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A simple explanation to the strong suppression of fermionic EFT operators

The present approach relies on the SM chiral symmetry breaking pattern $SU(2)_L \otimes SU(2)_R \to SU(2)_{L+R}$, with the EW Goldstone bosons given in a non-linear realization and the Higgs boson described by an EW singlet field. In addition, we assume the presence of new physics heavy states around the TeV scale that do not couple to the SM fermions, only to the SM bosonic sector. However, the mixing between gauge bosons and BSM resonances induces a small indirect interaction between the BSM sector and the SM fermions. This leads to an important suppression of the fermionic operators in the low-energy EW effective theory (bilinear and four-fermion operators) in comparison with the purely bosonic ones. This naturally explains the strong experimental bounds on fermionic operators and why these resonances could not be yet detected: even if energies of the order of the TeV can be reached in present and future accelerators, their production from initial SM fermions yields a very small cross section because of this suppression mechanism. On the other hand, they can leave an imprint in SM boson measurements accessible to future experimental runs (e.g., the oblique S parameter). Finally, we compare our results with constraints from collider data.

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