Origin of Energy Density

Deokjin Kim
EnTEs Institute, Korea. E-mail: entes@outlook.kr
September 12, 2024

Keywords: Black hole, Cosmological constant, Dark energy, Dark matter, Hubble constant

Abstract Quantum hole is a hole that quantizes 4D space, and the author has continuously proposed it from previous studies. Quantum hole of 4D has the characteristics of black hole of 3D, but the difference is that quantum hole is anti-matter, and it is 2π times heavier than matter. From this, it was calculated that dark matter is a quantum hole. From the mass densities of 4D quantum hole and 3D black hole, the relationship of physics between cosmological constant, Hubble constant, and dark energy ratio was derived. If this derivation is correct, new physics will be born.

1. Introduction

From the Friedman equation, the relationship between cosmological constant, Hubble constant, and dark energy density is derived. The purpose of this paper is to derive this relationship from a new perspective based on the contents of previous studies.

2. Previous Results

2.1 Our calculations

As shown in Fig. 1(a), in previous study [1], cosmological constant Λ 1.106169E-52 /m2, current time t_{C} 13.784 BY, and three Hubble constants H_{uni}^{C} 70.940 H_{cmb}^{Q} 67.833 H_{red}^{E} 72.777 km/s/Mpc were calculated.

2.2 Cosmological constant problem

The cosmological constant problem is that the product of the square of the Planck length l_{P} and the cosmological constant Λ becomes an incomprehensible value 1E-121.5. In section 5.23 of Ref. [2], it was calculated that the value is equal to the ratio of 0D neutrino mass to 3D neutrino mass. That is, l_{P} is the value of 0D, and Λ is the value of 3D. It is obvious that multiplying l_{P0} and Λ_3 yields a value that does not exist in physics. Quantum mechanics is the interpretation of 0D, and cosmology is the interpretation of 3D. Therefore, if the dimensions match, $l_{P3}^2 \cdot \Lambda_3$ becomes 1.

l_{P3} means the cosmic Planck length. Let's denote this as r_Λ. What is it? The above formula is simplified into ①, and t_Λ is calculated as 10.050E9 BY.

2.3 Dark energy ratio = dark time ratio

Centered on the age of the universe t_C, the time ratio t_Λ/t_C on the left side is the dark energy rate Ω_{Q}, and the time ratio $t_C/2t_\Lambda$ on the right side is the dark energy rate Ω_{E}. In mathematical terms, the product of the two is 1/2. In the figure, 0 is the center of 4D (Big Bang), 0 to t_Λ are quantum matter, t_C is our universe, $2t_\Lambda$ is the event horizon, and the entire figure is the quantum hole. The more detailed figure is shown in Fig. 1 of Ref. [1].

3. Dark Matter

3.1 Previous study

In Fig. 1 of Ref. [3], it is intricately calculated that our universe is inside a 4D black hole. However, from the discovery of Fig. 1(a), this has been proven very easily as follows.

3.2 Mass of anti-matter = 2 x mass of matter

In the figure of Fig. 1(b), the blue and the red are Planck Star, and the blue means anti-matter [S] and the red means matter [N]. In Ref. [1], section 8.2, etc., it was calculated that [S] is 2π times heavier than [N].

3.3 Mass of Planck Star

Let's understand that the Planck mass formula calculates 0D. Applying 3D and [S], the mass m_Λ of the blue is calculated as ⑤. Schwarzschild radius r_s is $2r_P$. The mass of black hole m_P expressed in terms of r_P is ⑥.

3.4 Planck 2018 results

In Planck 2018 results, the ratio of dark energy : dark matter : ordinary matter was presented as 68.89% : 26.19% : 4.92%. On Wikipedia's "observable universe" webpage, the mass of ordinary matter in the universe is given as about 1.5_E53 kg. Therefore, the mass of dark matter is about 8.0_E53 kg.

3.5 Mass of dark matter

From ⑤ and ①, the mass of dark matter m_Λ is calculated as 8.04E53 kg. This is exactly equal to 8.0_E53 kg.

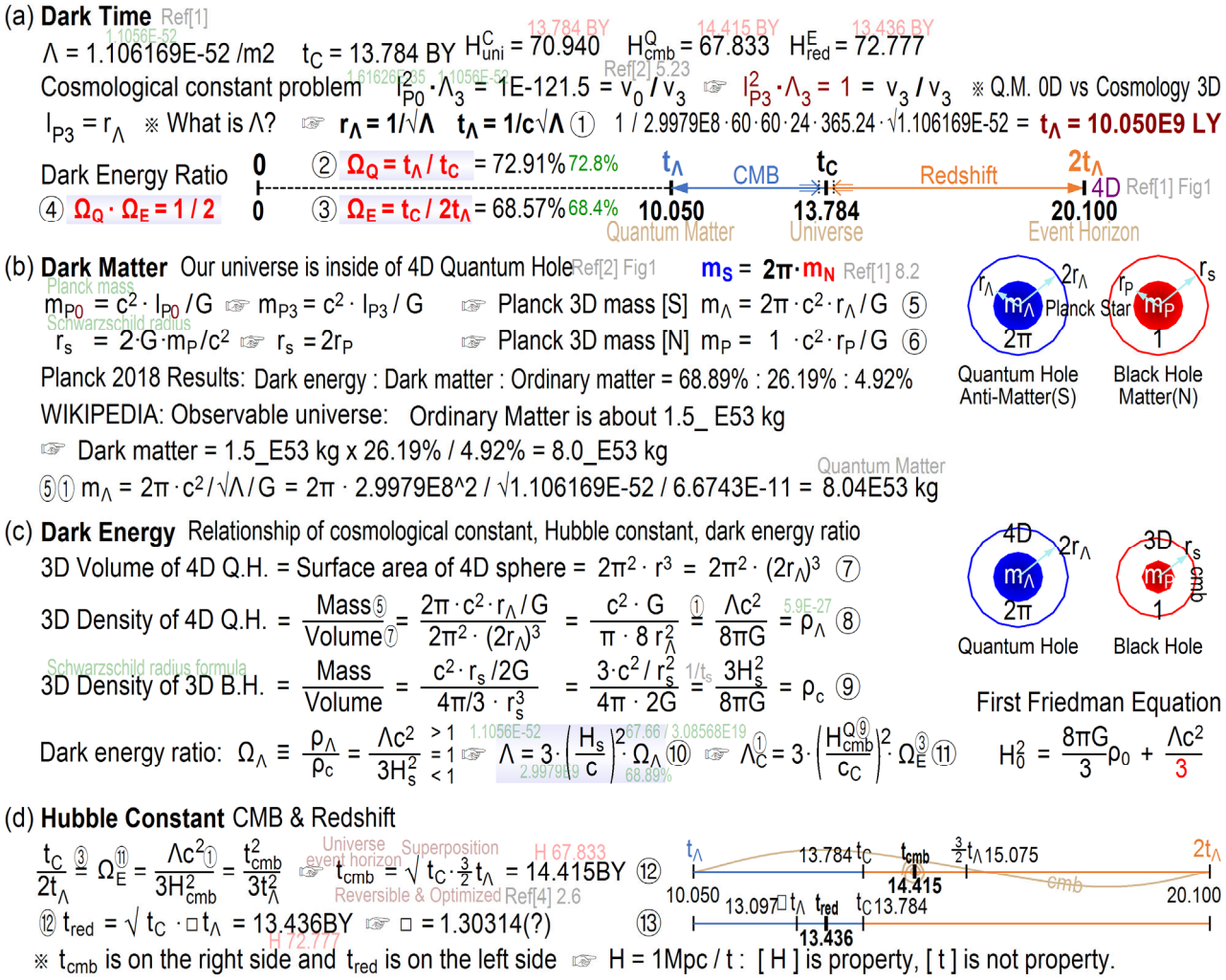

Fig. 1 Origin of energy density

4. Dark Energy

4.1 3D Density of 4D Q.H.

In Fig. 1(c), the radius of quantum hole is $2r_\Lambda$, and since the 4D surface area is the 3D volume, the 3D volume of the 4D Q.H. is ⑦. Therefore, the 3D density of 4D Q.H. is calculated as ⑧ from ⑤ and ⑦.

4.2 3D Density of 3D B.H.

From Schwarzschild radius formula, the 3D density of 3D B.H. is calculated as ⑨.

4.3 Relationship of Λ, H, Ω

Therefore, from the definition of dark energy ratio, Ω_Λ is derived and rearranged to ⑩. Here, Λ means r_Λ, H_s means the event horizon of black hole, and Ω_Λ means $2r_\Lambda$. Therefore, ⑪ is rearranged from ①, ⑨, and ③. Additionally, the subscript [C] is added, which means the combination of [Q] and [E], as explained in Section 2.9 of Ref. [1].

5. Hubble Constant

5.1 Meaning of CMB

The ⑫ t_{cmb} from ③⑪① is calculated as 14.415BY. The formula is illustrated in the figure. The $1.5t_\Lambda$ is the middle of t_Λ and $2t_\Lambda$. The t_C is the current time of the universe. The square root of the product of those two is the time at which CMB is located. The t_{cmb} means the event horizon of universe black hole. The equation on the right means that the quantum space of t_C and the quantum space of $1.5t_\Lambda$ are in a reversible and optimal superposition, as described in Section 2.6 of Ref. [4]. The author cannot explain what this mean.

5.2 Meaning of Redshift

The ⑫ is the formula for CMB. A formula for Redshift with a similar form to ⑫ has not yet been found. It is thought that the formula does not exist. Since 68 to 78 km/s/Mpc are all correct, the formula for redshift probably does not exist.

From the formula form of ⑫, □ is calculated as 1.30314.

5.3 Wrong location?

In the drawing of Fig. 1(a), CMB is located on the left side of t_C, and Redshift is located on the right side of t_C. However, in (d), the positions are reversed. This may be because H is 1Mpc / t, and Hubble constant is a physical property, while absolute time is not a physical property.

6. Conclusions

Quantum hole is a word proposed by the author, which is a hole that quantizes 4D space. From the relationship between quantum hole and black hole, the relationship among cosmological constant, Hubble constant, and dark energy ratio presented in physics were derived. If this derivation is correct, new physics will unfold.

References

[1] D. Kim, 2024, A New Methodology for Calculating the Universe, vixra.org/pdf/2406.0028v2.pdf

[2] D. Kim, 2022, New Standard Model, vixra.org/pdf/2207.0003v5.pdf

[3] D. Kim, 2022, The Universe Exists on Quantum Space inside a 4D Black Hole, vixra.org/pdf/2211.0111v2.pdf

[4] D. Kim, 2023, Origin of Quantum Mass and Cause of Koide Formula, vixra.org/pdf/2305.0054v2.pdf