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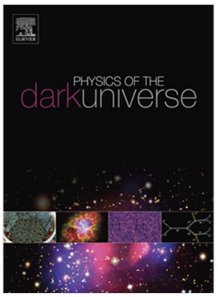

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The Einstein dark energy model

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In 1919 Einstein tried to solve the problem of the structure of matter by assuming that the elementary particles are held together solely by gravitational forces. In addition, Einstein also assumed the presence inside matter of electromagnetic interactions. Einstein showed that the cosmological constant can be interpreted as an integration constant, and that the energy content of the Universe should consist of 25% gravitational energy, and 75% electromagnetic energy. In the present paper we reinterpret Einstein's elementary particle theory as a vector type dark energy model, by assuming a gravitational action containing a linear combination of the Ricci scalar and the trace of the matter energy-momentum tensor, as well as a massive self-interacting vector type dark energy field, coupled with the matter current. Since in this model the matter energy-momentum tensor is not conserved, we interpret these equations from the point of view of the thermodynamics of open systems as describing matter creation from the gravitational field. In the vacuum case the model admits a de Sitter type solution. The cosmological parameters, including Hubble function, deceleration parameter, matter energy density are obtained as a function of the redshift by using analytical and numerical techniques, and for different values of the model parameters. For all considered cases the Universe experiences an accelerating expansion, ending with a de Sitter type evolution.

Contents

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I. INTRODUCTION

After proposing a static model of the Universe, based on the introduction of the cosmological constant in the gravitational field equations [1], Einstein tried to solve the problem of the structure of the elementary particles [2]. Adopting the basic assumption that material