Abstracts

Radiometry in the Submillimeter Region Using the Interferometric Modulator

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Radiometry in the submillimeter and far infrared regions involves problems of a type not encountered in the centimeter region which require solutions using techniques different from those used in centimeter-wavelength radiometry. The nonlinear variation of the magnitude of the black-body radiation spectral density with temperature and wavelength, the limitation of antenna beamwidth by factors connected with the size of the noncoherent detector and the antenna focal length (rather than by diffraction effects and the antenna aperture) and the heavy absorption of submillimeter radiation by atmospheric water vapor are typical of the problems normally not encountered in centimeter radiometry. The unavailability of microwave techniques (i.e., waveguides, coherent receivers, etc.) makes necessary the use of quasi-optical techniques in this wavelength region. The interferometric modulator, which has already been used in far infrared spectrometers, is proposed in this paper as the major component of a practical submillimeter radiometer. Its use as the wave-number-selection device in a radiometer is analyzed and estimates are obtained for the sensitivity of this submillimeter radiometer. It is estimated that a 0.2° minimum detectable temperature differential is achievable with this radiometer. Also discussed are the effects of atmospheric water vapor absorption and the sensitivity of a number of different types of radiation detectors suitable for use in the submillimeter-wavelength region.

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