A Quantum Spectrometer Using Phase-Controlled Spatial Light Modulators

B S Ham[1]

[1]*School of Electrical Engineering and Computer Science, Gwangju Institute of Science and Technology, 123 Chumdangwagi-ro, Buk-gu, Gwangju, South Korea. Contact Phone: +82-1092403689*
Contact Email: bham@gist.ac.kr

A quantum spectrometer is presented using phase-controlled spatial light modulators (SLMs) *via* polarization-basis projection measurements, resulting in fringe-controlled quantum erasers. Recently, quantum eraser-based superresolution has been proposed and experimentally demonstrated using a continuous-wave laser in a macroscopic regime. The polarization-basis projection measurement is a common technique in quantum sensing based on N00N states to interact with distinguishable photons in an interferometer. A spatial light modulator replaces the beam splitters and polarizers used in the original scheme to solve the limited scalability in the projection measurements. For a potential application of the quantum spectrometer, the intensity products between SLMs are numerically calculated to demonstrate enhanced frequency resolution in a Mach-Zehnder interferometer, which is impossible in our common understanding of coherence optics. A preliminary result of experimental data is also presented.

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