Special Section On Hyperspectral Imaging Systems

Miniaturized visible near-infrared hyperspectral imager for remote-sensing applications

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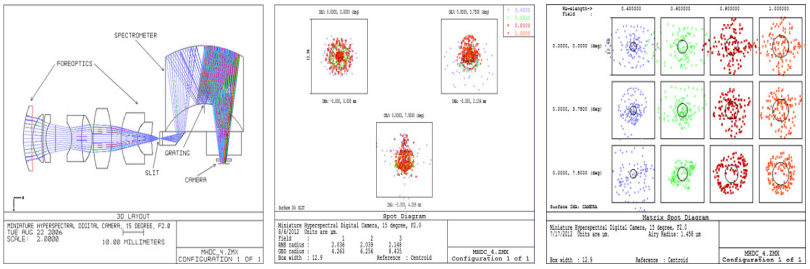
Abstract

Abstract. A new approach for the design and fabrication of a miniaturized hyperspectral imager is described. A unique and compact instrument has been developed by taking advantage of light propagation within bonded solid blocks of optically transmitting glass. The resulting series of micro-hyperspectral imaging (microHSI™) spectrometer has been developed, patented, and built as a visible near-infrared (VNIR) hyperspectral sensor capable of operating in the 400- to 1000-nm wavelength range. The spectrometer employs a blazed, convex diffraction grating in Offner configuration embedded within the optical blocks for ruggedized operation. This, in combination with fast spectrometer operation at $f/2.0$, results in high optical throughput. The resulting microHSI™VNIR spectrometer weighs 0.54 kg, including foreoptics and camera, which results in a $2\times$ decrease in spectrometer volume compared with current air-spaced Offner spectrometers. These instruments can accommodate custom, ruggedized foreoptics to adapt to a wide range of field-of-view requirements. These fast, telecentric foreoptics are chromatically corrected for wideband spectral applications. Results of field and laboratory testing of the microHSI™ spectrometers are presented and show that the sensor consistently meets technical performance predictions.



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Cameras ; Diffraction gratings ; Equipment and services ; Hyperspectral systems ; Near infrared ; Remote sensing ; Sensors ; Spectrometers

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