Contribution ID: **25** Type: **not specified**

Investigating some aspects of non-minimal coupling in the context of dynamical stability approach

Friday, 9 June 2023 15:00 (15 minutes)

Standard model of cosmology (Λ-CDM model) mainly suffers from two drawbacks, first one is the fine tuning problem and second one is a cosmic-coincidence problem. In this standard model of cosmology, Λ represents the cosmological constant and CDM denotes the cold-dark matter. Another important downside of the Λ-CDM model from the observational perspective is the discrepancy between the present observed value of Hubble's constant and with predicted value of Hubble's constant from theory. These fundamental discrepancies motivate us to study different kinds of cosmological models based on the coupled field-fluid sector. Based on these above considerations, we can build a theoretical framework for non-minimally coupled field-fluid sector. Where field sector is made of a non-canonical scalar field (k-essence sector) and the fluid sector is composed of pressureless dust. The nonminimal coupling term is introduced at the Lagrangian level. We employ the variational approach with respect to independent variables that produce modified k-essence field equations and the Friedmann equations. We have analyzed the coupled field-fluid framework explicitly using the dynamical system technique considering two forms of the interaction as well as the form of scalar field potential (one is constant and other is inverse power-law type). After examining these models it is seen that all these models are capable of producing stable accelerating solutions in late time phase.

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Session Classification: Lighting Talks