IMPOSSIBILITY OF EXISTENCE OF SCHWARZSCHILD WORMHOLES IN THE MODEL OF EXPANSIVE NONDECELERATIVE UNIVERSE

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Abstract: In our model of Expansive Nondecelerative Universe it is supposed nonstationary nature of gravitational field. It allows to localize its energy density. An attempt to localize the energy density of a Schwarzschild wormhole leads to a conclusion that its intensity would be inversely proportional to the third power of distance. It thus follows the impossibility of existence of wormholes from our model.

1: INTRODUCTION

One of the fundamental postulate of our Expansive Nondecelerative Universe (ENU) model declares that our Universe has been expanding by a constant velocity being equal to the velocity of light c [1 - 6]. The Universe matter and gravitational energy are gradually increasing. The Universe gravitational energy is negative and the total Universe energy is thus equal to zero and the conservation laws are obeyed.
Introducing the transformation $m \to m_t$ leads to

$$\dot{m} = \frac{dm_t}{c\,dt} = \frac{m_t}{a} \tag{1}$$

where a is the Universe gauge factor (a = 1.3 x 10^{26} m).
For the gravitational field energy, the component T_0^1 of energy-momentum tensor is of importance, which can be obtained applying Schwarzschild metric for nonstationary field

$$T_0^1 = -\frac{c^4}{8\pi G} e^{-\lambda_t} \frac{\dot{\lambda}}{r} = -\frac{c^4 r_g}{8\pi G a r^2} \tag{2}$$

At the same time it holds

$$T_0^1 \sim E_g \sim r^{-2} \tag{3}$$

where E_g is the gravitational field intensity.

2: SCHWARZSCHILD WORMHOLE

The metric of Schwarzschild wormhole can be expressed [7] as

$$ds^2 = c^2 dt^2 - dr^2 - (r^2 + b^2)(d\vartheta^2 + \sin^2\vartheta\, d\varphi^2) \tag{4}$$

where b is the wormhole radius. In order to localize the gravitational field energy based on the ENU model, the following transformation $b \to b_t$ is introduced. It holds

$$\dot{b} = \frac{db_t}{c\,dt} = \frac{b_t}{a} \tag{5}$$

For the Ricci tensor component R_{10} it holds

$$R_{10} = \frac{\partial \Gamma^{\alpha}_{10}}{\partial x^{\alpha}} - \frac{\partial \Gamma^{\alpha}_{1\alpha}}{\partial x^{0}} + \Gamma^{\alpha}_{\beta\alpha}\Gamma^{\beta}_{10} - \Gamma^{\alpha}_{\beta 0}\Gamma^{\beta}_{1\alpha} \tag{6}$$

Non-zero components of Christoffel symbols are as follows

$$\Gamma^{2}_{12} = \Gamma^{3}_{13} = \frac{r}{r^2 + b_t^2} \tag{7}$$

$$\Gamma^{2}_{02} = \Gamma^{3}_{03} = \frac{b_t^2}{a(r^2 + b_t^2)} \tag{8}$$

In addition,

$$\frac{\partial \Gamma^{2}_{12}}{\partial x^{0}} = \frac{\partial \Gamma^{3}_{13}}{\partial x^{0}} = -\frac{2 b_t^2 r}{a(r^2 + b_t^2)^2} \tag{9}$$

In case $b_t << r$, the component T^{1}_{0}, representing the gravitational field energy density, is obtained in the form

$$T^{1}_{0} = -\frac{c^4}{4\pi G}\frac{b_t^2}{a r^3} \tag{10}$$

3: CONCLUSIONS

Comparing relations (2), (3) and (10) it becomes obvious that the gravitational field intensity is inversely proportional to the third power of distance for the Schwarzschild wormhole. This intensity must, however, be inversely proportional to the square of distance. This is why the wormholes cannot exist within the framework of the ENU model. An identical conclusion concerning the nonexistence of wormholes follows also from other approaches [8-10]

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