

k constant shows the problem of calculating wavelength in the wave-particle duality

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Abstract

We use k constant for investigating the correctness of the equation of the wave-particle duality. We show that the equation of the wavelength of a massive object is not correct unless it moves in the speed of the light. According to the equations of the quantum of the mass, we rewrite the equation of the wave-particle duality.

Introduction

In 1924 de Broglie proposed wave-particle duality. In this theory, all objects have their frequency [1]. de Broglie used Einstein's equation [2] for formulating his theory. He proposed that the wavelength of each object is related to its linear momentum and Planck's constant. In 1927 Thomson discovered wave property of the electron. Also, Davisson and Germer showed that the electron makes diffraction patterns. These experimental results confirmed wave-particle duality. However, experimental results were based on the electron and molecules when they move close to the light speed [3-11]. Although according to the equation, physicists believe that the wavelength of the massive object is too low and we can deny it, we show that the de Broglie's equation does not work in the speeds less than the speed of the light.

In this paper, we use k constant [12] and show that de Broglie's formula is not correct. Our paper result is not against to concept of the wave-particle duality and we do not refuse the wave-nature of matter. We just refuse de Broglie's equation. We show that the wavelength of an object is related to its mass,

Planck's constant, and the speed of the light, while the particle moves in the speed of the light. This new formula is suitable for describing phenomena and investigating the path of stars in the galaxies and the formation of supermassive objects in the space [13-15].

de Broglie's wavelength and its problem

de Broglie related wavelength, momentum, and Planck's constant in a simple formula:

$$\lambda = \frac{h}{p}$$

where λ is the wavelength of the particle, h is the Planck's constant, and p is the linear momentum of the particle. In the classic physic, the linear momentum of each particle is equal to the multiplication of its mass by its speed

$p = m \times v$ and then

$$\lambda = \frac{h}{p} = \frac{h}{mv} \quad (1)$$

on the other hand, we showed that (8) we can present h and m based on the quantum of the mass

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$$h = kv^2 \quad (2)$$

where k is the quantum of the mass, h is the Planck's constant, and c is the speed of the light. Also, the mass of the object is given by:

$$m = kv \quad \text{or} \quad m = kf \quad (3)$$

where m is the mass, k is the quantum of the mass, and v or f is the frequency of the particle.

$$k = 7.3724973238127078929185371194939 \\ \times 10^{-51} \text{ kg} \cdot \text{s}$$

According to equations (2) and (3)

$$\lambda = \frac{h}{mv} = \frac{kc^2}{kf v} = \frac{c^2}{f v}$$

the relation can also be expressed as

$$\lambda = \frac{c^2}{f v} \quad (4) \quad \text{or}$$

$$\lambda f v = c^2$$

using that the speed of the particle $v = \lambda f$, therefore

$$v v = c^2 \\ v^2 = c^2 \\ v = c$$

as we can see, de Broglie's equation is true when the particle moves with the speed of the light.

$$\lambda = \frac{h}{mc} \quad (5)$$

Equation (5) shows that when a particle or photon moves with the speed of the light, its wavelength relates to its mass. Hence, a photon with more mass or energy has less wavelength.

On the other hand, when the speed of the particle is less than the speed of the light, we can see that de Broglie's equation is not correct. Hence using de Broglie's equation for calculating the wavelength of the object in the speeds less than the speed of the light not recommended.

Conclusion

We showed that de Broglie's equation is correct when the speed of the object is equal to the speed of the light.

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