Astrophys Space Sci (2013) 348:233–240
DOI 10.1007/s10509-013-1491-5

ORIGINAL ARTICLE

On the holographic dark energy in chameleon scalar-tensor cosmology

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Received: 8 April 2013 / Accepted: 14 May 2013 / Published online: 30 July 2013

Abstract We study the holographic dark energy (HDE) model in generalized Brans-Dicke scenario with a non-minimal coupling between the scalar field and matter Lagrangian namely Chameleon Brans Dicke (CBD) mechanism. In this study we consider the interacting and non-interacting cases for two different cutoffs. The physical quantities of the model such as, equation of state (EoS) parameter, deceleration parameter and the evolution equation of dimensionless parameter of dark energy are obtained. We shall show that this model can describe the dynamical evolution of fraction parameter of dark energy in all epochs. Also we find the EoS parameter can cross the phantom divide line by suitable choices of parameters without any mines kinetic energy term.

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Keywords Generalized chameleon Brans Dicke mechanism · Holographic dark energy · Conservation equation

1 Introduction

Cosmological and astrophysical observational data risen from supernovae type Ia (SNIa) (Riess et al. 1998; Perlmutter et al. 1999; Bean and Magueijo 2001; Riess et al. 2004), Cosmic Microwave Background Radiation (CMBR) (Bennett et al. 2003) and Sloan Digital Sky Survey (SDSS) (Abazajian et al. 2003, 2004, 2005; Tegmark et al. 2004; Hao et al. 2010) indicate that the Universe is in accelerated expansion regime.

There are two approaches to justify the source of accelerating phase of the Universe. Some people look for the source of this acceleration in the geometrical part of the Hilbert-Einstein action and have studied the modified gravity (Wands 1994; Nojiri and Odintsov 2007; Guranizo et al. 2004; Saaidi et al. 2012a, 2012b; Saaidi and Aghamohammadi 2012; Aghamohammadi et al. 2009, 2010). As a second way, some researchers propose an eccentric form of matter namely dark energy (DE) (Boisseau et al. 2000; Sahoo and Singh 2002, 2003; Capozziello et al. 2003; Faraoni 2007; Cervantes-Cota et al. 2010). Although the nature and origin of the DE are ambiguous for researchers up to now, but people proposed some useful candidates which could satisfy both theoretical and observational results (Nojiri and Odintsov 2004; Padmanabha 2003; Biswas et al. 2006; Sahni et al. 2003; Arkani-Hamed et al. 2004; Piazza and Tsujikawa 2004). Amongst these proposals cosmological constant model, Λ, is the fundamental block. It is clear that this model suffers from two well known problems i.e. the ”cosmological coincidence problem” and “the