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# 应用高精度旋转法的干涉仪检测误差校正

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# Error correction of interferometer detection with high-accuracy rotation method

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摘要 图/表 参考文献(0) 相关文章 (1)

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**摘要**

针对利用高精度菲索型干涉仪和旋转平均法对光学元件进行面形绝对检测时对旋转精度的要求,提出了一种旋转误差校正模型来修正面形绝对检测中的旋转非对称项误差。首先基于经典*N*步旋转平均法理论,通过泽尼克多项式给出面形误差的数学表达形式;然后根据旋转角度所引起的误差修正泽尼克系数进而修正旋转非对称项误差;最后用数值仿真及实验的方法验证了校正模型的正确性。在旋转角度误差为0.1°条件下的仿真结果显示:*N*步旋转平均法所得面形误差RMS值为真实面形的10.13%,校正后面形误差RMS值为真实面形的6.79%;实验结果显示:*N*步旋转平均法所得面形误差RMS值为真实面形的10.28%,校正后面形误差RMS值为真实面形的5.77%。这些结果证明所提出的校正模型准确可靠,提高了旋转平均法的检测精度。

**关键词** : 菲索干涉仪, 旋转平均法, 旋转非对称项面形误差, 面形绝对检测, 泽尼克多项式

**Abstract** :

According to the requirements of absolute flatness detection of optical elements for rotation accuracy by using high-accuracy rotation method based on a Fizeau interferometer, a rotary error correction model was proposed to correct the rotationally asymmetric deviation in the detection. Firstly, on the theoretical basis of the classical *N*-step rotation average method, a mathematical expression of surface deviation was given by Zernike polynomials. Then, the Zernike coefficient was corrected according to the error caused by the rotation angle and the rotationally asymmetric deviation was corrected. Finally, the correctness of the calibration model was verified by numerical simulation method and an actual experimental test. In the conditions in rotation error of 0.1°, the simulation shows that the absolute detection error(Root Mean Square, RMS) is 10.13% by using the *N*-step rotation average method, and it can be promoted to 6.79% after being corrected. Moreover, the experiment shows that the detection error(RMS) is 10.28% by using the same method, and it is promoted to 5.77% after being corrected. These results demonstrate that the proposed calibration model is accurate and reliable, which improves the detection accuracy of the rotational averaging method and reduces the rotationally asymmetric deviation to the proportion of 27.2%.

**Key words** : Fizeau interferometer rotational averaging method rotationally asymmetric surface deviation absolute flatness detection Zernike polynomial

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