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Early Dark Energy in Type IIB String Theory

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Early Dark Energy (EDE) is a promising model to resolve the Hubble Tension, that, informed by Cosmic Microwave Background data, features a generalization of the potential energy usually associated with axion-like particles. We develop realizations of EDE in type IIB string theory with the EDE field identified as either a C_4 or C_2 axion and
with full closed string moduli stabilization within the framework of either KKLT or the Large Volume Scenario. We explain how to achieve a natural hierarchy between the EDE energy scale and that of the other fields within a controlled effective field theory. We argue that the data-driven EDE energy scale and decay constant can be achieved without any tuning of the microscopic parameters for EDE fields that violate the weak gravity conjecture, while for states that respect the conjecture it is necessary to introduce a fine-tuning. This singles out as the most promising EDE candidates, amongst several working models, the C_2 axions in LVS with 3 non-perturbative corrections to the superpotential generated by gaugino condensation on D7-branes with non-zero world-volume fluxes.

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