

Dynamical Vacuum Energy and Cosmological Tensions

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Gravity and general relativity are considered as an Effective Field Theory (EFT) at low energies and macroscopic distance scales. The conformal anomaly of light or massless quantum fields has significant effects on macroscopic scales, which allows the effective value of the vacuum energy to change in space and time. The EFT of vacuum energy thereby replaces the fixed constant Λ of the classical theory with a dynamical condensate whose natural ground state value in empty flat space is $\Lambda_{\text{eff}} = 0$ identically, without any fine tuning. The implications for spatially inhomogeneous cosmology and resolution of cosmic tensions of Λ CDM will be discussed.

Presenter: Prof. MOTTOLA, Emil (Univ. of New Mexico)