

PHOTOMETRIC CALIBRATION OF DarkEnergyCamera

I. Requirements

II. Techniques

III. Issues and technical challenges

Use SDSS, Mosaic Camera Experience
as guides

Requirements

- I. Focus on most demanding project
- II. Don't be too demanding; don't be too cavalier
- III. Define requirements, basis, and test program together.

SDSS: Bright stars:

2% rms: g' , r' , i'

3% rms: u' , z'

Basis: a) Large Scale Structure
b) QSO Target Selection

Test plan: 11 items

Techniques

I. Classical photometry

- a. Independently set up up one or more "standard star" calibration patches, 2° diameter
- b. Observe once or more times per night
- c. Use sky flats (can we flatten 3° field?)
- d. Use star flats for low frequency corrections (a la HST)
- e. Independently measure extinction

II. Local calibration

- a. Independently set up grid of standard stars; calibrate "in situ"

Ancillary Equipment

1. 10 micron cloud camera
2. Monochrometer and calibrated light source
3. Monitor telescope w/CCD, 5 filters

Issues and Problems (I)

- PSF vs. aperture mags.
- How flat is sky?
 - Spatial & temporal variations
 - Vignetting
 - Scattered light
- Filter bandpass variations
- Manufacturing tolerances (1% typical)
 - Interference filter cutoff varies by 200 Å between atmosphere & vacuum!
 - Dry air is worst!
 - Geometric distortions

Issues and Problems (II)

- Filter Uniformity (lab test)
 - i' , z' aperture mags vs. CCD thickness
 - (Aperture mags vary with position)
 - Measure with grid tests (tedious!)
- Ghosting from CCD with nonflat lenses
 - Need good antireflection coatings
- Improper baffling
- Spatial PSF variations due to optics; defocus;
 - Correct PSF mag to aperture mag
- Temporal PSF variations due to seeing,
 - refocus

Issues and problems (III)

- Aperture correction for galaxies
- Linearity corrections
- Filter bandpass mismatch between DEC, standard star system
- Second order extinction corrections
- Atmospheric extinction variations
 - 3% p-p routinely seen