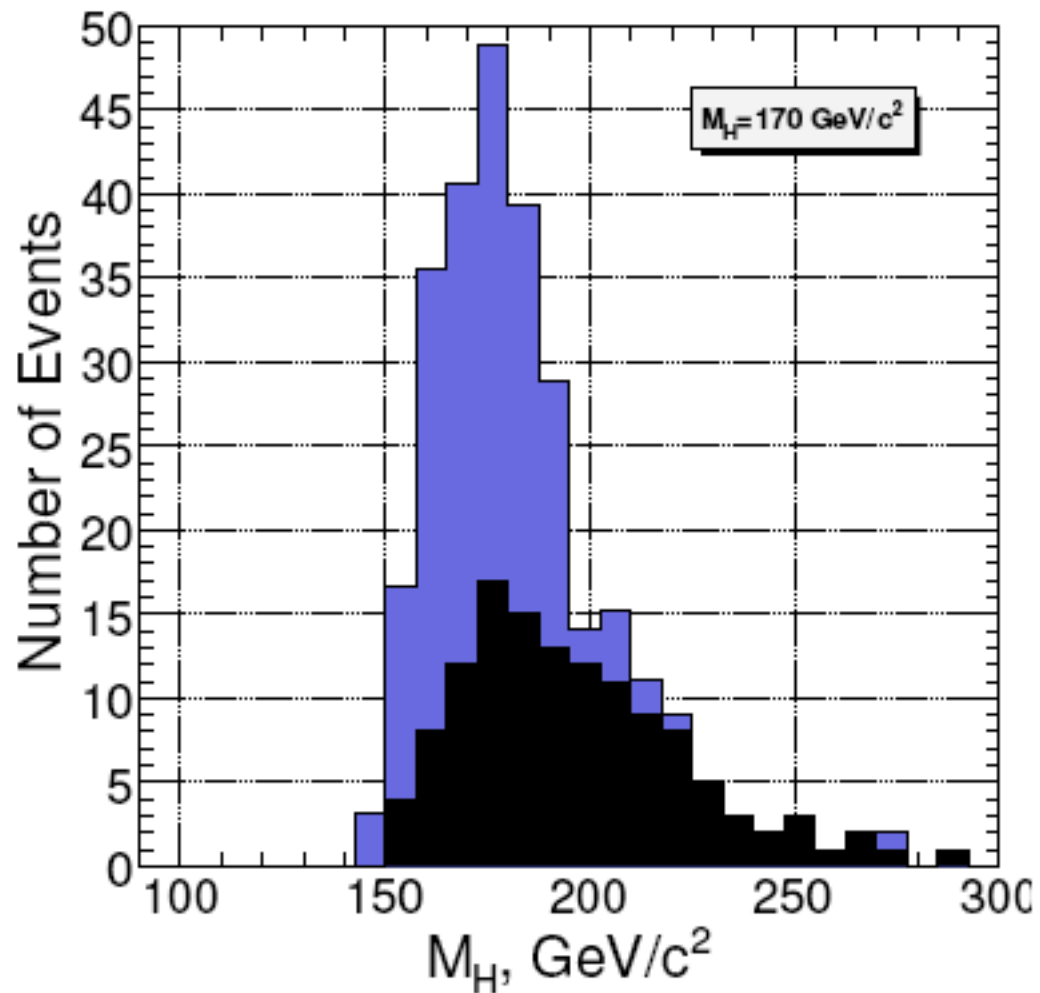
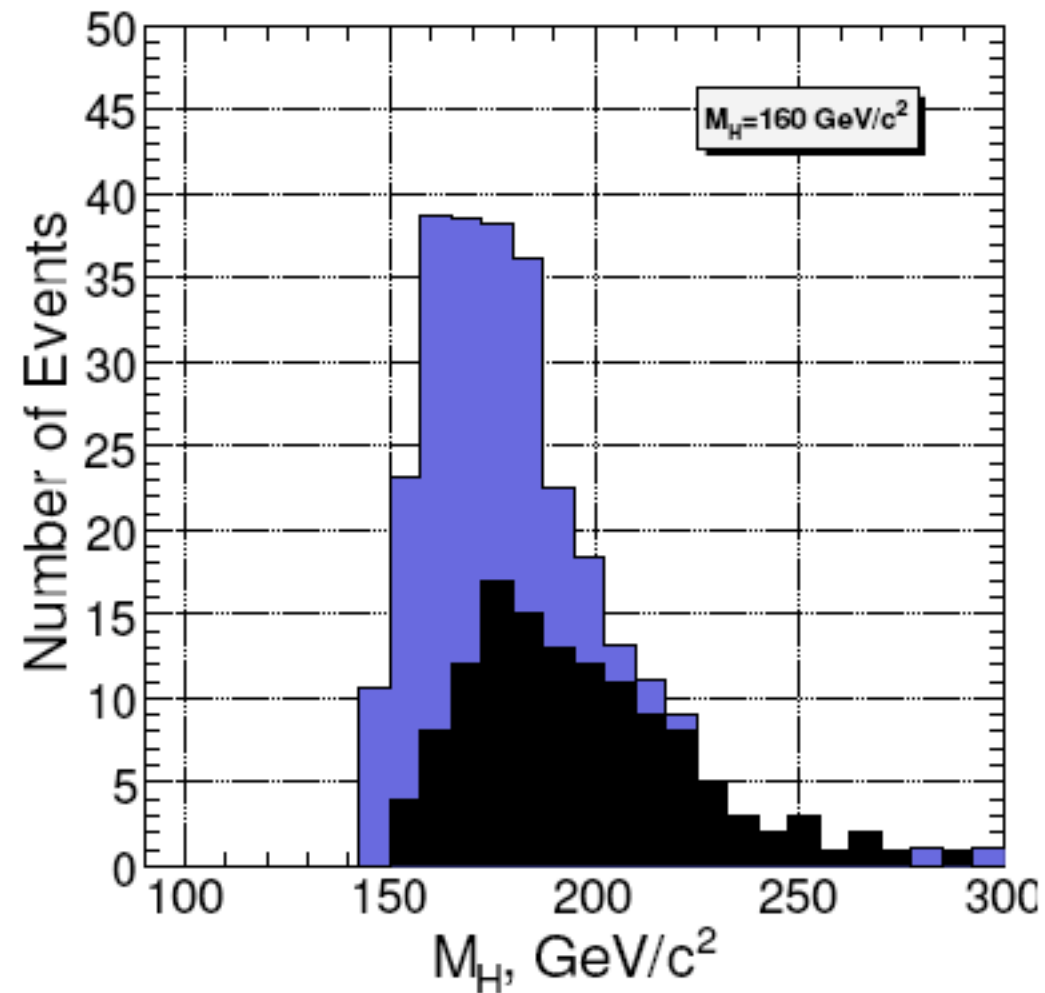
ATLAS

$$h^0 \rightarrow \tau^+ \tau^- \quad m_h = 135 \text{ GeV}$$



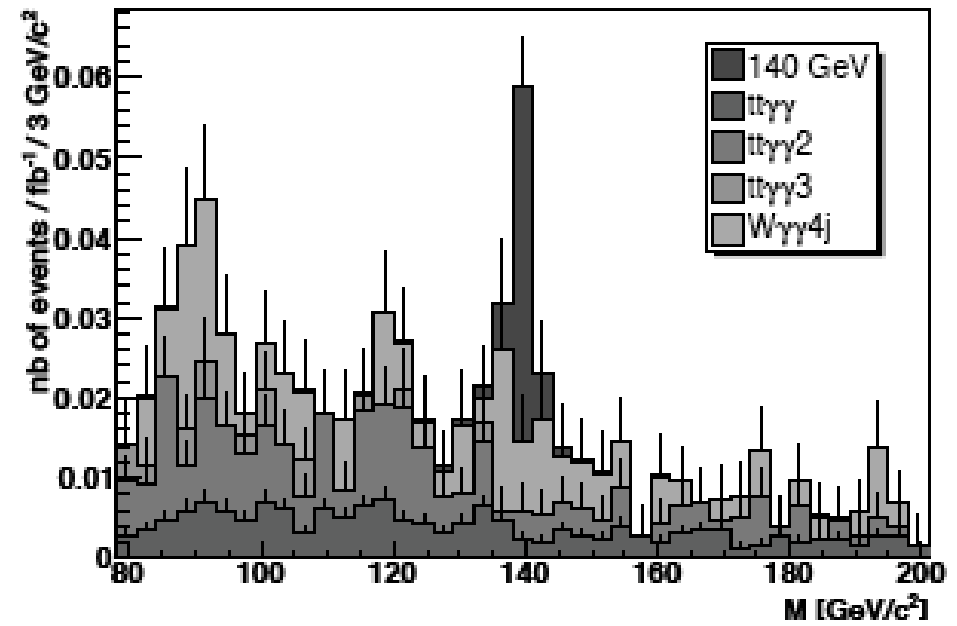
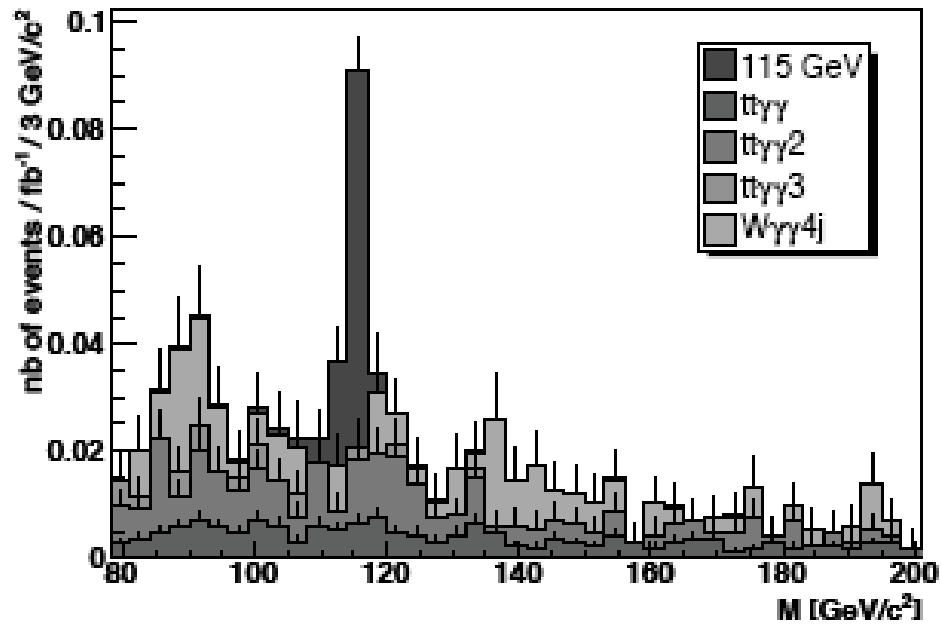
$$h^0 \rightarrow WW \rightarrow \ell\nu jj$$

$$m_h = 160, 170 \text{ GeV}$$

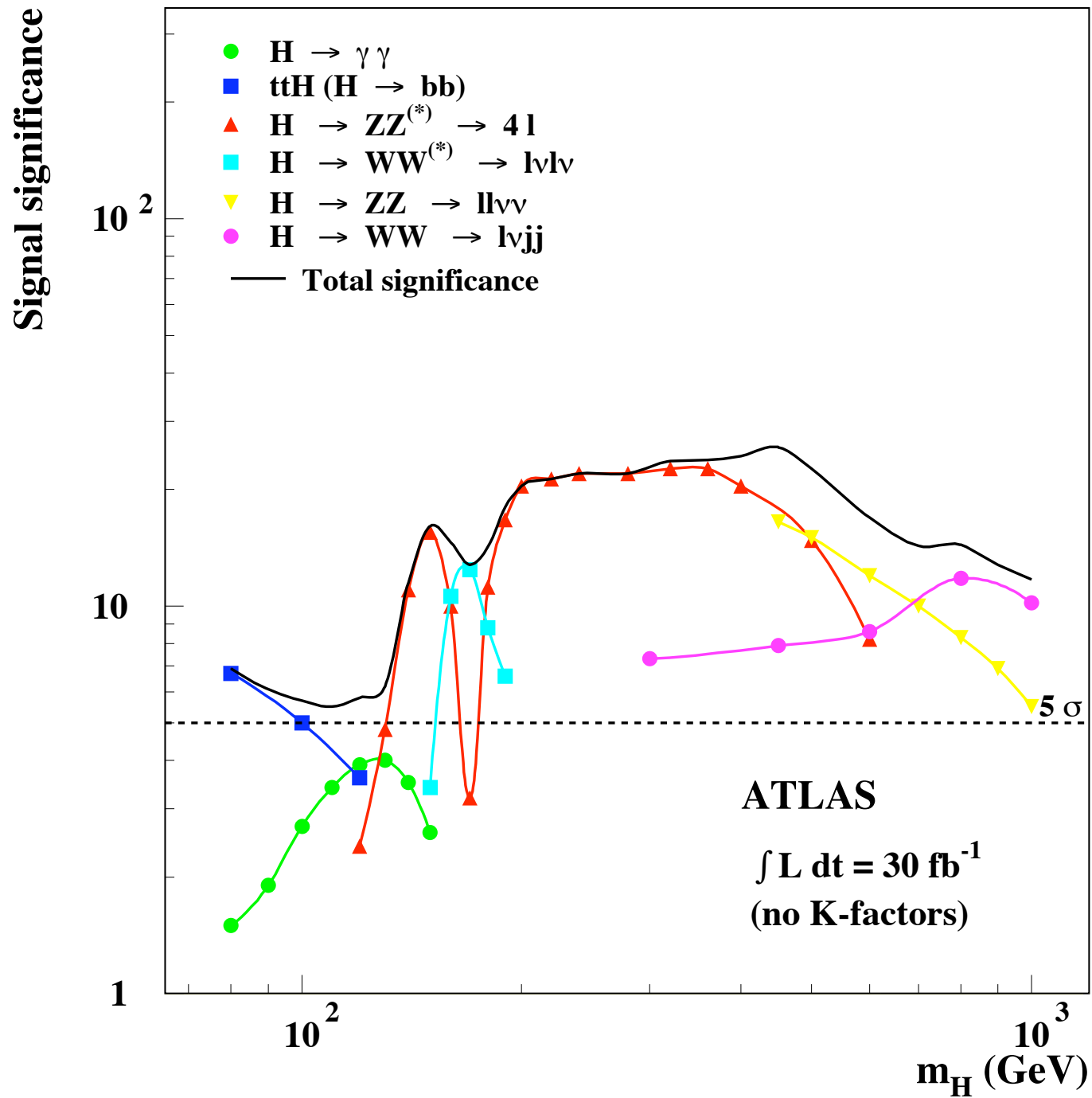


CMS

$$t\bar{t}h^0, h^0 \rightarrow \gamma\gamma \quad m_h = 115, 140 \text{ GeV}$$



CMS



Statistical Significance

CMS, 30 fb⁻¹

— LO
- - - NLO

- + H → γγ inclusive
- ttH, WH, H → bb̄
- H → ZZ*/ZZ → l⁺l⁺l⁺l⁻
- ▲ H → WW*/WW → llν_lν_l
- ★ qqH, H → τ⁺τ⁻ → lepton+τ jet
- ☆ qqH, H → γγ
- qqH, H → WW → lν_ljj
- ◇ qqH, H → ZZ → llν_lν_l

20

10

5

5σ at 10 fb⁻¹

5σ at 30 fb⁻¹

100

200

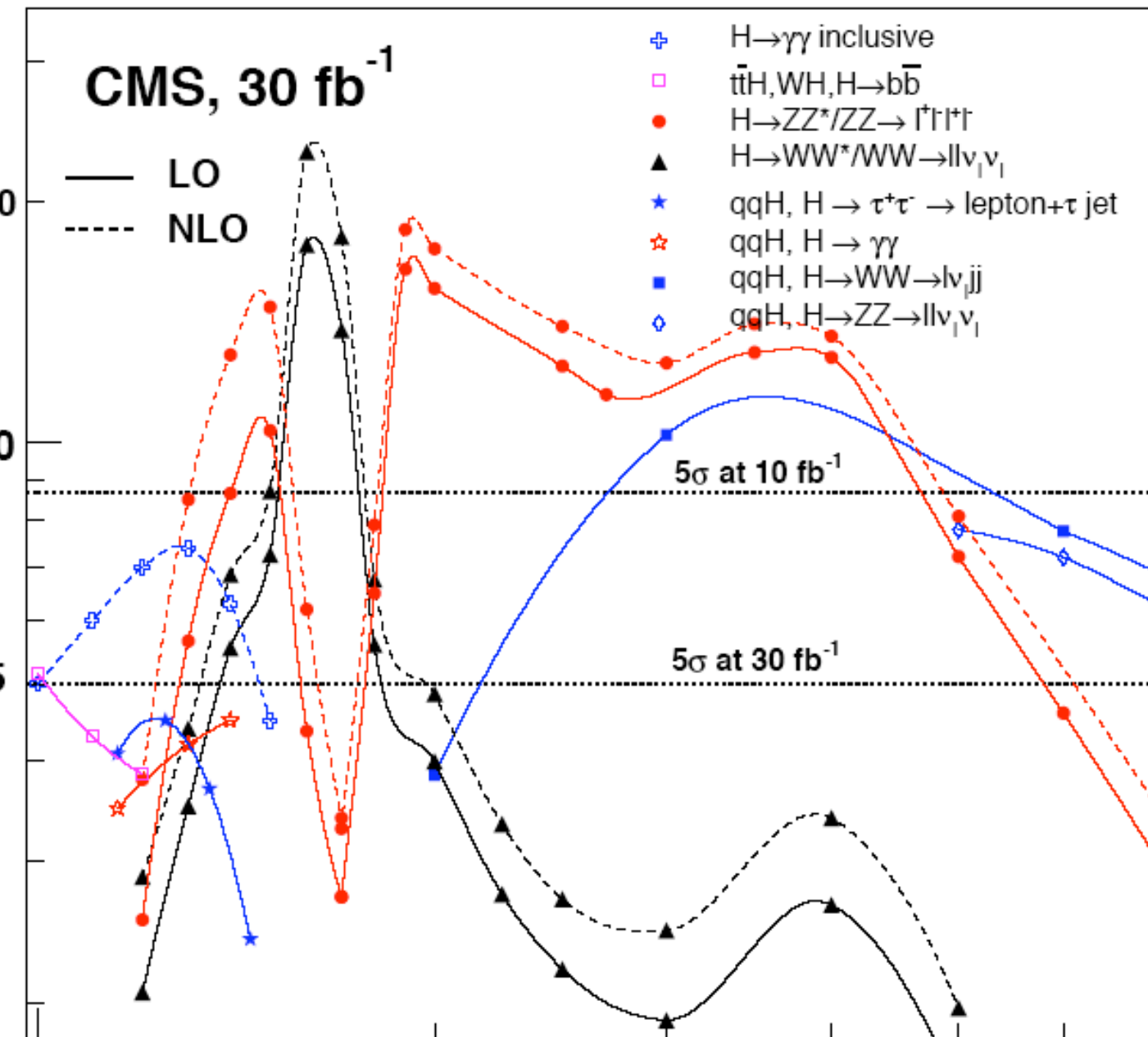
300

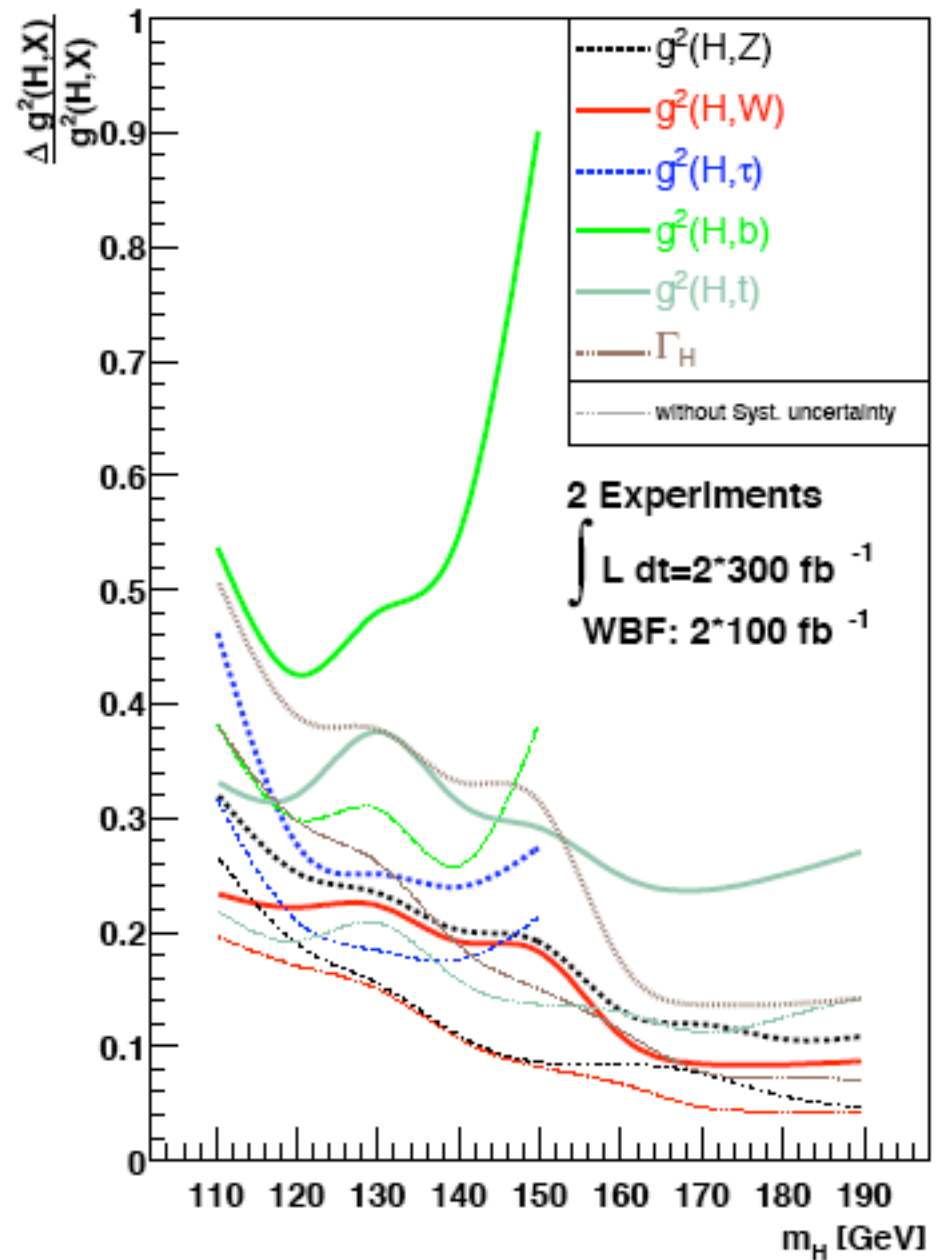
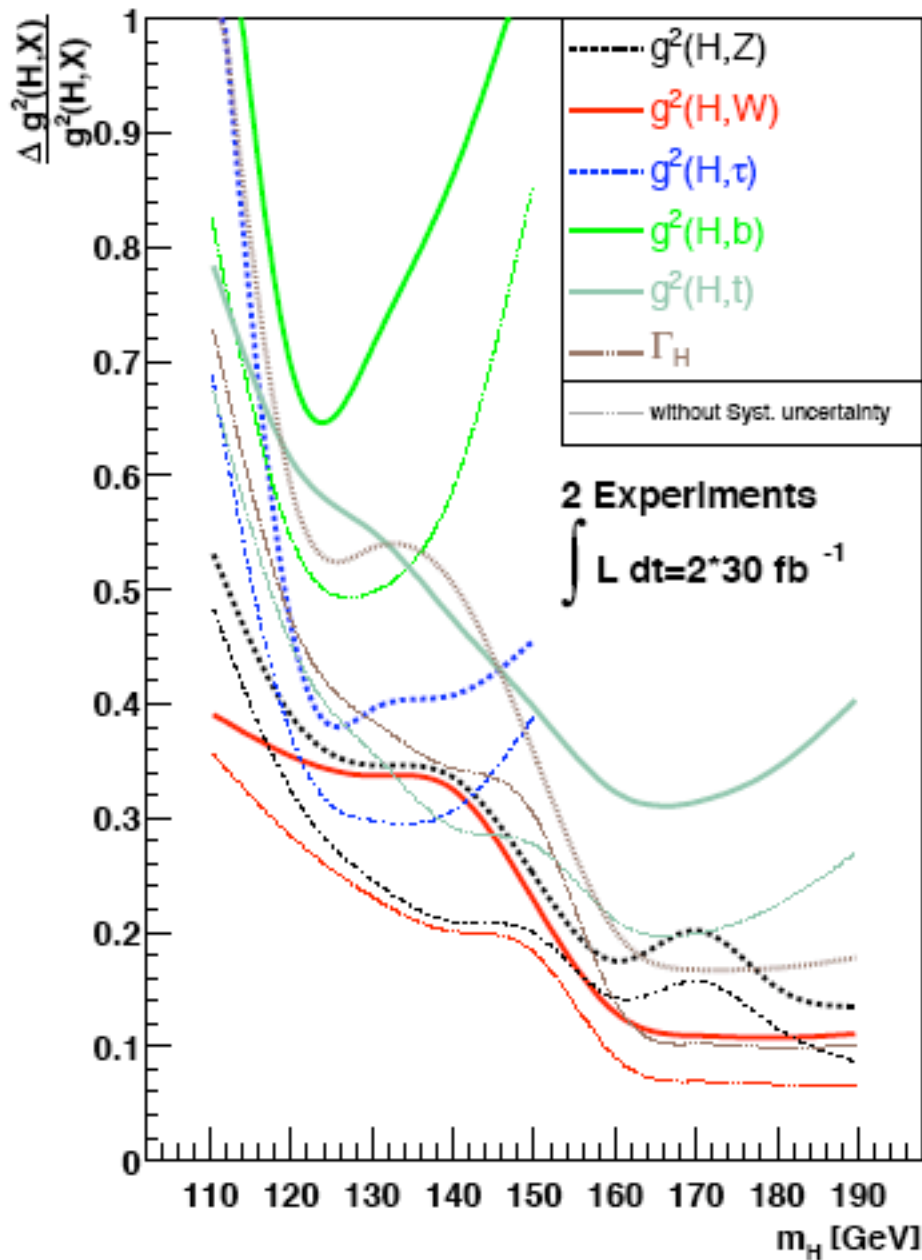
500

700

10²

m_H(GeV/c²)





Duhrssen, Heinemeyer, Logan, Rainwater, Weiglein, Zeppenfeld