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Renormalization of scalar EFTs at higher orders

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Because of its ability to systematically capture beyond Standard Model (SM) effects, effective field theory (EFT) has received much attention in phenomenological analyses of e.g. LHC data. Recent theoretical studies have focused on operator basis construction and loop level calculations in EFTs. In this work, we construct the complete basis for scalar ϕ^4 EFT up to mass dimension 12, with the help of the Hilbert series method. We present high loop calculations (up to 5 loop), and find unexpected zeros and interesting symmetric structures in the anomalous dimension matrix. The method we use can be extended to more general theories, i.e. SMEFT and be applied in high precision measurements within the SMEFT framework at the LHC.

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