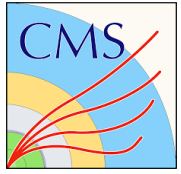
Long exercise: $t\bar{t}$ cross section measurement in early Run 3 data

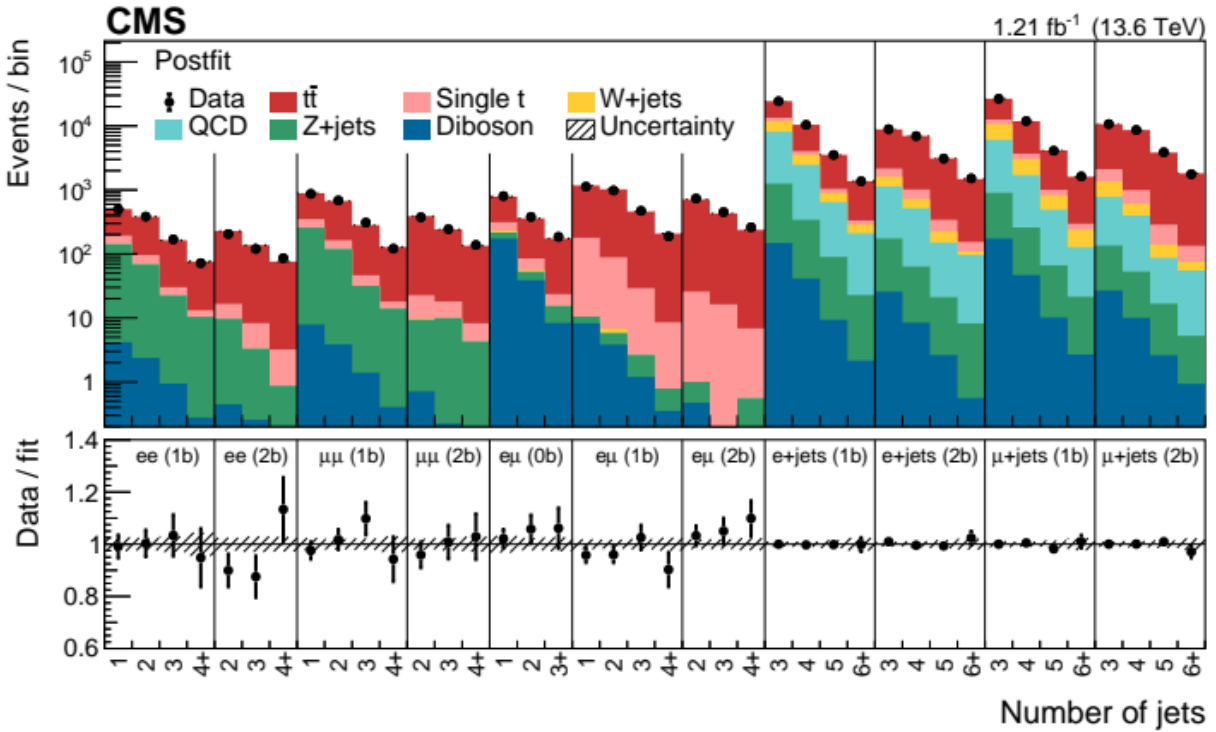
Laurids Jeppe & Evan Ranken

29.06.2023



Run 3 $t\bar{t}$ cross section measurement

- First measurement of the inclusive tt cross section at 13.6 TeV with early Run 3 data (1.21 fb-1)
- Currently submitted to JHEP for publication (TOP-22-012)
- First public physics result of LHC Run 3!
- Uses dilepton and lepton+jets decay channels
- Achieves ~ 3% precision



Long exercise idea

- Plan: participants perform a complete $t\bar{t}$ cross section measurement!
- Event selection & histogramming: uses Pepper, a python-based columnar framework directly reading nanoAOD
  - Easy to use and extend – e.g. defining additional variables, cuts…
  - Fast turnaround time
- Cross section extraction: uses Combine
  - Fit is very fast – could be experimented with by the participants
  - Configurable “export” script to create ROOT files & datacards

Long exercise – questions & problems

- Q1: Restrict to the dilepton channels only?
  - Less complexity, reduces computing cost, no data-driven QCD estimation required
- Q2: How to handle the computing load?
  - Pre-select some events? Reduce MC stats? Reduce data range?
  - Drop less relevant, computationally expensive systematic uncertainties
  - It would be best if the participants could create the input to combine on their own so they are free to experiment with cuts etc.
- Q3: Specific issues to Run 3?
  - E.g. btag scale factors – central to the measurement; no official values yet. We estimated those ourselves – should the participants do this too?

Backup