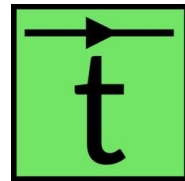


TOP tt cross section exercise

15.07.2025

Evan Ranken and Dominic Stafford



Overview

Exercise based on TOP-22-012

- Measure inclusive top pair production cross section at 13.6 TeV
- 1/fb lumi collected at start of LHC Run 3 in Jul-Aug 2022

History and resources

- Ran this exercise at 2023 PODAS (NAF) with Laurids Jeppe, as well as at 2024 DAS (lxxplus) with Dominic and Otto Hindrichs.
- Documentation cern pages: <https://cmsdas-2024-ttxs.docs.cern.ch/>
- Gitlab repo and separate repo with solutions:
<https://gitlab.cern.ch/cmsdas-cern-2024/long-ex-top-xsec>
<https://gitlab.cern.ch/eranken/pepper-ttxsec-das-exercise-2024/> (private, “solved” branch)
- MC sample skims with major backgrounds only, to keep runtime short

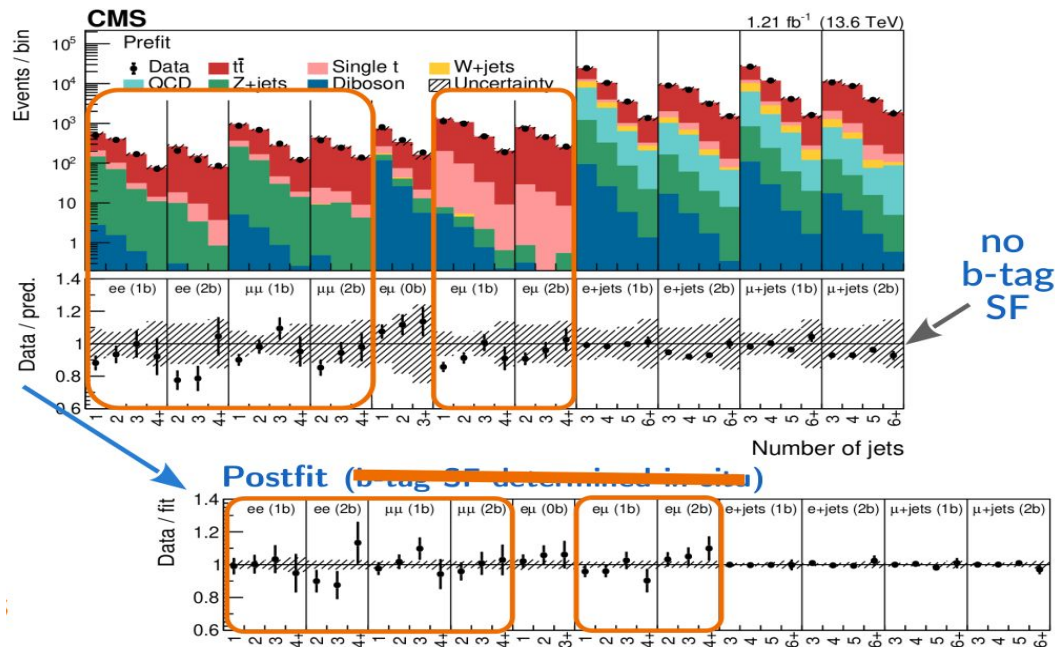
Measurement setup

Simplified version of TOP-22-012:

- Channel combination of l+jets and dilepton → **Dilepton channels only** (no QCD background)
- Simplified uncertainties → **no in-situ btag SF, reduced number of uncertainties**

Bins:

- Lepton flavor
 - b jet multiplicity
 - Jet multiplicity



Practical details

Exercise philosophy

- ◆ [Pepper framework](#): columnar, python+awkward-based
- ◆ Students inherit a **running NanoAOD-based framework**, but has missing pieces
 - ◇ Students tour the framework
 - ◇ Understand and fill in gaps in the event processing+plotting
- ◆ Includes **combine** component
 - ◇ Datacard writer script included to process their histogrammed data (again with gaps)
 - ◇ Learn standard combine commands, perform measurement, plot impacts

To-do

- ◆ Pull new pepper changes into repo (plotting update?)
- ◆ Test and finalize prescription for installing + running on afs/eos
- ◆ Check uncertainties and SF (last year, measurement results were low)
- ◆ Move data files to DAS 2025 directory?
- ◆ Solutions repo, student repo, new cern docs page