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## Search for associated production of a Higgs boson and a single top quark in proton-proton collisions at $\sqrt{s}=13$ TeV (Article) (Open Access)

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### Abstract

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A search is presented for the production of a Higgs boson in association with a single top quark, based on data collected in 2016 by the CMS experiment at the LHC at a center-of-mass energy of 13 TeV, which corresponds to an integrated luminosity of 35.9 fb<sup>-1</sup>. The production cross section for this process is highly sensitive to the absolute values of the top quark Yukawa coupling,  $y_t$ ; the Higgs boson coupling to vector bosons,  $g_{HVV}$ ; and, uniquely, their relative sign. Analyses using multilepton signatures, targeting  $H \rightarrow WW$ ,  $H \rightarrow \tau\tau$ , and  $H \rightarrow ZZ$  decay modes, and signatures with a single lepton and a  $b\bar{b}$  pair, targeting the  $H \rightarrow b\bar{b}$  decay, are combined with a reinterpretation of a measurement in the  $H \rightarrow \gamma\gamma$  channel to constrain  $y_t$ . For a standard model-like value of  $g_{HVV}$ , the data favor positive values of  $y_t$  and exclude values of  $y_t$  below about  $-0.9y_t^{SM}$ . © 2019 CERN.

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#### Funding text #1

A search is presented for the production of a Higgs boson in association with a single top quark, based on data collected in 2016 by the CMS experiment at the LHC at a center-of-mass energy of 13 TeV, which corresponds to an integrated luminosity of  $35.9 \text{ fb}^{-1}$ . The production cross section for this process is highly sensitive to the absolute values of the top quark Yukawa coupling,  $\gamma_t$ ; the Higgs boson coupling to vector bosons,  $g_{HVV}$ ; and, uniquely, their relative sign. Analyses using multilepton signatures, targeting  $H \rightarrow WW$ ,  $H \rightarrow \tau\tau$ , and  $H \rightarrow ZZ$  decay modes, and signatures with a single lepton and a  $b\bar{b}$  pair, targeting the  $H \rightarrow b\bar{b}$  decay, are combined with a reinterpretation of a measurement in the  $H \rightarrow \gamma\gamma$  channel to constrain  $\gamma_t$ . For a standard model-like value of  $g_{HVV}$ , the data favor positive values of  $\gamma_t$  and exclude values of  $\gamma_t$  below about  $-0.9 \gamma_t^{\text{SM}}$ . Bundesministerium für Wissenschaft, Forschung und Wirtschaft 10.13039/501100003413 Austrian Science Fund ... View all  $\checkmark$

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We congratulate our colleagues in the CERN accelerator departments for the excellent performance of the LHC and thank the technical and administrative staffs at CERN and at other CMS institutes for their contributions to the success of the CMS effort. In addition, we gratefully acknowledge the computing centers and personnel of the Worldwide LHC Computing Grid for delivering so effectively the computing infrastructure essential to our analyses. Finally, we acknowledge the enduring support for the construction and operation of the LHC and the CMS detector provided by the following funding agencies: BMBWF and FWF (Austria); FNRS and FWO (Belgium); CNPq, CAPES, FAPERJ, FAPERGS, and FAPESP (Brazil); MES (Bulgaria); CERN; CAS, MoST, and NSFC (China); COLCIENCIAS (Colombia); MSES and CSF (Croatia); RPF (Cyprus); SENESCYT (Ecuador); MoER, ERC IUT, and ERDF (Estonia); Academy of Finland, MEC, and HIP (Finland); CEA and CNRS/IN2P3 (France); BMBF, DFG, and HGF (Germany); GSRT (Greece); NKFI (Hu... View all  $\checkmark$

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