A NEW QUANTUM THEORY

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Presently, a new quantum theory has been proposed. It is based on the experimentally verified true characteristic: the spin motion of quanta (photons, electrons, nucleons etc.), not on the speculated wave nature of radiations of quanta. [Since the quantum mechanics is applied to electrons, nucleons etc. too, these should also be the quanta. Secondly, photons also possess spin motion which they derive from the orbiting electrons, the photons are emitted from (for its confirmation, see inside the article.)] The present quantum theory enables to give very clear and complete explanation of all the phenomena related with photons, electrons, nucleons etc, structures and properties of systems constituted by them. For example: 1. Spectroscopic phenomena; 2. Quantum mechanical phenomena; 3. Phenomena of interference and diffraction; 4. Relativistic phenomena; 5. Phenomenon of electromagnetism and the related properties generated in electron beams and current carrying rods; 6. Phenomenon of superconductivity and the related properties and effects; 7. Nuclear phenomena, structures and properties of neutrons, deuterons, alpha particles and nuclei. The speculated wave nature of radiations of quanta is not true. Then how the current quantum theory (i.e. the quantum wave theory) has succeeded to obtain so huge success, presently it has also been determined.

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1. INTRODUCTION

No doubt, the current quantum theory (i.e. the quantum wave theory) has huge success to its credit. But it has the following four very basic and fundamental faults:

1. The current interpretation of quanta 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 and importance of it, see Sects. 2.2, 2.2.1 respectively.)
2. The speculated wave nature of quanta is not true. [For faults in the speculation of their wave nature, see Sects. 2.1.1 (b) and 3.1; for faults in the expression of de Broglie wavelength, see 3.2. And for confirmation of that the speculation of their wave nature is not true, see Sec. 3.3.)
3. The phenomena of interference and diffraction of photons and electrons, to explain which the wave nature of photons and electrons has been speculated, they do not take place due to the characteristic of wave nature of photons and electrons (for confirmation of its truth, see Sec. 4.1), but take place due to the characteristic of their spin motion (how these phenomena take place due to the characteristic of their spin motion, see Sects. 4.2.1, 4.2.2, 4.2.3)
4. The account of spin motion of quanta though has been taken in some cases, e.g. in their spin quantum number and spin magnetic moment (μ_s), but the account of energy corresponding to their spin motion has not been taken anywhere, even in energy E, defined as total energy of particle in Schrodinger wave equation too.

Having four such very basic and fundamental faults, the quantum wave theory cannot be true. And hence, it 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, it has also been determined as to how despite having four such very basic and fundamental faults the quantum wave theory has obtained so huge success (see Sec. 5).

The present quantum theory is based on the experimentally verified true characteristic: spin motion of quanta (see Sec. 2.2). It enables to give very clear and complete explanation of all the phenomena related with photons, electrons, nucleons etc, structures and properties of systems constituted by them (for detail, see Sec. 2.2.1).

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

2.1 Current interpretation of quanta (photons)

According to the current interpretation of photons, photons are considered as discrete quanta of radiation energy given by $h\nu$, which involve the frequency ν 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 quanta (photons)

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, "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" has been added. But this added assumption gives rise to several very basic and fundamental questions.

If we examine 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 ν 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.

The above both the statements have number of faults and hence they give rise to several very basic and fundamental questions [see Sects. 2.1.1(a) and 2.1.1(b)].

2.1.1 (a) Faults in the first statement

The first statement is very much confusing and incomplete. It gives rise to question:

- 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 penetrating into metals in photoelectric effect etc.?

Since the photon travels with velocity c, scatters electron colliding with that in Compton scattering and ejects electron penetrating into metals in photoelectric effect etc., for photon, two things are necessary: 1. A bundle of radiation energy that provides physical existence to photon as a particle, as, e.g. a bundle of charge -e (which is actually the electric energy) that provides physical existence to electron as a particle. 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. 1.]

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

The first statement gives rise to several very fundamental questions too, e.g.:

i. Currently, it is assumed that energy $E_f - E_i$ [where E_f = K.E. (kinetic energy) + P.E. (potential energy) of the orbiting electron when that is excited, and E_i = 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? Further, how is that radiation energy emitted in the form of a bundle?

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) Faults in the 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 over there. Because when the sound is produced, a disturbance is produced in the medium and that generates waves in the medium. The waves are generated in 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 of that the assumption of wave nature of photons and electrons is not true, see Sec. 3.3.

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 to explain the motion of photons with velocity c, the phenomena of Compton scattering and photoelectric effect etc.

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

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 as particles? And if provides, how? Otherwise photons cannot collide with electrons in Compton scattering and penetrate into metals in Photoelectric effect and these phenomena cannot take place.

2. In $h\nu/c^2$, since every term h, ν and c has finite value, $h\nu/c^2$ should also be finite. Whereas if substituting in expression $m_{mov} = m_0/\sqrt{(1-\mathrm{v}^2/c^2)}$ [where m_0 and m_{mov} respectively are the rest and moving mass of 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 $h\nu/c^2$, $h\nu/c$ and $h\nu$, ν has been assumed as the frequency of wave nature of radiation energy of photon, i.e. ν is the characteristic of the 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. Then how are $h\nu/c$ and $h\nu$ applied to explain these phenomena? And most surprisingly, how do $h\nu/c$ and $h\nu$ succeed to explain these phenomena?

4. If the moving mass $h\nu/c^2$ and momentum $h\nu/c$ which depend upon the frequency ν 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 quanta

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 or stuff that provides mass = mass of proton – mass of charge +e, to proton.

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} ($\approx 3.38\times 10^{-36} Kg$) to it. [For mathematical proof of $m_{ph} \approx 3.38\times 10^{-36} Kg$, see Sec. IV B, Ref. 1.]

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. 1.

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), the moving mass (m_{mov}) of photon becomes infinite according to expression $m_{mov} = m_0 / \sqrt{(1-\mathrm{v}^2/c^2)}$, which cannot be possible.

But, presently, 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 to be finite (see, Ref. 2).

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. 1.) This quantum of radiation energy provides intensity to spectral lines (see Sec. III F, Ref. 1), to the fine lines of fine structure of spectral lines (see Sec. III K, Ref. 1) in spectroscopic phenomena, and also to bright fringes and bright bands respectively in the phenomena of interference and diffraction, in accordance as the amount of radiation energy contained in quantum (see Sec. 4.2).

● **Frequency *v* :** 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. 1). 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. 1).

● **Energy *hv* :** is motional energy E_m [$=E_k$ (kinetic energy) + E_s (spin energy)] of photon (for detail, see Sec. III E, Ref. 1). It provides linear motion and spin 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 *hv* :** is the total energy of photon (for detail, see Sec. III G, Ref. 1).

The orbiting electrons possess energy $= E_k + E_s +$ 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. 1). 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 emitted in the form of a bundle that provides particle like physical existence and rest mass m_{ph} to photon (for detail, see Sec. III F, Ref. 1).

● **Momentum *hν*/c associated with photons:** is spin momentum (p_s) of photons.

Since the spinning particles possess p_s (for confirmation of its truth, see Sects. I C and I D, Ref. 1), and photons possess spin motion; the momentum $h\nu / c$ should be p_s of photons.

The spin motion of particles generates actually two very important properties in them: 1. The tendency of linear motion along the directions of their respective spin angular momentum L_S (for verification of its truth and detail, see Sec. 2.1.1, Ref. 3). 2. Motional energy (E_m) = kinetic energy (E_k) + spin energy (E_s), and motional momentum (p_m) = linear momentum (p_{lin}) + spin momentum (p_S) [for verification of its truth and detail, see Sec. 2.1.2, Ref. 3]. And if the particles possess magnetism, e.g. electrons and nucleons, a strong, short range and charge independent attractive or repulsive force is also generated between them (for detail, see Sec. 2.2, Ref. 3)..

Therefore, photons, due to the first property generated in them, travel always along the directions of their respective L_S. And due to the second property generated in them, they possess always energy E_m and momentum p_m. But, since the photon moves always with constant velocity c, E_k and p_{lin} of photon become constant. And further, since the rest mass of photon (m_{ph}) happens to be extremely small, but frequency of its spin motion (ν) increases very rapidly as its energy increases, in $p_m\,(= p_{\text{lin}} + p_S)$ of photon, its $p_{\text{lin}}\,(= m_{ph}\,c)$ probably becomes negligible in comparison to its p_S. And consequently, wherever momentum of photon is expressed, it is expressed as $h\nu / c$ (i.e. p_S of photon) and it succeeds to explain the phenomena. But E_k $(= m_{ph}\,c^2 / 2)$ of photon, because of having c^2, probably does not become negligible in comparison to its E_s. Consequently, energy of photon is expressed as $h\nu$ (i.e. E_m of photon).

2.2.1 Consequences and importance of the present interpretation of quanta

The present interpretation of quanta enables to give very clear and complete explanation of all the phenomena related with quanta (i.e. photons, electrons, protons, neutrons etc.), structures and properties of systems constituted by them etc. For example: 1. Spectroscopic phenomena (see Sec. 4.1.1, Ref. 3). 2. Quantum mechanical phenomena (see Sec. 4.1.2, Ref. 3). 3. Phenomena of interference and diffraction (see Sects. 4.2.1, 4.2.2, 4.2.3). 4. Relativistic phenomena (see Sec. 4.1.4, Ref. 3). 5. Phenomenon of electromagnetism and the related properties generated in electron beams and current carrying rods (see Sec. 4.2.1, Ref. 3). 6. Phenomenon of superconductivity and the related properties and effects (see Sec. 4.2.2, Ref. 3). 7. Nuclear phenomena, structures and properties of neutrons, deuterons, alpha particles and nuclei (see Sec. 4.2.3, Ref. 3).

3. DISCUSSION OF SECOND FAULT (the wave nature of quanta 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 ν is the frequency of wave nature of radiation energy of photons while ν 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 ν 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 $\lambda = h / m_e \mathrm{v}$ (de Broglie expression), the wave should possess frequency $f = \mathrm{v}/\lambda = m_e \mathrm{v}^2 / h$. If we compare this expression with eqn. ω

$= m_e \mathrm{v}^2 / h$ [where ω, 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. 1], we find that these are exactly similar except the difference that in eqn. $f = m\mathrm{v}^2 / h$, f is the frequency of wave nature of electron, while in eqn. $\omega = m_e \mathrm{v}^2 / h$, ω is the frequency of spin motion of electron.

The above discussion leads to conclude:

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

Or in expression $\omega = m_e \mathrm{v}^2 / h$, ω 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 ω is frequency of spin motion of electrons (see Sec. I A, Ref. 1).

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

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

3.3 Confirmation of that the concept of the 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 because to photons too the electromagnetic wave nature has been associated. 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, they do not take place due to the characteristic of wave nature of photons and electrons, but take place due to the characteristic of their spin motion**)**

4.1 Confirmation of that the phenomena of interference and diffraction of photons and electrons cannot take place due to the characteristic of 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, e.g.:

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? And if collide, what does happen? Are the fringes then produced or not?

b). What does happen to radiation energy contained in photons when they fall on the screen and due to superposition of their waves, fringes are obtained on the screen?

c). How are the photons P_1' and P_n'', P_2' and P_{n-1}'',…….. 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 taking account of the characteristics of spin motion of photons, we try to explain the phenomena of their interference and diffraction, very clear and complete explanations are obtained as to: 1. How photons are deviated turning round the edges of obstacles, why and how their angle of deviation varies (see Sec. 4.2.1). 2. How bright fringes of equal width and intensity are obtained in the phenomenon of interference (see Sec. 4.2.2). 3. How diffraction bands of varying width and intensity are obtained in the phenomenon of diffraction (see Sec. 4.2.3).

4.2 Explanation of how the phenomena of interference and diffraction of photons and electrons take place due to the characteristic of their spin motion

4.2.1 Explanation of how the photons are deviated and at different angles from their paths turning round the edge of an obstacle due to the characteristic of their spin motion

4.2.1(a) In the geometrical shadow

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 QR placed perpendicular to the plane of the paper [the base R of the obstacle lying on the plane of the paper has not has been shown in Figs.2(b, c, d) because to show it is not possible], 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, Figs. 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, Figs. 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. [The present concept of striking of the edge of obstacle at different points 1, 2, 3, …..on the surface of photon is very hard to accept/believe because of extremely small size of photon. But this concept 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 but of white light, there occur photons of seven different frequencies $\nu_1, \nu_2, \nu_3, \ldots\ldots$ and hence of seven different momentum $p_1 (= h\nu_1 / c)$, $p_2 (= h\nu_2 / c)$, $p_3 (= h\nu_3 / c)$,....... 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 θ getting struck at point 4 on its surface, a photon of momentum p_2 or p_3 or p_4 or ….. (where $p_1 < p_2 < p_3 < p_4$ …..) may also be deviated by the same angle θ 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 θ 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(b)].

4.2.1(b) In direction opposite to the geometrical shadow

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,…. 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)..

4.2.2 Explanation of the phenomenon of interference of photons due to the characteristic of their spin motion

4.2.2(a) 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. 4.2.1(a) and shown in Figs. 2 (b, c, 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, ….. 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, ….. 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, …., 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(b) 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 (ν_1, ν_2,…….) 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. 4.2,1(a)], 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.

4.2.2(c) 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 Figs. 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,…. 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.:

$$\text{x (position of fringe at } Q_1\text{)} = \frac{D \times path\,difference\,between\,photons\,P_1'\,and\,P_6''}{d}$$

$$= \frac{D\,c \times phase\,difference\,between\,photons\,P_1\,'\,P_6\,''}{2\,\pi\,\nu\,d}$$

because phase difference = (2π $\times$path difference) / λ = (2π $\times$path difference) $\times$ ν /c.

But in the above expression, ν is not the frequency of wave nature of photon. It (ν) is in fact the frequency of spin motion of photon. And λ is not the wavelength of wave nature of photons. Because λ is defined as λ = c/ν, where c is constant and ν is characteristic of particle nature of photon, and hence λ 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 $P_6\,''$, $P_5\,'', P_4\,'', P_3\,'', P_2\,'', P_1\,'', P_6\,''$ and give bright fringes falling respectively at points Q_1, Q_2, Q_3, Q_4, Q_5, Q_6 on the screen if

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

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

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

4.2.3 Explanation of the phenomenon of diffraction of photons due to the characteristic of their spin motion

4.2.3(a) Diffraction at straight edge

Let A, Fig. 4, be a sharp straight edge of an opaque obstacle AB, S be a narrow rectangular slit and C be a screen. The sharp edge A and slit S both are parallel to each other and perpendicular to the plane of the paper along with the screen C. Let the slit be illuminated by a monochromatic source of light of frequency ν.

4.2.3(a1) 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 difference of angle of deviation between two successive 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 difference of angle of deviation 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. And as the density of crowd of photons varies, accordingly the intensity falls off in the geometrical shadow, Fig. 4.

4.2.3(a2) Explanation of how the 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 $P_1,\ P_2,\ P_3,\ldots$ [see Sec. 4.2.1(b)], 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 the 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 those 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 is obtained.

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

4.2.3(a3) Explanation of why and how the bright bands of continuously reducing intensity and width, as their order increases are obtained

During the rolling process of every photon round the straight edge, as shown in Figs. 2(b, c, d), colliding with this photon, not only one but probably several passing by photons are deviated by different angles from their respective paths. The number of photons deviated depends upon how many photons collide with the rolling photon during the process of its rolling. And the angles of their deviations depend upon at which different instants of the rolling process of the rolling photon the deviated photons collide with that before their deviations. Thus, during rolling process of photon getting struck at every point 1, 2, 3, , n located on its surface, due to collision with this, a series of photons is obtained deviated at different angles. Supposing, during the rolling process of photon getting struck at point 1 on its surface, colliding with this photon, a series of m_1 photons $P_{11}, P_{12}, \ldots\ldots P_{1m_1}$ are deviated respectively by angles θ_{11}, $\theta_{12}, \ldots.$ θ_{1m_1} from their path. During the rolling process of photon getting struck at point 2 on its surface, colliding with this photon, a series of m_2 photons P_{21}, $P_{22}, \ldots. P_{2m_2}$ are deviated respectively by angles θ_{21}, $\theta_{22}, \ldots.$ θ_{2m_2} from their path. And similarly, during the rolling process of photon getting struck at the last point n on its surface, colliding with this photon, a series of m_n photons P_{n1}, $P_{n2}, \ldots., P_{nm_n}$ are deviated respectively by angles θ_{n1}, $\theta_{n2}, \ldots\ldots$ θ_{nm_n} from their path. Since the duration of rolling of photon getting struck at point 1 on its surface happens to be maximum, as we can observe from Fig. 2(b, c, d), m_1 happens to be maximum. And since the duration of rolling of photon getting struck at point n on its surface happens to be minimum, m_n happens to be minimum.

The angles of deviation θ_{11}, $\theta_{12}, \ldots.$ θ_{1m_1} of the series of m_1 photons probably happen to be such that all the m_1 photons colliding with the photons coming straightly from the source and getting deviated along with them in their resultant directions fall all together on the screen C producing the first bright band. And the angles of deviation θ_{21}, $\theta_{22}, \ldots.$ θ_{2m_2} of the series of m_2 photons probably happen to be such that all the m_2 photons colliding with the photons coming straightly from the source and getting deviated along with them in their resultant directions fall all together on the screen C producing the second bright band. And similarly, the angles of deviation θ_{n1}, $\theta_{n2}, \ldots\ldots$ θ_{nm_n} of the series of m_n photons probably happen to be such that all the m_n photons colliding with the photons coming straightly from the source and getting deviated along with them in their resultant directions fall all together on the screen C producing the last bright band. Further, since $m_1 > m_2 > \ldots\ldots > m_n$, the density of crowd of photons and the width of spreading of photons in different bands go on reducing successively as their order increases. And consequently the bright bands of continuously reducing intensity and width, as their order increases are obtained on the screen, Fig 4.

4.2.3(a4) Explanation of why and how after every bright band, a dark band is obtained and the darkness and the width of that dark band go on continuously reducing as that's order increases

Since the groups of photons ($P_{11}, P_{12}, \ldots\ldots P_{1m_1}$), ($P_{21}$, $P_{22}, \ldots. P_{2m_2}$),…….(P_{n1}, $P_{n2}, \ldots., P_{nm_n}$) are deviated by colliding with the photons rolling round the straight edge getting struck at their points 1, 2, 3,……., n respectively, there occurs no continuity between the groups ($P_{11}, P_{12}, \ldots\ldots P_{1m_1}$), ($P_{21}$, $P_{22}, \ldots. P_{2m_2}$),…….(P_{n1}, $P_{n2}, \ldots., P_{nm_n}$), or can say between the groups of their angles of deviations (θ_{11}, $\theta_{12}, \ldots.. \theta_{1m_1}$), ($\theta_{21}, \theta_{22}, \ldots..$ θ_{2m_2}),………..(θ_{n1}, $\theta_{n2}, \ldots\ldots$ θ_{nm_n}). But there occurs a gap after every group. Further, since the angles of deviations of photons, colliding with the rolling photons round the straight edge, go on reducing, the width of the gap between two successive groups of angles also goes on reducing as the order of the gap increases.

In these gaps, since no photons fall, because the photons coming straightly from the source, those had to fall in these gaps are deviated along with the different groups and fall in the bright bands, these gaps appear as dark bands. Further, since beyond the last bright band, the uniform light occurs, because of its effect, the darkness of the dark bands is being reduced. The darkness of the nearest dark band (i.e. of the last dark band) is reduced to maximum and of the farthest ((i.e. of the first dark band) is reduced to minimum. And consequently, the dark bands of continuously decreasing darkness, as their order increases are obtained.

4.2.3(b) 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, Figs. 5(a and b).

4.2.3(b1) 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 Sects. 4.2.3(a2, a3 and a4) 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. 4.2.3(a1) 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. 4.2.2(a).

4.2.3(b2) When the wire is thick

If the thickness of wire is increased, a stage comes when the thickness of wire becomes equal to say 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

4.2.3(c) 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. 4.2.3(a2)] 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. 4.2.3(a2)] 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 range/width of spreading of photons in different groups varies, accordingly their width varies.

The blank spaces (i.e. gaps) of continuously decreasing darkness between every two groups are obtained accordingly as has been described in Sec. 4.2.3(a4).

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 separately.

5. DETERMINATION OF HOW DESPITE OF HAVING FOUR VERY BASIC AND FUNDAMENTAL FAULTS THE QUANTUM WAVE THEORY HAS OBTAINED SO HUGE SUCCESS

There are two reasons behind how despite of having four very basic and fundamental faults the quantum wave theory has obtained so huge success. They (reasons) are as follows:

1. 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 taken numerous assumptions in order to explain those phenomena. The assumptions have been taken merely keeping in view that they suit to the requirements 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 taken assumptions and to avoid/counter the negative consequences, several assumptions have further been taken. But they too are not true because they also 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:

a). If we examine the current interpretation of quantum closely and intently (see Sects. 2.1 and 2.1.1), we find that in it several assumptions have been taken. These assumptions have been taken merely keeping in view that these assumptions suit to the required demands and may give the desired results. 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.

b). If we examine the BCS (Bardeen–Cooper–Schrieffer) theory[4] 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. 5). These concepts have been taken 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. 5). But instead of realizing the truth, several assumptions have further been taken in order to justify the taken concepts (see Sec. 6, Ref. 5). These assumptions too are not true and give rise to numerous more very basic and fundamental questions (see Sec. 6, Ref. 5). Most importantly, the taken assumptions cannot be avoided otherwise the BCS theory fails to give the desired results

2. In the current quantum theory (i.e. the quantum wave theory), 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, those terms have been misinterpreted. For example:

i. The term ν, interpreted as the frequency of wave nature of photon in the current quantum theory, is in fact the frequency of spin motion of photon (see Sec. 2.2), i.e. the characteristic of spin motion of photon.

ii. 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.

iii. 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).

iv. The de Broglie expression $\lambda = h / m_e \mathrm{v}$ is true, but in it, the interpretation of λ is not true. It (λ) does not happen to be the wavelength of wave nature, i.e. not the characteristic of wave nature of matter particles. It (λ) is actually the characteristic of spin motion of the particle (see Sec. 3.2).

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FIGURE CAPTIONS

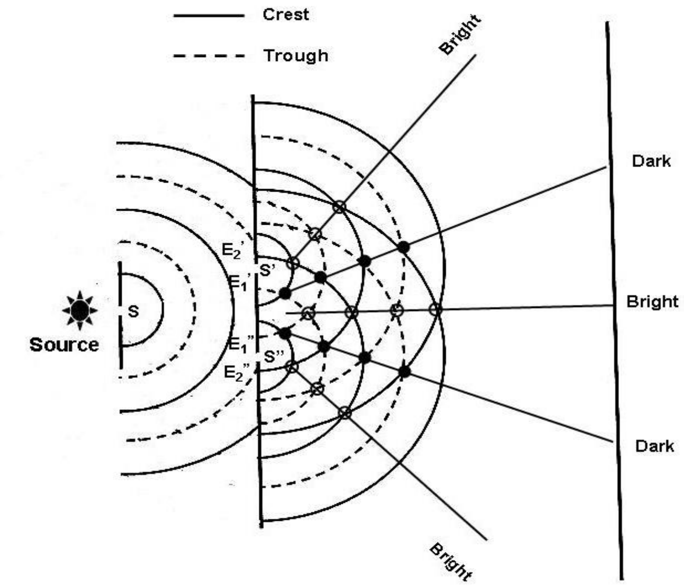
Fig. 1: (a): Interference of two wave trains; (b): Vibrations of electric and magnetic fields of electromagnetic waves during their propagation; (c): Production of bright and dark fringes due to superposition of waves of photons (photon waves and their superposition have not been shown in Fig. to avoid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

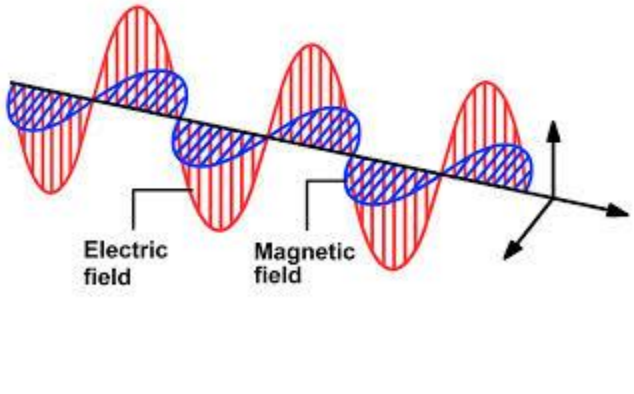
Fig. 3: Intensity distribution due to collisions of photons and their falling on the screen in interference phenomenon using two slits, e.g. in Young's experiment.

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

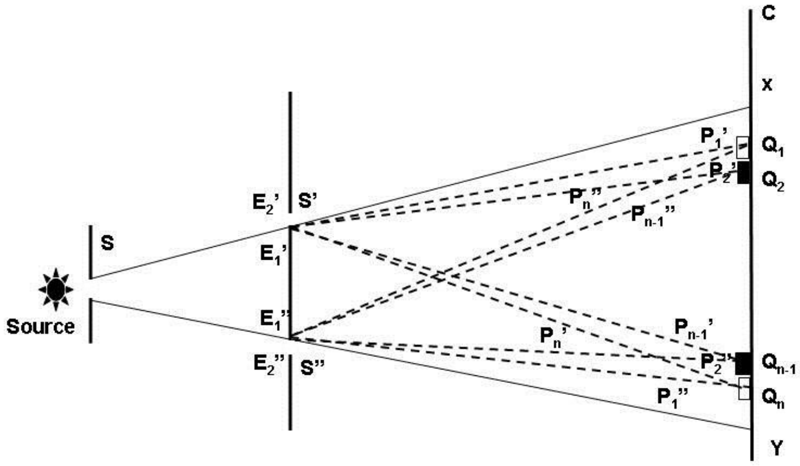
Fig. 5: Intensity distribution due to collisions of photons and their falling on the screen in diffraction at a wire: (a) When the wire is thin; (b) When the wire is thick.


Crest
Trough
Bright
Dark
Bright
Dark
Bright
Source
S
S'
S''
E2'
E1'
E1''
E2''

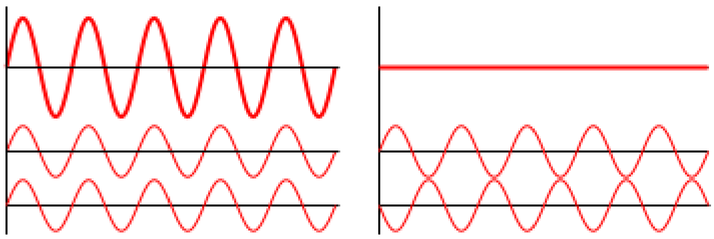
(a)


Electric field
Magnetic field

(b)

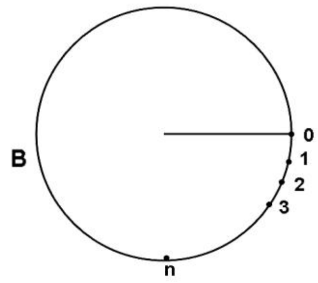


(c)

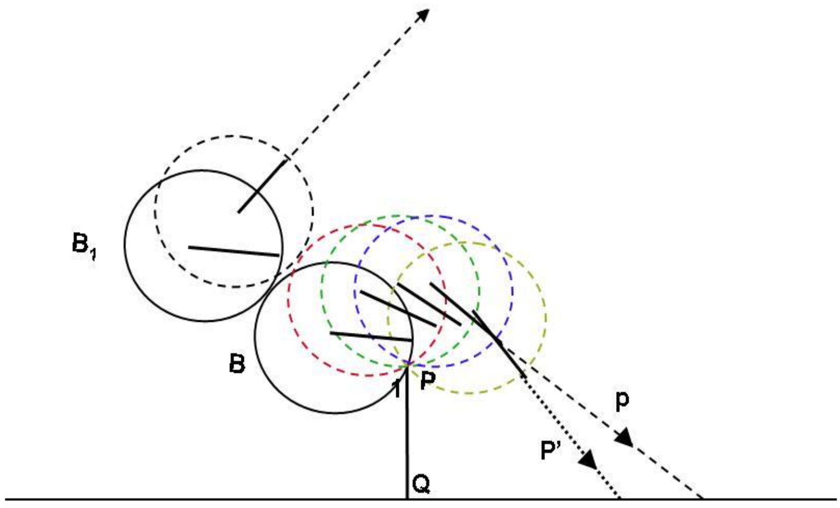


(d)

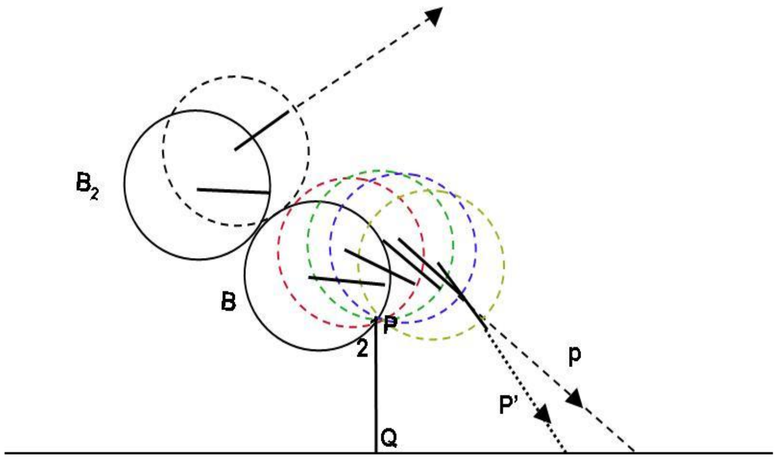
Fig. 1



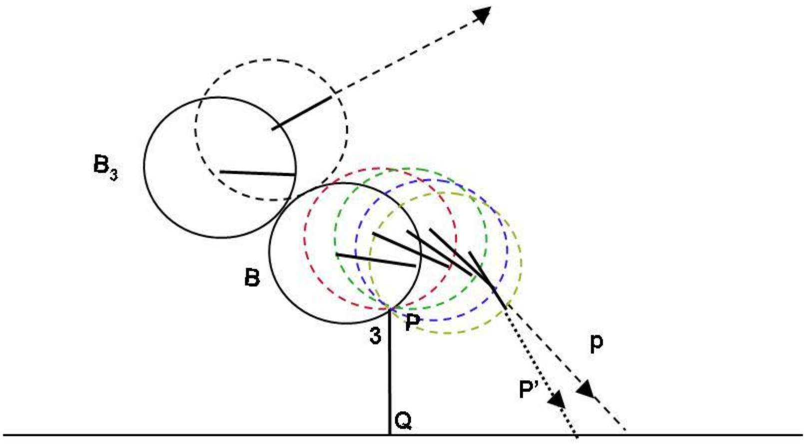
(a)



(b)

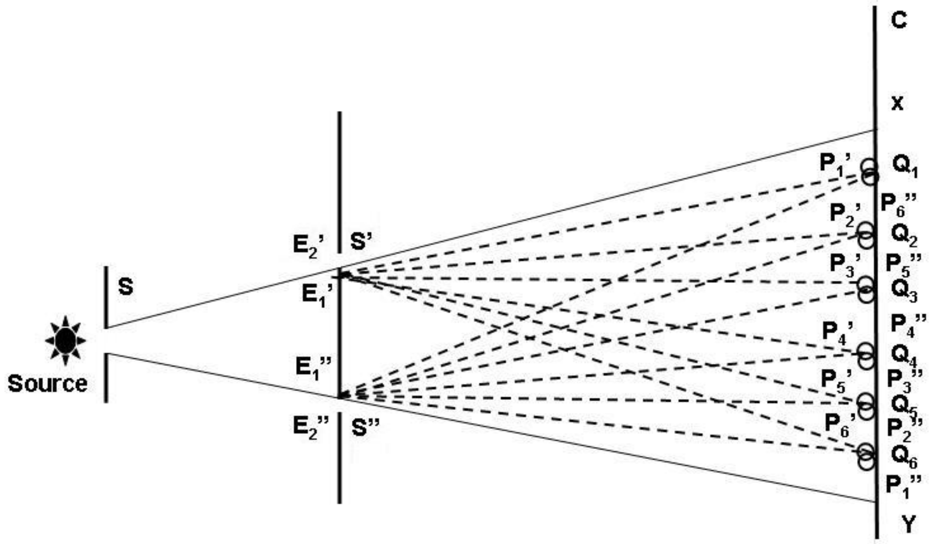


(c)

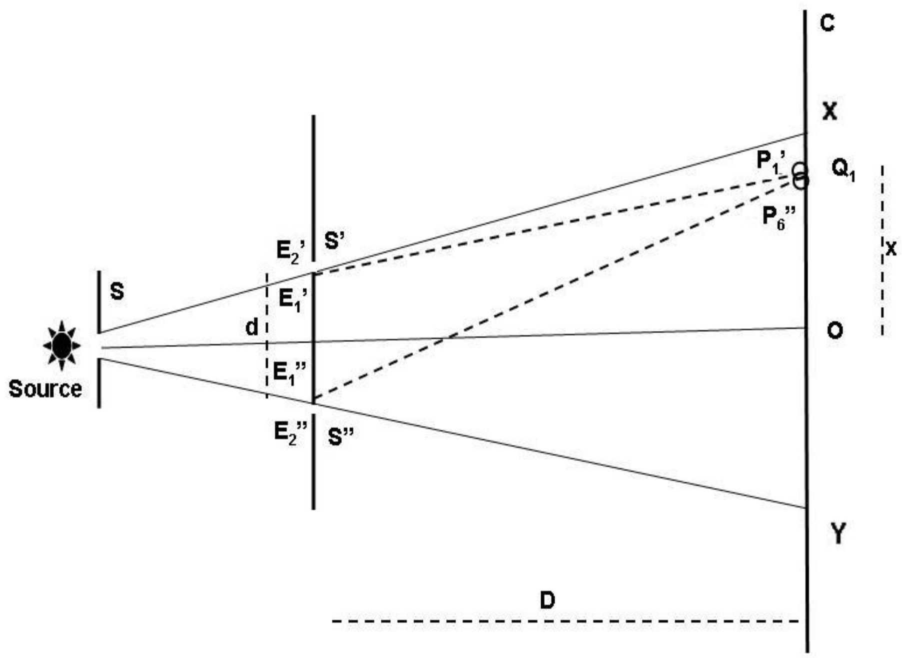


(d)

Fig. 2


C
X
P_1'
Q_1
P_6''
P_2'
Q_2
E_2'
S'
P_3'
P_5''
S
E_1'
Q_3
P_4'
P_4''
E_1''
Source
Q_4
P_5'
P_3''
Q_5
P_6'
P_2''
E_2''
S''
Q_6
P_1''
Y

(a)



(b)

Fig. 3

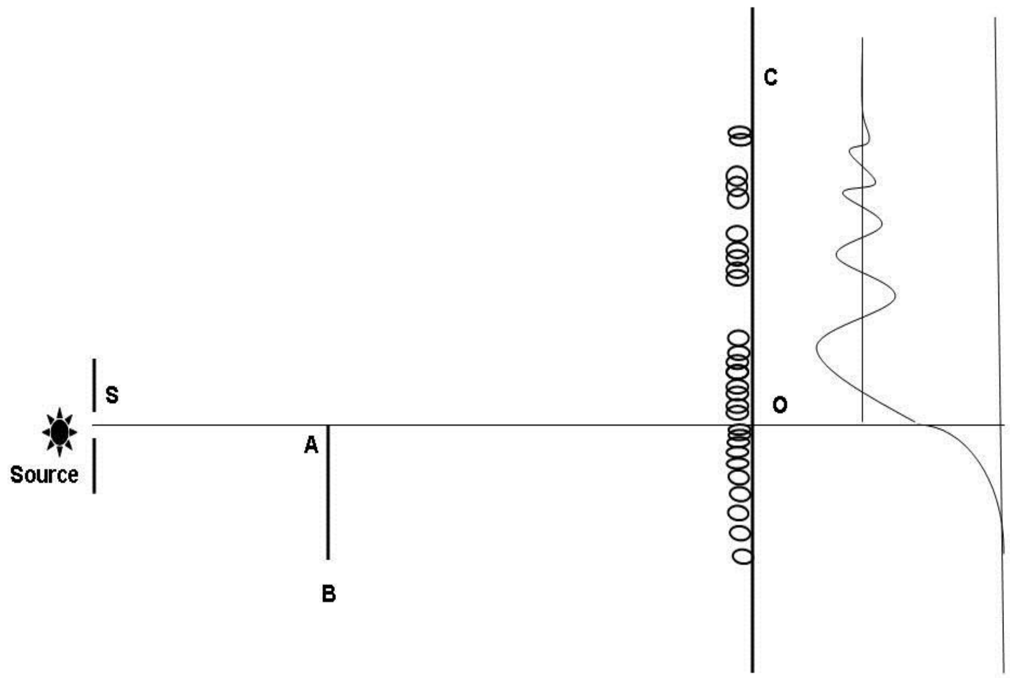
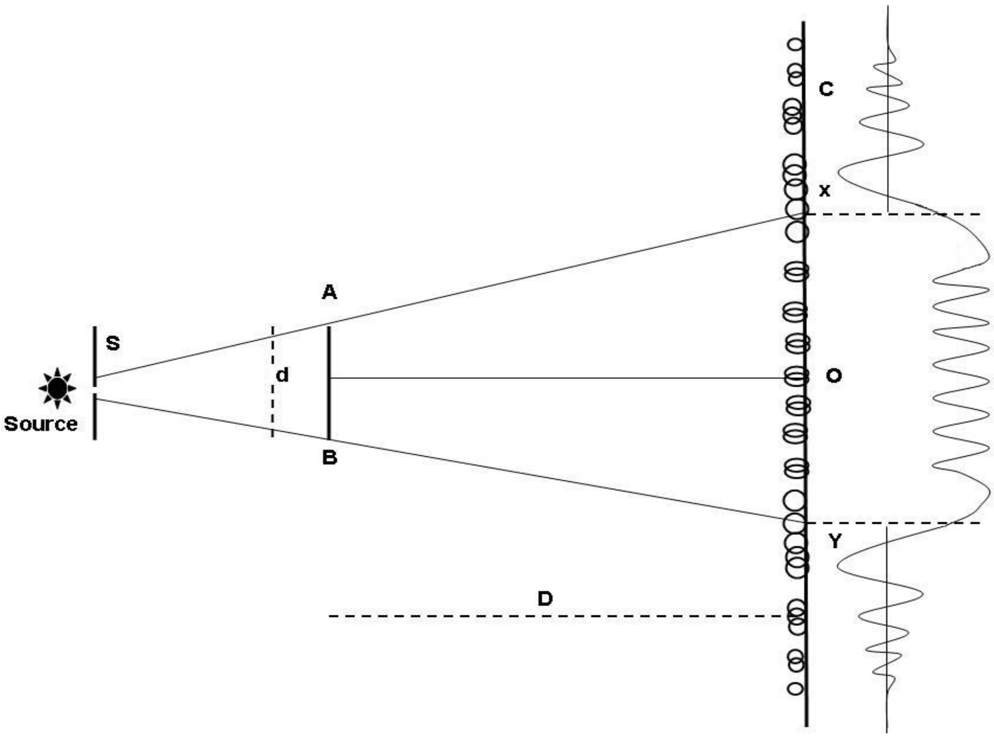
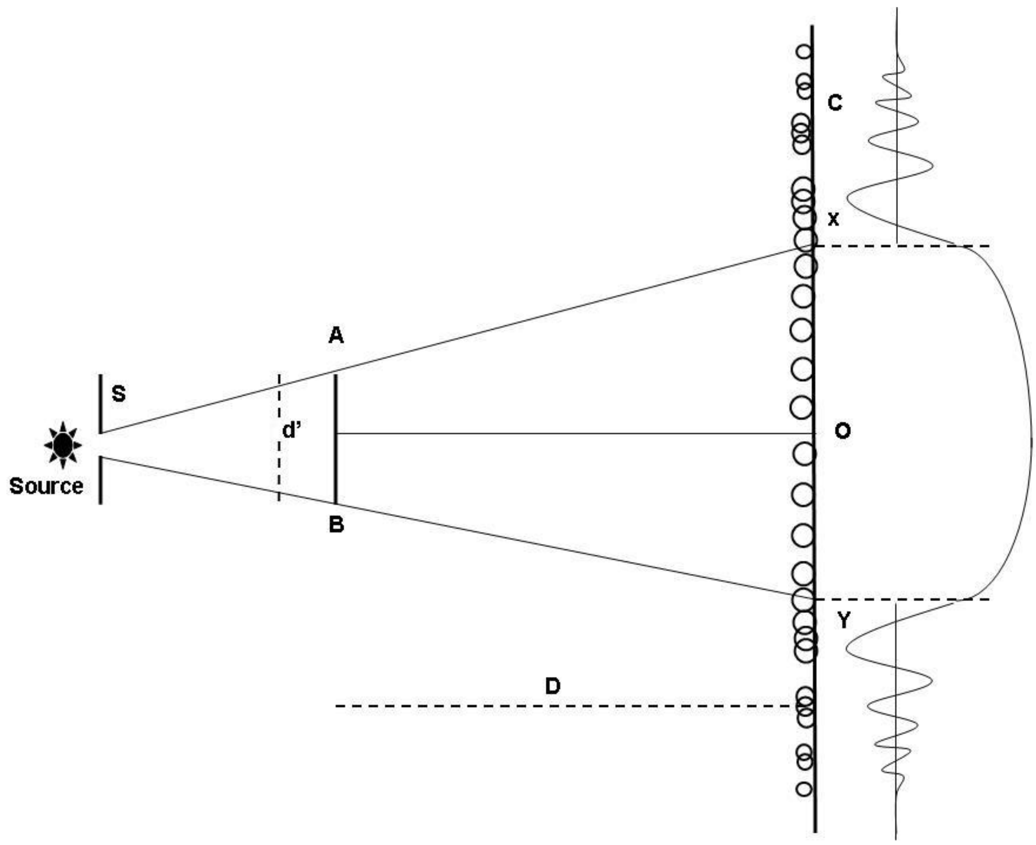


Fig. 4



(a)



(b)

Fig. 5