Quantum Entangled Interferometers and Their Applications

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A new type of quantum interferometer utilizes nonlinear parametric processes as the wave splitting and recombination elements. Because of the nonlinear interaction, the fields inside the interferometer are intrinsically entangled and quantum mechanically correlated. This type of quantum correlated interferometer exhibits some unique properties that we will review in this talk. Because of these properties, this type of interferometer is superior to traditional beam splitter-based interferometers in many aspects. We will present its various forms and its realizations with different types of waves such as microwave, atomic waves (both internal and external degrees), and sound waves. We will discuss its applications in quantum metrology, quantum imaging, quantum spectroscopy, and quantum state engineering.

Professor Ou obtained his BS in 1984 from Peking University and his Ph.D. in 1990 from University of Rochester. He is now a chair professor in City University of Hong Kong. Professor Ou is an expert in quantum optics, especially in quantum interference, for which he is famous for the Hong-Ou-Mandel interferometer. His current research focuses on quantum metrology, quantum sensing, quantum state engineering, and the fundamental quantum interference effects. Professor Ou is a fellow of American Physical Society and of Optica (formerly Optical Society of America).