Contribution ID: **3** Type: **not specified**

Towards the HEFT-hedron: the complete set of positivity constraints at NLO

Tuesday 3 June 2025 14:30 (15 minutes)

We present the complete set of positivity bounds on the Higgs Effective Field Theory (HEFT) at next-to-leading order (NLO). We identify the 15 operators that can be constrained by positivity, as they contribute to s^2-growth in the amplitude for longitudinal gauge-Higgs scattering, that is to all possible 2-to-2 scattering processes involving longitudinal gauge bosons, $V_L = W_L^{\pm}, Z_L$, and the Higgs boson, h. We find two sets of constraints: (i) specific linear combinations of CP-even Wilson coefficients (WCs) must be positive, and (ii) the magnitudes of some WCs—including all CP-odd ones—must be smaller than products of other CP-even WCs. We present our final constraints on the 15 dimensional HEFT space and show how known positivity bounds on the 3 dimensional space of dimension 8 SMEFT can be recovered from them. We find that only about 5% of the parameter space for WCs of HEFT operators at NLO complies with these positivity constraints. Additionally, we obtain double-sided bounds on these WCs by fully exploiting the implications of unitarity and st-crossing symmetry. For WCs contributing to the vector boson scattering process our final constraints are in most cases significantly stronger than the experimental ones. For the $V_L V_L, hh \to hh$ and $V_L V_L, hh \to V_L h$ process, there are no reported experimental limits and our theoretical constraints provide the first bounds.

Authors: CHAKRABORTY, Debsubhra; CHATTOPADHYAY, Susobhan (Tata Institute of Fundamental Research (TIFR), Mumbai); GUPTA, Rick S

Presenter: CHATTOPADHYAY, Susobhan (Tata Institute of Fundamental Research (TIFR), Mumbai)

Session Classification: Geometry / Positivity