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, in order to explain which the wave nature of photons and electrons has been assumed, take place due to their particle nature, not due to their wave nature. The present interpretation of quantum gives very clear and complete picture of quantum, about its structure, properties etc. It 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 why and how despite having three such very basic and fundamental faults, the current quantum theory has succeeded to obtain so wide success.

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1. INTRODUCTION

The current quantum theory (i.e. the quantum wave theory) has very wide 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, in order to explain which the wave nature of photons and electrons has been assumed, take place due to their particle nature, not due to their wave nature. (How these phenomena take place due to 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 (see Sec. 2.2), which enables to explain all the phenomena (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 (see Sec. 1.1 and also Sec. 5) despite having three such very basic and fundamental faults the quantum wave theory has succeeded to obtain so wide success.

1.1 How despite having three such very basic and fundamental faults the quantum wave theory has succeeded to obtain so wide 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, 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 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 chosen in order to explain the different phenomena. These assumptions have been chosen merely keeping in view that these suit 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[1] 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 chosen 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 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 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 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 quantised 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.

If we go thoroughly through the current interpretation of photon, there we find 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.

2.1.1 (a) Faults in the first statement

The meaning of the content "Photons are considered as discrete quanta of radiation energy" of the first statement is clear, i.e., photon is constituted by a quantum of radiation energy. It is similar as an electron is constituted by a quantum of charge (-e). But the meaning of the complete statement, i.e., of "Photons are considered as discrete quanta of radiation energy given by $h\nu$, which involve the frequency ν of radiation" is faulty (confusing) and incomplete, and hence gives rise to numerous very basic and fundamental questions. For example:

i. Is energy $h\nu$ whether of the amount of radiation contained in photon, or of photon as a particle that 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. Because for photon to travel etc., three conditions are necessary: 1. Physical existence of photon, 2. Something that provides physical existence to photon, and 3. Some energy that enables photon to travel with velocity c etc. Here it is possible that some people argue, since photon is itself a bundle of energy $h\nu$, it needs no additional energy to make it able to travel with velocity c etc. But this argument cannot be accepted. Because electron, which too is bundle of energy (electric energy, because charge –e of electron is a bundle of electric energy) that provides physical existence and rest mass to it, but electron does not travel itself. It needs some additional energy for its motion and in accordance to that, it obtains velocity. For example, as it obtains energy during coming out from an electron gun, accordingly it obtains velocity. [For experimental verification of why the mentioned above three conditions for photon to travel etc. are necessary, see starting from line-25, column-2, page-53 to line-15, column-1, page-54, Sec. I D, Ref. 3.]

ii. If energy $h\nu$ is of photon as a particle, then what is energy of the amount of radiation contained in photon?

iii. If energy $h\nu$ is of radiation contained in photon, then how does photon travel with velocity c and scatter electron colliding with that etc.? Currently, according to Einstein’s postulate of theory of relativity, the velocity of photon has been assumed to be = c. The rest mass of photon (m_{ph}) has also been assumed to be = 0. And in order that photons may scatter electrons colliding with those in Compton scattering and eject electrons in photoelectric effect penetrating into metals, moving mass $h\nu / c^2$ and momentum $h\nu / c$ have been assigned with photons. But these assumptions cannot be true. Because, according to mass-energy equivalence principle of theory relativity, 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 transformed energy is measured, that shall be found equal to the mass of material. In order to verify its truth, we can take the example of electron. Electron is a bundle of energy, but it possesses rest mass m_e. The rest mass of photon m_{ph} can be < or << m_e, but can never be = 0. And hence, in order to make able photon to travel with velocity c etc., some energy is necessary. [Currently, m_{ph} has been assumed to be = 0, otherwise, according to expression $m_{mov} = m_0 / \sqrt{(1 - \mathrm{v}^2 / c^2)}$, moving mass m_{mov} of photon becomes infinite (because, according Einstein's postulate, it is assumed that the velocity of photon v = constant c) which practically can never be possible. But this reason for assuming m_{ph} to be = 0 cannot be accepted because m_{ph} cannot be ruled out. Secondly, it is also possible that the Einstein's postulate may not be true (for its confirmation, see Sec. 2.2.1). And thirdly, for confirmation that photon possesses rest mass, see Sec. I D 1, Ref. 3 and also Sec. 2.2 onwards.]

iv. 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] $= h\nu$ is emitted from the orbiting electron as a bundle of radiation energy, i.e. photon. But 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 starts behaving like a particle?

v. 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. The concept of wave nature for radiation energy has actually been borrowed from the sound energy because 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, hence radiation energy too should possess wave nature. 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, firstly, 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, the electromagnetic wave nature should be assumed because electrons also suffer the phenomena of interference and diffraction as photons suffer. But for the charge of electrons, the packet wave nature has been assumed, not the electromagnetic wave nature. Why is this inconsistency or double standard?

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 confirm 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 intensity of spectral lines 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).

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. But this solution (i.e. the assignment of $h\nu / c^2$ and $h\nu / c$) cannot be true because it gives rise to several very fundamental questions. For example:

1. Do $h\nu, h\nu / c^2, h\nu / c$ provide both: 1. Something that provides physical existence to photon; 2. Energy 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? If yes then how? And if no then $h\nu, h\nu / c^2, h\nu / c$ cannot enable photon to travel with velocity c, scatter electron in Compton scattering and eject electron in Photoelectric effect. But on the contrary, $h\nu, h\nu / c^2, h\nu / c$ succeed to explain the phenomena of Compton scattering and Photoelectric effect. It means, there is something wrong/false with $h\nu, h\nu / c^2, h\nu / c$.

2. In $h\nu, h\nu / c^2$ and $h\nu / c$, ν has been assumed as the frequency of wave nature of radiation energy of photon, i.e. ν is the characteristic of wave nature of photon, while it

is believed that the phenomena of Compton scattering and Photoelectric effect etc. take place due to the particle nature of photon. But $h\nu, h\nu/c^2, h\nu/c$ succeed to explain the phenomena of Compton scattering and Photoelectric effect etc. It means, there is something wrong/false. Either ν is not the characteristic of wave nature of photon but it is the characteristic of particle nature of photon, or the phenomena of Compton scattering and Photoelectric effect etc. do not take place due to the particle nature of photon but take place due to photon's wave nature. Since the belief that the phenomena of Compton scattering and Photoelectric effect etc. take place due to the particle nature of photon cannot be ruled out, ν should not be the characteristic of wave nature of photon but it should be the characteristic of particle nature of photon.

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

2.2 Present interpretation of quantum

The quantum wave theory is applied to matter particles, e.g., electrons, protons etc. too. Therefore, the matter particles too should be quanta, but quanta of what? 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 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. 3] No escaping of light from the black holes verifies the truth of rest mass m_{ph} of photons. Because black holes have very strong gravitational force and these do not let even the photons to escape from these means photons have rest mass and are attracted by the black holes due to their very strong gravitational force.

● The true and complete interpretation of photon is as:

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

● **Quantum of radiation energy:** is an amount of radiation energy that constitutes the photon and provides particle like physical existence and rest mass m_{ph} to it (how 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 fine lines of fine structure of spectral lines (see Sec. III K, Ref. 3) in spectroscopic phenomena, and also to bright fringes/bands in the phenomena of interference and diffraction, in accordance as the amount of radiation energy contained in quantum (see Sec. 4).

● **Frequency ν :** 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 etc.

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

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. 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 *hν*/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 ν increases, where ν 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 Plausible arguments and evidence to prove that the current reason behind choosing rest mass of photon to be equal to zero is not true

Currently, the rest mass of photons (i.e. m_{ph}) has been assumed to be zero and moving mass m_{mov} $(= h\nu / c^2)$ has been assigned to these. Because, according to Einstein's postulate of theory of relativity, since it has been assumed that the photons move with constant velocity c and nothing can move with velocity > c, if some rest mass m_{ph} is assigned to photons (i.e. $m_0 = m_{ph}$) then according to expression $m_{mov} = m_0 / \sqrt{(1 - v^2/c^2)}$, their moving mass becomes infinite which practically can never be possible. But the rest mass of photon (m_{ph}) cannot be ruled out. Therefore, let us investigate the expression $m_{mov} = m_0 / \sqrt{(1 - v^2/c^2)}$ [see Sec. 2.2.1(a)] and the Einstein's postulate [see Sec. 2.2.1(b)], what is and where is fault.

2.2.1 (a) Investigation of expression $m_{mov} = m_0 / \sqrt{(1 - v^2/c^2)}$

Expression $m_{mov} = m_0 / \sqrt{(1 - v^2/c^2)}$ is true, but in it, m_{mov} is not the moving mass as currently defined. It is in fact the effective mass generated due to spin motion of electron. Because electron possesses spin motion (as has experimentally been verified) and hence possesses spin energy (E_s) as corresponding to its linear motion, it possesses kinetic energy (E_k). Consequently it possesses motional energy E_m ($= E_k + E_s$). And as E_k generates p_{lin} in electron along the direction of its velocity (v), similarly E_s generates p_s (spin momentum) in electron along the direction of its spin angular momentum (L_s). [For verification of the truth of possession of p_s by electron along the direction of its L_s, see Sects. I C and I D, Ref. 3.] Consequently, the electron possesses p_m (motional momentum) = $p_{lin} + p_s$. In these expressions, if superposing the effects of p_s and E_s of electron on its p_{lin} (= m_ev) and E_k ($= m_e v^2/2$) respectively we try to write down the expressions for p_m and E_m of electron in terms of its linear momentum and kinetic energy respectively, the expression shall be as: p_m = $(m_e)_{eff}$ v and E_m = $(m_e)_{eff}$ v ^{2}/2 respectively. The momentum $(m_e)_{eff}$ v and energy $(m_e)_{eff}$ v ^{2}/2 shall produce the same effects as the momentum p_m and energy E_m respectively shall produce. The term $(m_e)_{eff}$

is the effective mass. The spin motion of electron in fact does not increase its mass but increases the effect of its mass m_e to $(m_e)_{\text{eff}} = m_{mov}$. [For its confirmation, see how the expressions for relativistic energy $E_k = [m_e c^2 / \sqrt{(1-\text{v}^2/c^2)}]$ - $m_e c^2$ and relativistic momentum $p_{lin} =$ $m_e \text{v} / \sqrt{(1-\text{v}^2/c^2)}$ for electrons are obtained as the consequence of superposition of the effects of E_s and p_s of electrons on their E_k, and p_{lin} respectively, see starting from the last but one paragraph (column-1, page-69) to second paragraph (column-2, page-70, i.e., to the end of Sec. IV C) of Sec. IV C, Ref. 3.]

2.2.1 (b) Investigation of Einstein's postulate

If we look at the graph of Bertozzi[4] between v^2/c^2 and $kinetic\,energy/mc^2$ (= E_k/mc^2) of electron (where v is velocity of electron), Fig.1, on the basis of which the Einstein's postulate has been confirmed to be true, no doubt, the rate of increase in v^2/c^2 goes on decreasing as E_k/mc^2 increases. After E_k/mc^2 = 5, the rate of increase in v^2/c^2 becomes very slow, and after E_k/mc^2 = 25, the rate of increase in v^2/c^2 becomes very-very slow. But it does not lead to confirm that v^2/c^2 can never be >1. It (v^2/c^2) can be >1. Because the rate of increase in v^2/c^2 can never be = 0 .as long as E_k/mc^2 increases. It is possible that v^2/c^2 may become > 1 at very-very large or can say at extremely large E_k/mc^2, but the possibility of becoming $\text{v}^2/c^2 > 1$ cannot be ruled out.

Secondly, electrons and photons both possess spin motion and their velocity varies as their frequency of spin motion varies (for verification of its truth for electrons, see Eqn. 1.2, Sec. I, Ref. 3; and for photons, see Sec. IV B, Ref. 3). And as after attaining relativistic velocity by the electrons when the rate of increase in their v^2/c^2 starts decreasing in order to conserve their energy and momentum etc., their frequency of spin motion starts increasing. Because electrons possess E_m p_m L_s and hence E_m, p_m and L_s of electrons should be conserved (for detail, see Sec. 4.1.4, Ref. 5). The current assumption that after attaining relativistic velocity by the electrons when the rate of increase in their v^2/c^2 starts decreasing, their moving mass starts increasing in order to conserve their E_k and p_{lin}, is not true (for detail, see sec. 4.1.4, Ref. 5). Similarly, in order to conserve E_m, p_m and L_s of photons, their frequency of spin motion (ν) should start increasing. Since, as we know, the frequency of spin motion of photons increases, in order to conserve E_m, p_m and L_s of photons, the rate of increase in v^2/c^2 of photons should decrease. The decrease in the rate of increase in v^2/c^2 of photons can be possible only if their v is not assumed to be constant (i.e. $\neq$ c) but increases as their ν increases. (For mathematical proof that the velocity of photons is not constant but varies with their frequency of spin motion ν, see Sects. IV A and IV B, Ref. 3.) The rate of increase in v of photons may be extremely slow, can say $\to 0$, but cannot be = 0. Further, c is the velocity of photons of visible light, the velocity v of photons of ultraviolet rays, X-rays and γ-rays may be greater than c.

2.2.1 (c) Conclusion

When m_{mov} is not the moving mass but it is the effective mass, secondly, the velocity of photons varies with the frequency of their spin motion, and thirdly, the velocity of photons of ultraviolet rays, X-rays and γ-rays may be greater than c, in the expression $m_{mov} = m_0/\sqrt{(1-v^2/c^2)}$, c can be replaced by c_1, where c_1 is a hypothetical highest possible value of velocity, very-very close to c but > c and also > the velocity of photons of γ-rays. If c is replaced by c_1, all the problems are resolved.

2.2.2 Positive 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 = 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 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 μ_j is neither judicious nor meaningful; 2. The expression L_j = jh /2π is not true; 3. j (= s ± 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 elliptical orbits for the motion of orbiting electrons, 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 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? But 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 electrical effect should also be assumed due to the wave nature of electrons, not due to their charge. 2. And 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 $\lambda = h/m_e\text{v}$ (de Broglie expression), the wave should possess frequency $f = \text{v}/\lambda = m_e\,\text{v}^2/h$. If we compare this expression with eqn. $\omega = m_e\,\text{v}^2/h$ [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. 3], we find that these are exactly similar except the difference that in eqn. $f = m\text{v}^2/h$, f is the frequency of wave nature of electron, while in eqn. $\omega = m_e\,\text{v}^2/h$, ω is the frequency of spin motion of electron.

The above discussion leads to conclude:

Either in expression $\lambda = h/m_e\text{v}$, 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 $\omega = m_e\,\text{v}^2/h$, 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. 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 $\lambda = h / m_e \text{v}$, λ 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 the wave fronts of radiation energy coming from two slits S' and S'' superpose, and in accordance as at points where superposition happens to be constructive or destructive, respectively bright and dark fringes are obtained, Fig. 2(a). But the superposition of wave fronts and consequently obtaining bright and dark fringes, as currently being described and shown in Fig. 2(a), cannot be possible. Because:

1. It has been assumed that the radiation energy of photons possesses electromagnetic wave nature, but there occur two types of vibrations in planes perpendicular to each other, of electric field in X Z plane and of magnetic field in X Y plane if the wave fronts are suppose moving along X axis, Fig. 2(b), not one type of vibration and in one plane, as shown in Fig. 2(a), where the vibrations are taking place only in one Y Z plane, if the wave fronts are moving along X axis.

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

i. If we assume the superposition of wave fronts as shown in Fig. 2(a), number of fringes may be found even outside of both the sides of the geometrical shadow of the length between the two edges E_{11} and E_{21}, while all the fringes should be found inside the geometrical shadow, as shown in Figs. 4(a) and 6(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 quanta form, i.e. photons, not in continuous form. The superposition of wave fronts as shown in Fig. 2(a) can be possible if the radiation energy is emitted in continuous form and that possesses wave nature. The waves of photons can of course superpose. 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}'',………. coming through the slit S when fall on the screen after passing through the slits S' and S'' and deviating from their respective paths, Fig 2(c), during their fall on the screen their waves superpose. But it gives rise to several questions, e.g.:

a). As we see from Fig. 2(c), since the directions of motion of photons of every pair falling on the screen are not parallel to each other and not in the same plane but are making some angle with each other, obviously the directions of motion of their waves shall also not be parallel and not in the same plane while for their superposition, they (waves) should be parallel to each other and in the same plane, as shown in Fig. 2(d).

b). 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? How can/does it happen to be possible that they never collide? And if collide then what does happen? Are the fringes whether produced or not?

c). 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. 2(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 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 obtained due to the wave nature of photons but obtained due to photons themselves. 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 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, in order to explain which the wave nature of photons and electrons has been assumed, take place due to their particle 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 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. 3(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. 3(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. 3(b), 3(c), 3(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 turning round the edges E_1' and E_1'' of slits S' and S'' respectively in their respective geometrical shadow regions in interference phenomenon, Fig. 4(a), or round a straight edge, Fig. 5, or round a thin wire, Fig. 6(a and b), etc. in the geometrical shadow region in diffraction phenomenon, these are struck at their points 1 or 2 or 3 or…..and accordingly these 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 these 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 $\nu_1, \nu_2, \nu_3, \ldots\ldots$ 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 those (i.e. two photons of two different colors) overlap if 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).

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 shadow regions 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 region) too at different angles. It happens due to getting struck of these photons at different points on their surface with the photons deviating in the geometrical shadow region getting struck at points 1, 2, 3,…… on their surface, similarly as balls B_1, B_2 and 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, Figs. 3(b, c, d). Because, when the photons are deviated in the geometrical shadow region rolling round the edge of obstacle, during the course of their rolling, their surface may collide with the surface of passing by photons. And 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 at which instant of its rolling process.

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 region 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. 3 (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 region 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. 4(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, …., bright fringes are also 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 (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. 4.1), therefore when at point say Q on the screen, where suppose a photon of momentum p_1, turning round the edge E_1' after getting struck at point say 3 on its surface, form a bright fringe colliding with a photon of same momentum p_1 coming after turning round the edge E_1'' (see Sec. 4.2.1), at the same point (i.e. 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' after 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 after 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, very little shifted from each other, they do not overlap completely but 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 and p_2, and so on. And consequently, there is obtained no clear and distinct fringes of different colors, instead there is 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. 4(a), it is necessary that the photons $P_1', P_2', P_3', P_4', P_5'$, P_6' should be deviated rolling round the edge E_1', and photons $P_6'', P_5'', P_4'', P_3'', P_2''$, P_1'' should be deviated rolling round the edge E_1'' by the angles as shown in Fig. 4(a). Such situation is obtained by varying the distance D between the plane of two slits S', S'' and 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. 4(a)], consequently as distance d [see Fig. 4(b)] 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 regions of 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 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. 4(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.

Therefore, the situation, as shown in Figs. 4(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, Q_4, Q_5, Q_6, 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. For example:

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

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

because phase difference = ($2\pi\ \times$path difference) / λ = ($2\pi\ \times$path difference) $\times\ \nu$ /c.

But in the above expression, ν is not the frequency of wave nature of photon. It (ν) is the frequency of spin motion of photon. And λ is not the wavelength of wave nature of photons. Because it is defined as $\lambda = c/\nu$, where c (velocity of light) is constant and ν is characteristic of particle nature of photon, and hence λ should also be the characteristic of particle nature of photons. And 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 = $2n\frac{\lambda}{2} = 2n\frac{c}{2\nu} = n\frac{c}{\nu}$

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. 5, 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 ν, 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. 5. As the density of crowd of photons varies, accordingly the intensity varies in the geometrical shadow, Fig.5.

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

Above the geometrical shadow of the straight edge on the screen, the photons, coming directly from the source and those which are deviated in direction opposite to the direction of geometrical shadow region, e.g. photons P_1, P_2, P_3,…. (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 the 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 other passing by photons too and they 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. Consequently, photons coming from the source do not fall on the screen uniformly.

The deviated photons, colliding with any arbitrary X, Y, Z passing by photons, do not fall together on the screen but fall together on the screen colliding only with photons satisfying some condition depending on their path or phase difference. It is to be determined.

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

During the rolling of photon about the straight edge, 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 Suppose, during the rolling process of photon getting struck at point 1 on its surface, a group of m_1 photons $P_{11}, P_{12}, \ldots\ldots P_{1m_1}$ are deviated respectively by angles $\theta_{11}, \theta_{12}, \ldots.\ \theta_{1m_1}$ from their path, where $\theta_{11} > \theta_{12} > \ldots.$ $> \theta_{1m_1}$. During the rolling process of photon getting struck at point 2 on its surface, a group of m_2 photons $P_{21}, P_{22}, \ldots. P_{2m_2}$ are deviated respectively by angles $\theta_{21}, \theta_{22}, \ldots.$ θ_{2m_2} from their path, where $\theta_{21} > \theta_{22} > \ldots. > \theta_{2m_2}$. 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 $P_{n1}, P_{n2}, \ldots., P_{nm_n}$ are deviated respectively by angles $\theta_{n1}, \theta_{n2}, \ldots\ldots\ \theta_{nm_n}$ from their path, where $\theta_{n1} > \theta_{n2} > \ldots\ldots > \theta_{nm_n}$.

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..3(a)] the angles of group $\theta_{11}, \theta_{12}, \ldots.\ \theta_{1m_1}$ 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 θ_{n1}, θ_{n2},…… θ_{nm_n} are happened to be minimum but the number of photons deviated in this group happens to be maximum. And, therefore, when the photons deviated by angles θ_{11}, θ_{12},…. θ_{1m_1}, colliding and deviating the passing by photons fall together on the screen, the last group of photons on the screen is obtained. And the density of crowd of photons and the range (or can say 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 (θ_{21}, θ_{22},…. θ_{2m_2}), (θ_{31}, θ_{32},….. θ_{3m_3}),……., (θ_{n1}, θ_{n2},…… θ_{nm_n}). When the photons deviated by angles θ_{n1}, θ_{n2},…… θ_{nm_n}, colliding and deviating the passing by photons fall together on the screen, the first group of photons on the screen is obtained. And the density of crowd of photons and the range 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 (θ_{21}, θ_{22},…. θ_{2m_2}), (θ_{31}, θ_{32},… θ_{3m_3}), …,..(θ_{n1}, θ_{n2},…. θ_{nm_n}) do not occur in continuation. 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 gap regions because the 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 2nd , 3rd , 4th ,…..groups goes on reducing continuously, very few number of photons, say l_1, l_2, l_3,….. (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 thin wire

In the geometrical shadows of both the ends, say the right side end and the left hand side ends of the thickness d of wire, the photons coming from the source are distributed in the same manner as are distributed in the geometrical shadow of the straight edge, see Fig. If the thickness of wire is very less, the photons which are not overlapping but little separated from each other in the geometrical shadow of the right hand side end of the wire become able to reach and collide with the photons which are not overlapping but little separated from each other in the geometrical shadow of the left hand side end of the wire. Then few number of bright fringes are obtained in the geometrical shadow of the wire similarly as fringes are obtained in the geometrical shadows of two edges E_1' and E_1'' of slits S' and S'' respectively, Fig. 6(a).

If the thickness of wire is increased, a stage comes when [i.e. when the thickness of wire is increased, say to d', Fig. 6(b)] even the maximum deviated photon of the geometrical shadow of the right hand side end of the wire fails to reach and collide with the maximum deviated photon of the geometrical shadow of the left hand side end 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. 6(b), as continuously and rapidly falling intensity is obtained in the geometrical shadow of straight edge, Fig. 5

4.3.3 Diffraction at a single slit

The case of diffraction at single slit is equivalent to diffraction at two straight edges E_1 and E_2 placed in the same plane parallel and facing each other. In this case of diffraction, photons, deviated in different groups of angles colliding with photons rolling round the edge E_1 [as has been described in Sec.4.3.1(b1)], colliding further with the passing by photons coming directly from the source [as has been described in Sects. 4.3.1(b)] fall on the screen distributed in different groups colliding with similar photons deviated in different groups of angles colliding with photons rolling round the edge E_2 [as has been described in Sec.4.3.1(b1)], colliding further with the passing by photons coming directly from the source [as has been described in Sects. 4.3.1(b)]. And, as how many photons fall in any group, how much widely the photons are spread in that group and how the density of crowd of photons varies along the range (or can say width) of spreading of that group, accordingly the intensity of that group, the range of spreading of that group and the variation of intensity in that group along the range of that's spreading, vary. In the middle of screen, i.e. in the central group, since huge and maximum number of photons fall distributed over a wide range, the intensity of central band is found to be the maximum, and it (central band) is spread over a wide range. Further, in its center, maximum number of photons fall and on both the sides of it (centre), the density of crowd of photons goes on decreasing. Consequently, in the middle of the central band, intensity is obtained to be the maximum and on both the sides of it, the intensity goes on decreasing.

On both the sides of the central group, photons are distributed identically in several groups, where the number of photons fallen in different groups and the range of their spreading go on decreasing as the order of group increases. So, accordingly, the intensity of different groups and the range of their spreading go on decreasing as the order of band increases.

The dark bands of continuously decreasing darkness 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). 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 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 (photons, electrons etc.), i.e. their spin motion, not on their speculated characteristic of wave nature. .

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

1. 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 photons (see Sec. 2.2), i.e. the characteristic of particle nature of photons.

2. The term $h\nu$, interpreted as the discrete 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 motion and spin motion 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 $\lambda = h / m_e \text{v}$ 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 their particle nature (see Sec. 3.2).

And consequently the current quantum theory, despite having three very basic and fundamental faults, has succeeded to obtain so wide success.

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FIGURE CAPTIONS

Fig. 1: Variation of v^2/c^2 of electrons with respect to their $kinetic\,energy/mc^2$.

Fig. 2: (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 has not been shown in Fig.).

Fig. 3: (b,c,d): Deviation of ball B at different angles in the geometrical shadow of obstacle PQ getting struck respectively at points 1, 2, 3 on its surface by the edge P of the obstacle; 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. 4: 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. 5: Intensity distribution due to collisions of photons and their falling on the screen in diffraction at straight edge.

Fig. 6: 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.

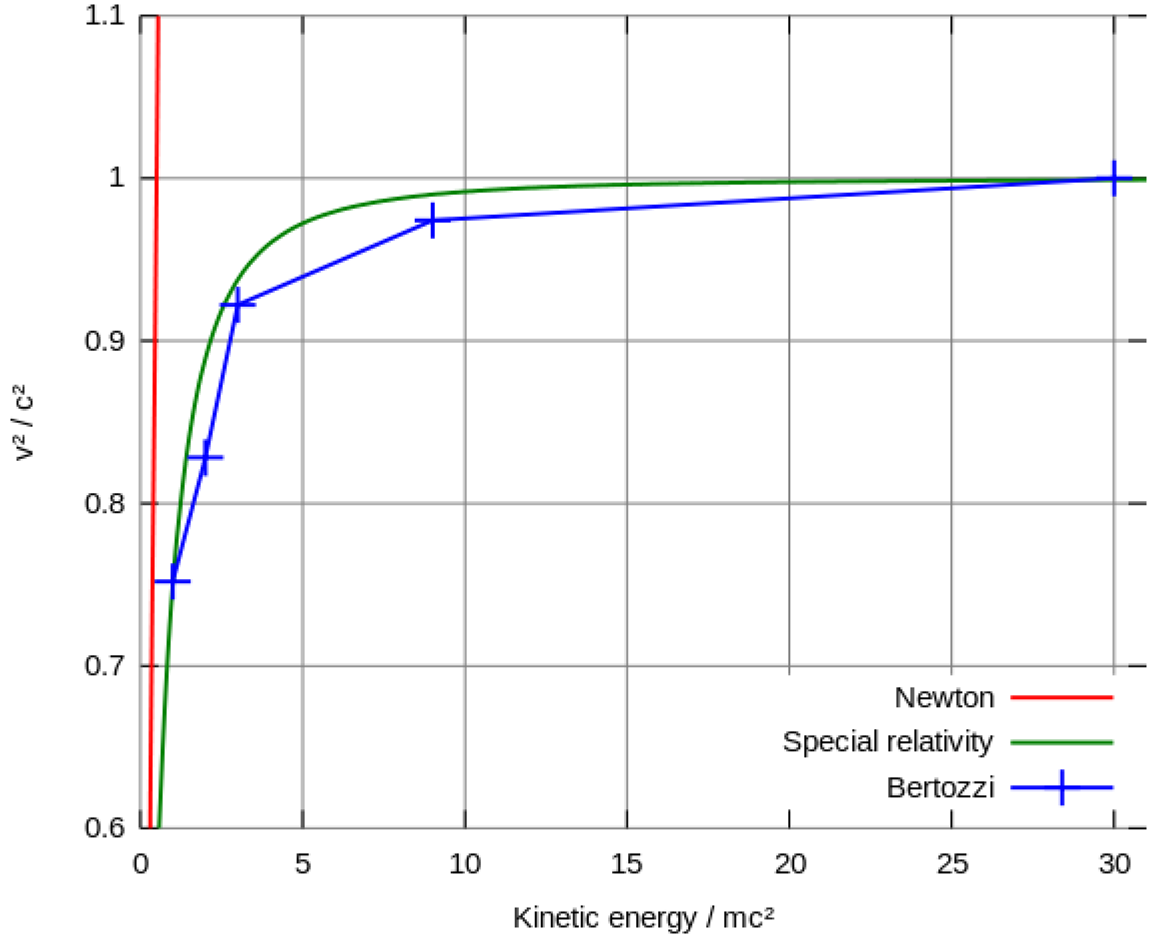
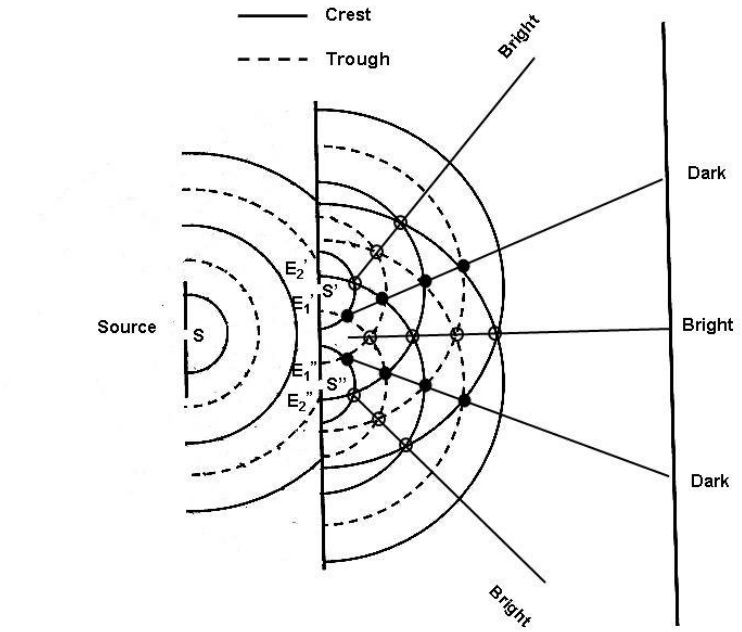
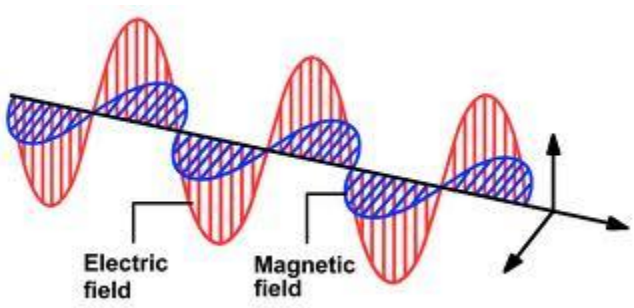

1.1
1
0.9
0.8
0.7
0.6
v² / c²
0
5
10
15
20
25
30
Kinetic energy / mc²
Newton
Special relativity
Bertozzi

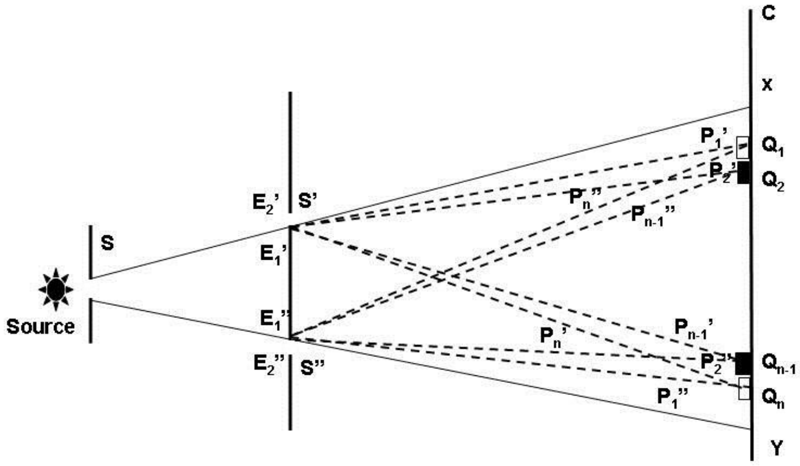
Fig. 1


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

(a)


Electric field
Magnetic field

(b)



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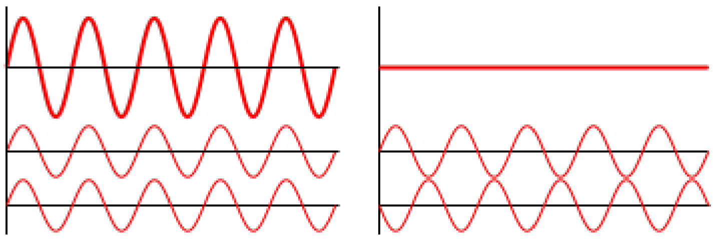

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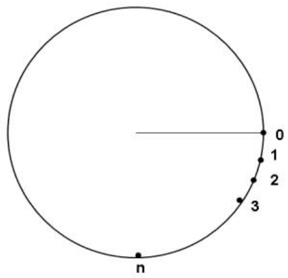
Fig. 2



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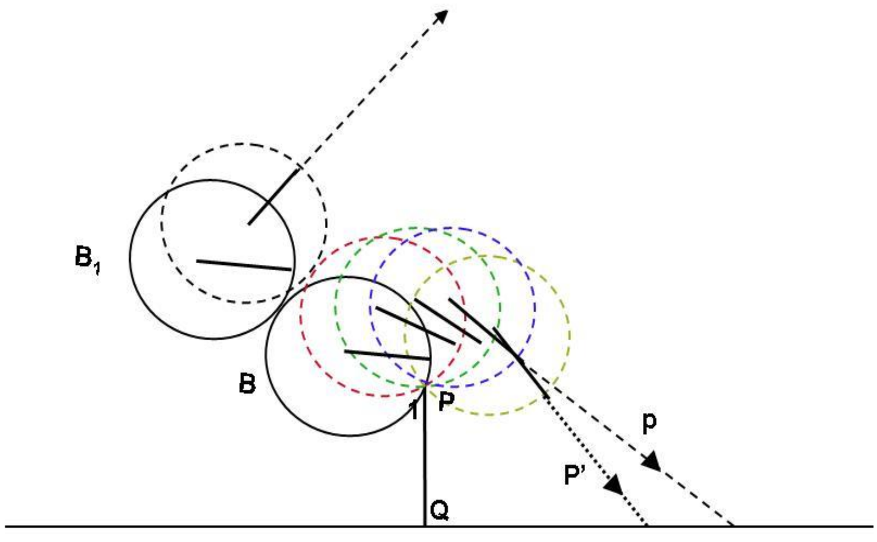

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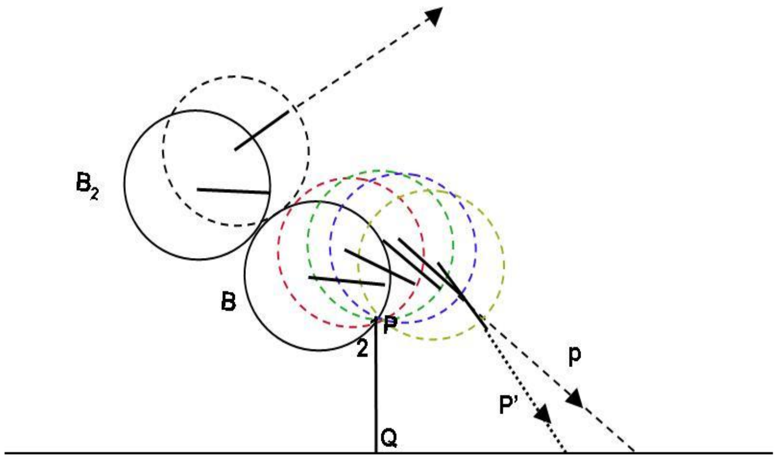

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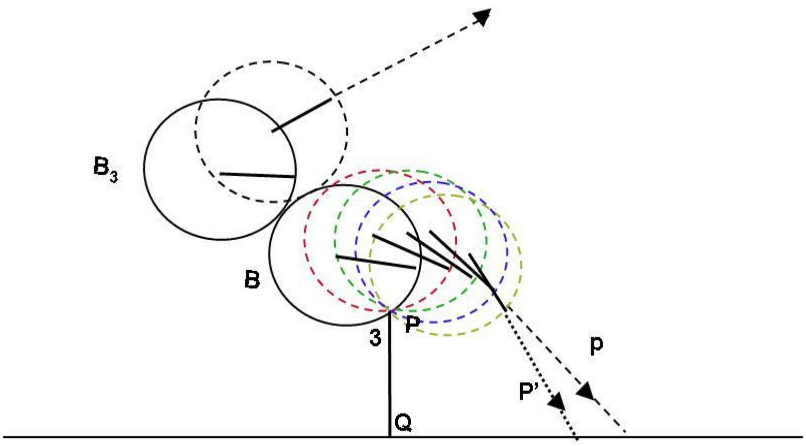

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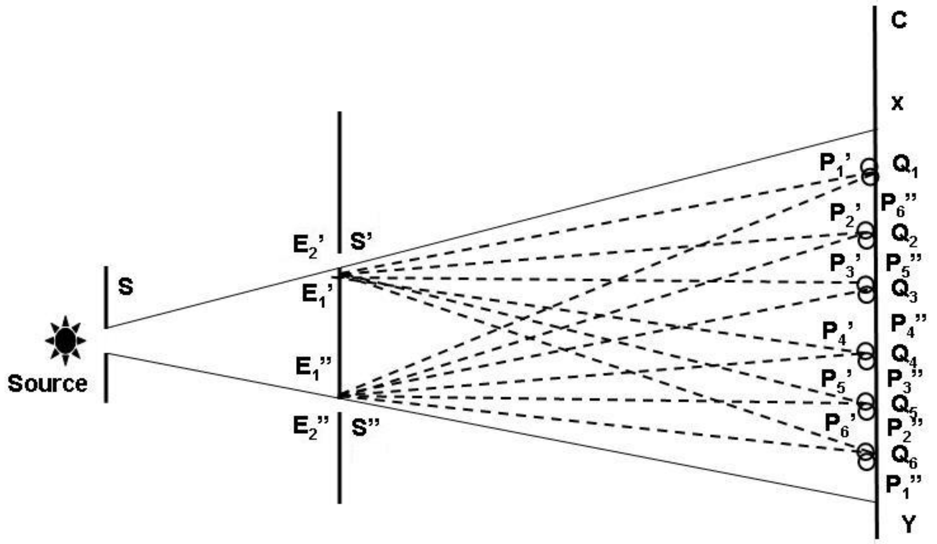
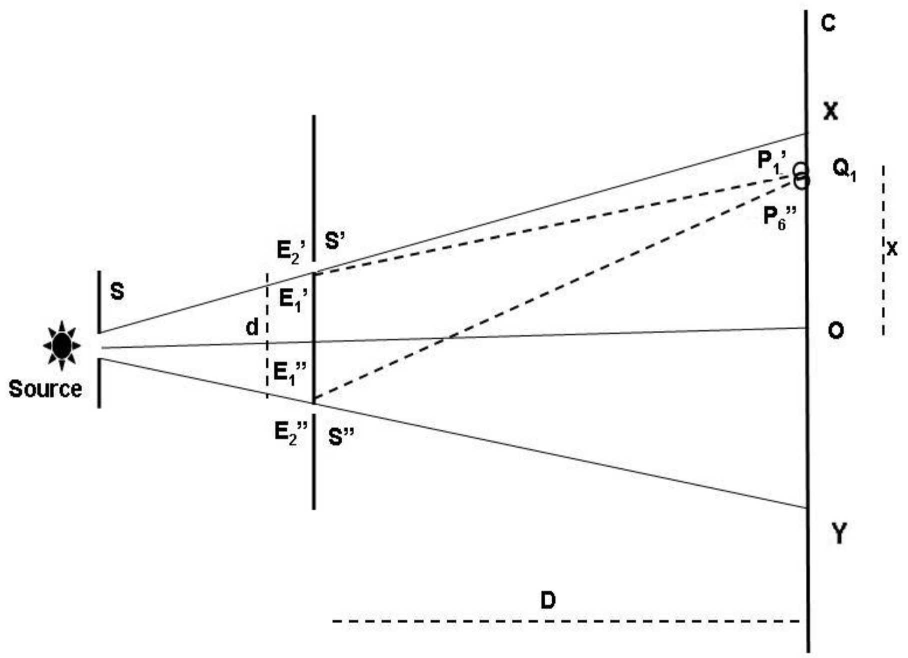
Fig. 3


C
X
S
Source
E2' S'
E1'
E1''
E2'' S''
P1' Q1
P6''
P2' Q2
P3' P5'' Q3
P4' P4'' Q4
P5' P3'' Q5
P6' P2'' Q6
P1''
Y

(a)



(b)

Fig. 4

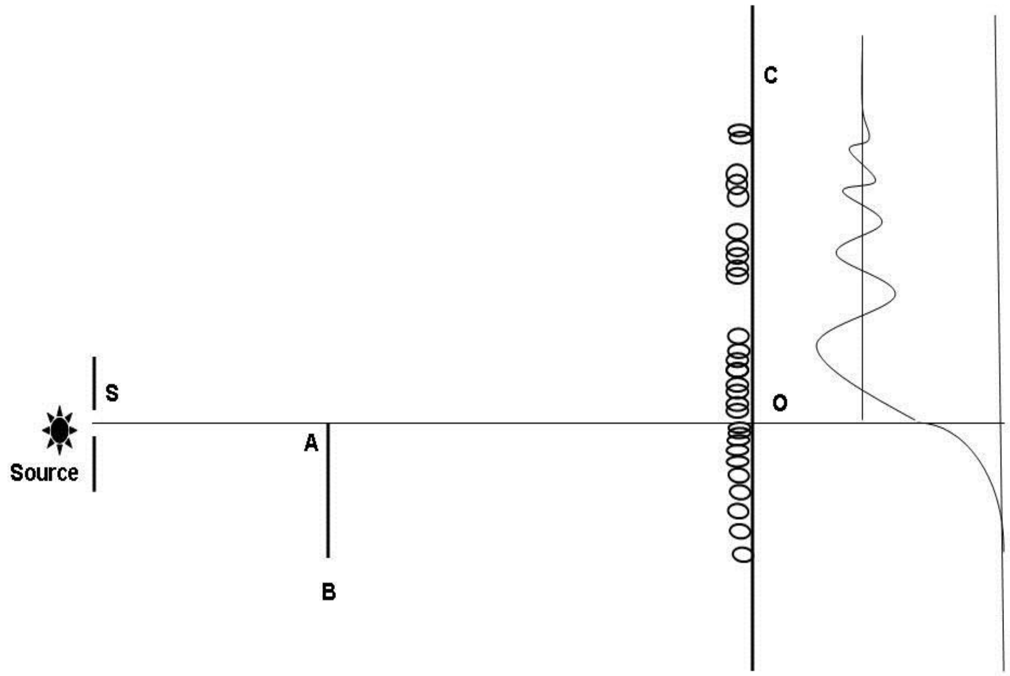
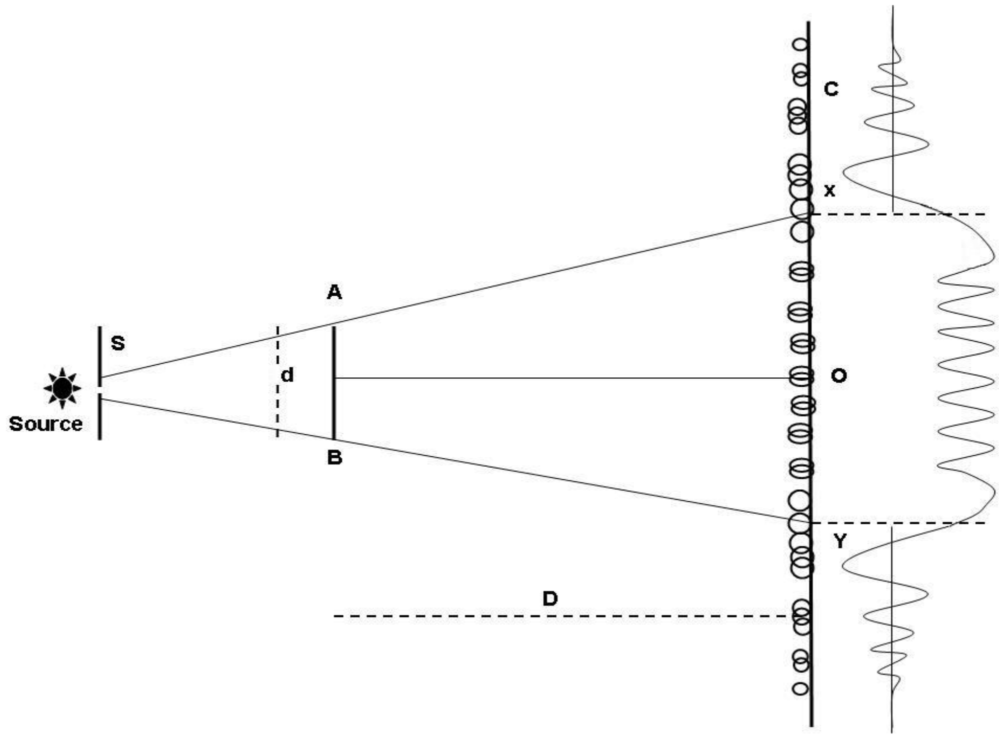
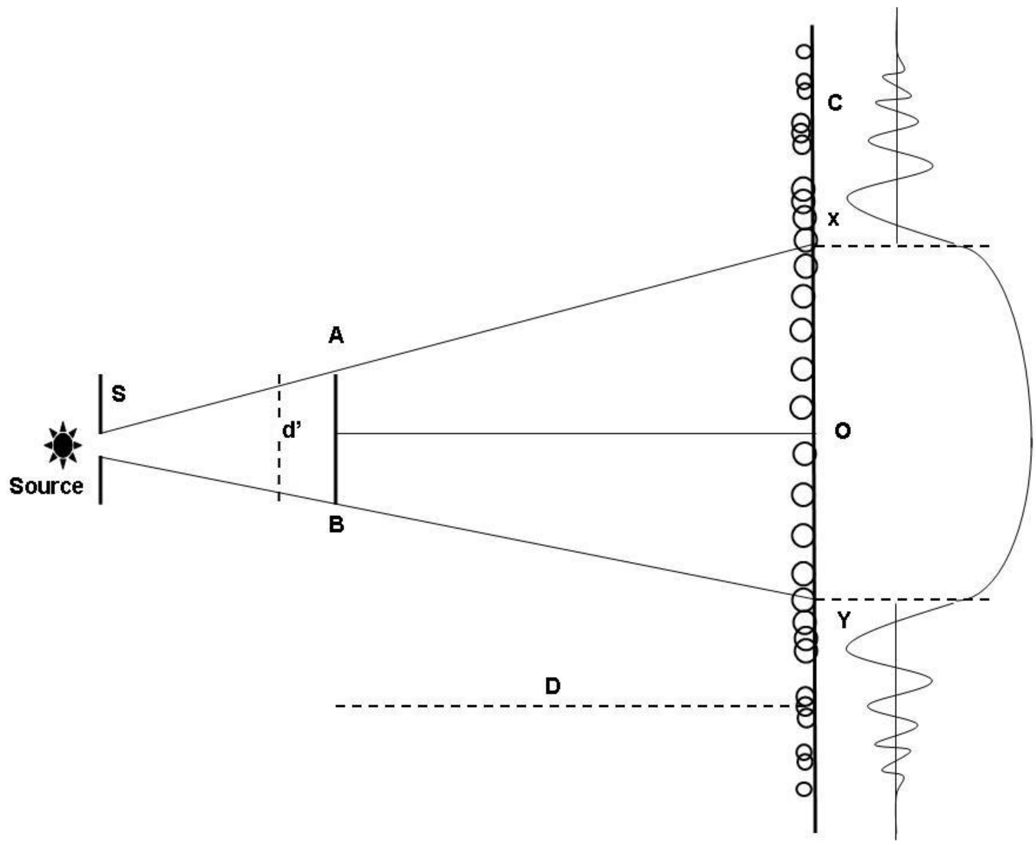


Fig. 5



(a)



(b)

Fig. 6