V. MICROWAVE SPECTROSCOPY

Prof. M. W. P. Strandberg
Dr. D. Kivelson
J. G. Ingersoll
B. Josephson, Jr.
J. D. Kierstead
S. Krongelb
M. Peter
I. H. Solt, Jr.
P. R. Swan, Jr.
G. J. Wolga

RESEARCH OBJECTIVES

The work of this group is, in broad terms, the study of the energy states of, and the interactions between, the elements of systems of atoms in vapor, liquid, and solid. The experimental techniques employed for the most part are radiofrequency spectroscopic techniques, mainly in the microwave region. Probably the best justification of the title "Microwave Spectroscopy" is that the experimental techniques are such a highly specialized application of admittedly universal ideas.

While this is so, most of the contributions of the group are in the field of application and interpretation rather than in apparatus development, although some of the latter must necessarily be carried on. Work in this apparatus development now in progress is on the observation of microwave resonant absorption of radiation propagating transverse to a molecular beam. Such observations allow us to eliminate the usual Doppler and pressure broadening, so that microwave spectroscopy techniques can possess the almost unlimited resolution long available with conventional molecular-beam deflection apparatus. We have also done some work in developing methods of stabilizing and measuring microwave sources with an accuracy consistent with this new resolving power which should be available with beam operation.

The apparatus will be of great use for many applications requiring high resolution, though at present it is being tried with the well-known 1.3-cm ammonia absorption.

Work is continuing in the study of the general field of internal rotation in molecules. The attempt here is to better understand the observed perturbations of the rotational spectra of these internal rotational states; to understand the source of internal hindering potential and the effect of excited torsional states on the observed molecular geometry.

Work on liquids and solids is being carried out through the observation of paramagnetic states. The application of the observation of paramagnetic spectra to the study of the solid state is still quite undeveloped. For this reason we plan, for the present, to exploit the novel applications of this powerful research tool.

M. W. P. Strandberg