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# Comments on a Recent Proposal by Garuccio and Vigier

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*The two photon problem defined by Vigier and Garuccio should be treated in the second quantization formalism; it is, thus, seen that the amplitude for finding one photon in the interference region of the two lasers remains the sum of the two interfering amplitudes.*

I feel that the test recently proposed by Garuccio and Vigier[1] is not so crucial as they believe. The amplitude for receiving one photon at $C$ and one photon at ($A$ or $B$), in the notations of the authors (see their Fig. 1), is the sum of the amplitude that one photon is emitted at I and one photon at II, *plus* the amplitude that two photons are emitted at I and zero at II. Therefore, the situation is not essentially different from what it is in the experiments of Pflegor and Mandel proper.

This nonseparability of two preparations converging into a common measurement[2] is so alien to common sense that additional experimental (if only "thought-experimental") considerations might be welcome.

In order to make clear if, say, lazer II has emitted one or zero photons, one may think of either weighing it, or measuring its recoil momentum, before and after the experiment. Respectively, the error in the measurement must be such that $c^2\Delta m < h\nu$ or $c\Delta p < h\nu$. But, in order to make sure that, if emitted, the photon has been emitted inside a given period or wavelength, the error in time or in length must, respectively, be such that $\Delta t < 1/\nu$ or $\Delta l < c/\nu$. Compatibility of the two conditions is forbidden by, respectively, the time-energy and the length-momentum uncertain relations.

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[2] Garuccio and Vigier mention that *P* Bergmann has remarked that Pflegor and Mandel's experiment displays a time reversed EPR correlation. I have independently made the same remark.[2]



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This makes clear how nonseparability is tied to Heisenberg uncertainties *via* phase coherence.

## REFERENCES

1. A. Garuccio and J. P. Vigier, *Found. Phys.* **10**, 797 (1980).
2. O. Costa de Beauregard, *Nuovo Cim.* **51B**, 267 (1979) (see pp. 269 and 273).