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ORIGINAL ARTICLE

Dynamics of Kantowski-Sachs universe with magnetized anisotropic Dark Energy

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Abstract Kantowski-Sachs cosmological model in the presence of magnetized anisotropic dark energy is investigated. The energy-momentum tensor consists of anisotropic fluid with anisotropic EoS $p = \omega\rho$ and a uniform magnetic field of energy density ρ_B. We obtain exact solutions to the field equations using the condition that expansion is proportional to the shear scalar. The physical behavior of the model is discussed with and without magnetic field. We conclude that universe model as well as anisotropic fluid does not approach isotropy through the evolution of the universe.

Keywords Electromagnetic field · Dark Energy · Anisotropy

1 Introduction

So far, many astronomy observations including SNe Ia (Riess et al. 1998, 2004; Perlmutter et al. 1999; Bahcall et al. 1999), SDSS (Tegmark et al. 2004), WMAP (Bennett et al. 2003; Hinshaw et al. 2009; Nolta et al. 2008) provide us such a clear outline of the Universe: It is flat and full of an unclamped form of energy density pervading the Universe. The unclamped energy density called "Dark Energy" (DE) with negative pressure attributes to about 74 percent of the total energy density. The remainder 26 percent of energy density consists of matter including about 22 percent dark matter density and about 4 percent baryon matter density. Beside this, we know little about nature of DE. So, understanding the nature of Dark Energy is one of most challengeable problem for modern astrophysics and cosmology. Recent cosmological observations contradict the matter dominated universe with decelerating expansion indicating that our universe experiences accelerated expansion. A variety of possible solutions such as cosmological constant (Weinberg 1989; Peebles and Ratra 2003), quintessence (Sahni and Starobinsky 2000; Sahni 2004; Padmanabhan 2008), phantom field (Caldwell 2002; Nojiri and Odintsov 2003a, 2003b), tachyon field (Sen 2002; Padmanabhan 2002; Padmanabhan and Choudhury 2002), quintom (Feng et al. 2005; Guo et al. 2005), and the interacting DE models like Chaplygin gas (Kamenshchik et al. 2001; Bento et al. 2002), holographic models (Wang et al. 2005; Setare 2006, 2007; Hu and Ling 2006; Kim et al. 2006) and braneworld models (Li 2004; Deffayet et al. 2002), etc. have been proposed to interpret accelerating universe. However, none of these models can be regarded as being entirely convincing so far. Cosmologists have proposed many candidates for dark energy to fit the current observations such as cosmological constant, tachyon, quintessence, phantom and so on. The major differences among these models are that they predict different equation of state of the dark energy and different history of the cosmos expansion. The simplest dark energy (DE) candidate is the cosmological constant Λ, but it needs some fine-tuning to satisfy the current value of the DE. Overduin and Cooperstock (1998), Komatsu et al. (2009) have suggested some dynamic mod-

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