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Search for an exotic decay of the Higgs boson to a pair of light pseudoscalars in the final state with two b quarks and two τ leptons in proton – proton collisions at s = 13TeV (Article) (Open Access)

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Abstract

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A search for an exotic decay of the Higgs boson to a pair of light pseudoscalar bosons is performed for the first time in the final state with two b quarks and two τ leptons. The search is motivated in the context of models of physics beyond the standard model (SM), such as two Higgs doublet models extended with a complex scalar singlet (2HDM + S), which include the next-to-minimal supersymmetric SM (NMSSM). The results are based on a data set of proton – proton collisions corresponding to an integrated luminosity of 35.9fb^{-1}, accumulated by the CMS experiment at the LHC in 2016 at a center-of-mass energy of 13TeV. Masses of the pseudoscalar boson between 15 and 60GeV are probed, and no excess of events above the SM expectation is observed. Upper limits between 3 and 12% are set on the branching fraction B (h→aa→2 τ 2b) assuming the SM production of the Higgs boson. Upper limits are also set on the branching fraction of the Higgs boson to two light pseudoscalar bosons in different 2HDM + S scenarios. Assuming the SM production cross section for the Higgs boson, the upper limit on this quantity is as low as 20% for a mass of the pseudoscalar of 40GeV in the NMSSM. © 2018 The Author(s)

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