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微纳技术与精密机械

空间摄像机热控系统设计

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摘要： 根据摄像机所处空间环境和结构特点,设计它的热控系统,同时进行了热平衡试验来验证热设计的合理性。首先,总结了摄像机热设计的基本原则,分析了摄像机所处的空间热环境。然后,对摄像机的各个部分进行了热设计;采用被动热控措施进行热隔离和热疏导,充分利用了摄像机安装平台的卫星平台的热容;采用主动热控措施将温度控制在热控指标范围之内。最后,根据摄像机的热环境和各种工作模式设计了4种极端试验条件,进行了热平衡试验。试验结果表明,摄像机在存储工况时,其温度与安装面温度相差3℃左右,满足存储温度指标要求;低温工况和高温工况时,镜头温度为-3.1℃和45.7℃,镜头温度为-4.5℃和46.8℃,均满足热控指标要求。试验结果证实设计的空间摄像机热控系统合理可行。

关键词： 空间光学 空间摄像机 热控系统 热设计 热平衡试验

Thermal design for space cameras

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Abstract: A thermal control system for space cameras was designed according to its space environments and s characteristics. Firstly, the thermal design guidelines of space cameras were summarized, and the thermal envi of a space camera was analyzed. Then, the thermal design of the space camera was carried out. By utilizing th thermal capacitance of a satellite, the passive thermal control was used for thermal isolation and thermal trans and the active thermal control was conducted to implement the temperature compensation. Finally, four extrer conditions were designed and thermal balance tests were undertaken according to various work patterns and different thermal environments. The test results show that the temperature difference is 3 ℃ between the spa camera and the fitting surface, which meets the system requirements for storage work conditions. Furthermore whole space camera temperatures are -3.1 ℃ and 45.7 ℃, the lens temperatures are -4.5 ℃ and 46.8 ℃ in the temperature and high temperature work conditions, respectively, and they meet the thermal control system requirements. In conclusions, the thermal design of the space camera is feasible and reasonable.

Keywords: space optics space camera thermal control system thermal design thermal balance test

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