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Bayesian analyses of the A2HDM with low-mass scalars

Two-Higgs-doublet models come with an augmented parameter space which allows them to possibly solve some of the shortcomings of the Standard Model, and opens the window to a plethora of new phenomena to be discovered. The introduction of scalar-mediated tree-level flavour-changing neutral currents may be tackled with the imposition of extra symmetries on the model or, alternatively, by demanding a strict proportionality between the flavour-changing couplings and fermion mass matrices. The latter is the very idea behind the Aligned-two-Higgs-doublet model (A2HDM). The coefficients that govern such proportionality are, in general, complex and, therefore, possible new sources of CP violation, a calling card of this class of models. We present here the results of new state-of-the-art analyses of the A2HDM where, in particular, we ascertain whether current data allows the A2HDM to accommodate extra scalars lighter than the 125 GeV Higgs boson. To this effect, we make use of theoretical constraints, bounds from Higgs searches at the LHC and LEP, electroweak precision observables, and a set of flavour observables, all globally combined within HEPfit, a software with a Bayesian Markov Chain Monte Carlo approach to statistical inference.

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