SALT RSS-NIR MID-TERM REVIEW MAY 20 & 21, 2009

DETECTOR SELECTION, OPERATION, INTEGRATION & TEST

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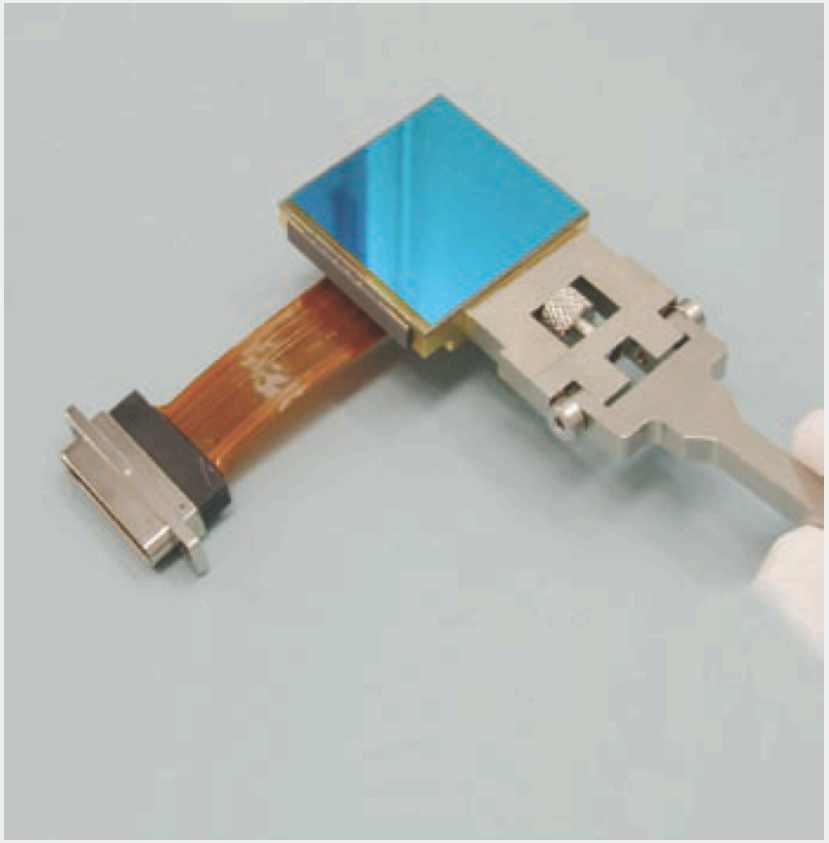
DETECTOR SELECTION

- Teledyne HAWAII-2RG
  - 2K × 2K HgCdTe array
  - 18 μm pixel size
- Meets RSS-NIR requirements
- Fielded in many systems
- 1.7 μm cut-off
  - Supernova Acceleration Probe (SNAP)

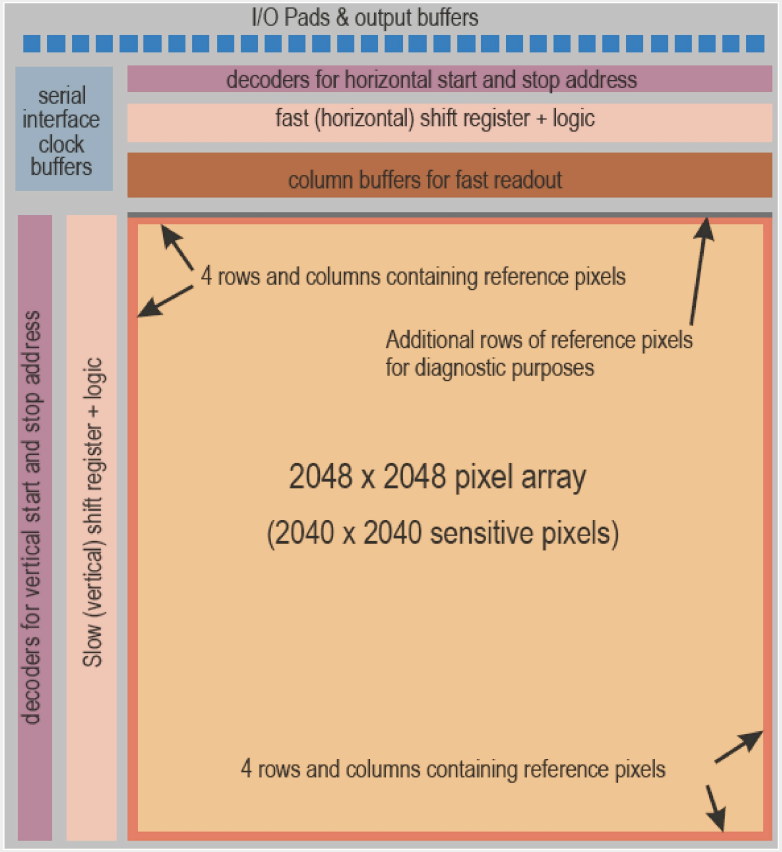


Loose et al. 2007

SCIENCE DETECTOR

- HAWAII-2RG

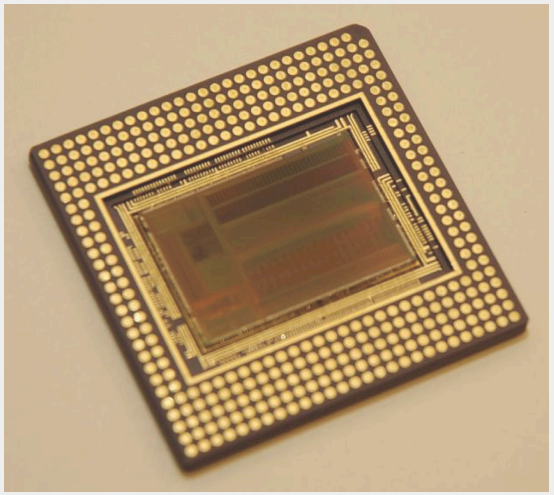
Parameter	Value
IR Material	HgCdTe
Substrate	CdZnTe (removed)
Array Format	2048 × 2048 pixels
Pixel Pitch	18 μm
Output Ports	1, 4, 32 (selectable)
Readout Mode	Ripple
Pixel Readout Rate	100 kHz to 5 MHz (continuously adjustable)
Sampling	CDS, Fowler, Up-the-Ramp
Read Noise (median)	< 15 e^- CDS (200 kHz)
Dark Current (median)	≤ 0.01 e^- s^{-1} (120 K)
Mean Quantum Efficiency	≥ 80%
Well Capacity	> 100,000 e^-
Pixel Operability	> 95%
Fill Factor	> 98%
Power Dissipation	< 8 mW (200 kHz)



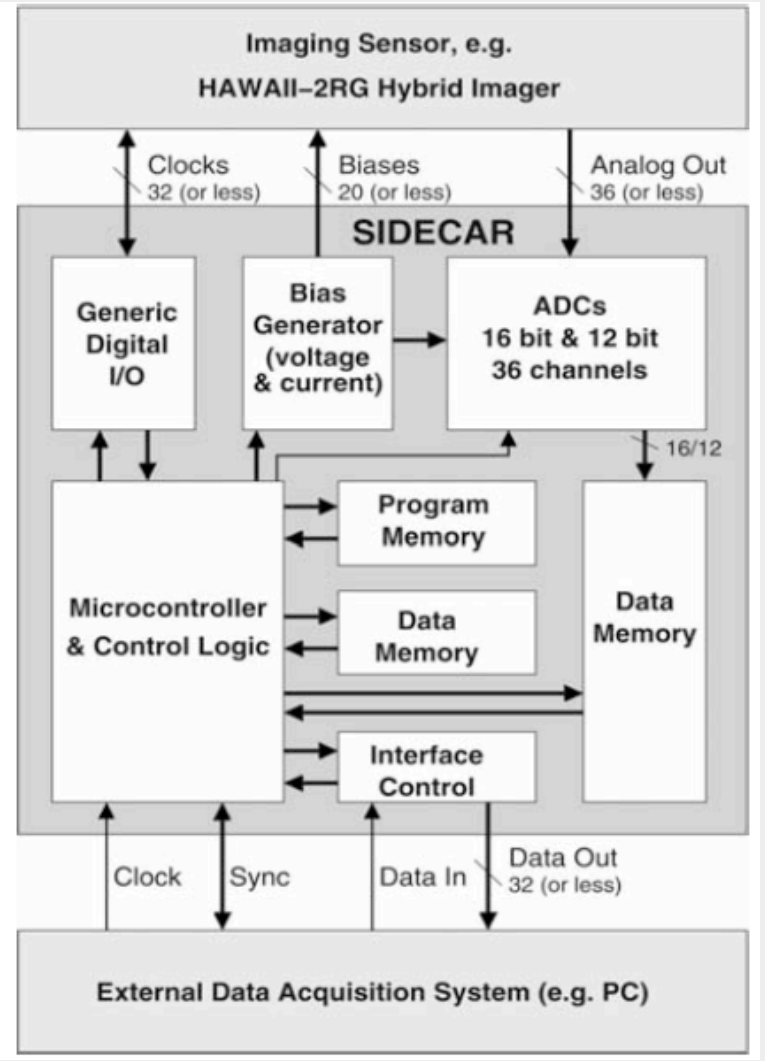
Loose et al. 2007

DETECTOR CONTROLLER

- SIDECAR ASIC
  - Packaged on separate board
  - Room-temperature and cryogenic versions
  - Clocks, Biases, Output
  - JADE2 card



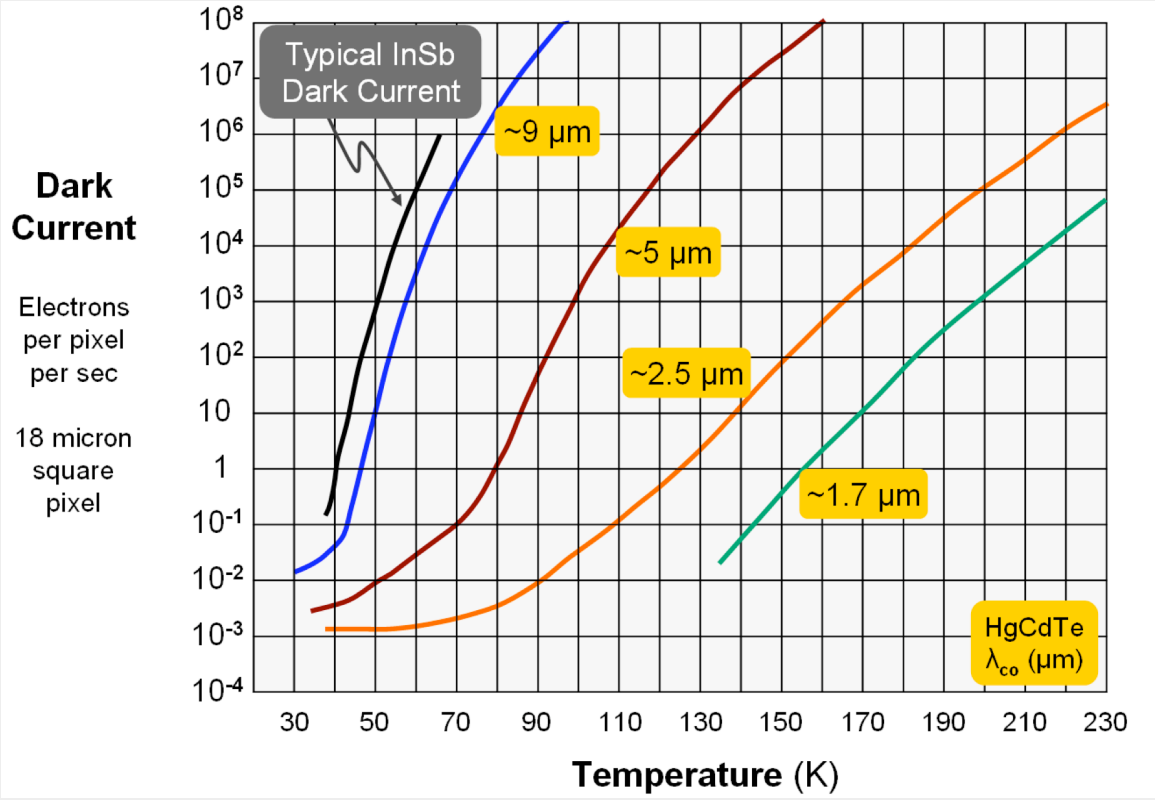
Loose et al. 2007



DETECTOR OPERATION

- Operating Temperature Considerations
  - Teledyne operating at 140 K
  - 1.7 µm cutoff
  - Dark current
  - Persistence
  - Cryocooler options

- T_{DET} = 120 K



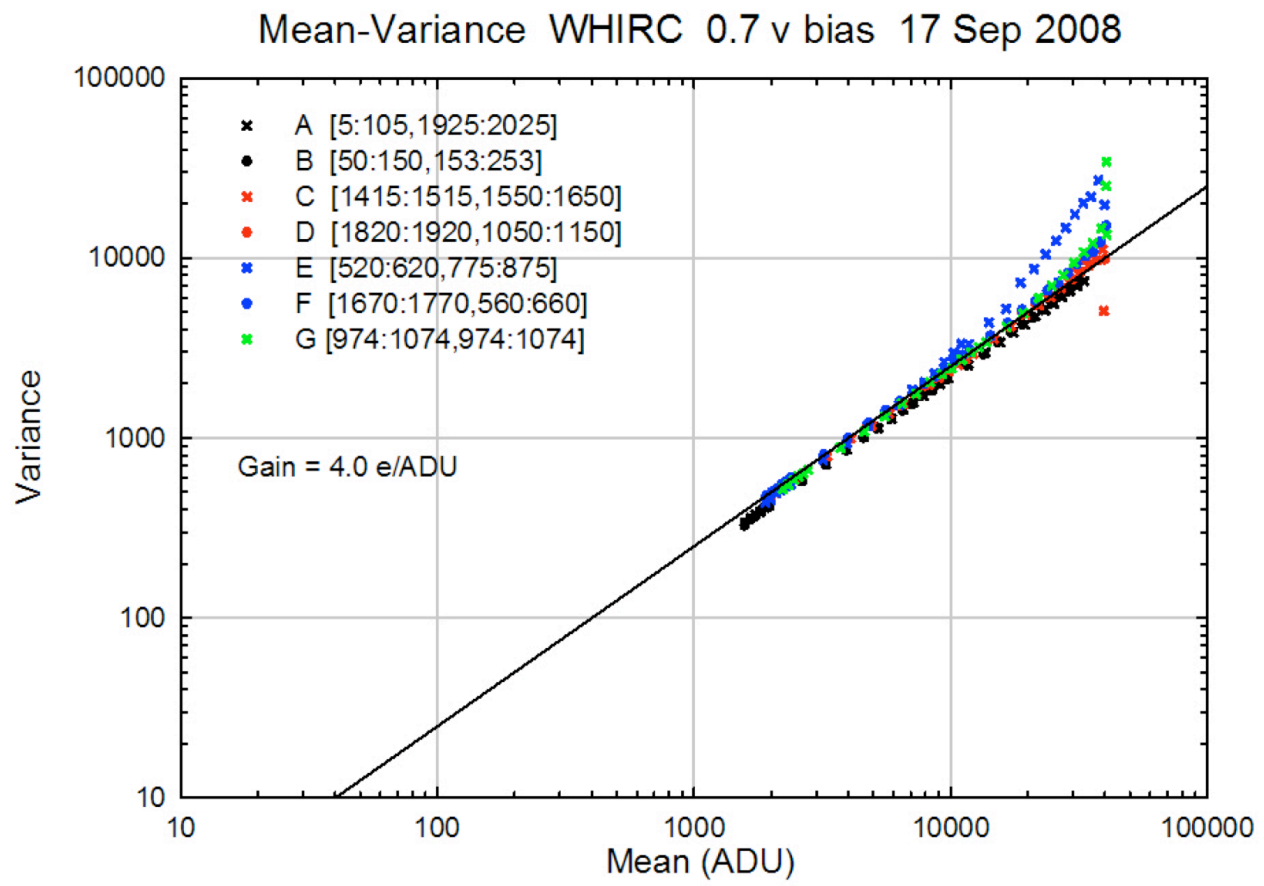
Beletic et al. 2008

INTEGRATION & TEST

- Goals
  - Verify functionality and understand operation
  - Characterize and optimize performance
  - Develop data calibration procedure
- Test phases
  - Detector subsystem (UW-Madison)
  - Instrument (UW-Madison)
  - Commissioning (SALT)
- MUX and engineering-grade detector for testing
- Visit Teledyne before delivery

DETECTOR TESTS

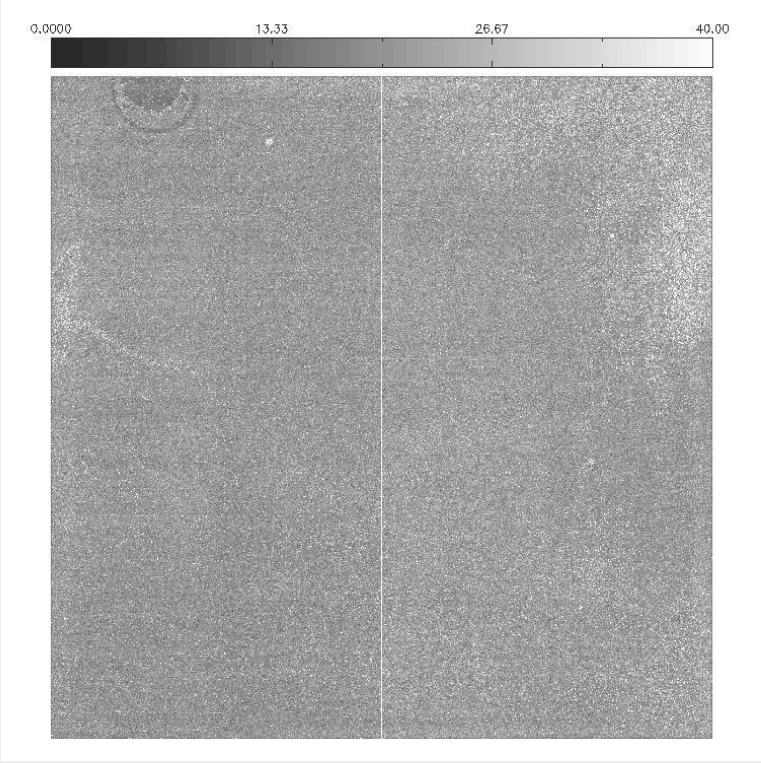
- Gain Measurement
  - Photon Transfer Method

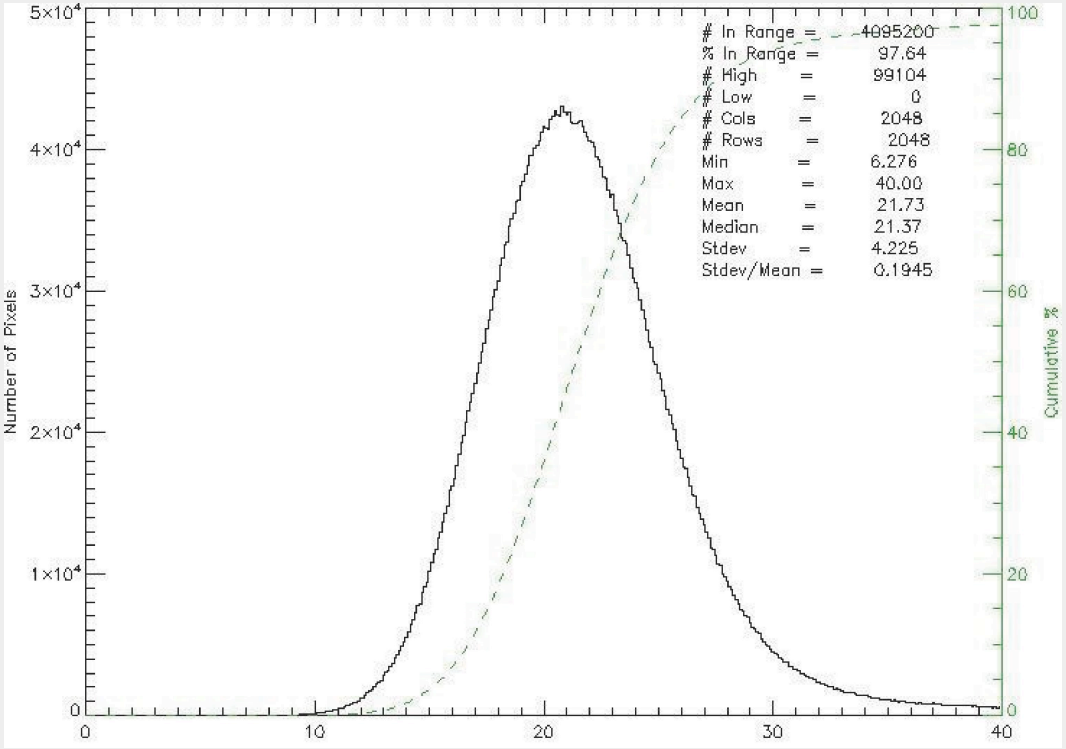


Meixner et al. 2008

DETECTOR TESTS

- Readout Noise
  - Noise frame
  - PTC

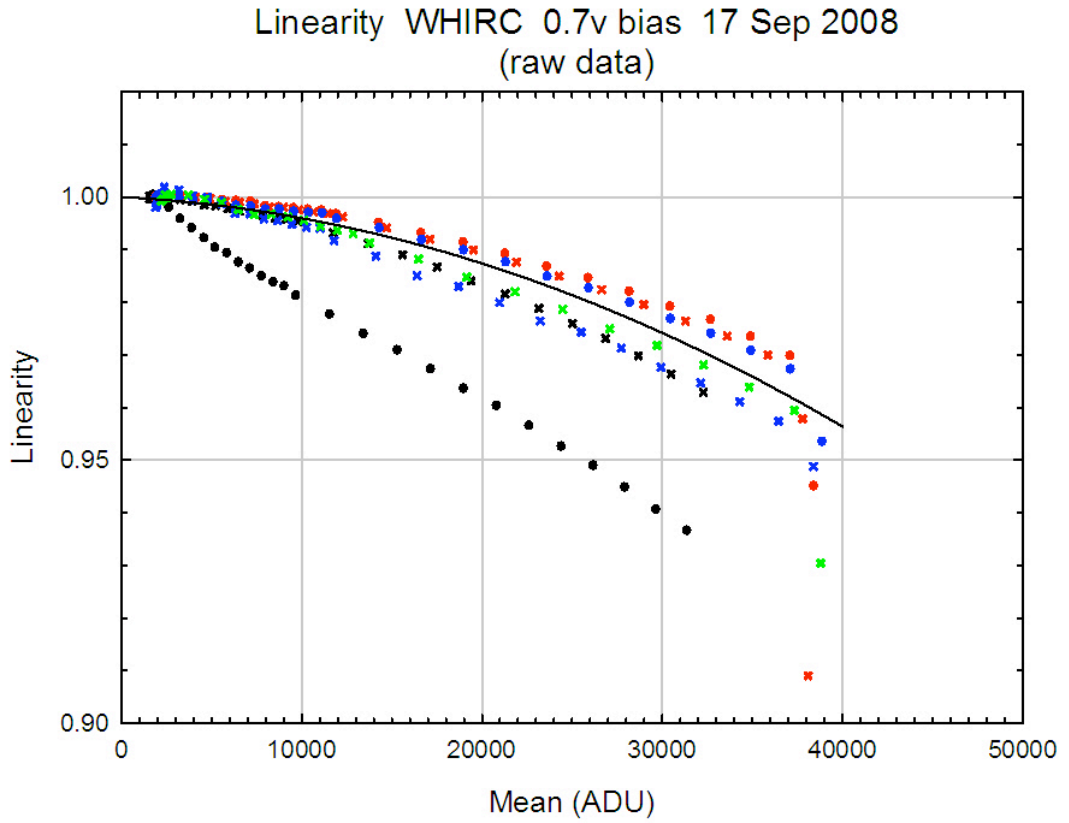




Loose et al. 2007

DETECTOR TESTS

- Linearity



Meixner et al. 2008

- Additional tests: Dark current, Persistence, QE