The universe's age and the special relativity theory in the initial universe

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ABSTRACT

The universe's age almost same the moving light's lifetime in the special relativity theory. Therefore, be able to consider that the universe's age effects the special relativity theory of the initial universe. Because the universe's present age is very huge, consider that this age is the constant time in the special relativity theory.

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I. Introduction

The article treats that the special relativity theory of the initial universe represents by the universe's age. The universe's age almost same the moving light's lifetime in the special relativity theory. Therefore, be able to consider that the universe's age effects the special relativity theory of the initial universe.

II. Additional chapter-I

Consider the universe's age $\tau_{universe} \sim 1.8 \times 10^{10} yrs$. Because the universe's present age is very huge, consider that this age is the constant time in the special relativity theory. Hence, the moving light's lifetime is almost same the universe's age in the special relativity theory. The light's velocity of the initial universe is $c_{initial}$. In the initial universe, be able to consider that the light has the velocity $c_{initial}$, the static light's lifetime τ_{light}, the static light's mass m_{0light} but this universe's time-space is treated by the light speed c in the free time-space. It is able to hypothesize that the light's velocity of the initial universe is $c_{initial} \leq$ the light speed c in the free time-space.

If light's time of the initial universe go during the universe's age,

$$-\tau_{universe} = \int_{t(light)}^{0} dt_{light} = -t_{light} = \int_{c(initial)}^{c(present)} d\left(\frac{\tau_{light}}{\sqrt{1-\alpha^2 \frac{c_{age}^2}{c^2}}}\right) = 0 - \frac{\tau_{light}}{\sqrt{1-\alpha_0^2 \frac{c_{initial}^2}{c^2}}}$$

$$= -\frac{\tau_{light}}{\sqrt{1-\frac{\beta_0^2 c_{initial}^2}{\gamma_0^2 c^2}}} = \int_{\tau(universe)}^{0} \tau_{light} \cdot \frac{d\tau_{uinverse}}{\tau_{light}} = -\tau_{light} \cdot \frac{\tau_{universe}}{\tau_{light}}$$

τ_{light} is constant. $$\alpha = \frac{c}{c_{age}} \sqrt{1-\left(\frac{\tau_{light}}{\tau_{universe}}\right)^2}, \quad \alpha_0 = \frac{\beta_0}{\gamma_0} = \frac{c}{c_{initial}} \sqrt{1-\left(\frac{\tau_{light}}{\tau_{universe}}\right)^2} \quad (1)$$

c_{age} is the light's velocity in the universe's age. $\tau_{universe}$ is the universe's age, τ_{light} is the static light's lifetime, t_{light} is the moving light's lifetime in the inertial system $S(t,x,y,z)$, the light's velocity of the initial universe is $c_{initial}$, In this time, α_0 is constant. But α isn't constant.

In this time, the light velocity of the universe's age is c_{age}. Therefore, by Eq(1)

$$\tau_{universe} = t_{light} = \frac{\tau_{light}}{\sqrt{1-\alpha_0^2 \frac{c_{initial}^2}{c^2}}} = \frac{\tau_{light}}{\sqrt{1-\frac{\beta_0^2 c_{initial}^2}{\gamma_0^2 c^2}}} = \tau_{light} \cdot \frac{\tau_{universe}}{\tau_{light}},$$

$$, \quad \alpha_0 = \frac{\beta_0}{\gamma_0} = \frac{c}{c_{initial}} \sqrt{1-(\frac{\tau_{light}}{\tau_{universe}})^2}, \quad (2)$$

$\tau_{universe}$ is the universe's age, τ_{light} is the static light's lifetime, t_{light} is the moving light's lifetime in the inertial system $S(t,x,y,z)$, the light's velocity of the initial universe is $c_{initial}$, In this time, α_0 is constant.

Therefore, in the initial universe

$$t_{particle} = \frac{\tau_{particle}}{\sqrt{1-\alpha_0^2 \frac{u^2}{c^2}}} = \frac{\tau_{particle}}{\sqrt{1-\frac{\beta_0^2 u^2}{\gamma_0^2 c^2}}}, \quad \alpha_0 = \frac{\beta_0}{\gamma_0} = \frac{c}{c_{initial}} \sqrt{1-(\frac{\tau_{light}}{\tau_{universe}})^2} \quad (3),$$

$t_{particle}$ is the particle's lifetime in the inertial system $S(t,x,y,z)$, $\tau_{particle}$ is the particle's lifetime

In the initial universe,

$$d\tau^2 = dt^2(1-\frac{\beta_0^2 u^2}{\gamma_0^2 c^2}) = dt^2 - \frac{1}{\gamma_0^2 c^2}(\beta_0^2 dx^2 + \beta_0^2 dy^2 + \beta_0^2 dz^2)$$

$$= dt^2(1-\alpha_0^2 \frac{u^2}{c^2}) = dt^2 - \frac{1}{c^2}\alpha_0^2 (dx^2 + dy^2 + dz^2)$$

$$= dt'^2 - \frac{1}{c^2}\alpha_0^2 (dx'^2 + dy'^2 + dz'^2) \quad (4)$$

$$x = \frac{x'+v_0 t'}{\sqrt{1-\frac{\beta_0^2 v_0^2}{\gamma_0^2 c^2}}} = \frac{x'+v_0 t'}{\sqrt{1-\alpha_0^2 \frac{v_0^2}{c^2}}}, t = \frac{t' + \frac{\beta_0 v_0}{\gamma_0^2 c^2}\beta_0 x'_{real}}{\sqrt{1-\frac{\beta_0^2 v_0^2}{\gamma_0^2 c^2}}} = \frac{t'+\alpha_0^2 \frac{v_0}{c^2} x'}{\sqrt{1-\alpha_0^2 \frac{v_0^2}{c^2}}}$$

$$, x' = \frac{x - v_0 t}{\sqrt{1-\frac{\beta_0^2 v_0^2}{\gamma_0^2 c^2}}} = \frac{x - v_0 t}{\sqrt{1-\alpha_0^2 \frac{v_0^2}{c^2}}}, \quad t' = \frac{t - \frac{\beta_0 v_0}{\gamma_0^2 c^2}\beta_0 x}{\sqrt{1-\frac{\beta_0^2 v_0^2}{\gamma_0^2 c^2}}} = \frac{t - \alpha_0^2 \frac{v_0}{c^2} x}{\sqrt{1-\alpha_0^2 \frac{v_0^2}{c^2}}}$$

$$y = y', z = z'$$

$$V = \frac{dx}{dt} = \frac{\frac{dx'}{dt'} + v_0}{1 + \alpha_0^2 \frac{v_0}{c^2} \frac{dx'}{dt'}} = \frac{u + v_0}{1 + \alpha_0^2 \frac{v_0}{c^2} u}, \quad u = \frac{dx'}{dt'} \tag{5}$$

In the initial universe, in the example, the light is

$$d\tau^2 = dt^2 (1 - \alpha_0^2 \frac{u^2}{c^2}) = dt^2 - \frac{1}{c^2} \alpha_0^2 (dx^2 + dy^2 + dz^2) = 0$$

$$cdt = \alpha_0 ds = \frac{\beta_0}{\gamma_0} ds \to c\gamma_0 dt = \beta_0 ds, \; ds = \sqrt{dx^2 + dy^2 + dz^2}$$

$$d\tau^2 = dt'^2 - \frac{1}{c^2} \alpha_0^2 (dx'^2 + dy'^2 + dz'^2) = 0$$

$$cdt' = \alpha_0 ds' = \frac{\beta_0}{\gamma_0} ds' \to c\gamma_0 dt' = \beta_0 ds', \; ds' = \sqrt{dx'^2 + dy'^2 + dz'^2} \tag{6}$$

In the initial universe, in this time, the static light's mass m_{0light} is

$$m_{0light} \sim \Delta m_0 \;, \quad m_{light} = \frac{m_{0light}}{\sqrt{1 - \alpha_0^2 \frac{c_{initial}^2}{c^2}}} = \frac{\Delta m_0}{\sqrt{1 - \alpha_0^2 \frac{c_{initial}^2}{c^2}}}$$

$$m_{0light} \sim \Delta m_0 = m_{light} \sqrt{1 - \alpha_0^2 \frac{c_{initial}^2}{c^2}} = m_{light} \frac{\tau_{light}}{\tau_{universe}}$$

$$, \; \alpha_0 = \frac{\beta_0}{\gamma_0} = \frac{c}{c_{initial}} \sqrt{1 - (\frac{\tau_{light}}{\tau_{universe}})^2} \tag{7}$$

The light's velocity of the initial universe is $c_{initial}$

Therefore Eq(7) is

$$m_{0light} = \frac{E_{0light}}{\gamma_0^2 c^2} = \frac{E_{light}}{\gamma_0^2 c^2} \frac{\tau_{light}}{\tau_{universe}} \;, \; m_{light} = \frac{E_{light}}{\gamma_0^2 c^2} \tag{8}$$

III. Additional chapter-II

In this theory, in the initial universe, the particle's the force definition and the kinetic energy definition, etc be similar the present special relativity theory's definition.

In this theory, in the initial universe, the particle's the force F and the kinetic energy KE, the power P, the momentum p, the total energy E are

$$F = m_0 a = \frac{d}{dt}\left(\frac{m_0\beta_0 u}{\sqrt{1-\frac{\beta_0{}^2 u^2}{\gamma_0{}^2 c^2}}}\right) = \frac{d}{dt}\left(\frac{m_0\beta_0 u}{\sqrt{1-\alpha_0{}^2\frac{u^2}{c^2}}}\right) = \frac{dp}{dt}$$

$$KE = \int_0^{\beta_0 u}\beta_0 u d\left(\frac{m_0\beta_0 u}{\sqrt{1-\alpha_0{}^2\frac{u^2}{c^2}}}\right) = \frac{m_0\gamma_0{}^2 c^2}{\sqrt{1-\alpha_0{}^2\frac{u^2}{c^2}}} - m_0\gamma_0{}^2 c^2 = E - m_0 c^2\gamma_0{}^2$$

$$P = \frac{d(KE)}{dt} = \frac{d}{dt}\left(\frac{m_0 c^2\gamma_0{}^2}{\sqrt{1-\alpha_0{}^2\frac{u^2}{c^2}}} - m_0 c^2\gamma_0{}^2\right) = F\cdot\beta_0 u = \frac{d}{dt}\left(\frac{m_0\beta_0 u}{\sqrt{1-\alpha_0{}^2\frac{u^2}{c^2}}}\right)\cdot\beta_0 u$$

And

$$E^2 = \frac{m_0{}^2 c^4\gamma_0{}^4}{1-\alpha_0{}^2\frac{u^2}{c^2}} = m_0{}^2 c^4\gamma_0{}^4 + p^2 c^2\gamma_0{}^2 = m_0{}^2 c^4\gamma_0{}^4 + \frac{m_0{}^2\beta_0{}^2 u^2 c^2\gamma_0{}^2}{1-\alpha_0{}^2\frac{u^2}{c^2}}$$

$$= \frac{m_0{}^2 c^4\gamma_0{}^4(1-\alpha_0{}^2\frac{u^2}{c^2}) + m_0{}^2\beta_0{}^2 u^2 c^2\gamma_0{}^2}{1-\alpha_0{}^2\frac{u^2}{c^2}} = \frac{m_0{}^2 c^4\gamma_0{}^4}{1-\alpha_0{}^2\frac{u^2}{c^2}}$$

$$E' = \frac{m_0\gamma_0{}^2 c^2}{\sqrt{1-\alpha_0{}^2\frac{u^2}{c^2}}} \quad , \quad p' = \frac{m_0\beta_0 u}{\sqrt{1-\alpha_0{}^2\frac{u^2}{c^2}}},$$

$$V = \frac{dx}{dt} = \frac{\frac{dx'}{dt'} + v_0}{1+\alpha_0{}^2\frac{v_0}{c^2}\frac{dx'}{dt'}} = \frac{u+v_0}{1+\alpha_0{}^2\frac{v_0}{c^2}u}, \quad u = \frac{dx'}{dt'}$$

$$E = \frac{m_0 c^2\gamma_0{}^2}{\sqrt{1-\alpha_0{}^2\frac{V^2}{c^2}}} = \frac{m_0 c^2\gamma_0{}^2(1+\alpha_0{}^2\frac{v_0}{c^2}u)}{\sqrt{1-\alpha_0{}^2\frac{u^2}{c^2}}\sqrt{1-\alpha_0{}^2\frac{v_0{}^2}{c^2}}} = \frac{E' + v_0\beta_0 p'}{\sqrt{1-\alpha_0{}^2\frac{v_0{}^2}{c^2}}}$$

$$, p = \frac{m_0 V\beta_0}{\sqrt{1-\alpha_0{}^2\frac{V^2}{c^2}}} = \frac{m_0(u+v_0)\beta_0}{\sqrt{1-\alpha_0{}^2\frac{u^2}{c^2}}\sqrt{1-\alpha_0{}^2\frac{v_0{}^2}{c^2}}} = \frac{p' + \frac{v_0\beta_0}{c^2\gamma_0{}^2}E'}{\sqrt{1-\alpha_0{}^2\frac{v_0{}^2}{c^2}}} \qquad (9)$$

If $a = a_0$,

$$a = a_0 = \frac{d}{dt}\left(\frac{\beta_0 u}{\sqrt{1-\frac{\beta_0{}^2 u^2}{\gamma_0{}^2 c^2}}}\right), \quad \beta_0 u = \beta_0 \frac{dx}{dt} = \frac{a_0 t}{\sqrt{1+\frac{a_0{}^2 t^2}{c^2 \gamma_0{}^2}}}$$

$$\beta_0 x = \frac{c^2 \gamma_0{}^2}{a_0}\left(\sqrt{1+\frac{a_0{}^2 t^2}{c^2\gamma_0{}^2}} - 1\right)$$

$$\alpha_0 = \frac{\beta_0}{\gamma_0} = \frac{c}{c_{initial}}\sqrt{1-\left(\frac{\tau_{light}}{\tau_{universe}}\right)^2} \qquad (10)$$

In this theory, in the initial universe, the Maxwell-equation is

$$\frac{1}{\beta_0}\left(\frac{\partial E_x}{\partial x}+\frac{\partial E_y}{\partial y}+\frac{\partial E_z}{\partial z}\right) = \frac{1}{\beta_0}\vec{\nabla}\cdot\vec{E} = 4\pi\rho$$

$$\frac{1}{\beta_0}\left[\left(\frac{\partial B_z}{\partial y}-\frac{\partial B_y}{\partial z}\right)i - \left(\frac{\partial B_z}{\partial x}-\frac{\partial B_x}{\partial z}\right)j + \left(\frac{\partial B_y}{\partial x}-\frac{\partial B_x}{\partial y}\right)k\right] = \frac{1}{\beta_0}\vec{\nabla}\times\vec{B}$$

$$= \frac{1}{c\gamma_0}\left[\left(\frac{\partial E_x}{\partial t}+4\pi j_x\right)i + \left(\frac{\partial E_y}{\partial t}+4\pi j_y\right)j + \left(\frac{\partial E_z}{\partial t}+4\pi j_z\right)k\right] = \frac{1}{c\gamma_0}\left(\frac{\partial \vec{E}}{\partial t}+4\pi\vec{j}\right)$$

$$\frac{1}{\beta_0}\left(\frac{\partial B_x}{\partial x}+\frac{\partial B_y}{\partial y}+\frac{\partial B_z}{\partial z}\right) = \frac{1}{\beta_0}\vec{\nabla}\cdot\vec{B} = 0$$

$$\frac{1}{\beta_0}\left[\left(\frac{\partial E_z}{\partial y}-\frac{\partial E_y}{\partial z}\right)i - \left(\frac{\partial E_z}{\partial x}-\frac{\partial E_x}{\partial z}\right)j + \left(\frac{\partial E_y}{\partial x}-\frac{\partial E_x}{\partial y}\right)k\right] = \frac{1}{\beta_0}\vec{\nabla}\times\vec{E}$$

$$= -\frac{1}{c\gamma_0}\left[\frac{\partial B_x}{\partial t}i + \frac{\partial B_y}{\partial t}j + \frac{\partial B_z}{\partial t}k\right] = -\frac{1}{c\gamma_0}\frac{\partial \vec{B}}{\partial t} \qquad (11)$$

$$\vec{B} = \frac{1}{\beta_0}\vec{\nabla}\times\vec{A} \quad , \vec{E} = -\frac{1}{\beta_0}\vec{\nabla}\phi - \frac{1}{c\gamma_0}\frac{\partial\vec{A}}{\partial t} \qquad (12)$$

In this time, uses Lorentz gauge.

$$\frac{1}{c\gamma_0}\frac{\partial\phi}{\partial t} + \frac{1}{\beta_0}\vec{\nabla}\cdot\vec{A} = 0 \text{ (Lorentz gauge)} \quad (13)$$

Therefore,

$$\left(\frac{1}{c^2\gamma_0{}^2}\frac{\partial^2}{\partial t^2} - \frac{1}{\beta_0{}^2}\nabla^2\right)\phi = 4\pi\rho \quad , \left(\frac{1}{c^2\gamma_0{}^2}\frac{\partial^2}{\partial t^2} - \frac{1}{\beta_0{}^2}\nabla^2\right)\vec{A} = \frac{4\pi}{c\gamma_0}\vec{j} \; (14)$$

The transformation of 4-vector operator $\left(\frac{1}{c\gamma_0}\frac{\partial}{\partial t}, \frac{1}{\beta_0}\vec{\nabla}\right)$ is

$$\frac{1}{c\gamma_0}\frac{\partial}{\partial t}=\gamma(\frac{1}{c\gamma_0}\frac{\partial}{\partial t'}-\alpha_0\frac{v_0}{c}\frac{1}{\beta_0}\frac{\partial}{\partial x'}),\frac{1}{\beta_0}\frac{\partial}{\partial x}=\gamma(\frac{1}{\beta_0}\frac{\partial}{\partial x'}-\alpha_0\frac{v_0}{c}\frac{1}{c\gamma_0}\frac{\partial}{\partial t'})$$

$$\frac{1}{\beta_0}\frac{\partial}{\partial y}=\frac{1}{\beta_0}\frac{\partial}{\partial y'} \ , \ \frac{1}{\beta_0}\frac{\partial}{\partial z}=\frac{1}{\beta_0}\frac{\partial}{\partial z'} \ , \ \gamma=1/\sqrt{1-\frac{v_0{}^2}{c^2}} \qquad (15)$$

The transformation of the Electro-magnetic 4-vector potential $(\phi,\vec{A})$ is

$$\phi=\gamma(\phi'+\alpha_0\frac{v_0}{c}A_{x'}), \quad A_x=\gamma(A_{x'}+\alpha_0\frac{v_0}{c}\phi')$$

$$A_y=A_{y'} \ , \ A_z=A_{z'}, \quad \gamma=1/\sqrt{1-\frac{v_0{}^2}{c^2}} \qquad (16)$$

Therefore, the transformation of Electro-magnetic field $\vec{E},\vec{B}$ is

$$E_x=E_{x'},E_y=\gamma E_{y'}+\gamma\alpha_0\frac{v_0}{c}B_{z'}, \ E_z=\gamma E_{z'}-\gamma\alpha_0\frac{v_0}{c}B_{y'}$$

$$B_x=B_{x'},B_y=\gamma B_{y'}-\gamma\alpha_0\frac{v_0}{c}E_{z'}, \ B_z=\gamma B_{z'}+\gamma\alpha_0\frac{v_0}{c}E_{y'}$$

$$\gamma=1/\sqrt{1-\frac{v_0{}^2}{c^2}} \qquad (17)$$

In the initial universe, in the quantum theory,

$$E=\frac{m_0c^2\gamma_0{}^2}{\sqrt{1-\alpha_0{}^2\frac{u^2}{c^2}}}=h\upsilon \ (18)$$

The Compton effects is

$$\beta_0\lambda'-\beta_0\lambda=\frac{h}{m_0c\gamma_0}(1-\cos\phi) \ (19)$$

The de Broglie wavelength $\beta_0\lambda$ is

$$\beta_0\lambda=\frac{h}{p}=\frac{h}{mu\beta_0} \ , \ m=\frac{m_0}{\sqrt{1-\alpha_0{}^2\frac{u^2}{c^2}}} \qquad (20)$$

The angular frequency ω and the wave number k/β_0 are

$$\omega=2\pi\upsilon \ , \ \frac{k}{\beta_0}=\frac{2\pi}{\beta_0\lambda} \ \rightarrow \ \beta_0\frac{d\omega}{dk}=\beta_0 u \ (21)$$

IV. Conclusion

If in the initial universe, the static light's life time $\tau_{light} = 0$ and if the light's velocity is $c_{initial} = c$, this theory does the present special relativity theory.

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