

Peer Review

Review of: "Aristotle, Heisenberg, and Non-locality and Non-temporality of a Single Photon"

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Prof. Driessen presents a research article exploring the properties of energy exchange by photons as seen by a supporter of Aristotelian philosophy and quantum mechanics. The paper discusses issues, such as the non-locality and non-temporality of photons as quantum entities, which in Aristotelian physics can be dealt with as merely classical metaphysical entities.

In a review of his previous work, I pointed out some difficulties in the technical aspect of the presentation. I still see the same difficulties, even though the metaphysical vision seems to have improved.

I maintain the opinion that, to say that the photon trajectory is causally influenced by the final state, makes sense in a deterministic vision of physical reality: Cause and effect link the past with the future and vice versa. Starting from the initial state, the photon trajectory and its final state are physically determined, and vice versa, starting from the final state. There are no problems in this case, and there would be agreement with a classical deterministic vision such as that of Aristotelian physics.

A technical aspect of the presentation by Prof. Driessen that I discussed in my previous review refers to the bandwidth $\Delta\nu$ of the full-width-at-half-maximum (FWHM) of the pulse spectrum that leads to the equation,

$$\Delta\nu \cdot \Delta t = 5/(4\pi) \quad (4).$$

I pointed out that, in my opinion, the quantity $\Delta\nu$ in Eq. (4) does not represent the uncertainty of the measurement of the frequency ν of a single photon. In fact, Eq. (4) refers to average values of some physical quantities of an ensemble of photons and is not necessarily related to the uncertainties of the physical quantities related to the HUP of a single photon. A priori, the wave properties of an ensemble are

not necessarily the same as those of an individual particle. It may be just an assumption of the theory. Different interpretations of Quantum Mechanics provide different visions about this controversial aspect. To assume that the wave properties of an ensemble are the same as those of an individual particle is possibly what leads to the paradoxes pointed out by Prof. Driessen.

Nevertheless, skipping technicalities, I agree with the author about the improvements in the presentation at the metalevel. Thus, I think that the new presentation deserves recognition as an improved version of the description of non-locality and non-temporality of photons.

Best wishes to Prof. Driessen for his research.

Declarations

Potential competing interests: No potential competing interests to declare.