

Constraint for a light charged Higgs boson and its neutral partners from top quark pairs at the LHC

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The charged Higgs boson plays an essential role in distinguishing between a wide variety of standard model extensions with multiple Higgs doublets. We study the prospect of a light charged Higgs boson, produced by top quark pairs at the Large Hadron Collider (LHC), and decaying into a W boson and a pair of bottom quarks via an intermediate neutral Higgs boson (H_i). We reinterpret the cross sections of $WWb\bar{b}$ final states measured by the ATLAS collaboration at LHC 13 TeV in the presence of the aforementioned decay, in a relatively wide range of Higgs masses. We find improved agreements with the data and obtain limits on the total branching ratio of the decay chain. The limits impose the strongest constraints on the parameter space of type-I two-Higgs-doublet model for most Higgs masses sampled when H_i is the CP -odd Higgs boson A . We also calculate potential constraints with pseudodata in high-luminosity runs of the LHC.

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