

SINGLE PARTICLES DO NOT EXHIBIT WAVE-LIKE BEHAVIOR

Through a qualitative analysis of the experiments, it is shown that the presumed wave-like behavior of a single particle contradicts the energy-momentum conservation laws and may be explained solely through particle interactions.

Key words:

qualitative analysis, wave-like behavior, single particle, the energy-momentum conservation.

THE EXPERIMENT OF THE MICROSCOPE

A particle smaller than the resolving limit of a microscope can not be seen. If it is assumed that a single particle has wave like behavior it may be seen when its de Broglie wavelength is larger than the resolving limit. But the microscope can only see a particle whose **size** is larger than the resolving limit, and does not involve the de Broglie wavelength.

DUAL SLIT INTERFERENCE EXPERIMENT

PART I

If a single particle has wave-like behavior, it will create an interference image when it has passed through a single slit. But the experimental result shows that this is not the case¹. Only a large number of particles can create an interference image when they pass through the two slits.

PART II

In the dual slit interference experiment, the single particle is thought to pass through both slits and interfere with itself at the same time due to its wave-like behavior. The motion of the wave is the same direction as the particle. If the particle passes through a single slit only, it can not be assumed that it has wave-like behavior. If it passes through two slits, it, and also the accompanying wave must be assumed to have motion in two directions. But a wave only has one direction of motion.

PART III

If one slit is obstructed in the dual slit interference experiment and a particle is launched in this direction, then according to Newton's first law, (assuming no external forces,) it will travel in a uniform straight line. It will not pass through the

closed slit and will not make contact with the screen. If it has wavelike behavior, there is a probability that it will make contact. But this will negate Newton's first law and the law of conservation of energy and momentum. Both quantum mechanics and classical mechanics are dependent on this law.

THE EXPLANATION FOR THE WAVE-LIKE BEHAVIOR OF THE PARTICLE

In the dual slit interference experiment, if one slit is unobstructed, particles will impact at certain positions on the screen. But when two slit are open, the particles can not reach these positions. This phenomenon brings us to the greatest puzzle regarding the image of the particle. But when we consider that the particle may experience two or more reflections, the puzzle may be resolved.

As indicated, when one of the slits is obstructed, the particles that move towards this slit can not get to the screen. However, they can return to the particle source by reflection and then pass through the open slit and reach the above positions since they have different paths when one or two slits are open. This indicates that wave-like behavior may be explained solely on the basis of particle interactions.

EXPERIMENTAL TEST

The above may be tested by an experiment which can absorb all the particles that move towards the closed slit. The diffraction image will appear on the screen, but the diffraction phenomenon would then be explained by particle interaction.

THE EXPLANATION OF THE DAVISSON - GERMER EXPERIMENT

The Davisson-Germer experiment is perceived as that which proved the wave-like behavior of the particle in the relationship between the particle's momentum P and its de Broglie wave length $\lambda \sim P=h/\lambda$. However, in view of the above analysis, a single particle will not exhibit wave-like behavior, but only a large number of particles. In order to explain the Davisson-Germer experiment, the relationship between the particle's de Broglie wave length and its momentum should be $np=nh/\lambda$, where 'n' represents the number of particles.

$Np = nh/\lambda$ and $p=h/\lambda$, are equivalent in terms of the above results, and can constitute an explanation for Davisson-Germer experiment. If $p=h/\lambda$ is correct, it is consistent with the single particle having wave-like behavior. This will lead to contradiction with the result of experiment and with the conservation laws of energy and momentum.

THE CONCLUSION

Single particles do not exhibit wave-like behavior.

The similarity of wave and particle behavior may be attributed to initial impulse and path.

The quantum mechanical explanation is suspect, since the probability of one particle and one particle among a large quantity reaching the screen is equal in mathematics and physics.

¹ Roger Penrose "The Emperor's New Mind-Concerning Computers, Minds, and The Laws of Physics", Chapter 6

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