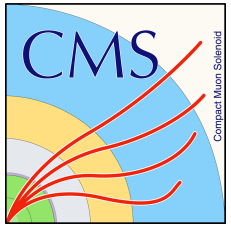
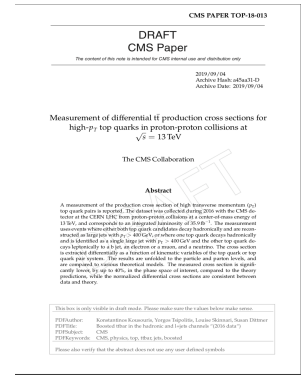
CMS ttX Round-table
Status Report
National Technical University of Athens

G. Bakas, K. Kousouris, I. Papakrivopoulos, G. Tsipolitis

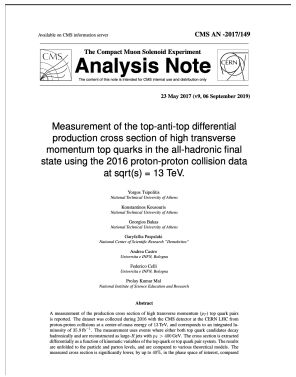


Status 2016 Analysis

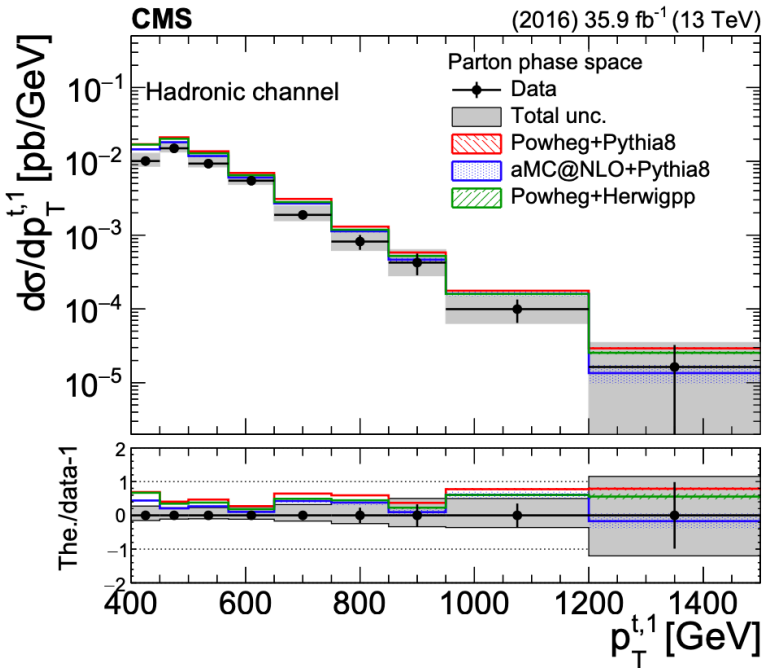
- ttbar differential cross sections in boosted l+jets and all-hadronic channel (2016)
  - TOP-18-013 and AN-2017/149
  - ARC authors meeting: decided that two investigated variables should change
    - No inclusive jet P_T and jet Eta
    - Now: leading jet P_T and absolute value of leading jet rapidity
    - Sub-leading jet P_T and absolute value of sub-leading jet rapidity
    - Consistent with the semi-leptonic analysis
    - Changes have been already implemented there are new versions both for AN and paper

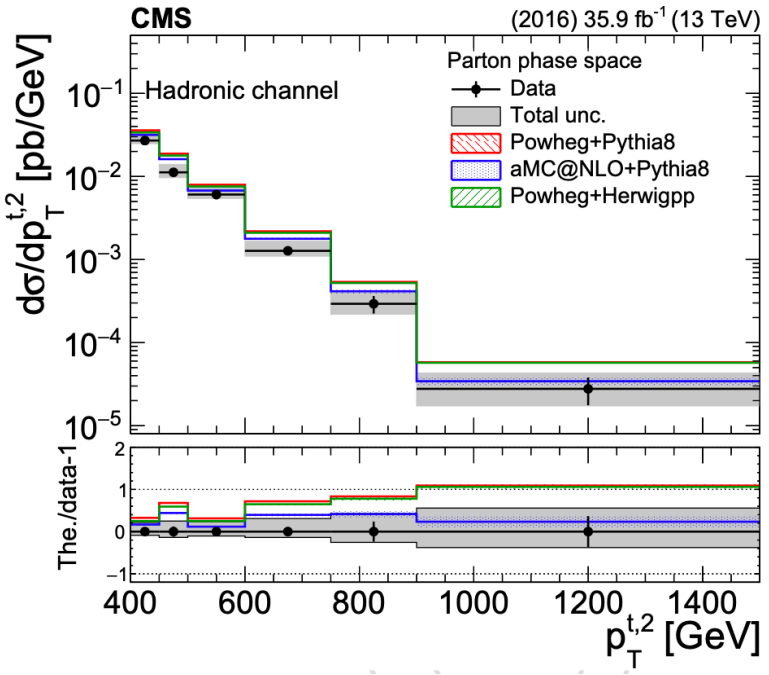


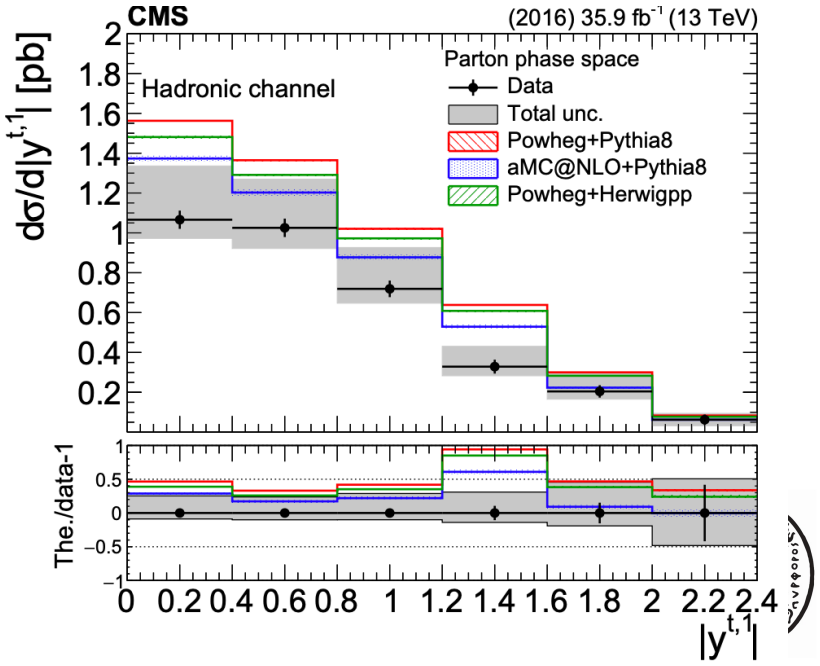
TOP-18-013



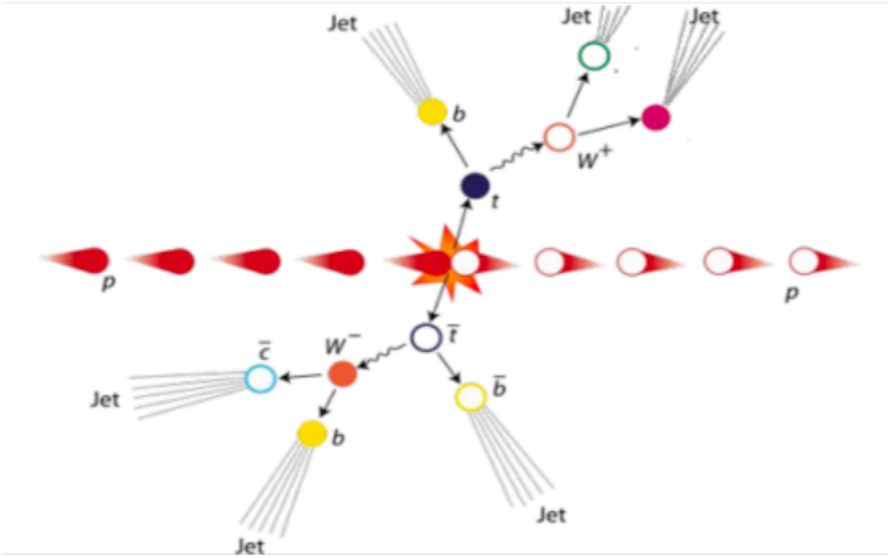
AN-2017/149



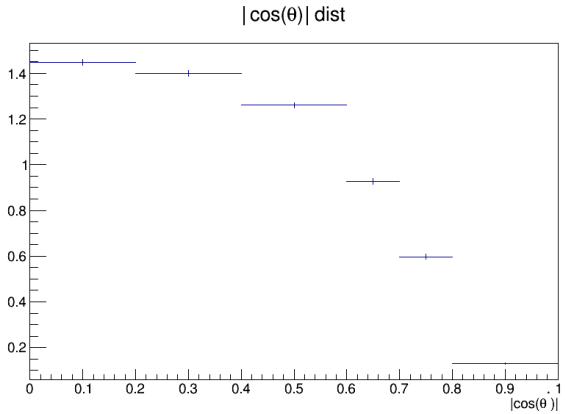




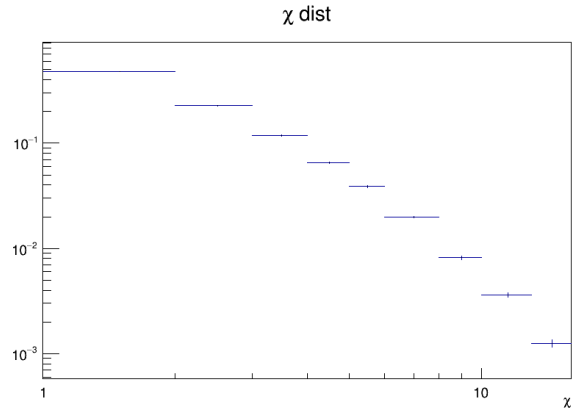
Status full RunII Data



- Final State/Decay Channel: Fully hadronic final state
- Boosted ttbar analysis ($P_T > 400$ GeV)
- Differential Cross section in different phase spaces for various variables
  - Fiducial and then unfolded to Particle and Parton phase space
  - ttbar system mass, P_T and rapidity (y)
  - Leading jet P_T and absolute leading jet rapidity (|y|)
  - Sub-leading jet P_T and absolute sub-leading jet rapidity (|y|)
  - |cos(θ*)|: where scattering angle θ* is the angle between top quark and z-axis in the Zero Momentum Frame
  - χ: where $\chi = e^{|2y^*|} = e^{|y_1 - y_2|}$ and y_1 and y_2 correspond to the rapidities of the 2 leading jets
- Looking into:
  - 2016: 9_4_XX re-reco
  - 2017: 9_4_XX
  - 2018: 10_2_XX
  - 2016 and 2017 and 2018 data
  - We are using only the TT bar samples with the Mtt cut (both 700-1000GeV and 1000-Inf GeV samples)



|cos(θ*)| parton: Sensitivity to BSM physics

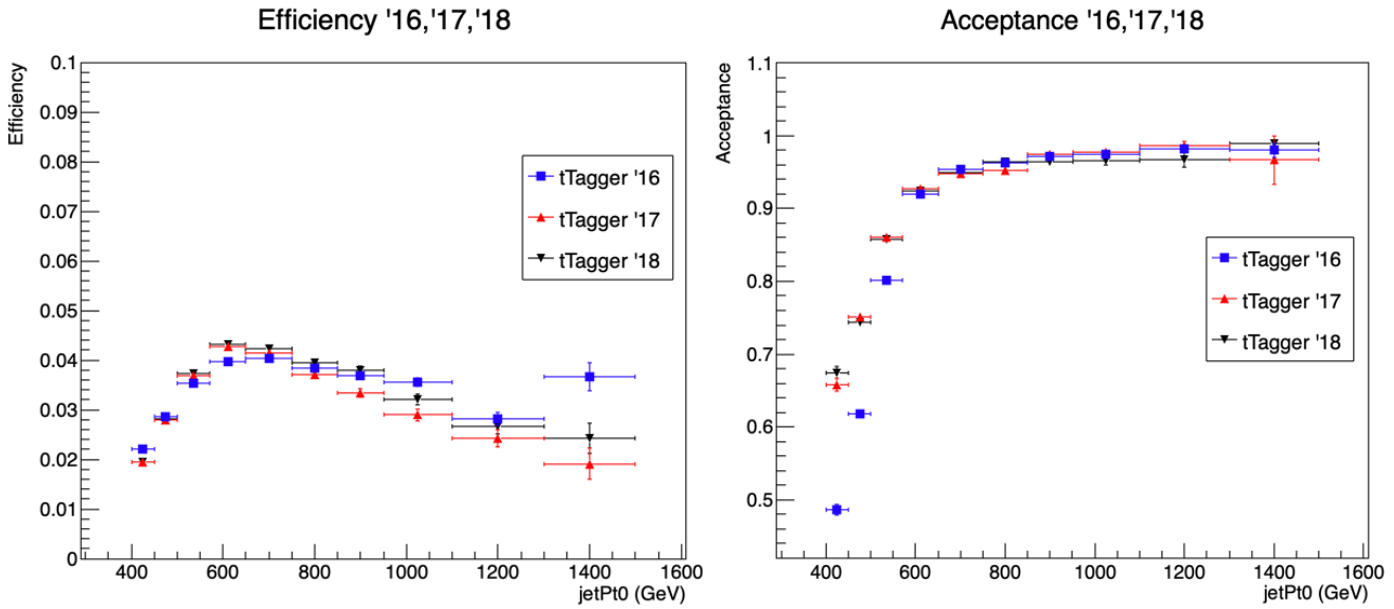


χ parton distribution

Status full RunII Data

- New “top Tagger” that discriminates top jet candidates and QCD multijet background jets
  - The new tagger is trained per jet and not per event
  - 3 separate trainings for each year (2016, 2017, 2018)
  - Efficiencies and acceptances for all variables for the 3 separate years
  - We have decided on 3 different Working Points for our tagger in order for the Efficiency of the leading jet P_T to be similar in all 3 years
  - Response matrices for all variables and for every year accordingly

- In agreement with other analysis as well as unknown CSVv2 Working Points for the 2018 MC , we are using the deepCSV b-tagger and not the CSVv2
- QCD closure tests
  - Shape comparison between signal and control region
- Data driven method to estimate the QCD bkg shape



Efficiency and Acceptance comparison for ‘16, ‘17, ‘18

Summary

- Finalize as soon as possible the 2016 publication (TOP-18-013)

- Full RunII analysis
  - Person power: 2 PhD students and 2 faculty members
  - Expand the 2016 analysis by adding more variables, attempt BSM constraints within the EFT framework (Effective Field Theory) and double differential cross section measurements
  - Timescale: End of 2020/ Winter Conference 2021
  - Significance Progress on software infrastructure and critical analysis tools (topTagger)
  - We plan to report regularly in forecoming ttX meetings