MicroArcsec Astrometry Technologies

Michael Shao*[1]

[1]Jet Propulsion Laboratory – United States

Abstract

Microarcsec astrometry with moderate sized telescopes must over come multiple challenges. A 1m class telescope has a diffraction limited PSF _˜0.1arcsec diameter. Centroiding the image to 1 uas means measuring the centroid to 1e-5 of the size of the PSF. Systematic errors include imperfections in the focal plane detector, imperfection in the optics, and in many cases measuring the position of a target star that is 10,000 times brighter than the reference stars nearby. This paper will discuss how these challenges can be met at least in theory and some practical limitations of these techniques. Quite a bit of progress has been made in subpixel calibration of CCD/CMOS devices, down to 1e-5 pixels. But certain types of CMOS devices can not be calibrated. In particular CMOS sensors with lenslet arrays can not be calibrate and at long wavelengths where the devices become semi-transparent calibration becomes much more difficult. The talk wil also discuss the calibration of beam walk and optical distortion under the assumption that optical surfaces have a 1/fˆ3 power spectrum of wavefront errors. Last we describe the calibration of the offset between the centroid of the core of an image to the centroid of diffraction spikes.

*Speaker