XIV. MAGNETIC RESONANCE*

Academic and Research Staff

Prof. J. S. Waugh
Dr. U. Haeberlen

Graduate Students

J. D. Ellett, Jr.
W. E. Good, Jr.
A. Leonardi-Cattolica
J. D. Ramshaw
H-N. Yeung

RESEARCH OBJECTIVES

1. Behavior of Spin Systems under Periodic Perturbations

We are studying the time-dependent magnetization of spin systems that are subjected to strong time-periodic disturbances, such as radiofrequency magnetic fields of constant or modulated amplitude and phase or rotation of the Zeeman field with respect to the system. A theoretical framework has been developed for the case in which the internal Hamiltonian of the spin system is constant in time,[1] and this has been extended to include the effects of a stochastic internal Hamiltonian. Emphasis is put on periodic disturbances having useful properties. It is possible, for example, to perturb the system so as (a) to erase the secular effects of dipole-dipole interactions and uncover much smaller shifts in resonance frequency or scalar spin-spin interactions, (b) to control the effective magnitude of resonance shifts relative to the other interactions, and (c) to observe spin-lattice relaxation properties under a variety of unusual conditions, thereby obtaining a detailed picture of random atomic motions.

2. Intermolecular Forces

We are investigating the anisotropy of intermolecular forces by two experimental methods: (a) temperature, composition, and density dependence of nuclear spin-lattice relaxation in dilute gas mixtures, and (b) density and temperature dependence of the static Kerr effect in gases.

J. S. Waugh

References

1. U. Haeberlen and J. S. Waugh, Phys. Rev. (in press).

*This work is supported by the Joint Services Electronics Programs (U. S. Army, U. S. Navy and U. S. Air Force) under Contract DA 28-043-AMC-02536(E).