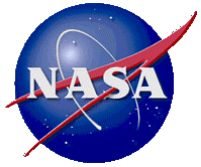


SIRTF

MIPS Germanium Detectors

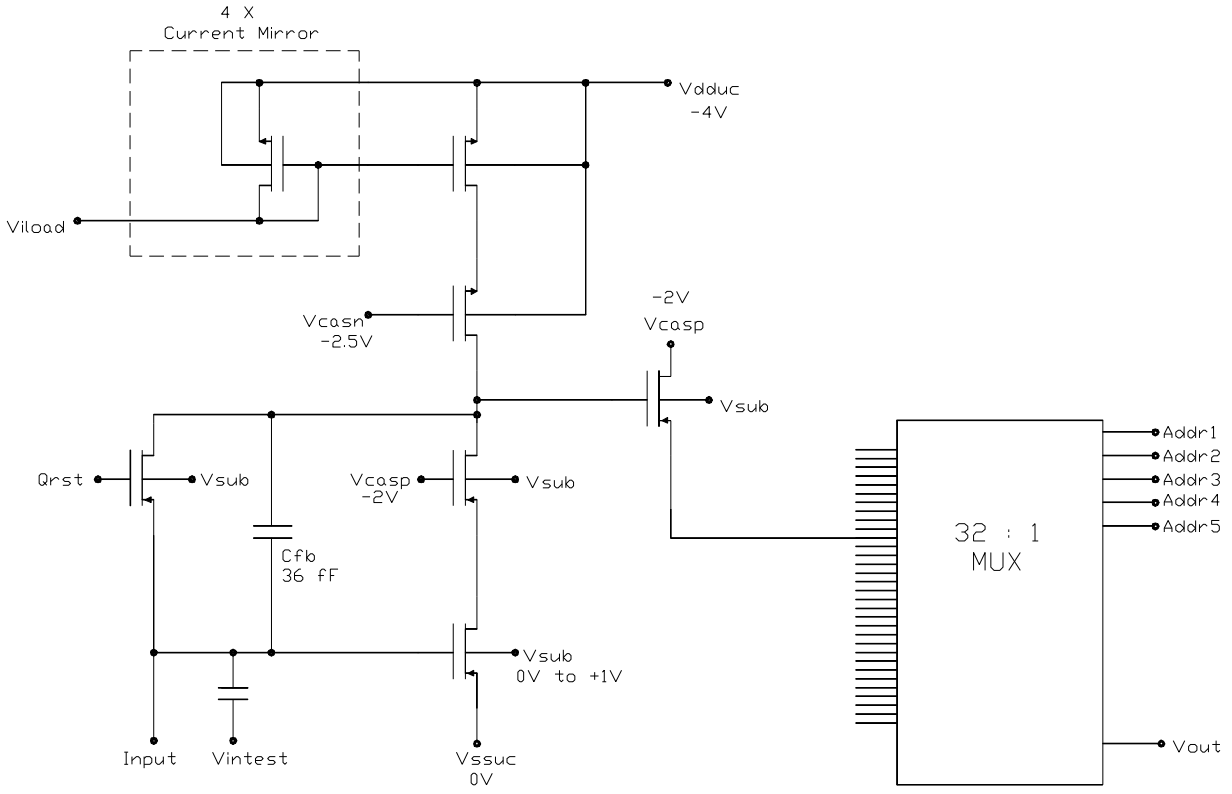
Erick Young

October 22, 1999

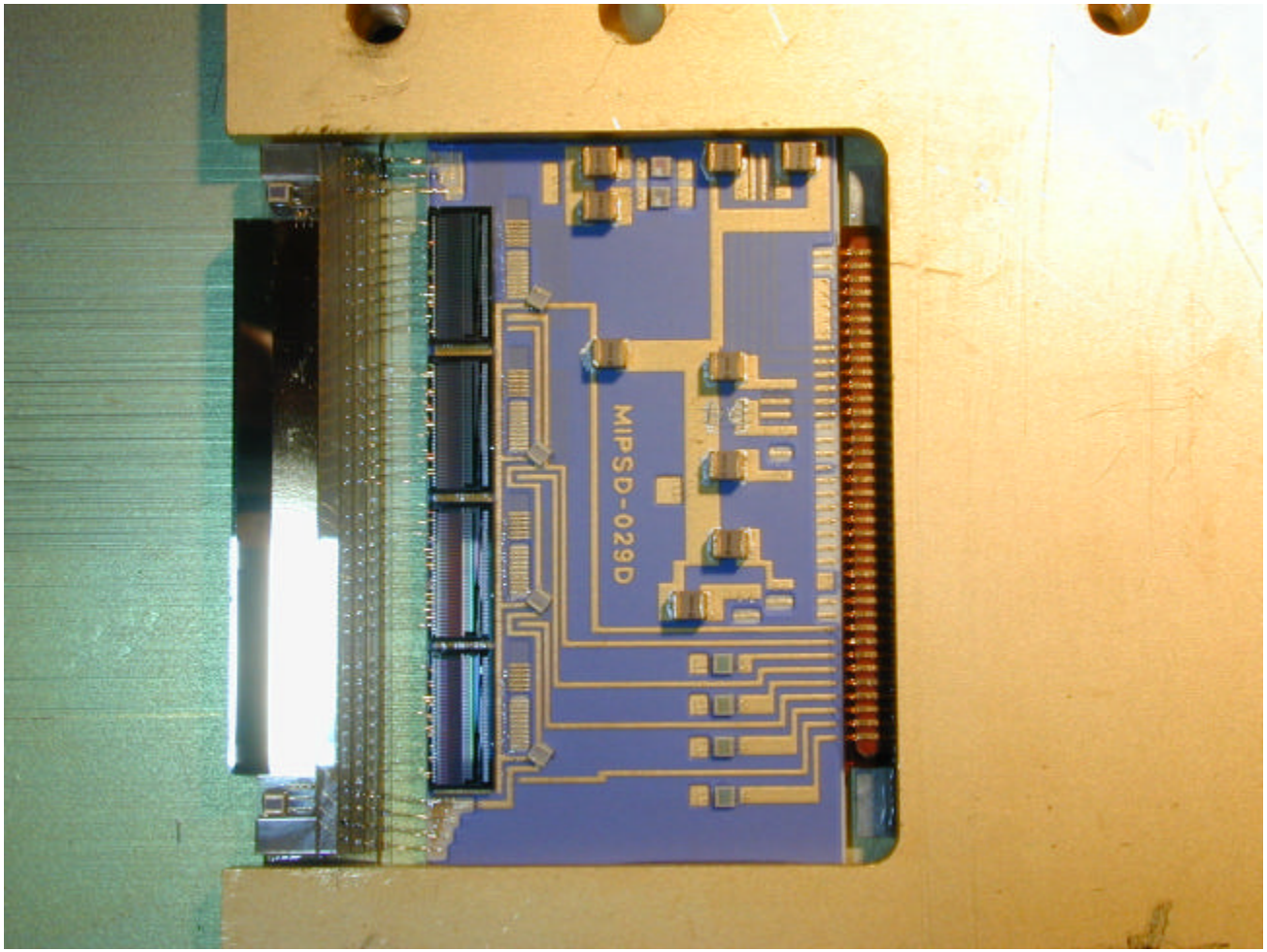
MIPS Detector Arrays

Band	Detector Type	Format	Wavelength Coverage (μm)
24 μm	Si:As BIB	128 x 128	20.5 – 26.5
70 μm	Ge:Ga	32 x 32	60 – 80 50 - 95
160 μm	Stressed Ge:Ga	2 x 20	140 - 180

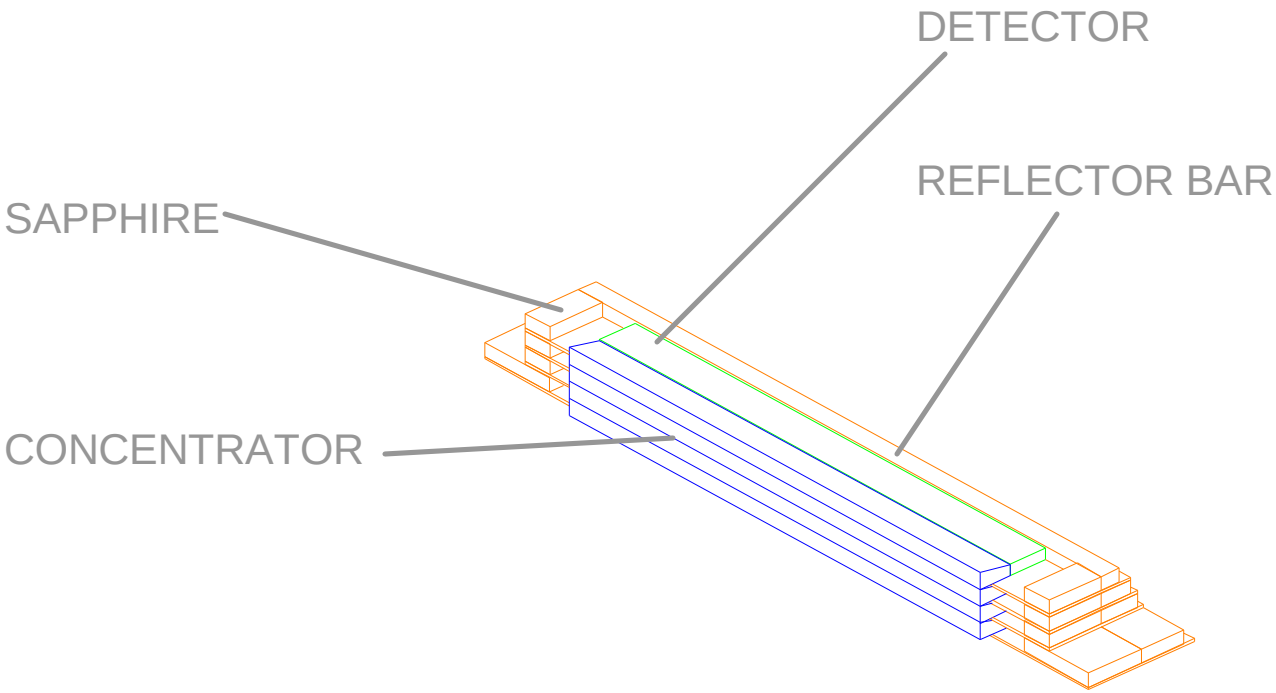
CRC-696 Readout Schematic
Capacitive Transimpedance Amplifier



70 μm 4x32 Array Module Detail



Front End Detail



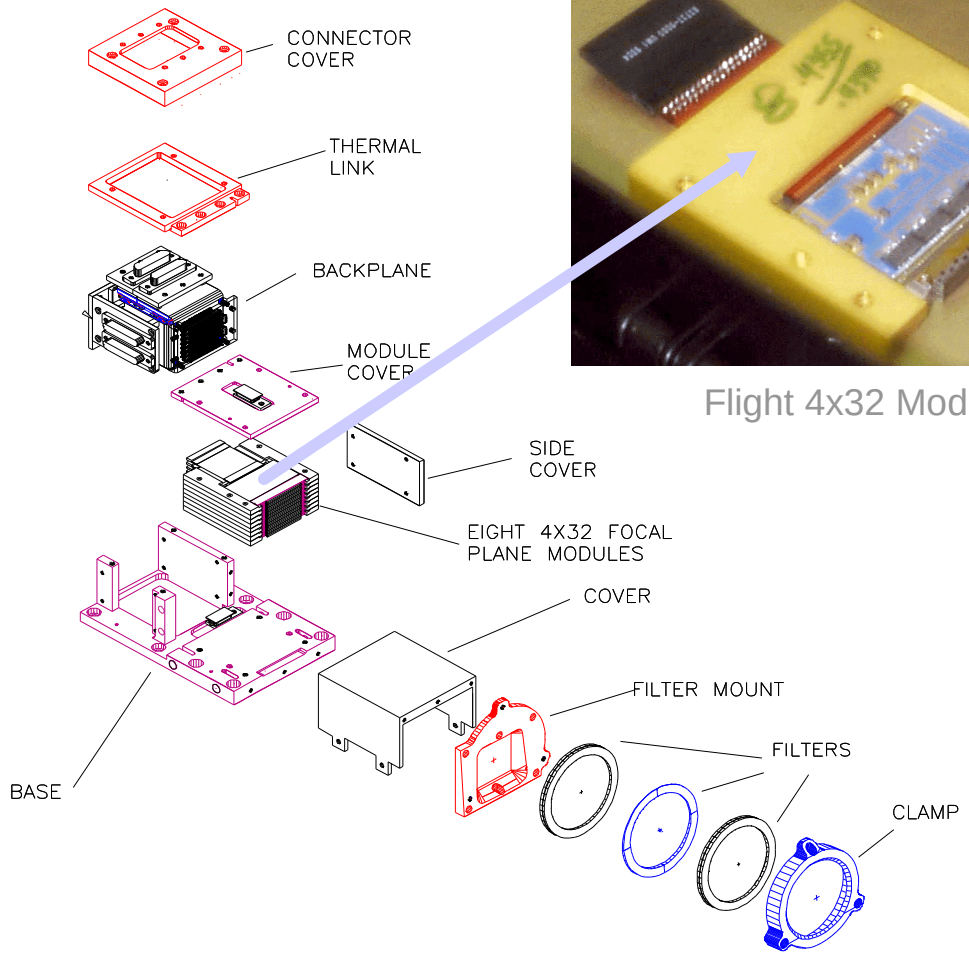
70 μm Array

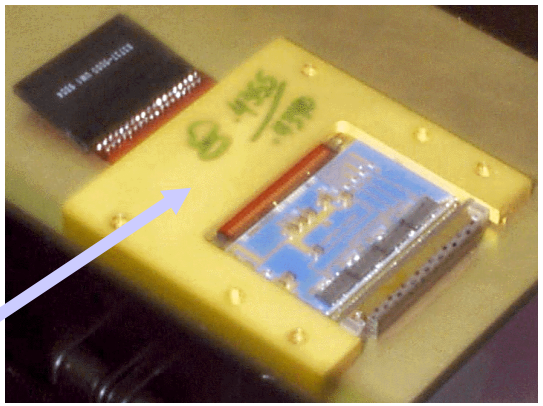
32 x 32 Ge:Ga photoconductor array

Developed and constructed at Steward Observatory

Detector material from Lawrence Berkeley Laboratory

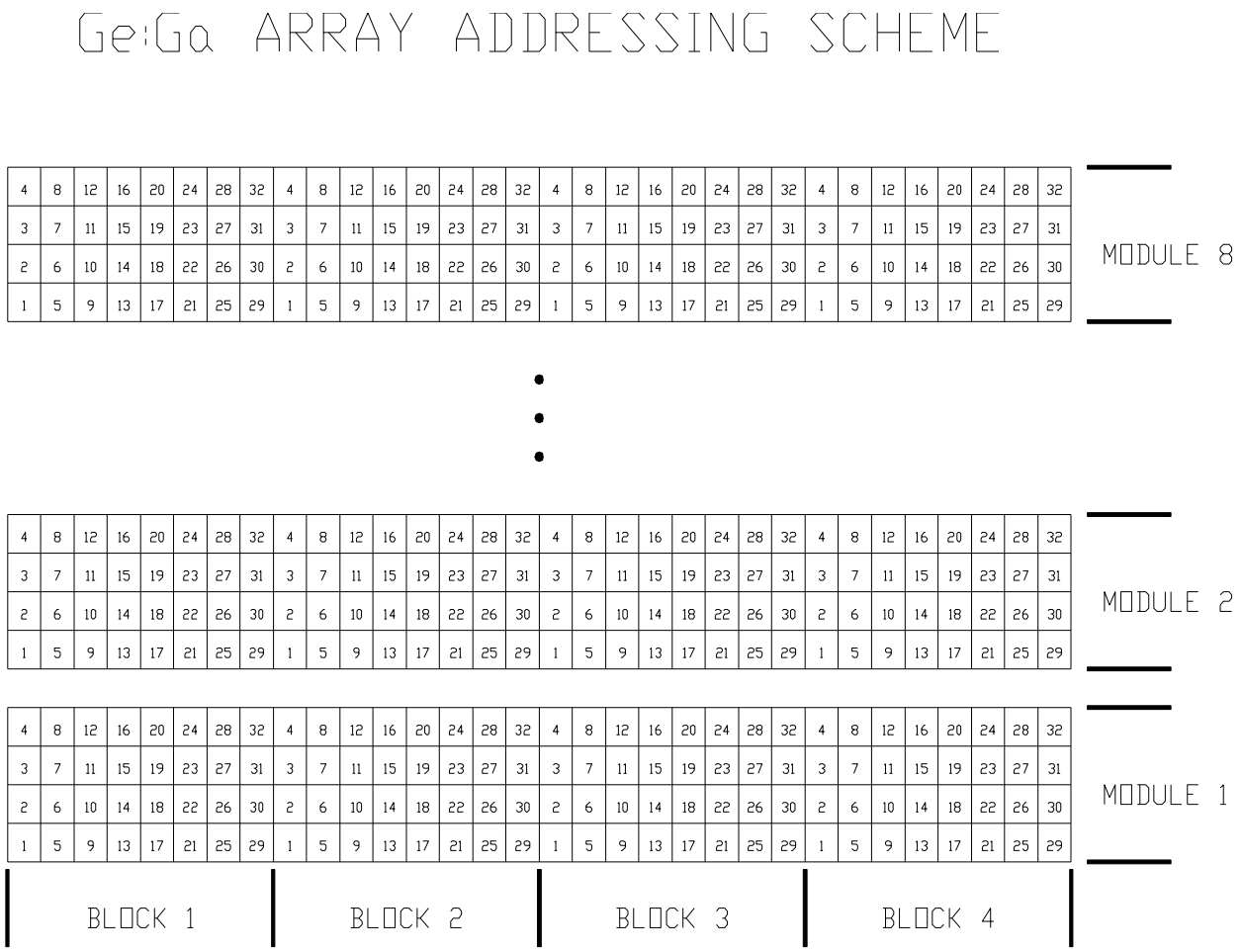
Custom cryogenic readouts (CRC-696)



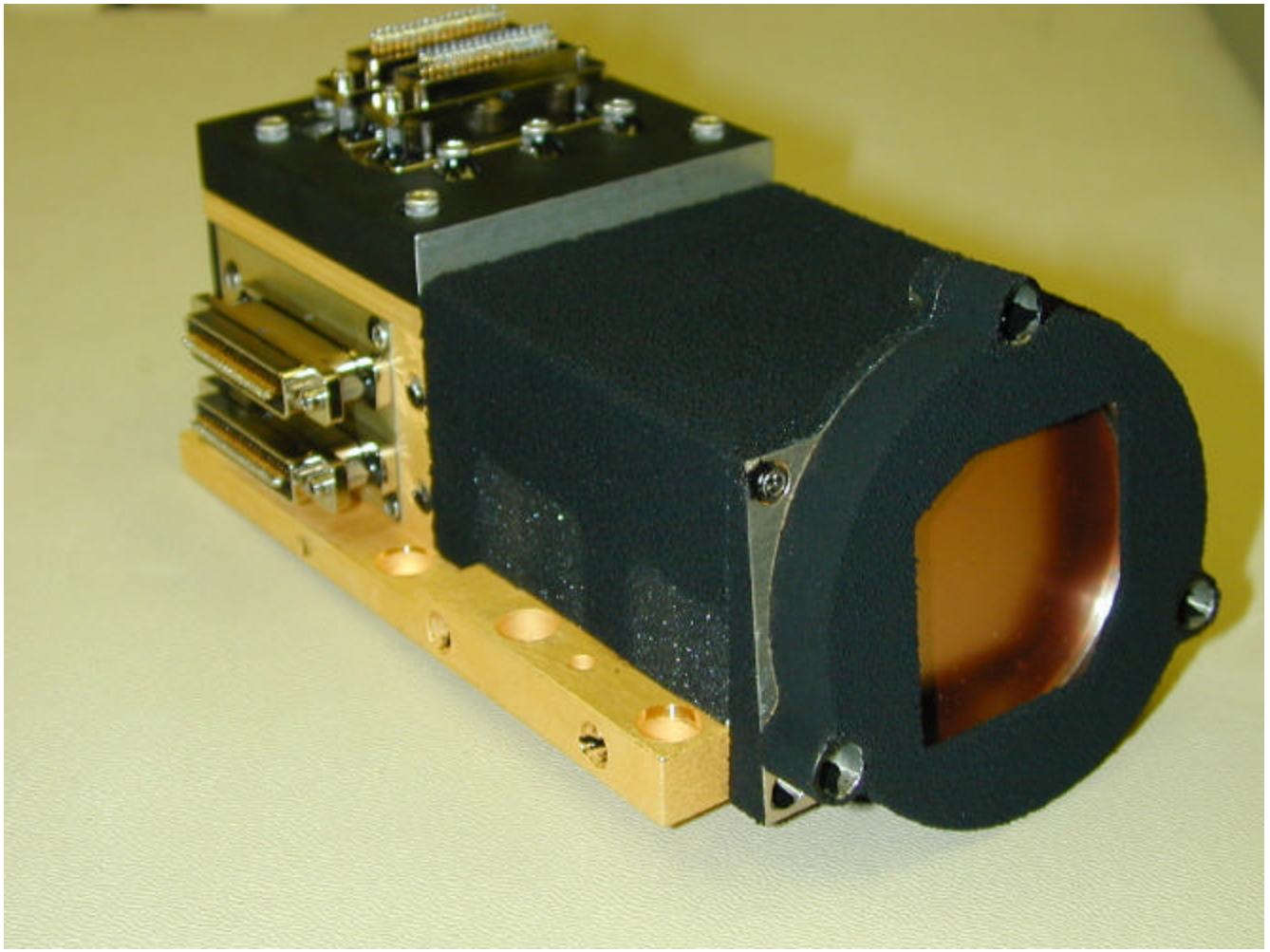


Flight 4x32 Module

Pixel Addressing Order



Flight 70 μm Array



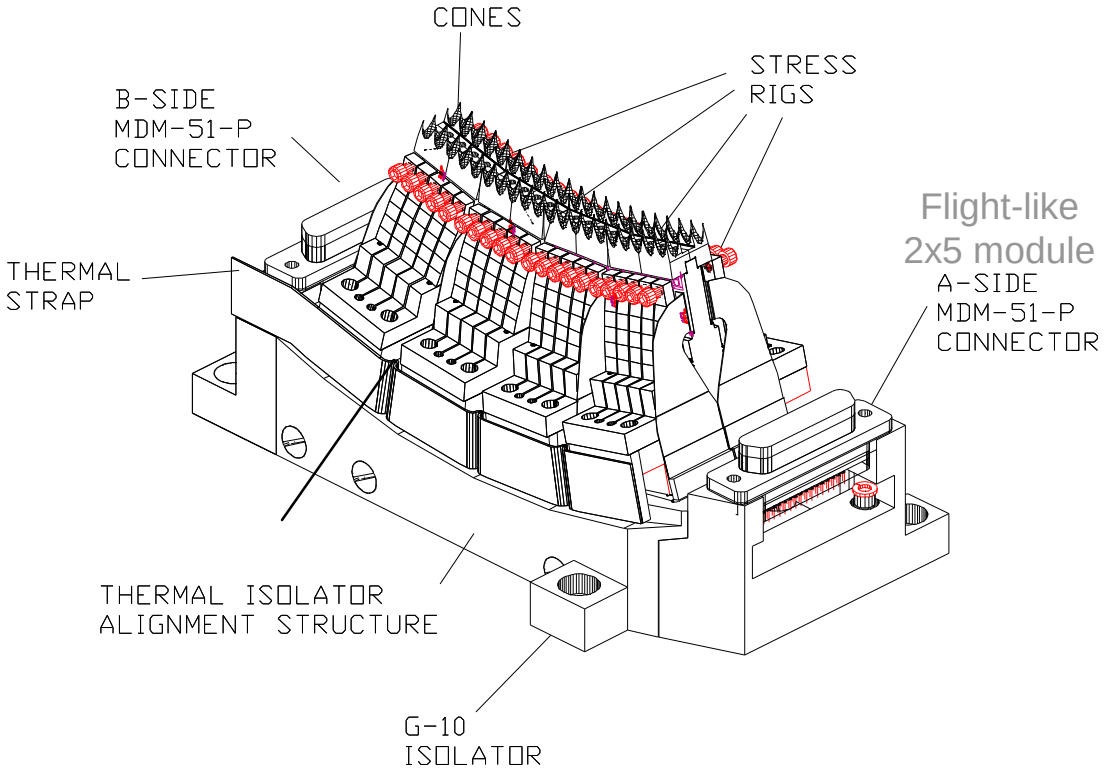
160 μm Array

2 x 20 Stressed Ge:Ga photoconductor array

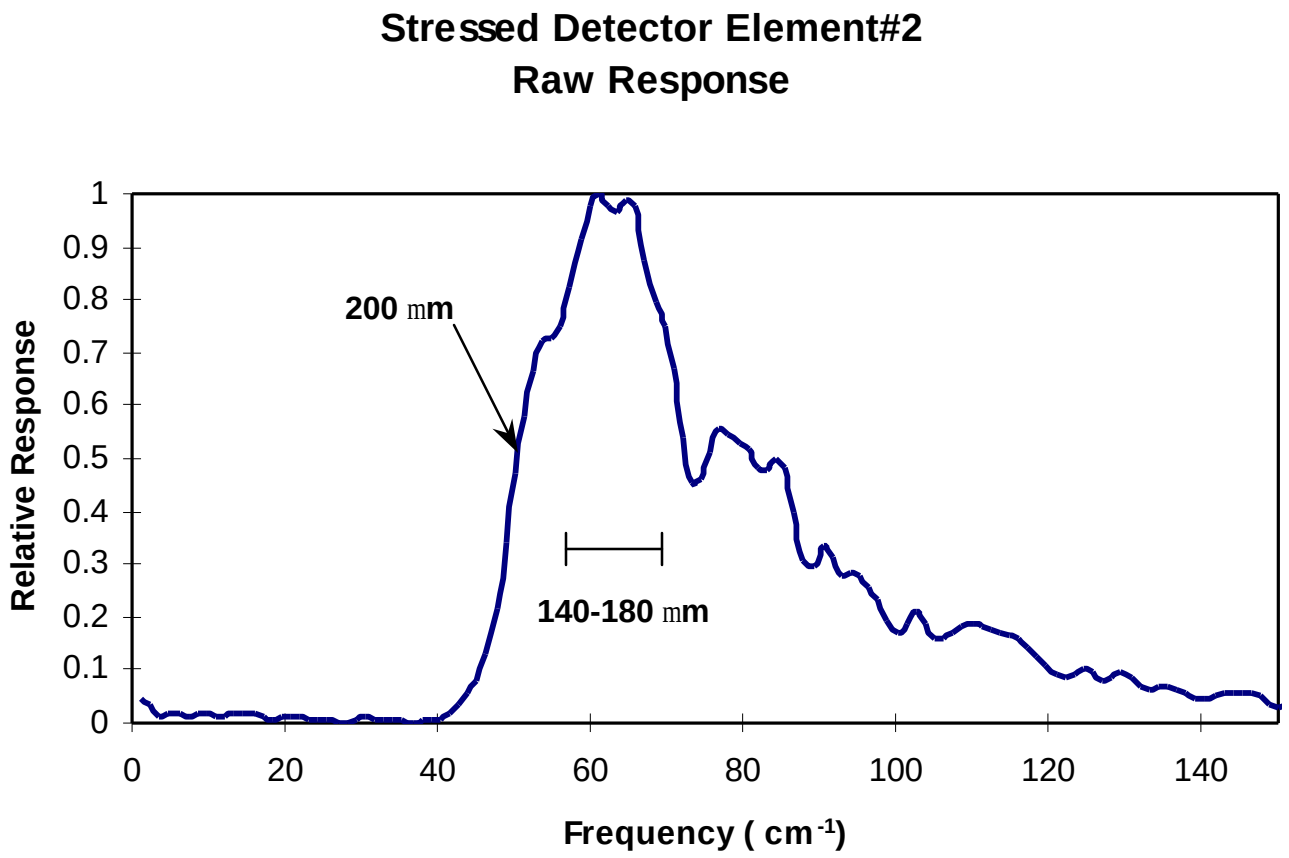
Developed and constructed at Steward Observatory

Detector material from Lawrence Berkeley Laboratory

Custom cryogenic readouts (CRC-696)

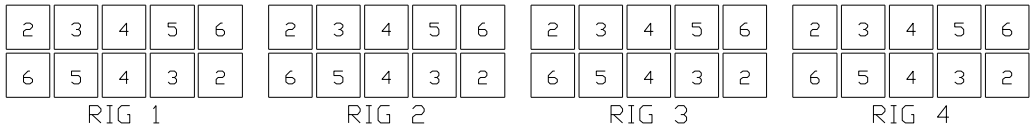


Stressed Detector Spectral Response



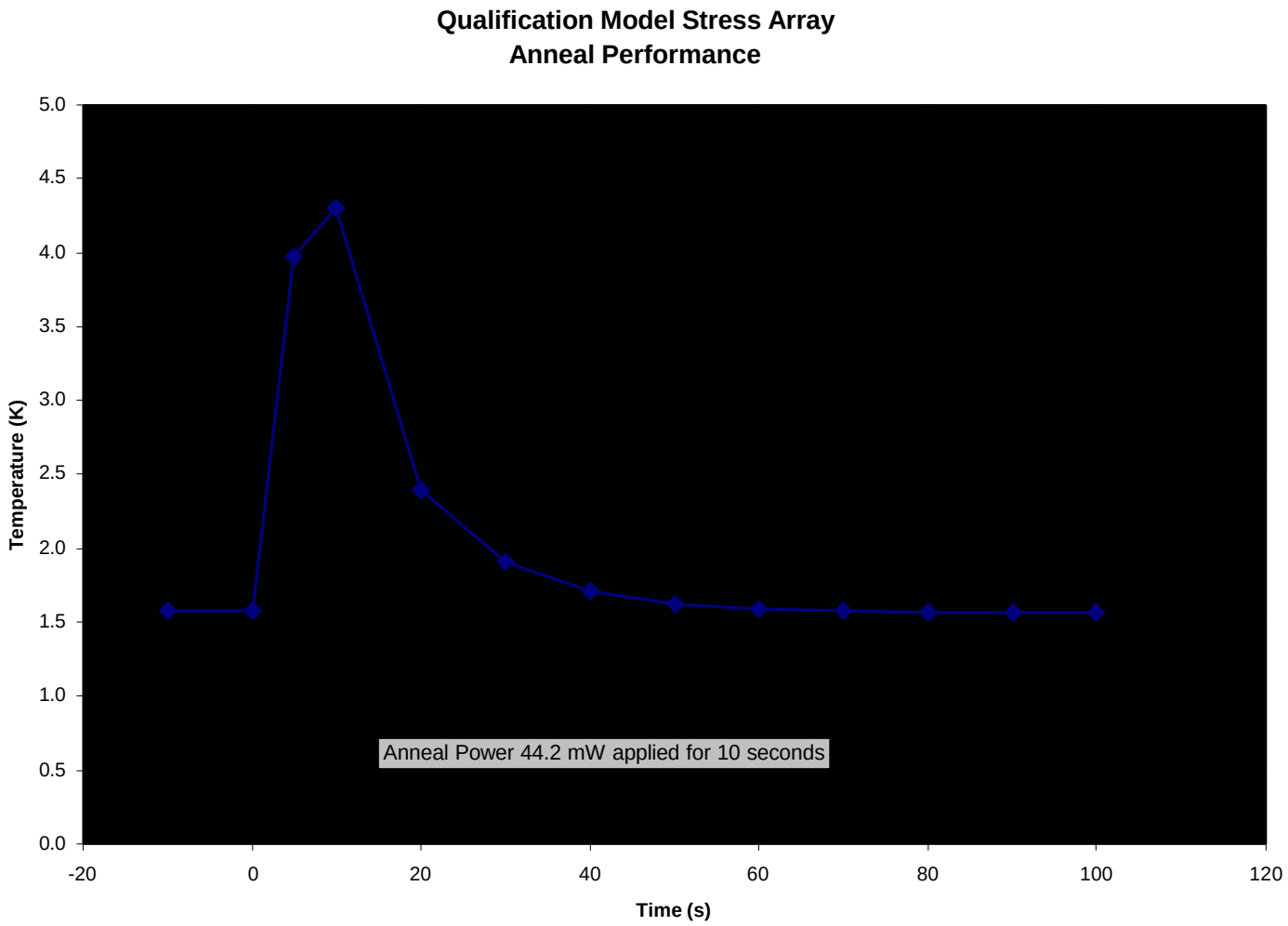
Stress Array Pixel Order

VIEW FROM FRONT OF STRESS Ge:Ga ARRAY

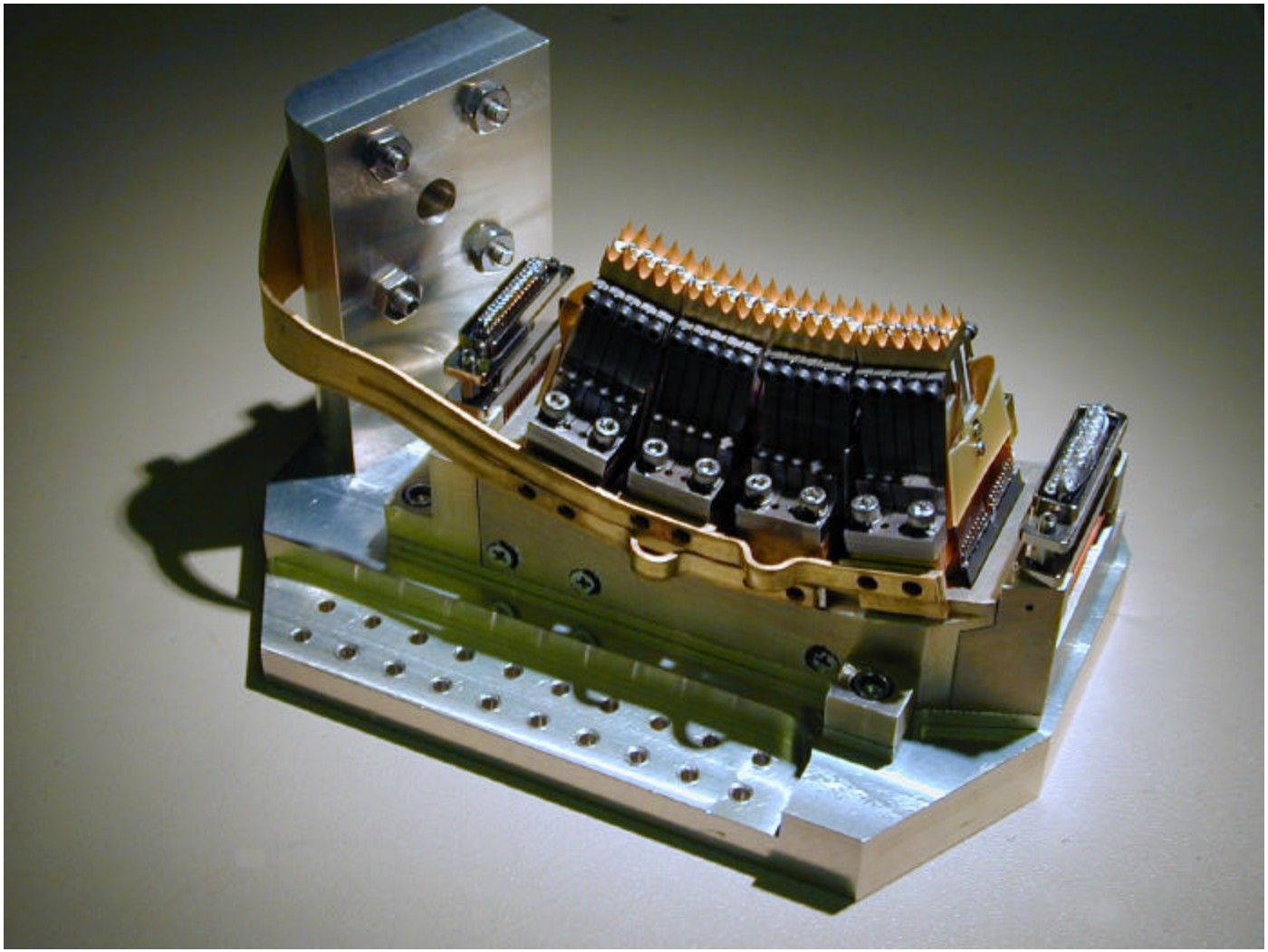


DURING EACH FRAME, EIGHT PIXELS ARE ADDRESSED PER READOUT, BUT ONLY PIXELS 2, 3, 4, 5, AND 6 ARE CONNECTED TO DETECTORS. SIGNALS APPEAR ON EIGHT PARALLEL OUTPUTS. FOR EXAMPLE, ALL PIXEL "2's" ARE ADDRESSED AND AVAILABLE AT THE SAME TIME.

Anneal Test


Qualification Model Stress Array
Anneal Performance
Temperature (K)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-20
0
20
40
60
80
100
120
Time (s)
Anneal Power 44.2 mW applied for 10 seconds

Flight Stress Detector Array



Overall Detector Status

- 24 μm Array
  - *Flight, Spare, and Qualification Units delivered to Ball by Boeing*
  - *Being installed today*
- 70 μm Array
  - *Flight Array has been delivered to Ball and has been installed into instrument*
  - *Flight Spare under construction*
- 160 μm Array
  - *Flight Array has been delivered to Ball and has been installed into instrument*
  - *Flight Spare under construction*

Future Prospects

- Advanced readouts for high backgrounds
  - *SBRC 190 readout has been fabricated to support SOFIA far-infrared arrays*
    - Switchable gains to give full wells 2 x 10^4 to 8 x 10^7 electrons
    - Built in sample and hold to eliminate time skew with rapid readout
- Larger format arrays
  - *64 x 64 Camera for SOFIA*
    - Coverage to 130 μm with Ge:Sb photoconductors