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The application of the self-adaptive tracking method to the sinusoidal phase modulating interferometry

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Keywords

sinusoidal phase modulation, surface profile measurement, spectral leakage, self-adaptive tracking method, DFT analysis

Abstract

In this paper, we analyze theoretically the accuracy of the surface profile measurement in a sinusoidal phase modulating interferometer, derive the relative error formula, and investigate the influence of spectral leakage on the measurement accuracy. The theoretical results show that when the offset of sampling frequency from its theoretical ideal is outside the range of - 0.188% to +0.075%, the spectrum leakage results in an relative error greater than $\lambda/320$ nm, and thus the spectral leakage is not negligible. In order to eliminate the influence of the spectral leakage, a self-adaptive tracking method is proposed. The tracking method can adjust automatically the sampling signal frequency in such a way that the sampling signal frequency is an integer multiple of the modulating signal frequency. The simulation and experimental results show that the problem of the spectrum leakage can be solved with the proposed technique, and therefore the measurement accuracy and reliability of the SPM interferometer are enhanced.



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