Contribution ID: **88**   Type: **not specified**

The k-essence scalar field in the context of Supernova Ia observations

Friday 16 October 2015 18:10 (15 minutes)

A k-essence scalar field model having (non canonical) Lagrangian of the form L=-V(\phi)F(X) where X=1/2gˆ{\mu\nu}\nabla_{\mu}\phi\nabl with constant V(\phi) is shown to be consistent with luminosity distance-redshift data observed for type Ia Supernova. For constant V(\phi), F(X) satisfies a scaling relation which is used to set up a differential equation involving the Hubble parameter H, the scale factor a and the k-essence field \phi. H and a are extracted from SNe Ia data and using the differential equation the time dependence of the field \phi is found to be: \phi(t) \sim \lambda_0 + \lambda_1 t + \lambda_2 tˆ2. The constants \lambda_i have been determined. The time dependence is similar to that of the quintessence scalar field (having canonical kinetic energy) responsible for homogeneous inflation. Furthermore, the scaling relation and the obtained time dependence of the field \phi is used to determine the X-dependence of the function F(X).

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Session Classification: Parallel