

Scalars 2023

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One class of 4HDM symmetry

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Content :

Multi-Higgs-doublet models equipped with global symmetry groups, either exact or softly broken, offer a rich framework for constructions beyond the Standard Model and lead to remarkable phenomenological consequences. Knowing all the symmetry options within each class of models can guide its phenomenological exploration, as confirmed by the vast literature on the two- and three-Higgs-doublet models. Here, we begin a systematic study of finite non-abelian symmetry groups which can be imposed on the scalar sector of the four-Higgs-doublet model (4HDM) without leading to accidental symmetries. In this work, we derive the full list of such non-abelian groups available in the 4HDM that can be constructed as extensions of cyclic groups by their automorphism groups. This list is remarkably restricted but it contains cases which have not been previously studied. Since the methods we develop may prove useful for other classes of models, we present them in a pedagogical manner.

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