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Title: Spectral and spatial uniformity in pushbroom imaging spectrometers

Author: Pantazis Mouroulis
Jet Propulsion Laboratory
California Institute of Technology
MS 306-336, 4800 Oak Grove Drive
Pasadena, CA 91109
(818) 393-2599
(818) 393-9567 fax
pantazis.mouroulis@jpl.nasa.gov

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It has been recently recognized that pushbroom imaging spectrometers must satisfy stringent spectral and spatial uniformity requirements in order to provide accurate spectroscopic and spatial information. These requirements go beyond the now commonly cited lack of distortion, to encompass the variation with field position in the shape of the spectral response function, and the variation with wavelength in the height of the optical point spread function.

A comparison between two concentric spectrometer forms is shown in terms of their ability to satisfy the above stringent uniformity requirements. The first form is the well-known and powerful Offner design, with a convex grating as the diffractive element. The second form is the less well-known but no less powerful Dyson design, which employs a concave grating.

The Dyson design is remarkable in its ability to handle very low f-numbers (e.g. f/1) while maintaining a compact size and simplicity comparable to the Offner design. The difference in f/no between the two forms means that a proper comparison must account for the potentially higher signal-to-noise ratio that the Dyson can provide. This and other trades between the two system designs will be discussed. Recommendations are also given for the optimization and evaluation of any spectrometer design in terms of the requirements previously described.

Key words: pushbroom imaging spectrometer, spectrometer design, spatial and spectral uniformity.

Brief biography: Pantazis Mouroulis is Principal Optical Engineer at the Jet Propulsion Laboratory, and formerly Associate Professor at the Center for Imaging Science, Rochester Institute of Technology. He has several publications in the fields of optical design, holography, and fiber optics.