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Renormalization and non-renormalization of scalar EFTs at higher orders

For its ability to systematically capture beyond the Standard Model (SM) effects, effective field theory (EFT) has received much attention in phenomenological analyses of e.g. LHC data. In EFT studies, it is essential to identify an operator basis and calculate the anomalous dimensions of the couplings, which encode their scale dependence. In this work, we renormalize the scalar EFT at high orders (5 loop at mass dimension 6 up to 1 loop at mass dimension 12), using the R*-operation. To this end, we explicitly construct the operator bases that are necessary in intermediate steps. Results are presented in the so-called basis of conformal primaries, which exposes interesting non-renormalization and symmetric renormalization structures. The applied method can be extended to more general theories, such as the SM EFT.

Collaboration / Activity

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