

Complex S_3 -symmetric 3HDM

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CP violation plays a very important role in nature with implications both for Particle Physics and for Cosmology. Accounting for the observed matter–antimatter asymmetry of the Universe requires the existence of new sources of CP violation beyond the Standard Model. In models with an extended scalar sector CP violation can emerge either explicitly, i.e., at the Lagrangian level, or spontaneously.

We discuss a three-Higgs-doublet model with an underlying S_3 symmetry, allowing in principle for complex couplings. In this framework it is possible to have either spontaneous or explicit CP violation in the scalar sector, depending on the regions of parameter space corresponding to the different possible vacua of the S_3 symmetric potential. The classification is based strictly on the exact S_3 -symmetric scalar potential with no soft symmetry breaking terms. The scalar sector of one such model was explored numerically. After applying the theoretical and the most important experimental constraints the available parameter space is shown to be able to give rise to light neutral scalars at the $O(\text{MeV})$ scale.

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