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Advancing SMEFT Global Analyses: NLO, RGE contributions, and the Role of Flavour Physics

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The Standard Model Effective Field Theory (SMEFT) is an essential tool for probing physics beyond the Standard Model. With New Physics signals remaining elusive, deriving constraints on SMEFT Wilson coefficients is increasingly important in order to pinpoint its low-energy effects. This talk presents comprehensive global fits of SMEFT under the Minimal Flavour Violation (MFV) hypothesis. We establish global limits on Wilson coefficients using both leading and next-to-leading order SMEFT predictions for various observables. Our findings highlight significant interactions among different observables, emphasizing the necessity of integrating diverse data from multiple energy scales in global SMEFT analyses. Even within this flavour-symmetric framework, where Flavour Changing Neutral Currents (FCNC) cannot be generated at tree-level, they significantly contribute via Renormalization Group Evolution (RGE) effects. More in general a consistent treatment of the RGE in global analyses is an often-overlooked aspect which proves to be crucial for analysing properly datasets spanning various energy scales.

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