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Connecting Scales: RGE Effects in the SMEFT at the LHC and Future Colliders

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Global interpretations of particle physics data within the framework of the Standard Model Effective Field Theory (SMEFT), including their matching to UV-complete models, involve energy scales potentially spanning several orders of magnitude. Relating these measurements among them in terms of a common energy scale is enabled by the Renormalisation Group Equations (RGEs). Here we present a systematic assessment of the impact of RGEs, accounting for QCD, electroweak, and Yukawa corrections, in a global SMEFT fit of LEP and LHC data where individual cross-sections are assigned a characteristic energy scale. We also quantify the impact of the RGE effects in projected global fits at the HL-LHC and the FCC-ee. Finally, we assess the role that RGEs play on the sensitivity at HL-LHC and FCC-ee to representative one-particle UV models matched onto SMEFT either at tree and one-loop level. Our study emphasizes the importance of a consistent treatment of energy scales to achieve the best precision and accuracy in indirect searches for heavy new physics through precision measurements.

Secondary track

T09 - Beyond the Standard Model

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