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Cosmological Parameters in Intrinsically Symmetric Models with Linear Perturbations

This work investigates cosmological parameters in the context of intrinsically symmetric models, a class of solutions in General Relativity that preserve local spatial symmetries while allowing for inhomogeneities and anisotropies. Unlike the standard model based on the FLRW metric, these models naturally include heat flux, anisotropic pressure, and dissipative effects, which can alter traditional cosmological predictions. The mathematical formulation adopts a foliation with intrinsically flat spatial sections and a shear-free velocity field, enabling the analysis of how such geometries influence cosmic dynamics. Recent studies show that this approach modifies the luminosity distance–redshift relation and can generate periodic behavior of inhomogeneities, allowing for more realistic averaging processes. Furthermore, the effective Friedmann equations obtained in this context feature new terms that may reduce the need for exotic dark components. In this work, we apply linear perturbation theory to study the evolution of metric and matter fluctuations on this background, assessing their impacts on parameters such as the expansion rate and matter density. The conceptual analysis suggests that intrinsic geometric effects may help address the H_0 tension between type Ia supernova observations and cosmic microwave background measurements. We conclude that the combination of intrinsically symmetric models and perturbative analysis offers a promising path to refining the determination of cosmological parameters and exploring alternatives to the standard scenario.

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