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Replacing Invisible Axions with Right-Handed Weak Interactions

Abstract

Using a conservative definition of naturalness, we discuss the issue of CP conservation in QCD which gives rise to fine-tuning of the coefficient of the possible topological term in the Lagrangian.

A popular method to address this fine-tuning gives rise to the prediction of invisible axions for which many searches are underway and more are planned. Here we question whether such axions, which have their own theoretical unnaturalness, exist in Nature, on the basis that more natural theories arise when a generalized electroweak sector is combined with QCD. Such combinations generally predict no axion but do predict right-handed weak interactions with W_R intermediaries. Providing that these right-handed intermediaries lie below 80TeV such models can satisfy a conservative definition of naturalness.