

## A NEW QUANTUM THEORY

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The current quantum theory (i.e. the quantum wave theory) has three very basic and fundamental faults: 1. The current interpretation of quantum is faulty and incomplete; 2. The assumption of wave nature of photons and electrons is not true; 3. The phenomena of interference and diffraction of photons and electrons, to explain which the wave nature of photons and electrons has been assumed, take place due to the particle nature of photons and electrons, not due to their wave nature. The present interpretation of quantum gives very clear and complete picture of quantum, about its structure, properties etc. The present quantum theory enables to explain all the phenomena related with quanta, even the phenomena of interference and diffraction of electrons and photons, that too very clearly and completely in a logically very convincing way. Presently, it has also been determined as to how despite having three such very basic and fundamental faults; the current quantum theory has obtained so huge success.

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## 1. INTRODUCTION

The current quantum theory (i.e. the quantum wave theory) has huge success to its credit. But it has the following three very basic and fundamental faults:

1. The current interpretation of quantum (e.g. photon) is faulty and incomplete. (For current interpretation of quantum, faults in it, negative consequences of it due to faults in it etc.; see respectively Sects. 2.1, 2.1.1, 2.1.2, 2.1.3. And for the present, true and complete interpretation of quantum, positive consequences of it etc., see Sects. 2.2, 2.2.1, 2.2.2 respectively.)
2. The assumption of wave nature of photons and electrons is not true. (For faults in the assumption, in the expression of de Broglie wavelength and in the explanation of the phenomena of interference and diffraction of photons and electrons accounting their wave nature, see respectively the Sects. 3.1, 3.2, 3.3. And for confirmation that the assumption of their wave nature is not true, see Sec. 3.4.)
3. The phenomena of interference and diffraction of photons and electrons, to explain which the wave nature of photons and electrons has been assumed, they take place due to the particle nature of photons and electrons, not due to their wave nature. (How these phenomena take place due to the particle nature of photons and electrons, see Sects. 4.1, 4.2, 4.3.)

Having three such very basic and fundamental faults, the quantum wave theory cannot be true and hence should not be able to explain the phenomena. While on the contrary, it has succeeded to explain numerous phenomena.

Therefore, presently, in addition to proposing a new quantum theory that enables to explain all the phenomena related with quanta (see Sects. 2.2.2 and 5), even the phenomena of interference and diffraction of photons and electrons that too very clearly and completely in a logically very convincing way (see Sec. 4), it has also been

determined as to how despite having three such very basic and fundamental faults the quantum wave theory has obtained so huge success (see Sec. 1.1 and also Sec. 5).

### **1.1 How despite having three such very basic and fundamental faults the quantum wave theory has obtained so huge success**

To explain the different phenomena applying the quantum wave theory, rigorous mathematical proofs have been given. But if we examine their rigorous mathematical proofs closely and intently, we find that there have been chosen numerous assumptions in order to explain the different phenomena. Those assumptions have been chosen merely keeping in view that they suit to the required demands and may give the desired results. No thinking has been focused over whether they are logically and/or practically possible or not. Consequently they give rise to numerous very basic and fundamental questions, and some negative consequences too. In order to justify the chosen assumptions and to avoid/counter the negative consequences, several assumptions have further been taken. But they too are not true because they too give rise to numerous very serious and fundamental questions. The taken assumptions cannot be avoided otherwise the theories fail to give the desired results. For example:

1. If we examine the current interpretation of quantum closely and intently (see Sec. 2.1.1), we find that in it several assumptions have been taken in order to explain the different phenomena. These assumptions have been taken merely keeping in view that these suit to the required demands and may give the desired results. But no thinking has been focused over whether these assumptions are logically and/or practically possible or not. Consequently, this interpretation gives rise to numerous very serious basic and fundamental questions [see Sects. 2.1.1(a) and 2.1.1(b)], and to several negative consequences (see Sec. 2.1.2). In order to justify the given interpretation and to avoid/counter the negative consequences, an assumption/solution has been proposed (see

Sec. 2.1.3) but that too is not true and gives rise to numerous very basic and fundamental questions (see Sec. 2.1.3). The assumptions taken cannot be avoided otherwise the current interpretation of photon fails to give the desired results.

2. If we examine the BCS (Bardeen–Cooper–Schrieffer) theory<sup>1</sup> of superconductivity and its rigorous mathematical proofs to explain the related different properties closely and intently, we find that it is based on such concepts which are practically not possible and contradict two well-observed facts too (see Sec. 6, Ref. 2). These concepts have been chosen keeping in view that these may give the desired results. No thinking has been focused over whether these are logically and/or practically possible or not. Consequently these concepts give rise to numerous very basic and fundamental questions (see Sec. 6, Ref. 2). But instead of realizing the truth, several assumptions have further been taken in order to justify the taken concepts (see Sec. 6, Ref. 2). These assumptions too are not true and give rise to numerous more very basic and fundamental questions (see Sec. 6, Ref. 2). Most importantly, the taken assumptions cannot be avoided otherwise the BCS theory fails to give the desired results

**2. DISCUSSION OF THE FIRST FAULT** (the current interpretation of quantum is faulty and incomplete)

### **2.1 Current interpretation of quantum**

According to the current interpretation of photons, photons are considered as discrete quanta of radiation energy given by  $h\nu$ , which involve the frequency  $\nu$  of radiation. These, unlike the light corpuscles of Newton, include in their very concept the wave nature also of radiation, because this alone and not the other quantum idea can account for the phenomena of interference and diffraction, the explanation of which is precisely why wave theory was postulated.

#### **2.1.1 Faults in the current interpretation to quantum (photon)**

As we know, the concept of quantum came across the floor after the Planck's quantum theory to explain the energy distribution in the radiation chamber. In his theory, instead of assuming the radiation chamber to be full of radiation in continuous form, he assumed the radiation chamber full of radiation in quantized form (i.e. in the form of bundles). These quanta (bundles) of radiation were later on known as photons.

In the current interpretation of photon, a new assumption has been added, i.e. the photons, unlike the light corpuscles of Newton, include in their very concept the wave nature also of radiation, because this alone and not the other quantum idea can account for the phenomena of interference and diffraction. But if we go through the current interpretation of photon thoroughly, there we find lot of faults.

In the current interpretation of photon, there we find actually the following two statements:

1. Photons are considered as discrete quanta of radiation energy given by  $h\nu$ , which involves the frequency  $\nu$  of radiation.
2. These (photons) include in their very concept the wave nature also of radiation, because this alone and not the other quantum idea can account for the phenomena of interference and diffraction.

### **2.1.1 (a) Faults in the first statement**

The first statement is incomplete because it gives rise to question:

- Is energy  $h\nu$  whether of the amount of radiation contained in photon, or of photon as a particle which enables it (photon) to travel with velocity  $c$ , scatter electron colliding with that in Compton scattering and eject electron in photoelectric effect penetrating into metals etc.?

Since the photon travels with velocity  $c$ , scatters electron colliding with that in Compton scattering and ejects electron in photoelectric effect penetrating into metals

etc., for photon, two things are necessary: 1. A bundle of radiation energy that provides physical existence to photon as, e.g. a bundle of charge (-e), which is actually electric energy, provides physical existence to electron. 2. Some energy, that enables photon to travel with velocity  $c$  etc. as, e.g. some energy is needed for electron to enable it to travel etc. [For experimental verification of the necessity of the mentioned above two things for photon to travel with velocity  $c$ , scatters electron colliding with that in Compton scattering etc., we can see also starting from line-25, column-2, page-53 to line-15, column-1, page-54, Sec. I D, Ref. 3.]

If energy  $h\nu$  is of the bundle of radiation that provides physical existence to photon, the question arises, where is the energy that enables photon to travel with velocity  $c$  etc.? And if  $h\nu$  is the energy that enables the photon to travel with velocity  $c$  etc., the question arises, where is the bundle of radiation energy that provides physical existence to photon?

The first statement gives rise to several very fundamental questions too: For example:

- i. Currently, it is assumed that energy  $E_f - E_i$  [where  $E_f = \text{K.E. (kinetic energy) + P.E. (potential energy)}$  of the orbiting electron when that is excited, and  $E_i = \text{K.E. + P.E.}$  of electron after emission of a photon from that] is emitted from the orbiting electron as a bundle of radiation energy  $h\nu$ . How can the energy  $E_f - E_i$ , which is the difference of K.E. + P.E. of orbiting electron between its two states  $E_f$  and  $E_i$  be emitted in the form of radiation energy? And further, how is that radiation energy emitted in the form of a bundle which behaves like a particle?
- ii. The electrons possess spin motion, but no account of energy corresponding to their spin motion is found in  $E_f$  and  $E_i$  of the orbiting electron, why?

### 2.1.1 (b) Fault in second statement

The content “These (photons) include in their very concept the wave nature also of radiation, because this alone and not the other quantum idea can account for the phenomena of interference and diffraction” of the second statement gives rise to numerous questions. For example:

- i. Since the sound energy also suffers the phenomena of interference and diffraction as the radiation energy suffers, and it is believed that the phenomena of interference and diffraction of sound energy take place due to its wave nature, the wave nature of radiation energy has also been assumed. But the belief that the sound energy possesses wave nature is not true. The sound energy itself does not possess wave nature. The waves are generated in the medium when the sound is produced because then a disturbance is produced in the medium and that generates waves in it. The waves are generated in the water of a water tank too when a piece of stone is dropped in it. Then the disturbance is produced in the water due to the kinetic energy of stone and that generates waves in it. The kinetic energy of stone does not possess wave nature. Similarly, the radiation energy also cannot possess wave nature.
- ii. However, suppose if the electromagnetic wave nature has been assumed for the radiation energy because the electromagnetic energy is emitted in the form of waves and these waves need no medium for their propagation similarly as radiation energy needs no medium for its propagation, and secondly, the concept of wave nature of radiation alone and not the other quantum idea can account for the phenomena of interference and diffraction, then: 1. There should be found some evidence of interference and diffraction of microwaves, radio waves etc, because these are assumed to be the electromagnetic waves. But no such evidence

has been found. 2. For the charge contained in electrons too the electromagnetic wave nature should be assumed because electrons also suffer the phenomena of interference and diffraction as photons suffer and need no medium for their motion. But for the charge of electrons, the packet wave nature has been assumed, not the electromagnetic wave nature. Why is this inconsistency?

In addition to the above questions, the concept of wave nature of radiation gives rise to many more question, see Sec. 3.1. And for confirmation that the assumption of wave nature of photons and electrons is not true, see Sec. 3.4.

### **2.1.2 Negative consequences that arise due to faults in the current interpretation of photons**

Since the current interpretation of photons fails to explain:

1. How can energy  $E_f - E_i = h\nu$ , which is the difference of K.E. + P.E. of orbiting electron between its two states  $E_f$  and  $E_i$ , be emitted in the form of radiation energy, and how is that radiation energy emitted in the form of a bundle which starts behaving like a particle;
2. Is energy  $h\nu$  whether of the amount of radiation contained in photon, or of photon as a particle that enables photon to travel with velocity  $c$ , scatter electron colliding with that in Compton scattering and eject electron in photoelectric effect penetrating into metals,

it (current interpretation of photons) fails also to explain:

- i. The motion of photons with velocity  $c$  and the phenomena of Compton scattering and photoelectric effect etc.;
- ii. The intensity of spectral lines; decrease in their intensity as their frequency increases; decrease in thickness of spectral lines as their order increases; how the fine lines of spectral lines are obtained; frequency and intensity of fine lines of



fine structures of spectral lines; and many more phenomena/events (see Sec. 2.2.2).

Therefore, to avoid the above failures, or can say, negative consequences, currently a solution has been provided (see Sec. 2.1.3). But it too gives rise to several very fundamental questions.

### **2.1.3 Current solution that has been proposed to avoid/counter the negative consequences, but it too is not true**

Currently, in order to enable the current interpretation of photon to explain the phenomena, e.g., Compton scattering, Photoelectric effect etc., the moving mass  $h\nu/c^2$  and momentum  $h\nu/c$  have been assigned to photon. Though  $h\nu/c^2$ ,  $h\nu/c$  succeed to explain the phenomena of Compton scattering etc., but in principle, these cannot be true. And hence give rise to several very fundamental questions. For example:

1. What is physical interpretation of moving mass? Does the moving mass of photons  $h\nu/c^2$  provide physical existence to them? And if provides, how? Otherwise photons cannot collide with electrons in Compton scattering and penetrate into metals in Photoelectric effect and hence these phenomena cannot take place.
2. In  $h\nu/c^2$ , since every term  $h$ ,  $\nu$  and  $c$  has finite value,  $h\nu/c^2$  should also be finite. Whereas if substituting in expression  $m_{mov} = m_0 / \sqrt{(1 - v^2/c^2)}$  [where  $m_0$  and  $m_{mov}$  respectively are the rest and moving mass of any particle moving with velocity  $v$ ] the rest mass  $m_0$  of photon to be = 0 (because  $m_0$  of photon has been assumed to be = 0),  $m_{mov}$  of photon is obtained to be indeterminate. Why is this discrepancy?
3. In  $h\nu/c^2$  and  $h\nu/c$ ,  $\nu$  has been assumed as the frequency of wave nature of radiation energy of photon, i.e.  $\nu$  is the characteristic of wave nature of photon, whereas

it is believed that the phenomena of Compton scattering and Photoelectric effect etc. take place due to the particle nature of photon.

4. If the moving mass  $h\nu/c^2$  and momentum  $h\nu/c$  which depend upon the frequency  $\nu$  of wave nature of photons have been assigned to photons, such moving mass and momentum depending on the frequency of wave nature of electrons should be assigned to electrons too. But no such moving mass and momentum have been assigned to electrons. Why is this inconsistency or double standard?

## 2.2 Present interpretation of quantum

Since the quantum wave theory is applied to matter particles, e.g., electrons, protons etc. too, the matter particles too should be the quanta. The electrons should be the quanta of charge ( $-e$ ). The protons should be the quanta of charge ( $+e$ ) and of some material (because proton possesses same amount of charge as the electron possesses but has mass much more than that of electron).

As the quantum of charge  $-e$  constitutes the electron and provides physical existence and rest mass  $m_e$  to it; similarly, the quantum of radiation energy too should constitute the photon and provide physical existence and rest mass  $m_{ph}$  ( $\approx 3.38 \times 10^{-36} \text{ Kg}$ ) to it. [For mathematical proof of  $m_{ph} \approx 3.38 \times 10^{-36} \text{ Kg}$ , see Sec. IV B, Ref. 3.]

No escaping of light from the black holes verifies the truth of rest mass  $m_{ph}$  of photons. Black holes have very strong gravitational force and they do not let even the photons to escape from them, it means, photons have rest mass and are attracted by the black holes due to their very strong gravitational force. However, for more confirmation that the photon possesses rest mass, we can see also Sec. I D, Ref. 3.

But currently,  $m_{ph}$  has been assumed to be  $= 0$ . It is because, otherwise, according to Einstein's postulate of theory of relativity, since the velocity of photon has

been assumed to be  $c$  (constant), according to expression  $m_{mov} = m_0 / \sqrt{(1 - v^2 / c^2)}$ , moving mass ( $m_{mov}$ ) of photon becomes infinite. Since  $m_{mov}$  cannot be infinite,  $m_{ph}$  has been assumed to be  $= 0$ .

But giving plausible arguments and evidences, a justified solution has been determined such that the moving mass of photons may not become infinite despite having their rest mass. (see, Ref. 4)

The rest mass of photon ( $m_{ph}$ ) cannot be  $= 0$ . Because, according to mass-energy equivalence principle of theory of relativity, since the matter is transformed into energy in equivalence to that's mass, that's mass is not being transformed into energy, somehow if the mass of the transformed energy is measured, that shall be found to be equal to the mass of the matter. And hence, the bundle of radiation energy of photon too should have some rest mass.

### **True and complete interpretation of photon:**

A photon = a quantum of radiation energy + energy  $h\nu$ ,

where

- **Quantum of radiation energy:** is a bundle of radiation energy that constitutes the photon and provides particle like physical existence and rest mass  $m_{ph}$  to it. (How the radiation energy is emitted from the electron in the form of a bundle, see Sec. III B, Ref. 3.) This quantum of radiation energy provides intensity to spectral lines (see Sec. III F, Ref. 3), to the fine lines of fine structure of spectral lines (see Sec. III K, Ref. 3) in spectroscopic phenomena, and also to bright fringes and bands respectively in the phenomena of interference and diffraction, in accordance as the amount of radiation energy contained in quantum (see Sec. 4).

● **Frequency  $\nu$**  : is frequency of spin motion of photon. Since photon is emitted from the orbiting electron which possesses spin motion, photon also obtains spin motion from that electron (for verification of its truth, see Sec. I A, Ref. 3). The frequencies of spectral lines and of fringes are happened to be the frequencies of spin motion of photons (for verification of its truth, see Sects. I A and III E, Ref. 3).

● **Energy  $h\nu$**  : is motional energy  $E_m$  [ $=E_k$  (kinetic energy) +  $E_s$  (spin energy)] of photon (for detail, see Sec. III E, Ref. 3). It provides spin motion and linear motion to photon, and consequently photon becomes able to travel with velocity  $c$ , scatter electron in Compton scattering and eject electron in Photoelectric effect penetrating into metals.

● **Radiation energy contained in photon + energy  $h\nu$**  : is the total energy of photon (for detail, see Sec. III G, Ref. 3).

The orbiting electrons possess energy  $E_k + E_s + \text{P.E. (potential energy)} = E_m$  (motional energy  $=E_k + E_s$ ) + P.E. The difference of energy  $E_m$  of orbiting electron between its energy states  $E_f$  and  $E_i$  is imparted to the emitted photon as its  $E_m$  and happens to be  $=h\nu$  (for detail, see Sec. III E, Ref. 3). And the difference of P.E. of the orbiting electron between its energy states  $E_f$  and  $E_i$  happens to be equivalent to the quantum of radiation energy of the emitted photon (for detail, see Sec. III F, Ref. 3).

● **Momentum  $h\nu/c$  associated with photons**: is spin momentum ( $p_s$ ) of photons because:

Since photons possess spin motion, and the spinning particles possess  $p_s$ , the momentum  $h\nu/c$  should be  $p_s$  of photons (for confirmation of its truth, see Sects. I C and I D, Ref. 3).

Secondly, since the velocity of photons has been assumed to be constant ( $= c$ ), their momentum should remain always to be constant while on the contrary, their

momentum increases as their  $\nu$  increases, where  $\nu$  is frequency of their spin motion. Hence  $h\nu/c$  cannot be the linear momentum ( $p_{lin}$ ) of photons. It should be their spin momentum ( $p_s$ ).

### 2.2.1 Consequences of the present interpretation of quantum

The present interpretation of quantum enables to explain all the phenomena, even the phenomena of interference and diffraction of electrons and photons (see Sects. 4.1, 4.2, 4.3) and the phenomenon of transmittance  $T = \text{finite}$  for particles possessing energy  $E < V_0$  where  $V_0$  is the energy of potential barrier (see Sec. 4.1.2, Ref. 5), which are currently being assumed as purely the properties of wave nature of photons and matter particles.

The present interpretation of photon enables to give very clear and complete explanation of almost all the main phenomena/events of spectroscopy [see from Sec. III B to Sec. III L, Ref. 3]. For example, it enables to:

1. Deduce the expressions both for frequency of spectral lines (see Sec. III E, Ref. 3) and intensity of spectral lines (see Sec. III F, Ref. 3);
2. Explain how and why the intensity of spectral lines decreases as their frequency increases (see Sec. III H, Ref. 3), and how and why the thickness of spectral lines decreases as their order increases (see Sec. III L, Ref. 3);
3. Give very clear and complete picture why and how the fine structures of spectral lines are obtained (see Sects. III I and J, Ref. 3), and deduce the expressions for number of fine lines in different spectral lines, for their frequency and intensity (see Sec. III K, Ref. 3).

The current theories fail to explain the intensity of spectral lines, decrease in intensity of spectral lines as their frequency increases; decrease in thickness of spectral lines as their order increases and many more phenomena/events

Regarding explanation of fine structure of spectral lines, the existing explanation has three very basic and fundamental faults: 1. The determination of  $\mu_j$  is neither judicious nor meaningful; 2. The expression  $L_j = jh / 2\pi$  is not true; 3.  $j (= s \pm l)$  can have only one value corresponding to each value of  $l$ , not more than one value (for detail, see Sec. 1, Ref. 6). Therefore, the existing explanation of fine structure of spectral lines cannot be true.

Further, the theories, existing to explain the fine structures of spectral lines, fail to explain why and how the fine structures of spectral lines are obtained. These somehow manage to give only the number of fine lines, that too adopting very complicated and tedious procedure of assigning number of sub-energy states corresponding to different energy states of electron and putting some selection rules for the occurrence of its transition among those. If we look at the procedure followed in these theories to explain the fine structure of spectral lines in different cases, we find that this procedure is not capable even to give the exact number of fine lines. In order to explain it, further interpretations have been presented [for detail, see starting from the last paragraph (column-1, page-66) to paragraph-4 (column-2, page-66) of Sec. III M, Ref. 3].

The present interpretation of photon enables to give very clear and complete picture of several such phenomena/events too which are equally important but their no explanations are yet available. For example:

1. How radiation energy is emitted from the orbiting electrons in the form of bundles which behave like a particles, and how those bundles obtain energy  $h\nu$  (see Sec. III B, Ref. 3);
2. Why and how in atomic spectra of hydrogen atom, there are found several series of spectral lines, e.g., Lyman series, Balmer series, Paschen series etc., not a single series (see Sec. III D, Ref. 3);

3. How and why the orbiting electrons acquire elliptical orbits despite moving in spherically symmetric field (see Sec. III C, Ref. 3). [The orbiting electrons move actually in elliptical orbits as all the planets of our solar system move in elliptical orbits, not in circular orbits. The Bohr's theory fails to explain accurately the frequency of higher order spectral lines of every series (Lyman series, Balmer series etc.) because in this theory, the motion of electrons has been assumed in circular orbits. Somehow, if assuming the motion of electrons in elliptical orbits, the expression for the frequency of spectral lines is deduced, that shall explain accurately the frequency of higher order spectral lines of every series.]

### **3. DISCUSSION OF SECOND FAULT (the wave nature of quantum is not true)**

#### **3.1 Faults in the assumption of wave nature of photons and electrons**

In addition to faults [see Sec. 2.1.1(b)], there are several more very serious faults in the assumption of wave nature of photons and electrons. For example:

1. Currently, it has been assumed that  $\nu$  is the frequency of wave nature of radiation energy of photons while  $\nu$  is the frequency of spin motion of photons (for its confirmation, see Sec. 2.2). How can it be possible? Some people may argue that, according to the concept of dual nature, when the wave nature of photons comes into play, since their particle nature is disappeared, there is no problem in associating frequency  $\nu$  with their wave nature too. But this argument cannot be accepted. Because, it gives rise to the question: When the wave nature of photons comes into play and their particle nature is disappeared, is their only particle nature disappeared or photons too are disappeared? Suppose, if it is argued that the photons too are disappeared, the question arises, where do the photons go away and how? And suppose if it is argued that photons do not disappear but remain present, only their particle nature is disappeared, it can never be possible because the particle nature of any particle can never disappear as long as that

particle exists. And when the photons are not disappeared but remain present, the characteristic of their particle nature, i.e. the frequency of their spin motion should also remain present. Therefore, the above argument is ruled out.

2. Currently, the production of light effect e.g., the production of intensities of interference fringes and diffraction bands has been assumed due to the wave nature of photons. If it is true then: 1. The production of electric effect should also be assumed due to the wave nature of electrons, not due to their charge. 2. The intensities of spectral lines too should be assumed due to the wave nature of photons. Can these be assumed? If not then why is this inconsistency? Somehow, if it is assumed that the light effect is produced due to the wave nature of photons then what does happen to the radiation energy contained in photon? What role does it play? What is its significance?

### 3.2 Fault in the expression of de Broglie wavelength

If a particle, say electron of mass  $m_e$  moving with velocity  $v$  possesses wave nature and its wave length is defined as  $\lambda = h/m_e v$  (de Broglie expression), the wave should possess frequency  $f = v/\lambda = m_e v^2/h$ . If we compare this expression with eqn.  $\omega = m_e v^2/h$  [where  $\omega$ ,  $m_e$  and  $v$  respectively are the frequency of spin motion, rest mass and velocity of electron, and  $h$  is Planck's constant, see eqn. (1.2), Sec. I, Ref. 3], we find that these are exactly similar except the difference that in eqn.  $f = m_e v^2/h$ ,  $f$  is the frequency of wave nature of electron, while in eqn.  $\omega = m_e v^2/h$ ,  $\omega$  is the frequency of spin motion of electron.

The above discussion leads to conclude:

Either in expression  $\lambda = h/m_e v$ ,  $\lambda$  should not be the wavelength of electron, i.e. not the characteristic of wave nature of electron, but should be actually  $= v/\omega$ , i.e. the characteristic of particle nature of electron.



Or in expression  $\omega = m_e v^2 / h$ ,  $\omega$  should not be the frequency of spin motion of electron, i.e. not the characteristic of particle nature of electron, but should be the frequency of wave nature of electron, i.e. the characteristic of wave nature of electron.

The later conclusion cannot be true, because:

1. The spin motion of electrons has experimentally been verified while their wave nature has been speculated.

2. There is evidence to confirm that  $\omega$  is frequency of spin motion of electrons (see Sec. I A, Ref. 3).

3. The speculation of wave nature of electrons gives rise to numerous such fundamental questions which can neither be contradicted nor can be overruled nor ignored [see Sects. 2.1.1(b) and 3.1].

Then obviously, the first conclusion should be true, i.e. in expression  $\lambda = h / m_e v$ ,  $\lambda$  should not be the characteristic of wave nature of electron, but should be the characteristic of its particle nature.

### **3.3 Faults in the explanations of the phenomena of interference and diffraction of photons and electrons accounting their wave nature**

Currently, it is assumed that, as shown in Fig. 1(a), the wave fronts of radiation energy coming from two slits  $S'$  and  $S''$  superpose, in accordance as at points where superposition happens to be constructive or destructive, respectively bright and dark fringes are obtained. But it cannot be possible, because:

1. It has been assumed that the radiation energy of photons possesses electromagnetic wave nature where occur two types of vibrations, of electric field and magnetic field in two planes mutually perpendicular to each other, Fig. 1(b), not one type of vibration and in one plane, as shown in Fig. 1(a).

2. Somehow if the vibration of one field, say magnetic field is assumed to be negligible, even then the superposition of wave fronts and bright and dark fringes, as shown in Fig. 1(a), cannot be obtained. Because:

i. If we assume the superposition of wave fronts as shown in Fig. 1(a), number of fringes may be found even outside of both the ends of the geometrical shadow of the width between the two edges  $E_1'$  and  $E_1''$ , whereas all the fringes should be found inside the geometrical shadow, as e.g., fringes are found inside the geometrical shadow X Y, Figs. 3(a) and 5(a).

ii. According to the current interpretation of photon (see Sec. 2.1), the radiation energy, which possesses wave nature, is emitted from the orbiting electrons in discrete form (i.e. in the form of photons), not in continuous form. The production of wave fronts in the radiation energy and their superposition, as shown in Fig. 1(a), can be possible if the radiation energy is emitted in the continuous form.

The waves of photons can of course superpose and as the consequence of their superposition, the interference fringes may be obtained. But it can be possible only if the photons of every set, e.g.  $P_1'$  and  $P_n''$ ,  $P_2'$  and  $P_{n-1}''$ , ....., when fall on the screen coming from the slits  $S'$  and  $S''$  deviating round their respective edges  $E_1'$  and  $E_1''$ , Fig 1(c), during their fall on the screen, their waves are parallel to each other and their vibrations are in the same plane, as shown in Fig. 1(d). But, since the two photons of every set are coming from two different slits  $S'$  and  $S''$ , their waves cannot be parallel to each other. Their vibrations too cannot always be in the same plane unless the light coming from the source is plane polarized. In the experimental setups, the light coming from the source does not happen to be plane polarized, but despite that the sustained interference fringes are obtained. It means the interference fringes are not obtained due to the superposition of waves of photons too.

The superposition of waves of photons gives rise to several questions too. For example:

a). What does happen to photons during superposition of their waves? Do they (photons) ever collide with each other or not? If not, why and how? Can it happen to be possible that they never collide? And if collide then what does happen? Are the fringes whether produced or not?

b). How the photons  $P_1'$  and  $P_n''$ ,  $P_2'$  and  $P_{n-1}''$ , ..... are deviated and at different angles from their respective paths turning round the edges  $E_1'$  and  $E_1''$  of slits  $S'$  and  $S''$  respectively as shown in Fig. 1(c). Suppose if it is argued that the diffraction (i.e. the turning round the edges or corners of the obstacle) is a characteristic of wave motion, and since the photons are the quanta of radiation energy possessing wave nature, the photons  $P_1'$  and  $P_n''$ ,  $P_2'$  and  $P_{n-1}''$ , ..... are deviated from their paths at different angles turning round the edges  $E_1'$  and  $E_1''$  of slits  $S'$  and  $S''$  respectively, this argument cannot be accepted unless a clear and complete explanation is found in the texts of diffraction as to how physically the waves are deviated turning round the edges of obstacles, and how and due to which reason or characteristic(s) of waves, the angles of their deviation vary. But no such explanation is found anywhere.

However, if we assume the occurrence of the phenomena of interference and diffraction of photons due to their particle nature, very clear and complete explanation is obtained: 1. How photons are deviated turning round the edges of obstacles, why and how their angle of deviation varies (see Sec. 4.1). 2. How bright fringes of equal width and intensity are obtained in the phenomenon of interference (see Sec. 4.2). 3. How diffraction bands of varying width and intensity are obtained in the phenomenon of diffraction (see Sec. 4.3).

### **3.4 Confirmation of that the assumption of wave nature of photons and electrons is not true**

In order to explain the phenomenon of interference, it is assumed that due to superposition of waves of photons/electrons, in accordance as the superposition happens to be constructive or destructive, bright and dark fringes (black and white in the case of electrons) are obtained on the screen/photographic plate. But, if the fringes are obtained on the screen/photographic plate due to the superposition of waves of photons/electrons, then the screen can be used in the case of electrons too to obtain fringes, because the wave nature has been associated with both photon and electron. Why is screen not being used in the case of electrons? Suppose, if it is argued that screen or photographic plate is being used in accordance as the nature of wave of the particle is, and since the waves of photons produce illumination effect and the waves of electrons do not, the screen is being used in the case of photons. But this argument cannot be accepted. Because if the waves of photons produce illumination effect, then if a source of radio waves or microwaves (which emit electromagnetic waves) is somehow enclosed in a chamber made of screen, illumination should be found on the screen of the chamber, similarly as if a source of light is enclosed in that chamber, illumination shall be found on the screen of the chamber. But will/can the illumination be found on the screen of the chamber if a source of radio waves or microwaves is enclosed in that? No. It leads to conclude that either the photons do not possess electromagnetic wave nature or the illumination of bright fringes is not being obtained due to the wave nature of photons. Since the photons cannot have any wave nature other than electromagnetic wave nature, and due to electromagnetic wave nature no illumination is obtained, the illumination of bright fringes is not being obtained due to the wave nature of photons but obtained due to photons themselves.

The use of photographic plate in the case of electrons too leads to conclude that the interference fringes are obtained due to electrons, not due to their wave nature. Because, the fringes on the photographic plate are obtained due to the effect of charge, and the charge is possessed by electrons. Their waves produce no effect of charge.

**4. DISCUSSION OF THIRD FAULT** (the phenomena of interference and diffraction of photons and electrons, to explain which the wave nature of photons and electrons has been assumed, take place due to the particle nature of photons and electrons, not due to their wave nature)

**4.1 Explanation of why and how photons are deviated, and at different angles from their paths turning round the edges of obstacles in their geometrical shadows**

We can observe that when a ball B suppose moving with velocity  $v$  parallel to the plane of paper gets struck at point 1 or 2 or 3 or .....located on its surface, Fig. 2(a), with the straight edge P of an obstacle PQ perpendicular to the plane of the paper, the ball is deviated from its path rolling round the edge of the obstacle in the geometrical shadow along the broken or dotted line paths, Fig. 2(b, c, d), depending upon:

1. At which point 1 or 2 or 3 or .... the ball gets struck by the edge of obstacle;
2. Momentum of ball with which the ball strikes with the edge of obstacle.

Suppose the ball is deviated along the broken line paths getting struck at points 1, 2, 3 located on its surface with the edge of obstacle, as shown respectively in Figs. 2(b), 2(c), 2(d). If the momentum of ball is increased from  $p$  to  $p'$ , the ball is now deviated along the dotted line paths, i.e. the angle of deviation is now increased. The angle of deviation of ball goes on increasing as the point at which it gets struck by the edge of obstacle shifts from 1 to 2, 3, 4, ....., n, or as the momentum of ball increases.

Similarly, when photons are deviated rolling round the edges  $E_1'$  and  $E_1''$  of slits  $S'$  and  $S''$  respectively in their respective geometrical shadows in interference

phenomenon, Fig. 3(a), or round a straight edge, Fig. 4, or round a thin wire, Fig. 5(a and b), etc. in their geometrical shadow in diffraction phenomenon, they are struck at their points 1 or 2 or 3 or.....and accordingly they are deviated at different angles. [Due to extremely small size of photons, the present concept of striking of the edge of obstacle at different points 1, 2, 3, .....on the surface of photons is very hard to accept/believe. But it cannot be ruled out. Because: 1. In the current explanation of the phenomena of diffraction and interference of photons, if the sharpness of the edges of slits and obstacles used in the experimental setups to demonstrate the phenomena of interference and diffraction can be assumed to be of the order of the wavelength of waves associated with photons, the present concept too can be taken. 2. In Compton's scattering, the photons and electrons are scattered at different angles. It can be possible only if they collide with each other at different points on their surface. (The photons and electrons can be scattered at different angles if they collide with each other at different angles too.) If in Compton's scattering experiment, photons and electrons can collide with each other at different points on their surface, the present concept of striking of the edge of obstacle at different points 1, 2, 3, .....on the surface of photons too can be possible.]

If the source of light is not monochromatic, e.g. of white light, there occur photons of seven different frequencies  $\nu_1, \nu_2, \nu_3, \dots$  and hence of seven different momentum  $p_1 (= h\nu_1/c), p_2 (= h\nu_2/c), p_3 (= h\nu_3/c), \dots$ . Then the angles of deviation of photons from their respective paths depend also upon their momentum. And consequently, suppose if a photon of momentum  $p_1$  is deviated by an angle  $\theta$  getting struck at point 4 on its surface, a photon of momentum  $p_2$  or  $p_3$  or  $p_4$  or ..... (where  $p_1 < p_2 < p_3 < p_4 \dots$ ) may also be deviated by the same angle  $\theta$  getting struck at point 1 or 2 or 3 on its surface. Then obviously they (i.e. two photons of two different colors)

overlap on each other when fall on some screen. Suppose if the photon of momentum  $p_2$  or  $p_3$  or  $p_4$  or ..... is not being deviated exactly by angle  $\theta$  but by an angle  $\theta'$  ( $<$  or  $>$   $\theta$ ), the photons of momentum  $p_1$  and of  $p_2$  or  $p_3$  or  $p_4$  or ..... shall not overlap completely but overlap partially. Consequently, when a source of white light is used, e.g., in the phenomenon of interference, there occur overlapping of photons and hence no clear and distinct fringes of different colors are obtained (for detail, see Sec. 4.2.2).

#### **4.1.1 Explanation of deviation of photons in direction opposite to the direction of geometrical shadow region**

In addition to deviation of some of photons of the beam in the geometrical shadows of the obstacles, some photons of the beam, say  $P_1, P_2, P_3, \dots$  are deviated in opposite direction (i.e. opposite to the direction of geometrical shadow) too at different angles. It happens due to getting struck of the latter photons at different points on their surface with the former photons deviating in the geometrical shadow getting struck at points 1, 2, 3, ..... on their surface by the edge of the obstacle, similarly as balls  $B_1, B_2, B_3$  are deviated in opposite direction getting struck at their surface with the ball  $B$  deviating in the geometrical shadow at different angles getting struck at points 1, 2, 3, ..... on its surface by the edge of the obstacle, Figs. 2(b, c, d). Because, when the photons are deviated in the geometrical shadow rolling round the edge of obstacle, during the course of their rolling, their surface may collide with the surface of passing by photons. When the collisions take place, the passing by photons are deviated in direction opposite to the geometrical shadow. The angle of deviation of the passing by photon depends upon which portion of it strikes with which portion of the rolling photon and at which instant of its rolling process, as shown in Figs 2(b, c, d)..

#### **4.2 Explanation of the phenomenon of interference**

#### 4.2.1 When the source of light is monochromatic

The photons coming from slit  $S$  when fall at the edge  $E_1'$  of slit  $S'$ , they are deviated in the geometrical shadow rolling round the edge  $E_1'$  in accordance as at which point 1, 2, 3,.... on their surface the edge  $E_1'$  strikes with them [as has been explained in Sec. 4.1 and shown in Fig. 2 (b, c and d)]. Similarly, the photons coming from the slit  $S$  when fall at the edge  $E_1''$  of slit  $S''$ , they too are deviated in the geometrical shadow rolling round the edge  $E_1''$  in accordance as at which point 1, 2, 3,.... on their surface the edge  $E_1''$  strikes with them. The photons  $P_1', P_2', P_3', P_4', P_5', P_6'$  deviated rolling round the edge  $E_1'$  when fall on the screen C at points  $Q_1, Q_2, Q_3, \dots$  respectively colliding respectively with photons  $P_6'', P_5'', P_4'', P_3'', P_2'', P_1''$  deviated rolling round the edge  $E_1''$ , at every point  $Q_1, Q_2, Q_3, \dots$  on the screen, a bright fringe is obtained, as shown in Fig. 3(a). If the photons, e.g.,  $P_2'$  and  $P_5''$  would have not fallen at point  $Q_2$  on the screen colliding with each other, photon  $P_2'$  had fallen at point somewhere in between  $Q_2$  and  $Q_3$ , and photon  $P_5''$  at point somewhere in between  $Q_1$  and  $Q_2$ . Since the photons  $P_2'$  and  $P_5''$  instead of falling respectively at point somewhere in between  $Q_2$  and  $Q_3$  and at point somewhere in between  $Q_1$  and  $Q_2$ , fall together at point  $Q_2$ , a bright fringe is obtained at point  $Q_2$  and blank spaces are obtained in between  $Q_2$  and  $Q_3$  and in between  $Q_1$  and  $Q_2$ . These blank spaces act as the dark fringes. Similarly, at points  $Q_1, Q_3, \dots$ , also bright fringes are obtained, and the blank spaces in between every two points, e.g., in between  $Q_1$  and  $Q_2$ , in between  $Q_3$  and  $Q_4$  and so on, act as the dark fringes.

#### 4.2.2 When the source of light is non-monochromatic, say of white light



When a source of white light is used, the photons of seven different colors, i.e. photons of seven different frequencies ( $\nu_1, \nu_2, \dots$ ) and hence of seven different momentum  $p_1 (=h\nu_1/c)$ ,  $p_2 (=h\nu_2/c)$ , ..... are emitted from the source.

Since the angle of deviation of photons depends upon their momentum too, and as their momentum increases, their angle of deviation increases (see Sec. 4.1), therefore, when at point say Q on the screen, where suppose a photon of momentum  $p_1$ , turning round the edge  $E_1'$  getting struck at point say 3 on its surface, form a bright fringe colliding with a photon of same momentum  $p_1$  coming, turning round the edge  $E_1''$ , at the same point Q or just forward or backward to it, a photon of momentum  $p_2$  (where  $p_2 > p_1$ ), turning round the edge  $E_1'$  getting struck at point say 2 on its surface may also form a bright fringe colliding with a photon of same momentum  $p_2$  coming, turning round the edge  $E_1''$ . When two bright fringes are formed at the same point by the photons of two different momentum, i.e., of two different colors, they overlap. If they are not formed exactly at the same point but are formed at two different points, little shifted from each other, they may not overlap or overlap partially. The bright fringe due to photons of momentum  $p_2$  may be formed in the blank space between two bright fringes formed due to the photons of momentum  $p_1$  too. Similarly, the fringes due to the photons of momentum  $p_3$  may also be formed completely or partially over the fringes formed due to photons of momentum  $p_1$  or  $p_2$  and so on. So, due to overlapping of fringes of different colors, there are obtained no clear and distinct fringes of different colors, instead obtained fringes of mixed colors.

#### **4.2.3 Mathematical treatment of interference phenomenon**

To obtain situation such that photons  $P_1', P_2', P_3', P_4', P_5', P_6'$  colliding respectively with photons  $P_6'', P_5'', P_4'', P_3'', P_2'', P_1''$  may give rise to bright fringes on the screen C, as shown in Fig. 3(a), it is necessary that the group of photons  $P_1', P_2', P_3', P_4', P_5', P_6'$  and the group of photons  $P_6'', P_5'', P_4'', P_3'', P_2'', P_1''$  should be deviated by the angles as shown in Fig. 4(a) rolling respectively round the edges  $E_1'$  and  $E_1''$ . Such situation is obtained by varying the distance D, Fig. 3(b), between the plane of two slits  $S', S''$  and the plane of screen C, shifting screen C backward or forward as the situation demands for a given distance d between two slits  $S'$  and  $S''$ . Because, photons incident upon the edges  $E_1'$  and  $E_1''$  not normally but incident making some angle with the normal on the surface of edges [as appear from Fig. 3(a and b)], consequently as distance d between slits  $S'$  and  $S''$  increases, the region of geometrical shadow on the screen (i.e. XY) and the angle of incidence (i.e. angle between normal and the direction of incidence of photon on the surface of slit) of photons increase. Due to increase in the angles of incidence of photons, the angles of their deviation in the geometrical shadow region of the width between edges  $E_1'$  and  $E_1''$  are decreased. Therefore, photons  $P_6'', P_5'', P_4'', P_3'', P_2'', P_1''$  fail to reach up to photons  $P_1', P_2', P_3', P_4', P_5', P_6'$  respectively and give bright fringes colliding and falling together at points  $Q_1, Q_2, Q_3, Q_4, Q_5, Q_6$  respectively. And hence to obtain situation such that photons deviated from the edges  $E_1'$  and  $E_1''$  colliding and falling on the screen may give bright fringes, as shown in Fig. 3(a), for every distance d between the edges  $E_1'$  and  $E_1''$ , the distance D is searched out by shifting the screen C backward or forward as the situation demands. If increase in the distance d is continued, a stage comes when even the maximum deviated photon from the

edge  $E_1'$  fails to reach up to the maximum deviated photon from the edge  $E_1''$ . Then no fringe is obtained by varying  $D$  to any value.

So, the situation, as shown in Figs. 3(a and b), is obtained for a particular set of  $d$  and  $D$ . And if positions of fringes, e.g.  $Q_1, Q_2, Q_3, \dots$  are determined, these should depend upon the combination of  $d$  and  $D$ . If we look at the existing determination of positions of fringes for a particular set of  $d$  and  $D$ , we find exactly the same thing, e.g.:

$$\begin{aligned} x \text{ (position of fringe at } Q_1) &= \frac{D \times \text{path difference between photons } P_1' \text{ and } P_6''}{d} \\ &= \frac{D c \times \text{phase difference between photons } P_1' \text{ and } P_6''}{2 \pi \nu d} \end{aligned}$$

because phase difference =  $(2 \pi \times \text{path difference}) / \lambda = (2 \pi \times \text{path difference}) \times \nu / c$ .

But in the above expression,  $\nu$  is not the frequency of wave nature of photon. It ( $\nu$ ) is in fact the frequency of spin motion of photon. And  $\lambda$  is not the wavelength of wave nature of photons. Because  $\lambda$  is defined as  $\lambda = c/\nu$ , where  $c$  (velocity of light) is constant and  $\nu$  is characteristic of particle nature of photon, and hence  $\lambda$  should also be the characteristic of particle nature of photons. Therefore, the phase difference is between the frequencies of spin motion of photons, not between the wavelengths of the wave nature of photons.

The photons  $P_1', P_2', P_3', P_4', P_5', P_6'$  can collide respectively with photons  $P_6'', P_5'', P_4'', P_3'', P_2'', P_1''$  and give bright fringes falling respectively at points  $Q_1, Q_2, Q_3, Q_4, Q_5, Q_6$  on the screen if

$$\text{the path difference between the colliding photons} = 2n \frac{\lambda}{2} = 2n \frac{c}{2\nu} = n \frac{c}{\nu}$$

or the phase difference between the colliding photons =  $n \times 2 \pi$

where  $n$  is a whole number and characterizes a particular bright fringe.

### **4.3 Explanation of the phenomenon of diffraction**

#### **4.3.1 Diffraction at straight edge**

Let A, Fig. 4, be a sharp and straight edge of an opaque obstacle AB and S a narrow rectangular slit both parallel to each other and perpendicular to the plane of the paper. Let the slit be illuminated by a monochromatic source of light of frequency  $\nu$ , C is screen placed perpendicular to the plane of the paper at O.

##### **4.3.1(a) Explanation of how the intensity falls off continuously and rapidly as we move into the geometrical shadow until complete darkness is reached**

Out of photons coming from the source, some photons are deviated in the geometrical shadow of the straight edge at different angles accordingly as they get struck by the straight edge at points 1, 2, 3,..... located on their surface. In the beginning of the geometrical shadow, the distance between two consecutive deviated photons falling on the screen happens to be very-very small, and as we proceed forward into the geometrical shadow (i.e. downward from the point O on the screen), the distance between two consecutive deviated photons goes on increasing. (The reason behind it shall be given latter on in my paper explaining exclusively the phenomena of interference and diffraction. Presently, it is beyond the scope of this paper.) Consequently photons fall on the screen partially overlapping on each other in the beginning of the geometrical shadow, and as we proceed forward into the geometrical shadow, the percentage of overlapping goes on reducing and finally they become separated from each other as shown in Fig. 4. As the density of crowd of photons varies, accordingly the intensity varies in the geometrical shadow, Fig. 4.

##### **4.3.1(b) Explanation of how a system of bright and dark bands are obtained outside the geometrical shadow**

Above the limit of geometrical shadow of the straight edge on the screen, Fig. 4, the photons, coming directly from the source and those which are deviated in direction opposite to the direction of geometrical shadow region, like photons  $P_1, P_2, P_3, \dots$  (see Sec. 4.1.1), fall. Some of the deviated photons, before falling on the screen, may collide with some passing by photons coming directly from the source and they fall together on the screen moving in their resultant direction obtained after their collisions. Before falling on the screen, these groups of photons (formed due to collisions between the deviated and directly coming photons) may collide with some other passing by photons too and fall together on the screen moving in the resultant direction obtained after their collisions. This process may go on and the photons may fall on the screen in groups of 2, 3, 4, ..... photons.

So, due to deviations of photons coming from the source, they do not fall on the screen distributed uniformly, but fall on the screen distributed in number of groups, each group separated by a gap. How many photons fall in different groups and how much widely the photons are distributed in them (groups), accordingly the intensity and the width of different groups are obtained. And how the photons are distributed in different portions of different groups – little separated from each other or touching each other or overlapping (partially or densely or very densely) on each other, accordingly intensity of different portions of different groups are obtained.

The deviated photons while colliding with the passing by photons to fall together on the screen, they do not collide with any arbitrary X, Y, Z passing by photons but collide only with those photons which satisfy some condition depending on their path or phase difference. That condition is to be determined.

**4.3.1(b1) Explanation of how photons fall on the screen in number of groups and the density of crowd of photons in different groups and their (groups) width vary**

During the rolling of every photon about the straight edge, as shown in Figs. 2(b, c, d), colliding with this not only one but probably several passing by photons are deviated by different angles from their respective paths depending upon how many passing by photons collide with the rolling photon and at which instants of its rolling process. Supposing, during the rolling process of photon getting struck at point 1 on its surface, a group of  $m_1$  photons  $P_{11}, P_{12}, \dots, P_{1m_1}$  are deviated respectively by angles  $\theta_{11}, \theta_{12}, \dots, \theta_{1m_1}$  from their path, where  $\theta_{11} > \theta_{12} > \dots > \theta_{1m_1}$ . During the rolling process of photon getting struck at point 2 on its surface, a group of  $m_2$  photons  $P_{21}, P_{22}, \dots, P_{2m_2}$  are deviated respectively by angles  $\theta_{21}, \theta_{22}, \dots, \theta_{2m_2}$  from their path, where  $\theta_{21} > \theta_{22} > \dots > \theta_{2m_2}$ . And similarly, during the rolling process of photon getting struck at the last point (i.e. n) on its surface, a group of  $m_n$  photons  $P_{n1}, P_{n2}, \dots, P_{nm_n}$  are deviated respectively by angles  $\theta_{n1}, \theta_{n2}, \dots, \theta_{nm_n}$  from their path, where  $\theta_{n1} > \theta_{n2} > \dots > \theta_{nm_n}$ .

During the rolling process of photon getting struck at first (i.e. 1) point on its surface, since the height of projection of the body of photon happens to be maximum [as we can see from Fig.2(b)] the angles of group  $\theta_{11}, \theta_{12}, \dots, \theta_{1m_1}$  are happened to be maximum but the number of photons deviated in this group probably happens to be minimum. During the rolling process of photon getting struck at last (i.e. n) point on its surface, since the height of projection of the body of photon happens to be lowest, the angles of group  $\theta_{n1}, \theta_{n2}, \dots, \theta_{nm_n}$  are happened to be minimum but the number of photons deviated in this group happens to be maximum. And, therefore, the photons deviated by angles  $\theta_{11}, \theta_{12}, \dots, \theta_{1m_1}$ , when deviating the passing by photons colliding with them fall together on the screen, the last group of photons on the screen is obtained. The density of crowd of photons and the width of spreading of photons in this group are

happened to be least. Similarly happens with all the groups of photons deviated respectively by angles  $(\theta_{21}, \theta_{22}, \dots, \theta_{2m_2}), (\theta_{31}, \theta_{32}, \dots, \theta_{3m_3}), \dots, (\theta_{n1}, \theta_{n2}, \dots, \theta_{nm_n})$ .

The photons deviated by angles  $\theta_{n1}, \theta_{n2}, \dots, \theta_{nm_n}$ , when deviating the passing by photons colliding with them fall together on the screen, the first group of photons on the screen is obtained. And the density of crowd of photons and the width of spreading of photons in this group are happened to be the maximum.

#### **4.3.1(b2) Explanation of how each group of photons on the screen is separated by a blank space (gap)**

The angles of deviation of groups  $(\theta_{21}, \theta_{22}, \dots, \theta_{2m_2}), (\theta_{31}, \theta_{32}, \dots, \theta_{3m_3}), \dots, (\theta_{n1}, \theta_{n2}, \dots, \theta_{nm_n})$  do not occur in continuous order. After every group of angles, there occurs a gap. And hence no deviated photons fall in these gaps. The photons coming directly from the source too are not being let to fall on the screen in these gaps. They (directly coming photons) are being deviated along with the deviated photons and fall on the screen along with them in their groups. But as we move upward from point O on the screen, since the number of photons deviated in 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, ..... groups goes on reducing continuously, very few number of directly coming photons, say  $l_1, l_2, l_3, \dots$  (in increasing order) are being left un-deviated and they fall on the screen in the gaps between the two groups. Consequently, the darkness of gaps goes on reducing accordingly as their order increases.

#### **4.3.2 Diffraction at a narrow wire**

Let AB be a narrow wire of thickness  $d$ , held parallel to narrow rectangular slit S placed perpendicular to the plane of the paper, Fig. 5(a and b).

##### **4.3.2(a) When the wire is thin**

Above X and below Y on both sides of the limits of the geometrical shadow, the diffraction bands of decreasing intensity and width are obtained similarly as diffraction bands of decreasing intensity and width are obtained above the limit of the geometrical shadow of a straight edge, discussed in Sec. 4.3.1(b) and shown in Fig. 4.

In the geometrical shadows of both, the upper and the lower ends of the thickness  $d$  of the wire, the photons coming from the source are distributed in the same manner as are distributed in the geometrical shadow of the straight edge, discussed in Sec. 4.3.1(a) and shown in see Fig. 4. If the wire is thin, out of photons deviated in the geometrical shadow of the upper end of the thickness of wire, few photons, which are not overlapping or touching each other but are little separated from each other, become able to reach and collide with some similar photons which are not overlapping or touching each other but are little separated from each other in the geometrical shadow of the lower end of the thickness of wire. After collisions, they fall on the screen and give rise to bright interference fringes, Fig. 5(a), similarly as interference fringes are obtained, discussed in Sec. 4.2.1.

#### **4.3.2(b) When the wire is thick**

If the thickness of wire is increased, a stage comes when, say the thickness of wire is increased to  $d'$ , Fig. 5(b), even the maximum deviated photon of the geometrical shadow of the upper end of the thickness of wire fails to reach and collide with the maximum deviated photon of the geometrical shadow of the lower end of the thickness of the wire. Then no fringes are obtained on the screen. There are obtained continuously and rapidly falling intensities in the geometrical shadows of both the ends of wire, Fig. 5(b), as continuously and rapidly falling intensity is obtained in the geometrical shadow of straight edge, Fig. 4

#### **4.3.3 Diffraction at a single slit**



The case of diffraction at a single slit is equivalent to diffraction at two straight edges  $E_1$  and  $E_2$  placed in the same plane parallel and facing to each other. In this case of diffraction, photons deviated in different groups of angles by photons rolling round the edge  $E_1$  [as has been described in Sec. 4.3.1(b1)] when, colliding and deviating the passing by photons (coming directly from the source) along with them, move onwards to fall on the screen, on their way, they collide with photons, coming similarly from the opposite side to fall on the screen, i.e. photons coming, getting deviated in different groups of angles by photons rolling round the edge  $E_2$  [as has been described in Sec. 4.3.1(b1)] and then colliding and deviating the passing by photons (coming directly from the source) along with them. Due to their collisions on their way, now when they fall on the screen, their distribution on the screen is being changed. In the centre of the screen (or can say, in the centre of edges  $E_1$  and  $E_2$ ), very large number of photons fall, i.e. the density of crowd of photons happens to be very high, and on both the sides of it, the density of crowd of photons symmetrically falls off rapidly. Apart from this central group, the photons are distributed in several groups also symmetrically on both the sides of the central group. These groups are obtained probably due to falling of: 1. Photons which are left from collision on their way and falling in the central group; and 2. Photons which do not become able to reach in the centre, but before that they fall on the screen. The density of crowd of photons and the width of their spreading in different groups go on reducing on both sides of the central group.

As the density of crowd of photons in different groups, and the density of crowd of photons at different places of different groups vary; accordingly, the intensity of different groups and the intensity of their different portions vary. And as the width of spreading of photons in different groups varies, accordingly the width of different groups varies.

The blank spaces (i.e. gaps) of continuously decreasing darkness between every two groups are obtained accordingly as has been described in Sec. 4.3.1(b2).

**NOTE:** The detail explanation of the phenomena of interference and diffraction, their mathematical treatments etc. are beyond the scope of the present paper. These shall be given sometimes later on.

## **5. IMPORTANCE OF THE PRESENT QUANTUM THEORY**

The present quantum theory enables to explain all the phenomena/events related with quanta (i.e. photons, electrons, protons, neutrons etc.), their structures and properties, structures and properties of systems constituted by them. For example: 1. Spectroscopic phenomena (see Sec. 4.1.1, Ref. 5). 2. Quantum mechanical phenomena (see Sec. 4.1.2, Ref. 5). 3. Phenomena of interference and diffraction of photons and electrons (see Sec. 3). 4. Relativistic phenomena (see Sec. 4.1.4, Ref. 5). 5. Phenomenon of electromagnetism and the related properties (see Sec. 4.2.1, Ref. 5). 6. Phenomenon of superconductivity and the related properties and effects (see Sec. 4.2.2, Ref. 5). 7. Nuclear phenomena, structures and properties of neutrons, deuterons, alpha particles nuclei (see Sec. 4.2.3, Ref. 5). All these happen because the present quantum theory is based on the experimentally verified true characteristic of quanta, i.e. their spin motion, not on their speculated characteristic of wave nature. .

In the current quantum theory (i.e. the quantum wave theory), though no account of spin motion of quanta has been taken, but if we investigate the explanations of different phenomena given applying the current quantum theory, we find that all the terms used in these explanations are actually the characteristics of particle nature of quanta, not the characteristics of their wave nature. In the current quantum theory, they (terms) have been misinterpreted, e.g.:

1. The term  $\nu$ , interpreted as the frequency of wave nature of photon in the current quantum theory, is in fact the frequency of spin motion of photons (see Sec. 2.2), i.e. the characteristic of particle nature of photons.
2. The term  $h\nu$ , interpreted as the quanta of radiation energy in the current quantum theory (see Sec. 2.1), is in fact the motional energy  $E_m$  [ $=E_k$  (kinetic energy) +  $E_s$  (spin energy)] of photon (see Sec. 2.2) which provides linear and spin motions to photon.
3. The terms  $h\nu/c$ , interpreted as the momentum of photon in the current quantum theory (see Sec. 2.1.3), is in fact the spin momentum of photon (see Sec. 2.2).
4. The de Broglie expression  $\lambda = h/m_e v$  is true, but in it, the interpretation of  $\lambda$  is not true. It ( $\lambda$ ) does not happen to be the wavelength of wave nature, i.e. not the characteristic of wave nature of matter particles. It ( $\lambda$ ) is actually the characteristic of their particle nature (see Sec. 3.2).

And consequently the current quantum theory, despite having three very basic and fundamental faults, has obtained so huge success.

## **ACKNOWLEDGEMENT**

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**FIGURE CAPTIONS**

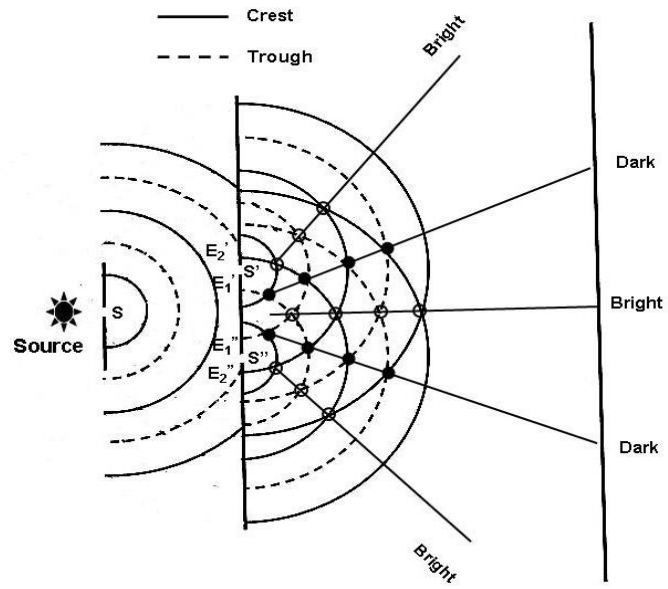
Fig. 1: (a): Interference of two wave trains; (b): Vibrations of electric and magnetic fields of electromagnetic waves during their propagation; (c): Production of bright and dark fringes due to superposition of waves of photons (photon waves and their superposition have not been shown in Fig. to avoid complication in it).

Fig. 2: (a): Ball B on the surface of which the points 0, 1, 2, 3. ..., n are located. (b, c, d): Deviation of ball B at different angles in the geometrical shadow of obstacle PQ depending upon its momentum  $p$  and  $p'$  and point 1, 2, 3 on its surface, getting struck respectively at which by the edge P of the obstacle, it is deviated; and deviation of balls  $B_1$ ,  $B_2$ ,  $B_3$  at different angles in direction opposite to the geometrical shadow getting struck by the ball B during its (ball B) rolling round the edge P of the obstacle PQ

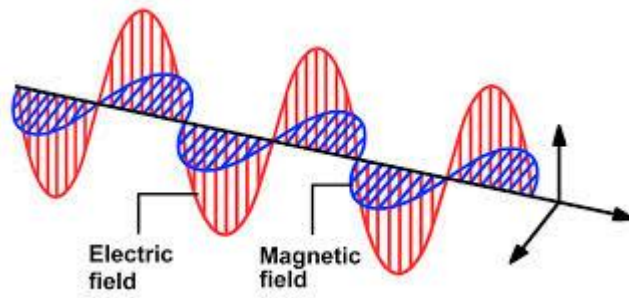
Fig. 3: Intensity distribution due to collisions of photons and their falling on the screen in interference phenomenon using two slits, e.g. in Young's experiment.

Fig. 4: Intensity distribution due to collisions of photons and their falling on the screen in diffraction at straight edge.

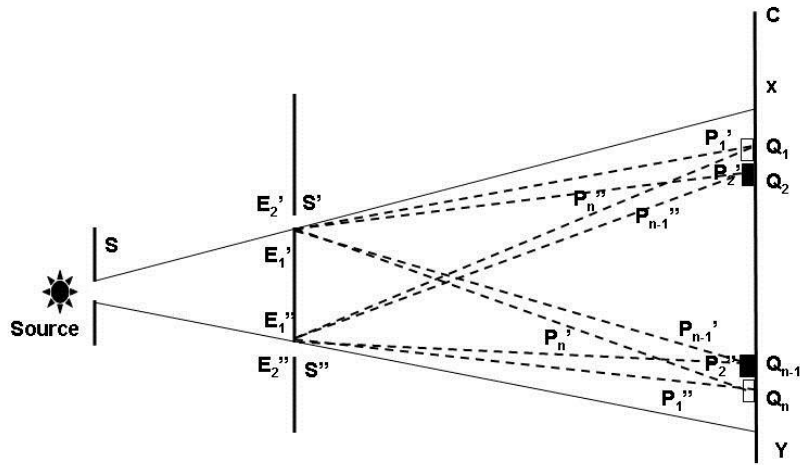
Fig. 5: Intensity distribution due to collisions of photons and their falling on the screen in diffraction at a wire: (a) When the wire is thin; (b) When the wire is thick.



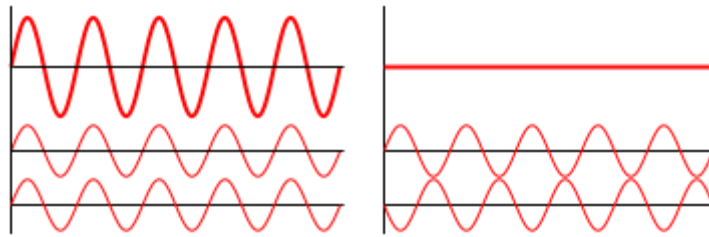
(a)



(b)

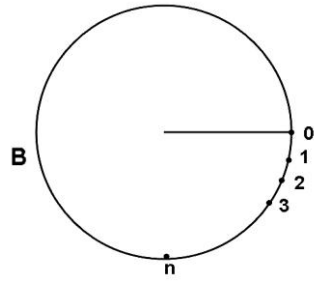


(c)

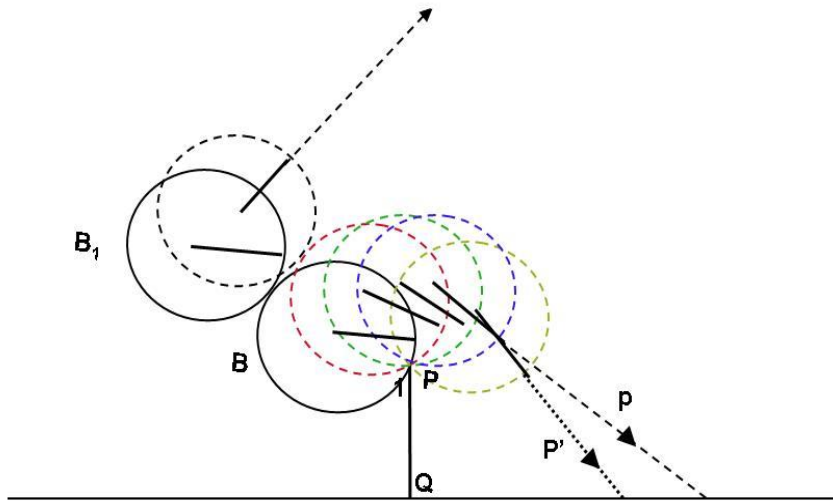


(d)

Fig. 1

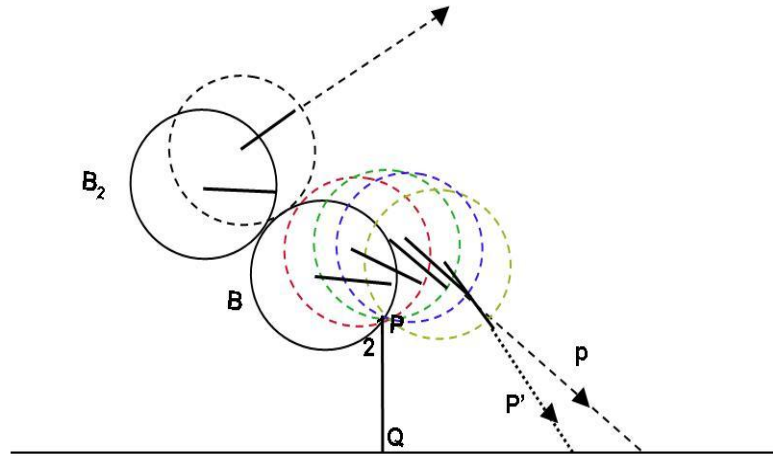


(a)

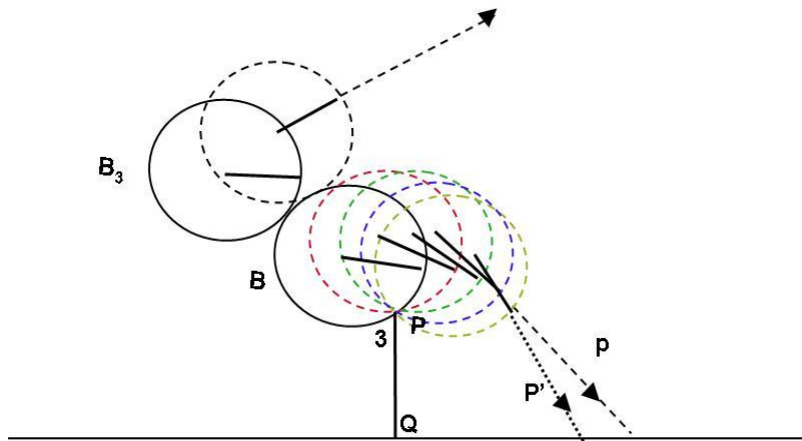


(b)



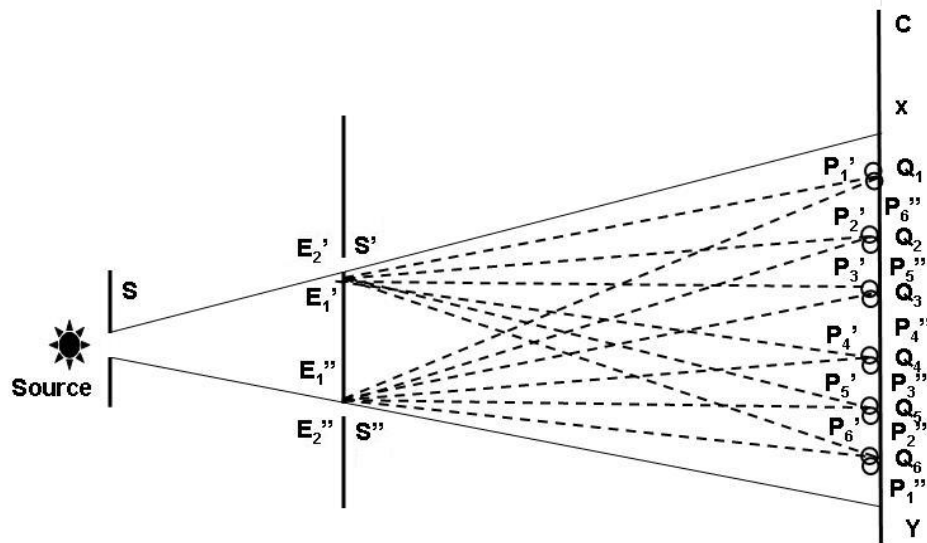


(c)

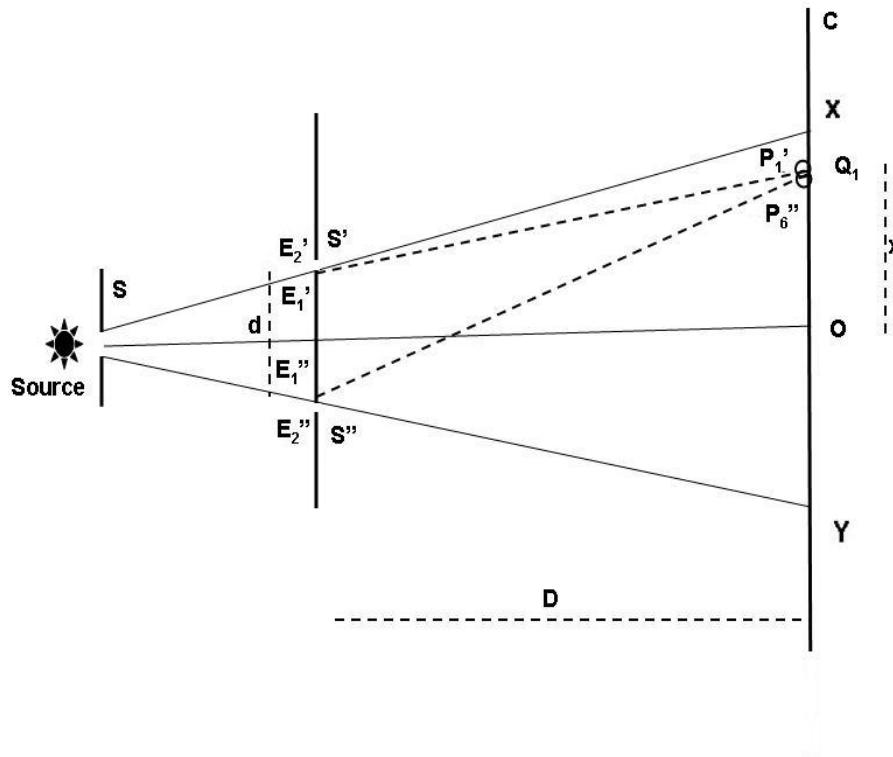


(d)

Fig. 2



(a)



(b)

Fig. 3

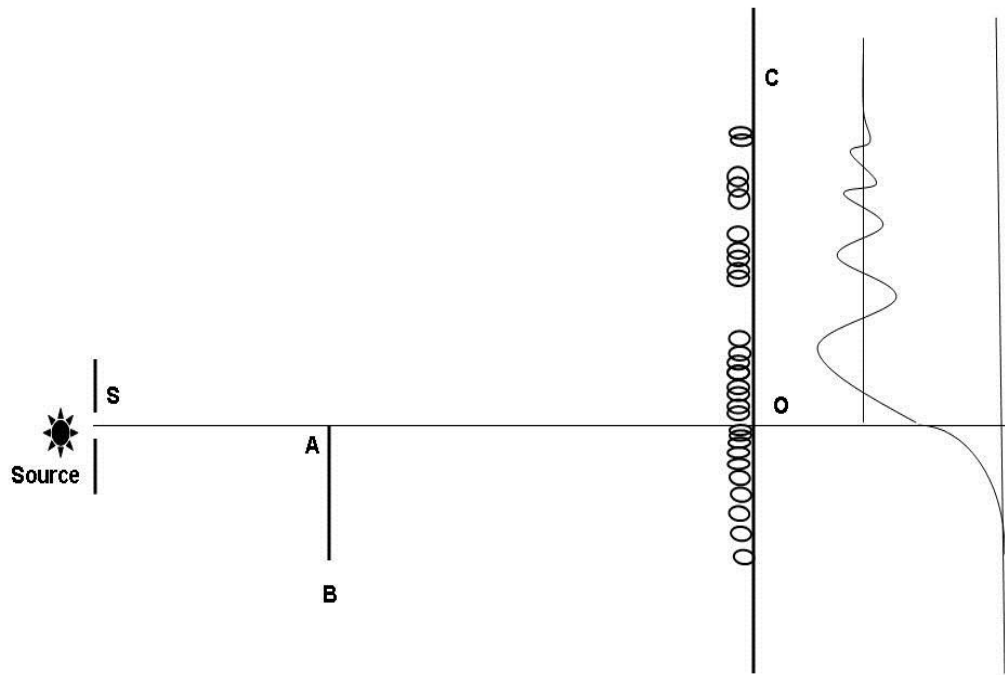
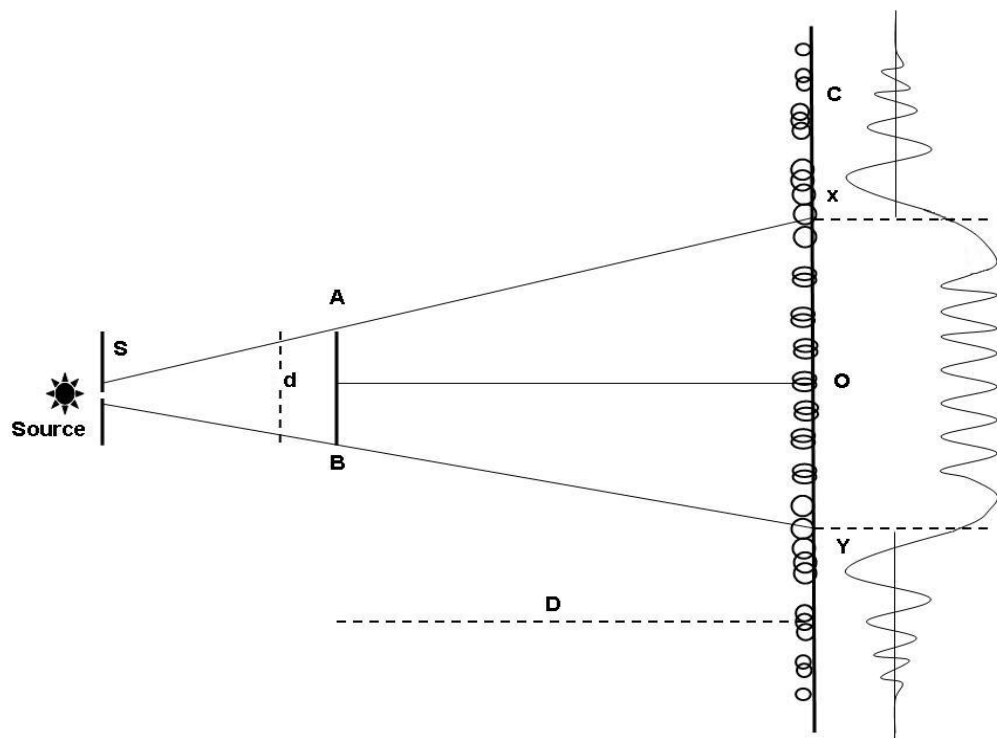
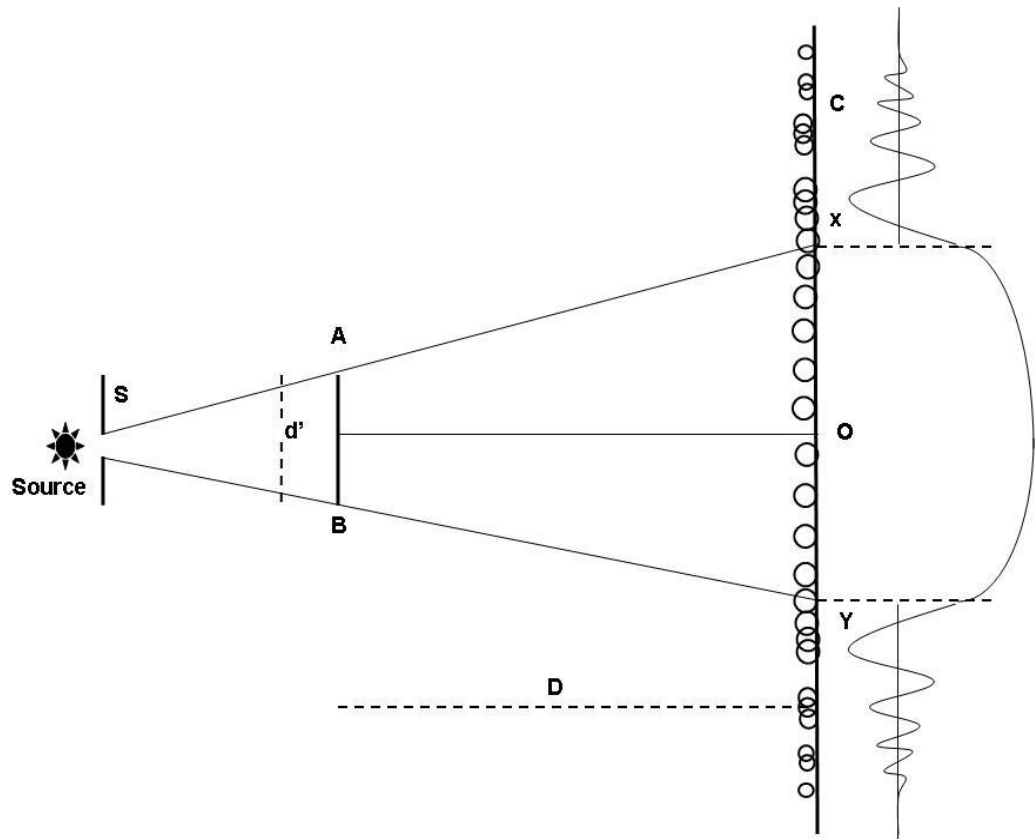


Fig. 4



(a)



(b)

Fig. 5