KINEMATICS OF THE MICROWORLD

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Abstract

In the research paper kinematics of the microworld author is analyzing the term wave of the particle and suggesting a new approach to kinematics of the particle through its spin movement, concluding that periods of a cycloid will always be constant and determined by the radius of spin rotation.

Keywords: microworld, kinematics, particle, motion, spin, quantum

KINEMATICS OF THE MICROWORLD

The microworld is a space which is determined by the size of atoms, molecules, elementary and complex particles and their mutual influence. In the macroworld, the laws of physics which describe events are close to everyday experience. In the microworld, the laws of physics may deviate significantly from practices and laws in the macroworld. The kinematics of the microworld is obtained when the notion of time is added to the space of the microworld. Kinematics studies the motion in space and time. The basic physical quantity which determines motion is the velocity of motion. It is defined as the quotient of trajectory in space and time.

Wave-particles

The kinematics of a particle in the microworld depends on the nature of the particle itself. The basic physical quantity which determines a particle of the microworld is the mass of the particle. Mass is a measure of the total energy which a particle possesses. The existence of a particle is determined by its mass and the motion is determined by the velocity of the particle in space.

At the beginning of the twentieth century, it was interpreted that each particle is accompanied by a certain wave. The existence of waves has been experimentally proven. The interpretation is that a wave-particle is an integral part of the nature of a particle and that it is a characteristic of its very existence. The physical interpretation of wave-particles has not been given to date. The existence of wave-particles is generally accepted due to experimental confirmation. The basic characteristic of each wave is its wavelength. The wavelength of a wave attached to a particle is determined by a known relation of quantum mechanics $\lambda = h/mv$. The quantity h is the constant of quantization. It shows that the relation refers to the microworld. Mass m is a measure of the total energy of the observed particle. The only variable on the right-hand side of the equation is the velocity of the particle v . The velocity of a particle as a physical quantity is kinematic. Kinematics studies the motion of a particle in space and time. Thus, the right-hand side of the equation determines the motion of a particle. It can be considered that this also applies to the left-hand side of the equation. Thus, the whole equation belongs to the field of kinematics. The wavelength λ is not a characteristic of the existence of a particle. The wavelength λ is a characteristic of the motion of a particle in space and time with velocity v . The wave exists only in a continuous medium. A particle with a wavelength λ moves with velocity v along a curved line which is periodic. The period of that curved line is denoted as the wavelength λ . The experimental results will be exactly the same whether the particle is of a wave nature or just moving along a curved line.

Spin of a particle

At the beginning of the twentieth century, the assumption of the existence of spin of a particle in the microworld was given. Spin is the rotation around one's own axis. This has been experimentally confirmed. Spin is defined by the momentum of the amount of motion. The value of spin momentum is equal to the elementary quantum. It is determined by the relation $mvr = \hbar$

Where $\hbar$ is an elementary quantum of the momentum of the magnitude of movement, m is the mass of a particle, v is the velocity of motion, and r is the radius of rotation. As the existence of spin has been experimentally confirmed, and in the macroworld it is often known in practice, such an understanding is generally accepted. To this day there is no interpretation of spin itself as a physical phenomenon. This may be solved by comparing the same phenomenon in the microworld and the macroworld.

The basic characteristic of spin in the macroworld is that the axis of spin rotation is always in the centre of mass. Due to the conditions of spin quantization in the microworld, this is not possible.

This means that the axis of spin rotation of a particle in the microworld will be distant from the geometric centre of the particle by a distance r . The distance r is determined by the quantum condition that the momentum of the quantity of the spin motion is an elementary quantum. In order to determine the radius of spin, it is necessary to define the velocity of a particle. In the microworld, each particle is moving at velocity v . There is no rest in the microworld.

The velocity of a particle in the microworld is the absolute velocity in space and time. It is the sum of all the relative velocities of a particle in the microworld and the macroworld. The existence of spin of a particle is not a characteristic of the existence of the particle itself. Spin is a consequence of the movement of a particle in space and time. The velocity of the particle rotation in spin is equal to the velocity of the particle itself. This arises from the condition that the kinetic energy of

spin rotation is equal to the kinetic energy of the motion of the particle. It is now possible to determine the radius of spin. The motion of a particle in space causes spin and the velocity determines the radius of spin. This is a consequence of the conditions of quantization and the constancy of the speed of light as the highest possible velocity for particles of the mass m .

Partilce kinematics

The simplest motion in space and time is the inertial motion. It is a motion at a constant speed in a straight line. Such movement is common in the macroworld and very rare in the microworld. When a particle of the microworld moves inertially/spin of the particle must be added to such movement. Thus, the trajectory of a particle is determined as the sum of rectilinear and circular motion. Such a curved line in mathematics is called a cycloid. The cycloid is a well-known curved line in both mathematics and engineering. It is a curved line described by each point on the circumference of points moving in a straight line at a constant speed.

When a microparticle moves in the macroworld, spin can be neglected, thus the inertial motion is reduced to a straight line. In the microworld as in an atom, a molecule, or the interspace, due to all the influences on the motion of the microparticle, this is not possible. There is no straight line in the microworld. The radius of the curved line along which the microparticles move is usually of the order of magnitude of the microparticles themselves. The radius of spin is also of the same order of magnitude. The final trajectory of the particle in the microworld will be the sum of the trajectory which the particle has due to the influence of the environment and spin of the microparticle.

The trajectories of particles in the microworld are very complex, thus spin will be observed in the inertial motion. The cycloid is a curved line along which a microparticle moves during the inertial motion. The relationship between the direction of velocity as a vector and the plane of spin rotation is important. As the particle in the atom has the spin, it follows from the condition that the radius of rotation of the electron must be constant, that the plane of rotation must be tangent to the trajectory of rotation. It follows that the trajectory of the particle as a vector must lie in the plane of rotation.

A beam of the plane of rotation corresponds to one direction of the motion. In the intersection of these planes, there is the trajectory of movement with the velocity v . The velocity v can be in any of these planes of rotation. Changing the plane of rotation is possible only under the action of an external force, i.e. by changing the energy and the velocity of movement. Knowing the plane of rotation, it is not possible to determine the trajectory of the particle because it is arbitrary in the plane itself. Thus, the velocity as a vector determines the plane of the motion. The normal vector of the plane of the spin rotation is always normal to the trajectory, i.e. velocity as a vector. Thus, in the case of inertial motion of the microparticle, the periods of a cycloid will always be constant and determined by the radius of spin rotation. Spin is a basic characteristic of the motion of a microparticle in space and time. It is a consequence of the motion itself. It is completely determined by the velocity of a particle. The wave of the particle, i.e. the period of curvilinear motion by inertia is the sum of the linear trajectory of the particle and spin.

Pictures

Picture 1