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NASA TECH BRIEF



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Infrared Radiometer

A radiometer has been designed and constructed for use either with an $f/16$ telescope to measure thermal radiation from the surface of the dark moon or with a short-range optical system to measure thermal radiation from laboratory samples.

The basic scheme of the radiometer is the same whether it is mounted on a telescope or used with a laboratory optical system. Radiation from the collecting optics is focused on a plate that has a 0.5-mm-diameter aperture. Gold-coated mirrors are used to image the aperture on the thermal detectors, two gallium-doped germanium bolometers. The focal number of the radiometer optical system is $f/16$. To reduce background radiation, both the aperture plates and the optics can be cooled with liquid nitrogen to a temperature of approximately 100°K . To provide continuous calibration, the radiometer has two internal calibration sources. A gold-coated chopper changes the direction of view of each detector so that each responds first to the incoming radiation then to one of the internal calibration sources. A magnetic pickup is used to sense the phase of the chopper and to provide a signal for demodulating the output from each detector. The signals from the two detectors are added in phase to produce an increased signal-to-noise ratio. Theoretically, the two-detector system has a signal-to-noise ratio 1.4 times greater than that of a single detector system. The actual gain will depend on the similarity of the signal and noise characteristics of the individual detectors and on the precision of the alignment of the

optical system. The two detectors used in the radiometer were well matched and had signal and noise characteristics that differed only by a few percent.

The spectral range of the radiometer is limited by the transmission of the window that is mounted on the detector dewar and by the band pass of the interference filter. The interference filters can be changed so that different band-pass filters can be used for making measurements in any spectral region up to the cutoff wavelength of the window.

Notes:

1. The radiometer has not yet been completely evaluated.
2. Inquiries concerning this instrument may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B67-10422

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D. C. 20546.

Source: A. N. Bird
of Southern Research Institute
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Category 01