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Article

Based on Absolute Airspace Reference System Analysis of Doppler Effect of Light (Electromagnetic Wave)

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Abstract: In this paper, the concept of absolute airspace is further elaborated, and the time transform effect, the frequency transform relation of clock timing, and the principle of Doppler effect of special relativistic light are analyzed and demonstrated. Based on the concept of absolute airspace, a new and accurate Doppler effect relation of light (electromagnetic wave) is proposed. It is proved that there is a synchronous relationship between the time shift effect and the frequency change of the timing inside the clock. When the light (electromagnetic wave) source is in motion, the Doppler effect includes two physical mechanisms: the frequency change caused by time transformation effect and the frequency change caused by relative motion. When the light source is in motion, the Doppler effect of the light there are some differences in different directions due to the rotation of the earth. The relation of Doppler effect of special relativistic light is only a highly approximate relation, and its theoretical basis, special relativity, is flawed in principle.

Keywords: absolute airspace; doppler effect; time shift effect; time-frequency relation; anisotropy

1. Introduction

At present, the relation of the Doppler effect of light is derived by Einstein using special relativity [1]. Special relativity is a theory of space-time transformation based on the principle of relativity and the invariance of the speed of light. The principle of special relativity holds that there is no anisotropic property in geophysical space-time [2]. However, the circumterrestrial clock experiment by J.C. Haffele and R.E.Keating [3,4] definitively demonstrated the existence of anisotropy in geophysical space-time(The same speed of the East-west direction clock, stationary at different latitudes of the clock, The speed of time is not the same). Some physical problems, such as stellar aberration and geostationary orbit satellite, show that there are serious problems in the principle of special relativity and its concept of space.

Therefore, according to the space concept of absolute airspace proposed by the author [5], that is, every star (or matter) has a local, relatively independent physical property, spherical absolute (only relative to the star or matter) stationary space coordinate reference system with its center of mass as a circular point. Space and matter are inseparable objective existence, the spatial reference system is the coexistence of absolute stillness within absolute airspace and relative motion between absolute airspace, and the cosmic space is the collection of all kinds of absolute airspace and their relative relations. All the so-called inertial reference systems cannot exist independently from the corresponding absolute airspace, and they cannot be equal rights to the absolute stationary reference systems of absolute airspace. This concept can perfectly explain the existing space-time physical phenomena and experiments, and eliminate the contradictions brought by them. At the same time, it also negates the principle of relativity and special relativity, and may bring about a series of adjustments of physical laws and new interpretations of physical principles.

In his paper "Analysis of the Basic Principles of Relativity and Elaboration and Demonstration of Different Space-time Concepts" [6], the author demonstrates the errors of the principle of special

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relativity and special relativity, and deduces a new time transformation relation based on the concept of absolute airspace. Therefore, it is necessary to re-analyze and demonstrate the Doppler effect relationship of light according to the new time transform relation and frequency transform relation.

Therefore, it is necessary to re-analyze and demonstrate the relation of Doppler effect of light according to the concept of absolute airspace and the corresponding relation of space-time and frequency transformation. Without considering the difference in the frequency of the light source caused by the static gravitational difference of general relativity, the optical Doppler effect formula is (09). It is verified by calculation that the Doppler effect also has anisotropy when the light source is in motion(Just as there is anisotropy in the clock problem around the earth). Under the conditions of specific parameters, the error between the calculation results of the optical Doppler effect derived from special relativity and the calculation results of Equation (06) is about $\pm 1.6\times10^{-6}$. The optical Doppler effect of special relativity is only a highly approximate relation, and there are mistakes in its physical principle.

2. Absolute airspace and its relation of time and frequency transformation

2.1. Absolute airspace

In the paper "Discussion on Physical Space Problems" [5], the author put forward the concept of "absolute airspace". "Absolute airspace" means: every star (or matter) has a local, relatively independent physical property, spherical absolute (only relative to the star or matter) stationary space coordinate reference system with its center of mass as a circular point. This paper calls it local absolute space or absolute airspace. The physical properties of substances moving within the absolute airspace range (including velocity and radius, two variable parameters that determine the absolute airspace range, see [5] for details), can only be accurately described by the absolute airspace reference system. All so-called inertial (or other) reference systems cannot exist independently of the corresponding absolute airspace, and cannot be equal to the absolute stationary reference system of absolute airspace. But the absolute stationary reference system between different absolute airspace is equal, and all its physical laws are the same.

The concept of absolute airspace also shows that space and matter are inseparable objective existence, and the space reference system cannot be separated from the corresponding star (or matter), and relative to the star (matter) is local absolute static. Stars move with each other (matter with matter); So, on the whole, the spatial reference system is the coexistence of absolute stillness within absolute airspace and relative motion between absolute airspace, the absolute and the relative coexist.

The space as a whole is still a huge absolute airspace, but its physical properties are not uniform, each local absolute airspace has considerable independence in physical properties, and the space is a collection of all kinds of absolute airspace and the relative relations between them.

2.2. The relationship of time transform effect

In his paper "Analysis of the Basic Principles of Relativity and Elaboration and Demonstration of Different Space-time Concepts" [6], based on the concept of absolute space space, the author deduces a new time transformation relationship different from special relativity:

$$dt/dt_0=[(C^2-\mathbf{v}^2)/(C^2-v_0^2)]^{1/2} \quad (01)$$

Where: The time of the earth's surface relative to the earth's stationary clock is t_0, and its absolute speed is v_0 (the linear speed of the earth's rotation there). A moving clock is timed t, and its absolute velocity in the corresponding absolute airspace is v.

And:

$$v_0=\omega R\cos\theta \quad (02)$$

ω is the angular speed of the earth's rotation; R is the radius of the earth at which the relative stationary clock is located; θ is the latitude of the Earth relative to the stationary clock.

$$\mathbf{v}=\mathbf{v}_r+\mathbf{v}_{r0} \quad (03)$$

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$\mathbf{v}_r$ is the relative speed vector of the motion clock; $\mathbf{v}_{r0}$ is the linear velocity vector of the Earth's rotation at the position of the motion clock.

Although Formula (01) comes from the basic relation of the time transformation of special relativity (hereinafter referred to as the original formula), there is an essential difference between the two due to the different concept of space.

First, the coordinate reference system is different; (01) can only use the local absolute stationary coordinate reference system of the corresponding absolute airspace; The original formula can adopt any inertial coordinate reference system which conforms to the principle of special relativity.

Second, the speed parameters of the moving clock are essentially different. Formula (01) can only use the absolute velocity in the local absolute coordinate reference system of absolute airspace. The original formula can adopt the relative uniform velocity in any inertial coordinate reference system conforming to the principle of special relativity.

Third, the calculation results of Formula (01) and the original formula will be different, and this difference will vary with the speed of the rotation speed of the star (matter) forming the absolute airspace, and the difference will be very large when the rotation speed is large.

Fourth, Formula (01) can reflect the anisotropy of space and time of the Earth (or other rotating stars); The original formula does not have the anisotropy of Earth space-time.

Due to the objective fact of anisotropy in geophysical space-time and related comprehensive evidence, the principle of special relativity is wrong, and the basic relation of time transformation of special relativity is also wrong.

2.3. Time-frequency relationship

According to the international standard definition of one second of physical time and the timing principle of atomic clocks, the change in the timing speed of atomic clocks is due to the change in the frequency of specific light waves (electromagnetic waves) inside the clock. Timing varies synchronously with its specific light wave frequency. That is, when the frequency of the specific light waves inside the clock is faster, the clock time is also faster; As the frequency of the specific light waves within it slows down, the timing of the clock also slows down.

According to the basic time effect transformation relationship of special relativity, the corresponding transformation relationship of specific light wave frequency in its atomic clock should be:

$$f/f_0=(1-v^2/C^2)^{1/2} \quad (04)$$

In the case of the local absolute stationary coordinate reference system in absolute airspace, according to Formula (01), the frequency transformation relationship between the clock relative to the ground stationary and the specific light wave in the relative moving clock is as follows:

$$f/f_0=[(C^2-\mathbf{v}^2)/(C^2-v_0^2)]^{1/2} \quad (05)$$

Where: f is the frequency of the light wave inside the relative motion clock; f_0 is the frequency of light wave inside the relative static clock. Other parameters are the same as Formula (01).

3. Doppler effect analysis of light

3.1. Analysis based on special relativity

According to the special relativity theory, the formula of the optical Doppler effect is as follows:

$$f/f_0=(1-v^2/C^2)^{1/2}/(1-v\cos\varphi/C) \quad (06)$$

When $\varphi=\pi/2$, is the transverse Doppler effect of light, and the formula is $f/f_0=(1-v^2/C^2)^{1/2}$, This formula is exactly consistent with Formula (04) of the corresponding transformation relationship of the specific light wave frequency in the atomic clock according to the fundamental time effect transformation relationship of special relativity. At this moment (instant), there is no change in distance between the light source and the observer. The change in frequency is essentially caused by the time-delay effect of special relativity. Therefore, the optical Doppler effect derived from special relativity consists of two parts in physical principle:

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The first is the frequency transformation effect caused by the time-slow effect, which should be the frequency transformation that has occurred when the light wave is emitted from the light source, the formula is:

$$f/f_0=(1-v^2/C^2)^{1/2} \quad (07)$$

The second is the frequency transformation effect caused by the relative motion between the light source and the observer, which should be the frequency transformation generated after the light wave leaves the light source, and belongs to the real Doppler effect; According to the derivation of special relativity, its relation is:

$$f=f_0/(1-v\cos\varphi/C) \quad (08)$$

3.2. Analysis based on absolute airspace theory

3.2.1. When the observer is stationary relative to the ground reference object, the light source moves relative; Or when both the observer and the light source are in relative motion

In the case of the local absolute stationary coordinate reference system in absolute airspace, based on the previous analysis and without considering the difference in the frequency of the light source caused by the static gravitational difference of general relativity, the formula of the optical Doppler effect is as follows:

$$f/f_0=[(C^2-\mathbf{v}^2)/(C^2-v_0^2)]^{1/2}/(1-v_r\cos\varphi/C) \quad (09)$$

Where: f is the frequency of the light received by the observer; f_0 is the frequency of light wave when the light source is relatively stationary. v_r is the relative speed between the light source and the observer; When the light source is relatively stationary, v_0 is calculated according to the absolute velocity of the stationary reference system in the absolute space of the earth, and the calculation method is the same as (02). v is the absolute velocity vector of the light source based on the absolute spatial stationary reference system, and its calculation method is the same as that of Formula (03); φ is the Angle between the connection between the observer and the light source and the direction of motion (the direction Angle of observation).

3.2.2. When the light source is stationary relative to (ground reference) and the observer is in relative motion

$$f=f_0/(1-v_r\cos\varphi/C) \quad (10)$$

The parameters in formula are the same as those in Formula (09).

3.2.3. When the observer and the light source are in the same device (position), the light wave is reflected and received by the observer

There are also two cases here, the first is the device (light source and observer) synchronous relative motion, the light reflection is relatively stationary or also relative motion, the relationship is (09); The second is that the device (the light source and the observer) is relatively stationary, and the reflection of the light is relative to the motion, and the relationship is (10).

4. Simple calculation verification

In order to simplify the problem and calculation, the calculation verification experiment was set up on the Earth's equator. And verify from two aspects:

The first is that the observer (receiving detector) is stationary relative to the Earth's surface, and the light source (electromagnetic wave source) is moving away from the observer along the equator in both east and west directions. The frequency change due to the difference in elevation is ignored. (09) The Doppler effect of light in different directions should be different.

The second is to verify the difference between Formulas (06) and (09), so as to confirm which of the two calculation formulas is more accurate and how much error.

Assume the following parameters:

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The frequency of light waves relatively stationary at the equator $f_0=10^{15}$Hz, The linear speed of the Earth's rotation at the equator $v_0=465$m/s, The relative velocity between the source and the observer $v_r=300$m/s, velocity of light C=299792458m/s, $\theta=0$, $\varphi=\pi$.

4.1. The observer is relatively stationary, and the light wave source is far away from the observer from west to east, The calculation result of Formula (09):

$$f=10^{15}\times[(299792458^2-(300+465)^2)/(299792458^2-465^2)]^{1/2}/(1+300/299792458)$$
$$=999998999306500\text{Hz}$$

The frequency of the light wave is reduced by 1000693500Hz. (11)

4.2. The observer is relatively stationary, and the light wave source is far away from the observer from east to west, The calculation result of Formula (09):

$$f=10^{15}\times[(299792458^2-(300-465)^2)/(299792458^2-465^2)]^{1/2}/(1+300/299792458)$$
$$=999998999309700\text{Hz}$$

The frequency of the light wave is reduced by 1000690300Hz. (12)

The difference between the calculation results (11) and (12) is about 3200Hz (due to the accuracy of the calculator, the error is within 100Hz). It shows that the Doppler effect is anisotropic when the light source is in motion.

4.3. The observer is relatively stationary and the light wave source is far away from the observer, the calculation result of Equation (06):

$$f=10^{15}\times(1-300^2/299792458^2)^{1/2}/(1+300/299792458)=999998999308100\text{Hz}$$

The frequency of the light wave is reduced by 1000691900Hz. (13)

In summary, (13)-(11)=-1600Hz, (13)-(12)=1600Hz; The result of (13) is the average of (11) and (12). Based on the results (13), the error range is $\pm1.6\times10^{-6}$.

5. Conclusion

5.1. The time shift effect has a synchronous relationship with the frequency change of the timing inside the clock.

5.2. When the light (electromagnetic wave) source is in motion, its Doppler effect includes two physical mechanisms: frequency change caused by time transformation effect and frequency change caused by relative motion.

5.3. When the light source is in motion, the Doppler effect of the light is anisotropic.

5.4. The optical Doppler effect of special relativity has errors and flawed in physical principles, and is only a highly approximate relation.

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