About the Possibility of Surface and Volume Creation from the Equivalence Principle

Spiros Koutandos

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We assume from previous work that the mass of the electron creates a spacetime curvature thus giving a picture of local change of volume and surface. The assumption comes from the relativistic radius of the electron which gives as a first estimate for a spacetime curvature. The volume created seems to be depending on the dielectric susceptibility which alters the speed of light thus creating a new metric. We find a formula for this new volume and the rate of change of the surfaces locally.

Keywords: NA

Classification: For Code: 020399

Language: English

London Journals Press

LJP Copyright ID: 925644
Print ISSN: 2631-8490
Online ISSN: 2631-8504

London Journal of Research in Science: Natural and Formal

Volume 21 | Issue 6 | Compilation 1.0

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I. INTRODUCTION

If we generalize the surface to area equivalence for a black hole [1] as a valid law describing the quantum phenomena taking in mind that the logarithm of probability is proportional to the entropy we naturally arrive at the following relationship:

$$dP = \frac{d|\psi|^2}{N} = 2\frac{|\psi|^2}{N^2K}dS \qquad (1)$$

In equation (1) K stands for the spacetime curvature found in our paper [2] which if multiplied by the dielectric susceptibility gives:

$$K\chi(\vec{r}) = \frac{dS}{dV} \qquad (2)$$

The right part of equation (2) is the surface to volume ratio.

We put forth some of the formulas we had derived in the afore mentioned article [2]:

$$\frac{\hbar^2}{2mN}\Delta|\psi|^2 = B = V\frac{dP}{dV} = \frac{|\psi|^2}{\chi}\frac{mc^2}{N} \qquad (3)$$

$$P = Pressure = \frac{|\psi|^2}{N}(E-U) \qquad (4)$$

Combining formulas (4) ,(3),(2),(1) we get:

$$B = V\frac{dP}{dV} = 2\frac{|\psi|^2}{N^2}V\chi(E-U) = mc^2\frac{|\psi|^2}{N\chi} \qquad (5)$$

The solution of equation (5) is equation (6):

$$2\chi^2 = \frac{mc^2}{(E-U)}\frac{N}{V} \qquad (6)$$

A natural consequence of equation (1) is the following result:

$$\nabla|\psi| = 2|\psi|\frac{\nabla S}{NK} \qquad (7)$$

Therefore by using equation (7) together with the results of the references[3,4] the velocity of the particle is written as:

$$\vec{v} = \psi\frac{d\vec{r}}{dt} + 2i\psi\frac{\nabla S}{NK} \qquad (8)$$

$$\frac{d\vec{r}}{dt} = \frac{\hbar}{m}\nabla\phi + \frac{e}{mc}\vec{A} \qquad (9)$$

Next we are going to produce the formula for vorticity by following reference [5]:

$$\vec{\Omega} = \frac{\nabla S}{NK} \times \frac{d\vec{r}}{dt} \qquad (10)$$

The meaning of equation (10) is that vorticity is a vector showing towards the change of volume.

However the change of volume and surface is phenomenological only due to the presence of mass from the equivalence principle which creates a curvature in spacetime. Thus we shall have the following restriction:

$$\frac{dS}{dt} = 0 = \nabla S\cdot\frac{d\vec{r}}{dt} + \frac{\partial S}{\partial t} \qquad (11)$$

From equations (11) ,(9) and (7) and by using the law for the continuation of current we derive the following result:

$$\frac{\partial|\psi|^2}{\partial t} = \frac{1}{KN}|\psi|^2\frac{\partial S}{\partial t} \qquad (12)$$

Therefore during the passage from on quantum state to the other the surfaces change locally.

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II. CONCLUSIONS

Since we are aware of the well known formula from thermodynamics connecting volume change to entropy we shall use it this time to find the final formula and solve for the volume:

$$\frac{dS}{NK} = \frac{dV}{V} \rightarrow \chi = \frac{N}{V} \qquad (13)$$

Using equations (13) and (6) apart from a factor of two which we are unsure about we find:

$$E - U = mc^2 \frac{V}{N} \qquad (14)$$

The formula for pressure now is written as follows:

$$P = mc^2 |\psi|^2 \frac{V}{N} \qquad (15)$$

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