The light velocity of the relativity theory in the α_0-parallel universe

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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 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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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 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, in the part of the this theory's the special relativity

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

α_0 is the constant number.

In this theory,

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

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

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

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

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

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

In the example, the light is

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

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

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

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

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 the part of the this theory's the special relativity, 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

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

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

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

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

And

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

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

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

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

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

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

If $a = a_0$,

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

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

In this theory, the Maxwell-equation is

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

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

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

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

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

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

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

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

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

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.

$0<\alpha_0\leq 1$, α_0 is the constant number. a is the real number.

In this time, uses Lorentz gauge.

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

Therefore,

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

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

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

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

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

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

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

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

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

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

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

In the quantum theory,

$$E = \frac{m_0 c^2 / \alpha_0{}^2}{\sqrt{1-\alpha_0{}^2 \frac{u^2}{c^2}}} = h\upsilon \ (18)$$

The Compton effects is

$$\lambda' - \lambda = \frac{h}{m_0 c / \alpha_0}(1-\cos\phi) \ (19)$$

The de Broglie wavelength λ is

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

IV. Additional chapter-III

In the part of the this theory's the general relativity, the general relativity theory's field equation is written completely.

$$R_{\mu\upsilon} - \frac{1}{2} g_{\mu\upsilon} R = -\alpha_0{}^4 \frac{8\pi G}{c^4} T_{\mu\upsilon} \ (21)$$

Eq (21) multiply $g^{\mu\upsilon}$ and does contraction,

$$g^{\mu\upsilon} R_{\mu\upsilon} - \frac{1}{2} g^{\mu\upsilon} g_{\mu\upsilon} R$$

$$= -R = -\alpha_0{}^4 \frac{8\pi G}{c^4} T^{\lambda}{}_{\lambda} \qquad (22)$$

Therefore, Eq (21) is

$$R_{\mu\upsilon} - \frac{1}{2} g_{\mu\upsilon} {\alpha_0}^4 \frac{8\pi G}{c^4} T^{\lambda}{}_{\lambda} = -{\alpha_0}^4 \frac{8\pi G}{c^4} T_{\mu\upsilon}$$

$$R_{\mu\upsilon} = -{\alpha_0}^4 \frac{8\pi G}{c^4} (T_{\mu\upsilon} - \frac{1}{2} g_{\mu\upsilon} T^{\lambda}{}_{\lambda}) \quad (23)$$

In this time, the spherical coordinate system's vacuum solution is by $T_{\mu\upsilon} = 0$

$$R_{\mu\upsilon} = 0 \,(24)$$

The spherical coordinate system's invariant time is

$$d\tau^2 = A(t,r)dt^2 - {\alpha_0}^2 \frac{1}{c^2} [B(t,r)dr^2 + r^2 d\theta^2 + r^2 \sin^2 \theta d\phi^2] \,(25)$$

Using Eq(25)'s metric, save the Riemannian-curvature tensor, and does contraction, save Ricci-tensor.

$$R_{tt} = -\frac{A''}{2B} + \frac{A'B'}{4B^2} - \frac{A'}{Br} + \frac{A'^2}{4AB} + \frac{\ddot{B}}{2B} - \frac{\dot{B}^2}{4B^2} - \frac{\dot{A}\dot{B}}{4AB} = 0 \quad (26)$$

$$R_{rr} = \frac{A''}{2A} - \frac{A'^2}{4A^2} - \frac{A'B'}{4AB} - \frac{B'}{Br} - \frac{\ddot{B}}{2A} + \frac{\dot{A}\dot{B}}{4A^2} + \frac{\dot{B}^2}{4AB} = 0 \quad (27)$$

$$R_{\theta\theta} = -1 + \frac{1}{B} - \frac{rB'}{2B^2} + \frac{rA'}{2AB} = 0 \quad (28)$$

$$R_{\phi\phi} = R_{\theta\theta} \sin^2 \theta = 0 \quad (29)$$

$$R_{tr} = -\frac{\dot{B}}{Br} = 0 \,(30) \quad R_{t\theta} = R_{t\phi} = R_{r\theta} = R_{r\phi} = R_{\theta\phi} = 0 \,(31)$$

In this time, $' = \frac{\partial}{\partial r}$, $\cdot = \alpha_0 \frac{1}{c} \frac{\partial}{\partial t}$

By Eq(30),

$$\dot{B} = 0 \quad (32)$$

By Eq(26) and Eq(27),

$$\frac{R_{tt}}{A} + \frac{R_{rr}}{B} = -\frac{1}{Br} (\frac{A'}{A} + \frac{B'}{B}) = -\frac{(AB)'}{rAB^2} = 0 \,(33)$$

Therefore,

$$A = \frac{1}{B} \,(34)$$

If Eq(28) is inserted by Eq(34),

$$R_{\theta\theta} = -1 + \frac{1}{B} - \frac{rB'}{2B^2} + \frac{rA'}{2AB} = -1 + (\frac{r}{B})' = 0 \,(35)$$

If solve Eq(35)

$$\frac{r}{B} = r + C \rightarrow \frac{1}{B} = 1 + \frac{C}{r} \qquad (36)$$

In this time, if $0 < \alpha_0 \le 1$, α_0 is the constant number.

$$C = -\alpha_0{}^2 \frac{2GM}{c^2} \qquad (37)$$

$$\frac{1}{B} = 1 - \alpha_0{}^2 \frac{2GM}{rc^2} \qquad (38)$$

Therefore, Eq(38) is

$$A = \frac{1}{B} = 1 - \alpha_0{}^2 \frac{2GM}{rc^2} \qquad (39)$$

In this time, by Eq(25)

$$A = \frac{1}{B} = 1 - \alpha_0{}^2 \frac{2GM}{rc^2} \ge 0$$

$$r \ge R > .R_S = \alpha_0{}^2 \frac{2GM}{c^2} \qquad (40)$$

R is the star's radius, R_S is the black hole's radius.

Therefore, the α_0-condition is $0 < \alpha_0 \le 1$, it isn't $1 < \alpha_0$ by Eq(40)

To know Eq(39)'s second term, does Newton's limitation

$$\frac{d^2 x^\lambda}{d\tau^2} = -\Gamma^\lambda{}_{\mu\upsilon} \frac{dx^\mu}{d\tau}\frac{dx^\upsilon}{d\tau} \quad (41)\,, dx^\rho = (\frac{c}{\alpha_0} dt, dx, dy, dz)$$

$$\frac{d^2 r}{dt^2} \approx \frac{1}{2}\frac{c^2}{\alpha_0{}^2}\frac{\partial(-A)}{\partial r} = -\frac{GM}{r^2} \quad (42),\ \ x^\rho = (\frac{c}{\alpha_0} t, x, y, z)$$

Hence, the distance of α_0-parallel universe is same that of the present universe but the time's velocity of α_0-parallel universe is faster than that of the present universe.

Therefore, by Eq(25) , if $0 < \alpha_0 \le 1$ in this theory, the spherical coordinate system's invariant time(vacuum solution) is

$$d\tau^2 = (1 - \alpha_0{}^2 \frac{2GM}{rc^2}) dt^2 - \alpha_0{}^2 \frac{1}{c^2} [\frac{1}{(1 - \alpha_0{}^2 \frac{2GM}{rc^2})} dr^2 + r^2 d\theta^2 + r^2 \sin^2\theta d\phi^2] \quad (43)$$

$0 < \alpha_0 \le 1$, α_0 is the constant number.

V. Conclusion

These α_0-parallel universes include the present universe.

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

Each α_0-parallel universe has each light velocity and each relativity theory.

Each light velocity or each permittivity constant and each permeability constant distinguishes each α_0 - parallel universe.

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