

**Title:** Two-Higgs-doublet model in light of the standard model  $H \rightarrow \tau^+\tau^-$  search at the LHC

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**Abstract:** We study the implications of the searches based on  $H \rightarrow \tau^+\tau^-$  by the ATLAS and CMS collaborations on the parameter space of the two-Higgs-doublet model (2HDM). In the 2HDM, the scalars can decay into a tau pair with a branching ratio larger than the SM one, leading to constraints on the 2HDM parameter space. We show that in model II, values of  $\tan\beta > 1.8$  are definitively excluded if the pseudoscalar is in the mass range  $110 \text{ GeV} < m(A) < 145 \text{ GeV}$ . We have also discussed the implications for the 2HDM of the recent dimuon search by the ATLAS collaboration for a CP-odd scalar in the mass range 4-12 GeV.

**KeyWords Plus:** Higgs Doublet Model; Symmetry-Breaking; Boson; LEP; Mass; Stability; Unitary; Scalars; Bounds

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