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LETTER

Brane cosmology from observational surveys and its comparison with standard FRW cosmology

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Abstract Several simple dark energy models on the brane are investigated. They are compared with corresponding models in the frame of 4d Friedmann-Robertson-Walker cosmology. For constraining the parameters of the models considered, recent observational data, including SNIa apparent magnitude measurements, baryon acoustic oscillation results, Hubble parameter evolution data and matter density perturbations are used. Also, explicit formulas of the so-called *state-finder* parameters in teleparallel theories are found that could be useful to test these models and compare Loop Quantum Cosmology and Brane Cosmology. The conclusion is reached that a joint analysis as the one developed here allows to estimate, in a very clear way, possible deviation of our cosmology from the standard Friedmann-Robertson-Walker one.

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1 Introduction

A number of difficult problems in cosmology have been put forward by the discovery of the accelerated expansion of the universe (Riess et al. 1998; Perlmutter et al. 1999). This cosmic acceleration can be explained via the introduction of a so-called dark energy (for a recent review, see Bamba et al. 2012a, 2012b; Li et al. 2011). It follows from recent observational results that dark energy currently accounts for about 73 % of the total mass/energy of the universe (Kowalski 2008). It may have rather strange properties, as a negative pressure and/or a negative entropy, the fact that it is undetectable in the early universe, etc. It is not excluded, however, that General Relativity (GR) and the ensuing vacuum fluctuations (as those leading, e.g., to the Casimir effect) could lead to an explanation of the issue, see e.g. Elizalde (2006, 2012), Cognola et al. (2005), Elizalde et al. (1994). One should also stress the following important connection: with the help of an ideal fluid GR can actually be rewritten, in an equivalent way, as some modified gravity (for a recent review, see Nojiri and Odintsov 2011).

For dark energy with density ρ_D and pressure p_D, the equation of state (EoS) parameter w_D,

$$w_D = p_D/\rho_D < 0 \tag{1}$$

is known to be negative and also, that astrophysical observations favor the standard ΛCDM cosmology. Dark energy as just a cosmological constant ($w_D = -1$) is the simplest and maybe most preferred model from the theoretical point of view, too. In this model over 70 % of the current energy