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ORIGINAL ARTICLE

Anisotropic quintessence stars

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Abstract We propose a relativistic model for: quintessence stars with the combination of an anisotropic pressure corresponding to normal matter and a quintessence dark energy having a characteristic parameter ω_q such that $-1 < \omega_q < -\frac{1}{3}$. We discuss various physical features of the model and show that the model satisfies all the regularity conditions and can provide stable equilibrium configurations.

Keywords Anisotropy · Quentessence · Compactness

1 Introduction

Compact objects are of great interest for a long time. Theoretical analysis of superdense stars have been done by several authors (Rahaman et al. 2012a,b; Kalam et al. 2012a,b, 2013; Hossein et al. 2012; Lobo 2006; Bronnikov and Fabris 2006; Egeland 2007; Dymnikova 2002). Ruderman (1972) show that nuclear matter may have anisotropic behaviors at a very high density ($\sim 10^{18}$ Kg/m^3). Consideration of an anisotropic behavior of the compact star leads to a realistic situation(Varela et al. 2010; Rahaman et al. 2010). Anisotropy in matter implies radial pressure (p_r) is not equal to the tangential pressure (p_t). As the density of a strange star exceeds the nuclear density, it is obvious that the pressure at the interior should be anisotropic (Bowers and Liang 1974; Sokolov 1980; Herrera 1992). It may occur for various reasons like existence of solid core, phase transition, presence of electromagnetic field etc. In recent past, Herrera and Santos (1997) provided an exhaustive review on the subject of anisotropic fluids. More recently a comprehensive work on the influence of local anisotropy on the structure and evolution of compact object has been studied by Herrera et al. (2004).

In recent WMAP measurement conclude that 73 % of the universe is *dark energy* (Perlmutter et al. 1998; Riess et al. 2004). Dark Energy theory is the most accepted one to explain the acceleration of the universe. It has some peculiar properties such as negative pressure and violation of the energy conditions. Current experimental data shows that pressure to density ratio ω is in the range $-1.38 < \omega < -0.82$. In the present work, we consider models of compact stars containing not only ordinary matter but also a quintessence matter having a characteristic parameter ω_q such that $-1 < \omega_q < -\frac{1}{3}$. The presence of dark energy motivates us to consider the existing strange stars are a mixture of both ordinary matter and quintessence matter in different proportions. The study of such kind of mixed matter is now an interesting problem and some works has already been done on this direction (Lobo 2006; Bronnikov and Fabris 2006; Chan et al. 2009; Rahaman et al. 2012a).

Some important works was carried out with Krori and Barua (1975) (KB) metric by Rahaman et al. (2012a)

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