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Interaction between localized photons and electrons in a Young's double-slit experiment

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The model of photon is usually expressed for an electromagnetic field confined inside a cavity. Thus, each photon has a uniform spatial distribution within the cavity, and therefore the single-mode state of photons are delocalized. However, the typical sources of quantum-optical experiments produce photons described by a spatial wavepacket, i.e., with some degree of localization. We study the non-local effects in the interaction between localized photons and electrons in the double-slit experiment, where it is known that the interference pattern is related to degree of coherence of the electron wave function, i.e., the correlations between the different components of the wave function.