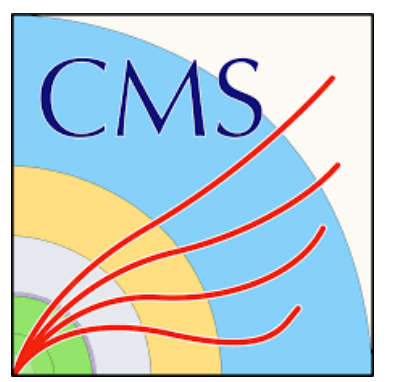


First measurement of the top quark pair production cross section at $\sqrt{s} = 13.6$ TeV at CMS



Laurids Jeppe on behalf of the CMS collaboration

DESY, Hamburg, Germany

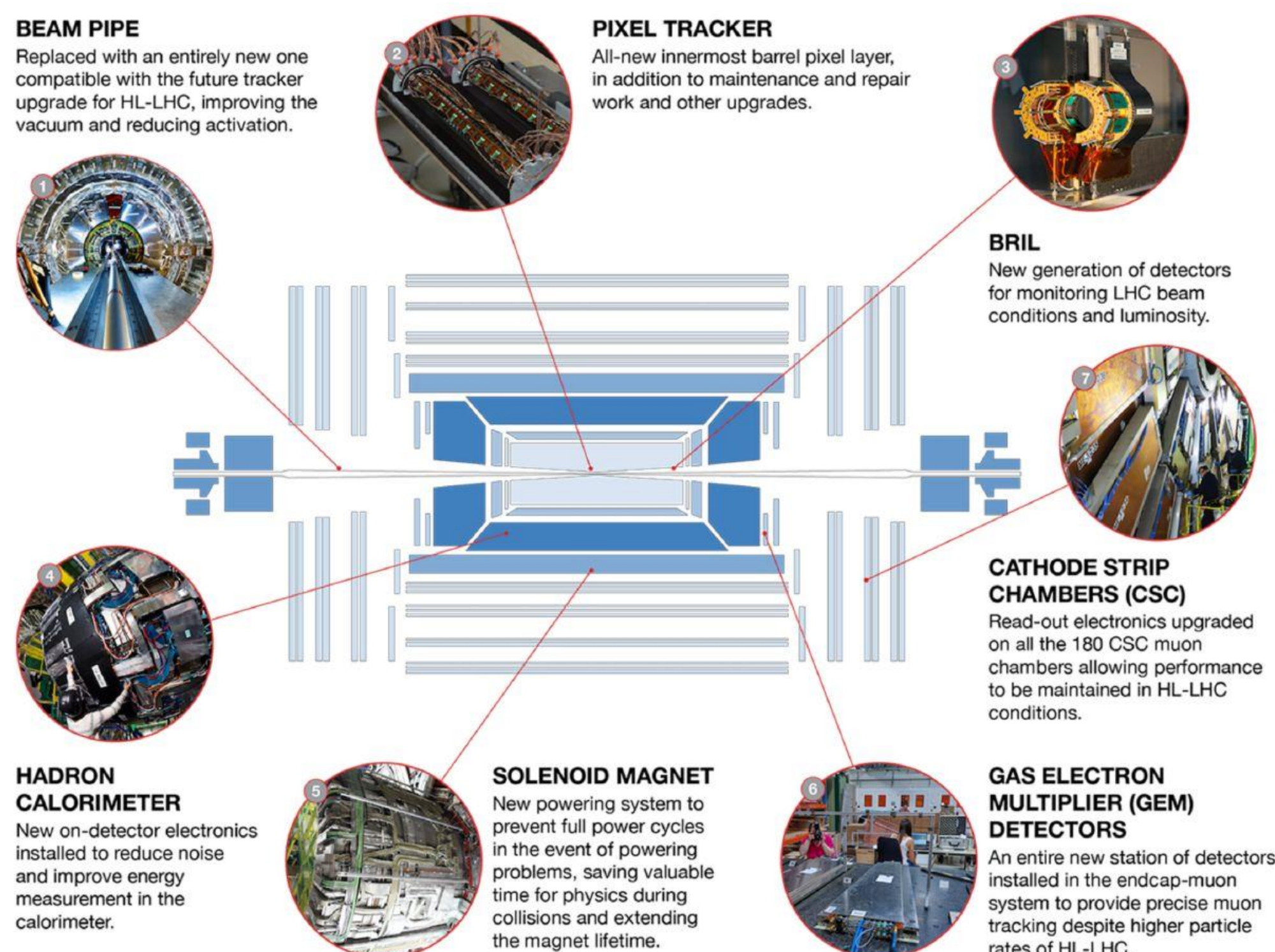


CLUSTER OF EXCELLENCE
QUANTUM UNIVERSE

We present the first measurement of the top quark pair production cross section at the new LHC center-of-mass energy of 13.6 TeV, using 1.2 fb^{-1} of data recorded at the CMS detector. We use a new method combining dilepton and lepton+jets decay channels, constraining as many nuisances as possible in situ. This way, we stay independent from external input on new calibrations, allowing for the earliest possible measurement.

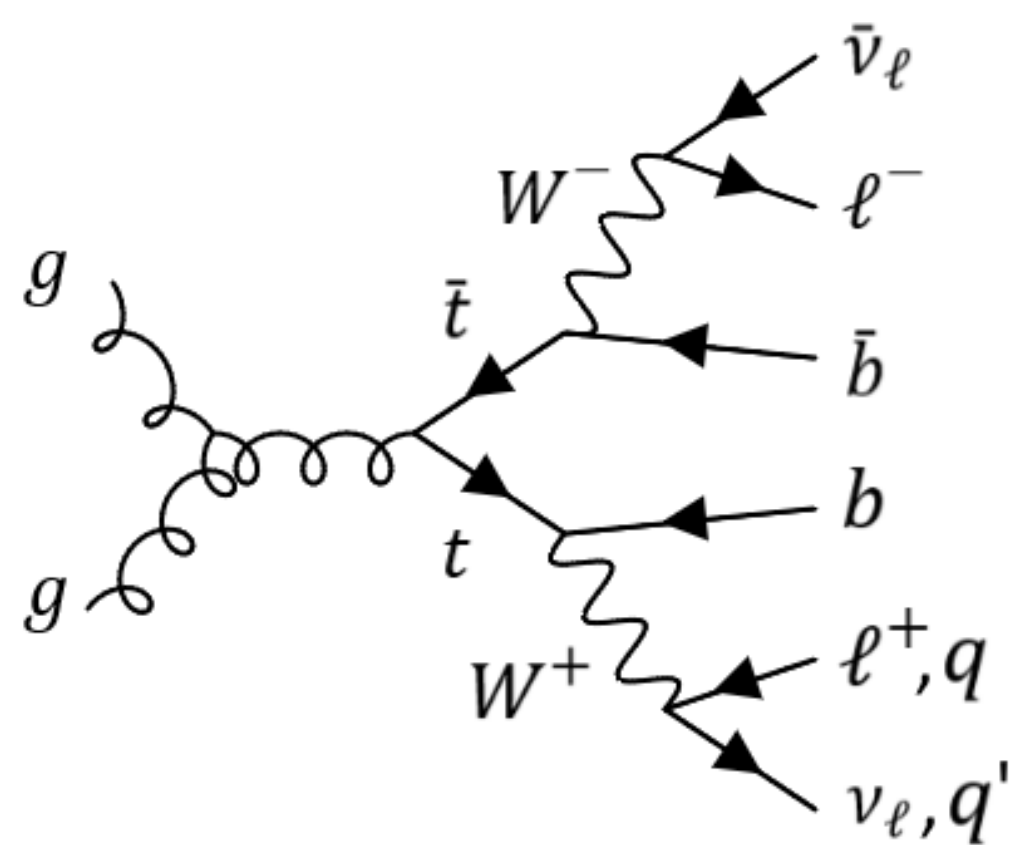
The CMS detector in Run 3

- Already collected $\approx 10 \text{ fb}^{-1}$ of data
- Several upgrades improving on Run 2 performance



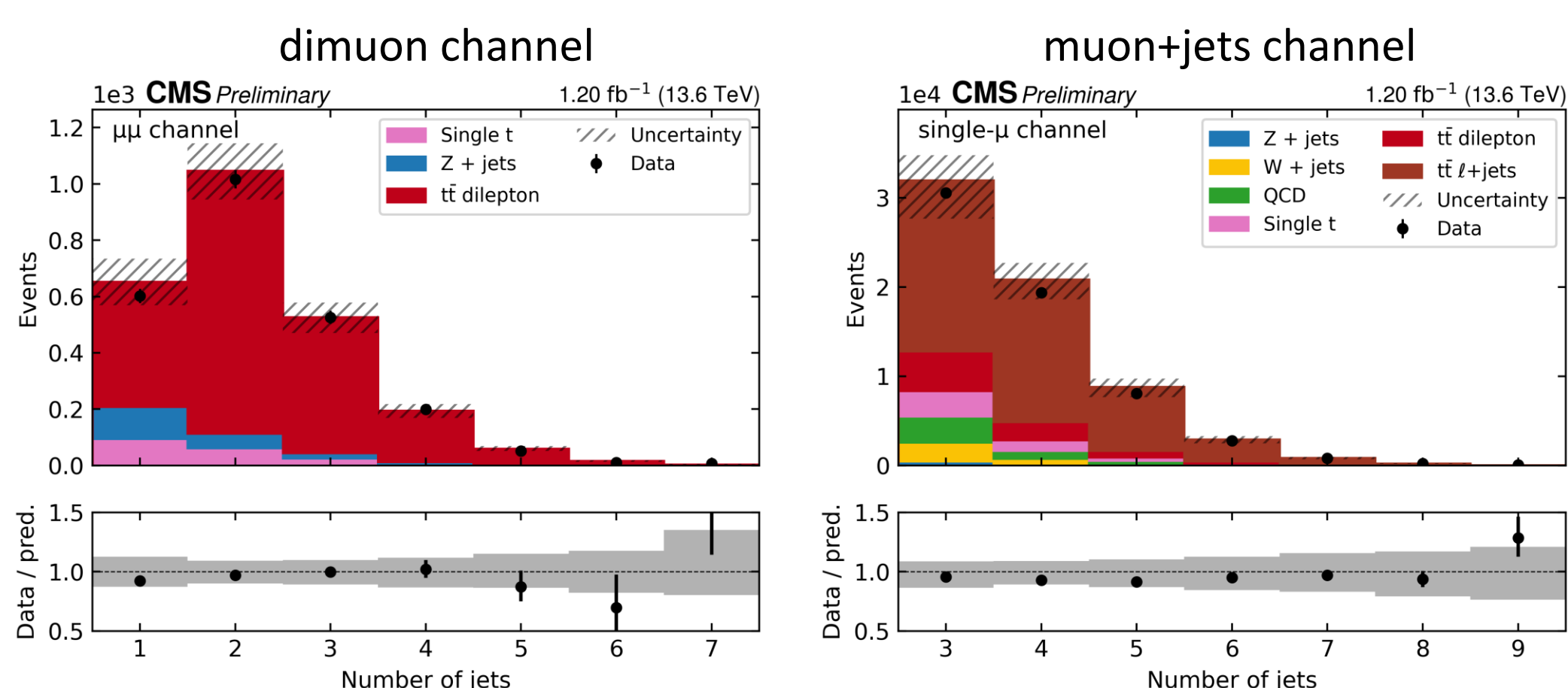
Event selection

- Combine dilepton and lepton+jets channels in same fit
- > Allows for constraint of lepton efficiencies



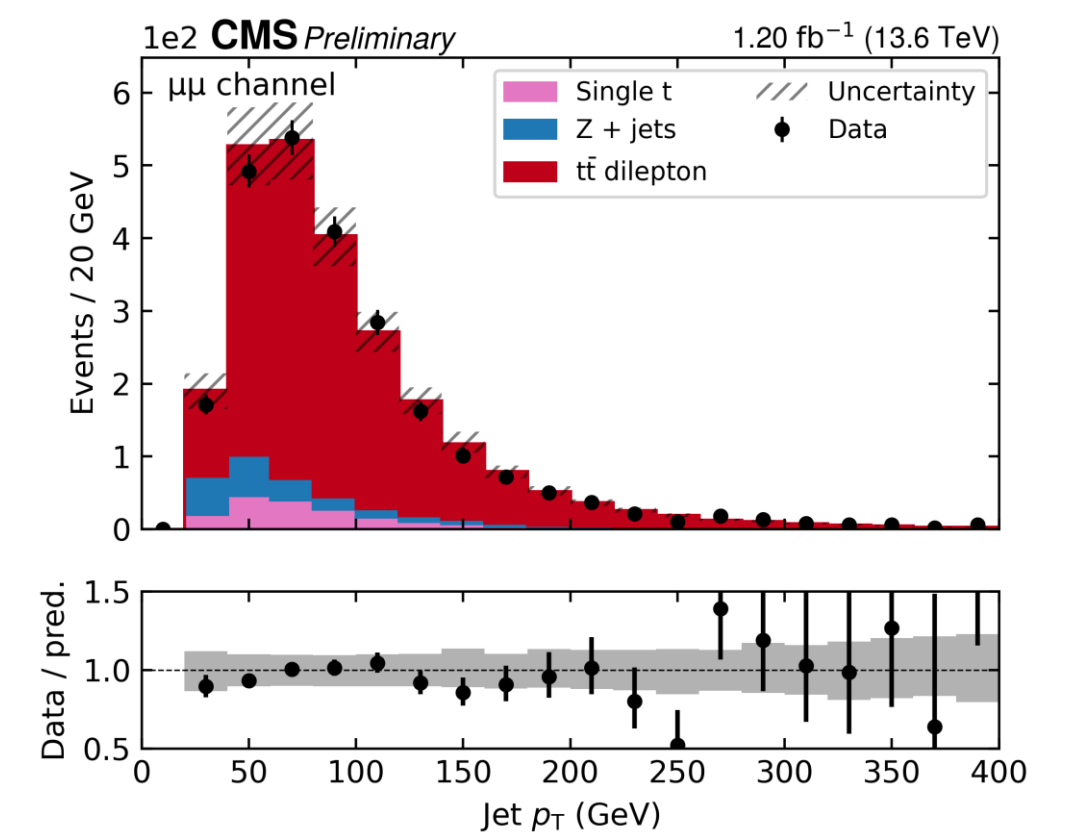
Background estimation

- Most backgrounds estimated by MC simulation
- Data-driven method used to estimate non-prompt QCD background for lepton+jets



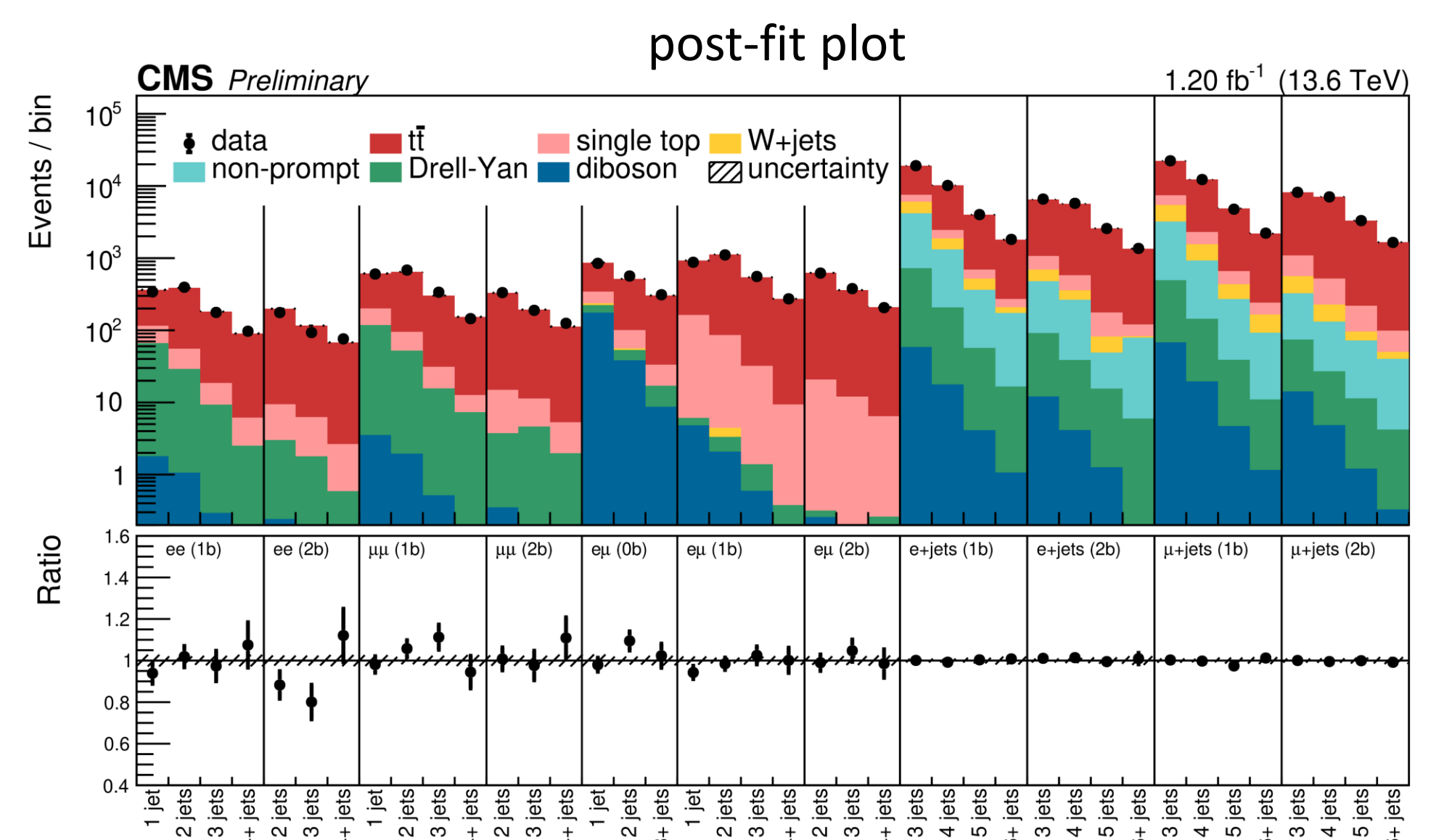
Corrections

- Jet energy corrections derived from hadronic W decays in $t\bar{t}$



Likelihood fit

- Combined likelihood fit with nuisance parameters for systematic uncertainties
- Categorization in lepton and b-tag content
- Constrain lepton and b-tag efficiencies in situ
- Luminosity is externalized



Result

$$\sigma_{t\bar{t}} = 887^{+43}_{-41} \text{ (stat+syst)} (\pm 53 \text{ (lumi)}) \text{ pb}$$

Consistent with SM theory prediction: $921^{+29}_{-37} \text{ pb}$

