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An interference search for heavy Higgs bosons decaying to a ttbar pair with the ATLAS experiment

New pseudoscalar (A) and scalar (H) states are predicted by many models with an extended Higgs sector, such as two-Higgs Doublet Models (2HDMs), which add a second Higgs doublet to the SM. In 2HDMs of type II, these states decay predominantly to ttbar, provided that they are massive enough (m > 400 GeV) and that the ratio between the vacuum-expectation-values of the two Higgs doublets ($\tan\beta$) is small ($\tan\beta$ < 3). To this date this parameter region is only little constrained by direct searches, as searches targeting the dominant A/H production mode (gluon-gluon initiated production) in this parameter region would be complicated by the interference between the signal process and the dominant SM ttbar background. This interference produces a characteristic peak-dip structure in the ttbar mass spectrum. In this poster, a search for pseudoscalar and scalar states decaying to a pair of top-quarks is presented, using the full Run-II dataset of the ATLAS experiment at LHC. Special attention is posed to the conceptual and technical challenges regarding the treatment of interference effects in the profile likelihood fit.

Collaboration / Activity

ATLAS

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