



Contribution ID: 306

Type: Oral Presentation

Optical Quadrature Microscopy with a polarization-sensitive camera

Wednesday 9 July 2025 12:10 (20 minutes)

Quantitative Phase Imaging (QPI) is an imaging technique enabling non-invasive, label-free measurement of optical path length differences within samples, facilitating three-dimensional reconstruction from two-dimensional microscopy data. This is traditionally achieved using interferometric approaches such as Phase Shifting Interferometry (PSI) where interferograms generated by combining reference and object beams with controlled phase shifts, are measured.

In this study we explore Optical Quadrature Microscopy (OQM), a variation of PSI that utilizes a quarter-wave plate combined with a rotatable analyzer to introduce controlled phase shifts in the reference arm of a Mach-Zehnder interferometer. We eliminate the need for an analyzer by integrating a polarization sensitive camera, potentially quadrupling the acquisition rate and enhancing temporal resolution. The details of the optical setup as well as preliminary results which validate the system's capability to perform accurate quantitative phase measurements will be presented. Additionally, the implications of our approach for studying dynamic samples will be discussed.

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Session Classification: Photonics

Track Classification: Track C - Photonics