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RGEs and positivity bounds of the SMEFT dimension-8 operators.

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The Standard Model effective field theory (SMEFT) is one of the preferred approaches for studying particle physics in the present scenario. The dimension-six SMEFT operators are the most relevant ones and have been studied in various works. The renormalization group evolution equations of these operators are available in the literature and facilitate examining the SMEFT on combined experimental information gathered across different energy scales. But, the dimension-six operators are not the dominant term for all observables, and some of these operators are loop-generated when UV theories are matched to the SMEFT. Also, considering that for relatively low values of the cut-off scale of the SMEFT, contributions from dimension-eight operators cannot be neglected.

In this work, we present the renormalization of the bosonic sector of the dimension-eight operators by tree-level generated dimension-eight operators in the matching of weakly coupled UV theories to the SMEFT. These operators appear in the positivity constraints, which determine the signs of certain combinations of Wilson coefficients based on the unitarity and analyticity of the S-matrix. These constraints are remarkably significant as any experimental evidence of a violation of these constraints would indicate the invalidity of the EFT approach, such as, for example, the existence of lighter degrees of freedom below the cut-off scale of the EFT. Also, these restrictions can be taken into account while defining priors on the fits aiming at constraining the SMEFT parameter space.

In-person participation

Yes

Primary author: DAS BAKSHI, Supratim**Presenter:** DAS BAKSHI, Supratim**Session Classification:** Formal Theory**Track Classification:** Formal Theory