

$$\text{Deduce the New Gravitational Formula: } \bar{F} = -\frac{mc^2}{R}$$

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Abstract: Using two methods we deduce the new gravitational formula, In the Universe there are two matters: (1) observable subluminal matter called tardyon and (2) unobservable superluminal matter called tachyon which coexist in motion. Tachyon can be converted into tardyon, and *vice versa*. Tardyonic rotating motion produces the centrifugal force, but tachyonic rotating motion produces the centripetal force, that is gravity. In this paper using tardyonic and tachyonic coexistence principle we find a new gravitational formula.

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

$$Z = \begin{pmatrix} ct & x \\ x & ct \end{pmatrix} = ct + jx, \quad (1)$$

where x and t are the tardyonic space and time coordinates, c is light velocity in vacuum, $j = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$.

(1) can be written as Euler form

$$Z = ct_0 e^{j\theta} = ct_0 (\text{ch } \theta + j \text{sh } \theta), \quad (2)$$

where ct_0 is the tardyonic invariance, θ tardyonic hyperbolic angle.

From (1) and (2) we have

$$ct = ct_0 \text{ch } \theta, \quad x = ct_0 \text{sh } \theta \quad (3)$$

$$ct_0 = \sqrt{(ct)^2 - x^2}. \quad (4)$$

From (3) we have

$$\theta = \text{th}^{-1} \frac{x}{ct} = \text{th}^{-1} \frac{u}{c}. \quad (5)$$

where $c \geq u$ is the tardyonic velocity.

Using the morphism $j: z \rightarrow jz$, we have

$$jz = \bar{x} + jc\bar{t} = \bar{x}_0 e^{j\bar{\theta}} = \bar{x}_0 (\text{ch } \bar{\theta} + j \text{sh } \bar{\theta}), \quad (6)$$

where \bar{x} and \bar{t} are the tachyonic space and time coordinates, \bar{x}_0 is tachyonic invariance, $\bar{\theta}$ tachyonic hyperbolic angle.

From (6) we have

$$\bar{x} = \bar{x}_0 \text{ch } \bar{\theta}, \quad c\bar{t} = \bar{x}_0 \text{sh } \bar{\theta}. \quad (7)$$

$$\bar{x}_0 = \sqrt{(\bar{x})^2 - (c\bar{t})^2}. \quad (8)$$

From (7) we have

$$\bar{\theta} = \text{th}^{-1} \frac{c\bar{t}}{\bar{x}} = \text{th}^{-1} \frac{c}{\bar{u}} \tag{9}$$

where $\bar{u} \geq c$ is the tachyonic velocity.

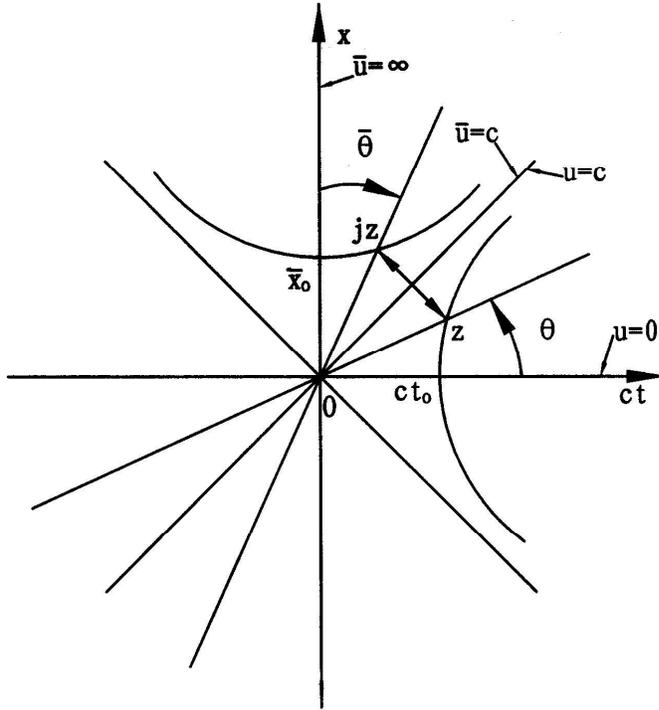


Fig. 1. Tardyonic and tachyonic coexistence principle

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 $\bar{u} = \infty \rightarrow \bar{u} = c$ is the negative acceleration, which coexist. At the x -axis we define the tachyonic unit length

$$\bar{X}_0 = \lim_{\substack{\bar{u} \rightarrow \infty \\ t \rightarrow 0}} \bar{u}t = \text{constant} \tag{10}$$

Since at rest the tachyonic time $t = 0$ and $\bar{u} = \infty$, we prove that tachyon is unobservable. Assume $\theta = \bar{\theta}$, from (5) and (9) we get the tardyonic and tachyonic coexistence principle [2-3]

$$u\bar{u} = c^2 \tag{11}$$

Using the analytical method we deduce the new gravitational formula. Differentiating (11) by the time, we get

$$\frac{d\bar{u}}{dt} = -\left(\frac{c}{u}\right)^2 \frac{du}{dt} \tag{12}$$

$\frac{du}{dt}$ and $\frac{d\bar{u}}{dt}$ 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

$$\frac{du}{dt} = \frac{u^2}{R} \tag{13}$$

where R is rotating radius.

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

$$\frac{d\bar{u}}{dt} = -\frac{c^2}{R} \tag{14}$$

(13) and (14) are twin formulas, which have the same form. From (13) we get the tardyonic centrifugal force

$$F = \frac{Mu^2}{R}, \tag{15}$$

where M is the inertial mass.

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

$$\bar{F} = -\frac{mc^2}{R}, \tag{16}$$

where m is the gravitational mass converted into by tachyonic mass \bar{m} .

(15) and (16) are twin formulas, which have the same form. (16) is a new gravitational formula.

Using the geometrical method we deduce the new gravitational formula..

Figure 2 shows that the rotation ω of body A emits tachyon mass \bar{m} , which forms the tachyon and gravitation field and gives the body B revolutions u and \bar{u} .

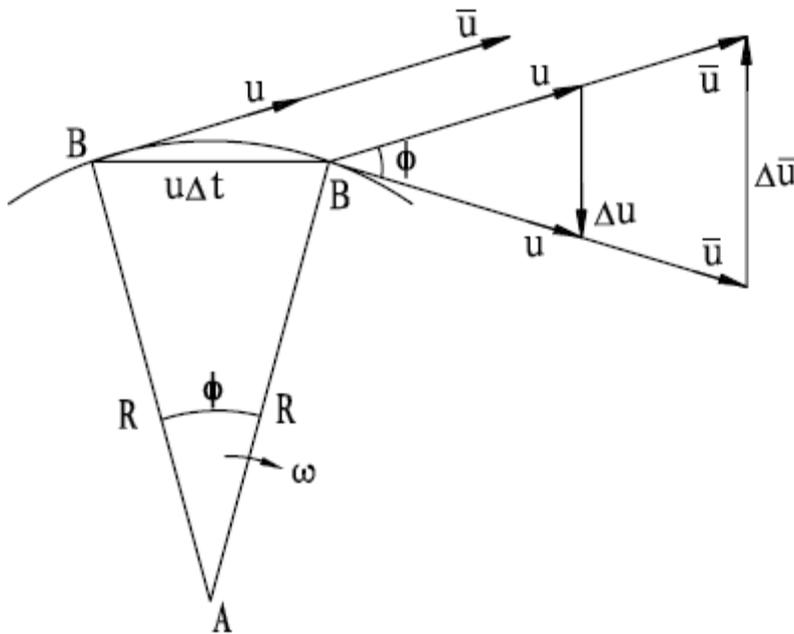


Fig.2. On body B $\frac{du}{dt}$ and $\frac{d\bar{u}}{dt}$ coexistence [2].

From Fig. 2 .it follows

$$\frac{u\Delta t}{R} = \frac{\Delta u}{u} \tag{17}$$

From (17) it follows the tardyon centripetal acceleration on the body B [2-6],

$$\frac{du}{dt} = \lim_{\substack{\Delta u \rightarrow 0 \\ \Delta t \rightarrow 0}} \frac{\Delta u}{\Delta t} = \frac{u^2}{R}. \tag{18}$$

From Fig. 2. it follows

$$\frac{u\Delta t}{R} = -\frac{\Delta \bar{u}}{\bar{u}}. \tag{19}$$

From (19) and (11) it follows the tachyon centrifugal acceleration on the body B [2-6],

$$\frac{d\bar{u}}{dt} = \lim_{\substack{\Delta \bar{u} \rightarrow 0 \\ \Delta t \rightarrow 0}} \frac{\Delta \bar{u}}{\Delta t} = -\frac{u\bar{u}}{R} = -\frac{c^2}{R}. \tag{20}$$

On body B $\frac{du}{dt}$ and $\frac{d\bar{u}}{dt}$ coexistence.

From (18) it follows the tardyon centrifugal force on body B [2-6],

$$F = \frac{M_B u^2}{R}, \tag{21}$$

where M_B is body B mass.

From (20) it follows the tachyon centripetal force on body B , that is gravity [2-6],

$$\bar{F} = -\frac{mc^2}{R}, \tag{22}$$

where m is the gravitation mass converted into by tachyon mass \bar{m} which is unobservable but m is observable. \bar{m} give all particles mass which replace the Higgs bosons. Elusive Higgs bosons have not been produced at the Large Hadron Collider at CERN.

(22) is a new gravitational formula. The equality of gravitational and inertial mass does not exist. Hence general relativity is wrong. On body B F and \bar{F} coexistence.

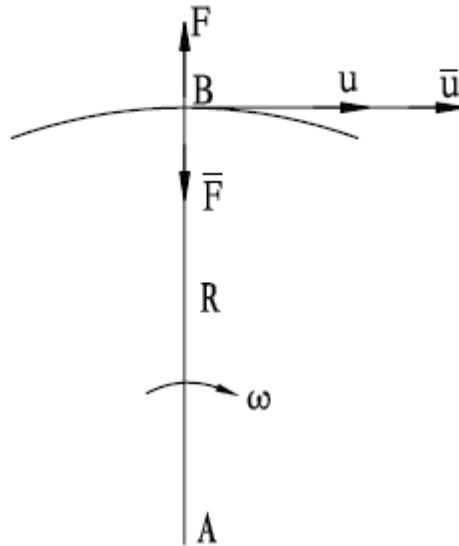


Fig.3. On body B F and \bar{F} coexistence[2].

From Fig. 3, it follows

$$F + \bar{F} = 0. \tag{23}$$

From (21), (22) and (23) it follows

$$\frac{m}{M_B} = \frac{u^2}{c^2}. \quad (24)$$

Body B increases mass m and centrifugal force is greater than gravitation force, then body B expands outward. [5,6]

From (22) it follows Newtonian gravitation formula. The m is proportional to body A mass M_A , in (24) m is proportional to M_B , is inversely proportional to the distance R between body A and body B . It follows

$$m = k \frac{M_A M_B}{R}, \quad (25)$$

where k is constant

Substituting (25) into (22) it follows the Newtonian gravitation formula [2-6]

$$\bar{F} = -G \frac{M_A M_B}{R^2}, \quad (26)$$

where $G = kc^2 = 6.673 \times 10^{-8} \text{ cm}^3 / \text{g} \cdot \text{sec}^2$ is gravitation constant.

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