

## 球面反射式日冕仪实验装置的杂光分析和实验验证

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## Stray light analysis and experimental verification of spherical reflective coronagraph experimental devices

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摘要

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## 摘要

研究了拉曼阿尔法反射式日冕仪的成像与杂光分布水平,以期获得可靠的杂散光测量方法。根据日冕仪和反射式日冕仪的设计原理,设计并加工了一种新型球面反射式日冕仪实验装置,用于观测太阳在太阳半径( $R_{\odot}$ )为 $1.3\sim 2.5R_{\odot}$ 时的拉曼阿尔法波段日冕的辐射。对该实验装置进行了成像分辨率测试,结果显示该实验装置的空间分辨率为 $17.96\text{ lp/mm}$ ,与设计结果相吻合。使用Trace pro软件建立了日冕仪的仿真模型,在零度视场情况下对比了仿真模型和该实验装置获得的子午方向上的杂光分布,得到了该日冕仪实验装置的系统杂光点源透射率(PST)曲线,通过计算得知相应的杂光系数为 $0.278$ 。文中亦对该实验装置的杂散光来源进行了分析。

关键词: 光学设计, 反射日冕仪, Lyman-alpha辐射, 杂散分析, 点源透射率

## Abstract:

This paper focuses on the imaging and stray light distribution levels of a Lyman alpha reflection coronagraph, and attempts to get a reliable stray light measurement method. A new sphere reflection coronagraph experimental device is designed and manufactured based on the design principles of coronagraphes to observe the corona radiation in Lyman alpha region when the sun is with a solar diameter ( $R_{\odot}$ ) of  $1.3\sim 2.5R_{\odot}$ . The imaging resolution of the experimental device is measured. The results show that the spatial resolution of the system is  $17.96\text{ lp/mm}$ , and in agreement with the design results. A coronagraph simulation model is established by using the Trace pro software, and the stray light distributions in the meridian direction are compared with the simulation model and the experimental device at a  $0^{\circ}$  field. By comparison, a Point Source Transmittance(PST) curve of the coronagraph experimental device is obtained, and the corresponding stray light of the device is  $0.278$ . Moreover, the main source of stray light is also analyzed.

Key words: optical design reflective coronagraph Lyman-alpha radiation stray light analysis point source transmittance

收稿日期: 2014-03-05

中图分类号: P111.41

## 基金资助:

国家自然科学基金资助项目(No.10878004)

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## 引用本文:

李达, 刘鹏, 陈斌, 王晓光, 陈波. 球面反射式日冕仪实验装置的杂光分析和实验验证[J]. 光学精密工程, 2015, 23(5): 1265-1271. LI Da, LIU Peng, CHEN Bin, WANG Xiao-guang, CHEN Bo. Stray light analysis and experimental verification of spherical reflective coronagraph experimental devices. Editorial Office of Optics and Precision Engineering, 2015, 23(5): 1265-1271.

## 链接本文:

<http://www.eope.net/CN/10.3788/OPE.20152305.1265> 或 <http://www.eope.net/CN/Y2015/V23/I5/1265>

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