

Phase Retrieval in Coherent Optical Metrology

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Summary

Coherent optical metrology represents a broad scope of techniques using coherent or partial coherent light as a probing matter for various measurements including refractive index, deformation, 3D shape, velocity, temperature, pressure etc. Phase retrieval places a central role in various coherent techniques such as optical non-destructive testing (NDT), surface plasmon resonance (SPR) optical biosensors, laser Doppler vibrometry (LDV), digital holography, optical coherence tomography (OCT) and spectral phase interferometry for direct electric-field reconstruction (SPIDER). Different phase retrieval schemes have been applied in different applications to meet their specific requirements. This article tends to provide a brief review and comparison on various phase retrieval methods in terms of principles, accuracy, robustness, applicability and requirements. Emphasis will be given on possible adoption of various phase retrieval techniques for applications in experimental mechanics for deformation measurement, vibration characterization and material evaluation. Recently advances in high speed wide-range dynamic measurement using speckle interferometry will also be emphasized.

