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Top pair cross section measurements (incl./diff.) and event modelling with the CMS detector (15' + 5')

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Precision measurements are presented of the top-quark pair inclusive production cross section in proton-proton collisions at the LHC at centre-of-mass energies of 7, 8 and 13 TeV. The data are collected with the CMS experiment during the years 2011, 2012, and 2015. The analyses profit from different top quark final states and make use of events with two, one or no reconstructed charged leptons. In most analyses b-jet identification is used to increase the purity of the selection. The backgrounds are determined using data-driven techniques. The results are combined with each other and compared with theory predictions. Indirect constraints on both the top quark mass and α_s are obtained through their relation to the inclusive cross section.

Differential top quark pair production cross sections are measured in proton-proton collisions at the LHC at centre-of-mass energies of 7, 8, and 13 TeV, using data collected by the CMS experiment in the years 2011, 2012, and 2015. The differential cross sections are measured as functions of various kinematic observables, including the transverse momentum and rapidity of the (anti)top quark and the top-antitop system and the jets and leptons of the event final state. Multiplicity and kinematic distributions of the jets produced in addition to the top pair are investigated. Measurements of the associate production of top quark pairs with additional b-quarks, and a search for four-top production are also presented.

State-of-the-art theoretical predictions accurate to next-to-leading order QCD interfaced with Pythia8 and Herwig++ event generators are tested by comparing the unfolded $t\bar{t}$ differential data collected with the CMS detector at 8 TeV. These predictions are also compared with the underlying event activity distributions in $t\bar{t}$ events using CMS proton-proton data collected in 2015 at a center of mass energy of 13 TeV.

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