

Particles do not behave as a Wave

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Abstract: While experimenting about light and particles, the concept that light behaves as particles shook the whole world of physics, that later gave result to a theory in which it is stated that "Particles behaves as waves". This theory is printed in almost every high school standard Physics book, manual and text book, which is readily accepted by most but have never bothered to question if it is really true? How can particles even change direction without being directed by any sorts of external disturbance? It must be explainable through an artistic view. When trying to visualize this nature of particle, there arose a question that objectified the validity of this idea. If the suggested hypothesis is proved by the experiment suggested, wave-particle duality nature of particle will be disproved which is going to affect the knowledge that we have about the universe in a large scale.

Keywords: Light, Electrons

1. Introduction

Particles' behaving as waves is an idea that is very familiar to physicists all around the world. But, does it actually? The result of the double slit experiment and the Davisson-Germer experiment was used as a proof for stating that particles behave as waves, both of which was concluded on the basis of electron deviation. Looking things apart from the recorded data in the Davisson-Germer's experiment, the deviations can also be explained in another way, that is, electron deviate their position due to the high positive charge of the Nickel Crystal Lattice. The stability of Nickel lattice also plays a huge role in diverting the path of electrons in the Davisson-Germer experiment. This must be the reason why the electron gave same deviations for lattices with similar structures. Particles not behaving as waves is even viable for present devices that are in use. Even the application of X-rays generated in an X-ray machine seems to be explained using this approach, in which particles do not behave as waves.

2. Nature of light (Approach)

A beautiful hypothesis proposed in the 20th century suggested that light was a collection of photons. Using that hypothesis, Einstein proposed the photoelectric effect. It explained the effect of light. But, what is the nature of light? And why does it behave as both: particle and wave? To visualize this, we just have to keep one thing in mind, the similarity of working principle behind production of light in the sun and a fluorescent lamp.

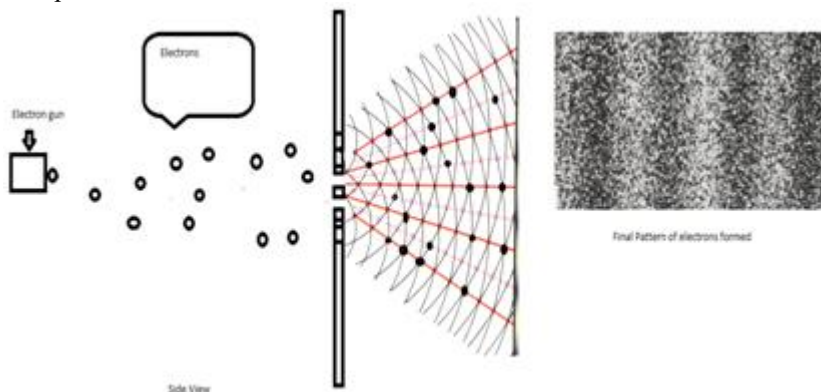
Light is energy that is received when particles disintegrate into its smallest particles (packets) and convert into energy. These mass packets when convert into energy, become particle with same size with much higher energy, i.e. photon. Since a mass will be disintegrated into many smaller particles, many photons are formed, and since all of these particles disintegrate in similar time frame, they spread together as packets of photon. This explains the particle nature of light.

Now, since they do not have mass, they act as a wave. Thus, they create interference pattern. In conclusion, due to the disintegration of the mass while transferring into energy, combination of packets with no mass is formed this describes light's behavior as both particle and a wave.

3. Particle cannot behave as a wave (Discussion)

The derivation shown by De Broglie suggests that the particle tends to reach the speed of light for it to act as a wave, but that is not possible as suggested in the theory above. Light is the energy that is converted due to the disintegration of the smallest particle of the mass. So, particles cannot reach the speed of light. So, do particles really act as a wave?

The pattern formed when electron is passed through the double slit in the double slit experiment is not formed because it is a wave but another phenomena acts on it as stated below the figure.



- The figure above shows the pattern formed. (Wavefronts after collision of several electrons in the same place is shown above. There will be many other electron forming wavefronts at the same time)
- What actually is happening is that just like when photon of UV rays strike the Zinc plate, electron is emitted. In a similar manner when the electrons are struck into the Zinc plate, it emits off a wave mechanical in nature.
- What happens is that when electrons get inside the plate and reach the other side of the plate, a wave is produced. Since many electrons hit the plate at the same time, many wave fronts are formed.
- These waves then interfere and form the interference pattern. Since the electrons are constantly emitted by the electron gun, this process constantly happens; creating much constructive and destructive interference at the same time.
- Then the electron which pass through the slit is directed by the constructive path of the mechanical wave formed. Thus, in time, fringes similar to light are formed.
- Now, in theory mechanical waves do not move the position of the particle, but since the electron already has some velocity, it moves with the waves.
- In contrast to this, according to photoelectric effect, only when UV rays are used, the Zinc plate emits the electrons. So, there lies the question of why when an electron strikes the plate, a wave mechanical in nature is emitted instead of UV rays . The answer to this is quite simple. Since the electron loses some of its energy while moving through the plate, the wave produced on striking the plate is lost by some amount. Due to this, the wave produced is not a UV ray and since to displace a particle in interference pattern, mechanical wave is required. The nature of the wave must be mechanical.
- Also, electrons do not form perfect constructive and destructive pattern as light. The reason for this is that, many electrons hit the Zinc plate at different places at the same time, which creates a lot of interference patterns at the same time that do not give a perfect constructive pattern. Thus, electrons also lie in the destructive fringe.
- Finally, the formula that relates the energy of the electron and the energy of the wave is given by:

Energy of the wave produced=
Energy of the electron -Energy lost by the electron while moving through the plate.

4. Suggested Experiment

A single slit experiment can be used to perform the validity of this idea. The ratio of electrons that strike the plate and that passes through the slit must be very high to very low for accurate results, as more the wavefronts produce, the more exact would be the interference pattern.

5. Conclusion

The wave like nature of particle behaving as waves is a well defined idea in Physics but there seems to be no answer on why it behaves such way. The whole conclusion is based on an experiment that supports an uncertain hypothesis at the time, suggested by De Broglie. The vagueness in the idea

can be tackled using this approach. The idea of particles not behaving as waves is the analysis of one of the possibilities that might actually be happening. This is a very simple and straight forward theory of an analysis of the behavior of particles in the double slit experiment.

This idea also fits on the X-ray machine model but, due to constant rotation of the Tungsten metal in the Machine does not allow the interference of the waves produced to give the pattern as in double slit experiment. This may also be one of the ways in which the X-rays are produced in the X-ray machine.

This idea is a strong possibility for the explanation of what might actually be happening in the Double slit experiment while testing the wave-particle duality nature of the electrons.

6. Future Scope

The validity of this very idea will certainly change the whole idea of us, visualizing the nature of small particles behaving as waves. Not only this, but if its proved it will question the theories developed on the assumption of particles behaving as waves.