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A Simple Perturbative UV Completion of HEFT

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Particles which acquire some fixed fraction of their mass from the Higgs are non-decoupling since their coupling to the Higgs grows in proportion to their mass. In particular, particles which acquire more than half of their mass from the Higgs, here termed Loryons, are appropriately described by HEFT rather than SMEFT. As such, BSM Loryons are a simple perturbative UV completion of HEFT which cannot be written as a convergent SMEFT. Unitarity constraints bound the size of the coupling and thus the mass of new Loryons to $\mathcal{O}(1)$ TeV, meaning that Loryons have a finite parameter space for experimental searches. We examine the bounds on possible new scalar and fermionic Loryons from direct searches and from indirect bounds through precision measurements. We find that a number of candidates remain viable and thus could be targets for future searches and that improved measurements of Higgs couplings would strongly constrain the viable parameter space.

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