

CPV double-aligned 2HDMs at the LHC

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We consider two Higgs doublet models (2HDMs) with both the Higgs potential and Yukawa interactions being aligned, which we call “double-aligned 2HDMs”. In this scenario, coupling constants of the discovered Higgs boson to the Standard Model (SM) particles are identical to those of the SM Higgs boson, and flavor changing neutral currents via neutral Higgs bosons do not appear at tree level. We investigate current constraints and future prospects of the model by using measurements from flavor experiments and data of multi-lepton final states at LHC. Especially, we focus on the electroweak pair production of the additional Higgs bosons with their masses below $2m_t$. We find that the most of the parameter space are already excluded by the current LHC data when the leptonic decays of the additional Higgs bosons are dominant, which can be interpreted to the scenario in the Type-X THDM as a special case. We also clarify the parameter region where the high-luminosity LHC can explore, and demonstrate the reconstruction of the masses of additional Higgs bosons from the $b\bar{b}\tau^+\tau^-$ final states in a few benchmark points.

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