Title:	Aspects of Tachyon Field Cosmology
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Abstract:	Observations have established that more than two-thirds of the energy density of the Universe is due to the contribution of dark energy. Dark energy accounts for the observed late-time acceleration of the universe. The nature of dark energy is, as yet, a mystery. To understand the nature of dark energy many models have been pro- posed, the simplest and the most favoured being the cosmological constant model (ΛC DM model). The agent for cosmological constant is the energy density of the vacuum, and it remains constant throughout the evolution of the Universe. This sim- ple explanation costs us some serious theoretical problems like 'the fine-tuning and the coincidence problem'. The ΛC DM model also suffers from some observational inconsistencies between independent observations. There is a tension between the Planck observations and the other independent growth rate measurements in esti- mation of cosmological parameters. These facts motivate us to go for dynamical dark energy models, e.g., canonical and non-canonical dark energy models. In this thesis, we have studied a particular scalar field dark energy model known as tachyon dark energy, and compared it with the cosmological constant and other dark energy models. This is a viable model in cosmology, and it has been shown that the tachyon scalar field can effectively explain dark energy. In this analysis, using low redshift distance measurement data, we obtain constraints on tachyon field parameters by way of combining these datasets. Our motivation is to compare the constraints on the tachyon models from previous studies using the same datasets and to check if the non-canonical scalar field models prefer different combinations of cosmological parameters. We find that constraints on tachyon models are stringent and these are as good as the ΛC DM model to satisfy the low redshift data we have used. Background data alone can not rule out degeneracy between different models. We study the effect of perturbations in tachyon dark energy in order to get con- straints on parameters from observations other than distance measurements. We analyze the dynamics and nature of tachyon perturbations and their effect on the evolution of matter clustering. Calculating the linear growth rate of matter cluster- ing, we compare our theoretical predictions with growth rate measurements. For tachyon models, the tension between the Planck observation and growth rate mea- surement is reduced. We find that dark energy perturbations are insignificant with respect to matter clustering at sub-Hubble scales, and dark energy can be considered homogeneous. However, at Hubble and super-Hubble scales, dark energy perturba-tions are significant when compared to the matter perturbation.
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