

Review of: "The origin of dark energy and dark matter: the galactic antigravitation"

Fotios K. Anagnostopoulos¹

¹ University of Peloponnese

Potential competing interests: No potential competing interests to declare.

The author adds a new particle (the so-called Kepleron) to the cosmic budget, which is assumed mass-less and without spin and is a mediator of a new force. It is claimed that this new force is of fundamental nature. Personally I am a dedicated supporter of new concepts in gravity and cosmology, beyond Lambda CDM and standard assumptions, i.e. FRWL spacetime and GR, and there is honor for a thinker that goes beyond the standard theory of his era. However, in my humble opinion, there are some important contradictions in this work.

In particular, this kepleron is assumed to interact with the gravitational field (i.e. with the graviton). The author does not address the nature of these interactions. For example, naively we expect that the graviton must be a spin-2 boson because the source of gravitation is the stress-energy tensor, a second-order tensor. This should enforce constraints on kepleron's spin and properties. In general, each modification of the standard model of particle physics needs to be properly embedded into the standard quantum field theory framework. Moreover, the initial argument used to establish the non-quantum nature of the proposed phenomenological approach (claimed to be of a fundamental nature) is debatable. Namely, the author claims that, given the failure (until now) of the community to produce a complete theory of quantum gravity, his/hers approach is ok to be semi-classical. This argument is problematic for the following two reasons. First, if it holds, it can be applied as-it-is on the Dark Matter - Dark Energy assumptions, i.e. given the failure of the community to explain the microphysics and/or unite DE/DM, the whole approach should be abandoned. Secondly, this claim by the author contradicts the claimed fundamental character of his/hers approach: a fundamental theory of gravity (beyond GR) must include quantum effects, by definition.

There are many arbitrary assumptions in the text, that are not explained/discussed/referenced. For example, I do not understand the part "(Note: All galactic interactions should be considered twice, since the present of an object A interacts with the past of B and the present of B interacts with the past of A, respectively.)". Where this is formally based? This should be properly discussed and addressed (including calculations).

Another problem that I deem also to be a no-go for a scientist to invest time and energy in further development of this work is the avoidance of a Lagrangian formulation of this new model. It is claimed however in the text (again, without further discussion) that the "least distance principle" is fulfilled (?).

Overall, the fundamental problem of this work is the ill-discussed, ill-formalized (and thus unprovable) claims. Please consider compiling this work in a physics model, within a Lagrangian description. There we can discuss it properly, fit the

model with the data and ultimately consider the model in its full extent (what implies at the level of elementary particles and accelerations, what implies for the local universe, i.e. galaxy rotation curves)

With respect,

Fotios K Anagnostopoulos