

Coherence and interference

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Abstract

Interference is a ubiquitous phenomenon in quantum mechanics and optics. It is traditionally explained by coherence; as long as two or more waves are mutually coherent they will interfere. However, as shown by the pioneers in the field, like Emil Wolf, Leonard Mandel, and Roy Glauber, coherence comes in many flavors and in different orders. The ultimate root of coherence is indistinguishability. If, in the detection stage, two or more photons that take different paths are indistinguishable, they will interfere. This simple sentence defines, in a nutshell, the necessary and sufficient criterion for interference.

In the lecture we shall discuss interference orders, strategies to obtain interference, how different detection strategies may influence the coherence and thus interference. We shall also revisit some of breakthrough experiments that have shaped our understanding of interference, coherence and indistinguishability.