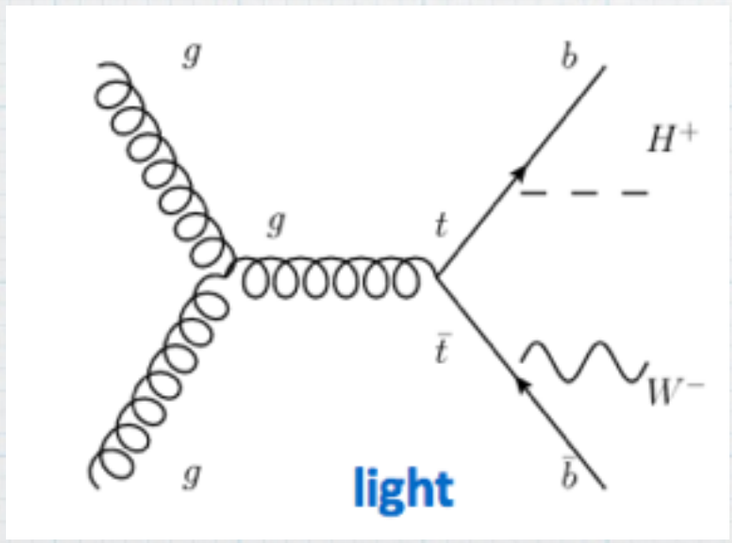
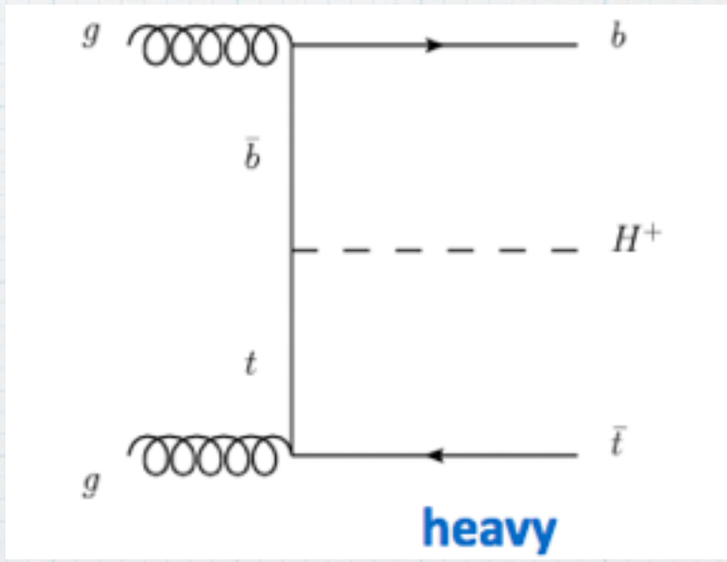
Charged Higgs search at ATLAS

Yoram Rozen - on behalf of SP4

Introduction

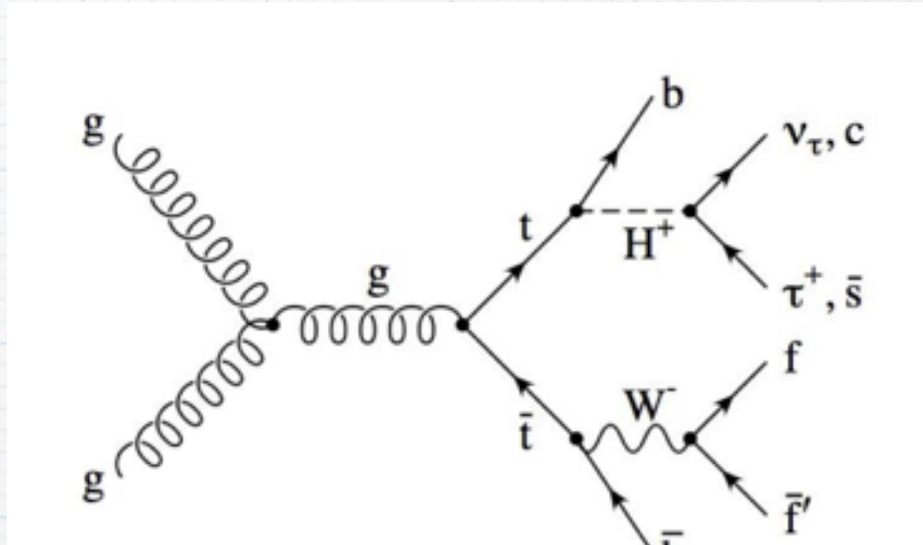
* In many extension of the SM a second Higgs doublet is allowed:
  - Five physical states: H^+ H^- H^0 h^0 A^0
  - H^+ H^- can be called light [m(H)<m(t)] or heavy which will determine its production and decay

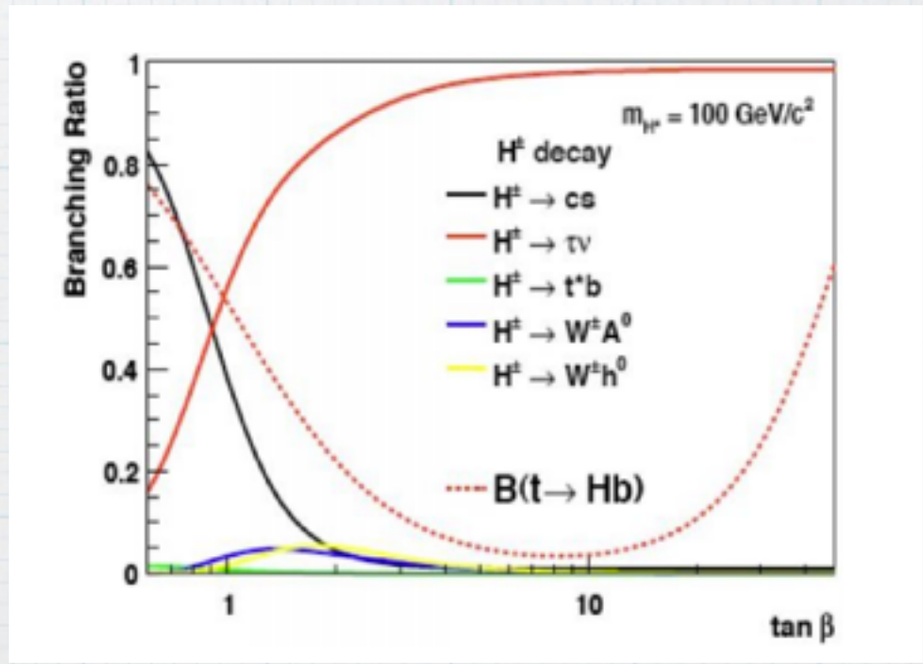




Light H^+

* gluon fusion production via top quark
* $t \to H^+ b$
* If $tg\beta < 1$ $H^+ \to cs$
  - "other" top leptonic
* If $tg\beta > 1$ $H^+ \to \tau\, \nu_\tau$
  - τ -> hadronic or leptonic
  - "other" top had or lep



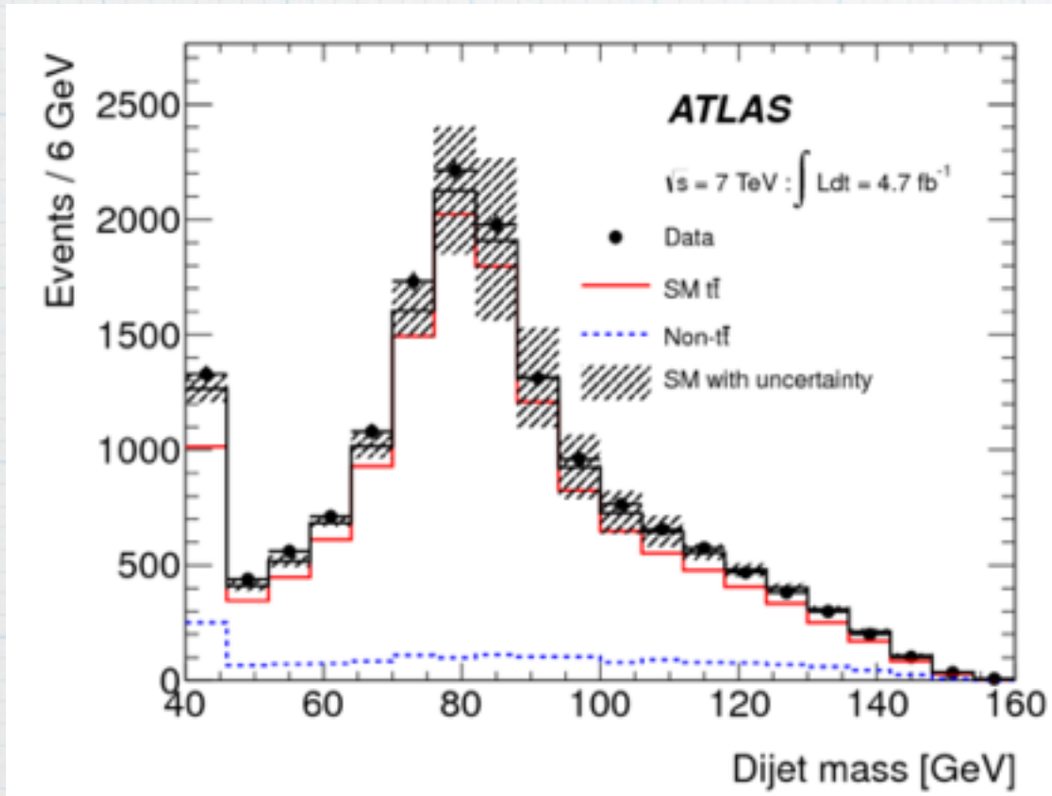


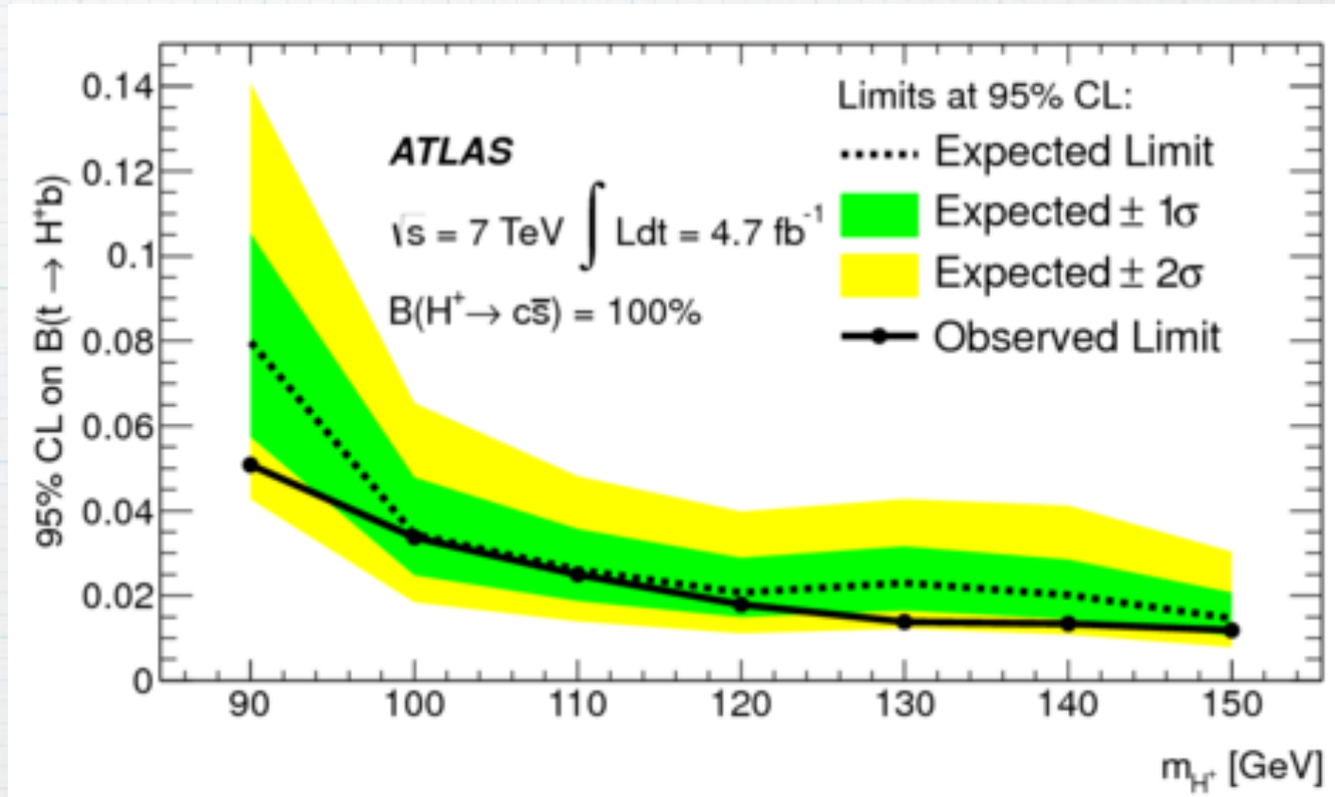
$H^+ \to cs$ ($90 < m_{H^+} < 150$ GeV)

* Lepton+jet environment
  - 1 lepton (e or μ)
  - >3 jets
    - with >1 b-tagged
  - MET cut (20, 30 GeV)
  - $M_T^W = \sqrt{2 p_T^l p_T^\nu [1-\cos(\Delta\Phi)]} > 30$ (60 inc MET for the μ channel)
  - 2 top systems (bjj and blν) within 1.5 GeV of top mass

H^+->cs results

* 4.7 fb-1 @7 TeV Eur. Phys. Jour. C 73 (2013)
* Background from multijets (QCD) and W+jets



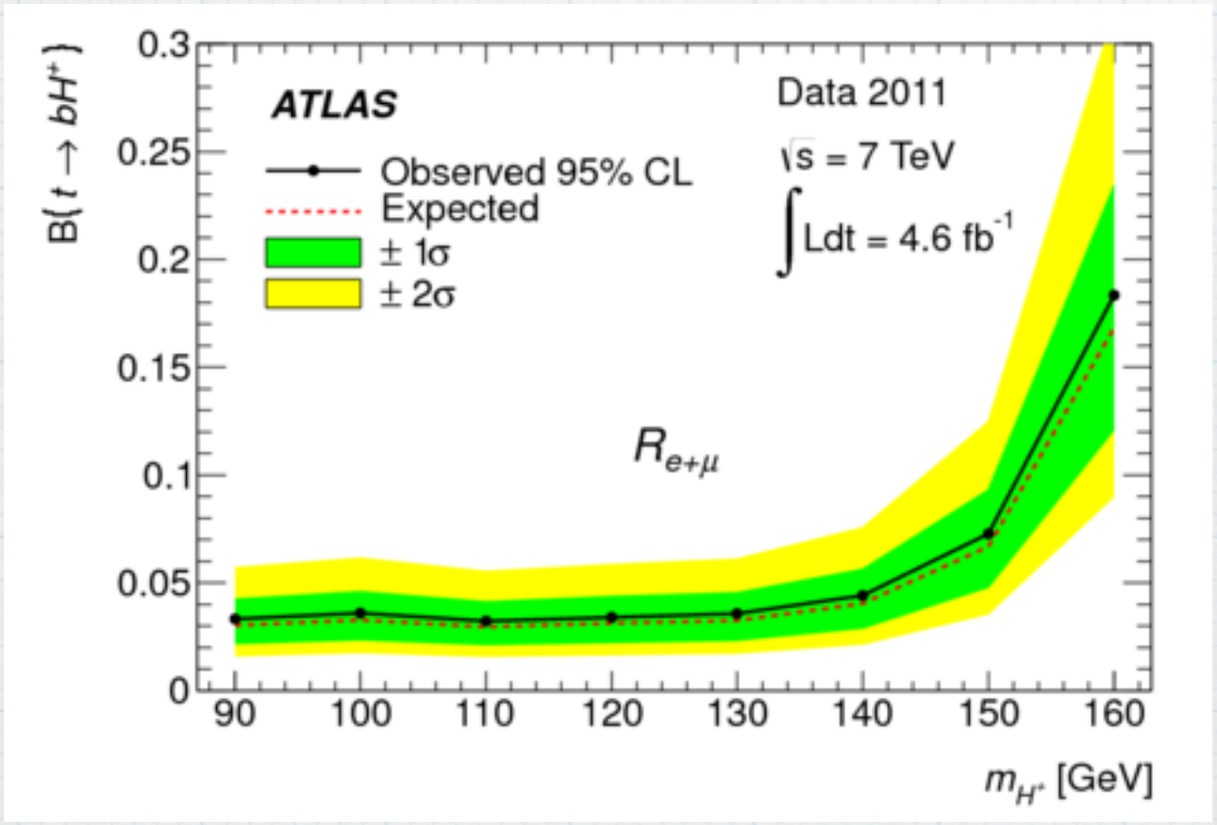


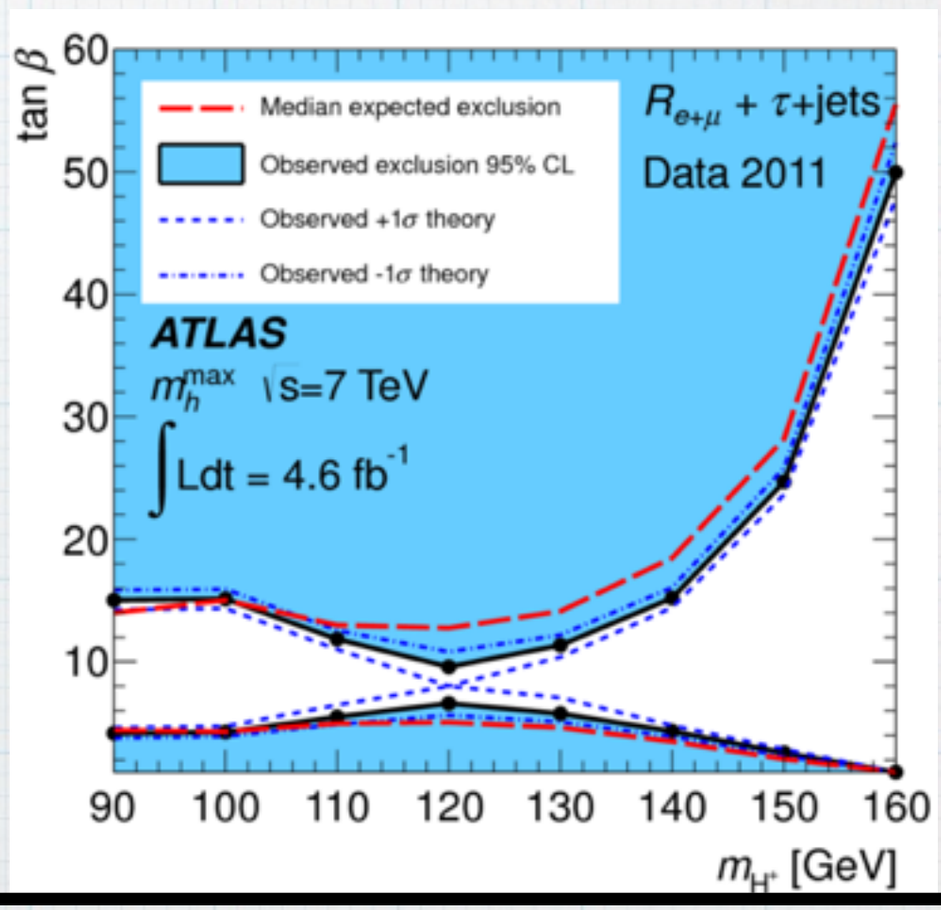
$H^+ \to \tau\nu$

* 7 TeV pubs:

JHEP 1206 (2012) 039

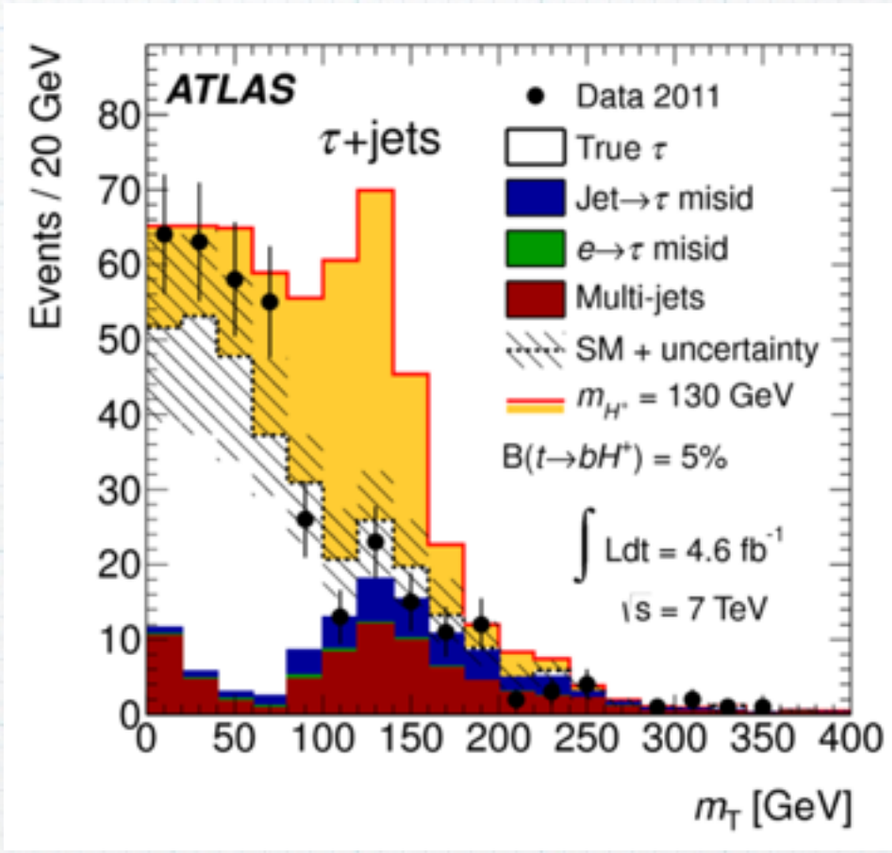
JHEP 03 (2013) 076 - Ratio method





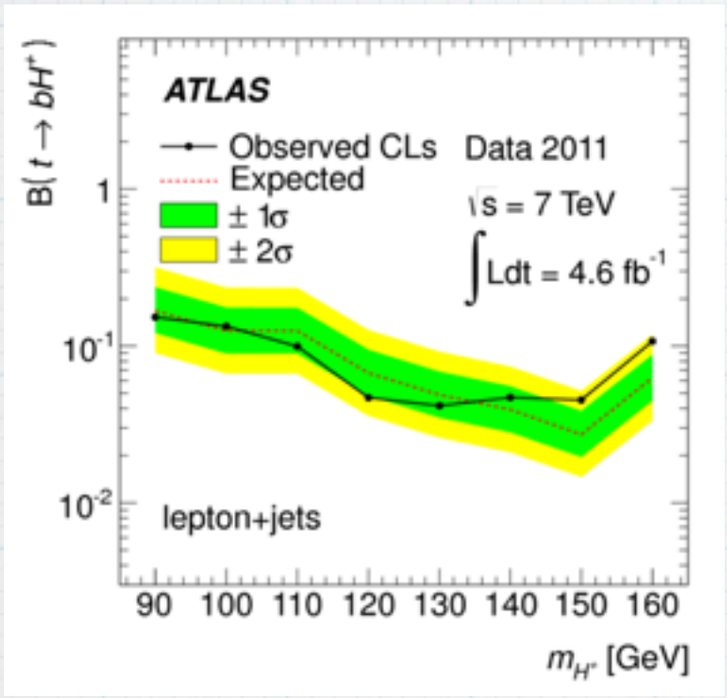
7 TeV $H^+ \to \tau\nu$

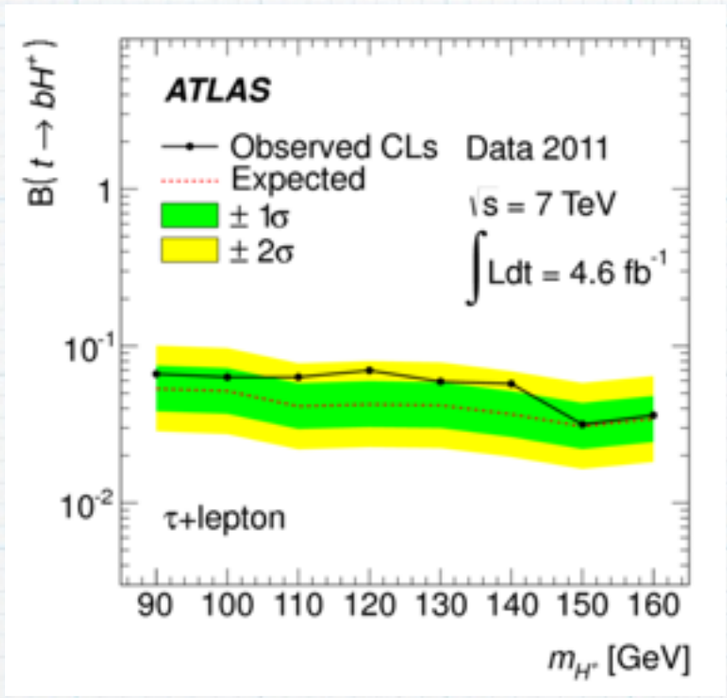
* Many different selections for the multiple final states
  - τ(had)+ jets
  - τ(had)+lepton
  - τ(lep)+jets

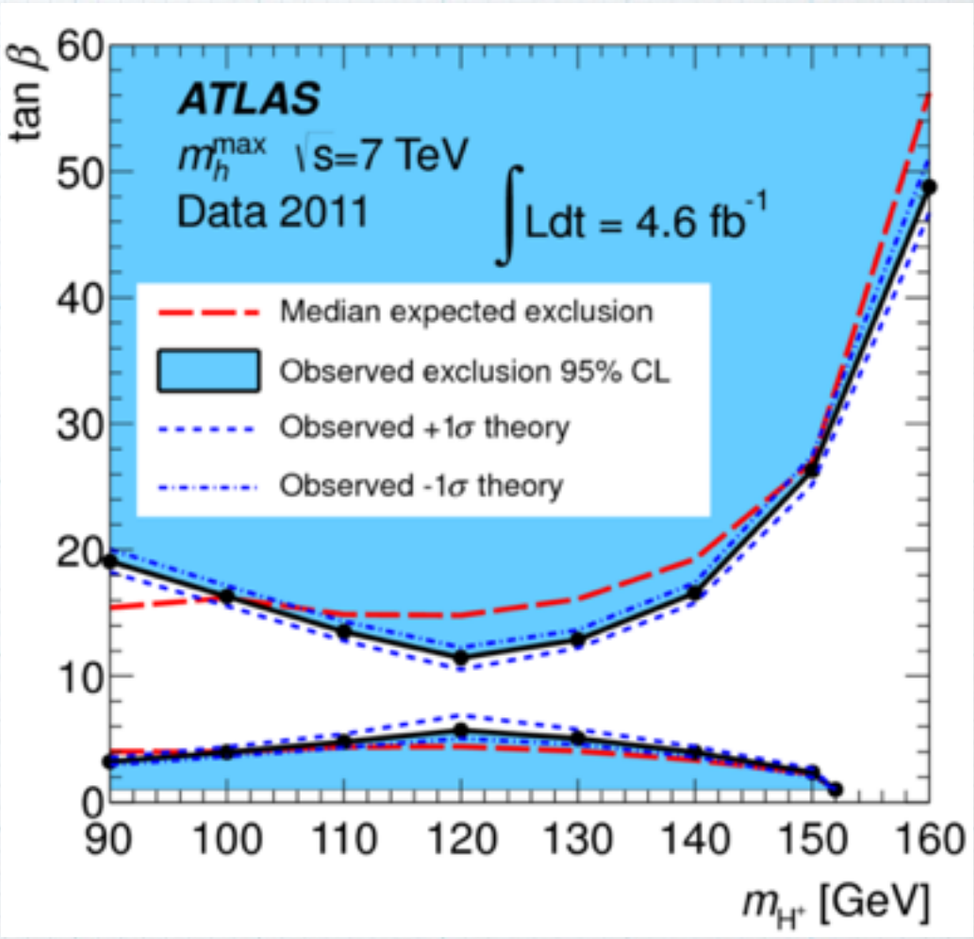


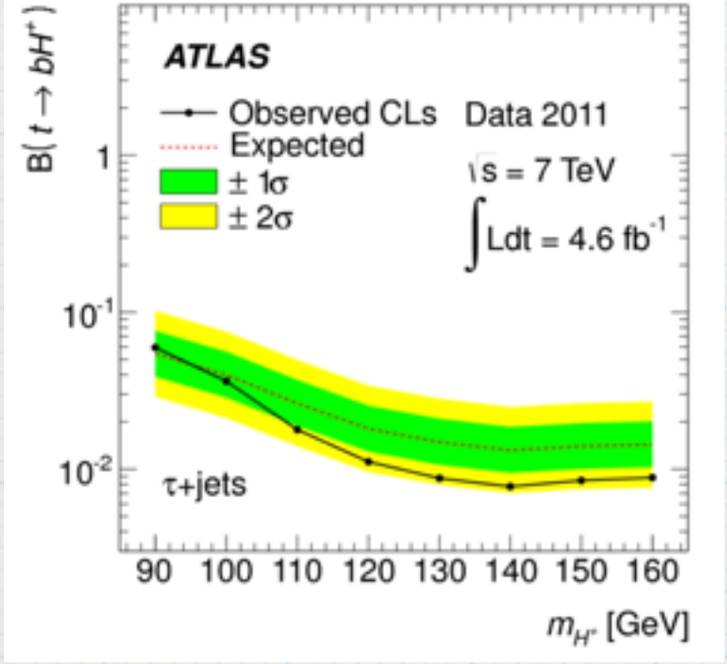
* Mostly data-driven background estimation

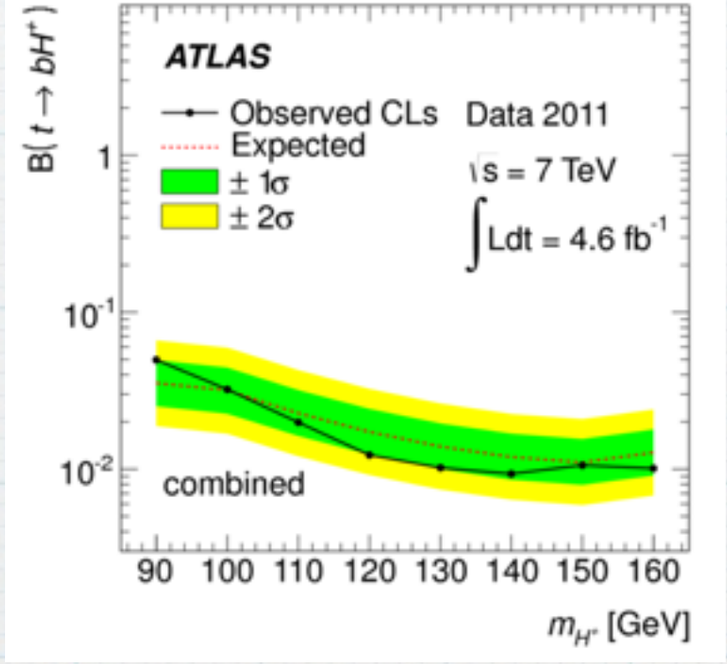
7 TeV $H^+ \to \tau\nu$ - Results





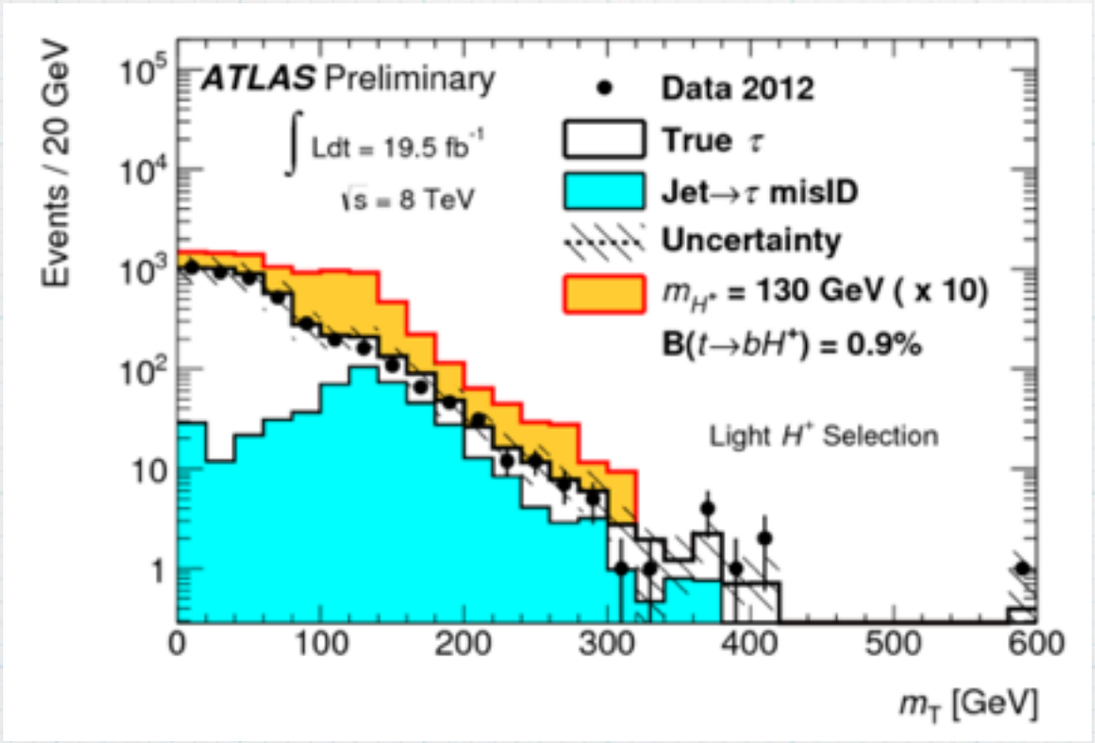


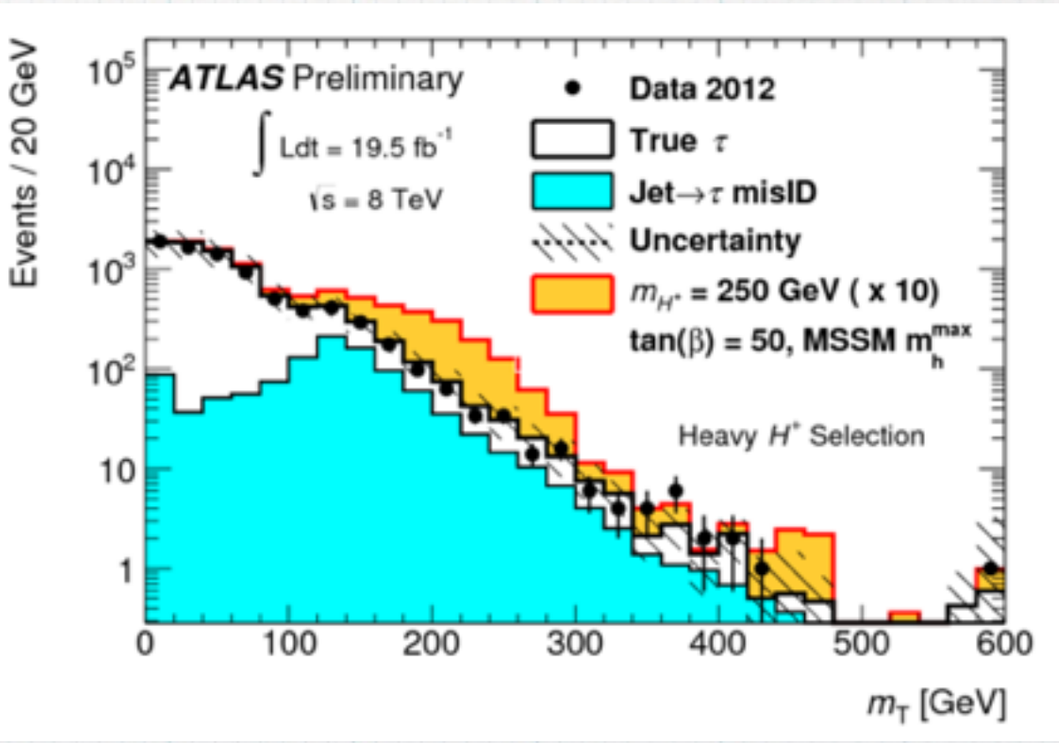




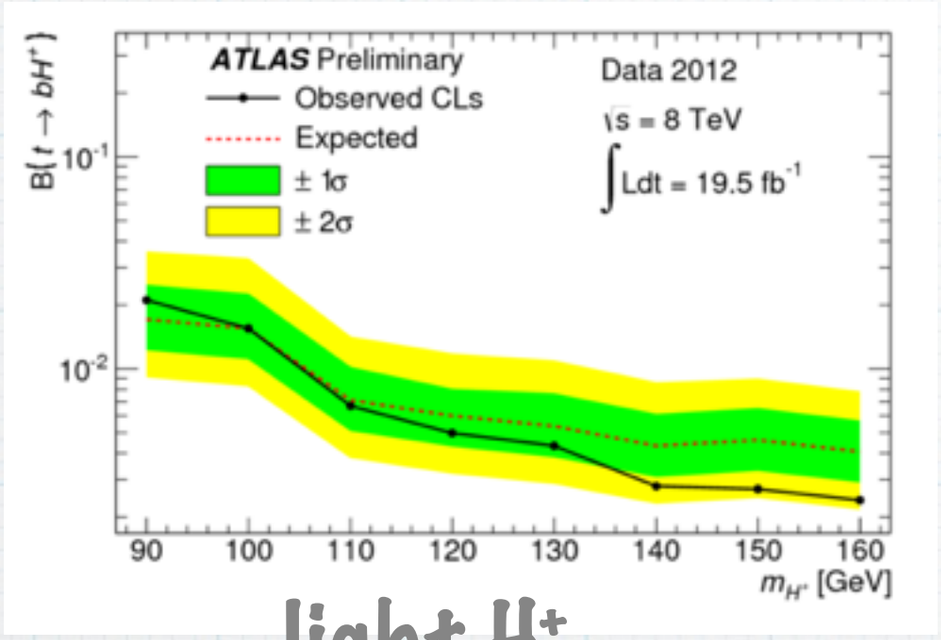
8 TeV $H^+ \to \tau\nu$

* Hadronic τ search for light and (heavy) H^+ [ATLAS-CONF-2013-090]
  - 4 (3) jets >1 b-tagged jet
  - MET > 65 (80)

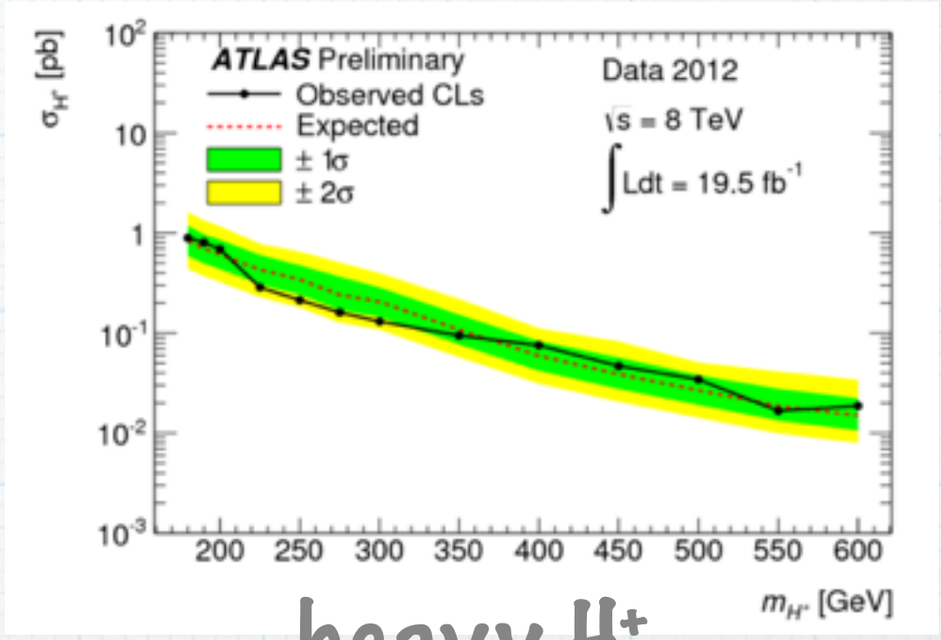




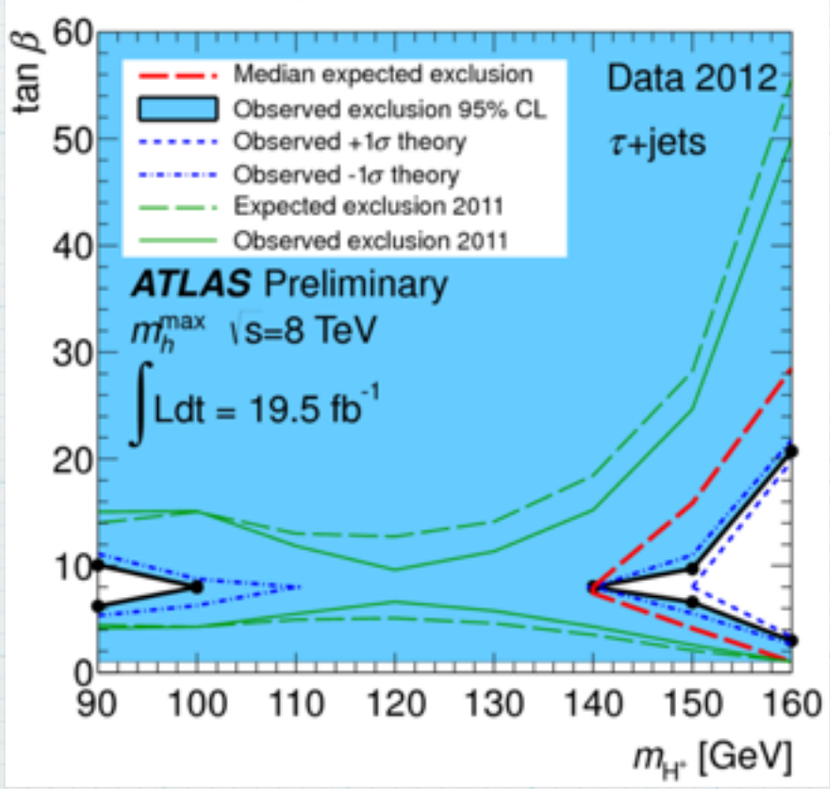
8 TeV $H^+ \to \tau\nu$ Results

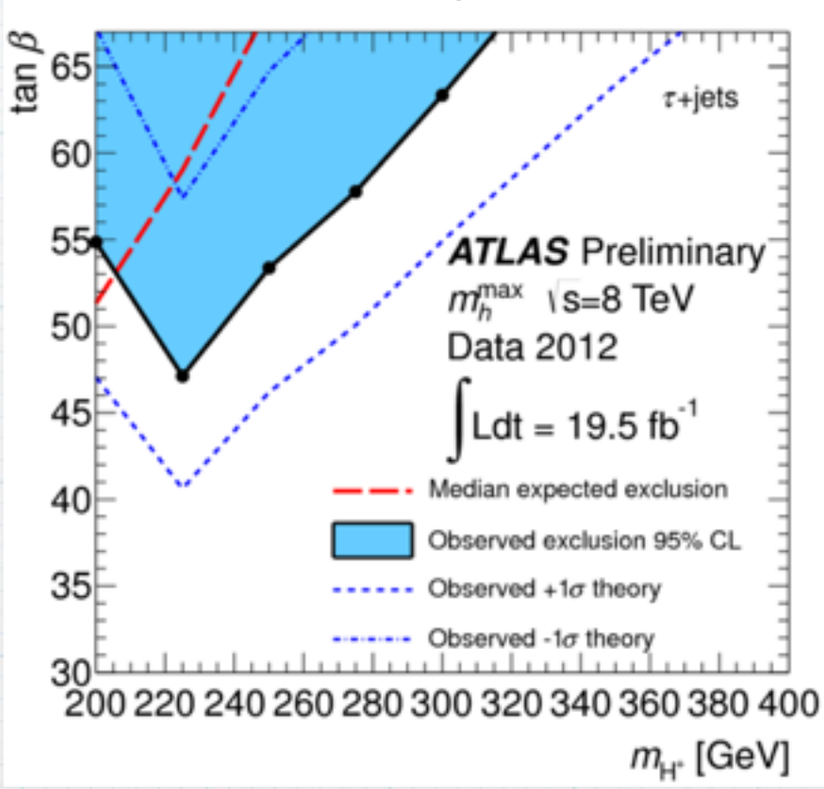


light H^+



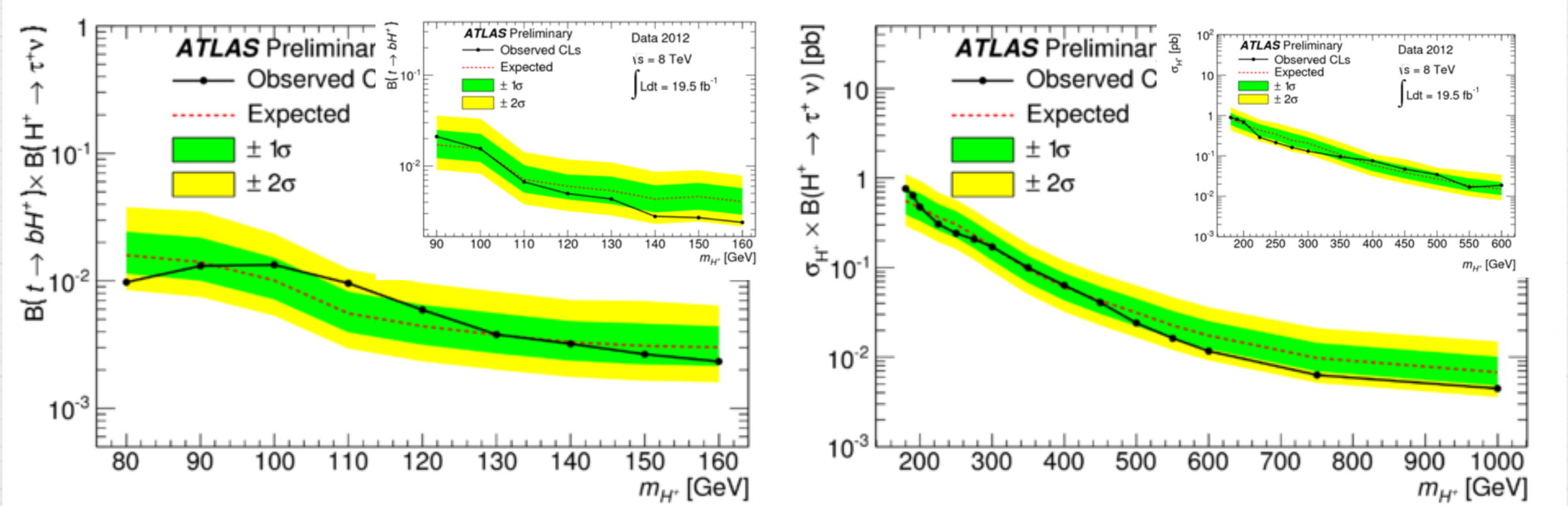
heavy H^+





8 TeV $H^+ \to \tau\nu$ Recent update (Sept 17th)

* [ATLAS-CONF-2014-050]



Notable Contributios

* Liron Barak - H^+->tb Coordinator
* Jana Schaarschmidt - Charged Higgs Convener

Summary

* The search for charged Higgs at ATLAS is carried in various production and decay modes. With both fermionic and bosonic couplings.

* SM prediction was found to be consistent with the ATLAS data ->No signal observation

* Large parts of the mH/tan β plane were excluded