Black Hole Universe and Gauss' Law for Gravity

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Abstract

The radial component of gravitational acceleration in the Black Hole Universe for small distances from the center in relation to the radius of the Universe coincides with the radial component of the acceleration resulting from the Gauss' Law for Gravity.

Keywords: Black Hole Universe, Gauss' Law for Gravity, radial component of gravitational acceleration, spacetime metric.

1. Introduction

In the dissertation [1] I proposed a black-hole model of the Universe. Our Universe can be treated as a gigantic homogeneous Black Hole with an anti-gravity shell. Our Galaxy, together with the solar system and the Earth, which in the cosmological scale can be considered only as a point, should be located near the center of the Black Hole Universe.

It follows from the Gaussian gravitational law that inside the homogeneous sphere the absolute value of gravitational acceleration grows linearly with the distance from the center, where it is equal to zero. It should be noted that Isaac Newton has already analyzed this situation in his *Principia*. The gravitational acceleration in the Black Hole Universe should behave in the same way.

2. Gaussian gravitational law in the Newtonian theory of gravity

On the basis of the Gaussian gravitational law, we will determine the radial component of gravitational acceleration (a^r) inside a homogeneous sphere with radius (R), mass (M) and density (ρ).

$$a^r = -\frac{GM^*}{r^2}, \quad r < R$$

$$\Big\downarrow \quad M^* = \frac{4}{3}\pi r^3 \rho$$

$$\boxed{a^r = -\frac{4}{3}\pi\rho G r}$$

$$\Big\downarrow \quad M = \frac{4}{3}\pi R^3 \rho$$

$$\boxed{a^r = -\frac{GM}{R^3} r}$$

G – gravitational constant
M^* – mass of the sphere of radius r

3. Spacetime metric inside the black hole with maximum anti-gravity shell and radial component of the gravitational acceleration

Spacetime metric inside the black hole with maximum anti-gravity shell is given by [1]:

$$(ds)^2 = \left(1 - \frac{r^2}{R^2}\right)^{-1}(dr)^2 + r^2(d\theta)^2 + r^2\sin^2\theta\,(d\varphi)^2 + \left(1 - \frac{r^2}{R^2}\right)(dx^4)^2,$$

$$x^4 = ict, \quad 0 \le r < R = \frac{1}{2}r_S, \quad r_S = \frac{2GM}{c^2}, \quad g_{11} = \frac{1}{g_{44}}, \quad g_{44} = 1 - \frac{r^2}{R^2}, \quad \rho = \text{const} > 0.$$

The radial component of the gravitational acceleration in the Black Hole Universe, determined from the motion equation, is [1]:

$$\boxed{a^r = -\frac{c^2}{R^2} r \cdot \left(1 - \frac{r^2}{R^2}\right)^{-\frac{1}{2}}}$$

$$\Big\downarrow \quad R = \frac{GM}{c^2}, \quad \frac{c^2}{R^2} = \frac{GM}{R^3}$$

$$\boxed{a^r = -\frac{GM}{R^3} r \cdot \left(1 - \frac{r^2}{R^2}\right)^{-\frac{1}{2}}}$$

$$\Big\downarrow \quad M = \frac{4}{3}\pi\rho R^3$$

$$\boxed{a^r = -\frac{4}{3}\pi\rho G r \cdot \left(1 - \frac{r^2}{R^2}\right)^{-\frac{1}{2}}}$$

R – radius of the Black Hole Universe
c – standard value of the speed of light

For $r \ll R$ the radial component of the acceleration in the Black Hole Universe coincides with the radial component of the acceleration resulting from the Gaussian gravitational law.

4. Final remarks

Once again it should be strongly emphasized that in the center of the Black Hole Universe the radial component of the gravitational acceleration equal to zero. If the Earth is in the center of the Black Hole Universe or in its vicinity, its local gravitational field is practically not disturbed by the field of the Universe.

References

[1] Zbigniew Osiak: *Anti-gravity*. viXra:1612.0062 (1916)
http://viXra.org/abs/1612.0062