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The Singularity of the Big Bang Can Be Described in Greater Depth than the Limits of the Planck Time and Length

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Abstract

In this paper, we determine the frequency, energy and momentum of the primordial spherical wave at the birth of our universe, which are consistent with the fact that the total energy of our universe was created in the hot Big Bang. With this, we also indirectly demonstrate the consistency of previous works on the hypothesis of primary particles, by using their results. We obtain a hyper-high initial frequency of the spherical wave, which is not in contradiction with string theory.

Keywords

Flat Space and Time, Primary Particles, Quantum of Speed, Spherically Wave

1. Introduction

In our four previous works, continued here, we obtained physical quantities that could describe the moment of the Big Bang itself.

In our hypothesis [1] we postulated the existence of primary particles in their ground state and in flat space and time, moving relative to each other at speeds much higher than the speed of light in a vacuum. We concluded that these particles would in some way have properties symmetrical with the properties of the particles of our Universe. The energy and momentum of these primary particles would thus increase sharply when slowing down during mutual collisions, as opposed to the increase in energy and momentum of the particles of our Universe that occurs when their speed increases. This description of the dynamic properties of these particles logically imposed the possibility of describing the very origin of the Big Bang. During some of these collisions therefore, the speed of one of these two particles could drop to a speed very slightly higher than the limit speed c. The energy and momentum thus acquired would tunnel through the Big Bang into our Universe, creating our energy and matter in our space and time.

We took a very important piece of data, the speed, very slightly higher than the limit speed c, to which the primary particle could be slowed in order to cause the Big Bang, from [2], where we saw a logically introduced new term in physics: the "speed quantum" $\varepsilon = \varepsilon_u \approx 2.38 \times 10^{-114}\ \text{m} \cdot \text{s}^{-1}$. This notion allowed us to understand that there is little difference between the actual speed of light in a vacuum and the limit speed c. For most purposes, the very small difference between these two speeds is not important, but we needed precisely this "speed quantum" to determine in [3] the energy of the primary particle in its ground state $E_p = m_p c^2 \approx 1.22 \times 10^{19}\ \text{GeV}$, and therefore the mass attributed to the energy of the primary particle $m_p = m_P = \sqrt{\frac{\hbar c}{G}} \approx 1.22 \times 10^{19}\ \text{GeV}/c^2 \approx 2.18 \times 10^{-8}\ \text{kg}$, which is equal to the Planck mass m_P. The Planck mass therefore took on this new meaning. From [2] we also took the data on the total energy generated in the Big Bang $E_t = E_U = m_U c^2 \approx 1.55 \times 10^{70}\ \text{J}$, and obtained complete agreement with our hypothesis [3] according to which

$$E_t = E_U = \frac{m_p c^2}{\sqrt{1 - \frac{c^2}{\left(c + \varepsilon_u\right)^2}}}. \tag{1}$$

This energy corresponds to the energy equivalent of the total mass of the universe $m_U \approx 1.73 \times 10^{53}\ \text{kg}$ and includes all types of mass (baryonic and dark matter) and the mass contained in all types of energy (photons, dark energy, etc.).

Then, in [4], we also described the Big Bang quantitatively through physical quantities that describe the initial moment of the Big Bang. We obtained a value for the time corresponding to the initial moment of our universe $t_B \approx 9.51 \times 10^{-114}\ \text{s}$ that is much shorter than the Planck time, and another for the resulting radius of the Big Bang itself $r_B \approx 2.85 \times 10^{-105}\ \text{m}$ that is much smaller than the Planck length.

In paper [5], we used modified uncertainty relations, which correspond to the spherically symmetric, very initial moment of the Big Bang, to obtain a constant $\upsilon_p = 1.48 \times 10^{-43}\ \text{J} \cdot \text{s}$ corresponding to the reduced Planck's constant.

2. In the Big Bang, a Spherical Wave of Hyper-High Frequency Is Created

We treated time symmetrically with the other coordinates, in agreement with Dirac's relativistic quantum mechanics, in which he gave a precise and well-defined derivation of this symmetry [6]. We now complete our hypothesis by showing that in the hypothetical collision of two primary particles, in which one of them has slowed to the limiting velocity c for our universe, a spherical wave was created with a wavelength equal to the radius of the Big Bang $r_B \approx 2.85\times10^{-105}$ m and a period equal to the time of creation of the Big Bang $t_B \approx 9.51\times10^{-114}$ s. Quantifying the spherical wave created at the very moment of the Big Bang, given by the constant $\upsilon_p = 1.48\times10^{-43}$ J·s, gives a result for its momentum

$$p = \frac{\upsilon_p}{r_B} \approx 5.19\times10^{61}\ \text{kg}\cdot\text{m/s} \tag{2}$$

and energy

$$E = \upsilon_p f = \upsilon_p \frac{c}{r_B} \approx 1.55\times10^{70}\ \text{J}. \tag{3}$$

Thus, this spherical wave would have a frequency of

$$f = \frac{c}{r_B} \approx 1.05\times10^{113}\ \text{Hz}. \tag{4}$$

This hyper-high frequency is only unusual at first glance: String theory assumes that Lorentz covariance implies the perfect symmetry of our universe [7]. If this is true, it would mean that a photon is allowed to have an arbitrary energy, even greater than that limited by the Planck length.

3. Results and Discussion

The values obtained for the impulse, energy and frequency of the spherical wave created at the very moment of the Big Bang complete our hypothesis. According to the Big Bang theory, our universe began as an extremely hot and extremely dense state, which matches our results. The values for the obtained physical quantities related to our previous, and this work, are given quantitatively. According to the value that we use for the mass of the universe, we would obtain a corresponding value for the speed quantum [2]. This would not affect the mass of the primary particles, whose mass is equal to the Planck mass [3]. Furthermore, this work affords a very approximate value for the frequency of the spherical wave.

It is clear that our new approach to the explanation of the Big Bang through the hypothesis of primary particles is significantly different from previous approaches, but it opens up a new possibility for describing the universe from its very beginning to the period of the very early universe. We thus consider the hypothesis interesting for further scientific work.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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