

## CCD SCANNING WITH A SMALL TELESCOPE

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We use a scanning CCD for acquisition and astrometry of new and recovered comets, asteroids and other objects. The CCD is an RCA SID 53612 thinned, buried channel array of 512 x 320 30-micron square pixels that are back-illuminated and refrigerated to -60 C in a vacuum housing. The readout noise is + 200 electron-hole pairs (ehp) per pixel per readout, the thermal dark current is 50 ehp/pixel/sec, and the scale of our 12-bit analog-to-digital converter is 25 ehp/AD unit. The Newtonian focus of a 91-cm telescope has been modified from f/5 to f/3.85 with a relay lens to give a platescale of 1.73 arcsecs per pixel, a scale chosen for efficient coverage of sky. The CCD is operated in the scanning mode with the telescope drive off, and the rate of transfer of signal charges is tuned to correspond to the rate at which the star images drift across the focal plane. The exposure time (the time the images take to transit the "512" dimension of the CCD) is 60 seconds at the celestial equator, giving a "six sigma" limiting (visual) magnitude of 19.5. A typical scan covers 30 minutes of time in right ascension by 0.156 deg in declination and is stored as a digital array of 14848 x 320 CCD pixels. A set of three 30-minute scans near the opposition point along the ecliptic nets about 5 new main-belt asteroids. Potential moving objects are revealed by determining the positions of all the stellar images in each scan and comparing the results of the three scans. Several potential reference (SAO) stars are in one scan. The reduction from pixel coordinates to apparent topocentric equatorial coordinates of date involves only three free parameters, making our astrometric reductions simpler than the classical affine transformation of plate coordinates. There is no rotational transformation and the scale in right ascension is defined by the clock. The declination scale is determined from the reference stars. The zero points of R.A. and Dec. are given by the average differences between the pixel coordinates and catalog positions of the reference stars.

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