Gravitational Diagram of an Ideal Black Hole

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Abstract. Black holes can only be inside quantized space-time. Without quantized space-time, black holes cannot exist. In this regard, all known work on black holes requires adjustment. We describe the state of a black hole by a system of equations in the form of a two-component solution of the Poisson equation for the quantum density of the medium and gravitational potentials. An analysis of the spherical deformation of quantized space-time allows us to look inside a black hole and describe its external gravitational field. We consider two types of black holes: black holes ideal and non-ideal black holes. The ideal black holes characterized discontinuities of the quantized space-time on the surface of the black hole. Its formation is completed. Such a black hole is completely invisible. Non-ideal black holes do not have discontinuities of quantized space-time on the surface of a black hole. Its formation is not completed. Such a black hole has a visible glow due to the reflection of photons from its surface. The quantum density of the medium inside the black hole is doubled due to its gravitational compression. Cosmic bodies falling into a black hole break up into quarks already on its surface. Only quarks can penetrate inside a black hole through its surface. Quarks can restore matter inside a black hole. The giant black hole inside may look like a new universe. The gravitational forces inside the black hole are determined by the gradient of the quantum density of the medium, which is characterized by the deformation vector of quantized space-time. It is possible that within a giant black hole can form star systems and planets with weak gravity like Earth where life is possible.

Keywords: black hole, ideal black holes, non-ideal black holes, quantum density, gravitational compression, deformation vector, gravitational forces.

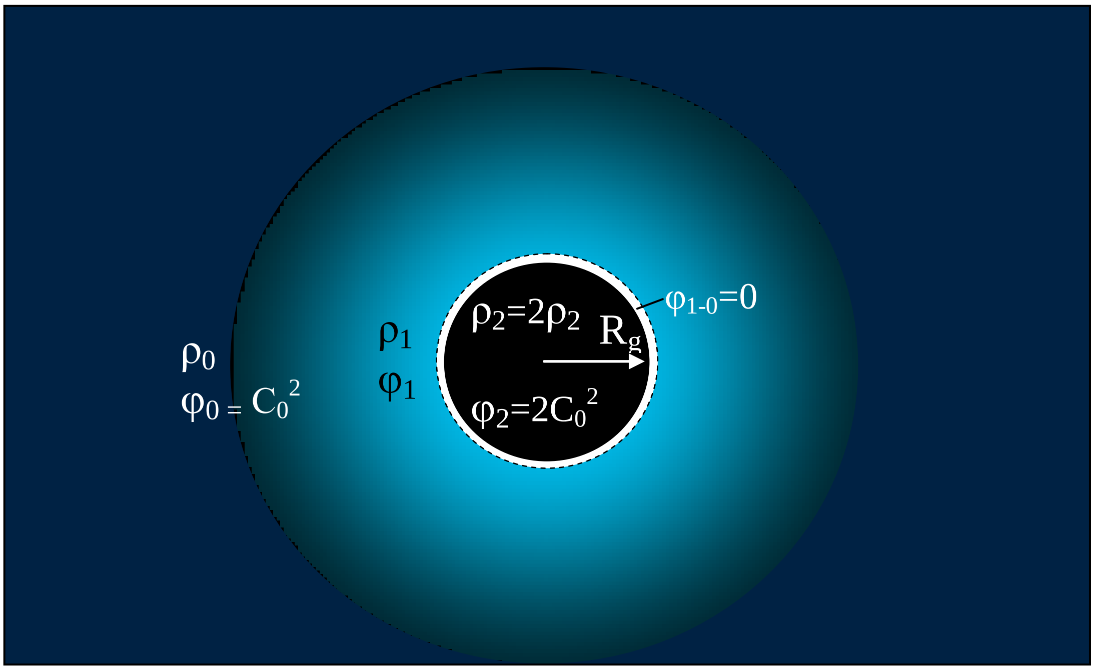

Fig. 1. An ideal black hole inside quantized space-time.

ρ_1, φ_1 is the region of expansion (blue); ρ_2, φ_2 is the region of compression (black); $\varphi_{1-0} = 0$ is the gap region of the quantized space-time (white rim).

Figure 1 shows an ideal black hole inside quantized space-time. The ideal black holes characterized rupture of the quantized space-time on the surface of the black hole. It is the gap region of the quantized space-time (white rim) $\varphi_{1\text{-}0} = 0$. Its formation is completed. Such a black hole is completely invisible.

We describe the state of a black hole by a system of equations in the form of a two-component solution of the Poisson equation for the quantum density of the medium and gravitational potentials:

$$\mathrm{div}(\mathrm{grad}\rho) = k_o \rho_m \qquad (1)$$

where k_0 is the proportionality coefficient,

ρ_m is the density of matter, kg/m^3.

The Poisson equation (1) has a two-component solution in the form of a system of equations for the regions of gravitational extension ρ_1 and compression ρ_2 of quantized space-time as a result of its spherical deformation during the formation of the mass of a particle (body) [1-4]:

$$\begin{cases} \rho_1 = \rho_o\left(1 - \dfrac{R_g}{r}\right) \text{ at } r \geq R_S \\ \rho_2 = \rho_o\left(1 + \dfrac{R_g}{R_S}\right) \end{cases} \qquad (2)$$

where ρ_o is quantum density of undeformed quantized space-time, q/m^3;

R_S is radius of the gravitational boundery (the interface) between the regions of tension and compression (radius of the particle, body), m;

r is distance, m;

R_g is gravitational radius (without multiplier 2), m:

$$R_g = \frac{Gm}{C_o^2} \qquad (3)$$

where $G = 6.67 \cdot 10^{-11}$ Nm^2/kg^2 is gravitational constant;

m is mass, kg;

$C_o^2 = 9 \cdot 10^{16}$ J/kg is gravitational potential of undeformed quantized space-time.

We write the classical Poisson equation for gravitational potentials φ:

$$\mathrm{div}(\mathrm{grad}\varphi) = 4\pi G \rho_m \qquad (4)$$

None of the physicists before could find a two-component solution of the Poisson equation (4) for gravitational potentials by analogy with the solution for the quantum density of the medium (2). Now, by analogy with solution (2), we can write a two-component solution of the Poisson equation (4) for gravitational potentials:

$$\begin{cases} \varphi_1 = C^2 = C_o^2\left(1-\dfrac{R_g}{r}\right) \text{ при } r \geq R_S \\ \varphi_2 = C_o^2\left(1+\dfrac{R_g}{R_S}\right) \end{cases} \quad (5)$$

where φ_1 and φ_2 are the distribution functions of the gravitation potential for the spherically deformed space-time, J/kg.

From (2) and (5), taking into account (3), we write down the parameters of the ideal black hole on its surface at $r = R_S = R_g$:

$$\begin{cases} \rho_{1-0} = \rho_o\left(1-\dfrac{R_g}{R_g}\right) = 0 \\ \rho_2 = \rho_o\left(1+\dfrac{R_g}{R_g}\right) = 2\rho_o \end{cases} \quad (6)$$

$$\begin{cases} \varphi_{1-0} = C^2 = C_o^2\left(1-\dfrac{R_g}{R_g}\right) = 0 \\ \varphi_2 = C_o^2\left(1+\dfrac{R_g}{R_g}\right) = 2C_o^2 \end{cases} \quad (7)$$

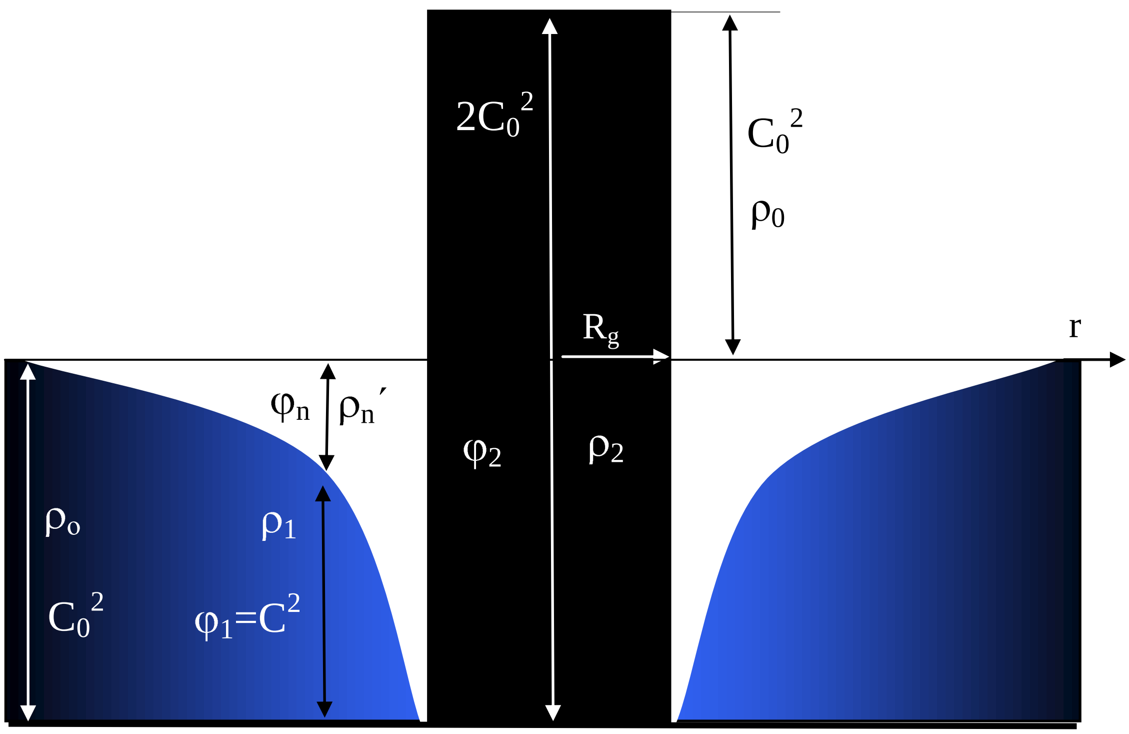

Fig. 2. Gravitational diagram of an ideal black hole.

Figure 2 shows gravitational diagram an ideal black hole inside quantized space-time. A black hole is formed as a result of the collapse of matter and compression of quantized space-time. We calculated the parameters of an ideal black hole using formulas (2), (5), (6), (7). The distinguishing feature of the black hole is the presence of discontinuities $\rho_{1\text{-}0} = 0$ (6) and $\varphi_{1\text{-}0} = 0$ (7) of the quantized space-time on its surface with radius Rg (3). The quantum density of the medium inside the black hole is doubled $\rho_2 = 2\rho_0$ (6) due to its gravitational compression. The gravitational potential $\varphi_2 = 2C_o^2$ (7) inside the black hole also doubles [1-5].

The speed of light C in the vicinity of the black hole is found from (5):

$$\varphi_1 = C^2 = C_o^2\left(1 - \frac{R_g}{r}\right) \tag{8}$$

$$C = C_o\sqrt{\left(1 - \frac{R_g}{r}\right)} \tag{9}$$

Light stops on the surface $r = R_S = R_g$ (9) of an ideal black hole, and photons decay:

$$C = C_o\sqrt{\left(1 - \frac{R_g}{R_g}\right)} = 0 \tag{10}$$

Cosmic bodies falling into a black hole break up into quarks already on its surface. Only quarks can penetrate inside a black hole through its surface. Quarks can restore matter inside a black hole. The giant black hole inside may look like a new universe. The gravitational forces inside the black hole are determined by the gradient of the quantum density of the medium, which is characterized by the deformation vector of quantized space-time. It is possible that within a giant black hole can form star systems and planets with weak gravity like Earth where life is possible. [1, 2].

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