Relativity theory and Quantum theory Are Caused by Quantitative Effects

Hu Chang-Wei
Room 801, No.17，Lane 1769, Pudong Wulian Road, 200129 Shanghai China，021-33828183，
huchangwei5@yahoo.com.cn

Abstract**:** The relativity theory and quantum theory mark an epoch in physics. But they are always to give person a kind of unnatural and indistinct feel. Generally, it is considered that the world is just so originally; while we consider that it is caused by the quantitative effects, which is the variability of actual quantitative standards, it makes the invariable into the variable and makes the variable into the invariable. The relativistic effects are a kind of quantitative effect, while the quantum is the reflection of the quantitative effects of relativity theory in microscopic system.

Key words：Relativity theory, Quantum theory, Absolute space-time theory、Variability of quantitative standard

The relativity theory and quantum theory are two bases of modern physics, they mark an epoch in physics, and bring a few pity as well, because the thing's image that described by them seem some unnatural and indistinct, are not like classical physics so natural and clear. Why are they so? their all are caused by quantitative effects.

1. The derivation of Lorentz transformation by fluid mechanics

The image of classical physics are natural and clear, because they are established on the basis of absolute space-time theory which is identical with human intuition. Generally, it is considerded that the relativistic space-time theory had negated the absolute space-time theory, which is wrong. Actually, this point can be showed by the derivation of Lorentz transformation by fluid mechanics.

In fluid mechanics, the velocity potential ϕ of incompressible fluid satisfies the equation:

$$\Delta\phi\left(x.\,y.\,z\right)=0 \tag{1}$$

In other hand, if the velocity is not affected when the fluid penetrates into itself, the velocity potential ϕ of compressible fluid satisfies linearized equation[1]:

$$\left(1-\frac{v^2}{c^2}\right)\frac{\partial^2\phi}{\partial x^2}+\frac{\partial^2\phi}{\partial y^2}+\frac{\partial^2\phi}{\partial z^2}=0 \tag{2}$$

(where c、v are the sound and flow speeds in the fluid, respectively)

We substitute the following into (2):

$$\begin{cases} x^{'}=\beta x \\ y^{'}=y \\ z^{'}=z \end{cases} \quad \left(\beta=\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\right) \tag{3}$$

Then the equation is identified with（1）: $\Delta\phi\left(x^{'}.y^{'}.z^{'}\right)=0$. So（3）is the transformation of fluid from compressible to incompressible state.

For two special super-fluids, satisfying equation (2), let them make a relative movement with speed *v*, in the absolute time-space theory, we will have Galileo transformation between them:

$$\begin{cases} x_2 = x_1 - vt_1 \\ y_2 = y_1 \\ z_2 = z_1 \end{cases} \qquad (4)$$

and

$$\begin{cases} x_1 = x_2 + vt_2 \\ y_1 = y_2 \\ z_1 = z_2 \end{cases} \qquad (5)$$

(Note: here time t is written as t_1 and t_2 separately)

Substitute （3）into（4）and（5）, where x_1 in （4）and x_2 in（5）do not change due to the fact that they are in relative rest, we obtain

$$\begin{cases} x_2^{'} = \beta\left(x_1^{'} - vt_1\right) \\ y_2^{'} = y_1^{'} \\ z_2^{'} = z_1^{'} \end{cases} \qquad (6)$$

and

$$\begin{cases} x_1^{'} = \beta(x_2^{'} + vt_2) \\ y_1^{'} = y_2^{'} \\ z_1^{'} = z_2^{'} \end{cases} \qquad (7)$$

Substitute the first equation in（6）into that in（7）, we obtain

$$t_2 = \frac{1}{v\beta}\left(x_1^{'} - \beta^2 x_1^{'} + \beta^2 vt_1\right) = \beta\left(t_1 - \frac{x_1^{'}\left(\beta^2 - 1\right)}{v\beta^2}\right),$$

Substitute $\beta^2 = \frac{c^2}{c^2 - v^2}$ into it, we obtain

$$t_2 = \beta\left(t_1 - \frac{vx_1^{'}}{c^2}\right) \qquad (8)$$

If the sound speed of the special super-fluid is replaced by the light speed, then the combination of（6）and（8）is just the Lorentz transformation

Lorentz transformation may be obtained by various methods of derivation. Both the Lorentz's hypothesis and Einstein's derivation did not show their physical nature, while the above derivation demonstrates: if a special fluid can be transformed from compressible to incompressible state, Lorentz transformation may be derived from Galileo transformation. Here one may see the physical background, not only the material nature of the physical vacuum, but also the dual nature of the time-space theory.

The derivation of Lorentz transformation by fluid mechanics shows the existence of a special super-fluid. What is this special super-fluid? Because its sound speed is the light speed in vacuum, so it can not be a conventional fluid, and it can only be the physical vacuum.

The vacuum is not void. Microscopically, the physical vacuum is the basic state of quantum field. Macroscopically, the physical vacuum is the four dimensional space-time continuum in the relativistic time-space; at the same time, the derivation of Lorentz transformation by fluid mechanics shows that the physical vacuum can be seen as a compressible super-fluid in the absolute time-space theory. There are two sounds in the general superfluid: the first sound is density wave, namely the general sound; the second sound is the temperature wave which spreads the heat. In the vacuum, the way of thermal propagation is heat, namely the electromagnetic wave, so the electromagnetic wave, including the light, is the second sound in the physical vacuum. Before, people studied the physical vacuum stressed on microscopic angle; afterward, we should probe into the physical vacuum from macroscopic angle yet.

2. the system of equations of quantitative effect in the theory of relativity

The derivation of Lorentz transformation by fluid dynamics further shows the physical meaning of Lorentz transformation, as the result of a transformation of the physical vacuum from a compressible state in absolute time-space into an incompressible state in four dimensional space-time in the theory of relativity. So we have a duplicate time-space theory: the absolute time-space theory and relativistic space-time theory. the former is the primary nature; the latter is realized through transformation（3）on the basis of the former, is the secondary nature. In the absolute space-time theory, the time and space, which are not related to matter, are invariable. But the actual standards of length and time, which are always related to the object, such as ruler and clock and the rotation of the earth, may vary with the environment (such as temperature and season). So there are always certain differences between actual quantitative relations and absolute time-space theory, which causes the quantitative effects. Now the most accurate standerds of time and length are related to the frequency and velocity of light, here the velocity of light is considered that is invariable, which is a hypothesis of relativity theory, then the theory of relativity is the theory with respect to how the actual space-time standerds vary with velocity and gravitational potential. The relativity theory, nothing negated but amended quantitatively the absolute time-space theory, has made up the differences of space-time standerds between actual and absolute time-space theory.

The special theory of relativity pointed out the relationship between unit length dr or time dt and velocity u are:

$$dt = \frac{dt_0}{\sqrt{1-u^2/c^2}} \qquad (9)$$

$$dr = \sqrt{1-u^2/c^2}\, dr_0 \qquad (10)$$

dr_0 and dt_0 are the proper unit length and time, which don’t vary with velocity, can be regarded as the unit length and time in absolute space-time theory. (9) and (10) are the equations of quantitative effects in the special theory of relativity.

Similarly, the general theory of relativity considered that unit length dr or unit time dt can vary with gravitational potential, which can be calculated through equivalent principle and conservation of energy: let an object falls free towards an isolated gravitational field of heavenly body, its first velocity is zero; when it is r away from the heavenly body, the velocity reach u and the gravitational potential is φ, (which is zero where it is infinite away from the heavenly body.) then $\frac{1}{2}mu^2 = m\varphi$, $\varphi = \frac{1}{2}u^2$ （11）

Substitute (11) into (9), (10), we obtain:

$$dt = \frac{dt_0}{\sqrt{1-2\varphi/c^2}} \quad (12)$$

$$dr = \sqrt{1-2\varphi/c^2}\,dr_0 \quad (13)$$

The dt_0 and dr_0 in the (12) and (13) are the unit length and unit time on the reference frame that is far away the gravitational field, don't vary with gravitational potential, namely the unit length and unit time in absolute space-time theory. Then the (12) and (13) are the equations of quantitative effects in the general theory of relativity.

3. The manifestations of quantitative effects

The effects of relativity theory is a kind of quantitative effect, they are caused by the variability of actual space-time standerds, which looks like a "magician", describes the primary invariable into the variable; and describes the primary variable into the invariable. The following are two instances.

In the absolute space-time theory, the light velocity in vacuum is variable, where the gravitational potential is bigger, that goes slower. Using (12) and (13) can obtain: $dr/dt = \frac{\sqrt{1-2\varphi/c^2}\,dr_0}{dt_0/\sqrt{1-2\varphi/c^2}} = (1-2\varphi/c^2)dr_0/dt_0$. One quantity, the bigger its unit, the less is its value , then the light velocity in gravitational field is: $c_0 = (1-2\varphi/c^2)c = (1-\frac{2GM}{c^2 r})c$. The delay of radar echo is caused chiefly by this reason[2]. But quantitatively, the length and time in gravitational field can be varied with gravitational potential, using quantitative standerds of length and time on every point measure the light velocity passing corresponding point, the result will be all c. thus the variable light's velocity is described into the invariable quantitatively.

In the absolute space-time theory，the proper frequency of light v_0 is invariable, only the clock in gravitational field is slower than in without that, the red shift of spectral line is occurred. A. Einstein had said, the light frequency "represents the number of ticks of the clock per unit time"[3], then according to (12), the light frequency $v = \frac{v_0}{\sqrt{1-2\varphi/c^2}} \approx \left(1+\frac{\varphi}{c^2}\right)v_0$. So using time standerd of where the photon is passing measure, spectral-line of the photon is red shifting when the photon pass from where the gravitational potential is bigger towards that is less. thus the invariable light's frequency is described into the variable quantitatively.

The effect of relativity theory is a kind of quantitative effect; perhaps the quantum character is the reflection of the quantitative effect of relativity theory in microscopic system. Here a basic conception is: quantitatively, because the light velocity is invariable, so the model of photon have some property in common, that is to say, the electromagnetic unit that make up the photon has elementary electric moment, magnetic moment, spin and energy h (Plank constant). This viewpoint can be proved by a fect: in Schrodinger equation, the spin as a extra freedom is put into theoretical frame, while the equation of relativistic quantum mechanics includes automatically the spin quantum number[4]. The following, the physical basis of light quantum will be described in the rough.

The light is the second sound in the physical vacuum, it is analogized with sound now. We know that the sound speed in atmosphere is on a level with the average speed of atmospheric molecules. Because the light velocity is invariable in vacuum, so quantitatively, either the vacuum unit which make up the physical vacuum is still, or it moves with light velocity, and its kinetic energy is constant h. The light is the electromagnetic wave whose energy is kinetic energy as well as electromagnetic energy, so the moved vacuum unit is a electromagnetic unit with electromagnetism. The photon is a wave-packet of density of electromagnetic unit whose electromagnetic stimulated quantivity are various in absolute space-time theory, but quantitatively, every electromagnetic unit is same pattern; a electromagnetic unit is corresponding to a wave-peak, so the more the frequency of light, the bigger is density of electromagnetic unit, and higher is energy, then the energy of photon is $E = h\nu$.

In the microscopic system, the great variability of space-time standerds are caused by high density of matter, huge moved speed and the relation that there are interdepend, interactive and interconvertible among physical vacuum, light and particle of object. Moreover the light velocity is a result of macroscopic statistics, which is similar to “the sound speed in atmosphere is on a level with the average speed of atmospheric molecules”. These caused the special property of microscopic system.

For the above reasons, the phenomena of relativity theory and quantum theory that are difficult to understand and define, their all are caused by quantitative effects. Clearing the physical basis of quantitative effects further, it is possible that we will return the intuition and clearness of classics with quantitative effects.

[1]、Л. Д. Ландау, Е. М. Лифшиц, The Mechanics of Continualmedium, Beijing, The Publishing House Of People Education, 1960，P597 (in Chinese)。

[2]、H.C.Ohanian and R. ruffini，Gravitation and Spacetime，Beijing, Science Press，2006，P150-151 (in Chinese)。

[3]、A. Einstein, Relativity The Special and The General Theory，London, Methuen & CO. LTD, 1955，P129。

[4]、Su Rukeng, Quantum Mechanics, Beijing, Higher Education Press，2002，P409 (in Chinese) 。