VI. MOLECULAR BEAM RESEARCH

Prof. J. R. Zacharias
Prof. B. T. Feld
Dr. V. Jaccarino
R. T. Daly, Jr.
J. H. Holloway
J. G. King
H. H. Stroke

A. THIRD ATOMIC BEAM APPARATUS

The operating and measuring instruments were set up in a control panel in preparation for experiments designed to study the hfs anomaly in the isotopes Cs^{133}, Cs^{134}, Cs^{135}, and Cs^{137}. The radioactive isotopes have already been obtained from the Oak Ridge Laboratories.

The magnet battery power supply is being stabilized for operation of the "C" magnet in the 5500 gauss region necessary in the study of the above isotopes.

A stabilized oscillator designed to operate in the region from approximately 1200 Mc/sec to 2000 Mc/sec was assembled. A new directional oven, especially well suited for the production of beams of radioactive atoms, has been designed and is now under construction.

A nuclear resonance magnetometer, based on the Pound circuit (1), was built for transition ("C") field measurements when atomic beam resonances cannot be observed. Proton resonance was observed in the 3500 gauss field of the Harvard permanent magnet. A signal-to-noise ratio of better than 5 was obtained in the initial test with a 1-cm^3, 1-N $MnSO_4$ sample. No attempt was made at that time to optimize this ratio. Developments are underway at present to permit observation of the resonance signal in the 1/4-inch gap of the atomic beam apparatus "C" magnet. The necessary reduction in sample volume decreases the signal-to-noise ratio, but the higher magnetic field (5500 gauss) at which the resonance will be observed and the use of Nujol, which has a considerably shorter relaxation time (2), as the proton source, will restore partly the original signal-to-noise ratio.

V. Jaccarino, H. H. Stroke, J. G. King

References

1. R. V. Pound, W. D. Knight: Rev. Sci. Instr. 21, 219-225, 1950
2. N. Bloembergen, E. M. Purcell, R. V. Pound: Phys. Rev. 679-712, 1948