Fourier series expression of Relativistic theory formula

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Abstract: In this paper we gave the new expression of Einstein relativistic equations. The most important transformation of the relativistic formula is the Lorenz transformation, which involves the mass-velocity relation coefficient, the relation coefficient is converted to Fourier expression. The Fourier series expression of the relativistic formula is derived. According to the theory of material wave, the new Einstein gravitation theory formula is deduced, and its new quantum mechanics formula is deduced by relative theory.

Key words: theoretical physics; relativity; Fourier series; quantum mechanics; gravitational field;

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0.Preface

In the derivation of Einstein's relativistic formula, the most important transformation is the Lorentz transform, which involves the mass-velocity relation coefficient, $1/\sqrt{1\text{-}v^2/c^2}$ where v is the velocity of the object, c is the speed of light. In general, is it possible to change it into an expression of Fourier series? Because v can not be greater than the speed of light, the formula can not satisfy the De Lickley condition of Fourier series, so it can not be expressed by Fourier series. In this paper, by introducing an infinitesimal quantity and taking the form of square and reciprocal number, we satisfy the De Lickley condition of Fourier series, and realize mass velocity coefficient to be expressed by Fourier series. According to the theory of de Broglie wave, quantum field and gravitational field, the complex number form of Fourier series is expanded, and the form of wave equation is introduced into the relativistic formula. The new mathematical form of relativistic formula is discussed. the new expression of its energy or mass to the dynamic velocity is introduced, and the new equation of gravitational field is given. Investigated in the relation between new formula and Schrodinger equation.[1-12].

1.The analyse and discussion

In relativistic mass and velocity equations, the inertia mass of an object is divided into static mass m_0 and relativistic mass m, the relationship between the two is called the mass-velocity relationship:

$$m = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}} \qquad (1)$$

The reciprocal is taken and the m is moved to the right of the equation, and the square is given the following formula:

$$\frac{m_0^2}{m^2} = 1 - \frac{v^2}{c^2} \quad (2)$$

Because v is less than the speed of light c, the-(c-w) ≤v≤c-w, w infinitesimal value. This inequality is divided by c-w, multiplied by π. get:

$$-\pi \leqslant (v\pi/c-w) \leqslant \pi \qquad (3)$$

Let x= vπ/(c-w), you can get:

$$v=x\,(c-w)/\pi \qquad (4)$$

Then (2) substituted by (4) is obtained:

$$\frac{m_0^2}{m^2} = 1 - \frac{x^2(c-w)^2}{\pi^2 c^2} \qquad (5)$$

This (5) satisfies the De Lickley condition that can be unfolded by Fourier series: according to the Fourier series formula:

Let $f(x) = \frac{m_0^2}{m^2} = 1 - \frac{x^2(c-w)^2}{\pi^2 c^2}$ (6)

Because $\pi \leq x \leq \pi$, f (x) can be expressed as:

$$f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx) \qquad (7)$$

Where a_n and b_n parameters are determined by the following formula:

$$a_n = \frac{1}{\pi}\int_{-\pi}^{\pi} f(x)\cos nx\,dx \quad (n = 0,1,2,3 \ldots..) \qquad (8)$$

$$b_n = \frac{1}{\pi}\int_{-\pi}^{\pi} f(x)\sin nx\,dx \quad (n = 1,2,3 \ldots\ldots\ldots) \qquad (9)$$

The (6) formula by (8), (9) can be obtained:

$$a_0 = 2 - \frac{2(c-w)^2}{3c^2} \qquad (10)$$

$$a_n = -\frac{4(c-w)^2}{n^2\pi^2c^2}\cos n\pi \quad (11)$$

$$b_n = 0 \qquad (12)$$

Then (7) obtained:

$$f(x) = \frac{m_0^2}{m^2} = 1 - \frac{x^2(c-w)^2}{\pi^2c^2} = 1 - \frac{(c-w)^2}{3c^2} - \sum_{n=1}^{\infty}\frac{4(c-w)^2}{n^2\pi^2c^2}\cos n\pi\cos nx \qquad (13)$$

The（4）substituting (13)

f（x）$= \frac{m_0^2}{m^2} = 1 - \frac{x^2(c-w)^2}{\pi^2 c^2} = 1 - \frac{(c-w)^2}{3c^2} - \sum_{n=1}^{\infty} \frac{4(c-w)^2}{n^2\pi^2 c^2} \cos n\pi \cos\frac{nv\pi}{c-w}$（14）

Let $\lim_{v\to c} w \to 0$

f（x）$= \frac{m_0^2}{m^2} = \frac{2}{3} - \sum_{n=1}^{\infty} \frac{4}{n^2\pi^2} \cos n\pi \cos\frac{nv\pi}{c}$（15）

This (15) is the Fourier series form expression of the mass-velocity relation.

2.Various forms and analyses of Fourier series of relativistic formulae:

For the motion process, we can given the for speed differential of (14) equation, multiplied i can obtained the following complex variable function:

$$\frac{df(x)}{dv} i = \frac{\partial \frac{m_0^2}{m^2}}{\partial v} i = i \sum_{n=1}^{\infty} \frac{4(c-w)^2}{n^2\pi^2 c^2} \cos n\pi \sin\frac{nv\pi}{c-w} \quad (17)$$

（15）-（17）：

$$\frac{m_0^2}{m^2} - \frac{\partial\left(\frac{m_0^2}{m^2}\right)}{\partial v} i = 1 - \frac{(c-w)^2}{3c^2} - \sum_{n=1}^{\infty} \frac{4(c-w)^2}{n^2\pi^2 c^2} \cos n\pi \left(\cos\frac{nv\pi}{c-w} + i\sin\frac{nv\pi}{c-w}\right) \quad (18)$$

According to Euler's formula:

$$\frac{m_0^2}{m^2} - \frac{\partial \frac{m_0^2}{m^2}}{\partial v} i = 1 - \frac{(c-w)^2}{3c^2} - \sum_{n=1}^{\infty} \frac{4(c-w)^2}{n^2\pi^2 c^2} \cos n\pi \cdot e^{\frac{nv\pi}{c-w} i} \quad (19)$$

Let (19)$\lim_{v\to c} w \to 0$

$$\frac{m_0^2}{m^2} - \frac{\partial \frac{m_0^2}{m^2}}{\partial v} i = \frac{2}{3} - \sum_{n=1}^{\infty} \frac{4}{n^2\pi^2} \cos n\pi \cdot e^{\frac{nv\pi}{c} i} \quad (20)$$

This (19) (20) formula can be considered a form of de Broglie wave (Fig. 1).

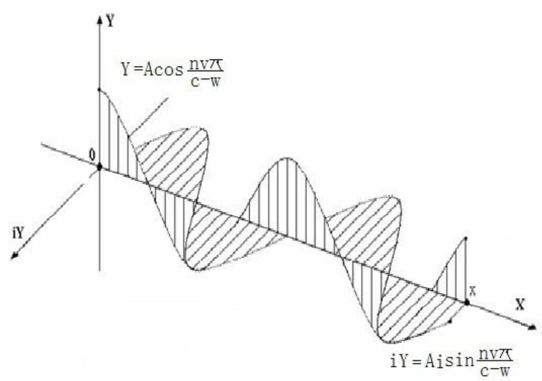

Fig. 1 The schematic of Geometric image form of wave function for complex variable function

Because the static energy E_0 and relativistic energy E, the relationship between the two is also a mass-velocity relationship:

$$\frac{E_0^2}{E^2}=\frac{c^2m_0^2}{c^2m^2}=\frac{m_0^2}{m^2} \qquad (21)$$

Therefore the substituting (20) into (21) gets:

$$\frac{E_0^2}{E^2}-\frac{\partial\frac{E_0^2}{E^2}}{\partial v}i=\frac{2}{3}-\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\cdot e^{\frac{nv\pi}{c}i} \qquad (22)$$

The (22) formula reflects a wave form of the gravitational field or energy field,

The gravitational field theory of general relativity can have an updated formula for mathematical expression, in which the form of gravitational waves derives more directly from the relativity itself, while new general relativistic gravitational fields have a higher degree of mathematical relevance.

3. The deformation expression of the relativistic formula

Then the momentum formula can be rewritten as:

$$p^2=m^2v^2 \qquad (23)$$

$$p^2=m^2v^2=\frac{m_0^2v^2}{\frac{2}{3}-\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\cos\frac{nv\pi}{c}} \qquad (24)$$

$$p=mv=\frac{m_0v}{\sqrt{\frac{2}{3}-\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\cos\frac{nv\pi}{c}}} \qquad (25)$$

Because the (25) formula shows that momentum is a variable that infinitely approximates a particular extremum, the Heisenberg uncertainty principle can have another explanation. In reality, the exact value of momentum is also related to the velocity of the measured object (or the distance and time ratio of the moving position), and it is the relation of the exact value of the series infinity approximation.

Newton’s power can be considered as:

$$F=\frac{d(mv)}{dt}=m\frac{dv}{dt}+v\frac{dm}{dt} \qquad (26)$$

Let: $V=\frac{v}{\sqrt{\frac{2}{3}-\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\cos\frac{nv\pi}{c}}}$ (27)

(27) substituting (25) gets:

$$p=m_0V \qquad (28)$$

Substituting (26) gets:

$$F=\frac{dp}{dt}=\frac{d(m_0V)}{dt}=m_0\frac{dV}{dt}+V\frac{dm_0}{dt} \qquad (29)$$

When v<<c, V is approximately equal to v, a is an acceleration, then (26) (29) can be approximated to:

$$F=\frac{dp}{dt}=\frac{d(m_0V)}{dt}=m_0\frac{dV}{dt}=m_0a \qquad (30)$$

The simplification is similar to Newton's mechanics, which shows that the formula is equivalent to the classical mechanics.

The kinetic energy equation can be rewritten as:

$$E_K=mc^2-m_0c^2=m_0c^2\left(\frac{1}{\sqrt{\frac{2}{3}-\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\cos\frac{nv\pi}{c}}}-1\right) \qquad (31)$$

If E_K is kinetic energy, then total power E, $E_0=m_0c^2$

$$E=E_K+m_0c^2=mc^2=\frac{m_0c^2}{\sqrt{\frac{2}{3}-\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\cos\frac{nv\pi}{c}}} \qquad (32)$$

If it is a fusion reaction, both kinetic E_K and static energy E_0 will change also.

$$\Delta E_K=\Delta m_0c^2=\frac{m_{02}c^2}{\sqrt{\frac{2}{3}-\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\cos\frac{nv_2\pi}{c}}}-\frac{m_{01}c^2}{\sqrt{\frac{2}{3}-\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\cos\frac{nv_1\pi}{c}}} \qquad (33)$$

The relationship between energy and momentum:

$$E^2=p^2c^2+E_0^2==p^2c^2+m_0^2c^4=\frac{m_0^2v^2c^2}{\frac{2}{3}-\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\cos\frac{nv\pi}{c}}+m_0^2c^4 \qquad (34)$$

The new relationship between quantum mechanics and relativity:

The formula (22) can be obtained:

$$\frac{E_0^2}{E^2}-\frac{\partial\frac{E_0^2}{E^2}}{\partial v}i=\frac{2}{3}-\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\cdot e^{\frac{nv\pi}{c}i}$$

then:

$$E_0^2=\frac{2}{3}E^2+iE^2\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\sin\frac{n\pi\Delta l}{c\Delta t}-E^2\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\cdot e^{\frac{n\pi\Delta l}{c\Delta t}i} \tag{35}$$

(35) if you multiply both sides by i, you can get

$$\frac{2}{3}iE^2-iE_0^2-iE^2\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\cdot e^{\frac{n\pi\Delta l}{c\Delta t}i}=E^2\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi\sin\frac{n\pi\Delta l}{c\Delta t} \tag{36}$$

The deformation (35) (36) can be thought of itself in the material energy wave contains a complex function form energy wave, because the vector speed equal to the vector distance Δl is (x,y,z) to (x',y',z') divided by the time difference Δt, the formula itself contains the space position (x,y,z)，(x',y',z') and time state function, the variables and number are the same to the Schrodinger equation's. It can be thought that the Schrodinger equation is just a special case of this new formula. Therefore, quantum mechanics and relativity have achieved good unity, and many of the unresolved problems of quantum mechanics are actually caused by the imperfect expression of the Schrodinger equation. Quantum mechanics requires a whole new formula, all of this requires further testing and verification, and more computational and analytical experiments are required from colleagues.

4.Conclusion

1. The paper put up with a new Fourier series expression of the Einstein relativistic into by the mathematical formula
2. A new formula for the expression of the gravitational field is given in the new relativistic formula.
3. By introducing the formula of complex function, we give a new wave function expression formula of quantum mechanics through the relativistic formula, and establish the relation with quantum mechanics by this formula,the Schrodinger equation is a special case of a new expression.
4. For the new formula of mass, momentum and energy, can only obtain a dynamic infinite approximately value in the measurement process,which is the true reason for Heisenberg uncertainty principle.

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