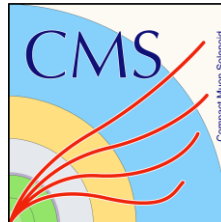


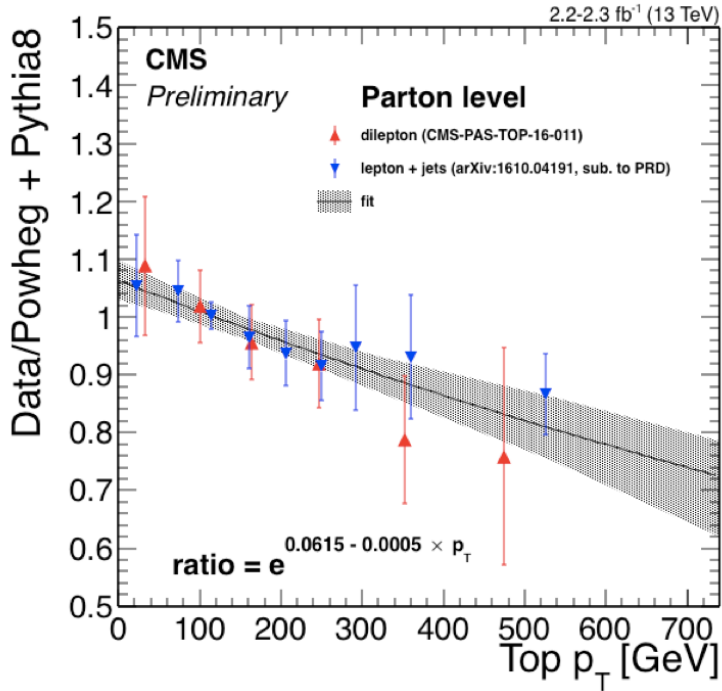
Measurement of differential $t\bar{t}$ production cross sections for high- $p_{T\text{top}}$ quarks with CMS at 13 TeV

ICHEP 2020

Ioannis Papakrivopoulos on behalf of the CMS Collaboration



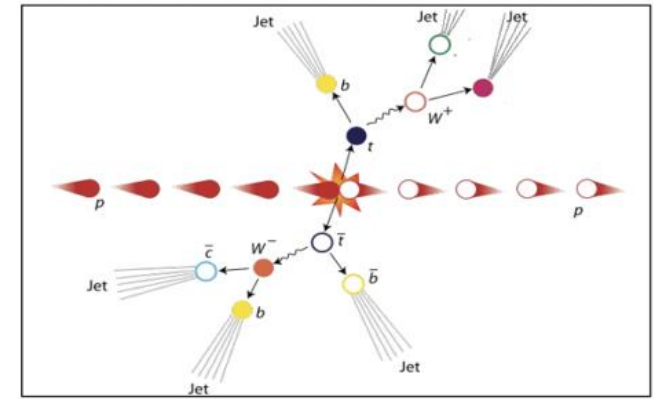
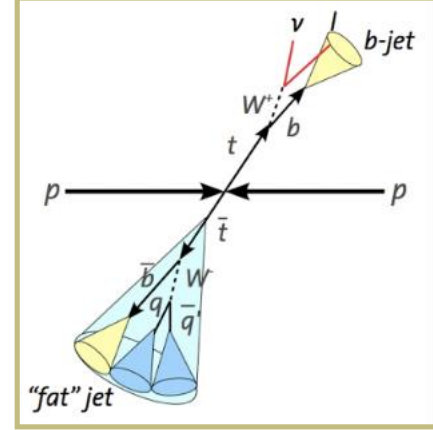
Introduction / Motivation



Explore the kinematic regions beyond the reach of the
resolve analyses ($p_t > 400$ GeV)

- Provide precision in that region
- Sensitivity to new physics
- Test for perturbative QCD

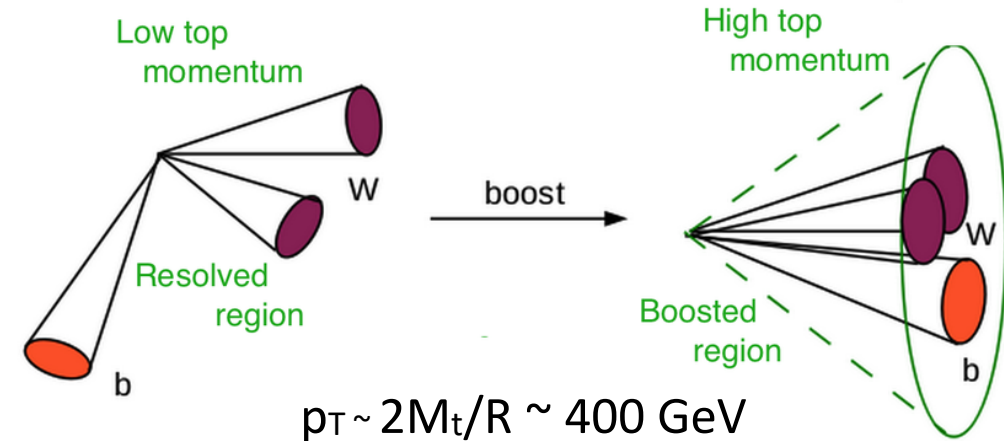
PAS TOP-18-013



Two distinct final states:

- l + jets (boosted hadronically decaying top quark and resolved leptonically decaying top quark)
- Hadronic (both boosted top quarks decaying hadronically)

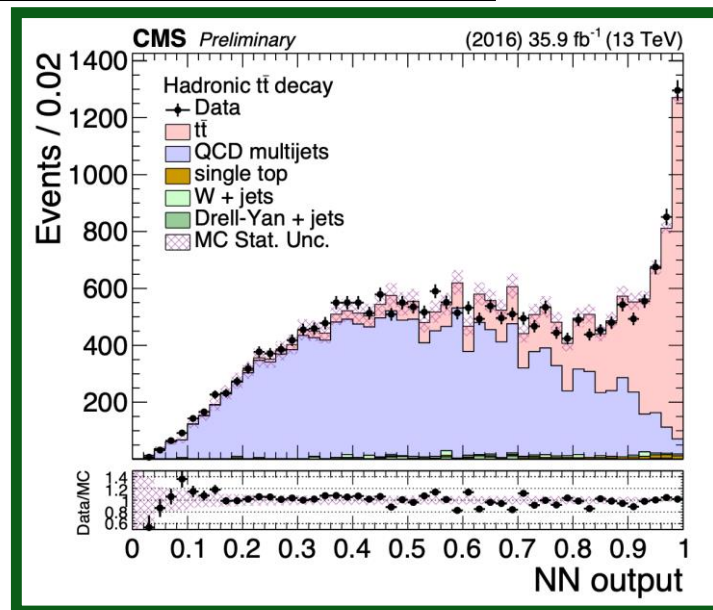
Compatible results with other analyses



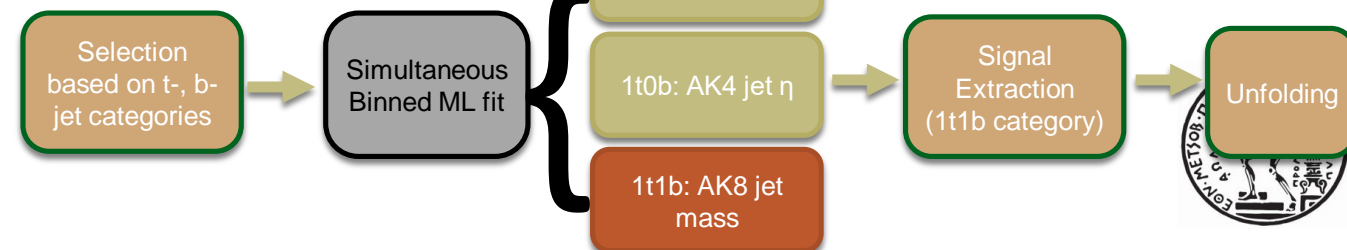
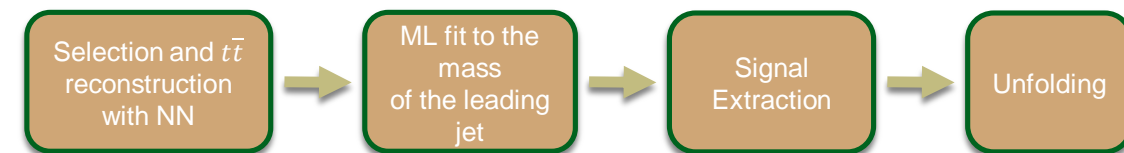
Object selection / reconstruction

Hadronic channel:

- Trigger selects two AK8 (anti-kt, $R=0.8$) jets and b-tagging @ HLT level
- Two AK8 (anti-kt, $R=0.8$) jets with $p_T > 400$ GeV
- $t\bar{t}$ event tagging with NN using jet substructure variables as inputs
- Selection split in categories based on the b-tagging requirements. 2b Signal Region (SR) 0b Control Region (CR)



Data driven background suppression. QCD shape taken from CR, while QCD yield is estimated by a ML fit to the mass of the leading jet.

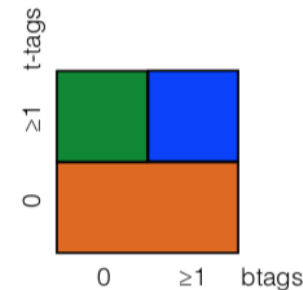


l + jets channel:

- Final state a lepton + b jet + MET + t jet
- Trigger selects a single lepton and two small R jets

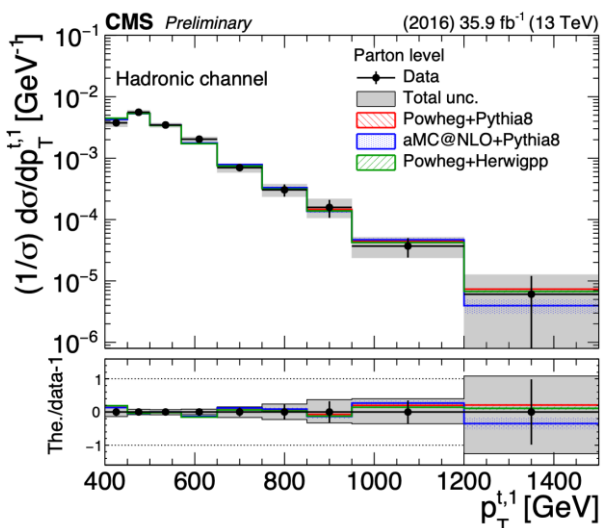
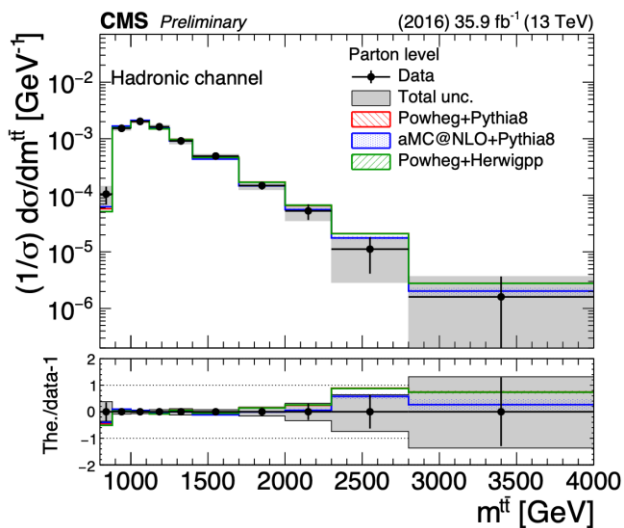
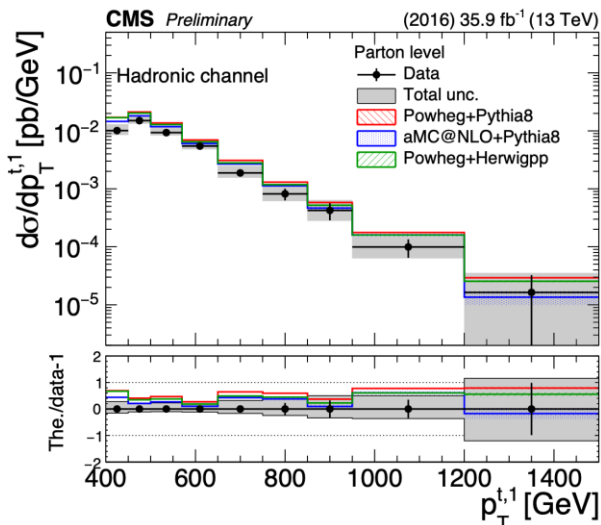
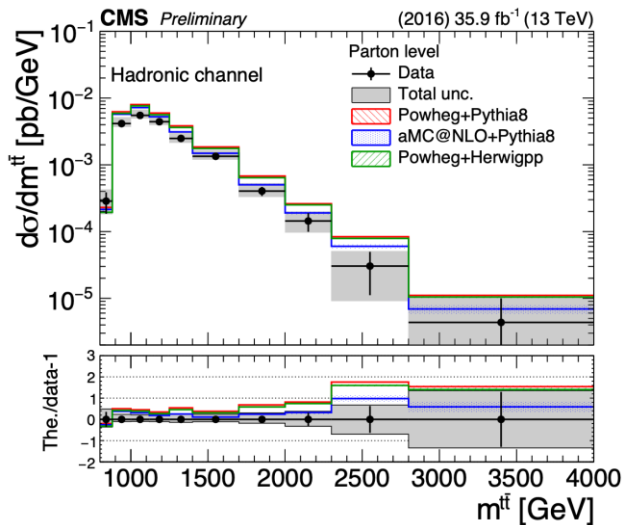
Selection:

- Exactly 1 lepton $e/\mu \geq 1$ small R jet (anti-kt, $R = 0.4$, leptonic top decay)
- ≥ 1 large R jet (anti-kt, $R = 0.8$, hadronic top decay)
- E_T^{Miss}
- b tagging AK4 jet, medium WP
- t tagging \rightarrow AK8 jet, $105 < m_{top} < 220$ GeV, subjetiness $\tau_{32} < 0.81$, No b tagging \rightarrow better acceptance
- Categories 0t, 1t0b 1t1b



QCD estimated from simultaneous fit in the 3 categories in a QCD dominated sideband (invert lepton isolation).

Hadronic channel



Absolute

Results

Results using unfolding with simple matrix inversion without regularization for both channels

Hadronic:

- Shapes overall compatible with theory
- Overall shift of 35% in the total cross section

l + jets:

- Differential distributions generally well described
- All models over predict the absolute cross section

More data is needed in order to enhance the statistical significance and investigate the severity of this discrepancy.

Normalized

l + jets channel

