

MagIC Upgrade for High-Speed Photometry

Jim Elliot, MIT

Magellan SAC
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MagIC SUMMARY

- CCD filter photometer for Baade (moved to Clay)
 - Detectors
 - 2k x 2k SITe (24 μm pixels; 2.3 x 2.3 arcmin field)
 - 2k x 4k Lincoln Lab red and blue (13 μm pixels; 1.2 x 1.2 arcmin field)
 - Modes
 - Full frame, dual, and quad readout (~23 sec)
 - Pixel binning
 - High-speed (with frame transfer)
 - 16 filter positions
- Instantly accessible
 - always in standby mode on a folded port
 - accessible by rotation of tertiary mirror (within a few minutes)
- Built by MIT and CfA (installed on Baade, March 2001)
 - Supported by NSF (MRI), gift to Harvard from Sackler, MIT internal funds
- Science programs
 - Narrow field imaging: gravitational lenses, compact objects, gamma-ray bursts, etc.
 - High-speed imaging: stellar occultations, compact objects , **planetary transits**

WHY UPGRADE MagIC?

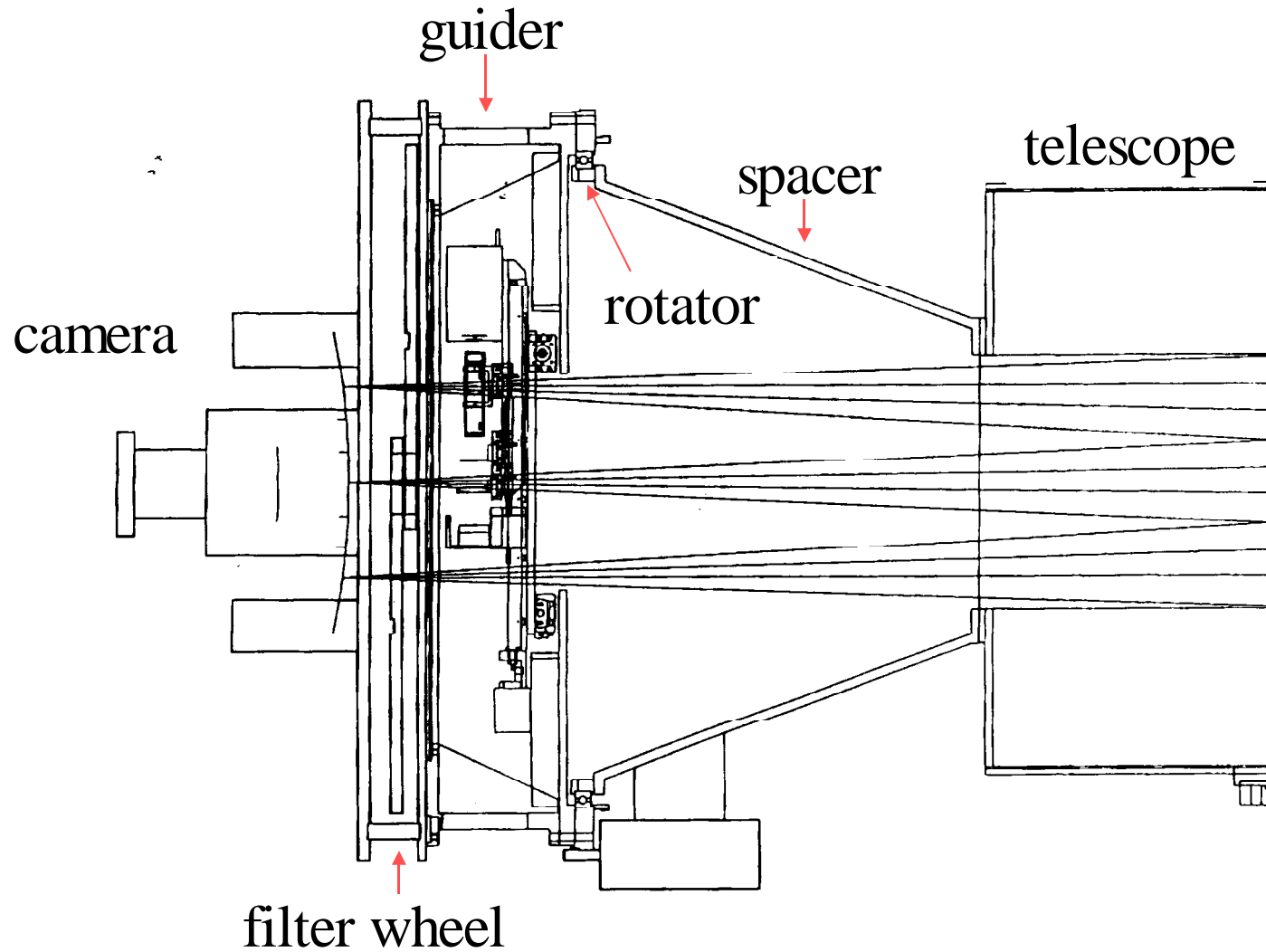
- MagIC original design included two frame transfer CCDs
 - Foundry run failed (\$38K lost)
- POETS (Portable Occultation, Eclipse, and Transit System)
 - Six systems built by MIT and Williams College (spring 2005)
 - On Clay in July 2005, June 2006, and June 2007
 - Planetary transits, stellar occultations, and speckle imaging
- How to have permanent high-speed capability on Magellan?
 - 1. Guiders
 - 2. POETS piggy back on MagIC
 - 3. Frame transfer CCD in MagIC dewar (according to original plan)

**Solution: #3 Clone the hardware and software for HIPO,
Ted Dunham's SOFIA instrument**

PERSONNEL

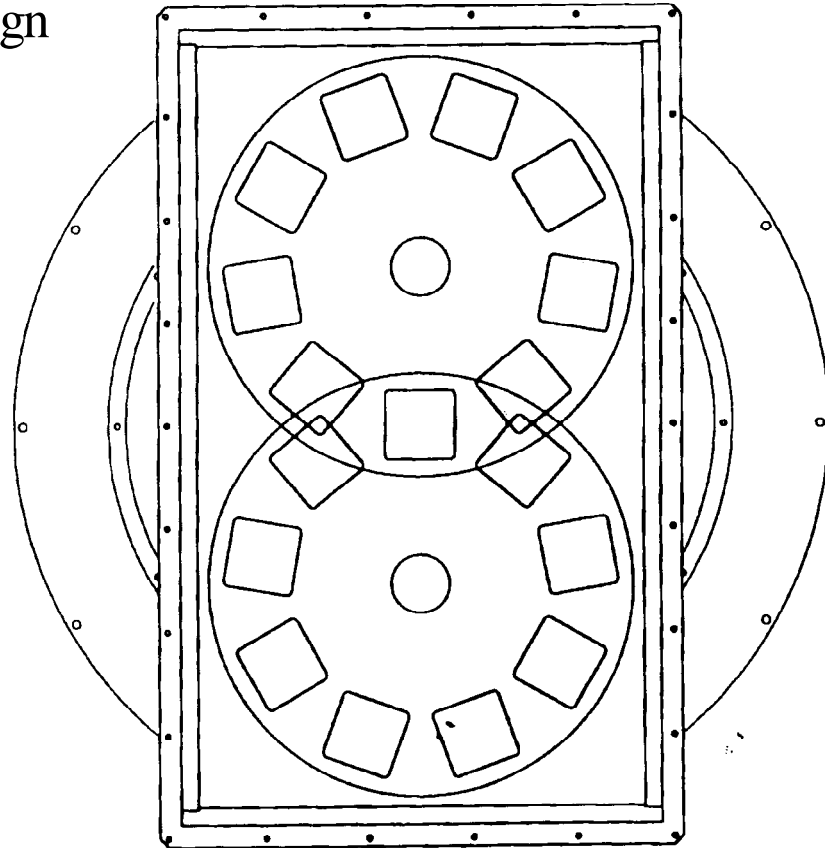
- Key Players
 - Jim Elliot (P.I.)
 - Steve Kissel (CCD wiring and testing)
 - Folkers Rojas (mechanical work)
 - Grad student (software)
- Auxiliary Players
 - Kenton Phillips (computer)
 - Brian Taylor (BU; software consultant for LOIS)
 - Bill Mayer (MKI oversight)
 - Ed Boughan, Mark Bautz (consultants)

MAGIC MODULES

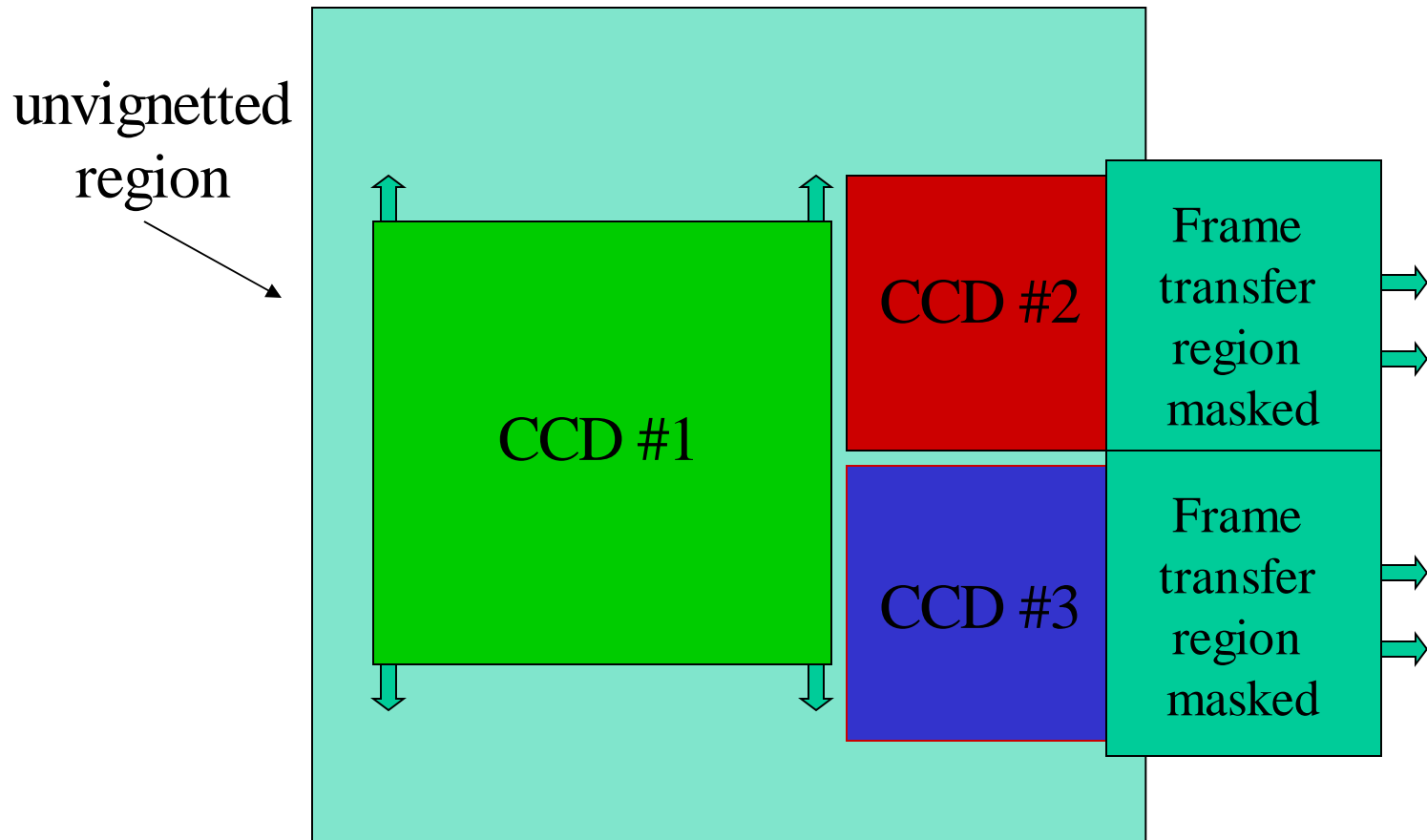


FILTER WHEEL (CfA)

- Based on MEGACAM design
- Filter format : 4" square
- 18 positions => 16 filters
- Filters:
 - Johnson-Cousins, B, V, R, I
 - Sloan: u' , g' , r' , i' , z'
 - VR
 - 6 visitor filters



MagIC FOCAL PLANE



#1: SITE CCD: 4 readouts, each 50 Kpix/sec => ~25 seconds

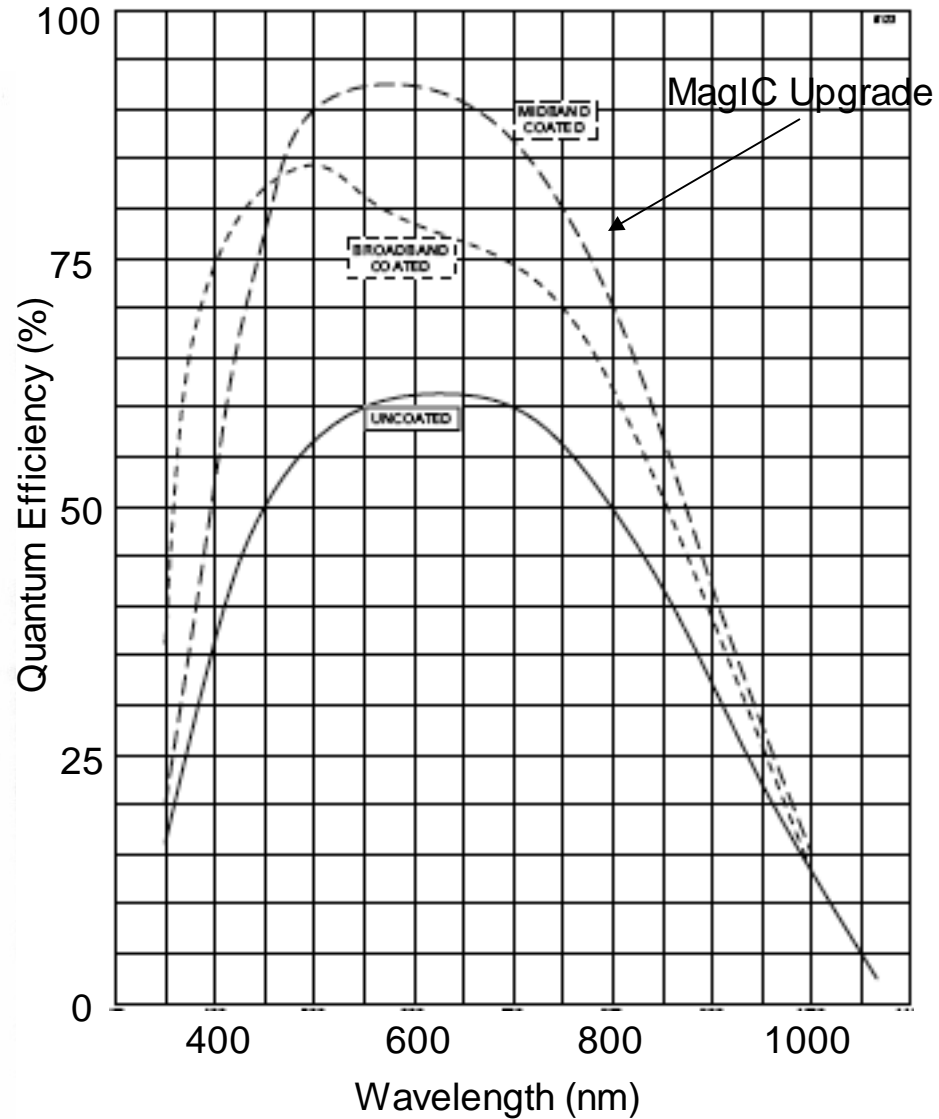
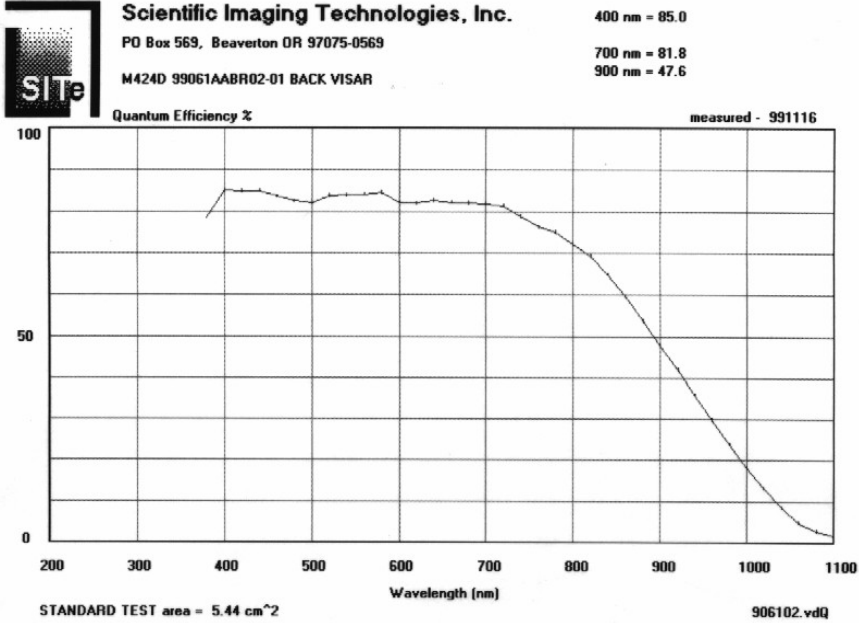
#2: CCD47-20: 2 readout, each up to 400 Kpix/sec (up to 50 Hz)

#3: open (for possible CCD in the future)

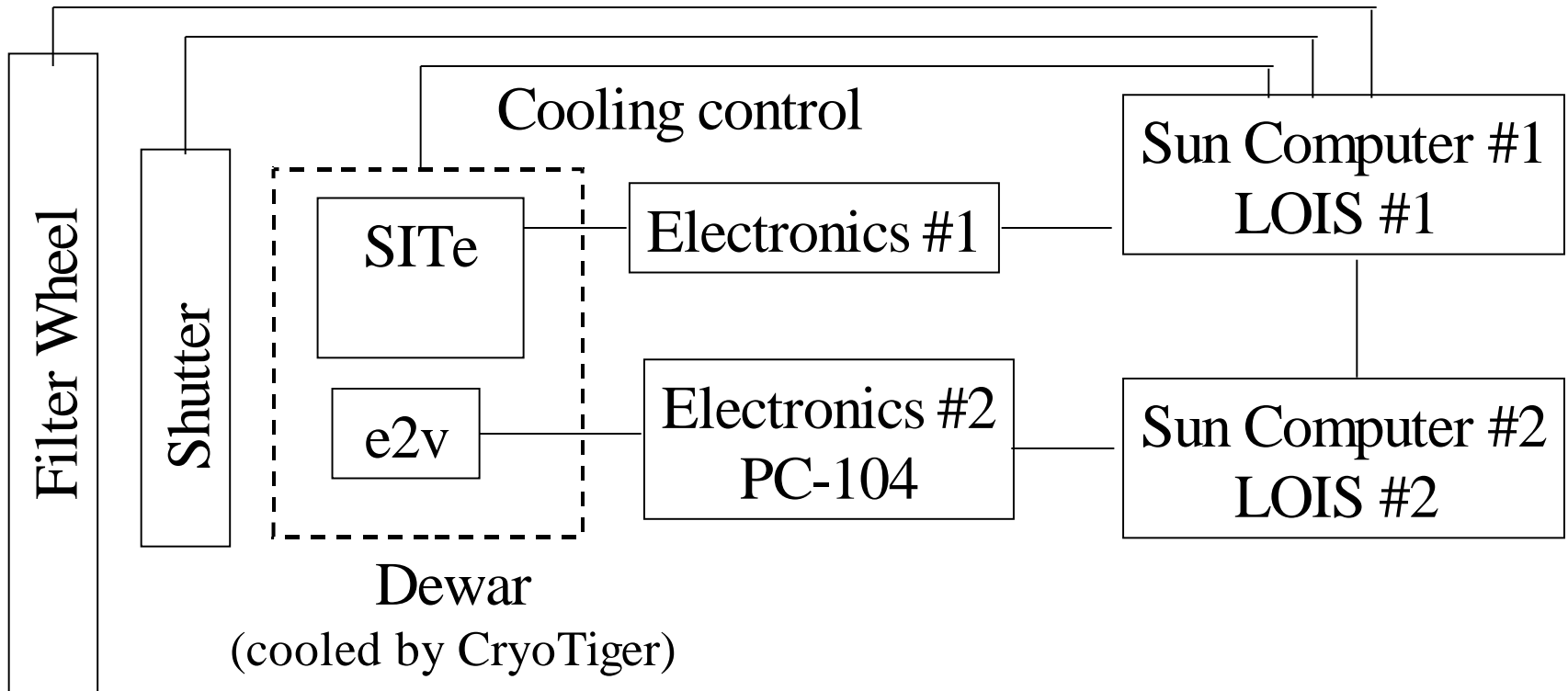
QUANTUM EFFICIENCY MagIC CCDs

SiTe

e2v CCD47-20



SCHEMATIC DIAGRAM



SCHEDULE

- Completed
 - In hand: CCDs, Leach electronics, control computer (Sun), dewar shell
 - Design for dewar modifications
- In progress
 - Software installation
 - CCD wiring and testing
- June 2007: Ship MagIC dewar, electronics, and computer from LCO to MIT
- July 2007:
 - Modify dewar to hold two CCDs
 - Install the CCDs
 - Test
- August 1, 2007:
 - Ship MagIC parts to Chile
- August 15, 2007:
 - Reassemble MagIC and test at LCO
- August 24 (or 28)
 - Engineering run