The special relativity theory in the α_0-parallel universe

Sangwha-Yi
Department of Math , Taejon University 300-716

ABSTRACT

The universe that the light's velocity is $\frac{c}{\alpha_0}$ instead of c and is likely parallel universe names the α_0-parallel universe.The theory is the special relativity theory in the α_0-parallel universe. In this time, this α_0-parallel universe is the universe that can treat inertial systems. In this universe, be able to consider that the light has the velocity $\frac{c}{\alpha_0}$ instead of c and the permittivity constant $\varepsilon_0(\alpha_0)=\varepsilon_0\alpha_0^{1+a}$ instead of ε_0, the permeability constant is $\mu_0(\alpha_0)=\mu_0\alpha_0^{1-a}$ instead of μ_0. Hence, In this theory, be able to consider that the light has the velocity $\frac{c}{\alpha_0}$ instead of c. Hence, In this theory, each α_0-parallel universe has each light velocity. Each light velocity or each permittivity constant and each permeability constant distinguishes each α_0-parallel universe.

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e-mail address:sangwha1@**nate.com**
Tel:051-624-3953

I. Introduction

The universe that the light's velocity is $\frac{c}{\alpha_0}$ instead of c and is likely parallel universe names the α_0-parallel universe. The article treats the special relativity theory in the α_0-parallel universe. This α_0-parallel universe is the universe that can treat inertial systems.

II. Additional chapter-I

The light's velocity is $\frac{c}{\alpha_0}$ in the α_0-parallel universe. Therefore,

$$t = \frac{\tau}{\sqrt{1-\alpha_0{}^2 \frac{u^2}{c^2}}} \quad (1), \ \alpha_0 > 0$$

α_0 is the constant number.

In this theory,

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

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

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

$$x = \frac{x'+v_0t'}{\sqrt{1-\alpha_0{}^2\frac{v_0{}^2}{c^2}}}, \ t = \frac{t'+\alpha_0{}^2\frac{v_0}{c^2}x'}{\sqrt{1-\alpha_0{}^2\frac{v_0{}^2}{c^2}}}, \ x' = \frac{x-v_0t}{\sqrt{1-\alpha_0{}^2\frac{v_0{}^2}{c^2}}}, \ t' = \frac{t-\alpha_0{}^2\frac{v_0}{c^2}x}{\sqrt{1-\alpha_0{}^2\frac{v_0{}^2}{c^2}}} \quad (3)$$

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

$$V = \frac{dx}{dt} = \frac{\frac{dx'}{dt'}+v_0}{1+\alpha_0{}^2\frac{v_0}{c^2}\frac{dx'}{dt'}} = \frac{u+v_0}{1+\alpha_0{}^2\frac{v_0}{c^2}u}, \ u = \frac{dx'}{dt'} \quad (4)$$

In the example, the light is

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

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

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

$$cdt' = \alpha_0 ds', \ ds' = \sqrt{dx'^2+dy'^2+dz'^2}, \ \frac{ds'}{dt'} = \frac{c}{\alpha_0} \quad (5)$$

The light's velocity of the this theory is $\frac{c}{\alpha_0}$

In this time, the mass m_0 is

$$m = \frac{m_0}{\sqrt{1-\alpha_0{}^2\frac{u^2}{c^2}}} \quad (6)$$

$$m = \frac{E}{c^2}\alpha_0{}^2$$

III. Additional chapter-II

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

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

$$p^{\alpha} = m_0 \frac{dx^{\alpha}}{d\tau}$$

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

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

$$P = \frac{d(KE)}{dt} = \frac{d}{dt}\left(\frac{m_0 c^2/\alpha_0^{\,2}}{\sqrt{1-\alpha_0^{\,2}\frac{u^2}{c^2}}} - m_0 c^2/\alpha_0^{\,2}\right) = F\cdot u = \frac{d}{dt}\left(\frac{m_0 u}{\sqrt{1-\alpha_0^{\,2}\frac{u^2}{c^2}}}\right)\cdot u \tag{7}$$

And

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

$$= \frac{m_0^{\,2}c^4\left(1-\alpha_0^{\,2}\frac{u^2}{c^2}\right)\frac{1}{\alpha_0^{\,4}} + m_0^{\,2}u^2c^2/\alpha_0^{\,2}}{1-\alpha_0^{\,2}\frac{u^2}{c^2}} = \frac{m_0^{\,2}c^4/\alpha_0^{\,4}}{1-\alpha_0^{\,2}\frac{u^2}{c^2}}$$

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

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

$$E = \frac{m_0 c^2/\alpha_0^{\,2}}{\sqrt{1-\alpha_0^{\,2}\frac{V^2}{c^2}}} = \frac{m_0 c^2\left(1+\alpha_0^{\,2}\frac{v_0}{c^2}u\right)\frac{1}{\alpha_0^{\,2}}}{\sqrt{1-\alpha_0^{\,2}\frac{u^2}{c^2}}\sqrt{1-\alpha_0^{\,2}\frac{v_0^{\,2}}{c^2}}} = \frac{E' + v_0 p'}{\sqrt{1-\alpha_0^{\,2}\frac{v_0^{\,2}}{c^2}}}$$

$$p = \frac{m_0 V}{\sqrt{1-\alpha_0^{\,2}\frac{V^2}{c^2}}} = \frac{m_0(u+v_0)}{\sqrt{1-\alpha_0^{\,2}\frac{u^2}{c^2}}\sqrt{1-\alpha_0^{\,2}\frac{v_0^{\,2}}{c^2}}} = \frac{p' + \frac{v_0}{c^2}\alpha_0^{\,2}E'}{\sqrt{1-\alpha_0^{\,2}\frac{v_0^{\,2}}{c^2}}}, \tag{8}$$

If $a = a_0$,

$$a = a_0 = \frac{d}{dt}\left(\frac{u}{\sqrt{1-\alpha_0^2 \frac{u^2}{c^2}}}\right) \quad u = \frac{dx}{dt} = \frac{a_0 t}{\sqrt{1+\frac{\alpha_0^2 a_0^2 t^2}{c^2}}},$$

$$x = \frac{c^2}{a_0 \alpha_0^2}\left(\sqrt{1+\frac{\alpha_0^2 a_0^2 t^2}{c^2}} - 1\right) \quad (9)$$

In this theory, the Maxwell-equation is

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

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

$$= \frac{1}{c/\alpha_0}\left[\left(\frac{\partial E_x}{\partial t} + 4\pi j_x\right)i + \left(\frac{\partial E_y}{\partial t} + 4\pi j_y\right)j + \left(\frac{\partial E_z}{\partial t} + 4\pi j_z\right)k\right] = \frac{1}{c/\alpha_0}\left(\frac{\partial \vec{E}}{\partial t} + 4\pi \vec{j}\right)$$

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

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

$$= -\frac{1}{c/\alpha_0}\left[\frac{\partial B_x}{\partial t}i + \frac{\partial B_y}{\partial t}j + \frac{\partial B_z}{\partial t}k\right] = -\frac{1}{c/\alpha_0}\frac{\partial \vec{B}}{\partial t} \quad (10)$$

$$\vec{B} = \vec{\nabla} \times \vec{A}, \quad \vec{E} = -\vec{\nabla}\phi - \frac{1}{c/\alpha_0}\frac{\partial \vec{A}}{\partial t} \quad (11)$$

Therefore, the speed of Electro-magnetic wave $\frac{c}{\alpha_0}$ is in the α_0-parallel universe

$$\frac{c}{\alpha_0} = \frac{1}{\sqrt{\varepsilon_0(\alpha_0)\mu_0(\alpha_0)}}, \quad c = \frac{1}{\sqrt{\varepsilon_0 \mu_0}} \quad (12)$$

ε_0 is the permittivity constant in the present universe

μ_0 is the permeability constant in the present universe

$\varepsilon_0(\alpha_0) = \varepsilon_0 \alpha_0^{1+a}$ is the permittivity constant in the α_0-parallel universe.

$\mu_0(\alpha_0) = \mu_0 \alpha_0^{1-a}$ is the permeability constant in the α_0-parallel universe.

a is the real number.

In this time, uses Lorentz gauge.

$$\frac{1}{c/\alpha_0}\frac{\partial \phi}{\partial t} + \vec{\nabla} \cdot \vec{A} = 0 \quad \text{(Lorentz gauge)} \quad (13)$$

Therefore,

$$\left(\frac{1}{c^2/\alpha_0^2}\frac{\partial^2}{\partial t^2} - \nabla^2\right)\phi = 4\pi\rho, \quad \left(\frac{1}{c^2/\alpha_0^2}\frac{\partial^2}{\partial t^2} - \nabla^2\right)\vec{A} = \frac{4\pi}{c/\alpha_0}\vec{j} \quad (14)$$

The transformation of 4-vector operator $\left(\frac{1}{c/\alpha_0}\frac{\partial}{\partial t}, \vec{\nabla}\right)$ is

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

$$\frac{\partial}{\partial y}=\frac{\partial}{\partial y'},\ \frac{\partial}{\partial z}=\frac{\partial}{\partial z'},\ \gamma=1/\sqrt{1-\alpha_0^2\frac{v_0^2}{c^2}} \quad (15)$$

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

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

$$A_y=A_{y'},\ A_z=A_{z'},\ \gamma=1/\sqrt{1-\alpha_0^2\frac{v_0^2}{c^2}} \quad (16)$$

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

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

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

$$\gamma=1/\sqrt{1-\alpha_0^2\frac{v_0^2}{c^2}} \quad (17)$$

In the quantum theory,

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

The Compton effects is

$$\lambda'-\lambda=\frac{h}{m_0c/\alpha_0}(1-\cos\phi) \quad (19)$$

The de Broglie wavelength λ is

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

IV. Conclusion

These α_0-parallel universes include the present universe.

If $\alpha_0=1$, this α_0-parallel universe's special relativity theory does the present special relativity theory.

If $\alpha_0\neq 1$, each α_0-parallel universe has each light velocity and each special relativity theory. Each light velocity or each permittivity constant and each permeability constant distinguishes each α_0-parallel universe.

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