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Progress in lattice simulations for two Higgs doublet models

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The custodial Two-Higgs-Doublet-Model with $SU(2)$ gauge fields is studied on the lattice. This model has the same global symmetry structure as the Standard Model but the additional Higgs field enlarges the scalar spectrum and opens the possibility for the occurrence of non-SM spontaneous symmetry breaking. Both the spectrum and the running of the gauge coupling of the custodial 2HDM are studied on a line of constant Standard Model physics with cutoff energy ranging from 300 to 600 GeV. The bounds of the realizable masses for the additional BSM scalar states are found to be well below the W boson mass. In fact, for the choice of quartic couplings the estimated lower mass is found to be about $\sim 0.2m_W$ and independent of the cutoff.

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