# THE NASA - ARC 10/20 MICRON CAMERA

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**Abstract.** A new infrared camera (AIR Camera) has been developed at NASA - Ames Research Center for observations from ground-based telescopes. The heart of the camera is a Hughes 58 x 62 pixel Arsenic-doped Silicon detector array that has the spectral sensitivity range to allow observations in both the 10 and 20 micron atmospheric windows.

**Key words:** IR Instrumentation – IR Camera – IR Astronomy

## 1. The Infrared Detector Array

The heart of the Ames Infrared Camera is a 58 x 62 pixel infrared detector array from the Hughes Technology Center, Carlsbad. The pertinent characteristics of the camera array are given in Table I. The underlying multiplexer is the new CRC 644C, which is based on PMOS rather than the conventional NMOS technology. Tests in the laboratory have shown that this multiplexer is capable of being driven at speeds up to a 1 MHz pixel rate at liquid-helium temperatures with an acceptable signal roll-off. This pixel rate is sufficient to drive the entire array to a frame rate of over 200 Hz. Since the active-load FETs incorporated on the multiplexer are biased by constant-current sources, this type of array also has much greater temperature stability, compared to those arrays that have voltage-biased FETs. A Si-diode thermometer and heater are mounted on the camera array carrier board for whatever additional temperature control is needed.

## 2. The Camera Optical Layout

The optics of the Ames Infrared Camera are very simple, consisting of a single lens that simultaneously re-images the sky image formed by the telescope onto the detector array as it also images the telescope secondary mirror onto a cold stop at the entrance to the array enclosure. Two filter wheels select among a variety of blocking, neutral density, and spectral definition filters, including a 3% 7.5-14 $\mu$m CVF and bandpass filters centered at 9.8, 10.3,





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18.0, 20.0, and 22.0 $\mu$m, rotating them into position just in front of the cold stop. The optical design allows changing between telescopes of different F-number ratios by changing the re-imaging lens, while keeping the filter wheels, cold stop, and array undisturbed. This optical design also keeps the A-$\Omega$ seen by the detector array at a constant value as the lens is changed, allowing the camera to be characterized and optimized for one infrared background level.

TABLE I
AIR Camera Array Characteristics

| | |
|---|---|
| Array Format: | 58 x 62 |
| Pixel Pitch: | 75 $\mu$m |
| Full well capacity: | $1.5 \times 10^6 e^-$ |
| Number of output lines: | 2 |
| Multiplexer: | CRC 644C |
| Detector Material: | Si:As IBC |
| Operating wavelength range: | 6 - 28 $\mu$m |

## 3. The Camera Performance on the Telescope

The camera has been used on engineering observing runs at the Mt. Lemmon 1.5m NASA/UA telescope for a week in November, 1992, and a week in February, 1993. The AIR Camera was found to have met all of its designed sensitivity performance goals during the tests at Mt. Lemmon, with the camera sensitivity measured to be 0.08 Janskys/pixel in one minute of telescope observing time at 10 microns with 3% spectral resolution, which translates into a diffraction-limited surface brightness sensitivity of 0.04 Janskys/sq. arc sec. in one minute of telescope observing time. When using this telescope, each camera pixel corresponded to a square 0.73 arc- seconds wide on the sky, which gave a total camera field-of-view of 42 x 45 arc-seconds.

## 4. Acknowledgments

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