

# Measurement of the top quark pair production cross section in 13 TeV proton-proton collision data in the lepton+jets final state with the ATLAS detector

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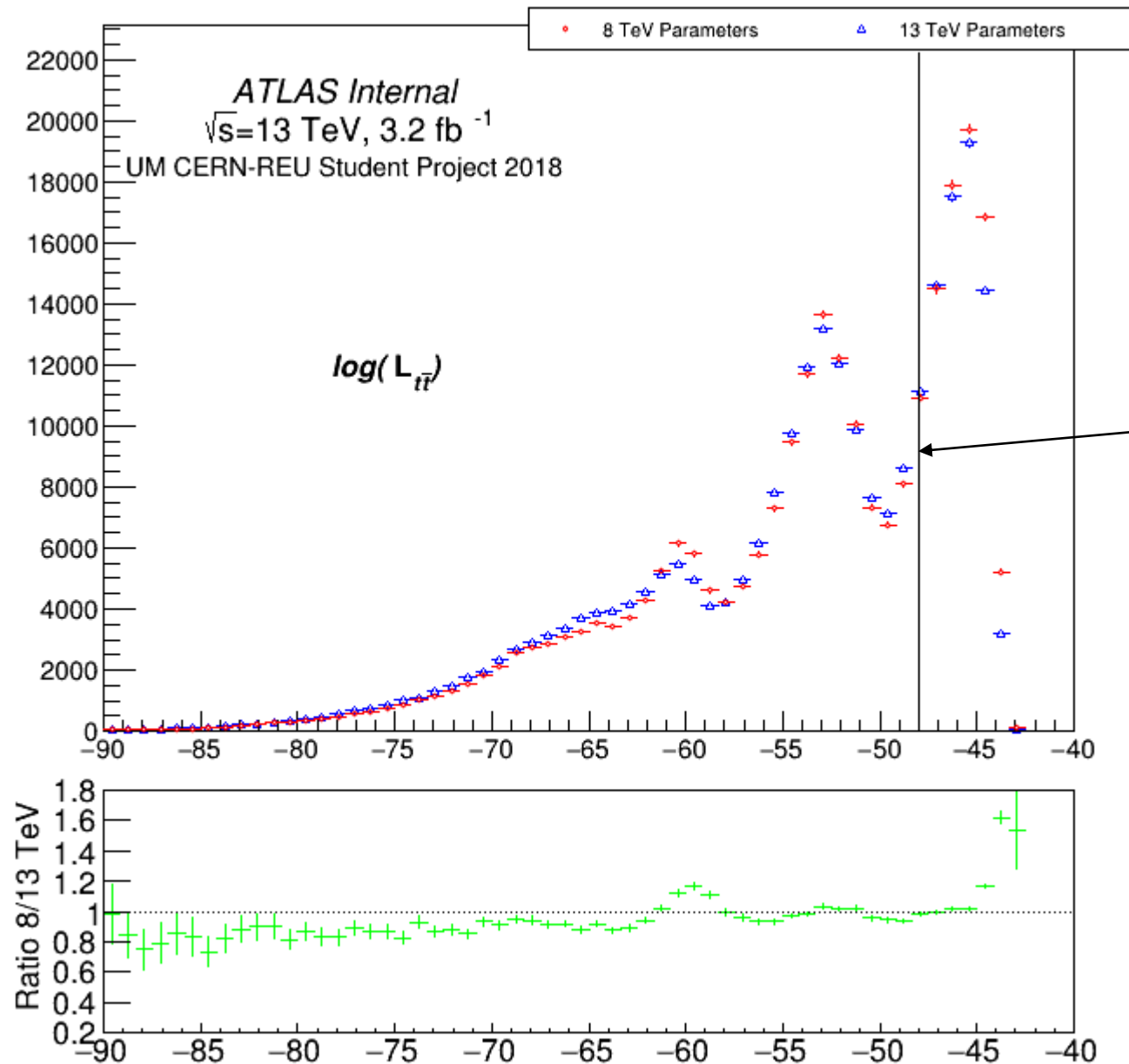
University of Michigan CERN-REU Student Project Update

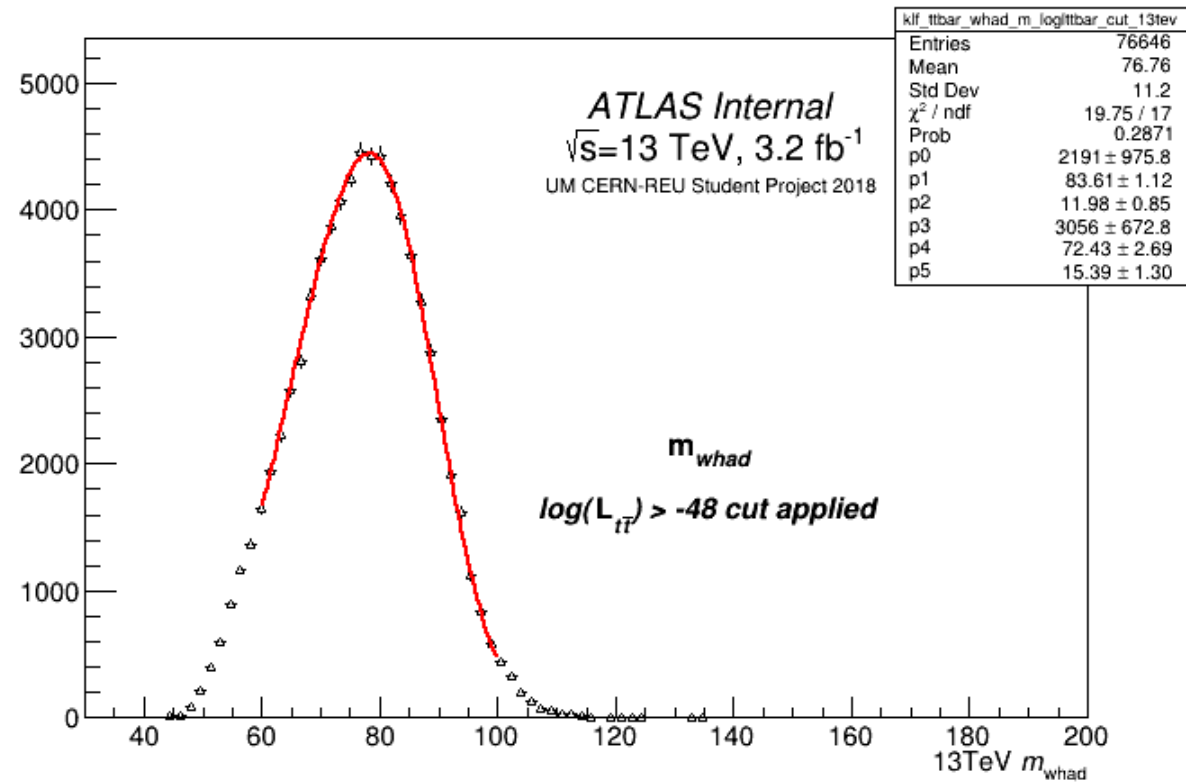
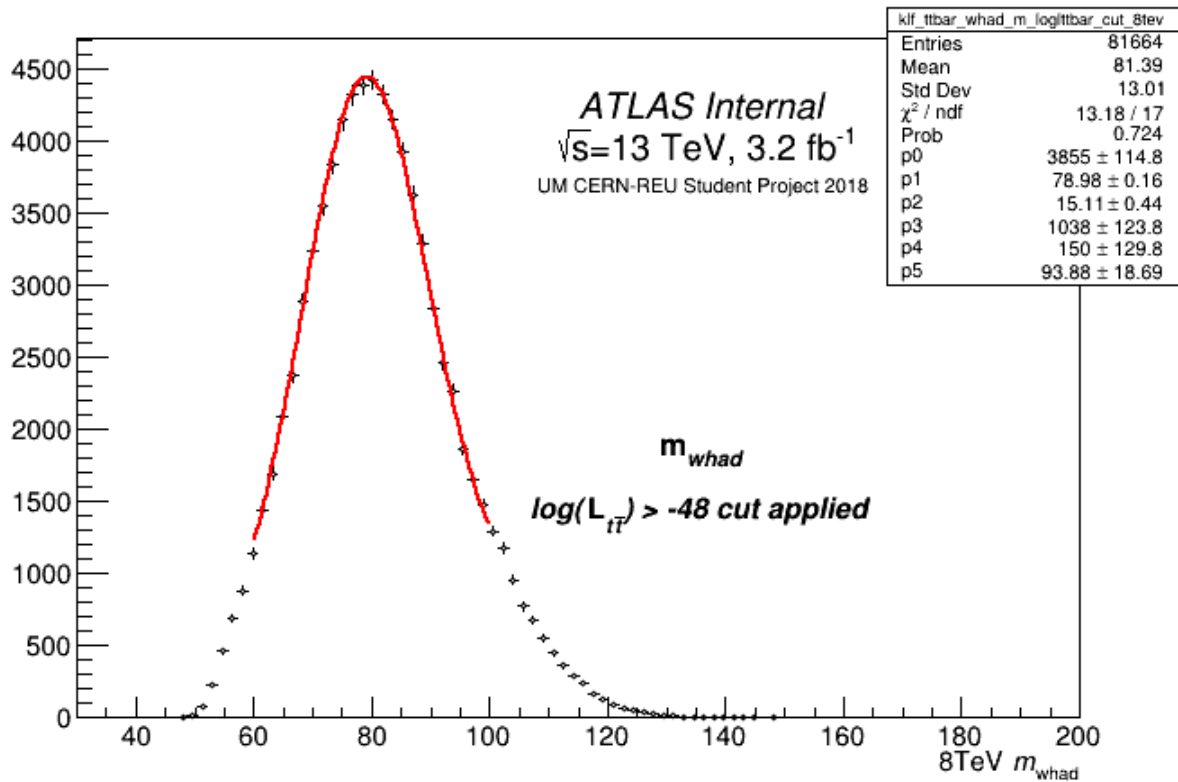
# ATLAS Top Quark Group & BCM Group

- Studies top quark production at LHC and precision measurements of its properties
- Top quark is biggest background for physics beyond the Standard Model searches
- Cross section is an important property used for overall modeling of the top quark
- BCM Detector gives luminosity uncertainty used in ATLAS physics analysis
- Cross section and luminosity are related by:
  - *Number of Events = Luminosity \*  $\sigma_{t\bar{t}}$*

# Comparing 8 vs 13 TeV Transfers Functions

- 8TeV transfer functions derived in  $\sqrt{s} = 8 \text{ TeV}$  are still used for  $\sqrt{s} = 13 \text{ TeV}$
- $3.2 \text{ fb}^{-1}$  data collected in 2015 with  $\sqrt{s} = 13 \text{ TeV}$  analyzed
- Goal:
  - To determine if using one vs the other makes a difference



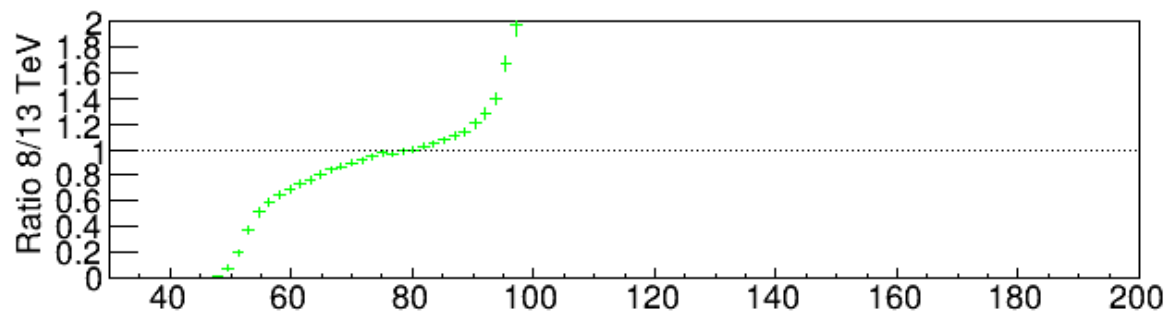
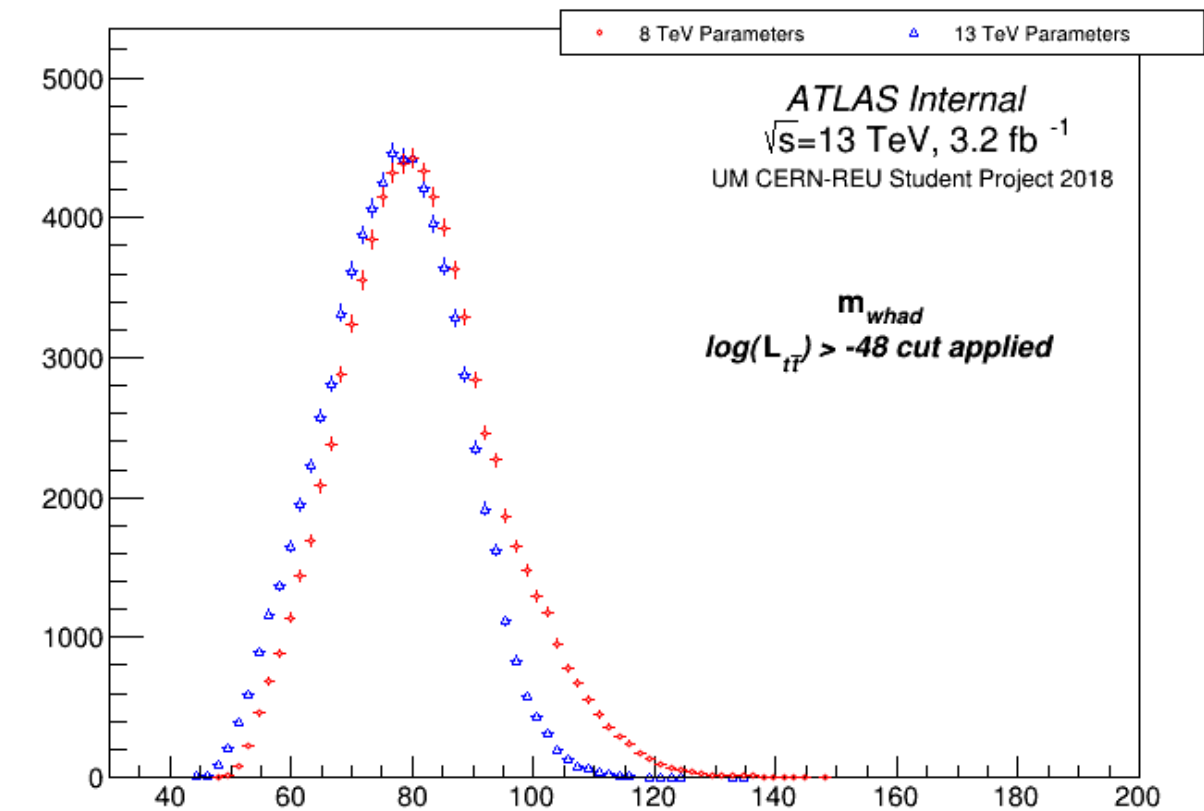
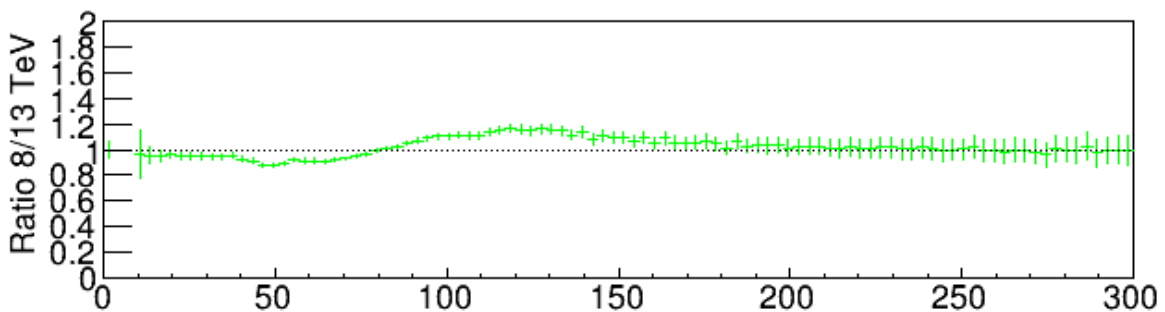
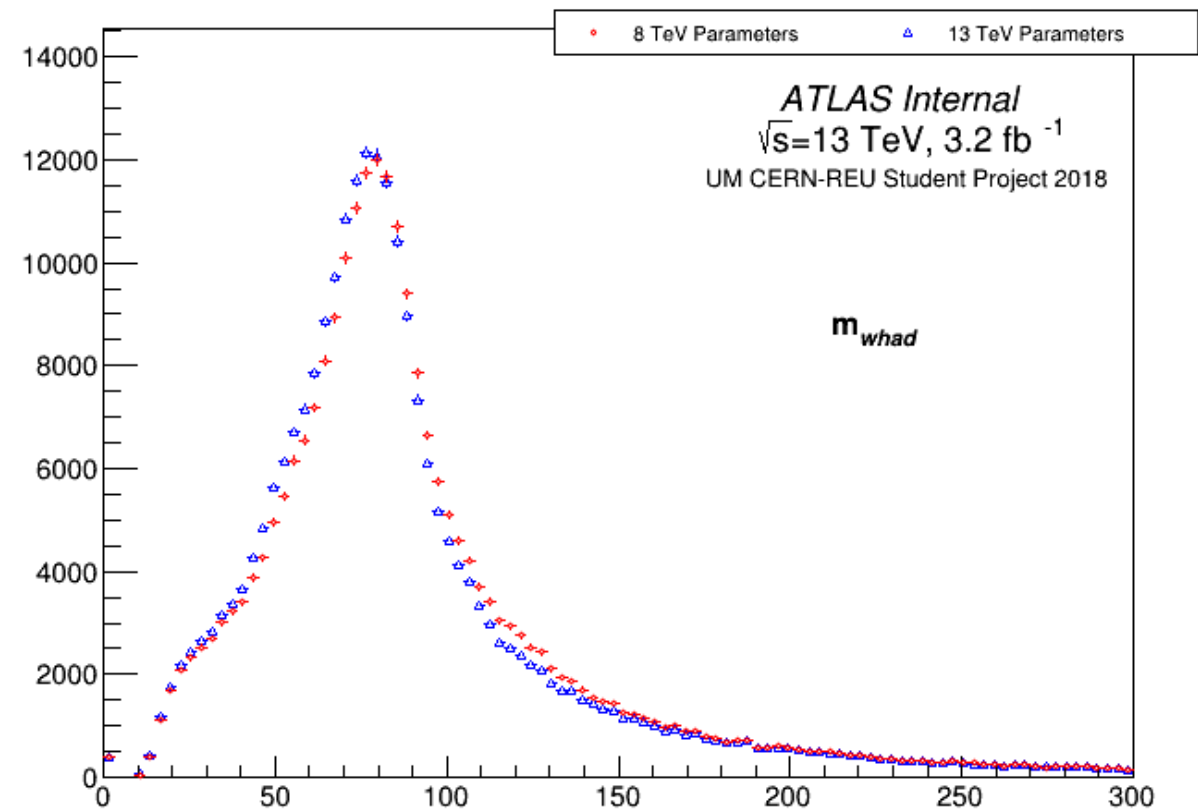


A shift to the left can be seen clearly after a double gaussian fit as been applied to the 8TeV and 13TeV results separately. The mean of  $m_{whad}$  with 8TeV parameters is  $\sim 81$ , while with 13TeV parameters it is  $\sim 77$ ; however, the resolution is about 2GeV better for 13 parameters.

# Summary and Outlook

- Compared 8TeV and 13TeV parameters for transfer functions
  - Noticed a difference, especially in the fit variables
- Future Tasks:
  - Investigate template fitting
  - Determine whether the 13TeV parameters result in smaller signal to background ratio
  - Analyze BCM data to find biggest cause of uncertainty

# Backup



There is a noticeable shift to the left in the mass of the hadronic W when using 13TeV parameters.



