# HEP NTUA
# Weekly Report

# 1/6/2022

George Bakas

# Summary

- ttX analysis:

  - Integrate chi2 results in our final results
  - Send an email to set up pre-approval
  - AN 1st draft is almost ready
  - Begin to write paper

Chi2 Calculation based on TOP-20-006: *Measurement of differential cross sections for the production of top quark pairs and of additional jets in pp collisions at s=13 TeV*

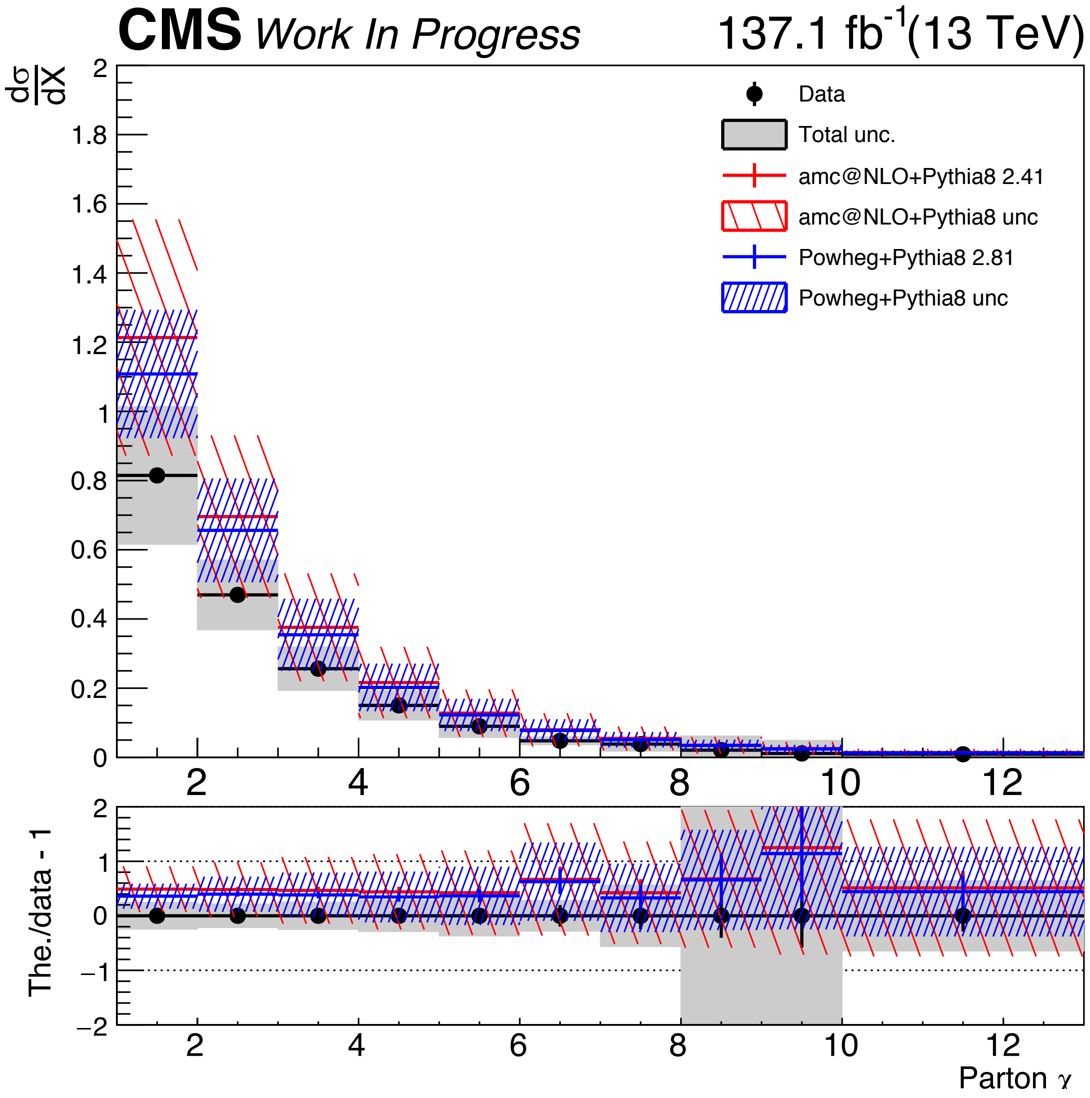
$$\chi^2 = R_N^T Cov_N^{-1} R_N$$

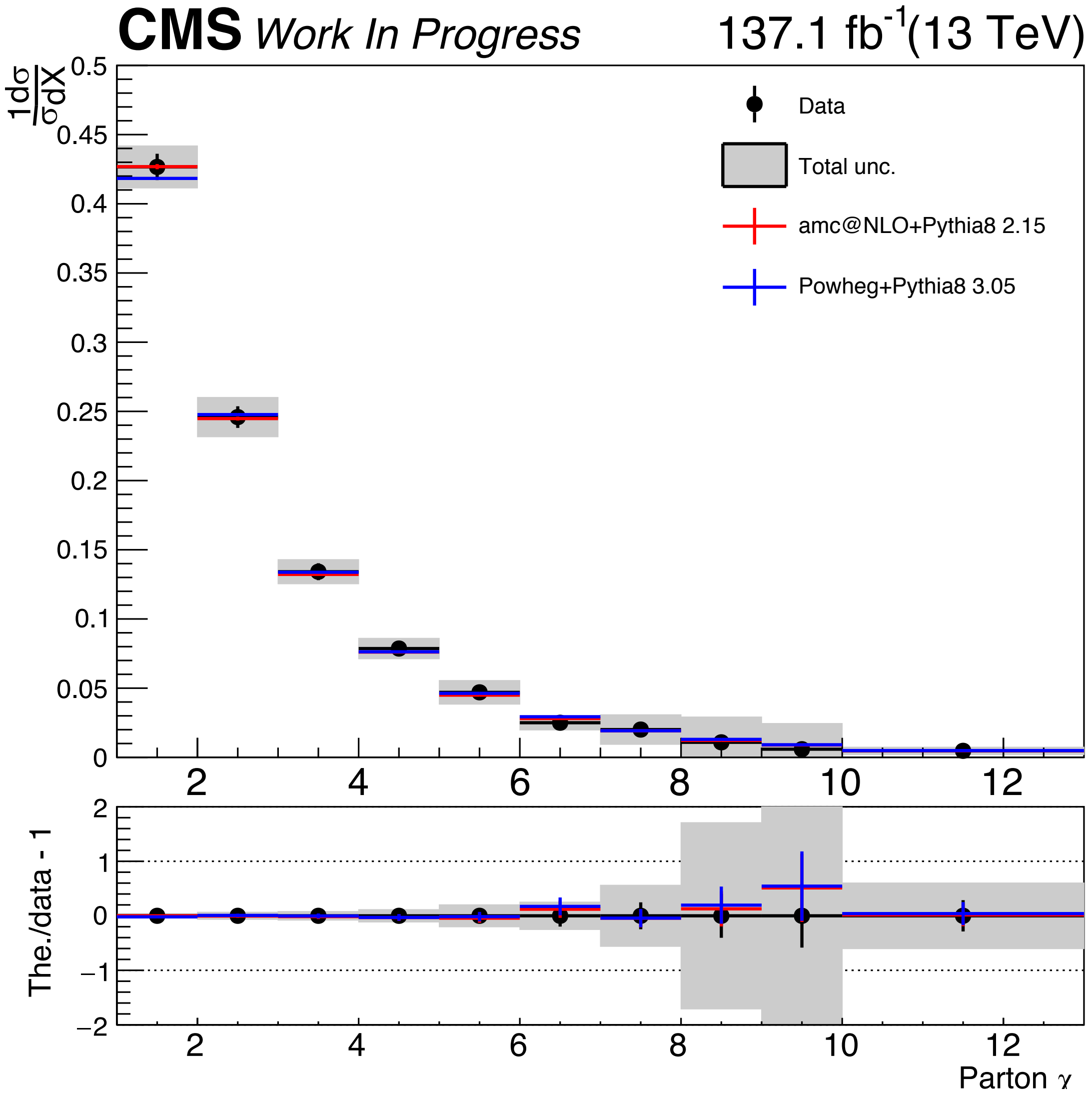
- N denotes the number of bins of the respective cross section distribution
- $R_N$: vector of differences of the measured cross sections and the corresponding predictions
- $Cov = Cov^{unf} + Cov^{syst}$, covariance matrices representing the statistical uncertainties from the unfolding, and the systematic uncertainties

$$Cov_{ij}^{syst} = \sum_{k,l} \frac{1}{N_k} C_{j,k,l} C_{i,k,l}\,, \qquad 1 \leq i \leq N\ , 1 \leq j \leq N\,,$$

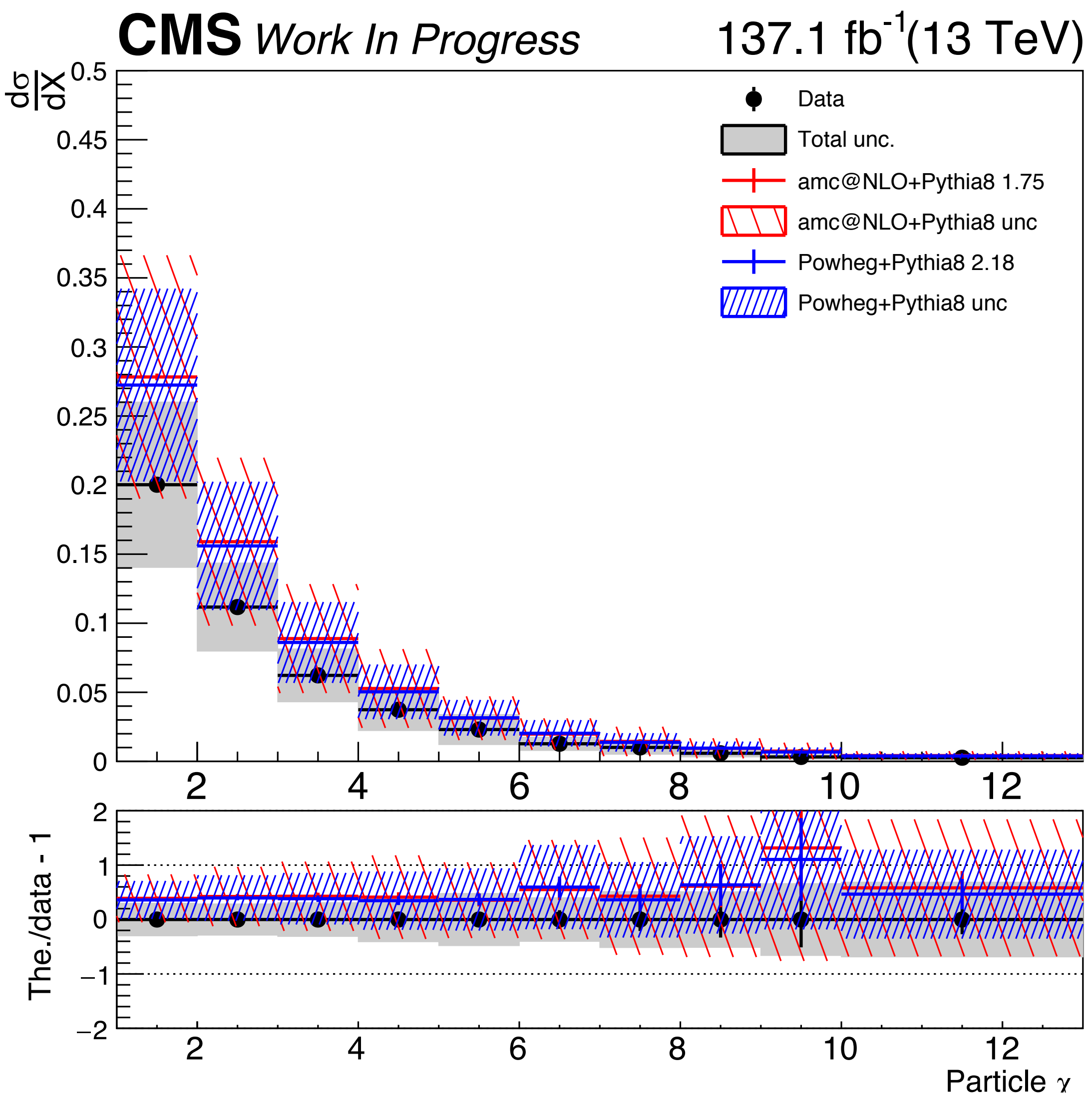
- Where $C_{j,k,l}$ denotes the systematic uncertainty from variation l of source k in the j-th bin
- $N_k$: number of variations of source k

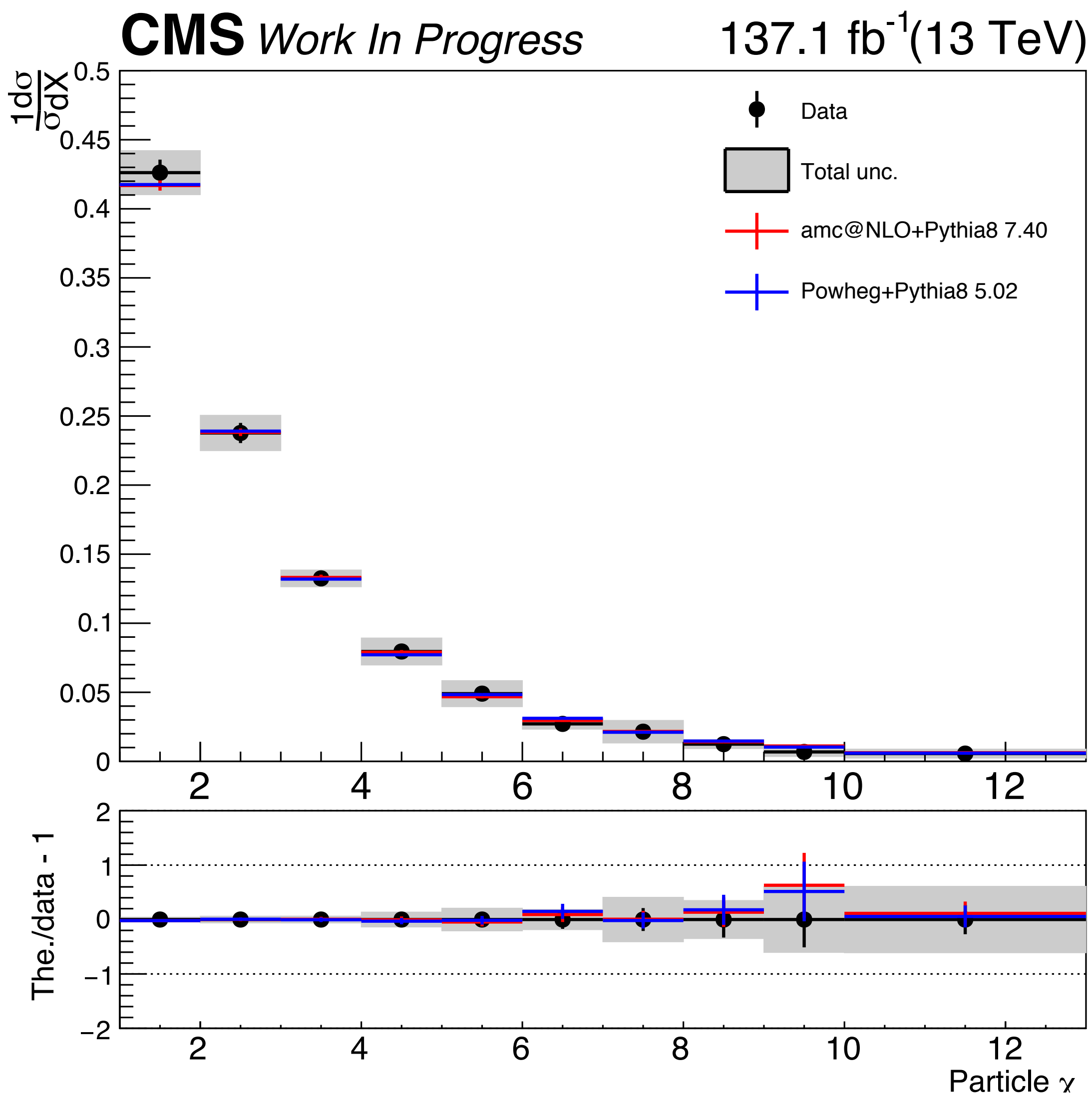
# Final Results Parton



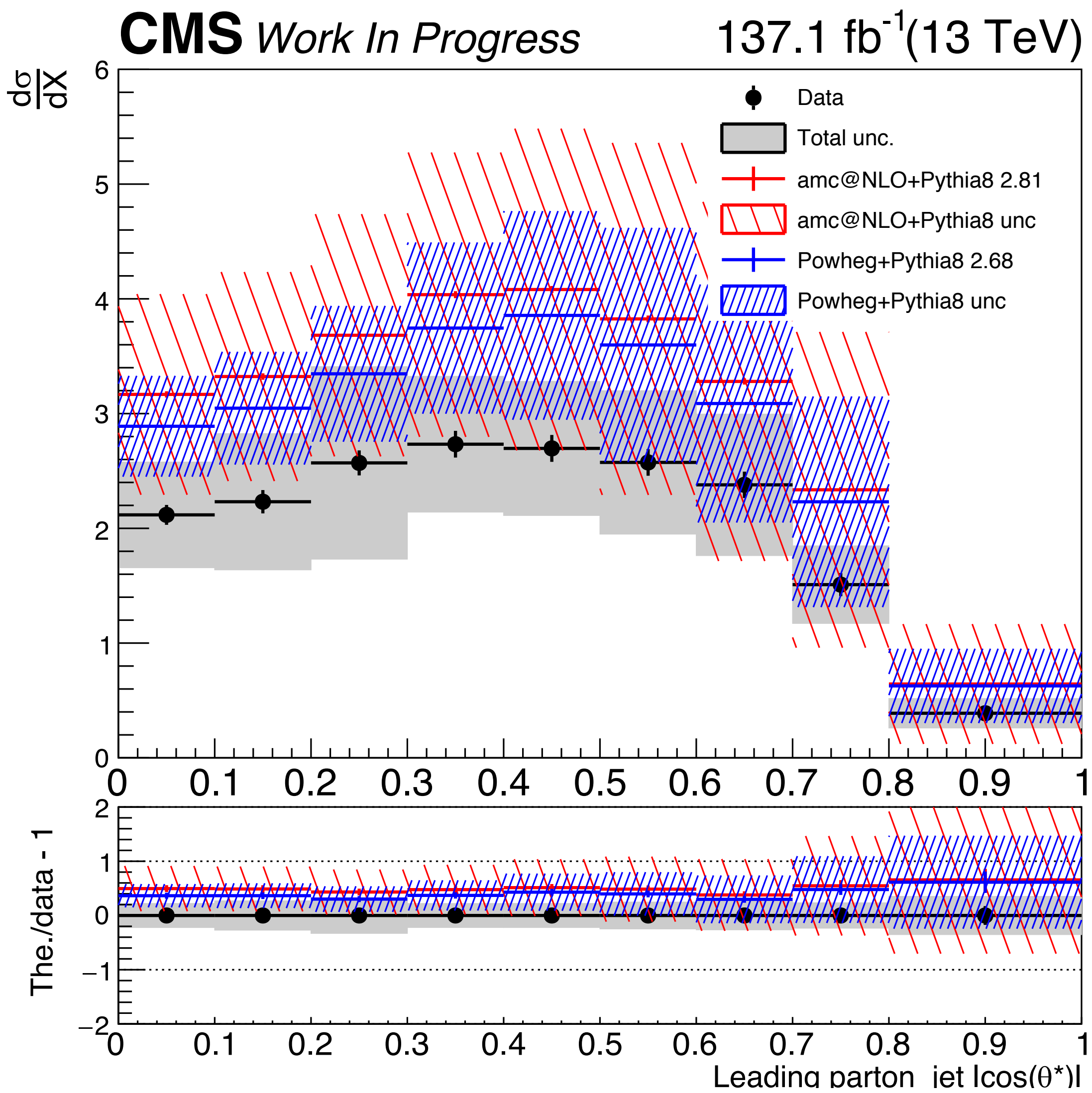



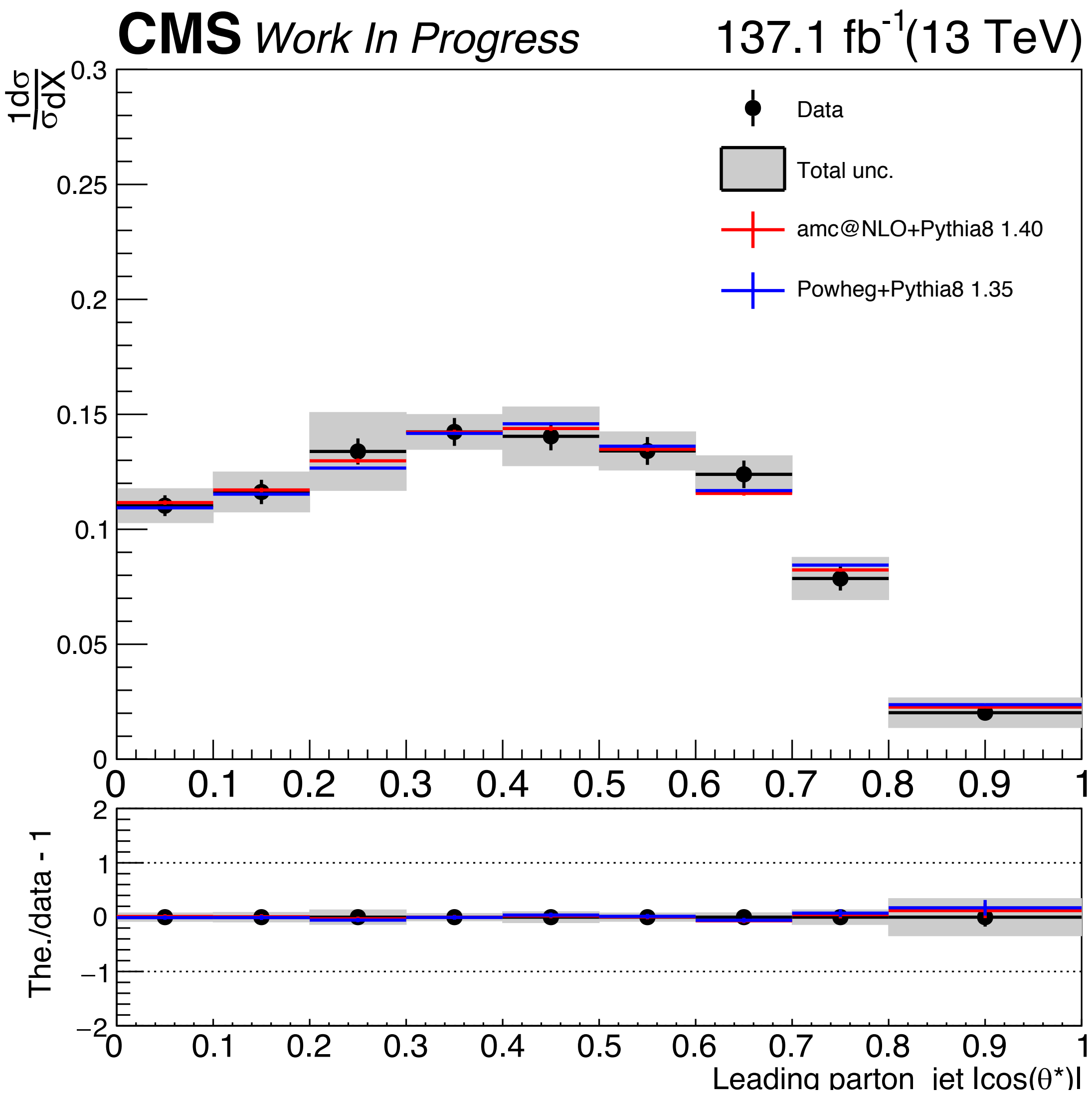
# Final Results Particle



# Final Results Parton



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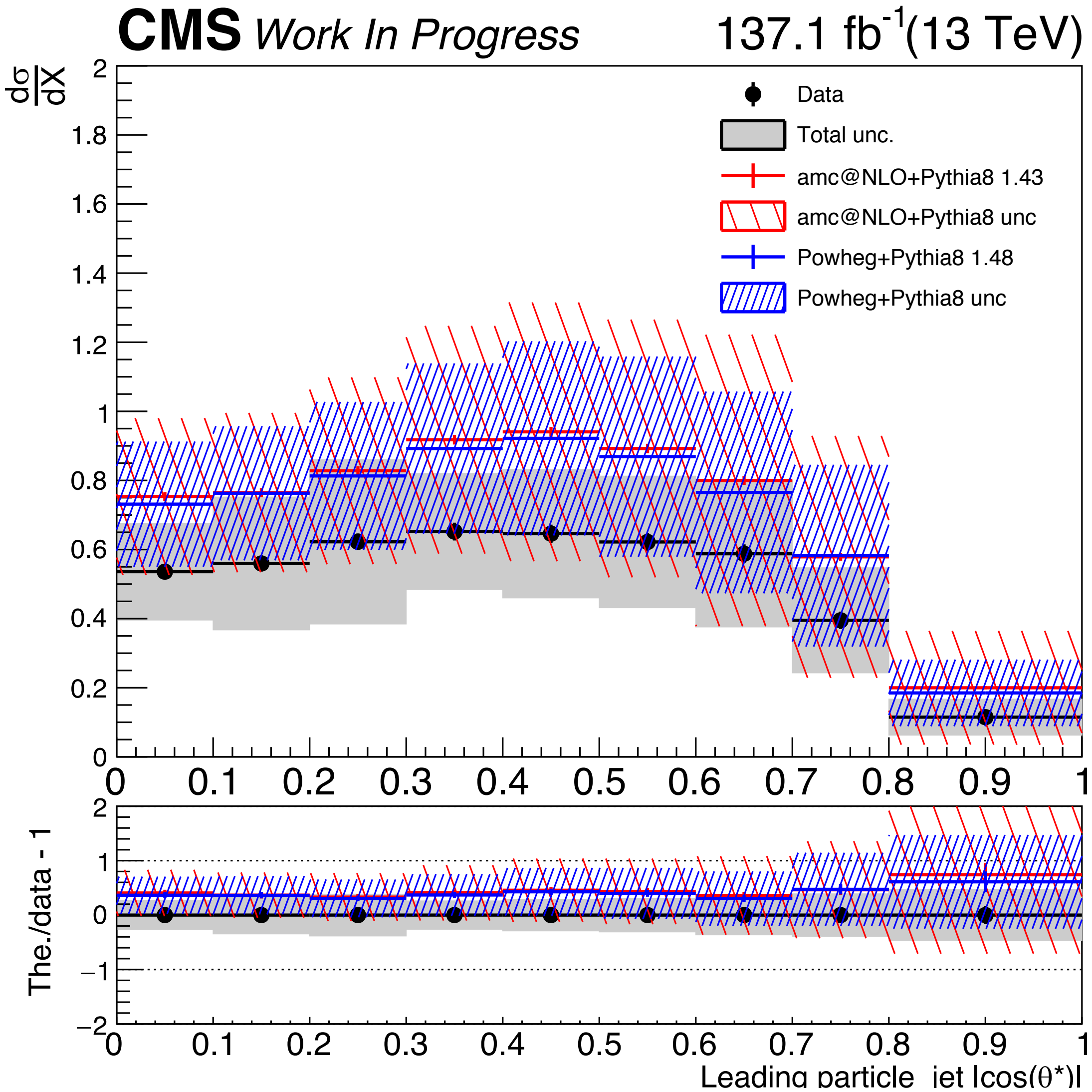
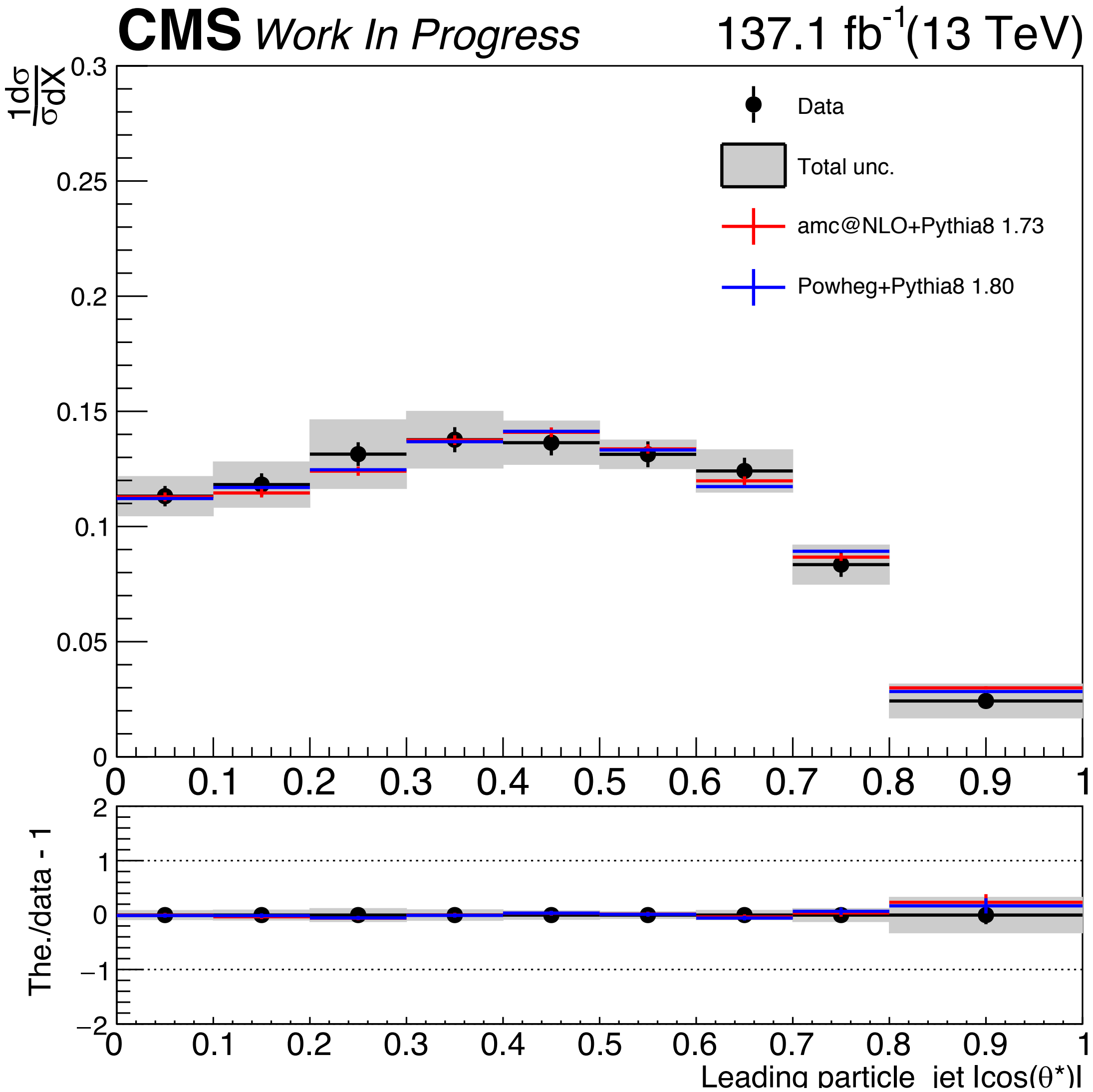


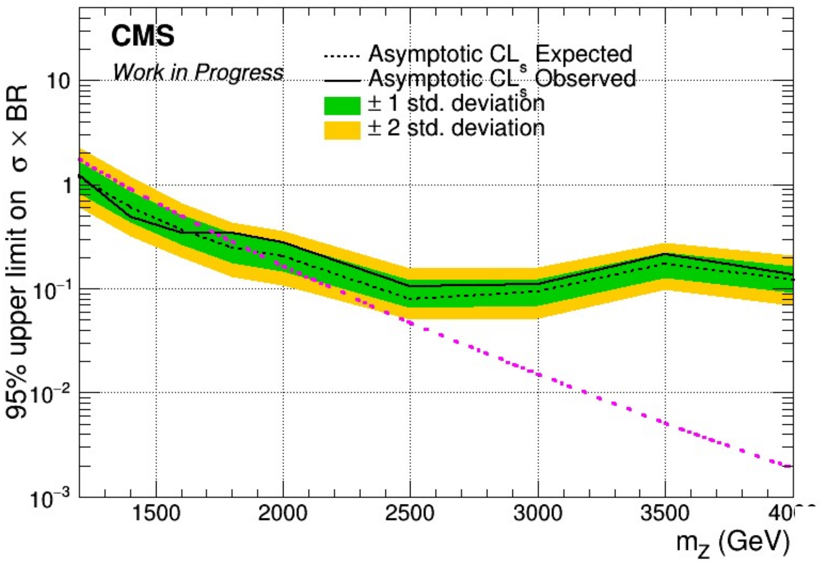
# BACKUP

# Summary

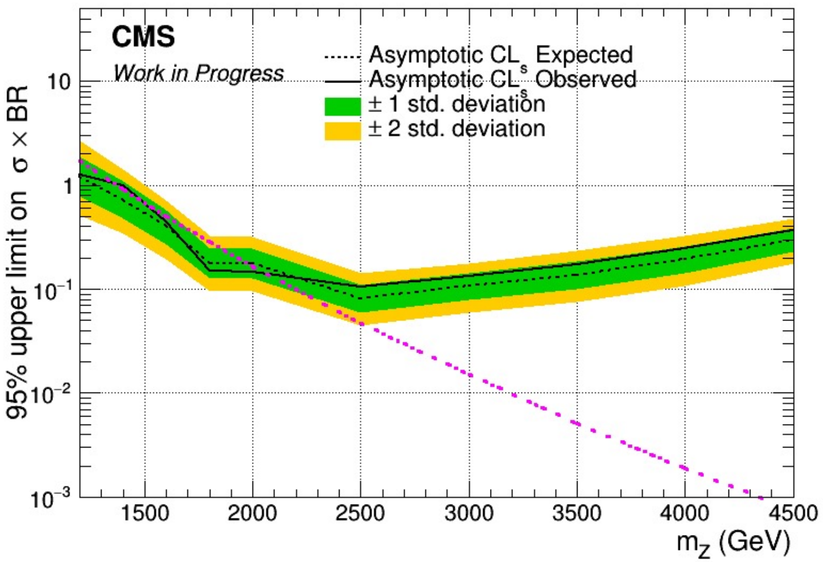
- ttX analysis Pipeline Creation
    1. We want to be able to handle all Nominal files and their variations in an automated way
    2. This requires deciding consistent naming conventions and a efficient planning
    3. Handling of:
        1. Nominal
        2. Parton Shower Weights
        3. PDF Variations
        4. JES
        5. Scale Variations
        6. bTagVariations
        7. Top quark mass variations
    4. Per year For all these we need to
        1. Create template files that have 2btag and 0btag in Extended and Reduced jetMassSoftDrop phase space
        2. 9 variables (mJJ, pTJJ, yJJ, jetPt[0,1], jetY[0,1], chi, |cosTheta*|[0,1]
        3. Template fit files (bkg qcd, bkg subdominant) and signal templates for all variations
        4. Fit on extended signal region for all variations
        5. Response matrices, Acceptance, Efficiency
        6. Signal Extraction
    5. Combine all Fiducial Level results (4 years) into 1 Extracted Signal for all variations
    6. Unfold the combined result into **Parton & Particle** levels
    7. Show systematic variations compared to the Nominal file
    8. The same procedure must be done using different nominal files
        1. Fill in 2btag histograms in our signal region in the parton
        2. For each variation and each year
        3. Combine all years together
        4. Calculate systematics for samples other than the nominal

# Brazilian Plots (2016_preVFP, 2017 and 2018) with sliding mJJ Cut

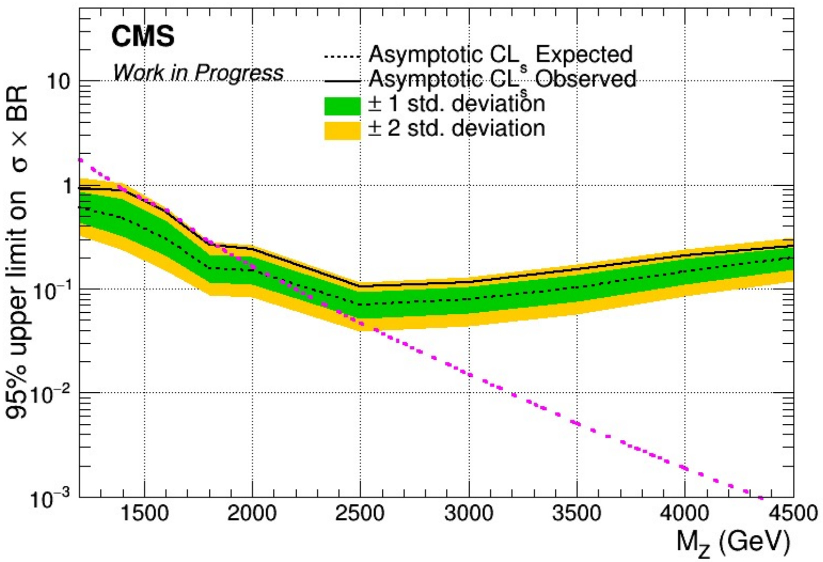
2016_preVFP




2017



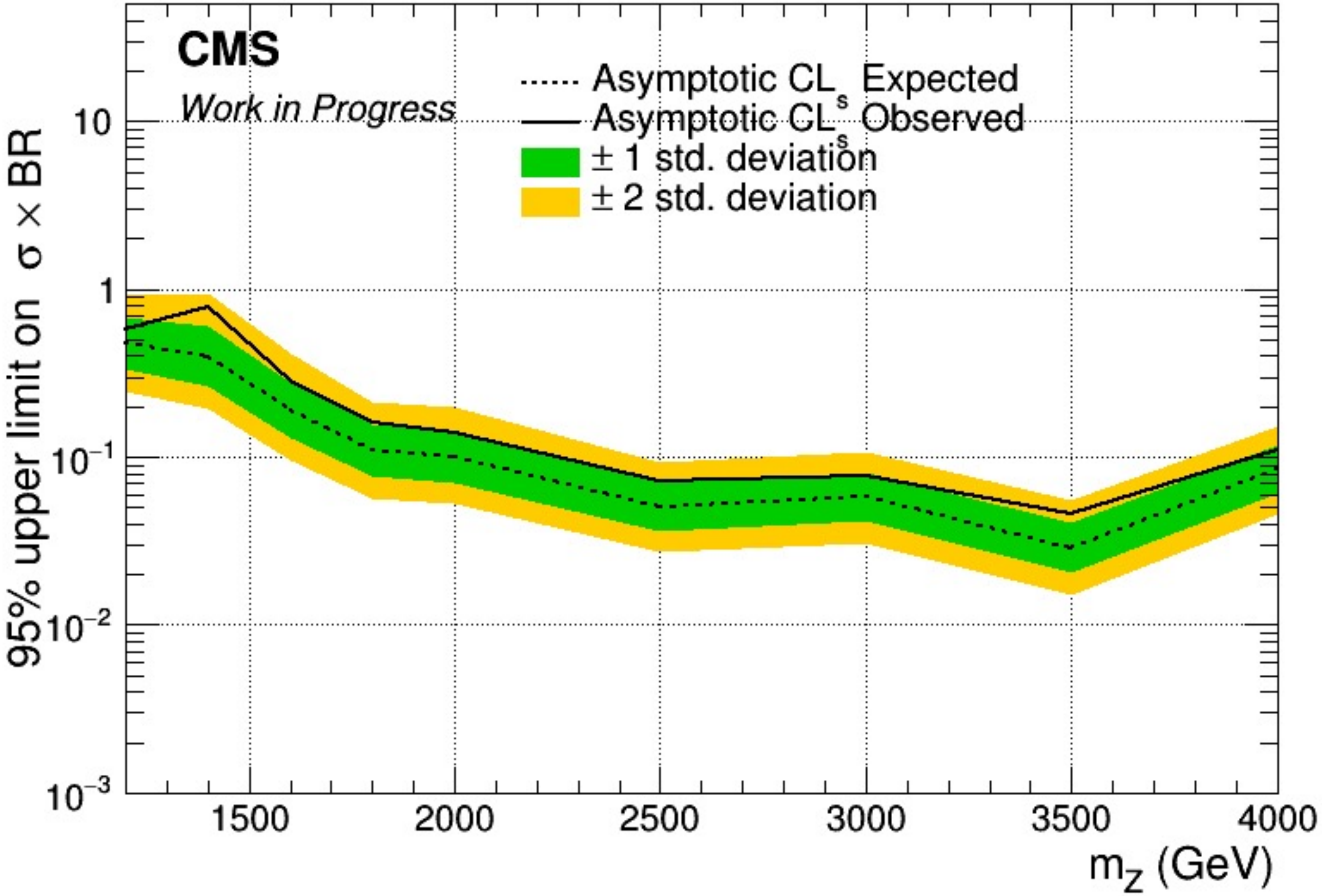

2018



# Combined Datacard for 2016_preVFP, 2017 and 2018

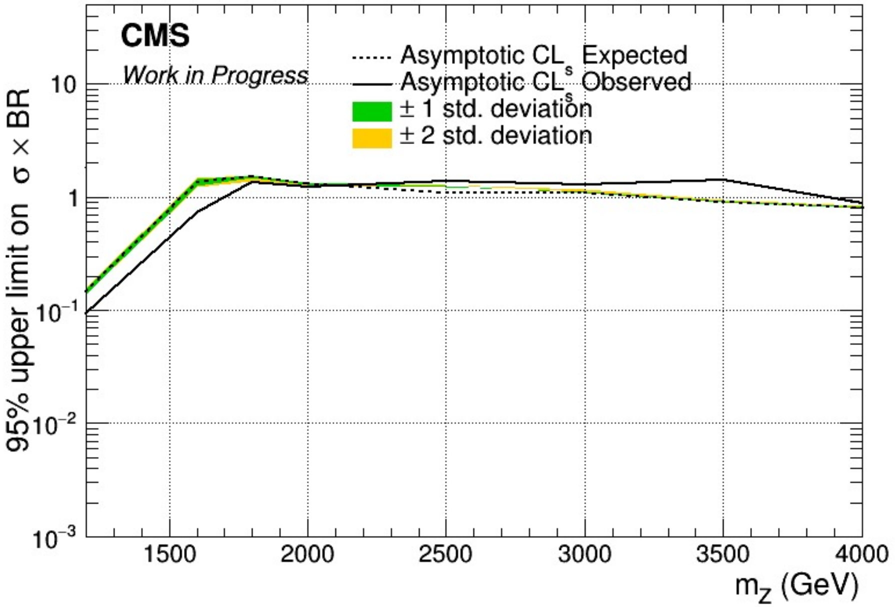
Mass  Cut Mapping

{"mZ_1200_12":1000, "mZ_1400_14":1200, "mZ_1600_16":1400, "mZ_1800_18":1600, "mZ_2000_20":1600,
"mZ_2500_25":2000, "mZ_3000_30":2000, "mZ_3500_35":2000, "mZ_4000_40":2000, "mZ_4500_45":2000}

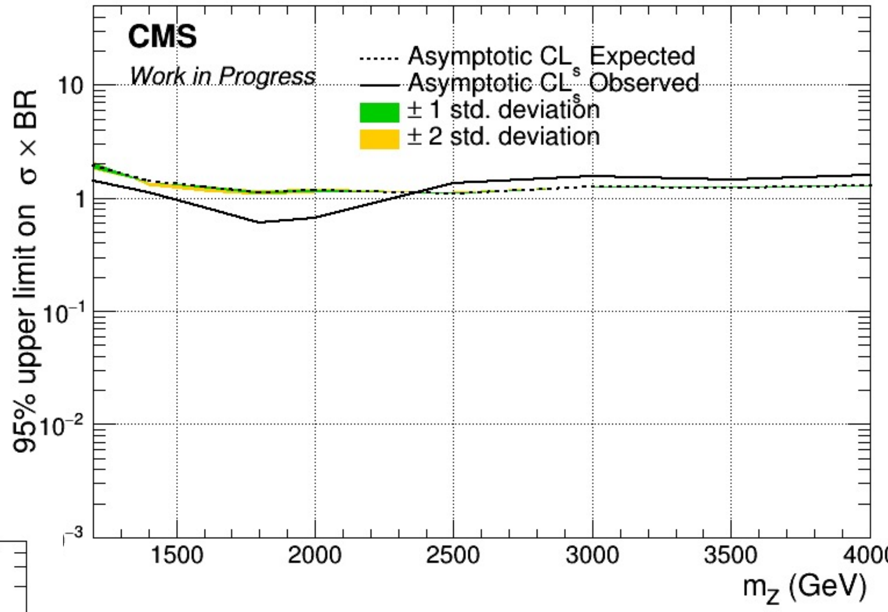


# Brazilian Plots (2016_preVFP, 2017 and 2018) with sliding mJJ Cut wrt 2018

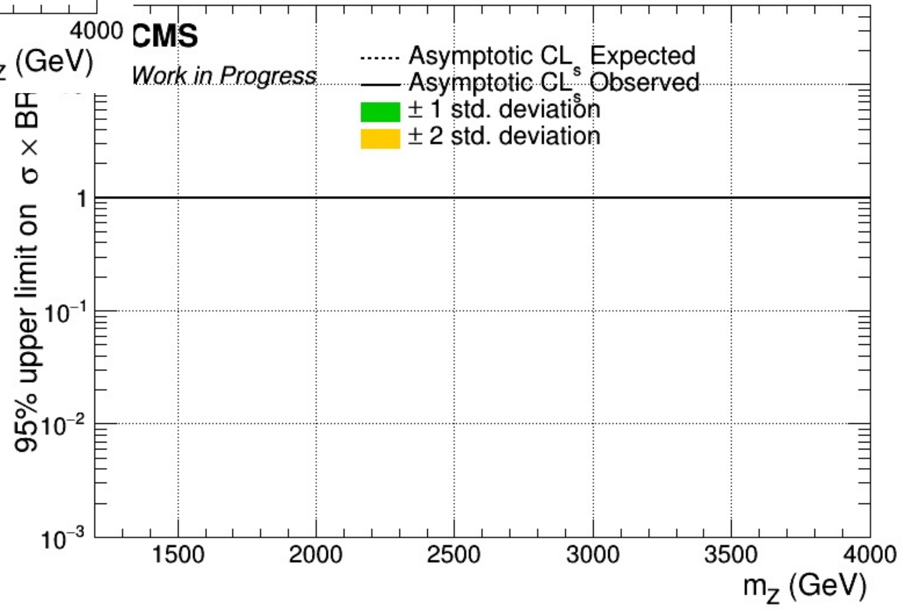
2016_preVFP




2017




2018



# Combined Datacard for 2016_preVFP, 2017 and 2018 wrt 2018

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{"mZ_1200_12":1000, "mZ_1400_14":1200, "mZ_1600_16":1400, "mZ_1800_18":1600, "mZ_2000_20":1600, "mZ_2500_25":2000, "mZ_3000_30":2000, "mZ_3500_35":2000, "mZ_4000_40":2000, "mZ_4500_45":2000}