

# The Universe Exists Inside a 4D Quantum Hole

Deokjin Kim

EnTEs Institute, Korea. E-mail: [entes@outlook.kr](mailto:entes@outlook.kr)

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**Abstract** Ordinary matter in the universe is currently suggested to be about  $1.45E53$  kg. The age of the universe is 13.787 billion years, so its distance is  $1.304E26$  m. The Schwarzschild mass of this value is  $0.8782E53$  kg, and multiplying  $2\pi$ , the value is calculated as  $5.518E53$  kg. The ratio of  $1.45E53$  to  $5.518E53$  is 26.28%. In 2018 Plank results, the ratio of dark matter is presented as 26.19%. The two values are very similar. From cosmological constant of  $1.1056E-52/m^2$ , the cosmological constant time of 10.053 billion years is calculated. This means the time of the birth of the first life in the universe. 10.053 billion years / dark energy 72.916% is 13.787 billion years, and from this, the Hubble constant of constant expansion is calculated as 70.92 km/s/Mpc.

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## 1. Introduction

In this study, it was calculated that the universe is in a 4D quantum black hole [Eq. (3-4) of pp. 56 in Ref. 1] and that the universe is expanding at a constant velocity [Fig. 7 of pp. 59 in Ref. 1].

## 2. 4D Quantum Hole

### 2.1 2018 Planck Results 26.69%, 26.58%, 26.19%

In 2018 Planck Results, the ratio of dark matter is presented as lowE 26.69%, lowE lensing 26.58%, and lowE lensing BAO 26.19%.

### 2.2 Ordinary Matter $1.45 \sim 1.46E53$ kg

Ordinary matter in the universe is currently suggested as about  $1.45 \sim 1.46E53$  kg [Observable universe - Wikipedia].

### 2.3 Age of the universe 13.787 billion years

In 2018 Planck Results, the age of the universe is presented as 13.787E9 years. Converting this to length, it is  $1.304E26$  m ( $= 13.787E9 \times 60 \times 60 \times 24 \times 365.24 \times 2.998E8$ ).

### 2.4 Mass of Black Hole $0.8782E53$ kg

Assume that our universe is in a universal black hole. From the Schwarzschild formula ( $m_b = r_s \times c^2 / 2G$ ), its mass is calculated as  $0.8782E53$  kg ( $= 1.304E26 \times 2.998E8^2 / 2 / 6.674E-11$ ). This value is similar to  $1.45 \sim 1.46E53$  kg of ordinary matter.

### 2.5 Mass of Quantum Hole $5.518E53$ kg

Multiplying the above value by  $2\pi$ , the value is  $5.518E53$

kg. Author insists that antimatter is twice as massive as matter. In other words, our universe is located on the horizon of the antimatter black hole surface where the fourth dimension is collapsing.

### 2.6 $1.45 \sim 1.46E53 / 5.518E53 = 26.28\% \sim 26.46\%$

$1.45 \sim 1.46E53$  divided by  $5.518E53$  is calculated as 26.28 ~ 26.46%. This is very similar to the proportion of dark matter 26.19%, 26.58%, 26.69%. The core is that Schwarzschild mass of 13.787 billion years is calculated as  $0.8782E53$  kg, which is similar to the mass of  $1.45 \sim 1.46E53$  kg of ordinary matter in the universe. What is the reason?

## 3. Amount of Ordinary Matter

### 3.1 Hubble Ultra Deep Field

It is known that there are about 200 billion galaxies in our universe. However, it is suggested that there are about 2 trillion from the Hubble Ultra Deep Field. In a few years, 20 trillion could be measured by James Webb telescope. Where does the  $1.45E53$  kg of ordinary matter correspond to?

### 3.2 4D Spherical Universe

If universe is a 4D sphere, the shape and change of universe would be independent of the amount of ordinary matter.

### 3.3 4D quantum hole

A 4D quantum hole exists inside of the universe, which makes the universe a 4D sphere space.

## 4. Cosmological constant problem

### 4.1 Cosmological constant problem $10^{-121.54}$

Cosmological constant  $\Lambda$  and Planck length  $l_P$  are given as  $1.1056E-52/m^2$  and  $1.61626E-35$  m. The  $l_P^2 \times \Lambda$  is  $10^{-121.54}$ , and this is called cosmological constant problem.

#### **4.2 Planck unit $\rightarrow$ 0D Planck unit**

Planck units derived from physics formulas are properties of 0D space. The zero-dimension means a space in which no straight lines exist. That is, not Planck unit, but 0D Planck unit is the correct name. The  $l_P$   $1.1056E-52/m^2$  is 0D value, and the  $\Lambda$   $1.1056E-52/m^2$  is 3D value. 0D and 3D are the difference between up pole and down pole. Because of this, an incomprehensible number of  $10^{-121.54}$  is calculated.

#### **4.3 Meaning of cosmological constant**

Our universe is now a 3D space. Even at the moment of the Big Bang, it was a 3D space. That is, the 3D Planck unit is correct for our universe. Representing the 3D Planck unit is the cosmological constant. Therefore,  $l_{P3}^2 \times \Lambda_3$  is obviously  $10^0$ , that is, 1.

#### **4.4 Numerical proof for $l_{P0}^2 \times \Lambda_3$**

Both the Planck unit and the cosmological constant are related to the mass of three generation neutrinos. In previous study [Eq. (7) of pp. 46 in Ref. 1], it was numerically proved that the value of  $l_{P0}^2 \times \Lambda$  is  $10^{-121.54}$  and the value of  $l_{P3}^2 \times \Lambda$  is  $10^0$ .

### **5. Origin of Life**

#### **5.1 Cosmological constant time 10.053 billion years**

From  $\Lambda$ , the cosmological constant time is calculated as 10.053 billion years ( $= 1 / \sqrt{1.1056E-52 / 60 / 60 / 24 / 365.24 / 2.9979E8}$ ). This is the Planck time  $t_{P3}$  of our universe.

#### **5.2 Birth of the first life, 3.7 billion years ago**

In 2018 Plank Results, the age of the universe is presented as 13.787 billion years. The difference between 13.787 and 10.053 is 3.734 billion years ago. At that time, there must have been some kind of change in the creation of the universe. Author judges that the time is the birth time of the first life. The first fossils of life on Earth were found to be about 3.5 billion years ago. A fossil of 3.7 billion years ago have been found, but it is the subject of debate among biologists as to whether it is living or nonliving.

#### **5.3 Dark energy 72.916%**

In 2018 Plank Results, the ratios of dark energy, dark matter, and ordinary matter are presented as 68.89%, 26.19%, and 4.92%. Ordinary matter has no effect on the entire universe. Therefore, the ratios of dark energy and dark matter are 72.46% and 27.54%. The value of 10.053 divided by 13.787 is calculated as 72.916%. Dark energy is dark time.

### **6. Hubble Constant**

#### **6.1 Hubble constant 70.92 km/s/Mpc**

If the universe is expanding at a constant velocity, the Hubble constant is calculated as 70.92 km/s/Mpc ( $= 977.813 / 13.787$ ).

#### **6.2 What is 67.66 km/s/Mpc**

In 2018 Planck results, Hubble constant was given as 67.66 km/s/Mpc, and dark energy, dark matter, and ordinary matter were given as 68.89%, 26.19%, and 4.92%. Ordinary matter should be excluded from the universal calculation.  $67.66 \times 72.46\% / 68.89\%$  is calculated as 71.16 km/s/Mpc. This is very similar to 70.92 km/s/Mpc calculated from cosmological constant.

#### **6.3 Constant velocity expansion**

The Hubble constant of 70.92 km/s/Mpc is a sufficiently acceptable value. All of above formulas are linear proportional. Therefore, the universe expands at a constant velocity.

### **7. Einstein Field Equation**

#### **7.1 2D flat map and 3D sphere map of the Earth**

When analyzing the topography of the Earth with 2D flat map, errors occur in several places. The topography of the Earth must be analyzed with 3D map.

#### **7.2 3D flat map and 4D sphere map of the Universe**

As such, when analyzing the universe as 3D flat map, errors occur in several places. The universe is a 4D sphere. As an example, gravity is described too easily as acting toward the direction of forth dimensional empty space.

#### **7.3 Absolute time and Relative time**

Since relative time is a curvature of space curved by gravity, relative time and local XYZ space are connected to each other. The shape of universe space is a 4D sphere. The linear expansion toward 4D direction is measured by Hubble constant, and the expansion rate toward 4D direction is the speed of light inside 3D space. Absolute time is included in the speed of light, and they are absolutely the same everywhere in the universe.

### **8. Conclusions**

Since our universe is a 4D sphere, ordinary matter should be excluded at overall universe calculation. This is core.

### **References**

[1] D. Kim, 2021, Theory of Everything and Logarithmic Elliptic Equation, <https://vixra.org/abs/2110.0023>