

Scan Angle Dependent Radiometric Modulation due to Polarization for the Atmospheric Infrared Sounder (AIRS).

Thomas S. Pagano, Hartmut H. Aumann
NASA Jet Propulsion Laboratory

Ken Overoye, George W. Gigioli
Sanders, A Lockheed Martin Company

Space based remote sensing instruments employing scanning mirrors to acquire data on the earth can experience a radiometric modulation with scan angle due to polarization effects. Mirrors inherently introduce polarization that depends on the angle of incidence and orientation of the mirror. In the case of the Atmospheric Infrared Sounder (AIRS) the angle of incidence is constant, however the orientation of the mirror changes with scan angle. The polarization of the scan mirror couples with that of the aft optics which is highly polarized due to use of a diffraction grating for spectral separation to produce a radiometric modulation with scan angle. This modulation must be considered when calibrating the radiometry of the instrument.

Data acquired during instrument testing on the polarization of the spectrometer were combined with data obtained for the scan mirror to model the expected radiometric modulation. Results were compared with direct measurements of the modulation obtained during radiometric testing while viewing a large area blackbody. Agreement is very good and shows that the modulation is very small and can be modeled to an accuracy consistent with the radiometric calibration budgets. Both modeled and measured results are presented for representative bands in the instrument as well as a discussion of the modeling techniques and equations used, and a discussion of the test data and the conditions under which it was obtained.