

现代应用光学

凸面光栅成像光谱仪的研制与应用

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摘要: 考虑传统光栅成像光谱仪受光学畸变的限制难以同时实现大光学孔径和小型化要求, 利用全息法设计并制作了凸面光栅, 并以该作为核心元件研制了便携式成像光谱仪。该光谱仪以推扫方式进行目标扫描, 获取成像光谱数据立方。仪器的光谱分辨率为2.4 nm, 光曲为0.1%, 色畸变为0.6%, 体积为209 mm×199 mm×110 mm。介绍了仪器的工作原理和结构设计, 并进行了实验室检测和室外光谱测量。测试结果表明: 凸面光栅成像光谱仪的光谱分辨率为2.1 nm, 光谱谱线弯曲为0.09%, 色畸变为0.6%, 均满足设计要求, 实际测试亦取得了较为理想的结果。

关键词: 成像光谱仪 凸面光栅 全息术 数据立方

Design and application of imaging spectrometer with convex grating

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Abstract: As traditional grating-based spectrometers can not offer fast apertures and small volume systems synchronously, this paper designs a convex grating by using holography and develops an imaging spectrometer with the convex grating as a core element. It acquires the image of target by pushbroom scanning, then obtains the cubes of the imaging spectra. The image spectrometer has a space resolution of 2.4 nm, a spectral line bend of the chromatic distortion of 0.6%, and a volume of 209 mm×199 mm×110 mm. The principle of imaging spectrometer with convex grating is analyzed and its constructs are described. Then, a spectral experiment in the laboratory carried out and the spectra of extraterrestrial flowers are tested. The result demonstrates that the real spectral resolution is 2.1 nm, line bend is 0.09% and the chromatic distortion is 0.6%. These data satisfy the design requirement, and obtained spectra are ideal results.

Keywords: imaging spectrometer convex grating holography data cube

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