Photometry with CCD Camera

Lancelot L. Kao
Astronomy Department
City College of San Francisco
San Francisco, CA 94112
An Outline

- What are CCDs?
- CCD-Vs-Photographic Material
- CCD Photometry
- Preparation
What are CCDs?

- Brief History
- Charge-Coupled-Devices
- Size & Price
Brief History

- Memory Chips
- JPL 1973
Charge-Coupled-Devices
Size & Price

- 8192 x 8192 pixels
- 7 micron - 30 micron pixel
- 2048 x 2048 pixels
  - US $ 110,000
**CCD-Vs-Photographic Material**

- **CCD Camera**
  - high QE (80%)
  - linear respond
  - digital format
  - easy to process
  - ‘real-time’
  - size limitation
  - ‘low’ resolution
  - expensive

- **Photographic Material**
  - low QE (< 2%)
  - non-linear respond
  - A/D Conversion
  - dark room skills
  - not ‘real-time’
  - no size limitation
  - ‘high’ resolution
  - inexpensive
Respond Curves
CCD Photometry

- Standard Stars
  - primary standards
  - secondary standards

- Photometric System
  - standard filters
  - SDSS photometric system

- Signal-to-Noise Ratio
Standard Stars

- Primary Standards
- Secondary Standards
Photometric System

- Standard Filters
- SDSS Photometric System
Signal-to-Noise Ratio

- **Signal**
  - photons from object

- **Noise**
  - dark current
  - read noise
  - bias-level & gain
  - photons from sky & object
Preparation

- Telescope
- CCD Camera
- Object List
- Finding Charts
- Photometric System (Standard Filters)
- Standard Stars List