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论文

温度变化对1.23 m望远镜光机系统的影响

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摘要:

为了实现1.23 m望远镜在环境温度从-35℃~+55 ℃变化范围内,光机系统的成像质量的指标要求,本文从原理上分析了温度变化对光机系统中光学元件面形准确度及相对位置关系的影响,推导出了主次镜间光学间隔变化与像面离焦量的比例关系.通过对1.23 m望远镜光学结构的像质分析,结合光机结构设计,搭建了适合环境温度变化的光机系统,从方案设计上满足了望远镜系统的成像要求.通过实际的成像实验,验证了温度变化导致的主次镜光学间隔变化对望远镜系统成像带来的离焦的影响,并给出了具体的温度补偿措施,即采取次镜调焦的方式,可满足具体观测实验的要求.同时,为今后1.23 m望远镜以及类似的大口径望远镜系统的实验和技术改造提出了切实可行的意见.

关键词: 光机系统 温度影响 大口径望远镜 离焦误差

Influences of Thermal Diversification to Opto-mechanical System of 1.23 m Telescope

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Abstract:

Influences of the thermal diversification to the accuracy of optical element and relatively position of the opto-mechanical system are analyzed. The scale ratio of the optical distance diversification and the defocus error of optical system is derived. Through integrated opto-mechanical design and analysis of image quality of the 1.23 m aperture telescope, an opto-mechanical system (fitting the thermal diversification of -35 ℃~+55 ℃) is built that meets the requirements of imaging of the telescope. It is also validated that the main influence of the thermal diversification to the telescope is defocus error, and some practical compensation methods such as focus mechanism on secondary mirror to satisfy the requirements of observation of the telescope are presented. Meanwhile, some feasible opinions for the observational experiments and upgrading of 1.23 m aperture telescope or larger aperture telescope analogously are proposed.

Keywords: Opto-mechanical system Influence of the thermal diversification Large aperture of telescope Defocus error

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