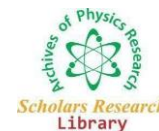




Extended Abstract

Archives of Physics Research, 2021, 13 (5)

<https://www.scholarsresearchlibrary.com/journals/archives-of-physics->



ISSN 0976-0970
CODEN (USA): APRRC7

Electromagnetic component of physical vacuum as a basic energy containing medium the ether of the universe: Phenomenology

Serge F Timashev

Karpov Institute of Physical Chemistry, Russia

E-mail: lframir@imp.mx

Today we can talk about a crisis of the modern astrophysics. The magnitude of the cosmological constant Λ , which in accordance with Einstein's equations of general relativity (GTR) is determined by the energy density ϵ_v of the physical vacuum, exceeds the experimentally determined value by 120 orders of magnitude if one uses the accepted ideas about the big bang dynamics for calculation. In the talk will be shown that the physical essence of emerging problems should first be understood at the level of the transcendental phenomenology. The ground for creating the corresponding phenomenological construction is an introduction into the physical science of a basic energy-containing medium, a sort of an ether, which is identified with the electromagnetic component of the physical vacuum – EM vacuum and which is considered as the basic reference system, tied to the expanding Universe. It is believed that the universe is an open system and the source of energy that feeds the universe is the external false vacuum, which is more energy-intensive than the EM vacuum of our Universe. It is assumed that the energetic power that constantly feeds our universe across the boundary the false vacuum – EM vacuum is equal to the Planck power. In this case, the energy flow entering the universe determines, after the Hubble equation is taken into account, the equation for the dynamics of the universe expansion (an analog of the first Friedmann equation), and the rate of the Universe volume increase determines the operating pressure. It is shown that the energy density ϵ_{vac} of the EM vacuum calculated on the basis of such representations is in full correspondence with the magnitude Λ (the solution of the 120 orders problem). In accordance with the general Casimir idea, all elementary particles and atomic nuclei in the Universe are open to the EM vacuum, and the Casimir polarization of the EM vacuum in the vicinity of each elementary particle or atomic nucleus is formed. It is shown that it is within the framework of such representations the essence of the gravity phenomenon and the origin of the unique smallness of the gravitational interaction in comparison with the nuclear (strong and weak) and electromagnetic interaction can be understood. It can be assumed that it is the wave propagation of the EM vacuum perturbation was recorded in the recent LIGO observation, and this disturbance could arise in the collision of two neutron stars or by some other large-scale events. It is shown that the adoption of the hypothesis that the electromagnetic component of physical vacuum, the vacuum of quantum electrodynamics (QED vacuum), undergoes polarization in the vicinity of elementary particles allows us to comprehend, on the phenomenological level, the physical essence of the basic hypotheses of the special theory of relativity, including the nature of the limitation of the velocity of material objects to the velocity of light in vacuum. The QED vacuum here plays the part of the base medium that governs the development of the fundamental strong and gravitational interactions.

CDM new standard model of cosmology has reached a robustness Δ The so-called level comparable to the one of the standard model of particle physics. However these two standard models are in conflict about the issue of the dark matter, an outcome of the cosmological standard model that is a contribution to the balance of cosmological densities, about five times the one of the ordinary (baryonic) matter, which does not seem to be explainable in terms of the theories of the particle physics standard model. The purpose of the present paper is to put in debate the hypothesis that this conflict could be resolved by linking dark matter with a concept which plays a crucial role in hadronic and nuclear physics, and belongs to the fundamentals of the standard model of particle physics, namely the QCD vacuum. Actually, to support this assumption, it appeared useful to revisit an almost centenary debate about a third concept, the Mach's ether of general relativity, which led me formulating my hypothesis in the following way: Mach's ether, dark matter and QCD vacuum are three modes of existence of a same entity. The idea is that in a quantum field theory like QCD, what one calls "vacuum" is the ground state, the state of minimal energy, namely the state in the Fock space for which all the occupation numbers are zero. But this vacuum is not the nothingness: it is a medium in which there is indeed no quantum of energy-momentum, but in which the quantum fields may fluctuate about a vanishing mean value, a medium which, in a cosmological context, could be assimilated to the Mach's ether.

The object of a cosmogonic theory is to look for ideally simple initial conditions from which can have resulted, through the interplay of known physical forces, the current world in its full complexity.

Bottom Note: *This work is partly presented at 3rd International Conference on High Energy Physics, December 11-12, 2017, Rome, Italy*