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Physical Review D
Volume 100, Issue 7, 17 October 2019, Article number 072007

Measurement of the top quark Yukawa coupling from $t\bar{t}$ kinematic distributions in the lepton+jets final state in proton-proton collisions at $\sqrt{s}=13$ TeV MEASUREMENT of the TOP QUARK YUKAWA COUPLING from ... SIRUNYAN et al. (Article) [\(Open Access\)](#)

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Abstract

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Results are presented for an extraction of the top quark Yukawa coupling from top quark-antiquark ($t\bar{t}$) kinematic distributions in the lepton plus jets final state in proton-proton collisions, based on data collected by the CMS experiment at the LHC at $\sqrt{s}=13$ TeV, corresponding to an integrated luminosity of 35.8 fb⁻¹. Corrections from weak boson exchange, including Higgs bosons, between the top quarks can produce large distortions of differential distributions near the energy threshold of $t\bar{t}$ production. Therefore, precise measurements of these distributions are sensitive to the Yukawa coupling. Top quark events are reconstructed with at least three jets in the final state, and a novel technique is introduced to reconstruct the $t\bar{t}$ system for events with one missing jet. This technique enhances the experimental sensitivity in the low invariant mass region, $M_{t\bar{t}}$. The data yields in $M_{t\bar{t}}$, the rapidity difference $|y_t - y_{\bar{t}}|$, and the number of reconstructed jets are compared with distributions representing different Yukawa couplings. These comparisons are used to measure the ratio of the top quark Yukawa coupling to its standard model predicted value to be $1.07-0.43+0.34$ with an upper limit of 1.67 at the 95% confidence level. © 2019 CERN.

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Topic: Collisions | Jets | Proton-proton collisions

Prominence percentile: 99.939 [ⓘ](#)

ISSN: 24700010
Source Type: Journal
Original language: English

DOI: 10.1103/PhysRevD.100.072007
Document Type: Article
Publisher: American Physical Society

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