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Constraints on anomalous HVV couplings from the production of Higgs bosons decaying to τ lepton pairs (Article) (Open Access)

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Abstract

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A study is presented of anomalous HVV interactions of the Higgs boson, including its CP properties. The study uses Higgs boson candidates produced mainly in vector boson fusion and gluon fusion that subsequently decay to a pair of τ leptons. The data were recorded by the CMS experiment at the LHC in 2016 at a center-of-mass energy of 13 TeV and correspond to an integrated luminosity of 35.9 fb⁻¹. A matrix element technique is employed for the analysis of anomalous interactions. The results are combined with those from the $H \rightarrow 4\ell$ decay channel presented earlier, yielding the most stringent constraints on anomalous Higgs boson couplings to electroweak vector bosons expressed as effective cross section fractions and phases: The CP-violating parameter $fa_3 \cos(\phi_{a3}) = (0.00 \pm 0.27) \times 10^{-3}$ and the CP-conserving parameters $fa_2 \cos(\phi_{a2}) = (0.08 - 0.21 + 1.04) \times 10^{-3}$, $f\lambda_1 \cos(\phi_{\lambda 1}) = (0.00 - 0.09 + 0.53) \times 10^{-3}$, and $f\lambda_1 Z \gamma \cos(\phi_{\lambda 1 Z \gamma}) = (0.0 - 1.3 + 1.1) \times 10^{-3}$. The current dataset does not allow for precise constraints on CP properties in the gluon fusion process. The results are consistent with standard model expectations. © 2019 CERN. for the CMS Collaboration. Published by the American Physical Society under the terms of the "https://creativecommons.org/licenses/by/4.0/" Creative Commons Attribution 4.0 International license. Further distribution of this work must maintain attribution to the author(s) and the published article's title, journal citation, and DOI.

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