The Hypothesis of a New Form of Light Particles——Based on Optical Quantum State Analysis

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Abstract: In the current knowledge system, photons are widely regarded as microscopic particles with wave- particle duality, and their fluctuations and particle properties have been experimentally proven over the past hundred years, but new problems have also arisen. With more and more experimental and empirical evidence showing that the quantum state of light under microscopic conditions has greatly exceeded the original understanding of scientists, in the past 50 years of research on the nature of its particles, It raises new questions and challenges about its basic wave-particle duality, and hypothetically demonstrates on the basis of existing ones. By analyzing the existing experimental phenomena, this paper idealizes the performance of light under macroscopic and quantum state hypothesis analysis at the theoretical and physical level, and establishes a new form hypothesis of light particles, that is, the movement of detected light is essentially the transfer of energy between photons.

Keywords: Light Quantum; Quantum Hypothesis; Virtual Photons; Quantum Optics

Introduction

Light, the material that existed at the beginning of the universe, has created many turning points of great significance to the historical development of civilization. In modern times, human beings have explored the physical nature of light and the physical properties of microscopic particles to a higher level. At the end of the 17th century, Huygens believed in his "On Light" that the movement of light is not the movement of matter particles but the movement of media, and subsequent scientists began to study the wave theory of light.

The definition of virtual photons coincides with the author's conjecture, and as a microscopic particle, we have to note that Brownian motion, that is, all small molecules are doing non-stop irregular motion, but in a high-speed quantum-scale world, it seems to be very excessive. If it is assumed that the virtual photon is not assigned to the energy, due to the chaotic force of the surrounding microenvironment doing irregular motion, that is, the virtual photon at each moment when being observed will be extremely small because the order of magnitude of the observation scale is extremely small and cannot be calibrated and tracked, and the possible area and probability of occurrence of the virtual photon can only be estimated by measuring the chaotic force received. With the vigorous research of precision optical instruments in recent

years, this paper expounds some experimental phenomena in the form of a paper review, and puts forward a scientific hypothesis about the nature of light quantum morphology based on this.

1. Modern classical experiments

1.1 Mechanical effect of light:

Light has energy and momentum, and the momentum of light is a fundamental property of light. The interaction of light carrying momentum with matter is accompanied by the exchange of momentum, thus manifesting itself as light exerting a force on the object. The force acting on the object is equal to the change in the momentum of the object per unit time caused by light, and the resulting change in the displacement and velocity of the object is called the mechanical effect of light.

In the 70s of the 20th century, Steven Zhu and others used the principle of light pressure to develop a method of cooling and imprisoning atoms with lasers, and this research result also provided an effective experimental means for the work on Bose-Einstein condensates. At the same time, the mechanical effects of light on tiny macroscopic particles are also being explored. In 1986, Ashkin et al. successfully used a strongly converging laser beam to achieve three-dimensional capture of biological particles, and this invention result is also figuratively called optical tweezers, which has become a unique manipulation and research method for particles in this scale.

1.2 The volatility of light

1.2.1 Light interference

Light interference is a unique feature of fluctuations, if light is really a wave, it is inevitable to observe the interference phenomenon of light. In 1801, British physicist Thomas Young successfully observed the interference of light in his laboratory. The light emitted by two independent light sources is not coherent light, and the double-slit interference device makes a beam of light become two coherent lights after passing through the double slit, forming stable interference fringes on the light screen. In the double-slit interference experiment, when the distance difference from a point to the double slit on the optical screen is an even number of times the half-wavelength, a bright stripe appears at the point, and when the distance difference from a point to the double slit on the light screen is an odd number of times the half-wavelength, a dark stripe appears at the point.

1.2.2 Diffraction of light

All waves can be diffracted and energy is transmitted to the shadow area by diffraction, and obvious diffraction can occur if the size of the obstacle or hole is similar to the wavelength. The law of single-slit diffraction, when the wavelength is fixed, the narrow central stripe of the single slit is wide, and the distance between the stripes is large. When the single slit is unchanged, the wider the central bright line of the light wavelength (red light), the larger the streak interval. The single-slit diffraction stripes of incandescent lamps are bright in the center, colored stripes on both sides, and red on the outside and purple on the inside near the light source.

1.3 Particle properties of light

At the beginning of the 20th century, the German physicist Max Planck proposed the concept of

energetons. Subsequently, Einstein noticed the significance of energon and proposed that when light is absorbed and emitted, the energy is one by one, and light itself is composed of inseparable energy particles, which are called photons. Einstein proposed the famous equation of the photoelectric effect: Ek=hv-W0 (where h is Planck's constant, ν is the frequency of light, and W0 is the work of escape, It explains many conclusions well and lays the foundation for the particle theory of light.

From 1918 to 1922, when the American physicist Compton studied the scattering of X -rays by graphite, he found that in the scattered X-rays, there were not only rays with wavelengths equal to the original wavelength, but also parts with wavelengths greater than the original wavelength λ0, that is, the Compton effect. He successfully explained this phenomenon with a model of photons, arguing that photons not only have energy but also momentum, and the momentum of photons p=h/λ, which further supports the particle theory of light (Compton effect constant: h=6.626 ×10^-34 J · s).

2. Modern experimental phenomena

Under the background of practical application as the main purpose and national strategic goals as the core, in modern optical research, laboratories and scientific research institutes of major universities have undertaken important tackling forces, and many scientific research achievements in the field of optics have been achieved since the reform and opening up.

Based on the vigorous development of quantum entanglement, cutting-edge technologies such as quantum secure communication, quantum radar, and universal quantum computers are gradually moving from theory to reality. Photonic systems have the advantages of fast propagation speed, strong coherence and multiple degrees of freedom, and are excellent carriers for studying quantum entanglement. In order to meet the needs of the application field, how to realize the quantum entanglement light source with higher channel capacity and stronger anti-interference ability has become a hot spot in research, which puts forward higher requirements for the entanglement dimension and particle number of the quantum light source. The birth of a new type of quantum light source provides a new development direction for human research on light sources, and its most important concept is quantum entanglement. The study of quantum entanglement is not only the core of quantum theory, but also the most important resource in quantum communication and quantum computing.

3. Propose a hypothesis

Based on the above experimental accumulation, the paper proposes a conjecture that photon is a particulate substance much smaller than an electron (it is known that the diameter of photons measured by experiments is less than 10-45m). The movement of light detected by the experiment is essentially energy fluctuations, that is, the transfer of energy between photons. Light propagates at a speed of approximately 3*108 (m/s), essentially energy propagates in a form similar to gravitational radiation waves, and the photons themselves do not move. Through the human eye visual persistence explained by the movie, the movement of the light we observe is partly due to the photon through contact or special non-contact way to transfer energy, after the energy is all transferred to other photons, the photon falls to a state similar to virtual photons (hereinafter referred to as "suspended animation photons"), at this time the photon has no obvious energy fluctuations (similar to animal suspended animation), existing

instruments can not detect its existence, that is, the photons it transfers energy are "observed photons".

Figure A: Hypothetical photon movement

Figure B: Photon movement in the classical sense

That is, in the same space, photon A presents a wavelength of 5 60 nm at the first observation point, and photon B also presents a wavelength of 560nm at the next observation point and the energy is the same as the A limit (because there will be energy loss during propagation, but this value is much smaller than the energy order of magnitude of a single photon, so it can only be the same limit, and the energy value is infinitely close but not equal). In the time of the two observation points, the energy is transferred (Figure a), and the light quantum is considered to be "mobile" under the experimental conditions of the existing accuracy, and it cannot be proved that the A photon at the first observation point moves to the next observation point (Figure B)., that is, mistakenly believing that energy only exists in a single particle that is classified as a state without energy after exhaustion in the particle, ignoring the uncertainty and heterogeneity of the transfer properties of energy between particles in the quantum world when the experimental accuracy and observation instruments do not allow.

4. Conjectures based on hypotheses

In the existing cognitive system, photons are microscopic particles with "wave-particle duality". Photons are particles with velocity and energy, and the rest mass is zero, and in experimental research, the study of the coherent resonance and other properties of light is based on the wave equation of light. Similarly. As a result, in the non-dominant angle, the photon energy disappears instantaneously (converted into other forms of energy) after instantaneous excitation, and cannot produce a continuous and stable optical path path (that is, a beam of light will be rapidly converted into other forms of energy due to various physical properties. When the energy is exhausted, the light on that path disappears). Although light and electricity travel at approximately the same speed in a vacuum and have many similar physical properties, the two particles are very different in nature. Electrons are microscopic particles that have been confirmed to actually exist, and a relatively complete scientific knowledge framework has been established under the experimental demonstration by Thomson and others. Although photons put forward the concept earlier, the study of their nature has been debated for more than a hundred years, and the wave-particle duality that is popular and popularized in modern times is based on the research results of scientists on light quanta over the past hundred years.

5. Summary

At the end of the article, the author conjectures that the bisexual wave function of microscopic particles has been fixed since the beginning of the universe. The composition of the same particles is completely the same, but there are very slight differences, that is, the fetter factors mentioned above (for example, small changes occur under the influence of each other in a certain period of time and space, so that the particles have a unique relationship with each other). This subtle difference also leads to the fact that when energy vibrations occur under certain circumstances, they are not transmitted to nearby particles, but to distant particles with mutual bonding factors. This is just a small idea of quantum entanglement, and I will not repeat it here.

In recent years, with the development of human science and technology, quantum theory and quantum optics have been proved by many new experiments, virtual photonics, quantum optics and other emerging sciences have become research hotspots, breakthroughs in the quantum field are crucial to human scientific and technological progress, and it is of great significance to space exploration, philosophy, cutting-edge science and technology and military fields. At the same time, in 2022, China's photonic chip technology has achieved a major breakthrough, achieving corner overtaking in the silicon- based electronic chip track, I believe that human beings will continue to make breakthroughs in the research of light because of the new journey towards the future, realize the scientific research dreams of more predecessors and continue to pioneer and innovate.

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