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论文

光刻物镜中压电陶瓷驱动器的动态性能研究

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摘要:

针对压电陶瓷在光刻机投影物镜中作为像质补偿镜组促动器的特定应用要求,对一种以集成运算放大器构成的压电陶瓷驱动器的动态性能进行了研究.首先,针对驱动器系统中集成运放固有频率特性对动态性能的影响进行了分析,确定了外部补偿网络的参量.然后,针对驱动器系统大容性负载对动态性能的影响进行了分析,提出了隔离电阻的补偿方法.最后,讨论了驱动器系统中寄生电容对动态性能的影响.计算表明:补偿后的压电陶瓷驱动器系统相位裕量为79°,阶跃响应无超调量,调节时间为5 μs.基本满足压电陶瓷在光刻物镜中作为像质补偿镜组促动器的稳定性强、响应快速、超调量小等动态要求.

关键词: 光刻物镜 压电陶瓷 动态性能

Dynamic Performance of the PZT Driver Used in a Lithographic Objective

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Abstract:

The dynamic performance of a PZT driver which contains an operational amplifier was studied according to the specific requirements of the image quality compensator in a lithographic objective. Firstly, the impact of the inherent frequency characteristics of the operational amplifier on dynamic performance was analyzed and the parameters of the compensatory network were fixed. Secondly, the impact of the capacitive load of the driver system on dynamic performance was analyzed and the corresponding solution was provided. Finally, the impact of the parasitic capacitance in the driver system was discussed. As calculated, after compensated the PZT driver system had a phase margin of 79 degrees and a setting time of 5 microseconds, and presented no overshoot in step response. The driver would fulfill the dynamic requirements of strong stability, rapid response and little overshoot when the PZT was used as actuator of the image quality compensator in a lithographic objective.

Keywords: Lithographic objective PZT Dynamic performance

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