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Noise reduction in electronic speckle pattern interferometry fringes by merging orthogonally polarised speckle fields

A. Brozeit, J. Burke, H. Helmers *, H. Sagehorn, R. Schuh

Carl von Ossietzky Universität Oldenburg, FB Physik, PF 2503, 26111 Oldenburg, Germany

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Abstract

The noise in sawtooth fringes generated by electronic speckle pattern interferometry (ESPI) is investigated. When deformations of depolarising objects are studied, the scattered object light can be decomposed into two orthogonal linearly polarised speckle patterns which are partially decorrelated. Their correlation coefficient decreases with increasing depolarisation coefficient of the object. By suitable merging of the phase distributions of these two speckle fields on the basis of a modulation depth analysis, the rms phase error in the ESPI sawtooth fringes can be reduced significantly. © 1998 Elsevier Science Ltd. All rights reserved.

Keywords: Electronic speckle pattern interferometry (ESPI); Polarised speckle fields; Phase reconstruction

1. Introduction

statistical density has been shown to be one per two speckles [4, 7] and their effect on phase unwrapping

For further information:

Heinz.Helmers@uni-oldenburg.de

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