

II. MICROWAVE SPECTROSCOPY*

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A. WORK COMPLETED

1. A STUDY OF ELECTROMAGNETIC OSCILLATIONS IN SPHERICAL CAVITIES

This work has been completed by Barrett A. Eisenstat and submitted as a thesis to the Department of Physics, M. I. T., May 1969, in partial fulfillment of the requirements for the degree of Bachelor of Science. A summary of the thesis research follows.

The resonant frequencies of spherical cavities are determined by Maxwell's equations and boundary conditions. A selected set of frequencies has been confirmed experimentally. The Q arising from Joule heating has also been determined by theory, and a lower limit of approximately 10^4 was found experimentally. Optimal filling factors were determined for many mode designations. Frequency splitting of degenerate modes and perturbations to the boundary of the cavity by both loops and probes and to the internal areas by small metallic objects were briefly considered. The spherical cavity, as well as the cylindrical and rectangular forms that are already in use, has great possibilities in electron-spin resonance experiments in the microwave frequency range.

M. W. P. Strandberg

2. FABRICATION OF THIN-FILM SUPERCONDUCTING BOLOMETERS

This work has been completed by Oliver U. O. Mobisson and submitted as a thesis to the Departments of Electrical and Mechanical Engineering, M. I. T., May 1969, in partial fulfillment of the requirements for the degree of Bachelor of Science. A summary of the thesis research follows.

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(II. MICROWAVE SPECTROSCOPY)

We have previously observed excess high-frequency noise in thin-film tin superconducting bolometers.¹ It has been suggested that the sharp corners of the scribe marks which were used to increase the current path length on the film could be a source of instabilities.

The present work was a test of the fabrication of meandering thin-film bolometers without sharp corners by photoetching techniques. The photoresist material can be left on the film to prevent deterioration of the film by oxidation. An appropriate etchant for tin was found, and bolometers were fabricated. Noise figure measurements have not yet been made on them.

R. L. Kyhl

References

1. M. W. P. Strandberg, Quarterly Progress Report No. 91, Research Laboratory of Electronics, M. I. T., October 15, 1968, pp. 2-3.