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# Is the HEFT matching unique?

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## Abstract

Physics beyond the Standard Model (BSM) can be described in a consistent and general way through the Higgs Effective Field Theory (HEFT). Measurements of model-independent HEFT coefficients allow one to constrain the parameter space of BSM models via a matching procedure. In this work, we show that this procedure is not unique and depends on the scalings of the parameters of the Lagrangian. As examples, we consider three BSM models: the real singlet extension of the SM with a  $Z_2$  symmetry, the complex singlet extension (CSE) of the SM and the 2 Higgs Doublet Model. We discuss several physical observables, and show that different scalings of the model parameters with the UV scale in the matching to the HEFT can yield quite different results. This complicates the interpretation of HEFT measurements in terms of parameters of BSM models. Additionally, as a by-product, we report the first matching of the CSE to the HEFT

