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The Redefinition of Planck Dimensions

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***Abstract*— Starting from the definition of the gravitational radius $R=\frac{GM_0}{c^2}$ and the condition that the quantum effects are visible when a dimension of the observed source is of the order of the magnitude of the wavelength of the light engaged, the value for wavelength is obtained $\lambda=\sqrt{\frac{hG}{c^3}}$. That is thediameter of a particle, in other words,a line that corresponds to the Planck length, and it is $\sqrt{2\pi}$ times larger than the Planck's definition of length.**

***Index Terms*— gravitational radius, Planck length.**

I. Introduction

Working on the eigenvalue equation (17), [5], from the condition $R \sim \ell_p$, the value for m_0 is obtained:

$$m_0 = 1{,}9 \cdot 10^{-8}\, kg$$

which does not correspond tothe starting assumption $m_p \gg m_0$, $m_p = 2{,}17 \cdot 10^{-8}\, kg$, so the Planck value $\ell_p = 1{,}6 \cdot 10^{-35}\, m$ has been put underthe*magnifying glass*$\ell_p = \sqrt{\frac{\hbar G}{c^3}}$.

From the definition of thegravitational radius:

$$R = \frac{Gm_p}{c^2}$$

and the quantum condition $R = \lambda \equiv$ de Broglie wavelength mass m_p , for the Plancklength is obtained$\sqrt{2\pi} = 2{,}506$ times larger value than the Planck value.

Excerpt of the Planck length from the condition $R = \ell_p = \lambda$

Planck dimensions are defined in the following order:

the Planck length $\ell_p = \sqrt{\frac{\hbar G}{c^3}} = 1{,}616 \cdot 10^{-35}\, m$

the Planck time $t_p = \sqrt{\frac{\hbar G}{c^5}} = 5{,}38 \cdot 10^{-42}\, s$

the Planck mass $m_p = \sqrt{\frac{\hbar c}{G}} = 2{,}176 \cdot 10^{-8}\, kg.$

The Planck mass is a particle mass, black hole, whose diameter, Schwarzschild radius, is equal to the Planck length ℓ_p so we let the Planck mass be thenucleus of the gravitational atom.

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Quantum effects are manifested when the dimension of the nucleus $R \sim \ell_p$ is of the order of magnitude of the length of the de Broglie waves which correspond to the Planck mass, i.e.

$$R = \frac{Gm_p}{c^2} = \lambda = \frac{Gm_p c^2}{c^4} = \frac{Gh\nu}{c^4} = \frac{Gh\frac{c}{\lambda}}{c^4} = \frac{Gh}{c^3\lambda} \Longrightarrow \lambda^2 = R^2 = \frac{Gh}{c^3} = \ell_p{}^2 \qquad (1)$$

Therefore, Planck dimensions defined this way are:

$$\ell_p = \sqrt{\frac{\mathrm{Gh}}{c^3}}\,,\; t_p = \sqrt{\frac{\mathrm{Gh}}{c^5}}\,,\; m_p = \sqrt{\frac{\mathrm{ch}}{G}} \qquad (2)$$

Hence, we obtain redefined Planck dimensions by replacing the reduced Planck constant $\hbar$with the Planck constant hinthe Planck definition.

Planck dimensions are $\sqrt{2\pi} \sim 2{,}506$ times smaller than redefined values.

In favour of redefined values, we invoke the equation (17), [5], in which for the basic state$n = 0$ is valid the following relation:

$$R^2 m_0{}^2 > \frac{3}{4}\frac{\hbar^2}{c^2} \qquad (3)$$

that for $R = \ell_p = 1{,}6 \cdot 10^{-35}\, m$ gives the following value:

$$m_0 > 1{,}9 \cdot 10^{-8}\, kg\,,\quad m_p = 2{,}17 \cdot 10^{-8}\, kg$$

For redefined value $\ell_p = 4{,}05 \cdot 10^{-35}\, m$

$$m_0 > 0{,}75 \cdot 10^{-8}\, kg$$

and redefined Planck mass m_p:

$$m_p = 5{,}45 \cdot 10^{-8}\, kg \gg m_0$$

which corresponds to the initial assumption $m_p \gg m_0$.

The gravitational atom contains the nucleus $R = m_p$ and the mass $m_0$which moves due to interaction with m_p.

II. Conclusion

Planck dimensions defined this way match its own energy values E_n from [5], (12), (13) with a note that for the basic state$n = 0$, exists only one solution of bicubic equation (17) that corresponds to matter-antimatter. Induced conditions $n \geq 1$ also correspond to matter-antimatter in the entire space, except in finite intervals where exist two more solutions and not just the matter-antimatter. We will name those two solutionsdark matter.

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