A derived formula for electron mass calculation

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Here, we establish an equation for electron mass which depends on the age of the Universe T by combination between the result of our reference article [1] and Space time description [2], this equation is so depending on the four physical constants. That allows us to calculate T ; the numerical value obtained matches that deduced from the analysis of the cosmic microwave background (CMB) with a greater precision.

Derived Formula

Let's start with the very simple formula established in the intermediate stage in our referenced article [1], giving the mass of the electron Me (formula 9):

Me = (alpha/4 c).(h ko) (1)

Where alpha is the fine-structure constant, h is Planck's constant, c is the speed of light, and ko is the fundamental wavenumber.

In publications [2] and [1], we established the value of ko in relation to the distance L between two vibrators (QF) of the fundamental lattice; this value is:

ko = pi/L = [(pi^2 c^2)/(4 G T h)]^1/3 (2)

where G is the gravitational constant and T is the age of the universe.

Combining (1) and (2), we get:

Me = alpha/4.[(pi^2 h^2) / 4 (G c T)]^1/3 (3)

This formula shows the dependence of the mass, and therefore the intrinsic energy, of the electron on the age of the universe. While simpler than the one given in publication [1], it is less robust due to its dependence on a variable which is precisely the age of the universe.

Using the updated CODATA values, and taking T = 13.78 Billion Years (obtained by the CMB [3]), the numerical application of formula (3) gives the value: Me = 0.9111×10^{-30} kg.

This value is greater, by a relative difference of 2×10^{-4}, than the most precise experimental value.

If we now use, as required, the values of the constants in intrinsic space

(see [4]), the numerical application gives **Me = 0.91081 × 10^{-30}** kg, very close value (5×10^{-5}) to the experimental one Me = 0.91094 × 10^{-30} kg.
In fact, we must take into account a relative uncertainty of about 310^-3 on the value of T deduced from the CMB, this places our result in the range:
0.9107 10^-30 kg < Me < 0.9111 10^-30 kg,
Which is quite satisfactory; the derived formula is therefore correct.

Calculation of the age of the universe

Equating formula (3) with that given in publication [1], we obtain the following equation:
(pi^2 h^2)/(4 G T c)^1/3 = (16 e^137)^-1/3.(h c/4 G)^1/2
137 is the inverse of alpha in intrinsic space [4]
The solution to this equation is: T = 16 lo e^137 / pi c = 16 R / pi c (4)
with lo =2 (h G/c^3)^1/2 (transverse dimension of a QF) [1]
The numerical application in intrinsic space gives: **T = 13.773** Billion Years, with an uncertainty of 3×10^{-5}, which is 100 times better than that of the CMB see [3] : (13.75 < T < 13.80 in Billions of Years).
This result, which overlaps with that of the CMB with significantly improving the precision, is also a further verification of the results of our work on the electron [1], moreover, it validates (if validation were needed) the CMB measurements.

If we use this very precise value of T into the equation (3), we find Me = 0.910936 kg, compared to 0.910938 kg for CODATA, this is excellent and we can speak about a strong validation of our equations.

Conclusion

It is very gratifying for us to obtain further justifications, which seems decisive, for the results of our work about the electron mass and granular quantum superfluid spacetime; this is obtained by an excellent fitting for the electron mass. An other important result related in this article is the confirmation of the CMB measurement for the age of the universe, and more with a significant improvement in precision.

References

[1] Raverdy YC., “A formula for electron mass calculation based on new fundamental concepts”. J Pure Appl Math. 2023;7(2):129-133 and viXra 2208.0154

[2] Raverdy YC “About Dark Energy” viXra 2405.00061

[3] See Wikipedia: “Cosmic microwave background”

[4] Raverdy YC, “Intrinsic empty space” viXra 2411.0030, filed on 04/11/2025

[5] Raverdy YC, “The evolution of the Universe from the Big Bang to the Big Bonce” viXra 2509.0067 , on Quantum Gravity

[6] See Wikipedia, “Hubble constant”; “ Observation of Cepheid variables in the Large Magellanic Cloud (after precise calibration) by the Hubble Space Telescope”