

HIGH PRECISION STELLAR PHOTOMETRY WITH CCDs. I.

A. J. Penny

Rutherford Appleton Laboratory

ABSTRACT: This talk is about the limits to the precision of stellar photometry in comparing one star with another in a single CCD frame. This is concerned with bright stars, and concentrates on three problems at the 0.1 percent level of accuracy: how to flatfield; how to deal with varying point-spread-functions that vary across an image; how to deal with the fact that the response inside a pixel is not uniform. The first is the well-known difficulty of getting a uniform illumination across the CCD to use as a flatfield; the use of a rotatable CCD mounting and of drift-scanning is discussed. The second depends on the ability to detect and define small, but significant, changes in the PSF. The third is the fact that the pixels of optical CCDs can have non-uniformities inside them of ten percent, and these when folded with the PSF produce systematic errors significant at the 0.1 percent level; with infra-red arrays these problems can be much worse. The use of software to model these variations and reduce these errors is described.