The Relativity of the Time with the Universal Density of Potential Energy at Different Stationary and Moving Reference Frames

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ABSTRACT

This article is an analysis of the relativity of time as a function of the Universal density of potential energy in both stationary and moving frames. In the first work developed and published with the title "The relativity of the time with the universal density of potential energy at different stationary reference frames" published in the *International Journal of Physics* [2020, 8(1), 11-13. DOI: 10.12691/ijp-8-1-2] led us to a new view of relativity because we found the dependence of time on the square root of the respective universal potential energy density.

In this new article, in addition to concluding what was previously said, we also conclude that the same relativity occurs in relation to the amount of Universal density of potential energy crossed by moving references. We conclude that the time at each location varies in inverse proportion to the square root of the potential energy density crossed by each reference frame.

(Keywords: time, quantum mechanics, relatively, matter, quantum physics, relativistic time)

INTRODUCTION

In this paper the author offers a new proposal to the model originally presented in 2020 and which takes into account the Relativity of time proposed by Einstein in relation to the variation in speed.

In this work, I consider a body that moves vertically in relation to the surface of body M, within the gravitational field with initial velocity V.

The relativity of time between a moving reference frame and another stationary one on the surface is given by Equation 1. In reference A to the surface with speed V, vA and stopped on the surface of M, A.

$$\left(\frac{t_{vA}}{t_A}\right)^2 = \frac{C^2 - V^2}{C^2} \quad \textbf{(1)}$$

In the reference frame C at the limit of the action of the gravitational field of M and on the surface of M, A.

$$\left(\frac{t_{vC}}{t_A}\right)^2 = \frac{C^2 - (V^2 - \frac{2GM}{R})}{C^2} \quad \textbf{(2)}$$

$$\left(\frac{t_{vC}}{t_A}\right)^2 = \frac{C^2 - V^2 + \frac{2GM}{R}}{C^2} \quad \textbf{(3)}$$

The difference between the potentials will be given by:

$$\left(\frac{t_{vA}}{t_A}\right)^2 - \left(\frac{t_{vC}}{t_A}\right)^2 = \frac{C^2 - V^2}{C^2} - \frac{C^2 - V^2 + \frac{2GM}{R}}{C^2} \quad \textbf{(4)}$$

$$\left(\frac{t_{vA}}{t_A}\right)^2 - \left(\frac{t_{vC}}{t_A}\right)^2 = -\frac{2GM}{RC^2} \quad \textbf{(5)}$$

It is concluded that the time differential between these references does not depend on the initial speed.

As can be seen, the time differential is independent of the initial speed V, depending exclusively on its location in height.

Assuming the time in the reference frame, C, 1, as unitary, we have:

$$\left(\frac{t_A}{t_C}\right)^2 = 1 - \frac{2GM}{RC^2} \quad \textbf{(6)}$$

$$\frac{t_A}{t_C} = \sqrt{1 - \frac{2GM}{RC^2}} \quad \textbf{(7)}$$

The same as, that I proposed in the article entitled "The Relativity of the Time with the Universal Density of Potential Energy at Different Stationary Reference Frames", published in the International Journal of Physics, Pub. Date: February 18, 2020", whose publication address is:

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$$\frac{t_A}{t_C} = \sqrt{1 - \frac{2GM}{RC^2}} \quad \textbf{(8)}$$

$$\frac{t_A}{t_C} = \sqrt{\frac{C^2 - \frac{2GM}{R}}{C^2}} \quad \textbf{(9)}$$

$$\frac{t_A}{t_C} = \sqrt{\frac{\frac{C^2}{2G} - \frac{M}{R}}{\frac{C^2}{2G}}} \quad \textbf{(10)}$$

$$\frac{t_A}{t_C} = \sqrt{\frac{\rho_U - \frac{M}{R}}{\rho_U}} \quad \textbf{(11)}$$

$\rho_{UA} = \rho_U$ – Universal density of potential energy at the Earth's surface

$\rho_{UB} = \rho_U - \frac{M}{R}$ - Universal density of potential energy at the limit of Earth's gravitational field.

It is concluded that time is inversely proportional to the square root of the Universal Potential Energy Density at each location.

$$\frac{t_A}{t_B} = \sqrt{\frac{\rho_{UB}}{\rho_{UA}}} \quad \textbf{(12)}$$

<u>Relativity of Time Between Frames of Reference in Relative Movement.</u>

In general terms, time in moving frames will depend on the speed at which they move.

According to Einstein, the relativity of time in relation to speed is given by:

$$\frac{t_{vB}}{t_{vA}} = \sqrt{\frac{C^2 - V_B{}^2}{C^2 - V_A{}^2}} \quad \textbf{(13)}$$

<u>Relativity of Time Between Moving Reference Frames with Different Universal Density of Potential Energy</u>

Therefore, times in frames of reference that move at different speeds located in locations with different universal potential energy density will have a time relativity given by:

$$\frac{t_{v\rho B}}{t_{v\rho A}} = \sqrt{\frac{C^2 - V_B{}^2}{C^2 - V_A{}^2}} \sqrt{\frac{\rho_A}{\rho_B}} \quad \textbf{(14)}$$

$$\frac{t_{v\rho B}}{t_{v\rho A}} = \sqrt{\frac{\frac{C^2}{C^2 - V_A{}^2}}{\frac{C^2}{C^2 - V_B{}^2}}} \sqrt{\frac{\rho_A}{\rho_B}} \quad \textbf{(15)}$$

$$\frac{t_{v\rho B}}{t_{v\rho A}} = \sqrt{\frac{\frac{C^2}{C^2 - V_A{}^2}\ \rho_A}{\frac{C^2}{C^2 - V_B{}^2}\ \rho_B}} \quad \textbf{(16)}$$

Can we then say that time will be inversely proportional to the square root of the universal potential energy density crossed by each of the frames?

Perhaps it is then the amount of energy crossed that changes the body's energy and thus its time.

$$\frac{t_{v\rho B}}{t_{v\rho A}} = \sqrt{\frac{C^2 - V_B{}^2\ \ \rho_A}{C^2 - V_A{}^2\ \ \rho_B}} \quad \textbf{(17)}$$

Are we Facing the Solution of Mach's Principle?

We can think that time does not depend on speed, but on the density of universal potential energy crossed by the reference frame. Are we facing the solution of Mach's principle?

"Mach's principle, in theoretical physics, particularly in discussions of theories of gravitation, is a hypothesis first stated by physicist and philosopher Ernst Mach in 1893, in which he states: "The inertia of any system is the result of the interaction of this system and the rest of the universe. In other words, every particle in the universe ultimately has an effect on every other particle." Taken from Wikipedia, Mach's Principle – Wikipedia, the free encyclopedia (wikipedia.org).

CONCLUSION

Until today, it was incomprehensible why a body moving at speed would have more energy than one at rest. I think the answer is here.

The time and energy depend fundamentally on the amount of Universal Density of Potential Energy in which the reference is immersed. Potential density of potential energy has very specific characteristics.

In the case of black holes, we sometimes know that they exist because they gravitate around empty areas with masses of significant size.

As we know, black holes are capable of bending light, but this type of radiation, Ru, which also generates gravitation, is not subject to the gravitational effect of matter. If this is so, then we can say that it is not subject to deviations due to the action of gravitational fields and as such moves in a straight line.

If we go back to the Big Bang, we understand two things, that the universe is spherical and that it grows at approximately the speed of light, very close to the speed of less energetic photons.

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