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Review Article

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About Dark Energy

Yvan-Claude Raverdy*

Free Researcher, Grenoble, France

***Corresponding Author**
Yvan-Claude Raverdy, Free Researcher, Grenoble, France.

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Abstract

We have considered the physical space filled by a quantum fluid made up of discrete elements organized into several coexisting phases. In this model, what we call "dark energy" appears as main phase of the Vacuum, we propose here that it is the phase associated with the fundamental level of this quantum fluid.

After an examination of its main properties, we show that the refractive index of the real vacuum, which is consisting largely of dark energy and fossil radiation, has an "abnormal" value compared to it.

We thus verify that the inverse of the fine structure constant associated with the dark energy is indeed the integer 137.

1. Introduction

The origin of the notion of dark energy is recent, it came from the analysis of the cosmic microwave background by the Planck satellite (2014), adding to the discovery of the acceleration of the expansion of the universe through the analysis of radiation of super-noveas. These analyzes indicate that this component holds a very important place order in the universe because it represents approximately 70% of its energy and, on the other hand, it is uniformly distributed (that is to say its density is constant at every point in space). It is a repulsive energy, unlike gravitational energy, the more it does not seem to be in direct connection with the other fields. Its existence is no longer contested but no model from theories in vigor does not account for its properties, we can nevertheless relate it to the cosmological constant which appears in Einstein's equation for curvature of space.

The consideration of a granular space-time which is a quantum fluid opens up very interesting perspectives, as we are going to see it, to understand the nature of this energy which appears so mysterious with regard to current theories and associated research [1,2].

1.1 Reminder Regarding Previous Publications on the Energy of the Universe

Our basic publications (ref.1 and 2) describe the universe as a quantum fluid made up of corpuscles, which are also harmonic vibrators, of unbreakable energy and infinitesimal value, that we called QF.

This fluid presents three phases, in mutual physical equilibrium, which characterize:

- Ordinary matter (baryonic) where the QF are in a state of movement synchronous and stationary (like a vortex) which can be described by a function unique three-dimensional wave defining an elementary particle.
- Gravitational energy, which we have assimilated to dark matter, associated to the previous phase, where the QF are in an interactive but disordered state quasi-total, the proportion of order concerns the gravitons which correspond to a progression of QF deficits generated by the exchange of a quantum of action with baryonic particles and which can be described by a two-dimensional wave function.
- Finally the phase attributed to dark energy where the QF constitute a vibrators network three-dimensional, each QF vibrating at the same frequency. We will see that this phase can correspond to a one-dimensional wave function identical at any point in space and corresponding to a limit value of the gravitational phase [2].

The elementary particles of ordinary matter have a density maximum energy (of the order of 10^35 J/m^3) and dark energy a minimum value (nearly 10^-9 J/m^3). The gravitational phase is intermediate in energy density which, moreover, is very variable depending on of the importance of the source mass.

1.2 Description of Dark Energy

We have already considered this phase as the one where the "granules" fundamental (QF) are in a state of less constraint which leads to a minimum density, this is the case of the evanescence of gravitational energy where it is shown that the energy density tends towards a limit which is a constant of space [2].

We also postulated that the QFs of dark energy are vibrators harmonics, which implies the wave nature of this energy. On

the other hand it is necessary to consider a dipolar character to make takes in account its dielectric properties; we can therefore imagine the energy dark like an organized network of vibrating dipoles, where a network of waves perfectly homogeneous and isotropic, which is equivalent.

The application of a external electric field then introduces a weak axial anisotropy. The condition of isotropy (in the absence of field) has the consequence that the distance between vibrating dipoles, in the network, must be equal to a wavelength and this for all vibrators. We therefore have the conditions to postulate that this is the level fundamental of the quantum fluid, overall because the corresponding wave function, at literal sense of the term, is the same for every location and that the energy density is minimal.

1.3 The Wave Number ko

The dark energy density was obtained as the lower limit value of that of gravitational energy according to the formula: **(E) = c^2 / (2pi GT^2)** where (c) is the speed of light, (G) the constant of gravitation and (T) the age of the universe. The value of this density is **E = 1.13 10^-9 J /m^3**. If we introduce a second relation which concerns the individual energy of the network waves (which we called counter-graviton): **e = 2h/T** whose value is **e = 3 10^-50 J** (where h is Planck's constant), it is possible to calculate the wavelength (L) which, as we have said, must be the distance between two vibrators; we obtain **L = (4pi G T h / c^2)^1/3**, whose calculation provides **L = 1.39 10^-14 m** [2,3].

This value corresponds precisely to the wave number ko highlighted during of the establishment of the formula giving the mass of the electron (we report the reader at reference 5), we qualified it as a “fundamental value of electromagnetism", we find here the justification as the number wave of the fundamental level of the quantum fluid which constitutes the universe [5].

1.4 Vacuum Refraction Index

The object here is to analyze the contributions of the vacuum components, (dark energy and radiation), on the value of the refraction index which is set, arbitrarily, equal to 1. It is also the question to answer why cosmic microwave background radiation is the only one to take into account. From this analysis, we will deduce the difference relative speed of light for dark energy and real vacuum.

As the number of dark energy vibrators is enormously greater than the number of photons of the radiations, we can consider the relationships that deal with dilute dielectric media.

Two cases arise; first the index is “normal” if the speed of light is lower than that of vacuum, the index is then slightly greater than 1 as this is the case for gases, second; the index is “abnormal” if it is slightly less than 1, we think that we are in this case of figure because there can only be a coupling with electromagnetic radiation, in conditions close to resonance (…).

The formula for calculating the dilute media index for abnormal refraction is the following:
n = 1 - (N q^2 c^2) / (2 eps. h nu^3) [4].

Where (N) is the number of photons per unit volume, (q) the elementary charge, (eps.) There dielectric constant and (nu) the photon frequency.

If we apply this relationship to what we know about fossil radiation:
N = 4 10^8 / m^3 and c/nu = 0.65 10^-3 m (average half wavelength of radiation for the temperature of the diffuse background, i.e.: 2.7°K), we find **n = 0.9992**, which is the value of anomalous refractive index of real vacuum by compared to the vacuum of dark energy, it is also the quotient of the speeds of the light in these two mediums.

This value of the refractive index intersects the result obtained by the analysis made from the formula giving the mass of the electron on the speed of light [6].

From this result follows the deviation on the inverse of the fine structure constant between the two mediums and the value of the integer **137** corresponding to the vacuum pure dark energy [6]. It also indicates that the radiation from the cosmic background is indeed the only to consider.

2. Remarks

The previous developments are a continuation of our others publications, while confirming the main results they contain. In this very concrete description of dark energy, which we think to be the fundamental level of the quantum fluid that is the universe, we put into evidence that its **wave number ko** is also necessary for the construction of the electron, which can be interpreted by the resonance of the wave of this particle with that of the fundamental level of dark energy.

We can also think that this criterion of resonance applies to all elementary particles, which can contribute to the explanation of their existence.

3. Conclusion

The results we obtained place dark energy as the major component of the quantum fluid which constitutes the universe, this despite the extreme weakness of its density. It is located in the continuity of energy gravitational force as far away from the masses, its interaction with it is the transformation, reciprocal, of gravitons into counter-gravitons which are guided waves in an isotropic network.These waves have an electromagnetic character very weakened and a minimum energy which is common to them and with extremely low value.

We used the term “counter-gravitation” to express that this phase is subjected to expansion by the pressure exerted on the “external nothingness”, which causes the expansion accelerated of the universe, pulling the large masses it contains.

We think that the wave number **ko**, associated with the fundamental level which is dark energy, is an element that directs the structure of all elementary particles of so-called “ordinary matter”, that is to say all of the masses, we have shown it with regard to the electron.

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(*): would have to be verified by a formal and complete study of the quantum fluid…