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Isotropic and Anisotropic Dark Energy Models

In this review we have studied the evolution of the universe filled with dark energy with or without perfect fluid. In doing so we considered a number of cosmological models, namely Bianchi type I, III, V, VI0, VI and FRW ones. For the anisotropic cosmological models we have used proportionality condition as an additional constrain. The exact solutions to the field equations in quadrature are found in case of a BVI model. It was found that the proportionality condition used here imposed severe restriction on the energy-momentum tensor, namely it leads to isotropic distribution of matter.

Anisotropic BVI0, BV, BIII and BI DE models with variable EoS parameter ω has been investigated by using law of variation for the Hubble parameter. In this case the matter distribution remains anisotropic, though depending on the concrete model, there appear different restrictions on the components of energy-momentum tensor. That is why we need an extra assumption such as variational law for Hubble parameter. It is observed that, in early stage, the EoS parameter is positive i.e. the universe was matter dominated in early stage but in late time, the universe is evolving with negative values i.e. the present epoch. DE model presents the dynamics of EoS parameter whose range is in good agreement with the acceptable range by the recent observations.

A spatially homogeneous and anisotropic locally rotationally symmetric Bianchi-I space time filled with perfect fluid and anisotropic DE possessing dynamical energy density is studied. In the derived model, the EoS parameter of DE is obtained as time varying and it is evolving with negative sign which may be attributed to the current accelerated expansion of Universe. The distance modulus curve of derived model is in good agreement with SNLS type Ia supernovae for high red-shift value which in turn imply that the derived model is physically realistic. A system of two-fluid within the scope of a spatially flat and isotropic FRW model is studied. The role of two fluid either minimally or directly coupled in the evolution of the dark energy parameter has been investigated. In doing so we have used three different *ansatz* regarding scale factor, that gives rise to a variable decelerating parameter. It is observed that in non-interacting case both open and flat universes can cross the phantom region whereas in interacting case only open universe can cross phantom region. The stability and acceptability of the solution obtained are also investigated.