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Effective Field Theory of Dark Energy in the Effective Field Theory of Large-Scale Structure

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In the next few years, we are going to probe the low-redshift universe with unprecedented accuracy. Among the various fruits that this will bear, it will greatly improve our knowledge of the dynamics of dark energy, though for this there is a strong theoretical preference for a cosmological constant. We assume that dark energy is described by the so-called Effective Field Theory of Dark Energy, which assumes that dark energy is the Goldstone boson of time translations. Such a formalism makes it easy to ensure that our signatures are consistent with well-established principles of physics. Since most of the information resides at high wavenumbers, it is important to be able to make predictions at the highest wavenumber that is possible. The Effective Field Theory of Large-Scale Structure (EFTofLSS) is a theoretical framework that has allowed us to make accurate predictions in the mildly non-linear regime. In this paper, we derive the non-linear equations that extend the EFTofLSS to include the effect of dark energy both on the matter fields and on the biased tracers. For the specific case of clustering quintessence, we then perturbatively solve to cubic order the resulting non-linear equations and construct the one-loop power spectrum of the total density contrast.

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