Gravitational Diagram of a Nucleon For Quantum Density of a Medium

Professor Vladimir Leonov

Abstract. The gravity diagram shows a graphical distribution of the quantum density of the medium or gravitational potentials around the nucleon and inside it. The gravitational field of a proton is a gravitational well around a proton. This is a potential well. The presence of a gravitational well at a proton and atomic nucleus was not previously taken into account in the physics of elementary particles and the atomic nucleus. However, the gravitational pit around the atomic nucleus is fundamental in describing the properties of an orbital electron. On the surface of a proton at its gravitational boundary, we observe a jump in the quantum density of the medium. The quantum density of the medium is an analogue of the gravitational potential. However, the processes of deformation of quantized space-time are much more convenient and easier to study by analyzing the change in the quantum density of the medium.

Keywords: gravity diagram, quantum density, nucleon, proton, gravitational well.

In the theory of Superunification, we describe the state of a nucleon inside quantized space-time using the Poisson gravitational equation for the quantum density ρ of a medium [1-4]:

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

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]:

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

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:

$$R_g = \frac{Gm}{C_o^2} \tag{3}$$

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.

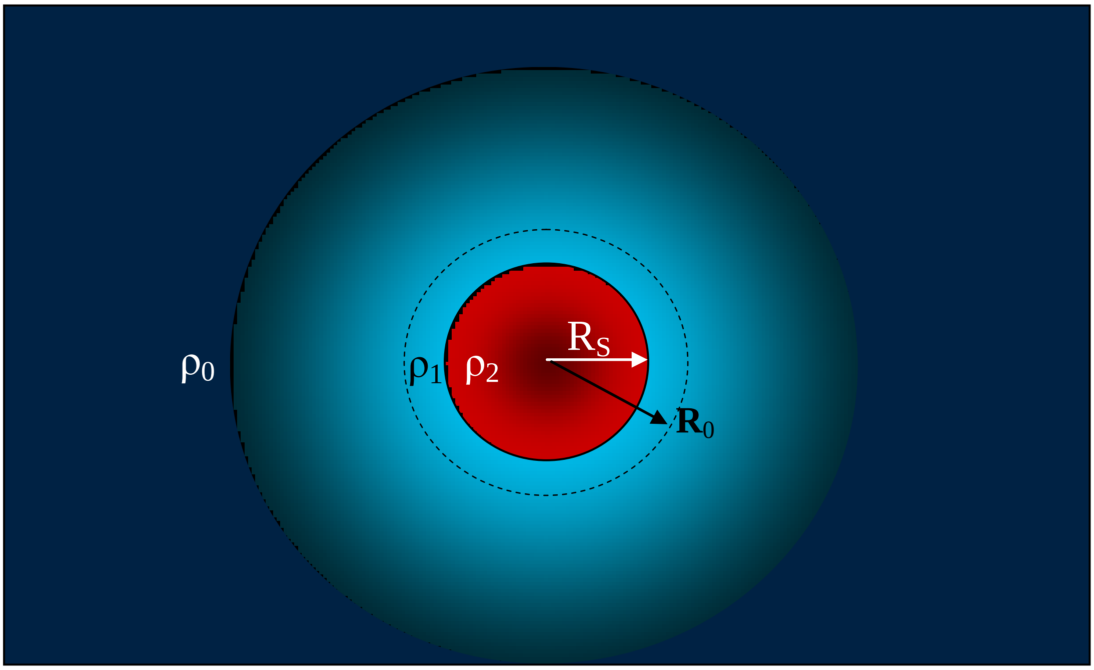

Fig. 1. Formation of the gravitation field and the nucleon mass as a result of spherical deformation of the quantized space-time by the shell of the nucleon with radius R_S. ρ_1 – the region of expansion (blue) and ρ_2 – the region of compression (red).

Figure 1 shows in the section the region of quantized space-time with a spherical sign-alternating shell of the nucleon (the dotted sphere) formed inside the region. The shell is initially compressed to a sphere with radius R_S. As already mentioned, the non-perturbed quantized space-time is characterized by the quantum density of the medium ρ_0 [1, 5]:

$$\rho_o = \frac{k_3}{L_{qo}^3} = 3.55 \cdot 10^{75} \frac{q}{m^3} \tag{4}$$

where $k_3 = 1.44$ is the coefficient of filling of vacuum with spherical quantons;

L_{q0} is diameter of the quanton [1, 6]:

$$L_{qo} = 0.74 \cdot 10^{-25} \, m \tag{5}$$

Evidently, in compression of the shell of the nucleon together with the medium, the quantum density ρ_2 in the middle of the shell increases above ρ_0 as a result of stretching of the external region whose quantum density ρ_1 decreases.

This is the process of spherical deformation of the quantized space-time as a result of which the mass and gravitational field appears at the nucleon. The shell of the nucleon has the function of a gravitational boundary, separating the medium with different quantum densities ρ_1 and ρ_2 inside the nucleon and outside its shell.

The sign-alternating shell of the nucleon has noteworthy properties. It can pass through the stationary quantized space-time like fishing net immersed in water. In movement, the alternating shell of the nucleon retains the spherical deformation of the quantized space-time ensuring the wave transfer of the mass of the nucleon and the corpuscular transfer of the alternating shell. In experiments, this is confirmed by the results which show that the nucleons are governed by the principle of the corpuscular-wave dualism and represent a particle-wave as an open quantum mechanics system.

In the model shown in Fig. 1, the space topologically changes when this topology differs from the topology of the non-deformed space. The geometry of such space-time can be represented by a population of Lobachevski spheres with different curvature, threaded onto each another, forming the topology of the Lobachevski spherical space. Taking into account that the dimensions of the quanton are of the order of 10^{-25} m (2), and the radius R_S on the nucleon is approximately 10^{-15} m, then in relation to the fundamental length of 10^{-25} m of the given space, the radius of the Lobachevski spheres is a very high value. This corresponds to the postulates of the Lobachevski theory and for mathematicians the given region of investigations is a gold vein because it has specific practical applications.

The model, shown in Fig. 1, can be calculated quite easily mathematically because it is determined by the properties of a homogeneous quantized medium whose plastic state is described by the Poisson equation [1]. It should be mentioned that there is still no Poisson gravitation equation. In the general theory of relativity, the classic Poisson equation is replaced by the more complicated Einstein tensor equation whose solution has not helped physicists to understand the reasons for gravitation.

Any ‘distortion’ of the quantized space-time is linked with two types of deformation: compression and extension, accompanying each other in elastic media. Compression deformation is balanced by tension deformation. In the absence of the second component which resists deformation in the elastic quantized medium, the space should be unstable and any gravitation should result in the collapse of the mass of matter into a black hole or microhole. However, the instability of quantized space-time has not been observed in experiments. Quantized space-time shows the properties of a highly stable and durable medium indicating the presence in space of the elastic properties capable of resisting any deformation.

In particular, the model of spherical deformation of the quantized space-time shown in Fig. 1 demonstrates clearly that compression deformation of the nucleon shell to radius R_S inside the shell is balanced by the tensile deformation of the quantized space-time on its external side. This model makes it possible to obtain for the first time the correct equations of state of the nucleon as a result of the spherical deformation of quantized space-time.

The distribution of the quantum density of the medium (2) was determined for the two components ρ_1 and ρ_2 which balance each other, forming a stable system (Fig. 1). The system (2) is the correct solution of the Poisson for the quantum density ρ of a medium. The solution (2) of the gravitational Poisson (1) equation is obtained for a spherically deformed space-time based on the effectively selected physical model of the nucleon inside the quantized space-time.

It should be mentioned that the solution of the tasks described previously cannot be carried out by purely mathematical methods without knowing the physical model of gravitation which is based on the straight mathematical conditions defined by nature. The quantum density ρ_0, ρ_1, ρ_2 (2) of the medium is equivalent to gravitational potentials, respectively [1].

Fig. 1 shows the process of a spherical deformation of the quantized space-time of a sign-alternating shell nucleon. Fig. 1 is a three-dimensional picture of the spherical deformation of a quantized medium. Since the three-dimensional picture (Fig. 1) of the spherical deformation of the medium is a spherically symmetric picture, it can be depicted in the form of a two-dimensional gravitational diagram (Fig. 2).

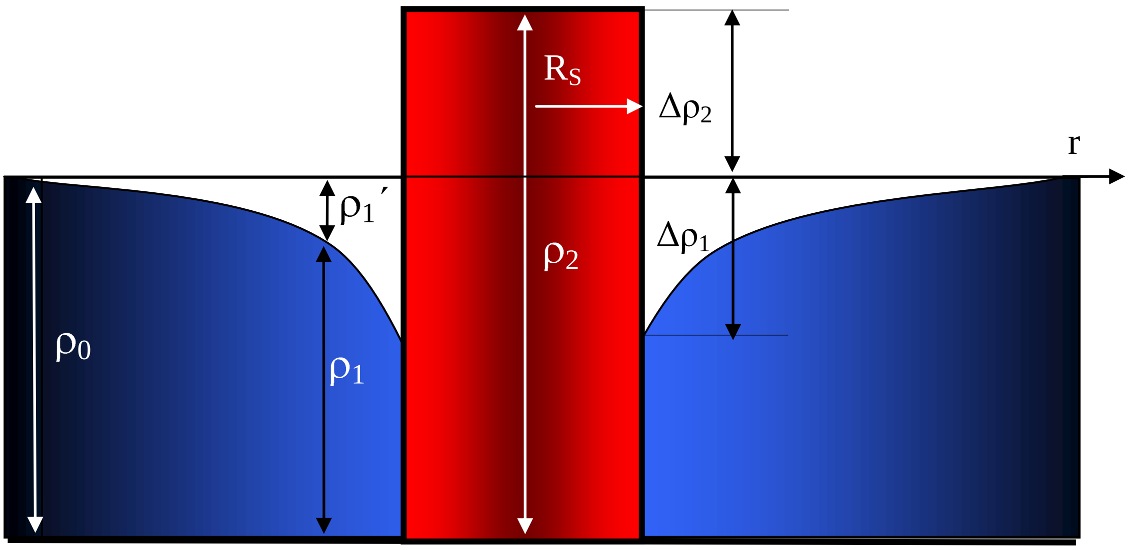

Fig. 2. Gravitational diagram of the nucleon in quantized space-time.
ρ_1 – the region of expansion (blue); ρ_2 – the region of compression (red).

The gravity diagram (Fig. 2) shows a graphical distribution of the quantum density ρ_1 and ρ_2 (2) of a nucleon for a spherically deformed quantized space-time. The sign-alternating shell of the nucleon has a radius R_S which are a gravitational boundary (interface) in a quantized medium. The gravitational boundary R_S divides the compression (ρ_2 – red) and expansion (ρ_1 – blue) regions of the quantized medium.

Undeformed quantized space-time is characterized by the quantum density ρ_o (3) of the medium. The quantized space-time is an elastic quantized medium. We have an increase of the quantum density ρ_2 (Fig. 2) of the medium inside the nucleon (radius R_S) as a result of compression of its sign-alternating shell:

$$\rho_2 = \rho_o \left(1 + \frac{R_g}{R_S}\right) \tag{6}$$

Next, we substitute in (6) the mass $m_p = 1.67 \cdot 10^{-27}$ kg of the proton and its radius $R_S \sim 0.44 \cdot 10^{-15}$ m, $G = 6.67 \cdot 10^{-11}$ Nm^2/kg^2, $C_o^2 = 9 \cdot 10^{16}$ J/kg:

$$\rho_2 = \rho_o \left(1 + \frac{Gm_p}{C_o^2 R_S}\right) = (1 + 2.81 \cdot 10^{-37})\ \rho_o \tag{7}$$

It can be seen from (7) that the quantum density of the medium inside the proton increased on $\Delta\rho_2 = 2.81 \cdot 10^{-37} \rho_o$:

$$\Delta\rho_2 = \rho_o \frac{R_g}{R_S} = +2.81 \cdot 10^{-37} \rho_o \tag{8}$$

This is a very small quantity and it indicates the colossal elasticity and energy of quantized space-time. Only inside a black hole do we have a 2-fold increase in the quantum density of the medium at $R_g = R_S$.

The absolute value $\Delta\rho_2$ (8) is found taking into account (4):

$$\Delta\rho_2 = \rho_o \frac{R_g}{R_S} = \frac{k_3}{L_{qo}^3} \frac{R_g}{R_S} = +10^{39} \frac{q}{m^3} \tag{10}$$

We see a decrease in the quantum density ρ_1 of the medium on the outside of the proton (Fig. 2). The distribution of the quantum density of the medium is characterized by the function $\rho_1 = f(r)$ (2):

$$\rho_1 = \rho_o \left(1 - \frac{R_g}{r}\right) \text{ at } r \geq R_S \tag{11}$$

The function (11) describes the gravitational field of the proton and its strength through a deformation vector **D** [1, 7]:

$$\mathbf{D} = \operatorname{grad}\rho_1 = \frac{\partial \rho_1}{\partial \mathbf{r}} = \rho_o \frac{\partial}{\partial \mathbf{r}}\left(1 - \frac{R_g}{r}\right) = \rho_o \frac{R_g}{r^2}\mathbf{1_r} \qquad (12)$$

where $\mathbf{1}_r$ is the unit vector in the direction of radius r.

The gravitational field of a proton is a gravitational well around a proton (Fig. 2). This is a potential well. The presence of a gravitational well at a proton and atomic nucleus was not previously taken into account in the physics of elementary particles and the atomic nucleus. However, the gravitational pit around the atomic nucleus is fundamental in describing the properties of an orbital electron [8].

On the surface of a proton at its gravitational boundary R_S, we observe a jump $2\Delta\rho_2$ in the quantum density of the medium (Fig. 2):

$$\Delta\rho_2 + \Delta\rho_1 = 2\Delta\rho_2 = 2\rho_o \frac{R_g}{R_S} = 2 \cdot 10^{39} \frac{q}{m^3} \qquad (13)$$

The quantum density of the medium is an analogue of the gravitational potential. However, the processes of deformation of quantized space-time are much more convenient and easier to study by analyzing the change in the quantum density of the medium.

References:

[1] V. S. Leonov. Quantum Energetics. Volume 1. Theory of Superunification. Cambridge International Science Publishing, 2010, 745 pgs.

[2] Download free. Leonov V. S. Quantum Energetics. Volume 1. Theory of Superunification, 2010. http://leonov-leonovstheories.blogspot.com/2018/04/download-free-leonov-v-s-quantum.html [Date accessed April 30, 2018].

[3] Vladimir Leonov. Unification of Electromagnetism and Gravitation. Antigravitation. viXra:1910.0300 *submitted on 2019-10-17.*

[4] Vladimir Leonov. Two-Component Solution of the Poisson Gravitational Equation. viXra:1910.0533 *submitted on 2019-10-26.*

[5] Vladimir Leonov. Quantum Density of the Universe. viXra:1910.0468 *submitted on 2019-10-23.*

[6] Vladimir Leonov. Fundamental Length - Leonov's Length. viXra:1910.0478 *submitted on 2019-10-23.*

[7] Vladimir Leonov. Deformation Vector D of Quantum Density is the Basis of Quantum Gravity. viXra:1910.0591 *submitted on 2019-10-28.*

[8] Vladimir Leonov. Nature of Non-Radiation and Radiation of the Orbital Electron. viXra:1910.0330 *submitted on 2019-10-18.*