

## Light Velocity Obeys Galilean Principle of Relativity

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**【Abstract】** Article 1 and article 6 point out that principle of constancy of the light velocity is deficient. The conclusion of this paper is that light velocity has superposition feature: in the vacuum, light wave has no oscillating medium to propagate, and the mass of light field is zero, motion of field does not need the action of force, so the motion of light is a radiation, and it is a vector  $c_0$  which is relative to the radiation velocity of light source, this is a relative velocity which is relative to the radiation source, but not the absolute velocity, and it obeys superposition principle of velocity vector, when the relative velocity  $v$  exists between light source and observer, the relative light velocity that observer measures is  $c = c_0 + v$ , and such conclusion indicates: light velocity obeys Galilean principle of relativity.

**【Key words】** light velocity, radiation, vector, vector superposition principle, Galilean principle of relativity

### 1 Introduction

Article 1 points out that the hypothesis of constancy of the light velocity is deficient: when the light source with wavelength  $\lambda$  is still, when the measurer moves away from or close to light source at the speed of  $v$ , according to the hypothesis of constancy of the velocity of light, if the light velocity that the measurer measures is still  $c_0$ , so according to the identical equation  $f' = \frac{c'}{\lambda} = \frac{c_0}{\lambda}$ , frequency deviation does not exist. Although relativity concluded “period = time that light source moves + time that light wave propagates” later through mathematical transformation, which derived the so called “relativity Doppler effect”, not only the physical concept is unreasonable, but also contradiction exists in calculation. The wavelength deducted by “relativity effect” is contradictory to  $\lambda'$  in the length (wavelength) contraction formula of itself, and the period deducted by “relativity effect” is contradictory to time expansion formula  $T'$  of itself. Such patched “effect” is self contradictory, which I really disagree with. The important key problem is: the “effect” and identical equation  $f = \frac{c}{\lambda}$  don't comply with each other, in other words, frequency of relativity  $f'$ , wave

crest length  $\lambda'$  of relativity, and relativity light velocity  $c' = c_0$  lead to  $c_0 \neq f'\lambda'$ , so relativity can not justify itself. This paper thinks, as for the sound wave, water wave and other mechanical waves, they are propagated because force (or kinetic energy) acts on the oscillation medium, so when the source of mechanical wave moves, the compressed medium and force exist in the wave crest, so the wavelength is changeable. But electric wave and light wave have no oscillation medium, they belong to direct radiation, and the wave crest has no compressed medium, and is not forced by the compressed force, so the wavelength of electric wave is constant. For example, air borne half wave—oscillator—wavelength of microwave of radiation of antenna  $\lambda$  is inherent, so the wavelength  $\lambda$  does not change with the movement. Especially when radar is on the ground, wavelength is more impossible to change, which is inherent from radiation source, so under this condition, in the identical equation  $f = \frac{c}{\lambda}$ , only when the relative speed that reconnaissance measures is  $f = \frac{c}{\lambda}$ , frequency shift exists. A great deal military reconnaissance receivers prove that  $f = \frac{c_0 \pm v}{\lambda} = \frac{c_0}{\lambda} \pm \frac{v}{\lambda} = f_0 \pm f_d$  is accurate.

The conclusion of this paper is: in the vacuum, light wave has no oscillation medium to propagate, and the mass of field is zero, motion of field does not need force, so the motion of light is a kind of radiation, and the radiation speed is a vector  $c_0$ , this is a relative speed which is relative to the radiation source, but not the absolute speed, which obeys Galilean principle of relativity, and obeys velocity vector superposition law, when the relative speed  $v$  exists between the light source and observer, the relative light velocity that the observer measures is  $c = c_0 + v$ . The experimental proof is: the reconnaissance, PD radars, MTI and MTD systems, including Michelson-Morley experiment and Fizean experiment of the whole world, and so on, are the experimental proofs of light velocity superposition principle.

## 1 Rigidity of Electric Wave and Light Wave

### 1.1 Longitudinal Rigidity

First let's see the rigidity of magnetic lines at the time when magnet moves, as shown in the figure 1. When the magnet stays in the train, the space where magnet is located is filled with magnetic lines. When the magnet moves with the train together, will the magnetic lines stay in the train because of moving? Will the magnetic lines are compressed into disk like by Ether medium? Of course not, and magnetic lines move with the train together. Besides that, the distribution of magnetic lines around magnet will also not deform because of the motion. In other words, magnetic lines will not deform because of the motion of its origin (magnet). This is the rigidity of magnetic field. In fact, the earth itself moves, and the distribution of magnetic lines has nothing to do with the motion of east-west direction.

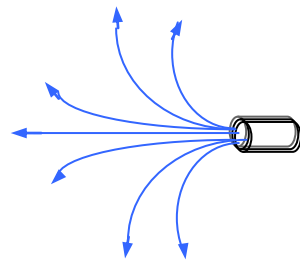


Figure 1 Magnet's movement

Let's see the rigidity of time variable magnetic field, as shown in figure 2, the experiment is done on the ground, there is  $B(r) = Kt$ . Now do the experiment in the running train again, there is still  $B(r) = Kt$ ,  $r$  here is the distance from point  $P$  to radiation source, but not the distance to railway station.  $P$  is the magnetic field intensity, which will not be weakened because of the left and right motions of radiation source  $Idl$ , for example: when radiating magnetic wave on the ground, after 1 second,  $B(r) = k$ , put the radiation source  $Idl$  on the running train to do experiment again, after 1 second, it is still  $B(r) = k$ .  $r$  here is the distance from point  $P$  to radiation source, in other words, this is how the ground magnetic field radiates. When the radiation source moves, it still radiates like that. This is the rigidity of time variable magnetic force. Because the mass of magnetic lines is zero, so it has the character of rigidity.

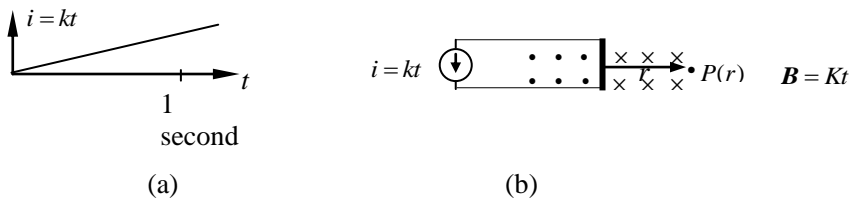


Figure 2 rigidity radiation of magnetic field

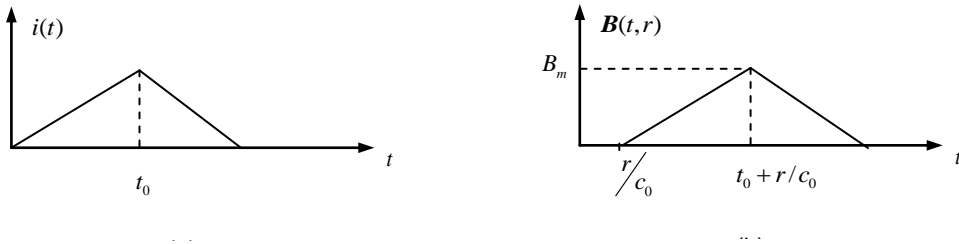


Figure 3 rigidity radiation of magnetic wave

Let's further see the rigidity of magnetic wave, as shown in figure 3,  $\tau = r/c_0$  in the figure is the delay from radiation source of magnetic field to  $P(r)$  point. First do the test on the ground, when the current element  $Idl$  applies trigonometric current element, trigonometry magnetic field wave is also derived at  $P(r)$  point,  $P(r)$  point has maximum value at the time  $t_0 + \tau$ ,  $r$  is the distance from measuring point to radiation source. Then put this radiation source in the running train to do experiment again, when the current element  $Idl$  applies trigonometric current element, trigonometric magnetic field wave is also derived at  $P(r)$  point. At the time  $t_0 + \tau$ , the maximum value is derived at point  $P(r)$ ,  $r$  is the distance from measuring point to radiation source, but not the distance from measuring point to railway station.

Triangular wave is like this, sine wave is the same, as shown in figure 4. The location where wave crest exists (distance length from radiation source) will not change because of the motion of radiation source. In other words, the distance between wave crest and wave crest (wavelength) will not change because of the motion of radiation source, which means wavelength has rigidity, no matter how radiation source moves, only if the frequency of radiation source does not change, the wavelength  $\lambda$  will not change. This is the longitudinal rigidity. As everyone knows, propagation of water wave will cause the wavelength to change as wave source moves in the medium, but, why does the wavelength of electric wave has rigidity? The reason is that, electric wave has no medium to propagate, speaking of the essence, it is a radiation wave in the vacuum, and it does not depend on oscillation medium to propagate. It is just because the mass of field is zero, the motion of field does not need the action of force, and the movement is a radiation, so the motion of field has rigidity, which is greatly different from the oscillation-propagation of medium.

Sound wave, water wave and other mechanical waves are propagated by the action of force (or kinetic energy) on oscillation medium, so when the source of mechanical wave moves, the compressed medium and force exist on the wave crest, so the wavelength is changeable. But electric wave and light wave have no medium of oscillation, and it is a direct radiation, its wave crest has neither compressed medium, nor compressed force, so the electric wave in the vacuum is constant.

Magnetic wave is like this, electric wave is the same, obviously light wave is also the same: in the vacuum, wavelength will not change because of the motion of light source, which is the necessary character which is determined by propagating medium not existing in the vacuum.

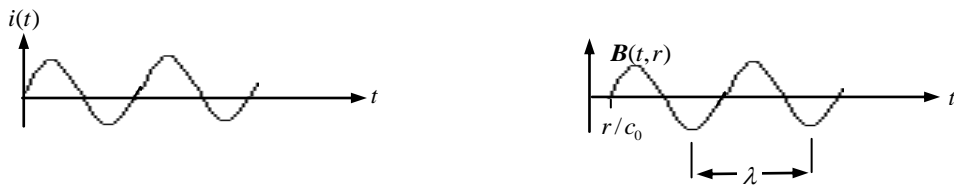


Figure 4 Rigidity of wavelength

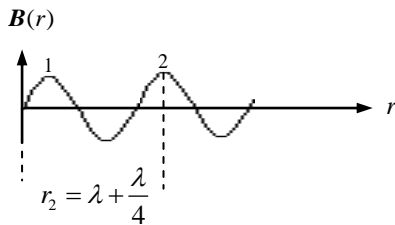


Figure 5 Distance where wave crest exists

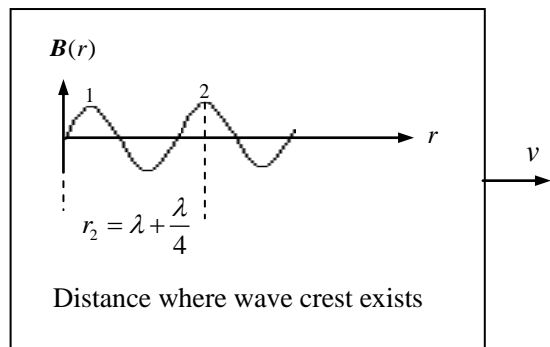


Figure 6 Position where radiation source moves, and wave crest exists

How to understand that wavelength of light wave does not change with the motion of light source in the real life? For example, laser beam and ground are still, the wavelengths of light beams which we measure are all  $\lambda$ , which is undoubted. But the earth itself moves, in other words, laser beams move with the earth, now that the front wavelength of motion of earth equals to the back wavelength of motion, so wavelength has rigidity, and is not compressed by “Ether”. This is the necessary character which is determined by electric wave and light wave not having propagating medium in the vacuum: after the frequency is certain, wavelength is constant. For example, do the experiment on the ground, the distance from the first wave crest to radiation source is  $r_1 = \frac{\lambda}{4}$ , the distance from the second wave crest to radiation source is  $r_2 = \lambda + \frac{\lambda}{4}$ , when moving the same experiment to the train, and the distance from the first wave crest to radiation source is still  $r_1 = \frac{\lambda}{4}$ , the distance from the second wave crest to radiation source is still  $r_2 = \lambda + \frac{\lambda}{4}$ , when you turn the direction of radiation in the train 180 degree, the experimental results are still the same. This is the longitudinal rigidity, and wavelength does not change because of the motion of source. A kind of equipment of waveguide propagation system exists on the radar, and the distance must be calculated by wavelength, or arc will happen. The ground radar is the same, airborne radar is also the same. If wavelength is compressed by Ether because of the motion, air borne radar will not be realized. This proves that electric wave has longitudinal rigidity, and wavelength does not change because of the motion. Once the frequency is certain, there is  $\lambda = \frac{c_0}{f}$ . Figure 5 shows the distance from wave crest to radiation source under the condition that radiation source is still, figure 6 shows the distance from wave crest to radiation source under the condition that radiation source moves, magnetic wave is like this, electric field wave is the same, and the wavelength depends on the identical equation  $\lambda = \frac{c_0}{f}$ , which will not change because of the motion of radiation source.

What needs to note is: sound wave, water wave and other mechanical waves are propagated by the action of force (or kinetic energy) on oscillating medium, so when the source of mechanical wave moves, the compressed medium and force exists on the wave crest, so the wavelength is changeable. But electromagnetic wave has no oscillating medium, and it is a direct radiation, the wave crest has neither compressed medium, nor the compressed force, so the wavelength of electromagnetic wave in the vacuum is constant. For example, wavelength of microwave of air borne half wave-oscillator-antenna radiation  $\lambda_0$  is constant, and the wavelength  $\lambda_0$  will not change because of the motion. Our fluorescent lamp moves with the earth, but the east wavelength and west wavelength are equal, but not compressed by Ether medium, a laser bullet will not be blocked because laser gun moves forward, and it will not stay in the laser-bore. Automobile headlamp is also

like this, it will not be dragged by Ether to stay in the light source. This character tells us, when the light source moves at the speed of  $v$ , the light velocity that static person measures is  $c_0 + v$ . In other words, these two velocity vectors obey vector superposition principle.

## 1.2 Horizontal Rigidity

Everyone knows that as for the electric field in the capacitor, magnetic field in the inductor, no matter how its source moves, its magnitude and direction always do the same motion with its source, which always synchronizes with the source, for example, the experiment of Ampere loop theorem, when doing this experiment on the ground, the magnetic powder is ring-shaped, when doing this experiment in the high speed train, the magnetic powder is still ring-shaped. In fact, the earth moves at a high speed, which has already indicated that magnetic field moves synchronously with its source. Static field is like this, the time variable field is the same. Now that longitudinal motion has rigidity, of course horizontal motion also has rigidity, in other words light radiation moves horizontally together with light source, and it never stays in the original luminescent direction. Light column which flashlight radiates moves horizontally together with the flashlight, and laser beam in the stage also moves rigidly together with the light source, which is the necessary character that mass being zero brings. The most important is that Ether does not exist, and electric wave is not dragged by Ether. For example, when radiating a laser beam to the outside in the high speed train, the luminescent person only sees the longitudinal launching velocity  $c_0$ , but the person on the ground not only sees longitudinal launching velocity  $c_0$ , but also sees the horizontal speed  $v$ , so the superposition velocity is  $c_0 + v$ . In other words, laser beam is not blown to the back of the train by Ether wind. In other words, in the vacuum, because light wave has neither medium of oscillation-propagation, nor the compressed force, it is a radiation, so it has longitudinal rigidity, and the wavelength will not change because of the motion of light source, it is just because the light wave has no mass, and it does not have inertia either, so it also has horizontal rigidity, and can move horizontally with light source together. Laser beam and radar wave beam move horizontally together with source emitter together, and this is horizontal rigidity.

Speaking in total: in the vacuum, because light wave has no medium of oscillation propagation, it is a radiation, so it has longitudinal rigidity, and the wave length does not change with the motion of light source, it moves longitudinally together with the light source, it is just because light field has no mass, and no inertia either, so it also has horizontal rigidity, and it moves horizontally together with the light source.

We call sound wave and water wave mechanical waves, call electric wave and light wave field waves. The essential difference between field wave and mechanical wave reflects on whether rigidity exists. Propagating speed of mechanical wave depends on the propagating medium, radiation speed of field waves are all limit speeds  $c_0$ . Such character is also a necessary character which is brought by whether mass and inertia exist, and whether absolute space is occupied. As for this problem, nobody has answered before, this paper having answered the character difference between field and mechanical wave should be said.

The above indicates that, electric field wave and light field wave in the vacuum have longitudinal

rigidity and horizontal rigidity, and these two characters determine that radiation speed of field obeys vector superposition principle. As shown in figure 7(a), luminescent person sees the perpendicular longitudinal light beam. We say that light beam has horizontal rigidity, because light beam is not dragged by Ether, the luminescent person sees that light beam and the direction of motion  $v$  form perpendicular line and it is like “a rigid stick” to be driven by train. If this light beam is a red laser beam, the person on the ground (static person) not only sees longitudinal launching velocity  $c_0$ , but also sees horizontal moving at the velocity of  $v$ , so the light velocity that static person sees is  $c = c_0 + v$ , in other words, velocity vector obeys superposition principle.

So this paper thinks that horizontal rigidity of light indicates that Ether does not exist. Michelson-Morley experiment also proves that Ether does not exist.

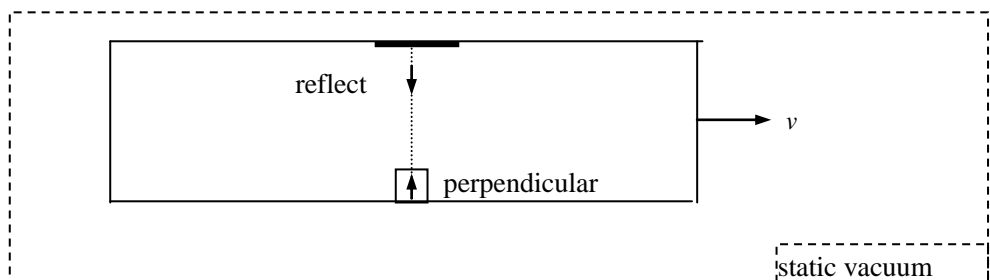


Figure 7 (a) Light beam is not dragged by vacuum

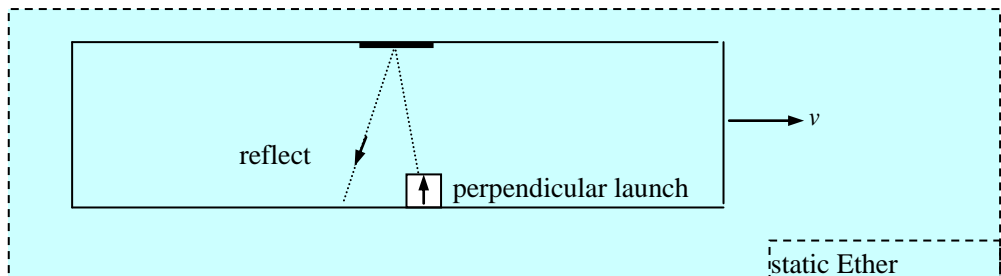


Figure 7 (b) Light beam is dragged by Ether

What needs to note here is: motion of field and motion of substance both obey Galilean principle of relativity, the most important difference is, motion of field is a radiation, and there is no medium of oscillation propagation. If the medium existed, the case would be different, for example, if radiating a laser outside in the submarine, the horizontal rigidity of laser beam will be dragged by sea water, and such direction between light beam and motion is not perpendicular line. Longitudinal rigidity will also be dragged by medium, which is Fizean experiment. On the other hand, the principle is the same, now that the light beam in the vacuum has horizontal rigidity, and it indicates that Ether does not exist. In fact, Trouton-Noble experiment also proves that Ether does not exist.

## 2 Light Velocity has Superposition Character

As for the spherical wave at the beginning of last century, when discussing the superposition character of light vector, it is difficult to describe intuitively, and it is fortunately that laser beam exists now, which can conveniently describe the superposition character of light velocity-vector.

## 2.1 Superposition of Light Velocity

Suppose that a laser beam radiates outside the train which is at the uniform speed  $v$ , the relative radiation speed from laser beam to light source  $c_0$  is known, now let laser beam radiate outside, as shown in the figure 8, because of the rigidity of light beam, the observer in the train only sees longitudinal speed  $c_0$ . But the person on the ground not only sees longitudinal light velocity, but also sees horizontal motion of light beam.

Suppose that laser gun launches a laser bullet at the time when  $t = 0$ , where is the point of impact (or the first wave crest of light beam)? Obviously, the person on the ground has two components for the calculating velocity of laser bullet, one is  $c_y = c_0$ , the other is  $c_x = v$ . If the person on the ground thinks that laser bullet only has  $c_y$  component, this means that laser beam does not move with the train, and still stays in the “original luminescent place” or railway station, this is of course not the fact. Because the light beam in figure 8-7 really moves horizontally with the train, which is a commonsense that everyone knows. The light of stage is like this, laser beam rotates horizontally with the laser source. So, the calculation speed of laser bullet should have been

$$\mathbf{c} = c_0 \mathbf{j} + v \mathbf{i} \quad (1)$$

Or be written as

$$\mathbf{c} = \mathbf{c}_0 + \mathbf{v} \quad (2)$$

It obeys velocity vector superposition principle, as shown in figure 8.

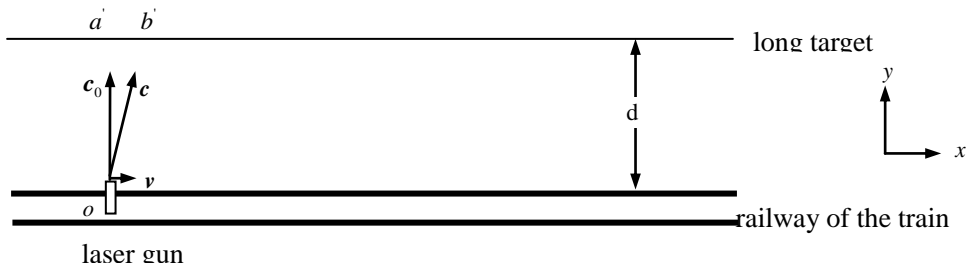


Figure 8 Light beam orbit  $c$  that the person on the ground draws

So, after the superposition of light velocity, the speed is  $c = \sqrt{c_0^2 + v^2}$ , the direction is deviating the railway orbit perpendicular line  $\theta$  angle,  $\theta = \arcsin \frac{v}{\sqrt{c_0^2 + v^2}}$ . Because the velocities are superposed, the moving orbit is along the vector direction of velocity  $c$ , in other words, the point of impact is at  $b'$  point. The time needed is  $t = \frac{d}{c_0}$  (longitudinal rigidity), length

is  $\overline{a'b'} = vt = v \frac{d}{c_0}$  (horizontal rigidity), oblique distance is  $\overline{ob'} = \sqrt{d^2 + \overline{a'b'}^2} = \sqrt{c_0^2 t^2 + (vt)^2} = t\sqrt{c_0^2 + v^2}$ , in other words, the actual velocity amplitude of light is  $c = \sqrt{c_0^2 + v^2}$ , that actual distance that light covers is  $\overline{ob'} = \sqrt{d^2 + \overline{a'b'}^2}$ . So the resultant velocity in the figure 8 is  $V_{\text{add}} = \sqrt{c_0^2 + v^2}$ . Easily speaking, the laser beam that luminescent person (train attendant) sees only has longitudinal velocity, and the observer on the ground sees that laser beam not only has longitudinal velocity, but also has horizontal velocity. In other words, light velocity has the character of vector superposition.

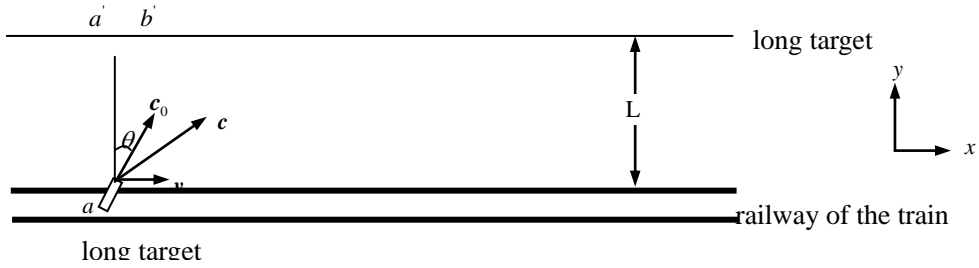


Figure 9 Light beam orbit that the person on the ground draws

Now, let's consider the case when a certain joint angle  $\theta$  exists between laser beam and the direction of orbit perpendicular line, according to principle of vector parallelogram, the actual speed of light beam is

$$c = \sqrt{c_0^2 + v^2 + 2c_0v \sin \theta} \quad (3)$$

Especially, if  $\theta = 90^\circ$ , there is  $c = c_0 + v$ , which is the case in figure 8.

Here, we strongly believe that, because light beam has rigidity, the light beam in the figure 8 has horizontal velocity, the actual relative light velocity after superposition  $c$  is greater than  $c_0$ , now that light beam superposition principle in figure 8 is tenable, of course the light beam superposition principle in figure 9 is also tenable. So, formula (2) that is written into the form of vector is tenable.

### 3 Conclusion

The conclusion of this paper is: in the vacuum, light wave has no oscillation medium to propagate, and the mass of light field is zero, the motion of field does not need the action of force, so motion of light is a radiation, which is a vector  $c_0$  relative to the radiation speed of light source, this is a relative speed which is relative to the radiation source, not the absolute speed, which obeys velocity vector superposition principle, when the relative speed  $v$  exists between light source and observer, the relative light velocity that the observer measures is  $c = c_0 + v$ , such conclusion indicates that: light velocity also obeys Galilean principle of relativity.

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