III. RADIO ASTRONOMY*

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A. STUDIES OF WATER-VAPOR MICROWAVE EMISSION FROM INFRARED STARS

An observational study of water-vapor microwave emission from infrared stars is being conducted with the Haystack 120-ft antenna. The observations include a search for new stellar H_2O emitters (at 22.235 GHz), and regular monitoring of known stellar H_2O emitters for time variations in peak fluxes. We are searching among all stars with negative K magnitudes listed in the California Institute of Technology Two-Micron Sky Survey.[1] All known stellar H_2O microwave emitters, except NML Cyg, have negative K magnitudes, and this is the major criterion for our source selection. We are also searching among long-period variable stars at maximum light.

Thus far we have detected H_2O emission in NML Tau (IRC+10050), R Crt (IRC-20222), both of which had been observed earlier with negative results, IRC-30182, and RR Aql (IRC+00458). The H_2O emission feature in NML Tau is at +24.7 km/s (with respect to LSR), with an antenna temperature of 2.3°K, on March 27, 1972. The H_2O emission in R Crt has been resolved into three components extending over a velocity range from +12.5 km/s to +19.3 km/s, with the main feature at +18.5 km/s; the antenna temperature of the main feature was 8°K on March 26, 1972. The emission feature in IRC-30182 is at +15.9 km/s, with an antenna temperature of 1.6°K. The emission feature in RR Aql is at +27.9 km/s, with an antenna temperature of 1°K.

We have observed significant time variations in peak H_2O spectral-line fluxes from some of these infrared stars, including the recently discovered NML Tau and R Crt. We will also be able to compare these microwave flux variations with variations in the infrared fluxes.[2] We hope that this will give us additional clues to the physical processes involved in these unusual objects.

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A paper on this work will be presented at the 137th Meeting of the American Astronomical Society, in April 1972, and we are also preparing a longer paper for publication.

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References

1. G. Neugebauer and R. B. Leighton, Two-Micron Sky Survey – A Preliminary Catalog (NASA SP-3047, Washington, D.C., 1969).
2. P. Harvey, G. Neugebauer, and E. Becklin, Department of Astronomy and Physics, California Institute of Technology, Private communication, 1972.