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EFT Diagrammatica: UV roots of the CP-conserving SMEFT

The Standard Model Effective Field Theory (SMEFT) is an established theoretical framework that parametrizes the impact of UV models on low-energy observables. Such parametrization is achieved by studying the interactions of SM fields encapsulated within higher mass dimensional (≥ 5) operators. Through judicious employment of the EFT toolkit, SMEFT has become a source of new predictions as well as a platform for conducting a coherent comparison of new physics (beyond Standard Model) scenarios. In this talk, I will elucidate a diagrammatic approach to establish selection criteria for the allowed heavy field representations corresponding to a subset of the dimension-6 SMEFT operator basis. The contact interactions representing each effective operator can be unfolded into tree- and (or) one-loop-level diagrams to reveal unique embeddings of heavy field propagators within them. The unfolding of operators can be accomplished based solely on symmetry arguments. The interrelation between SMEFT operators and observables has been well documented in recent years. Our diagrammatic procedure enables us to catalogue heavy field representations for each SMEFT operator, thereby building well-defined links between different sets of observables and families of UV models. This makes it convenient to test the viability of the models involving these heavy fields. This also prevents redundant analyses of similar models.

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