About the fine structure constant

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Abstract

This study builds on a previous publication entitled "*a formula for electron mass calculation based on new fundamental concepts*" (ref.1), it shows that the relationship obtained between the mass of the electron and the four fundamental constants of physics, including fine structure constant, is precisely satisfied (to the millionth) if we take the inverse of the latter equal to the whole number **137**. This value is interpreted as "ideal" for a Vacuum which would be free from radiation and other particles, therefore consisting exclusively of dark energy, this would imply a slight modification of the speed of light and Planck's constant, in this medium.

Introduction

The calculation of the mass of the electron, carried out according to the established formula, see reference (1) and further, gives a precisely correct result for omega value (inverse of the fine structure constant) which is **137.0036** using the real and precise experimental values of others physical constants.
The experimental omega value is **137.0360**; why such a difference ? ; we think that the reason is that the Vacuum energy is not entirely pure because at least the photons of the fossil radiation are added to the anti-graviton gas constituting most of the vacuum energy (dark energy) and with which the electron is in equilibrium (ref 1). However, a very slight variation for omega must cause a small modification of the permittivity of the vacuum, therefore the speed of light. The aim of this study is to clarify the omega value for an ideal vacuum containing only anti-gravitons dark energy (reference 3), taking into account the very weak variations induced on the other constants.

Development

The formula providing the electron mass that we have demonstrated is as follows (reference 1)

Me = (pi / 8 omega) . 1 / (16 e^omega)^1/3 . (h c / G)^1/2 (1)

where h is Planck's constant, c the speed of light and G the gravitational constant.
We also showed that we could express omega by a very simple relationship between the two fundamental extreme lengths which are the "radius" of the universe **R** and the radius of the graviton **lo** (comparable to the Planck distance), this relationship is:

omega = Ln (R / lo) (2) (Ln: natural logarithm)

We have also explained the value of **lo** within the framework of a theory corpuscular for the gravitation (reference 2) :

lo = 2 (h G / c^3)^1/2 (3)

By setting k = (h c / G)^1/2 and using formulas (2) and (3), a calculation, which we do not report here, results in the differential relation :

d(omega) = (omega 1 – omega o) = 3 Ln (k1 / ko)

The comparison of this relationship with the formula for the mass of the electron (1) in the two cases where it gives a correct result:

1) omega = 137.0036, k unmodified (index 1)

2) Values with index o integrating the variation of k (k(o))

provides the value: **omega (o) = 137.0000**…

This result incorporates a modification of the speed of light such that **c**(o) = 0.9992 **c**(1) and a variation, twice this, of the Planch constant **h**.

Conclusion and Discussion

Thus, strictly speaking, the formula for calculating the mass of the electron is precisely exact for a value of omega which is the whole number **137**, as far as we can tell it for a millionth precision.

This implies a relative reduction in the speed of light of 810^-4, this is a fairly significant variation that can be explained by the subtraction of all the radiation present and capable of acting, indirectly, on the dielectric permittivity of the vacuum, in agreement with the found value of the fine structure constant (**1/137**). The conclusion is that the three constants, **omega**, **c** and **h** would not be not totally universal, the ideal values found could not be exactly reached, even in the great intergalactic voids where only fossil radiation would remain in addition to anti-gravitons of dark energy; there would remain a relative difference of the order of 10^-4 for the three sizes.
The fact that **omega** can be a whole number has been considered since the beginning of the consideration of the fine structure constant by *Sommerfeld* and *Eddington* was convinced of this and had imagined one justification which was not accepted, especially since the details made to the measurement have completely excluded it from reality.
The discovery of a relationship between the mass of the electron and the four fundamental constants of Physics (ref.1), reintroduces the number **137** for an ideal case where the vacuum would be purified of every electromagnetic radiation and other particles etc., it is possible that this condition can put on a path of understanding this fact, possibly in relying, why not, on the reasoning of Eddington (ref.3) and others.
In any case, a practical application would be the selection and weighting of radiation having an impact on the permittivity of the vacuum .

In fact, knowledge of the influence of this radiation on dielectric properties of the vacuum is likely to provide information on the nature of dark energy.

Références

1) Raverdy YC “A formula for electron mass calculation based on new fundamental concepts”. viXra, Hight Energy Particles Physics 22(8): 0154. , J. Pure Appl Math Vol 7 No 2 March 2023

2) Raverdy YC “A corpuscular space-time to explain the gravitation” J. Mod. Appl. Phys. 2023; 6(2):1-4.

3) Eddington “A fundamental theory” Cambridge University Press 1946