Black Hole Universe and Missing Components

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Abstract

It was shown that the density of the Black Hole Universe is over 17 times bigger than the density of the Friedman's Universe. Our model does not require the assumption of the existence of dark energy and matter.

Keywords: Black Hole Universe, Friedman's Universe, critical density, density parameter, Hubble constant, dark energy, dark matter.

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.

In the following, we will show that the density of the Black Hole Universe is over 17 times bigger than the density of the Friedman's Universe. Our model does not require the assumption of the existence of dark energy and matter.

2. Critical density of Friedman's Universe

Critical density of universe in Friedman's theory [2] is a density, where universe becomes spatially flat.

$$\boxed{\rho_c = \frac{3H^2}{\kappa c^4} = \frac{3H^2}{8\pi G}}$$

See [2], page 131

$$H = 75\,\mathrm{km}\cdot\mathrm{s}^{-1}\cdot\mathrm{Mpc}^{-1} \approx 2.43\times10^{-18}\,\mathrm{s}^{-1}, \quad G = 6.6742\cdot10^{-11}\,\frac{\mathrm{m}^3}{\mathrm{kg}\cdot\mathrm{s}^2} \approx 6.7\cdot10^{-11}\,\frac{\mathrm{m}^3}{\mathrm{kg}\cdot\mathrm{s}^2}$$

$$\kappa = \frac{8\pi G}{c^4} = 2.073\times10^{-43}\,\frac{\mathrm{s}^2}{\mathrm{kg}\cdot\mathrm{m}}, \quad c = 2.99792458\times10^8\,\frac{\mathrm{m}}{\mathrm{s}} \approx 3\times10^8\,\frac{\mathrm{m}}{\mathrm{s}}$$

$$\boxed{\rho_c \approx 1.058\times10^{-26}\,\frac{\mathrm{kg}}{\mathrm{m}^3}}$$

where:
H – Hubble constant
c – standard value of the speed of light in vacuum
G – gravitational constant

3. Density parameter and current average density of Friedman's universe

The density parameter (Ω) is the ratio of current average density (ρ_F) of Friedman's Universe to its critical density (ρ_c).

$$\boxed{\Omega \overset{df}{=} \frac{\rho_F}{\rho_c}}$$

Knowing the value of density parameter and critical density, we can state current average density of Friedman's Universe.

$$\boxed{\rho_F = \Omega \rho_c}$$

$\Omega = 0.47$ according to [3]

$$\rho_c \approx 1.058 \times 10^{-26} \frac{kg}{m^3}$$

$$\boxed{\rho_F \approx 4.97 \times 10^{-27} \frac{kg}{m^3}}$$ that is almost 3 protons per every cubic meter

4. The average density of our Universe according to Hubble observation

We will now determine the average density (ρ) of our Universe with mass (M) and radius (R).

$$\boxed{\frac{M}{R} = \frac{c^2}{G}}$$ See [1], page 26

$$M = \frac{4}{3}\pi R^3 \cdot \rho$$

$$R = \frac{c}{2H}$$ See [1], page 47

$$\boxed{\rho = \frac{3H^2}{\pi G}}$$ This density is 8 times bigger than critical density of Friedman's Universe.

$$H = 75\,\mathrm{km} \cdot \mathrm{s}^{-1} \cdot \mathrm{Mpc}^{-1} \approx 2.43 \times 10^{-18}\,\mathrm{s}^{-1}, \quad G = 6.6742 \cdot 10^{-11} \frac{m^3}{kg \cdot s^2} \approx 6.7 \cdot 10^{-11} \frac{m^3}{kg \cdot s^2}$$

$$\boxed{\rho \approx 84.59 \times 10^{-27}\,kg \cdot m^{-3}}$$ that is almost 51 protons per every cubic meter

$$\boxed{\frac{\rho}{\rho_F} \approx 17.02}$$

For Hubble constant $\mathrm{H} = 75\,\mathrm{km} \cdot \mathrm{s}^{-1} \cdot \mathrm{Mpc}^{-1}$ and density parameter $\Omega = 0.47$ the density of Black Hole Universe is over 17 times bigger than the density of Friedman's Universe. **Our model doesn't require us to assume the existence of dark energy and matter.**

5. Final remarks

Interpretation of observattional data within Friedman's Model of Universe forced cosmologists to hypothesise about existence of dark energy and matter.

The Black Hole Universe is a one-parameter model of Our Universe. This parameter is the Hubble constant. Our Universe consists only of ordinary matter, the density of which is over 17 times bigger than the density of Friedman's Universe. The Black Hole model of the Universe explains in a natural way the rapid increase in redness of light from distant sources [4] without the need to take hypotheses about the missing components.

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References

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