

A Green's Basis for the Bosonic SMEFT to Dimension 8

We present a basis of dimension-eight Green's functions involving Standard Model (SM) bosonic fields, consisting of 86 new operators. Rather than using algebraic identities and integration by parts, we prove the independence of these interactions in momentum space, including a discussion on evanescent bosonic operators.

Our results pave the way for renormalising the SM effective field theory (SMEFT), as well as for performing matching of ultraviolet models onto the SMEFT, to higher order. To demonstrate the potential of our construction, we have implemented our basis in `matchmakereft` and used it to integrate out a heavy singlet scalar and a heavy quadruplet scalar up to one loop. We provide the corresponding dimension-eight Wilson coefficients. Likewise, we show how our results can be easily used to simplify cumbersome redundant Lagrangians arising, for example, from integrating out heavy fields using the path-integral approach to matching.

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