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Some reflexions on hidden features of SM extensions with scalar triplets

The Standard Model of particle physics is in remarkable agreement with most experimental data so far. However, a lot of questions remain unanswered, such as the origin of neutrino masses or the need for extra sources of CP violation. Possible solutions rest on scalar sector extensions, popular beyond-the-Standard-Model scenarios, in which the addition of scalar triplets is an attractive possibility. Such models are much studied in the literature, but they still hide some features underneath. In the Higgs-triplet model, in which small neutrino masses may be generated via the type-II seesaw mechanism, the theory can a priori develop a charge-breaking vacuum as the global minimum of the theory, which would spoil electromagnetism. Furthermore, and although not possible with just one triplet, a CP-breaking vacuum is possible with the addition of two triplets, which could lead to interesting leptonic CP-violating effects. However, it also introduces novel and unexpected features in its scalar spectrum. In this work, we briefly present such hidden features.

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