AN OFF-THE-SHELF RETICON SYSTEM

R.K. Honeycutt and B.F. Peery
Indiana University
Bloomington, Indiana 47401
U.S.A.

Howard University
Washington, DC 20059
U.S.A.

ABSTRACT. EG&G Princeton Applied Research produces a Reticon detector system intended for laboratory applications. However, current versions of the system are well-suited to astronomical observations at observatories with modest financial and technical resources.

The detector inputs are intensified by microchannel plates, fiber-optically coupled to a 1024-pixel Reticon. Controller and readout electronics, and software for data pre-processing and graphical display are also available off-the-shelf, enabling the observer to put the system to use without a major development effort.

The Optical Multichannel Analyser is a linear silicon-diode array detector system produced by Princeton Applied Research, Inc., of Princeton, New Jersey, U.S.A. The OMA has found application in laboratories, especially in spectroscopic studies of fast chemical reactions, but has been utilized by few astronomers for astronomical spectroscopy. The system is available as an off-the-shelf unit with all required electronics and software. It would seem to merit scrutiny by smaller observatories as a developed reticon system requiring relatively modest technical and financial resources to be put to use straightforwardly. We present here our preliminary evaluations of recent intensified versions of the PAR reticon as astronomical detectors.

The model 1420 detector is a 1024-pixel silicon diode array intensified by a proximity focussed microchannel plate and phosphor screen, fiber-optically coupled to the reticon. The size of the microchannel plate illuminates only either 512 or 700 pixels. A plane photocathode injects photoelectrons into the microchannel plate of model 1420. In the more recent model 1422 detector, photoelectrons are electrostatically focussed upon the microchannel plate. The microchannel plate and phosphor screen are large enough to illuminate all 1024 pixels of the reticon. Either detector can be powered, controlled and computer-interfaced by PAR model 1461 interface electronics package and model 1463 controller boards.

Table I presents a number of parameters of the PAR Reticon System.

The PAR Reticon Detectors incorporate a thermoelectric cooling

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system that can achieve cooling to about -40 deg C. Even at that temperature, however, the dark current may still be too large for some applications. Table II presents extrapolated numbers of noise counts (less signal shot noise) at -40 deg C and at dry ice temperature (-70 deg C). We have subjected a sample assembly to temperatures near -150 deg C without impairment of performance. We conclude that dry ice cooling is unlikely to be hazardous to these detectors.

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Table I Parameters of PAR Models 1420 and 1422 Detectors

Geometric Distortion	2%
Number of Pixels	1024
Pixel Size	25 micrometers x 2.5 mm
Read out Noise	1 Electron/Pixel
Dark Current (at 5 deg C)	900 Counts/sec
Approximate Cost, (Electronics and Detector)	$US 31,000 (Model 1420) $US 25,000 (Model 1422)

Table II Predicted noise counts (less signal shot noise)

Integration time (sec):	Counts -40 deg C	-70 deg C	-100 deg C
1	3.2	1.2	1.0
10	10	2.5	1.1
100	32	7.4	1.9
1,000	102	23	5.3
10,000	322	73	17

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