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Renormalization in Higgs inflation

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We study the renormalization of theories with large non-minimal scalar-gravity coupling, of which Higgs inflation (inflation with the Higgs field playing the role of the inflaton) is the most prominent example. Despite the popularity of these models, their renormalization has never been worked out systematically. We provide an on-shell renormalization scheme, organized as an expansion in inverse powers of the non-minimal coupling constant. Our toy model is a complex, non-minimally coupled U(1) scalar field coupled to a fermion and a gauge field. We compute its relevant betafunctions, comment on their validity, show the generalization to the full theory of Standard Model Higgs inflation and compare these results with the approximate ones encountered in the literature.

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