The Balance of the Quantum Density of a Medium in Statics

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Abstract. The gravitational state of a particle (body) is characterized by four parameters of the quantum density of the medium inside the quantized space-time: ρ_0, ρ_1, ρ_2, ρ_n (1). Where ρ_0 is quantum density of undeformed quantized space-time; ρ_1 is quantum density of deformed quantized space-time outside of the particle (body); ρ_2 is quantum density of deformed quantized space-time inside a particle (body); ρ_n is imaginary quantum density of the quantized space-time. This is a fundamentally new method of gravitational analysis based on the quantum theory of gravity. The balance of the quantum density of the gravitational field of a particle (body) inside the quantized space-time is a constant: $\rho_0=\rho_1+\rho_n=$Const. [1-7].

Keywords: balance, , quantum density, imaginary quantum density.

The gravitational state of a particle (body) is characterized by four parameters of the quantum density of the medium inside the quantized space-time [1-7]:

$$\rho_o,\ \rho_1,\ \rho_2,\ \rho_n \tag{1}$$

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

ρ_1 is quantum density of deformed quantized space-time outside of the particle (body), q/m^3;

ρ_2 is quantum density of deformed quantized space-time inside a particle (body), q/m^3;

ρ_n is imaginary quantum density of the quantized space-time, q/m^3;

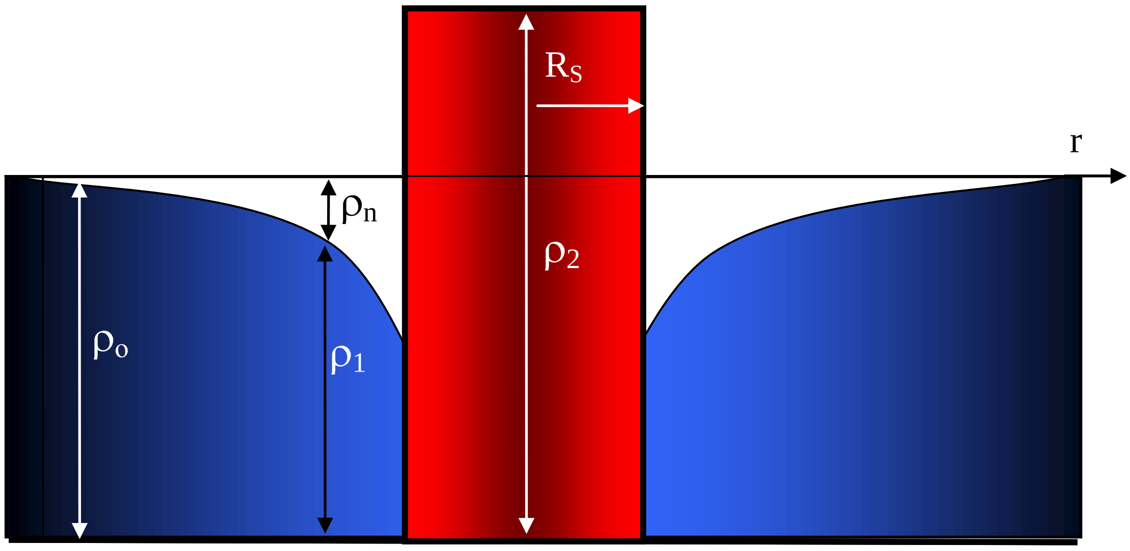

Fig. 1. Gravitational diagram of the distribution of the quantum density of the medium (ρ_1, ρ_2, ρ_0, ρ_n) of the particle (body); ρ_2 is the region of compression of the medium, ρ_1 is the region of stretching of the medium.

Figure 1 shows **g**ravitational diagram of the distribution of the quantum density of the medium (ρ_1, ρ_2, ρ_0, ρ_n) of the particle (body). The region of stretching of the medium is ρ_1 = f (r), where r is the radius. The region of compression of the medium is ρ_2.

In the theory of Superunification, we describe the state of the particle (body) inside quantized space-time using the Poisson gravitational equation for the quantum density ρ of a medium [1-7]:

$$\mathrm{div}(\mathrm{grad}\rho) = k_o\rho_m \qquad (2)$$

where k_0 is the proportionality coefficient,

ρ_m is the density of matter, kg/m^3.

The Poisson equation (11) 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) in statics [1-6]:

$$\begin{cases} \rho_1 = \rho_o\left(1 - \dfrac{R_g}{r}\right) \text{ at } r \geq R_S \\ \rho_2 = \rho_o\left(1 + \dfrac{R_g}{R_S}\right) \end{cases} \qquad (3)$$

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

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

$$R_g = \frac{Gm}{C_o^2} \qquad (4)$$

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.

From (3) we find the balance of the quantum density of the medium for the particle (body) inside the quantized space-time:

$$\rho_1 = \rho_o\left(1 - \frac{R_g}{r}\right) = \rho_o - \rho_o\frac{R_g}{r} \qquad (5)$$

or:

$$\rho_o = \rho_1 + \rho_o\frac{R_g}{r} = \rho_1 + \rho_n \qquad (6)$$

where ρ_n is imaginary quantum density:

$$\rho_n = \rho_o \frac{R_g}{r} \tag{7}$$

The gravitational state of a particle (body) is characterized by balance of the quantum density (6) in statics which is a constant:

$$\rho_o = \rho_1 + \rho_n = \text{Const} \tag{8}$$

The implementation of balance (8) we see on the **g**ravitational diagram (Fig.1). We also see that there is an imaginary ρ_n is imaginary quantum density of the quantized space-time.

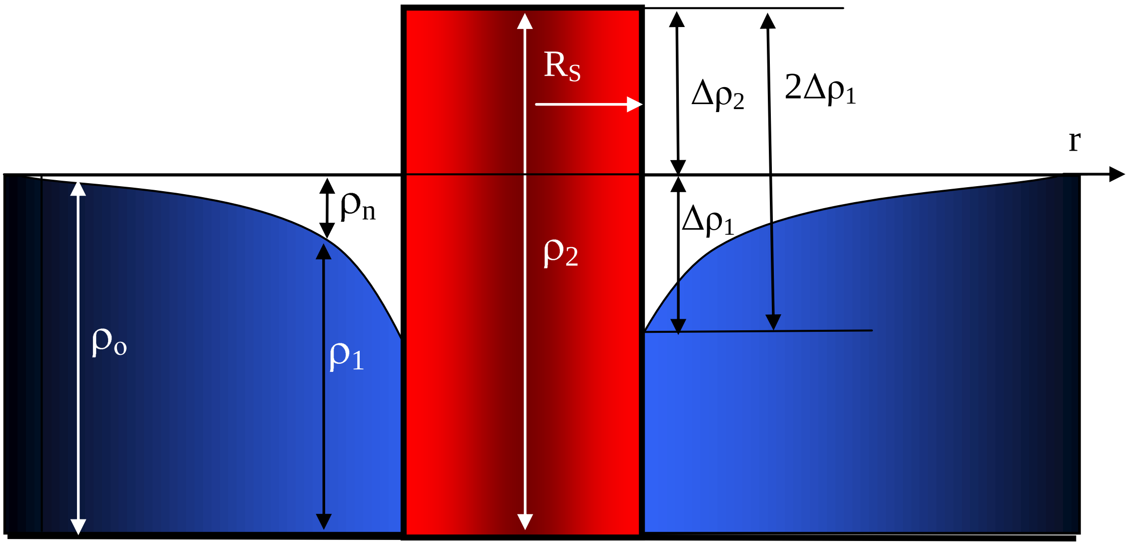

Fig. 2. The quantum density jump $2\Delta\rho_1$ on the gravitational boundary at $r = R_S$.

On the gravitational boundary, we observe a jump $2\Delta\rho_1$ in the quantum density of the medium at $r = R_S$ [1-7]:

$$2\Delta\rho_1 = 2\Delta\rho_2 = \Delta\rho_1 + \Delta\rho_2 \tag{9}$$

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