European Journal of Applied Sciences – Vol. 13, No. 05
Publication Date: September 25, 2025
DOI:10.14738/aivp.1305.19399.
Peng, H. (2025). Double Slit Experiments Showing that Light is Photons Producing both Non-Interference-Pattern and Interference-Pattern in Same Experiment, and thus, Wavefunction Represents Simply Useful Tool Describing Interference-Pattern. *European Journal of Applied Sciences, Vol - 13(05).* 166-181.

Double Slit Experiments Showing that Light is Photons Producing both Non-Interference-Pattern and Interference-Pattern in Same Experiment, and thus, Wavefunction Represents Simply Useful Tool Describing Interference-Pattern

Hui Peng
James Peng Lab, Fremont, CA USA

ABSTRACT

Recently, Nature magazine made a survey about how Physicists think of what quantum mechanics says about reality. The survey shows that 47% of respondents consider the wavefunction in the quantum mechanics representing simply a useful tool, and 36% respondents consider the wavefunction representing something real. In this article we show that the double slit experiments support the opinion of 47% of respondents. It is the standard understanding that the double slit experiment shows that the light is waves, not particles. The photoelectric experiment shows that the light is particles. The two experiments show the conceptually different natures of the light and thus led to the wave-particle duality of the light. To thoroughly study the real nature of the light in the double slit experiments, we utilizing added Photon-chamber, Shield, Blocker, Lenses, and Metal tubes respectively. We observed the following phenomena in the same double slit experiments: (1) the light is photons before and after passing through the double slit, not waves; and (2) it is the photons that produce both the non-interference patterns in Zone-0, Zong-1 and Zone-2, and the interference patterns in Zone-3 (referred to it as "PhotoWave phenomena"). The observed phenomena show that: (1) the wave-particle duality is invalid; (2) the wavefunction is simply a useful mathematical tool to describe the interference-pattern in Zone-3; (3) the wavefunction cannot be utilized to describe the no-wave phenomena in Zone-0, Zong-1, Zone-2, and Zone-3; (4) support the particle reality of quantum mechanics.

INTRODUCTION

Recently (July 2025), Nature magazine made a survey about the quantum mechanics [1]. The survey shows that 47% of respondents consider the wavefunction in the quantum mechanics representing simply a useful tool, and 36% respondents consider the wavefunction representing something real.

Before studying/testing the above radically different opinions, let us brief review the development of the wave-particle duality and the quantum mechanics.

- **Light is optical waves** [2]. In 1801, Young performed the double slit experiment, observed the *interference pattern*, and proposed that the light was waves before and after passing through the double slit.
- **Matter is particles** [3]. In 1808, Dalton proposed the concept of "atom".
- **Light is EM waves** [4]. In 1860s, Maxwell's electromagnetics predicted that the light is the EM waves.

- **Quantizing Energy of EM wave** [5]**.** In 1900, Planck proposed that the energy of EM waves is quantized.
- **Light is particles** [6]. From 1887 to 1905, Hertz, Thomson, Lenard, and Einstein discovered/interpreted the "Photoelectric effect", which shown that the light is photons. Then the light has the wave-particle duality.
- **Matter waves** [7]**.** In 1924, de Broglie extended the concept of the wave-particle duality of the light to the matter, proposed the "de Broglie matter wave", which led to the wave-particle duality of the matter.
- **Matrix mechanics.** In 1925, Heisenberg, Born, and Pascual developed the Matrix mechanics that is the first formular of quantum mechanics.
- **Schrodinger equation** [8]. In 1926, the concept of "matter wave" led Schrodinger to propose his "wave equation" to describe the matter-wave.
- **Feynman's Mystery of double slit experiment** [9]**.** In 1956, Feynman called the double slit experiment "a phenomenon … has in it the heart of quantum mechanics. In reality, it contains the only mystery. We cannot make the mystery go away by 'explaining' how it works".
- **Light is photons in double slit experiments** [10, 11]. In 2021, Peng shown that the light is photons, not waves, in the comprehensive double slit experiments. And photons distribute as interference patterns.
- **Penrose's statement** [12]**.** In 2022, Penrose in an interview stated: "Now you see current quantum mechanics strictly speaking is an inconsistent theory that is rather brutal way of saying what Einstein and Schrodinger and even Dirac said that quantum mechanics is incomplete".
- **Nature magazine** [1]. In July 2025, Nature magazine made a survey, which shows that 47% of respondents considered the wavefunction in the quantum mechanics representing simply a useful tool, while 36% respondents considered the wavefunction representing something real.

The apparatuses of the Photon-chamber, Shields, Blockers, Lens and Metal tubes show the nature of the light, and do not alter the nature of the light. To thoroughly study the nature of the light in the double slit experiments, we utilize the above apparatuses. Referred to those experiments as the comprehensive double slit experiments that show that the light is particles, not waves, and thus, invalidates the wave-particle duality, and demands the re-consideration of the concept of the wavefunction in quantum mechanics.

Table 1 shows the conceptual development from the double slit experiment to the quantum mechanics.

Table 1: Development of quantum mechanics from double slit experiment

1	**Light**		**Matter**
2			
3	**Light is EM waves**	**Light is optical wave** ⟹	**Matter is waves**
4	1860: Maxwell [4]: Light is EM waves	1801: Young [2]: Light is waves in double slit experiments	1924: de Broglie [7]: Matter waves concept 1926: Schrodinger [8]: Schrodinger matter wave

			equation
5			
6	**EM waves is quanta** ⟹	**Light is particles** ⟸	**Matter is particles**
7	1900: Planck [5]: EM wave is quantized	1905: Einstein [6]: Photoelectric effect 2021: Peng [9,10]: Light is particles in double slit experiment	1808: Dalton [3]: Found "atoms"

Table 1 briefly review the development of the wave-particle duality of light/matter and the quantum mechanics.

ZONES AND POSTULATES

Four Zones

To study the natures of the light at the different locations between the source and the double slit, and between the double slit and the detector, let us divide the space between the laser source and the detector into four Zones (Figure 1). Each Zone is defined by the corresponding patterns in the Zone. There are is no clear-cut between two Zones. When the pattern gradually evolves, the corresponding Zone gradually changes to the next Zone.

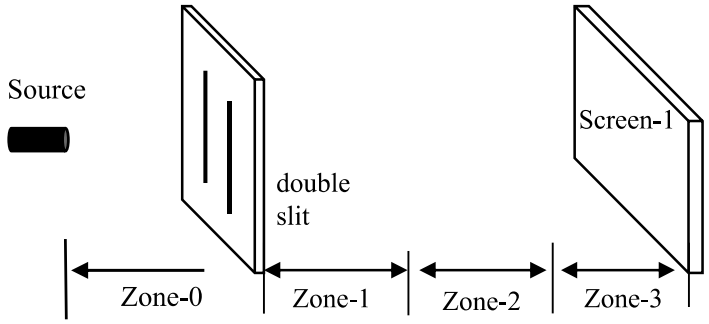


Figure 1: Four Zones

1. Zone-0: between the source and double slit, in which the pattern is non-wave and thus, the light is particles;
2. Zone-1: near the double slit, in which the patterns are *non-interference* and thus, the light is particles; referred to the patterns as ***Particle patterns***;
3. Zone-2: between zone-1 and zone-3, in which the patterns are *non-interference* and thus, the light is particles; referred to the patterns as ***Transition patterns***; in Zone-2 Particle patterns in Zone-1 gradually evolve to the Interference patterns in Zone-3.
4. Zone-3: near the screen, in which the patterns are ***Interference patterns***;

The double slit experiments with the above apparatuses show that, in all of four Zones, the light is photons. But in the Zone-3, the photons distribute as the interference patterns. Therefore, only in the Zone-3, one needs to introduce the wave function to describe the pattern of the light. The wave function cannot be used to describe the particle behaviors of the light in Zone-0, Zone-1 and Zone-2. Thus, the experiments represented in this article support the opinion of the 47% respondents of Nature's survey, i.e., the wavefunction in the quantum mechanics represent simply a useful tool.

Postulate on Light

1. **"Classical Postulate on Light"**: ***the light is waves before and after passing through a double slit***. To my knowledge, there is no experiment testing it. The existing experiments only show that the light distributes as the interference pattern ***on the detector***, but not in Zone-0, Zone-1, Zone-2 and Zone-3. Now, we propose a New Postulate on light and then, experimentally test/confirm it.
2. **"New Postulate on Light": *Light is particles before and after passing through a double slit, and landing on a detector.*** One of the conclusions of the "New Postulate on light" is that the nature of the Light in a double slit experiment does not change. Namely, if an experiment confirms that the light is particles in one of Zones, then, the light is particles in all of Zones. "New Postulate on light" completely alters the understanding of the nature of the light, especially the nature of the light in the double slit experiment. **Note**: "New Postulate on light" avoids the introduction of the concept of the "*Collapse of Wave Functions*" and thus, supporting Penrose's statement.
3. **Photo Wave Phenomena**: If it is confirmed that the light is particles in one Zone and then, the light is particles in all Zones. And it is photons that produce both the non-interference/non-diffraction patterns and the interference/diffraction patterns in the same experiment, referred to it as the PhotoWave phenomena.

Postulate on Lens

In the classical double slit experiments, it was assumed that the function of the convex lens is to *bring light rays to a focal point P on the screen.* We will show that the pattern varies with the distance from the diaphragm. To study the evolution of the patterns, the lens moves between the diaphragm and the detector and thus, the patterns arriving at the input surface of the lens change. The light patterns arriving at the input surface of the lens are position-dependence. Based on above consideration, we suggest the Postulate on lens.

Postulate on Lens:

1. the lens enlarges the image that arrives at the input surface;
2. The lens breaks the evolution of the patterns;
3. The lens does not change the nature/characteristic of the input pattern.

Example: After passing a lens, the patterns keep the same nature: e.g., (a) if the input pattern is Particle pattern, the output pattern is still Particle pattern, and vice versa; (b) if the input pattern is Transition pattern, the output pattern is still Transition pattern, and vice versa; (c) if the input pattern is Interference pattern, the output pattern is still Interference pattern, and vice versa.

COMPREHENSIVE DOUBLE SLIT EXPERIMENTS: LIGHT IS PHOTONS THAT PRODUCE BOTH NON-INTERFERENCE PATTERN AND INTERFERENCE PATTERN

In Section 3, we confirm experimentally the "New Postulate on light", i.e., the light is photons in the classical wave experiment, the double slit experiment.

Light is Particles Before Passing Through Double Slit

Double Slit Experiment with Photon Chamber: Light is Particles in Zone-0:

Now, let us experimentally show that the laser beam is particles before passing through a double slit, i.e., in Zone-0, the light is particles.

Experiment-1 (Figure 2): Light is photons before passing through double slit:

Experimental Setup (Figure 2a): Placing a Photon Chamber between the laser and the double slit (Zone-0).

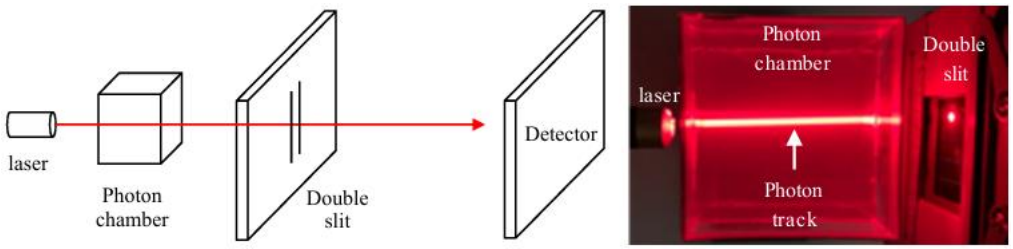


Figure 2: Experimental setup and pattern showing Light is particles before passing through double slit

Observation (Figure 2b): The Photon Chamber shows the photon track (pattern) which shows that the light is photons, not waves.

Conclusion: the light is photons before passing through the double slit.

Double Slit Experiment with Beam Splitter (BS): Light is Particles in Zone-0:
We will utilize the following Fact: A Beam Splitter (BS) does not change the behavior of the light.

Experiment-2 (Figure 3): Light is photons before passing through double slit

Experimental Setup (Figure 3a): the light passing through BS1/BS2/BS3/slide-4/M4 arrives at D4; the light reflected by BS1 arrives at D1; the light reflected by BS2 passes through slide-2 and arrives at D2; the light reflected by BS3 arrives at D3.

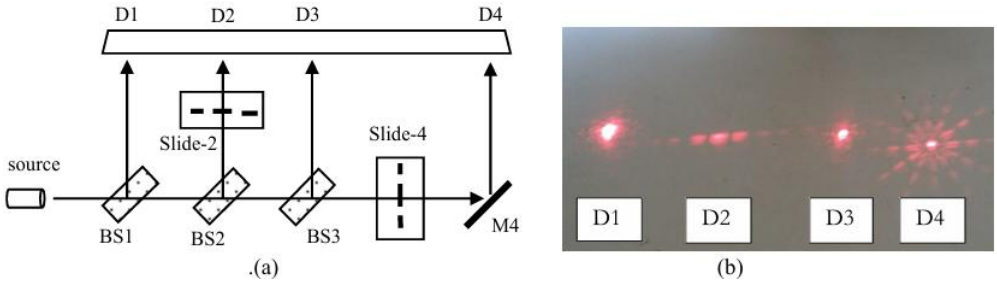


Figure 3: Light is particles before passing through slides of double slit

Observations (Figure 3b): D1 shows the image of the source, which indicates that the light is particle before passing the slide-2 and slide-4; D2 shows the wave distribution; D3 shows the image of the source, which indicates that the light is particle before passing the slide-4; D4 shows the wave distribution. Slide-2 is a double slit, while Slide-4 is a cross-double slit.

Conclusion:

1. Since the light reflected by BS1 and BS3 behaves as particles, thus, before arriving at slide-2 and slide-4, the light is particles respectively.
2. Slide-2 and slide-4 convert light's particle behavior (before arriving) to wave distribution (after passing through) respectively.
3. We will show that the wave distribution doesn't indicate that the light is waves.
4. The particle nature and wave distribution coexist in the same experiment.

Light is Photons After Passing Through Double Slit: Photons form Interference Patterns in Zone-3

Double Slit Experiment with Photon-Chambers placed in Zone-1, Zone-2 and Zone-3

Experiment-3 (Figure 4): Photon Chambers show the top view of patterns.

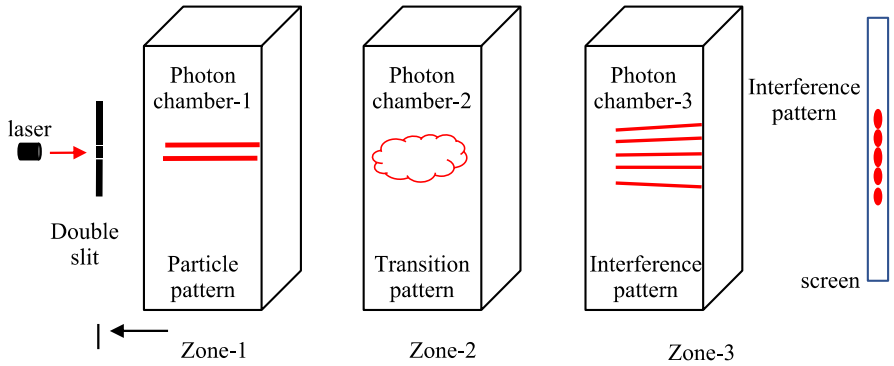
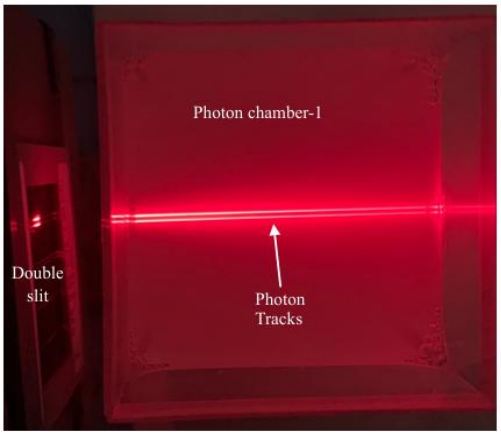


Figure 4a: Experimental setup

The Photon chamber is a transparence container filling with water and fine powder. If the light is photons after passing through the double slit then the powder will reflect photons. We observe the reflections.

Experimental setup (Figure 4a): Photon chamber-1, Photon chamber-2 and Photon chamber-3 placed in Zone-1, Zone-2 and Zone-3 respectively. Each photon chamber is 50x50 mm. Let us define Particle pattern, Transition pattern and Interference pattern:



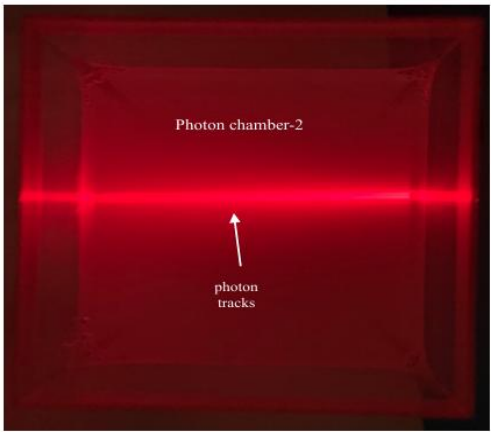


Figure 4b: Particle patterns in Zone-1 **Figure 4c: Transition pattern in Zone-2**

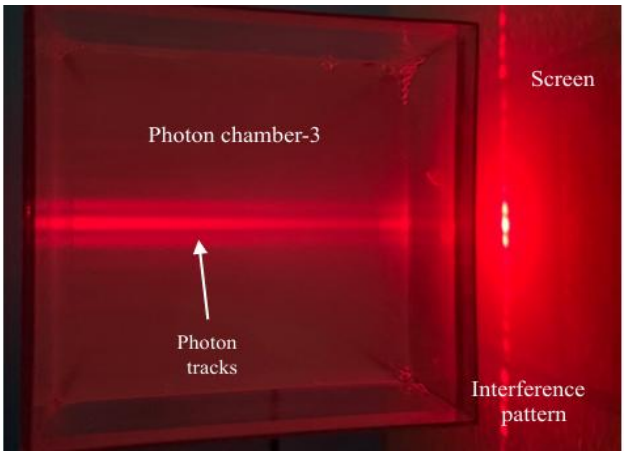


Figure 4d: Interference pattern in Zone-3 and on detector

1. **Particle Pattern** (Figure 4b): When classical particles going through a double slit, they will form the pattern with the shape of the double slit, referred to it as Particle pattern. A double slit produces the same shape patterns in Zone-1 as two photon tracks in Figure 4b. Thus, we define the pattern of two photon tracks as "Particle pattern" that indicates that the light behaves as particles in Zone-1.
2. **Transition Pattern** (Figure 4c): Transition patterns are in between the Particle patterns in Zone-1 and the Interference patterns in Zone-3. During Particle patterns gradually evolve to Interference patterns, they are neither Particle pattern nor Interference pattern and thus, the light behaves not as a wave in Zone-2. We call them the "Transition patterns", which still show the particle nature of the light.
3. **Interference Pattern** (Figure 4d): Figure 4d shows that the photons in photon-chamber-3 form the interference pattern, referred to it as "PhotoWave phenomenon". Thus, the interference pattern is formed by photons either in the photon chamber or on the detector.

Observation: Photon chamber-1 shows the top view of the photon tracks distributing as Particle pattern. Photon chamber-2 shows the top view of the photon tracks distributing as Transition pattern. Photon chamber-3 shows the top view of the photon tracks distributing as Interference pattern.

Conclusion: Particle patterns and Transition patterns indicate that the light is particles, not waves, after passing through the double slit. Figure 4d shows that the light is photons and it is photons that form the interference pattern. Thus, the light is photons in all four Zones, which supporting the "New Postulate on light".

Theoretical Description: **Wavefunction is Simply a Useful Tool Describing Interference Pattern**

Double Slit Experiments with Light as Particles, not Waves:

* Photons of the Particle pattern in Zone-1 can be described by particle Hamilton:

$$H_1 = cp_1 + V_{1-interaction}.$$

* Photons of the Transition pattern in Zone-2 can be described by particle Hamilton:

$$H_2 = cp_2 + V_{2-interaction}.$$

* Photons of the Interference pattern in Zone-3 can be described by the same form particle Hamiltonian:

$$H_3 = cp_3 + V_{3-interaction}. \quad (1)$$

Wavefunction Describing Interference Pattern in Zone-3 with Light as Particles:
On the other hand, to easily describe the wave behavior/pattern of photons in Zone-3, we introduce the wavefunction, ψ, and operators,

$$H_3 \to i\hbar\frac{\partial}{\partial t}, \qquad p_3 \to -i\hbar\nabla$$

The particle Hamilton gives the Dirac-type equation, Eq. 1:

$$i\hbar\frac{\partial}{\partial t}\psi = -i\hbar c\nabla\psi + V_{3-interaction}. \quad (2)$$

Note: *Only for describing the Interference patterns in Zone-3, we introduce the wavefunction and Dirac-type equation. Therefore, we suggest that Experiment-3 shows clearly that we only need to introduce the wavefunction in Zone-3 for simply describing the wave pattern. The wavefunction is not suitable for describing the behaviors of photons in Zone-0, Zone-1 and Zone-2. However, we actually need both the particle-view and the wave-view, simultaneously, to describe the photons' behavior in Zone-3.*

We referrer to the phenomenon of "the photons distributing as waves" as "**PhotoWave phenomena**". To explain the mechanism of "photons distribute as waves" is a challenge.

Note: the boundaries between Zone-1 and Zone-2, and between Zone-2 and Zone-3 are not clear cut. Patterns in one Zone gradually evolve to different Patterns in another Zone.

Double Slit Experiments with Matter as Particles, not Waves:

* Matter-particle in slit-1 and slit-2 can be described by particle Hamilton, respectively:

$$H_{m-slit-1} = \frac{1}{2m}p_{m-slit-1}^2 + V_{m-slit-1-interaction};$$
$$H_{m-slit-2} = \frac{1}{2m}p_{m-slit-2}^2 + V_{m-slit-2-interaction}.$$

  Where $V_{m-slit-1-interaction}$ and $V_{m-slit-2-interaction}$ represents the interaction between matter-particle and the slit-1 and between matter-particle and slit-2, respectively.
* Matter-particle of the Particle pattern in Zone-1 can be described by particle Hamilton:

$$H_{m-1/1} = \frac{1}{2m}p_{m-1/1}^2 + V_{m-1/1-interaction}.$$
$$H_{m-1/2} = \frac{1}{2m}p_{m-1/2}^2 + V_{m-1/2-interaction}.$$

  Where: $H_{m-1/1}$ and $\frac{1}{2m}p_{m-1/1}^2$ describe the matter-particles in the top-Particle pattern, referred to as Particle pattern-1; $H_{m-1/2}$ and $\frac{1}{2m}p_{m-1/2}^2$ describe the matter-particles in the bottom-Particle pattern, referred to as Particle pattern-2; $V_{m-1/1-interaction}$ is the interaction between the matter-particles in the top-Particle pattern; $V_{m-1/2-interaction}$ is the interaction between the matter-particles in the bottom-

Particle pattern. Here we ignore the interaction between matter-particles in top-Particle pattern and matter-particles in bottom-Particle pattern.

* Matter-particles of the Transition pattern in Zone-2 can be described by particle Hamilton:

$$H_{m-2} = \frac{1}{2m} p_{m-2}^2 + V_{m-2-interaction}.$$

Where $V_{m-2-interaction}$ is the interaction between photons in the Transition pattern.

* We need both the particle description and wave description of photons in Zone-3.

Particle Description: Photons in the i^{th} fringe of the Interference pattern in Zone-3 can be described by the same form of particle Hamiltonian:

$$H_{m-3} = \frac{1}{2m} p_{m-3}^2 + V_{m-3-interaction}. \quad (3)$$

Where $V_{m-3-interaction}$ is the interaction between photons in the i^{th} fringe of the Interference pattern. Here we ignore the interaction between photons in different fringes.

Wavefunction Describing Interference Pattern in Zone-3 with Matter as Particles

Wave Description: To describe the interference pattern of matter, it is convenient to introduce the wavefunction, ψ, and operators, in Zone-3.

$$H_{m-3} \to i\hbar \frac{\partial}{\partial t}, \qquad p_{m-3} \to -i\hbar\nabla$$

Substituting the wavefunction ψ and operators into the particle Hamilton (Eq. 3) gives the *Schrodinger* wave equation:

$$i\hbar \frac{\partial}{\partial t}\psi = -\frac{\hbar^2}{2m}\nabla^2\psi + V_{3-interaction}\psi. \quad (4)$$

Note: *Only for describing the Interference patterns in Zone-3, we need to introduce the wavefunction and obtain Schrodinger equation. Therefore, we suggest that Experiment-3 shows clearly that we only need to introduce the wavefunction in Zone-3 for simply describing the wave distribution/pattern. The wavefunction is not suitable for describing both the particle behaviors of photons in Zone-0/Zone-1/Zone-2, and the particle behaviors of photons in Zone-3. Therefore, we actually need both the particle-description and the wave-description, simultaneously, to describe the photons' behavior in Zone-3.*

Challenge: To explain the mechanism of "matter particles distribute as waves" is a challenge.

Note: the boundaries between Zone-1 and Zone-2, and between Zone-2 and Zone-3 are not clear cut. Patterns in one Zone gradually evolve to different Patterns in another Zone.
In Experiment 4, we show how the non-interference patterns (in Zon-1 and Zone-2) evolve to the interference patterns (in Zone-3).

Pattern-Evolution: Lens

Experiment-3 show that the light is photons after passing through the double slit, i.e., in Zone-1 to Zone-3. However, in Zone-3, the photons distribute as wave. To study the pattern evolution, i.e., from the Particle pattern (non-interference pattern in Zone-1) to the Transition

pattern (non-interference pattern in Zone-2) to the interference pattern in Zone-3, we utilize a lens.

Experiment-4: Pattern evolution of Double slit experiment with lens

Experimental Setup: the left of Figure 5a shows the experimental setup.

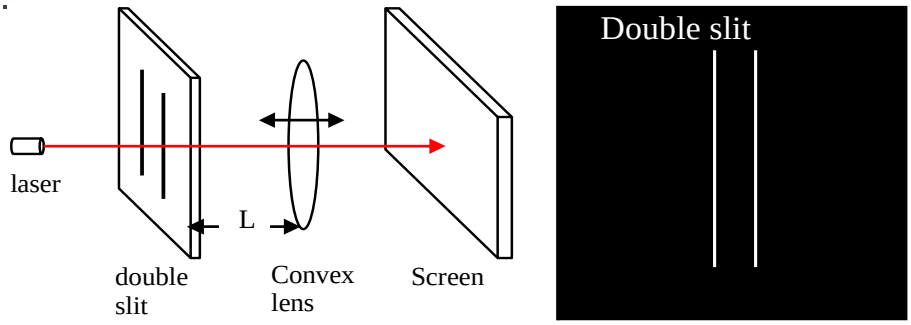


Figure 5a: Experimental setup and apparatus of double slits

When placing the lens at different positions L, we have the following patterns which show the pattern evolution (Figure 5b).

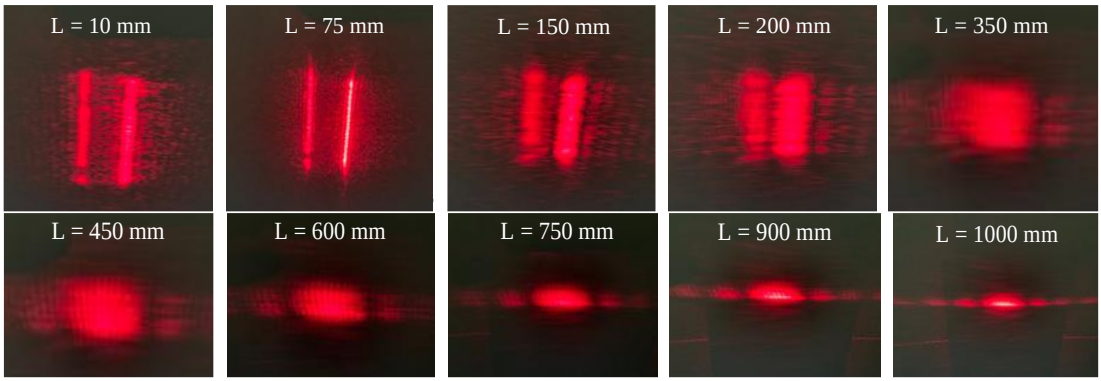


Figure 5b: Evolution of patterns of double slit experiment

Observation (Figure 5b): When L = 75 mm, the vertical pattern is the typical image of double-slit, Particle pattern. When L = 350 mm, the pattern is the typical Transition patterns. Both the Particle pattern and the Transition patterns are the non-interference patterns and thus, indicate that the light is particles after passing through the double slit (from L = 10 mm to L = 600 mm). When $L \geq 750$ mm, the patterns are the horizontal interference patterns.

Conclusion: "New Postulate on light" is confirmed: the light is photons after passing through the double slit, and it is photons that form both the non-interference and the interference patterns in the same experiment. For simply describing the interference pattern of photons only in Zone-3 ($L \geq 750$ mm to the detector), the wavefunction is needed.

Note: The Particle patterns gradually evolve to the *orthogonal* interference patterns.

In Experiment 5 to Experiment 8 below, we focus on the particle nature and wave distribution of the light in Zone-3.

Double Slit Experiment with Shields
Experiment-5 (Figure 6): Light is photons after passing through double slit: two Shields

Experimental Setup: Two shields form a narrow channel. Shield-1 and Shield-2 are 70 inches long, 1.5 inch wide, and 0.3 mm thick. Both Shield-1/Shield-2 contact the detector.

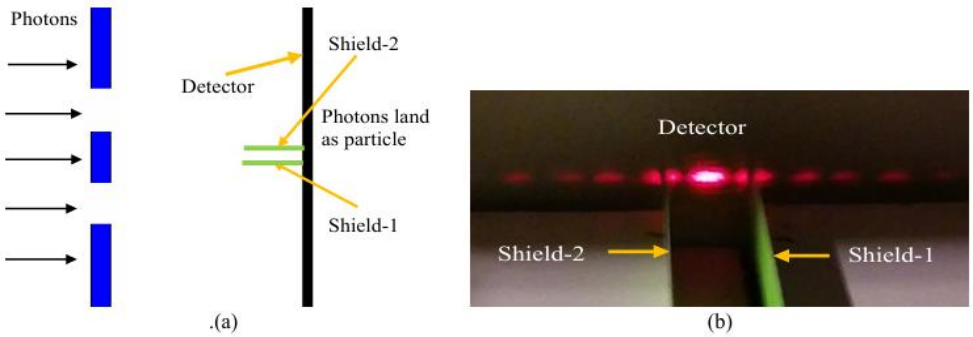


Figure 6: Double slit experiment with two Shields

Observation (Figure 6b): We observe the interference pattern that is the same as there were no shield-1 and shield-2. The existence of two parallel Shields has no effect on the "interference" pattern, which indicates that the light is photons that producing interference pattern on the detector.

Conclusion: Only the light as particles can (1) pass through the narrow channel; (2) strike at the positions of the zeroth-order fringe and two first-order fringes on the detector; and (3) do not disturb the existing interference pattern. It is a challenge to use either a particle-view or a wave-view to describe the phenomena. We have to use both the particle-view and wave-view simultaneously.

Double Slit Experiment with Blockers
Experiment-6 (Figure 7): Light is photons after passing through double slit: Blocker.

Experimental Setup (Figure 7): Blocker-11 and blocker-12 are placed along the normal vector of the surface of the detector and separated by 4 inches.

Observation (Figure 7): Two blockers are arranged such that portions of the zeroth-order fringe are formed on the detector, blocker-11 and blocker-12, respectively. Thus, the fringe can be formed partially. The existence of each blocker does not affect the fringes formed on other blockers and on the detector. Namely, fringes are formed independently.

Conclusion: Experiment-6 show that_Fringes are formed independently and partially, which would be expected only if the light is photons in Z-3 near the detector. Some of photons form fringes on blockers, while some of photons form the rest interference pattern on the detector.

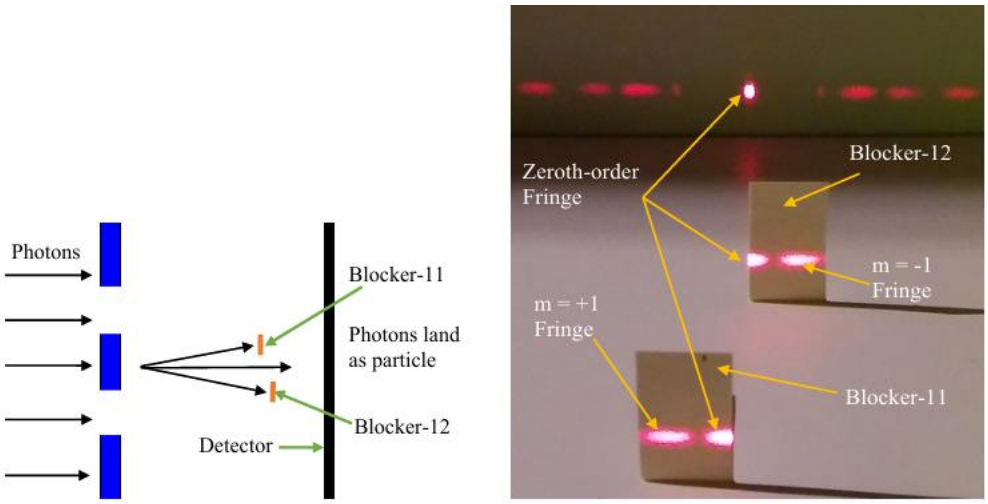


Figure 7: Fringes Formed Independently and Partially

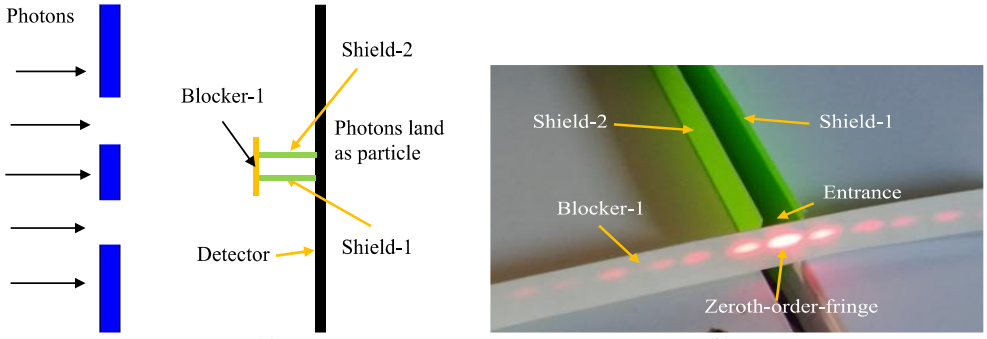
It is convenient to introduce wavefunctions to describe each of fringes. "New Postulate on light" is experimentally confirmed.

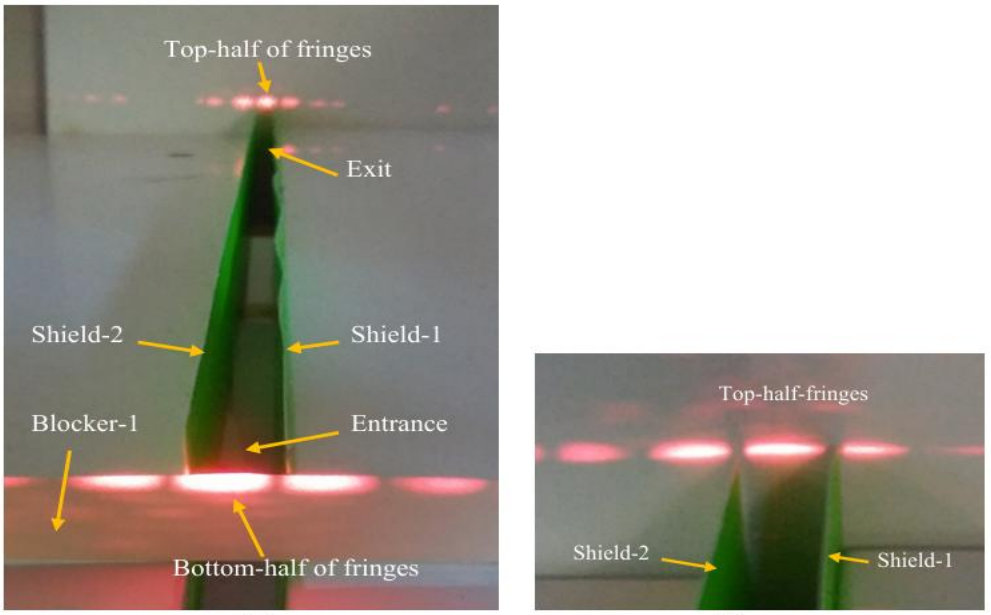
Double Slit Experiment with Both Shields and Blockers

Now let us show the effects of combinations of Shields and Blockers.

Experiment-7: Testing "New Postulation on light": combination of Shields and Blocker in two setups.

Experimental Setup-1 (Figure 8): One end of the channel of shield-1/shield-2 contacts the detector. Place blocker-1 at the other end of the channel, where we denote it as Entrance.





(c) (d)

Figure 8a and 8b. Testing New Postulate on light with Shields and Blocker
Figure 8c and 8d. Cut Top Half of Blocker-1

Observation (Figure 8b): The interference pattern is formed on blocker-1.

Experimental Setup-2 (Figure 8c): Cutting off the top portion of blocker-1.

Observation (Figure 8c and 8d): The bottom half of the fringes still appears on the bottom half of the Blocker-1, while the top half of the fringes appears on the detector. Namely each fringe is formed partially. Shields have no effect on the interference pattern at all.

Conclusion: the light is particles and it is the particles that form both the half-interference patterns on both the detector and the Blocker-1 respectively. It is easier to use two wavefunctions to describe two half-interference patterns on the Blocker-1 and the detector respectively.

Experiment-8 (Figure 9): We perform this experiment in two setups.

Experiment Setup-1 (Figure 9a): Insert transverse blocker-2 one inch wide into the channel formed by shield-1 and shield-2.

Observation (Figure 9b): Two fringes are formed on blocker-2, and the remaining fringes are formed on the detector. Namely, Fringes are formed independently.

Conclusion: Two shields have no effect on the interference pattern. This observation indicates that the light is photons.

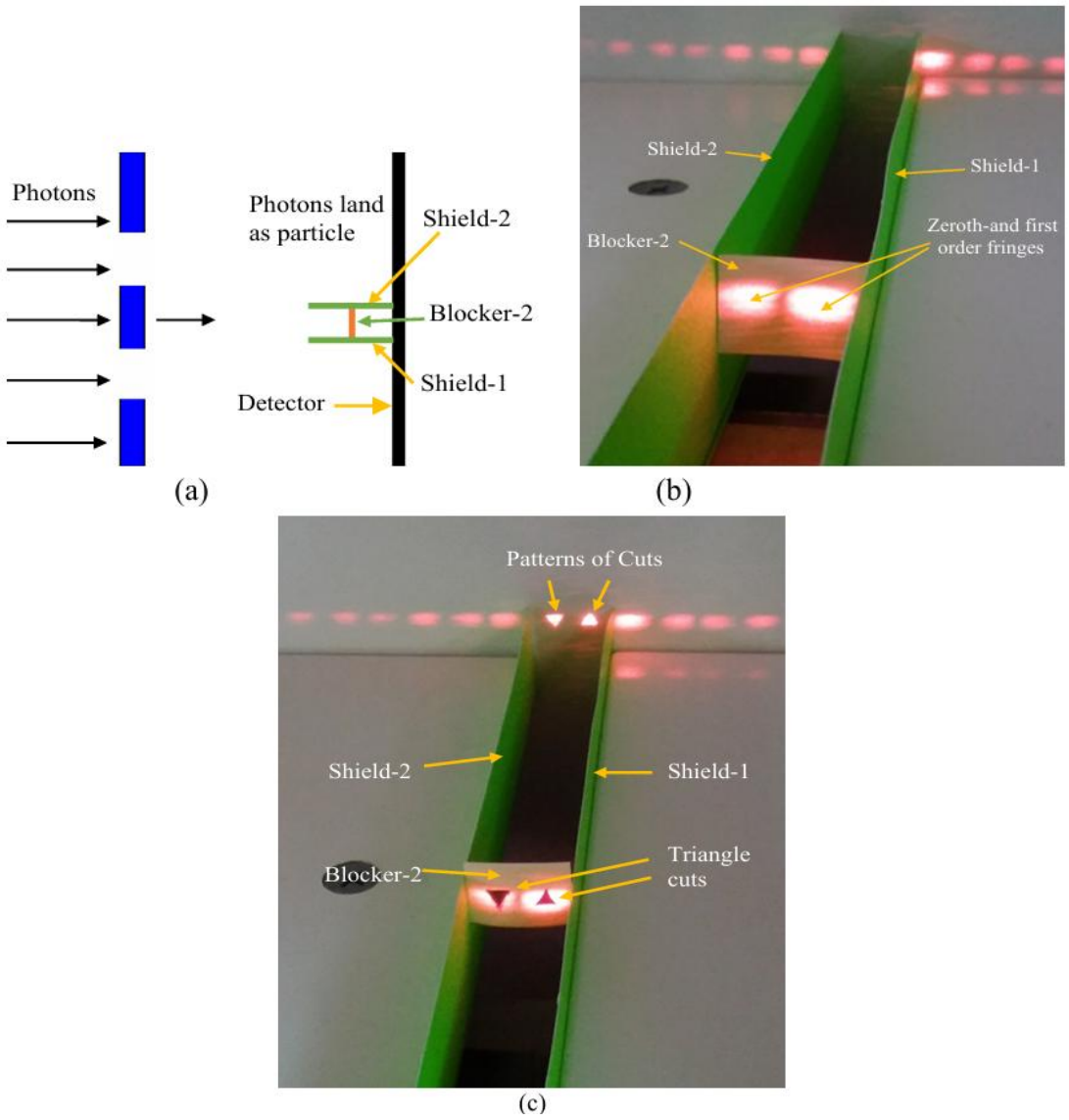


Figure 9a and 9b. Blocker-2 in Channel; Figure 9c. Blocker-2 with Two triangle Cuts

Experimental Setup-2 (Figure 9c): Cut two triangles on blocker-2 at the locations of the zeroth-order fringe and a first-order fringe respectively. Then place blocker-2 into the channel.

Observation (Figure 9c): The light passes through two triangle-shaped cuts and forms exactly the same triangle-shaped patterns on the detector.

Conclusion: Figure 9c shows that the light is photons that move along straight lines, pass through two triangle cuts, and form two triangle shape patterns on the detector.

However, on the other hand, the pattern on the detector is still an "interference pattern", except the two triangle patterns.

To describe the interference pattern on the detector we can still introduce the wavefunction. While to describe the two triangle patterns on the detector, we can only use the particle Hamilton equation.

Note: the light just passes through a double slit, and is not waves. "New Postulate on light" is confirmed experimentally.

Double Slit Experiment with Conductive Metal Tube: Light is not EM Waves
Experiment-9 (Figure 10): Testing EM theory of light

Experimental setup: In this setup, an Aluminum (AL) rectangular tube of 0.75x1.1x48 inches is used.

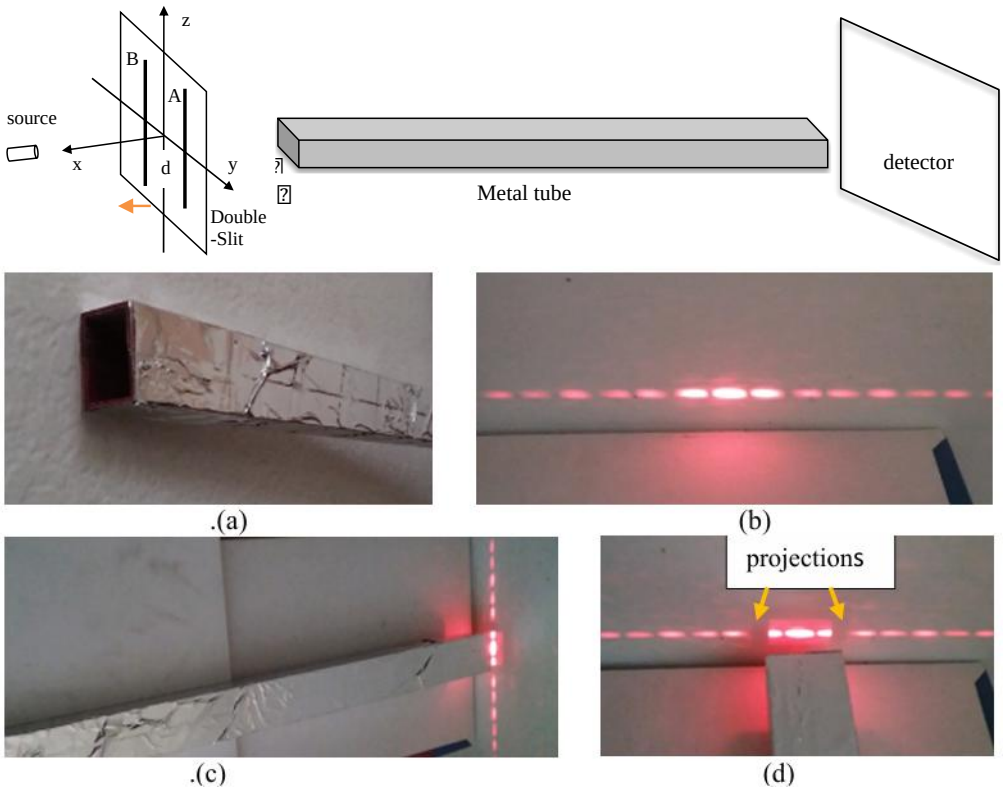


Figure 10: Aluminum-tube-shield and interference pattern

Observation (Figure 10): Figure 10b shows the interference pattern without AL tube. Figure 10c and 10d show the unaffected interference patterns. Figure 10d also shows the projections of the two side walls of the AL tube on the detector.

Conclusion: The conductive metal tube has no effect on the interference pattern, which indicates that the light is not the electromagnetic (EM) waves.

SUMMARY AND CONCLUSION

Therefore, we suggest that Experiment-1 to Experiment-9 show clearly that:

1. The light is photons before and after passing through the double slit, i.e., in Zone-0, Zone-1, Zone-2, and Zone-3.
2. The wavefunction of the photons is needed only in Zone-3 for simply describing the interference pattern of photons.
3. The wavefunction is not suitable for describing the particle behaviors of photons in Zone-0, Zone-1, Zone-2, and Zone-3.
4. The wave-particle duality of the light is invalidated.
5. The light is not EM wave, although the EM wave theory is utilized in many situations.

The same double slit experiments can be done with, for example, elementary particles. We expect to observe the same phenomena. So, the wave-particle duality of particles will be invalidated. Thus, the concept of matter-wave and thus, the quantum wave equation of matter is challenged.

Acknowledgement

The Author Thanks Dr. Bing Liang and Dr. Arvid Ali for Discussions and Help.

References

[1] Elizabeth Gibney, “Physicists disagree wildly on what quantum mechanics says about Reality, Nature survey shows”, Nature, 30 July 2025.

[2] Young, T. (1804). “The Bakerian Lecture, Experiments and Calculation Relative to Physical optics”, Philosophical Transactions of the Royal Society of London. 94: 1–16. doi:10.1098/rstl.1804.0001. S2CID 110408369.

[3] J. Dalton, “A New System of Chemical Philosophy” (1808)

[4] J. Maxwell, "A dynamical theory of the electromagnetic field". Philosophical Transactions of the Royal Society of London. 155: 459-512. doi:10.1098/rstl.1865.0008 (1865).

[5] M. Planck, "Über das Gesetz der Energieverteilung im Normalspektrum". Ann. der Physik, 4 (3): 553–563. Bibcode:1901AnP...309..553P. doi:10.1002/andp.19013090310. (1901).

[6] A. Einstein, “On a Heuristic Point of View Concerning the Production and Transformation of Light”, Ann. der Physik, Vol. 17, pp132-148. (1905).

[7] de Broglie, Louis, “La nouvelle dynamique des quanta”, in Solvay 1928, pp. 105–132, 1928.

[8] E. Schrödinger, "An Undulatory Theory of the Mechanics of Atoms and Molecules" (PDF). Physical Review 28 (6): 1049–70. doi:10.1103/PhysRev.28.1049. (1926).

[9] R. Feynman, R. Leighton, and M. Sands, “The Feynman Lectures on Physics” (Addison-Wesley, Reading), Vol. 3. (1965).

[10] H. Peng, “Double Slit to Cross Double Slit to Comprehensive Double Slit Experiments’. Research Square, preprint. DOI: https://doi.org/10.21203/rs.3.rs-555223/v1 (2021).

[11] H. Peng, “New experiments/phenomena in optics: photoelectric effect to photowave phenomena,” Proc. SPIE 12723, Seventeenth Conference on Education and Training in Optics and Photonics: ETOP 2023, 127231F; doi: 10.1117/12.2670639 (28 June 2023)

[12] R. Penrose, “Why Quantum Mechanics Is an Inconsistent Theory | Roger Penrose & Jordan Peterson”. YouTube (2022)