On the duality of quantum particles and the Copenhagen interpretation of quantum mechanics

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Abstract.
In this article, we will examine experiments that prove that light, photons most commonly referred to by the abbreviation EMW (Electromagnetic Waves), are in fact completely electromagnetically neutral. We will prove that EMWs do not interact with real Coulomb and magnetic fields. Accordingly, the electrical and magnetic effects that we observe and measure, such as in the cases of Pokels cells, Kerr cells, or the liquid crystals under consideration, are not caused by EMWs. In fact, they are a consequence of a secondary effect from the intermediate substance through which EMWs pass, a substance that has been affected by magnetic and Coulomb fields.

Keywords: EMW, light, photons, interference pattern, quantum particles

Contents

Abbreviations:
CI - Copenhagen Interpretation
QPM - Quantum Particle with Mass
EMW - Electromagnetic Waves
IP - Interference Pattern

1. Introduction

The contemporary paradigm of the duality of quantum particles, imposed in the 1920s by supporters of the Copenhagen Interpretation (CI), is accepted as a proven fact, which serves as a starting point for the consideration of Quantum Mechanics as a whole. It is assumed that duality is a property of both Quantum Particles with Mass (QPM) at rest and photons, which for convenience we will refer to as Electromagnetic Waves (EMW). However, the duality of quantum particles has never been experimentally proven when all properties of quantum

particles are taken into account, see [1] (1998) where the author D.N. Klyshko provides a thorough analysis of the case.

Einstein, like many other physicists, categorically rejected QM and its required properties of duality, uncertainty and non-locality of quantum particles. He expressed his disagreement with the famous phrase "God does not play dice" at the well-known Solvay Congresses. A clear example of Einstein's attitude towards QI can also be seen in his letter to Schrödinger, [2] p. 527, where he writes:

"The comforting philosophy (or religion?) of Heisenberg-Bohr helps the believer to get a pillow for a peaceful sleep. It is difficult to drive him away from this pillow. Let him lie down. But this religion has a devilishly weak effect on me, and I say despite everything: Not "E and v", but "E or v". It is not v, but E - ultimately, it is this quantity that possesses reality."

Later, Einstein, together with Podolsky and Rosen (1935) [3], considered the possibility of a decisive experiment that would refute or prove the claims of QI. They proposed measuring (tracking) the state of two systems that had interacted for a certain period of time beforehand. Accordingly, according to the ideas and requirements of QI, they already "obey" the requirements of the wave function.

However, it is important to note that in 1935, the two quantum systems were considered as two QSMs, both in the article by Einstein, Podolsky and Rosen (EPR) and in the "counter" article by N. Born. (It should be noted that in this case, both articles were published under the same title.)

2. Electrical and magnetic Neutrality of EMW

Fig. 1 shows a symmetrical Mach-Zehnder interferometer, through which experimental setup, we can prove the electrical and magnetic neutrality of EMW. The interferometer in Fig. 1 has a laser light source – L, semi-transparent mirrors – P1 and P2, as well as standard reflective mirrors – M1 and M2. Accordingly, when the laser is operating, we observe an interference pattern (IP) on the screen – E. In this case, we use a Mach-Zehnder interferometer because the two arms can be placed at a large distance from each other, which is necessary for our purpose. (See [4], where the advantages of the Mach-Zehnder interferometer are discussed and relevant literature on the subject is provided). In the arm P1, M2, P2 of the interferometer, there is a coil, as well as a "device" in the form of a capacitor (which we will call a capacitor for convenience). In this way, the laser beam in the arm P1, M2, P2 passes through the interior of the coil, as well as between the plates of the capacitor shown. And through switches – SW, the coil and the capacitor can be connected to a power source – IE. When the coil is connected to the power source, it creates a magnetic field inside it. Accordingly, when the energy source is connected to the so-called capacitor, there is a Coulomb field between the plates. Using switches SW, we can select different combinations of connection of the coil and capacitor, as well as different types of voltages (direct or alternating, as shown in Fig. 1).

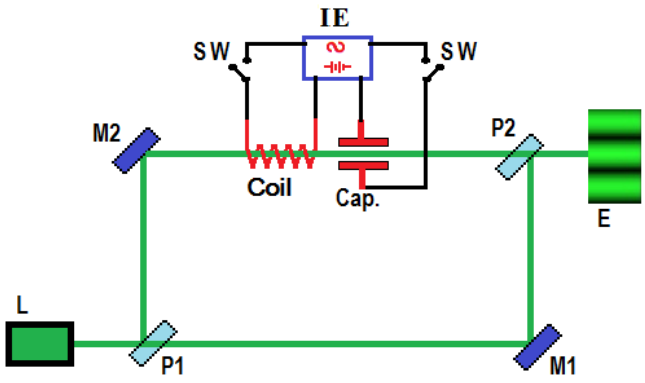

Fig. 1 shows a Mach-Zehnder interferometer. In arms P1, M2, P2 there is a coil, as well as a "device" in the form of a capacitor, through which the laser beam from the laser passes. Using switches – SW, the coil and the capacitor can be connected to a power source (voltage) – IE. Regardless of whether SW are switched on, there will be no change in the interference pattern on the screen – E.

However, regardless of the different combinations of connecting the coil and capacitor to the power source, there will be no change in the IP observed on the screen. From this we can

From this we can draw one of the main conclusions. **We cannot replace an experiment considered with QPM, as in Einstein, Podolsky, Rosen in** [3]**, with an optical experiment using EMW, as considered by Alain Aspect in** [7]. Because they obey different laws.

Accordingly, the author's stated claim in [7], point ***2.1. Experiment scheme***:

"Note: There is a mutually unambiguous correspondence between the scheme of the thought EPR experiment according to Bohm and the experiment with two particles with spin ½ in an entangled state, which are subjected to analysis using Stern-Gerlach filters with two orientations."

This is incorrect and contradicts the experiments discussed above and the conclusions drawn.

It should be noted that the author in [7], declares full correspondence between experiments with QPM (according to EPR) and an optical experiment using EMW, referring to D. Bohm and J. Bell. However, this reference does not have the force of experimental fact, but is only a way of complicating the case and blurring the essence. In literature [8], information can be found on the chronology of the case in question.

Literature

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