

### III. SOLID STATE PHYSICS

Prof. W. P. Allis  
Prof. S. C. Brown  
Prof. G. G. Harvey

G. Ascarelli  
K. R. Dawber

T. Higier  
R. G. Newburgh  
J. B. Thomas

#### RESEARCH OBJECTIVES

Work in this field is largely concentrated on (a) soft X-ray spectroscopy of metals, and (b) microwave study of semiconductors.

The soft X-ray spectroscopy program has as its objective the experimental study of the structure of the conduction band of electrons in a series of metals, particularly the alkalis, alkaline earths, and some of the transition metals. The filled portion of such a band can be studied by observing the emission spectrum produced by transitions from this band to the nearest sharp levels below this band. In most metals this corresponds to an energy in the range of 15-250 ev (wavelengths in the range 50-900A), so that the technique of extreme ultraviolet vacuum spectroscopy is applied. The energy width of these bands usually lies in the range of 2-10 ev. This particular research work was inactive for over a year, but in the past few months it has been started again. We plan to measure the band structures of some alloys of metals that have been measured (or are to be measured, also) in the pure state. A more detailed description of the procedures will be found in the Quarterly Progress Report of January 15, 1954, page 9.

One of the general aims of the research on microwave study of semiconductors is to apply the methods and general point of view of the microwave gaseous discharge work to those problems involving semiconductors wherever it seems profitable. We are studying, both theoretically and experimentally, the general problem of the mechanism of raising the electrons from the impurity levels to the conduction band (equivalent to a gaseous discharge breakdown) in a number of semiconductors.

S. C. Brown, G. G. Harvey