Echoes of quadratic divergences cancellation on the Next-two Higgs doublet model

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Abstract

Our focus is to address the naturalness issue within Type II Next-to-Two-Higgs Doublets model. We investigate the fulfillment of the modified Veltman condition (mVC) by incorporating an additional singlet at the tree level. The allowed parameter space of the model is significantly restricted by considerations such as unitarity, boundedness from below, and consistency with the diphoton Higgs decay data from LHC Run-II. Our analysis of the naturalness condition for the three CP-even states, namely: h_1, h_2, and h_3, has a profound impact on the masses of the heavy Higgs bosons h_3, A, and $H^{\pm}$, thereby narrowing down the range of variation for the charged Higgs boson mass, $m_{H^{\pm}}$.

References

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