An Expansion Theory Of The Universe With No Dark Matter And No Dark Energy

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Abstract

In this paper we find a new gravitational formula: \( F = -\frac{mc^2}{R} \) and establish an expansion theory of the universe with no dark matter and no dark energy.

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In the Universe there are two kinds of matter: (1) observable subluminal matter called tardyon and (2) unobservable superluminal string matter called tachyons which coexist in motion.

We first define two-dimensional space and time ring [1]

\[
\left( \begin{array}{c} x \\ t \end{array} \right) = \left( \begin{array}{c} ct \\ x \\ ct \end{array} \right) = ct + jx,
\]

(1)

where \( x \) and \( t \) are the tardyonic space and time coordinates, \( c \) is light velocity in vacuum,

\[
j = \left( \begin{array}{cc} 0 & 1 \\ 1 & 0 \end{array} \right).
\]

(1) can be written as Euler form

\[
z = ct_0 e^{i\theta} = ct_0 (\text{ch} \ \theta + j \text{sh} \ \theta),
\]

(2)

where \( ct_0 \) is the tardyonic invariance, \( \theta \) tardyonic hyperbolical angle.

From (1) and (2) we have

\[
ct = ct_0 \text{ch} \ \theta, \quad x = ct_0 \text{sh} \ \theta
\]

(3)

\[
ct_0 = \sqrt{(ct)^2 - x^2}.
\]

(4)

From (3) we have
\[ \theta = \text{th}^{-1} \frac{x}{ct} = \text{th}^{-1} \frac{u}{c}, \]  

(5)

where \( c \geq u \) is the tardyonic velocity, \( \text{ch} \theta = \frac{1}{\sqrt{1-(u/c)^2}} \) and \( \text{sh} \theta = \frac{u/c}{\sqrt{1-(u/c)^2}} \).

The \( z \) denotes mathematics of the tardyonic theory.

Using the morphism \( j : z \to jz \), we have

\[ jz = \bar{x} + jct = x_0 e^{i\theta} = \bar{x}_0 (\text{ch} \vartheta + j \text{sh} \vartheta), \]

(6)

where \( \bar{x} \) and \( c \) are the tachyonic space and time coordinates, \( \bar{x}_0 \) is tachyonic invariance, \( \vartheta \) tachyonic hyperbolical angle.

From (6) we have

\[ \bar{x} = x_0 \text{ch} \vartheta, \quad ct = x_0 \text{sh} \vartheta. \]

(7)

\[ \bar{x}_0 = \sqrt{(\bar{x})^2 - (ct)^2} \]

(8)

From (7) we have

\[ \bar{\theta} = \text{th}^{-1} \frac{ct}{x} = \text{th}^{-1} \frac{c}{u}, \]

(9)

where \( u \geq c \) is the tachyonic velocity, \( \text{ch} \bar{\theta} = \frac{1}{\sqrt{1-(c/u)^2}} \) and \( \text{sh} \bar{\theta} = \frac{c/u}{\sqrt{1-(c/u)^2}} \).

The \( jz \) denotes mathematics of the tachyonic theory. Both the \( z \) and the \( jz \) form the entire world but the \( jz \) world is unexploited and unstudied.
Figure 1 shows the formulas (1)-(9). $j : z \rightarrow jz$ is that tardyon can be converted into tachyon, but $j : jz \rightarrow z$ is that tachyon can be converted into tardyon. $u = 0 \rightarrow u = c$ is the positive acceleration, but $\overline{u} = \infty \rightarrow \overline{u} = c$ is the negative acceleration, which coexist. At the $x$ - axis we define the tachyonic string length

$$X_0 = \lim_{\overline{u} \rightarrow 0} \overline{u}t = \text{constant},$$

where $t$ is the rest time.

Since at rest the tachyonic time $t = 0$ and $\overline{u} = \infty$, we prove that the tachyon is unobservable. In rest system tachyonic motion as an action-at-a distance motion.

Assume $\theta = \bar{\theta}$, from (5) and (9) we get the tardyonic and tachyonic coexistence principle [1-3]

$$u\overline{u} = c^2$$

(11)

Differentiating (11) by the time, we get

$$\frac{d\overline{u}}{dt} = \left(\frac{c}{u}\right)^2 \frac{du}{dt}. \quad (12)$$

$\frac{du}{dt}$ and $\frac{d\overline{u}}{dt}$ can coexist in motion, but their directions are opposite.

We study the tardyonic and tachyonic rotating motions. In 1673 Huygens discovered that the tardyonic rotation produces centripetal acceleration

$$\frac{du}{dt} = \frac{u^2}{R}, \quad (13)$$
where $R$ is rotating radius.

Substituting (13) into (12) we have the tachyonic rotation produces centrifugal acceleration

$$\frac{d\vec{u}}{dt} = -\frac{c^2}{R}.$$  \hspace{1cm} (14)

It is independent of tachyonic velocity $\vec{u}$ and tardyonic velocity $u$, only inversely proportional to radius $R$. (13) and (14) are dual formulas, which have the same form. It is unique and perfect. From (13) we get the tardyonic centrifugal force

$$F = \frac{Mu^2}{R},$$ \hspace{1cm} (15)

where $M$ is the inertial mass.

From (14) we get the tachyonic centripetal force, that is gravity

$$\vec{F} = -\frac{mc^2}{R},$$ \hspace{1cm} (16)

where $m$ is the gravitational mass converted into by tachyonic mass $\overline{m}$ which is unobservable but $m$ is observable.

Whether $u = 0$ or $u \neq 0$, all matter produce the gravity. (15) and (16) are dual formulas, which have the same form. (16) is a new gravitational formula. This simple thought made a deep impression on me. It impelled me toward a theory of gravitation. It is simplicity, elegance and mathematical beauty. It is the foundations of gravitational theory and cosmology. In the universe there are two main forces: the tardyonic centrifugal force (15) and tachyonic centripetal force (16) which make structure formation of the universe.

Now we study the freely falling body. Tachyonic mass $\overline{m}$ can be converted into tardyonic mass $m$, which acts on the freely falling body and produces the gravitational force

$$\vec{F} = -\frac{mc^2}{R},$$ \hspace{1cm} (17)

where $R$ is the Earth radius.

We have the equation of motion

$$\frac{mc^2}{R} = Mg,$$ \hspace{1cm} (18)

where $g$ is gravitational acceleration, $M$ is mass of freely falling body.

From (18) we define the gravitational coefficient

$$\eta = \frac{m}{M} = \frac{Rg}{c^2} = 6.9 \times 10^{-10}.$$ \hspace{1cm} (19)

In 1922 Eötvös experiment $\eta \sim 5 \cdot 10^{-9}$ and in 1964 Dicke experiment $\eta \sim 10^{-11}$ [4]. Since the gravitational mass $m$ can be transformed into the rest mass in freely falling body, we define Einstein’s gravitational mass $M_g = M_i + m$ and inertial mass $M_i = M$ [5]. We prove

$$M_g > M_i.$$ \hspace{1cm} (20)
Therefore we prove that the principle of equivalence is nonexistent. At the heart of the general theory of relativity is the principle of equivalence[4]. Therefore the general theory of relativity and black holes conjecture could all be wrong.

Using (16) we study the expansion theory of the Universe. Figure 2 shows a expansion model of the Universe. The rotation \( \omega_1 \) of body \( A \) emits tachyonic flow, which forms the tachyonic field. Tachyonic mass \( \overline{m} \) acts on body \( B \), which produces its rotation \( \omega_2 \), revolution \( u \) and gravitational force

\[
\overline{F}_1 = -\frac{mc^2}{R},
\]

(21)

where \( R \) denotes the distance between body \( A \) and body \( B \), \( m \) is gravitational mass converted into by tachyonic mass \( \overline{m} \) which is unobservable but \( m \) is observable.

The revolution of the body \( B \) around body \( A \) produces the centrifugal force

\[
F_1 = \frac{M_B u^2}{R},
\]

(22)

![Fig. 2. A expansion model of the Universe](image)

At the \( O_2 \) point we assume

\[
F_1 + \overline{F}_1 = 0.
\]

(23)

From (21)-(23) we have the gravitational coefficient

\[
\eta = \frac{m}{M_B} = \left(\frac{u}{c}\right)^2.
\]

(24)

At the \( O_3 \) point the tachyonic mass \( \overline{m} \) can be converted into the rest mass \( m \) in body \( B \), we have

\[
F_2 = \frac{M_B u^2}{R} + \frac{mu^2}{R}.
\]

(25)

Since \( F_2 + \overline{F}_1 > 0 \), centrifugal force \( F_2 \) is greater than gravitational force \( \overline{F}_1 \), then the body \( B \)
expands outwards and its mass increases. This is a expansion mechanism of the Universe. If body $A$ is the Earth, then body $B$ is the Moon; if body $A$ is the Sun, then body $B$ is the Earth; ... It can explain our accelerating universe. In the universe there are no dark matter and no dark energy. This simple thought made a deep impression on me. It impelled me toward an expansion theory of the universe with no dark matter and no dark energy.

If the body $A$ is the Sun and body $B$ is the planet. We calculate the gravitational coefficients $\eta$ as shown in table 1.

<table>
<thead>
<tr>
<th>Planet</th>
<th>$u$ (km/sec)</th>
<th>$\eta(10^{-10})$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>47.89</td>
<td>255.2</td>
</tr>
<tr>
<td>Venus</td>
<td>35.03</td>
<td>136.5</td>
</tr>
<tr>
<td>Earth</td>
<td>29.79</td>
<td>98.7</td>
</tr>
<tr>
<td>Mars</td>
<td>24.13</td>
<td>64.8</td>
</tr>
<tr>
<td>Jupiter</td>
<td>13.06</td>
<td>19.0</td>
</tr>
<tr>
<td>Saturn</td>
<td>9.64</td>
<td>10.3</td>
</tr>
<tr>
<td>Uranus</td>
<td>6.81</td>
<td>5.2</td>
</tr>
<tr>
<td>Neptune</td>
<td>5.43</td>
<td>3.3</td>
</tr>
<tr>
<td>Pluto</td>
<td>4.74</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Since gravitational mass $m$ can be transformed into the rest mass in body $B$, we define Einstein’s gravitational mass $M_g = M_i + m$ and inertial mass $M_i = M_B$ [5].

We prove

$$M_g > M_i.$$  \hspace{1cm} (26)

Therefore we prove that the principle of equivalence in the Solar system is nonexistent.

The tachyonic mass $\overline{m}$ can be converted into electrons and positrons which are the basic building-blocks of elementary particles [6, 7]. In the universe there are no Higgs particles which are not produces at the Large Hadron Collider and other particle accelerators. This simple thought made a deep impression on me. It impelled me toward a unification of gravitational theory and particle theory[3].

References