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摘要: 为了对畸变波前进行精确校正,研究了液晶波前校正器在不同灰度级之间的动态位相响应特性,准确确定其响应时间。首先给出校正器的响应时间和位相变化的检测方案。然后检测了液晶波前校正器在0和255灰度级之间的上升和下降时间,分别为7 ms和11 ms。校正精度的条件下,对该位相曲线采取 $\lambda/10$ 的误差截断,使上升和下降时间分别减少到4 ms和6.8 ms。最后,研究了各灰度级依次上升从255再以次回落到各灰度级的动态响应时间。结果表明,各灰度级的上升时间在2~5.2 ms之间变化,下降时间在3.66~8.74 ms之间。无论是上升还是下降,150和255灰度级之间转换速度最快,在255灰度级邻近的灰度响应速度最慢,且响应时间长于0和255灰度级之间。因此,在波前校正中,须以255灰度级邻近的灰度级中最长的响应时间作为液晶波前校正器的响应时间,以确保波前校正精度。

关键词: 液晶波前校正器 位相 响应时间 动态

Dynamic Phase Response of Liquid Crystal Wavefront Corrector

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Abstract: To achieve the high accuracy correction of the distorted wavefront, dynamic phase response characteristics between different grey levels of liquid crystal wavefront correctors (LC WFCs) was investigated. First, a scheme given to measure the response time and phase modulation of the LC WFC. Then, the fall and rise time of a LC WFC were measured between 0 and 255 grey levels. The results indicate the rise and fall time are 7 ms and 11 ms respectively. To assure the correction accuracy, the phase modulation curves were cut off with error of $\lambda/10$ (λ : nm) and then the rise and fall time were reduced to 4 ms and 6.8 ms respectively. At last, the dynamic response time which is produced with every other grey levels go up to 255 grey level and the reverse process, was measured. The measured results show that the rise and fall time of the grey levels vary at the range of 2~5.2 ms and 3.7~8.7 ms respectively. Simultaneously, the switching time between the grey level of 150 and 255 is shortest for both of rise and fall time, and the response time is longest for the grey levels which is adjacent to 255 grey level. Furthermore, the response time of the grey levels nearby 255 grey level is larger than the response time between 0 and 255 grey level. Therefore, to assure the accurate correction of the wavefront, the response time of the LC WFC should be selected with the longest switch time among the grey levels which is adjacent to 255 grey level.

Keywords: liquid crystal wavefront corrector phase response time dynamic

收稿日期 2012-07-18 修回日期 2012-08-29 网络版发布日期

基金项目:

国家自然科学基金(No.60736042, No.11174274)

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参考文献:

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