

Schwarzschild Sphere and Nastasenko Hole, Justification of their Structure and basic Parameters

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ABSTRACT

At the present time, black holes are reduced to the parameters of the Schwarzschild sphere. It is shown that Schwarzschild determined only half of the mass and energy of a black hole, and its spherical shape makes it difficult to interact with the external environment. The elimination of this drawback is the main goal of this work, and the substantiation of the shape, structure and parameters of black holes on the basis of the strict laws of the material world is its scientific novelty.

The Methods of Research: Used in the work are based on deduction and induction, as well as on the application of reliable laws of physics and the general principles of the theory of knowledge.

Work Results: It is proposed to replace the Schwarzschild sphere at the quantum level of the material world with a hole-die, which consists of 2 layers of hexagonal prisms of circular space quanta, formed from 6 regular trihedral prisms of elementary space quanta. The length of all their faces is $\lambda_g = 4.05125 \cdot 10^{-35} \text{m}$ and is equal to the wavelength of the gravitational field forming this hole. Its energy and mass are added to the energy $E = mc^2$ due to the rotation of the gravitational field in it. The connection between the hole-die and the black and white holes, which change radially to the quantum λ_g in concentric columns, is justified.

Conclusions: Strict calculated dependences are found and numerical values are obtained on their basis, which confirm the new parameters of black holes.

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Introduction

The work relates to the field of quantum physics, cosmic physics and cosmology, in particular, to the determination of the parameters and structure of black holes, as well as to the foundations of the material world and the entire Universe. The solution of these problems is necessary for a better understanding of the principles of building the foundations of the Universe.

An analysis of the state of the problem has shown that the information about black holes obtained in recent years is based only on indirect astronomical observations of the zones surrounding them, which made it possible to single out a black spot of light absorption inside them, which is further identified as a black hole (Fig. 1) [1]:

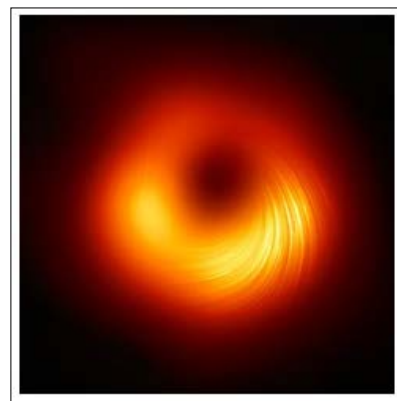


Figure 1: The shadow of the supermassive black hole at the center of the galaxy Messier 87, located 54 million light years from Earth

The structure inside this spot and the parameters of its structure have not been found on a rigorous physical basis, only the M – mass parameters and R – radius of black holes within the

Schwarzschild sphere are actually known, which are determined from the dependence (1) and (2) [2]:

$$M = \frac{c^2 r_G}{2G} (kg), \quad (1)$$

$$r_s = \frac{2GM}{c^2} (m). \quad (2)$$

where M – sphere mass, kg,

c – speed of light in vacuum: $c = 0,299792458 \cdot 10^9$ (change) $\left(\frac{m}{s}\right)$ [3],

r_G – sphere radius, m, G ,

G – gravitational constant: $G = 6.67408(31) \cdot 10^{-11} \left(\frac{m^3}{kg \cdot s^2}\right)$. [3].

This dependence is usually used to determine the Schwarzschild radii for objects with a known mass. For example, a black hole with a mass equal to the mass of the Earth has radius ≈ 9 mm. For the sun, the Schwarzschild radius is about 3 km.

The basis of the work performed is a new direction of research, from the initial (zero) level of the material world, to higher levels: elementary particles, nuclei of atoms, atoms, etc. [4]. The main feature of this level (hereinafter the Nastasenko level) is its formation on the basis of fundamental physical constants. On this basis the structure of the Universe from minimal quanta of space is rigorously substantiated [5], with the length of all its elements l_p (3) and the maximum possible mass m_p (4):

$$l_p = \sqrt{\frac{hG}{c^3}} = \sqrt{\frac{6.626070040 \cdot 10^{-34} \left(\frac{kg \cdot m^2}{s}\right) \cdot 6.67408 \cdot 10^{-11} \left(\frac{m^3}{kg \cdot s^2}\right)}{\left(0.299792458 \cdot 10^9 \left(\frac{m}{s}\right)\right)^3}} = 4.05128 \cdot 10^{-35} (m), \quad (3)$$

$$m_p = \sqrt{\frac{hc}{G}} = \sqrt{\frac{6.626070040 \cdot 10^{-34} \left(\frac{kg \cdot m^2}{s}\right) \cdot 0.299792458 \cdot 10^9 \left(\frac{m}{s}\right)}{6.67408 \cdot 10^{-11} \left(\frac{m^3}{kg \cdot s^2}\right)}} = 5.45560 \cdot 10^{-8} (kg). \quad (4)$$

where h – Planck's constant [3]:

$$h = 6.626070040 \cdot 10^{-34} (J \cdot s) = 6.626070040 \cdot 10^{-34} \left(\frac{kg \cdot m^2}{s}\right).$$

Therefore, further attention is paid to the Planck's level black hole, it is hypothetical black hole which has parameters (3) and (4) [6]. In it was shown that the parameters (3) is equal to the wavelength of the gravitational (Unified) field of the Universe $\lambda_G = l_p$ [7]. In this case, value m_G (4) will be the mass characteristic of a quantum black hole, which follows from the equality of the wave energy $E_G = hc/\lambda_G$ according to de Broglie's law and the relationship between the mass and its total energy according to the Einstein law $E_G = m_G c^2$ [8].

On this base we get (5):

$$m_G = \frac{E_G}{c^2} = \frac{h}{\lambda_G c} = \frac{6.62607004 \cdot 10^{-34} \left(\frac{kg \cdot m^2}{s}\right)}{4.051248 \cdot 10^{-35} (m) \cdot 0.299792458 \cdot 10^9 \left(\frac{m}{s}\right)} = 5.455647896 \cdot 10^{-8} (kg). \quad (5)$$

Formation of a Planck-level black hole was performed in taking into account the possibility of violation of the symmetry of objects in the material world [9]. Therefore, in, a hypothesis was put forward about the possibility of the formation of a hole instead of the initial space quantum (by analogy with “vacancies” in crystal lattices) and the probability P of such an event exists [9].

New Results of the Work and Their Discussion

In is created, that not only the translational motion of matter in the black holes (the initial Schwarzschild solution for a spherically symmetric black hole), but also its rotation [9]. The rotation version is also introduced in the Kerr solution for a stationary axisymmetric rotating black hole [10]. These rotations shown confirm is light of streams (Fig. 1). However, there is no charge in a black hole.

Schwarzschild in his solution determined only half of the total mass and energy for a spherically symmetric immobile black hole, which is reduced only to its kinetic energy. This is contradiction with Einstein's total energy law $E = mc^2$.

The elimination of this drawback is the **main goal** of the work performed, and its **scientific novelty** is the substantiation of the hole-die structure and its parameters based on strict scientific provisions and reliable physical laws. To this end, the task was set to develop adequate theoretical foundations and methods of research that would provide more complete and reliable knowledge about the structure and parameters of black holes.

Working Methods

The performed work is based on the methods of deduction and induction in the study of the material world, as well as the application of reliable known laws of physics and general principles for the development of the theory of knowledge [11]. Other research methods have been used only partially. Complete methods are not yet known, since the work being performed is associated with fundamentally new scientific discoveries, the search for which is difficult to formalize with previously known technical methods and techniques work.

This contradiction is eliminated by taking into account the transverse shift of elementary space quanta. With the same quantum jumps by the value $\lambda_G = R_F$ for longitudinal and transverse displacement with the speed c of light in vacuum, their energy and mass are the same and doubling. Therefore, in dependences of the Schwarzschild sphere for the hole-die mass M_F , and for the radius RF, do not have a coefficient 2.

The scheme of the version of the formation of a quantum black hole is shown in Fig. 2. This hole 1 of quantum level is surrounded by 6 quanta of space 2. To view the hole, the 2 closing columns of space quanta in the scheme are conditionally removed.

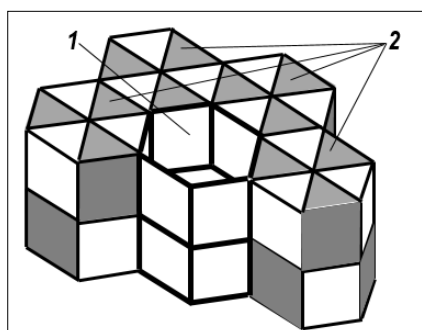


Figure 2: Schematic image of a quantum level hole (1) (Nastasenko holes) in the general array of space quanta (2),

For real objects, the number n of quantum hole-die is determined by the ratio of their mass M to quantum mass $M_F = 5.45565 \cdot 10^{-8}$ kg. Since the mass of black holes is estimated in the masses of the Sun $M_o = M_s = 1.988744 \cdot 10^{30}$ kg, then we gets for it [12]:

$$n_s = \frac{M_s}{M_F} = \frac{1.988744 \cdot 10^{30} (kg)}{5.455648 \cdot 10^{-8} (kg)} = 0.3645294 \cdot 10^{38} (\text{units}), \quad (6)$$

Considering that the black hole mass and radius are directly proportional to each other, each new mass quantum M_F leads to an adequate increase in the radius R_F . Then the number n is the coefficient of increase in the black hole radius, which for the Sun will give radius:

This value coincides with the currently declared radius of a black hole with the mass $M_o = M_s$ of the Sun $R_{gS} = 2.953250 \cdot 10^3$ m to within 4 decimal places [12]. The discrepancy is due to the accuracy of the gravitational constant G used in the data calculations and in the declared calculations.

$$R_{gS} = 2R_F n_s = 2 \cdot 4.051248 \cdot 10^{-35} (m) \cdot 0.364529 \cdot 10^{38} (\text{units}) = 2.953599 \cdot 10^3 (m). \quad (7)$$

Thus, on a rigorous basis, it is confirmed:

1. Quantum-layered structure of black holes by concentric rings of the same mass M_F , in which its density decreases in proportion to the area of the n-th ring within the framework.
2. The black hole has not a spherical shape, but a circular disk form with the parameters of concentric Nastasenko hole.
3. Strict calculated dependences are found and numerical values are obtained on their basis, which confirm the new parameters of circular disk form black holes.

Considering that within the framework of the equations following from Einstein's GR [12], a black hole can be not only absorbing matter, but also emitting it, i.e. be a “white hole”, so in [8] the 3rd hypothesis was put forward that a quantum black hole consists of 2 quantum layers, one of which works like a black hole, and the other layer works like a white hole. In a pair, they form a longitudinal hole-die. Such a scheme of actions is implemented by a hole-die that is open to the external environment, and not by a sphere closed on itself, since the quantization conditions are violated in the minimal form, when was proposed in [8].

Conclusions

1. The Schwarzschild sphere at the level of Planck dimensions and masses does not correspond to the general principles of quantization of the material world, which excludes the reality of the existence of its spherical shape and the conditions for its interaction with the material objects, of physical fields and quantum's of the Universe space, surrounding of this sphere.
2. The Schwarzschild sphere should be replaced by a prismatic of hole-die, which is formed by two layers of circular quanta of space in the form of regular hexagonal prisms, consisting of 6 regular trihedral prisms of elementary space quanta with their common face on the central axis of the circular quanta and other their faces by quantum jumps length $\lambda_G = 4.05126 \cdot 10^{-35}$ m and the mass changes by quantum jumps with a maximum value of $m_G = 5.45565 \cdot 10^{-8}$ kg.
3. In the proposed of hole-die, as a model of a quantum black hole, the longitudinal and transverse motion of the gravitational field in it by quantum jumps by the value λ_G at the speed of

- light c is taken into account, which supplements of the energy and mass of the hole-die to the total energy $E = mc^2$.
4. On a rigorous basis, was confirmed quantum-layered structure of black holes by concentric rings of the same mass M_{F_i} in which its density decreases in proportion to the area of the i -th ring within the framework, at the same time the black hole has not a spherical shape, but a flat circle with the parameters of concentric Nastasenko hole. The received data are confirmed solar black hole.
 5. Strict calculated dependences are found and numerical values are obtained on their basis, which confirm the new parameters of black holes.
 6. Proposed quantum-layered form of a black hole in the form of a hole-die with a gravitational field rotating in it has a better basis for its existence in the material world than the Schwarzschild sphere. Therefore, the Nastasenko hole disk form has every reason for its recognition in the scientific world and can be accepted as the starting point for further research.

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