

A Search for the 1.36-cm Water-Vapor Line in Venus

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A search for the water-vapor line was made by Stevens, Drake, Jones, Sato, Stelzried, Potter, and others at the Jet Propulsion Laboratory at the California Institute of Technology. A 30-ft diam altazimuth radio telescope at the Goldstone Tracking Station was used. The radiometer was a conventional superheterodyne radiometer with a backward-wave oscillator as the local oscillator, which permitted frequency scanning from 20.5 to 24.0 Gc/s. On-off observations were made of Venus throughout the day, with frequent changes of the frequency observed. Extinction was measured using the Moon as a radio source. It was found, however, that extremely accurate extinction values for all frequencies could be derived from the theory of Barrett and Chung, using the radiosonde measurements made at the Edwards Air Force Base some 50 miles from the observing site. Measurements were made of the antenna gain, using a remote transmitter at a relatively high elevation on Tiefert Mountain. Although these measurements were entirely self-consistent, they differed markedly from theoretical predictions of the antenna gain as a function of frequency, thus producing some uncertainty as to the true value of antenna gain. Measurements were made at eight discrete frequencies between 20.5 and 24.0 Gc/s. The results give no evidence for the presence of the water-vapor line. An upper limit on the line intensity, using three standard deviations as a criterion, is 10 percent.

Discussion Following F. D. Drake's Paper

C. Sagan: What is the maximum permissible depression in the radio spectrum, as allowed by your results?

F. D. Drake: 15 °K.

W. E. Gordon: Are all the data taken at the same time?

F. D. Drake: The eight frequencies observed were observed over and over in a random sequence, with the frequency being changed at about half-hour intervals in the course of a day.

C. Sagan: Do visible terrestrial clouds affect the microwave measurements?

W. J. Welch: We think the answer is yes. Our measurements at or near the water vapor line become affected by sporadic errors when large cumulus clouds are present.

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Radiation of Venus at the 13.5-mm Water-Vapor Line

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Brightness temperature measurements of Venus at 13.5-mm wavelength were made following the lower conjunction in November 1962, and also preceding the next closest approach in June 1964.