Discussion on the basic effect of the theory of relativity of electromotive space-time

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Abstract: The paper discussed the basic effect of the relativity of electromotive space-time [1], i.e., the principle of quaternion electromotive superposition, effect of time expansion, effect of space contraction and their major particular cases, and put forward several prediction, testing method for the effect of time expansion of scalar electric potential for testing through experiment. At the same time, the equation to calculate the limit electric potential on the basis of experimental data was proposed. The paper is one on the basic effect of the author's serial papers.

Keywords: principle of quaternion electromotive superposition; effect of electromotive time expansion; effect of electromotive length contraction; time expansion of electric potential

In the relativity of electromotive space-time [1], the basic assumption of the basis for the theory , the detailed physical and mathematical deduction process of were described, expressions for different theories of relativity were given. However, its basic form is the following sets of equations for the basic time-space relation of quaternion relativity, other forms of relativity can be obtained through conversion and simplification. Therefore, it is the major target for discussions of the basic effect of electromotive relativity.

The symbols and their physical meaning of the equations have been described in detail in the relativity of electromotive space-time[1]，it is not necessary to repeat here.

$$R_q{}' = R_q - V_q t_q \tag{1}$$

$$t' = \gamma\left(t - \frac{|V_q|}{{C_0}^2} R_1\right) \tag{2}$$

其中，$$\gamma = \frac{1}{\sqrt{1 - \frac{|V_q|^2}{{C_0}^2}}} \tag{3}$$

$$R_2 = \gamma\left(R_1 - |V_q| t\right) \tag{4}$$

$$R_1 = r\cos\theta + F\sin\theta \tag{5}$$

$$t_q = \frac{(R_1 - R_2)}{|V_q|} \tag{6}$$

1. Superposition principle of the relativity of electromotive space-time

From the analysis of the above-mentioned equations, it is known that the equations (2), (3) and (4) are the same as the special theory of relativity in form, and are all real number equations, physically, V_q represents the magnetitude of the velocity of quaternion, so there is:

$$|V_q| = \sqrt{{V_\phi}^2 + {V_X}^2 + {V_Y}^2 + {V_Z}^2} \tag{7}$$

$$R_1 = r\cos\theta + F\sin\theta = \frac{\mathbf{R_p} \cdot \mathbf{V_\theta}}{V_\theta}$$

And, $|V_q| = V_\theta = |\mathbf{V}_\theta|$

$$\mathbf{R_p} = \mathbf{F} + \mathbf{X} + \mathbf{Y} + \mathbf{Z} \tag{8}$$

$$\mathbf{V}_\theta = \mathbf{V}_\phi + \mathbf{V}_X + \mathbf{V}_Y + \mathbf{V}_Z \tag{9}$$

Therefore, the above-mentioned equations can be written in the form of hyperbolic function[2]:

$$R_2 = R_1\cosh(\varphi) - C_0 t\sinh(\varphi) \tag{10}$$

$$C_0 t' = -R_1\sinh(\varphi) + C_0 t\cosh(\varphi) \tag{11}$$

Where, $\cosh(\varphi) = \frac{1}{\sqrt{1-(\frac{|V_q|}{C_0})^2}}$ (12)

Because, $\cosh^2(\varphi) - \sinh^2(\varphi) = 1$ (13)

From(12) and(13) it can be obtained: $\tanh(\varphi) = \frac{|V_q|}{C_0}$ (14)

Assume: $\varphi = \varphi_1 + \varphi_2$, $\frac{|V_{q1}|}{C_0} = \tanh(\varphi_1)$和$\frac{|V_{q2}|}{C_0} = \tanh(\varphi_2)$

$$\frac{|V_q|}{C_0} = \tanh(\varphi_1 + \varphi_2) \tag{15}$$

According to(14), the formula for superposition of velocity of the relativity of electromotive space-time can be obtained:

$$|V_q| = \frac{|V_{q2}| + |V_{q1}|}{1 + \frac{|V_{q1}||V_{q2}|}{{C_0}^2}} \tag{16}$$

Where, $|V_{q1}| = \sqrt{{V_{\phi1}}^2 + {V_{X1}}^2 + {V_{Y1}}^2 + {V_{Z1}}^2}$ (17)

$$|V_{q2}| = \sqrt{{V_{\phi2}}^2 + {V_{X2}}^2 + {V_{Y2}}^2 + {V_{Z2}}^2} \tag{18}$$

When the superposition status of one dimensional movement velocity $V_{X1} \neq 0$, $V_{X2} \neq 0$, $V_{X'} \neq 0$, all other terms are zero. By substituting the above-mentioned formula for superposition, the formula for velocity superposition of special theory of relativity can be obtained:

$$V_X = \frac{V_{X2} + V_{X1}}{1 + \frac{V_{X1}V_{X2}}{{C_0}^2}} \tag{19}$$

According to the formula for speed and electric potential conversion and from $V_q = \frac{C_0}{\Phi_0} i\phi_q$, the formula for superposition of electric potential of the relativity of electromotive space-time can be obtained:

$$|\phi_q| = \frac{|\phi_{q2}| + |\phi_{q1}|}{1 + \frac{|\phi_{q1}||\phi_{q2}|}{{\Phi_0}^2}} \tag{20}$$

Because $\phi_h = -i\phi_q$the formula for superposition of electric potential of H-shaped quaternion of the same form can be obtained.

When the scalar electric potential is only considered, $\phi_1 \neq 0$, $\phi_2 \neq 0$, $\phi' \neq 0$, other termsare all zero. By substituting the above-mentioned formula, the formula for superposition of electric potential can be obtained:

$$\phi = \frac{\phi_2 + \phi_1}{1 + \frac{\phi_1\phi_2}{{\Phi_0}^2}} \tag{21}$$

So, the conclusion different to the modern physics is deduced：our superposition of static electric potential is nonlinear.

2. Time effect of the relativity of electromotive space-time

(1)Effect of time expansion

Because in any reference system of electromotive inertia, time is even and homogeneous, the time measured by the clock put in the real space of the inertial system is the time of the inertial system. If two events happen at two different moments t_1 and t_2 at the same location of the reference system of electromotive static inertia, their time difference is Δt; For the moments t_1' and t_2' corresponding to the reference system of electromotive relative movement inertia, the time difference is $\Delta t'$. From(2)，(3) and (7) it can be known that the expression for the velocity of the relativity of electromotive space-time in term of the relation of $\Delta t'$ and Δt is:

$$\Delta t' = \frac{1}{\sqrt{1-\frac{V_\phi{}^2+V_X{}^2+V_Y{}^2+V_Z{}^2}{C_0{}^2}}}\Delta t \tag{22}$$

The expression for electric potential of the relativity of electromotive space-time is:

$$\Delta t' = \frac{1}{\sqrt{1-\frac{\phi^2+\phi_X{}^2+\phi_Y{}^2+\phi_Z{}^2}{\Phi_0{}^2}}}\Delta t \tag{23}$$

In the reference system of complex electromotive inertia, i.e., there are only static electric potential ϕ and one dimentional spped V_X，from $V_\phi = \frac{C_0}{\Phi_0}\phi$, it can be obtained：

$$\Delta t' = \frac{1}{\sqrt{1-\frac{V_X{}^2}{C_0{}^2}-\frac{\phi^2}{\Phi_0{}^2}}}\Delta t \tag{24}$$

In(24)，$\phi = 0$, the formula for time expansion of special theory of relativity is obtained:

$$\Delta t' = \frac{1}{\sqrt{1-\frac{V_X{}^2}{C_0{}^2}}}\Delta t \tag{25}$$

In(24)，$V_X = 0$, the formula for the time expansion of the relativity of electric potential is obtained：

$$\Delta t' = \frac{1}{\sqrt{1-\frac{\phi^2}{\Phi_0{}^2}}}\Delta t \tag{26}$$

（2）Relationship between system time t_q, reference system time t and t'

From (6)(2)(4), it can be obtained：

$$t_q = \left((1-\gamma)\frac{C_0{}^2}{|V_q|^2}-\gamma\right)t-\left(\frac{1}{\gamma}-1\right)\frac{C_0{}^2}{|V_q|^2}t' \tag{27}$$

3. Space effect of the relativity of electromotive space-time

In the static electromotive reference system, event 1（R_{q1}，t_1）and event 1（R_{q2}，t_2）occur，in the moving electromotive reference system, the events corresponding to these events are（$R_{q1}{}'$，$t_1{}'$）and（$R_{q2}{}'$，$t_2{}'$），V_q is the relative electromotive velocity of two reference systems. From equation(27)，$t_{q1} = f(t_1, t_1{}')$ and $t_{q1} = f(t_2, t_2{}')$ can be obtained, therefore，from equation (1) it can be known:

$$R_{q1}{}' = R_{q1} - V_q t_{q1}$$
$$R_{q2}{}' = R_{q2} - V_q t_{q2}$$

So there is，$\Delta R_q{}' = \Delta R_q - V_q \Delta t_q$ (28)

$$\Delta t_q = \left((1-\gamma)\frac{C_0{}^2}{|V_q|^2} - \gamma\right)\Delta t - \left(\frac{1}{\gamma} - 1\right)\frac{C_0{}^2}{|V_q|^2}\Delta t' \tag{29}$$

From(2), $\Delta t' = \gamma\left(\Delta t - \frac{|V_q|}{C_0{}^2}\Delta R_1\right)$ (30)

The measurement of an electromotive length ΔR_q in the static electromotive reference system is completed at time Δt. Howevere, in the moving electromotive reference system, the measurement of ΔR_q must be completed simultanously, so there is $\Delta t'$=0， while the measured value is $\Delta R_q{}'$. By substituting $\Delta t'$=0 into(30)(29), it can be obtained：

$$\Delta t_q = \frac{\left(1-\frac{1}{\gamma}\right)\Delta R_1}{|V_q|} \tag{31}$$

By substituting(31) into(28), the relational expression of the relativity of electromotive space-time can be obtained：

$$\Delta R_q{}' = \Delta R_q - \frac{V_q}{|V_q|}\left(1 - \frac{1}{\gamma}\right)\Delta R_1 \tag{32}$$

Where $\Delta R_1 = \Delta r\cos\theta + \Delta F\sin\theta$ (33)

Equation(32) is developed into the equations of imaginary number and vector equation of real number：

$$\Delta\, F' i = \Delta F i + i\frac{V_\phi}{|V_q|}\left(1 - \frac{1}{\gamma}\right)\Delta R_1 \tag{34}$$

$$\Delta \mathbf{r}' = \Delta \mathbf{r} - \frac{\mathbf{V_r}}{|V_q|}\left(1 - \frac{1}{\gamma}\right)\Delta R_1 \tag{35}$$

When $V_\phi \neq 0$，$V_r = 0$，there is：

$$\mathbf{r}' = \mathbf{r} \tag{36}$$

That is, in any space of relatively steady static electric potential, the real time length is not related to scalar electric potential. For the same reason, in any moving space of electric potential equal to zero, the virtual length is not related to the movement velocity.

When $V_\phi = 0$，$\mathbf{V_r} \neq 0$，$|V_q| = V_r$，$\Delta R_1 = \Delta r$

$$\Delta r' = \frac{1}{\gamma}\Delta r \tag{37}$$

That is the formula for length contraction of special theory of relativity.

4. Prediction and verification of the theory

The above deduction indicates that in the relativity of electromotive space-time, time and space are not only related to velocity but also to electric potential. Electric potential and velocity may be conversed each other. Therefore, it can have multiple variations of combination. In principle, different experiments can be designed to verify the theory, among them, the effect of electric potential expansion is easier to be verified by experiments.

Equation(26) indicates that under completely steady conditions, only when there is sufficiently high electric potential difference in two reference systems, their time is also different. Therefore, an experiment may be designed： after alignment, two clocks of high precision Tc and Td are put separately in two metal confined rooms completely the same C and D, they are isolated each other and relatively steady. Room C is grounded and its electric potential is assumed as zero. A electric potential generator of super high voltage is used to charge room D and stable super high electric potential ϕ is maintained compared to room C. Equation(26) indicates that as long as the time is long enough, after room D is electrically discharged, the electric potential in room Dis also kept as zero. Then two clocks Tc and Td are put together to compare their reading, it may be found that there is time difference induced by electric potentialϕ between time Δt and $\Delta t'$ recorded by Tc and Td， and $\Delta t < \Delta t'$。 Comparing the measured value and the value calculated by equation (26) will give the verification result of the theory. If the experiment proves that the theoretic calculation is correct, from the experiment data, we will get the magnitude of the limit electric potential Φ_0 :

$$\Phi_0 = \frac{\phi}{\sqrt{1 - \frac{\Delta t^2}{\Delta t'^2}}} \tag{38}$$

From the electric potential superposition equation (21) it can be known that the electric potential superposition is nonlinear. Another experiment can be also designed to verify the prediction of the theory.

References:

[1] Yingtao Yang, The theory of relativity of electromotive space-time, National Science and Technology Library,www.nstl.gov.cn/preprint

[2] Yingtao Yang, Discussion on the relationship between relative velocity, absolute velocity and rapidity, National Science and Technology, Library,www.nstl.gov.cn/preprint