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Dimensionless Values and Planck Units for Mathematical Universe

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Abstract: The formulas of certain significant masses, temperatures and radii in relation to the corresponding Planck units are determined. Thus, problems with the system of measuring units are avoided, and there are many short formulas that always contain the same mathematical and physical constants.

Keywords: dimensionless, Planck units, fine structure constant, physical constant, mathematical universe.

Introduction

The goal is to show some relationships inevitable in the universe in the simplest way. There is no need to refer to the values of the physical constants mentioned here, because the ratios of the same kind are always a dimensionless number. All the formulas presented are the result of rearranging my previously published formulas to obtain the simplest mathematical form with only two physical constants. For the masses, temperatures and radii shown here, they are in all formulas: the fine structure constant and the mass ratio of the proton and electron.

Formulas

For simplicity and shortness, we present formulas in the form of a logarithm for basis 2 and mark such values with the underlined symbols. Thus, for example, all masses are given as logarithms for the basis 2 of the Planck mass and the observed mass, $\underline{m} = \log_2 (m_{planck} / m)$, the same for temperatures, $\underline{T} = \log_2 (T_{planck} / T)$. In order to avoid negative logarithm, the radiuses are shown inversely as the ratio of the observed radius to the Planck length, $\underline{r} = \log_2 (r / l_{planck})$.

We use physical constants: The inverse value of the fine structure constant, ά, mass ratio of proton - electron, μ. We will also use abbreviations that appear in all formulas, thus further shortening them:

Mathematical: $t = \log_2(2\pi)$, $cy = \exp(2\pi) = e^{2\pi}$ and

Physical: $a = \log_2 ά$, $m = \log_2 μ$, Proton shift [1] and $\Delta p = 2\text{-}1/(μ/ά+2)$

We do not show value of the any parameter, so anyone can check with the values of their choice of the unit of measure and the value of the dimensionless constants. The formulas from [1] for logarithms have been rearranged to relate masses of neutron (1), protons (2), and electrons, (3) to Planck mass:

$$\underline{m}_n = cy/8 + 3t/4 - 3\Delta p/4 - (3cy/4 - \Delta p/2 + 2t/3)/(1+\alpha'^2 m) \quad (1)$$

$$\underline{\mathrm{m}}_p = cy/8 + 3t/4 - 3\Delta p/4 \tag{2}$$

$$\underline{\mathrm{m}}_{el} = cy/8 + 3t/4 - 3\Delta p/4 + m \tag{3}$$

We also present the formula for the hypothetical fundamental particle, (4), because of its importance in physics [2]:

$$\underline{\mathrm{m}}_f = cy/8 + t/4 - \Delta p/12 \tag{4}$$

For background microwave radiation temperature, (5) and hypothetical quantum of the temperature, (6) the formulas from [3] are rearranged:

$$\underline{\mathrm{T}}_{bg} = 3cy/16 + 5t/8 - \Delta p/8 + \left[\log_2(cy/4 + t/2 - \Delta p/6\right]/2 \tag{5}$$

$$\underline{\mathrm{T}}_q = 3cy/8 + 5t/4 - \Delta p/4 + \left[\log_2(cy/4 + t/2 - \Delta p/6\right] \tag{6}$$

Also from [3], we consider that the temperature in (7) and the (8) should be significant.

$$\underline{\mathrm{T}}_f = cy/8 + t/4 - \Delta p/12 \tag{7}$$

$$\underline{\mathrm{T}}_n = cy/4 + t - \Delta p/6 + \left[\log_2(cy/4 + t/2 - \Delta p/6\right] \tag{8}$$

The temperature in (7) is very close to Hagedorn's temperature [4].

For Rydberg's constant, (9), Bohr radius, (10) and the classical electron radius, (11):

$$1/\underline{R} = cy/8 + t/4 - 3\Delta p/4 + 2a + m \tag{9}$$

$$\underline{\mathrm{r}}_{bohr} = cy/8 - 3t/4 - 3\Delta p/4 + a + m \tag{10}$$

$$\underline{\mathrm{r}}_{cl} = cy/8 - 3t/4 - 3\Delta p/4 - a + m \tag{11}$$

Note that in (9) we use inverse value of Rydberg's constant, which is due to the fact that it is dimensionally defined as the inverse of the length, (L^{-1}). It is clear that on the basis of the definition of formulas from the beginning, according to the rules of logarithms, real values are:

For any mass: $$m = m_{pl} * 2^{-\underline{m}} \quad (12)$$

For any temperature: $$T = T_{pl} * 2^{-\underline{T}} \quad (13)$$

And for each radius without minus at the exponent:

$$r = m_{pl} * 2^{\underline{r}} \quad (14)$$

Where, "pl" in the index, indicates that it is a Planck value.

Formulas for 11 physical constants that give precise mass, temperature and radius relationships are shown. Eight values are very well known, and the results are easily verifiable for them. For three temperatures, the formulas (6), (7), and (8) are not well known values obtained by the measurements, and they have yet to be verified. Similar formulas can be obtained for many other physical quantities.

Mathematical constants in all the above formulas are naturally unchanged values. For physical constants we believe that they are unchanged, but for that we have no proof. However, all the above relations predominantly depend on the mathematical constant, $cy = \exp(2\pi)$ and much less of the physical constants ά and μ. From there follows the conclusion that proton, electron, and neutron will always exist as all phenomena among them, even in the case that ά and μ are variables.

Conclusion

The universe is a mathematical creation. The best way to show the mathematical universe is by using dimensionless relations and the Planck units. The 11 formulas shown here are simple, with 3 to 6 summands, but not necessarily too simple. It is also expected that formulas for complex structures and elementary particles of the second and third generations are far more complex, but for them the formulas are not also unreachable.

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