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Quantitative Phase Imaging System Based on a Three-Lens Common-Path Interferometer

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Abstract : White-light quantitative phase imaging is an effective technique for achieving sub-nanometer phase sensitivity. Highly stable interferometers based on common-path geometry have been developed in recent years to solve this task. Some of these methods also apply multispectral approach. The purpose of this research is to suggest a simple and effective interferometer for such systems. We developed a three-lens common-path interferometer, which can be used for quantitative phase imaging with or without multispectral modality. The lens system consists of two components, the first one of which is a compound lens, consisting of two lenses. A pinhole is placed between the components. The lens-in-lens approach enables effective light transmission and high stability of the interferometer. The multispectrality is easily implemented by placing a tunable filter in front of the interferometer. In our work, we used an acousto-optical tunable filter. Some design considerations are discussed and multispectral quantitative phase retrieval is demonstrated.

Keywords : acousto-optical tunable filter, common-path interferometry, digital holography, multispectral quantitative phase imaging
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