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Symmetry-restoring finite counterterms of SMEFT four-fermion operator insertions at one-loop

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Dimensional regularization is nowadays the most used technique to perform loop calculations in Quantum Field Theories. However, it faces some complications when applied to chiral gauge theories such as the Standard Model of particle physics because it is not possible to define a mathematically consistent D-dimensional scheme that preserves gauge symmetries. Nonetheless, for a theory free of physical anomalies it is always possible to restore the symmetry by the addition of the appropriate set of both infinite and finite counterterms. In our work, we present the complete calculation of such finite counterterms needed for the consistent renormalization of the dimension six four-fermion operators of the Standard Model Effective Field Theory at one loop using the Breitenlohner-Maison-'t Hooft-Veltman scheme.

Abstract

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