New results of the $H^{+} \rightarrow tb$ search using full Run-2 data with the ATLAS detector

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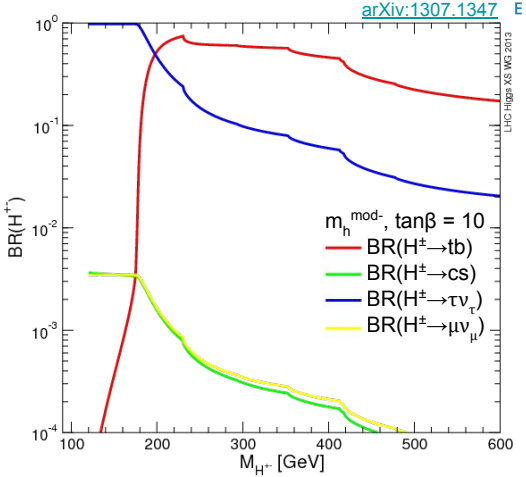
Motivation

➔Charged Higgs predicted in many BSM models

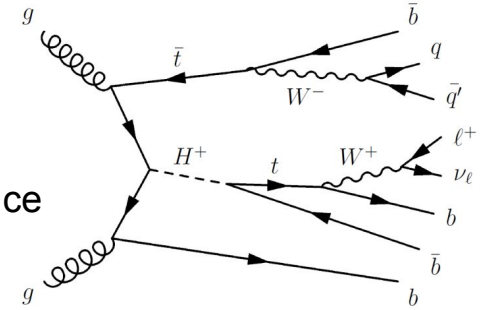
- In the 2HDM with cos(β-α) ~ 0 (the light neutral scalar is SM-like) the dominant decay is $H^+ \to tb$ for masses larger than 200 GeV

arXiv:1307.1347



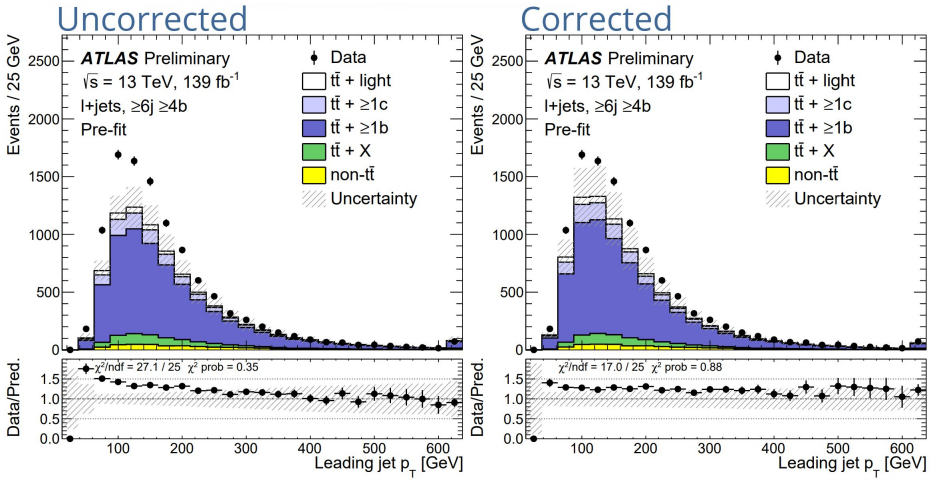
➔Search for H^+ produced in association with top and bottom quarks in 200 - 2000 GeV mass range

- Full Run-2 dataset used (139 fb^{-1}), previous publication based on 2015+2016 (36 fb^{-1}) 10.1007/JHEP11(2018)085
- Focused on the single lepton channel since it provides the best significance

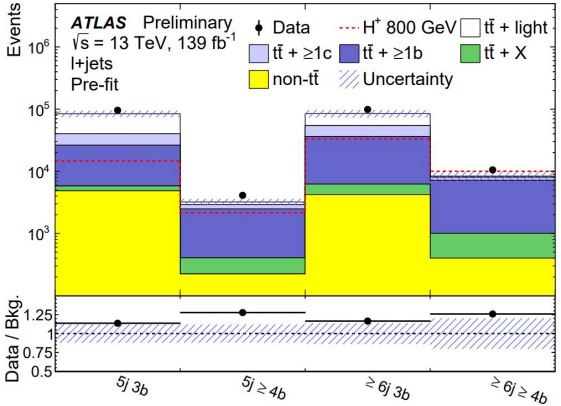


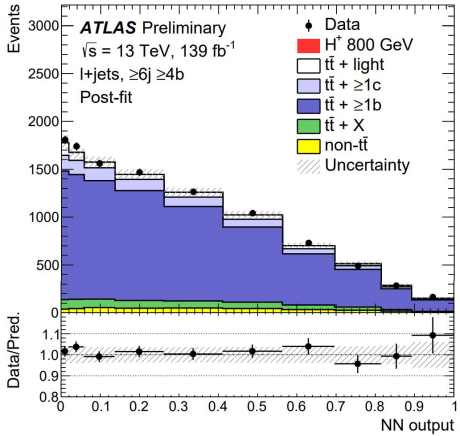
Analysis strategy

- Classify events depending on jet and b-jet multiplicities
  - Main background: $t\bar{t}$+≥1b in ≥4b regions and $t\bar{t}$+light in 3b regions
- Data/MC-based correction to mitigate $t\bar{t}$+jets mismodelling

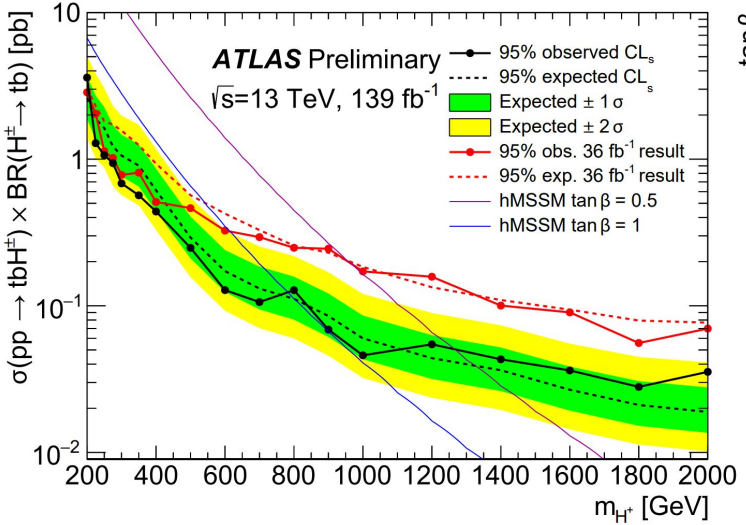


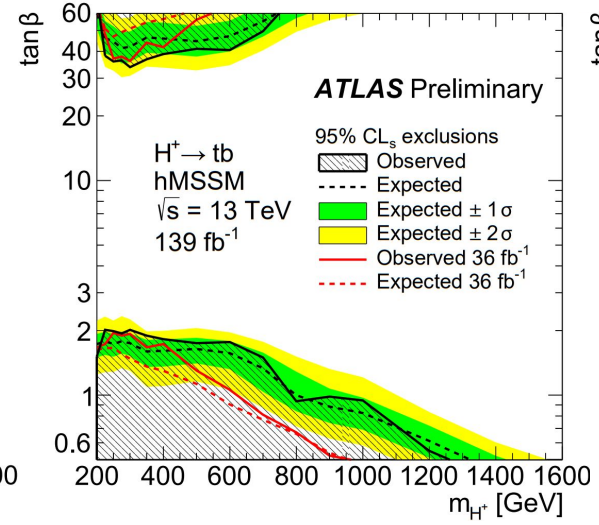
- Profile likelihood fit to mass-parameterised neural network (NN) output
  - Single training for each region and including all H^+ signal mass points
  - Normalisation of $t\bar{t}$+≥1b and $t\bar{t}$+≥1c backgrounds free floating in the fit
  - Systematic uncertainties included as nuisance parameters

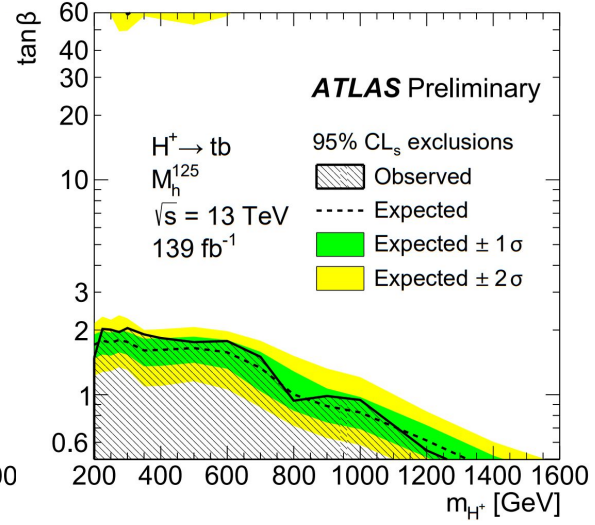




Results







➔Improved exclusion limits at 95% CL with respect to the 36 fb^{-1} publication, especially at high H^+ mass signal

➔More information in the full poster