

## II. SOFT X-RAY SPECTROSCOPY\*

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### RESEARCH OBJECTIVES

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 available sharp levels below this band. In most metals, this corresponds to an energy in the range 15-250 ev (wavelengths in the range 50-900 Å), so that techniques of extreme ultraviolet vacuum spectroscopy need be applied. The energy widths of these bands usually lie in the range 2-10 ev.

In order to eliminate uncertainties concerning the contamination of the metals that are being studied, a new ultrahigh vacuum spectrograph has been constructed. Upon proper bakeout it has attained pressures of  $5 \times 10^{-10}$  mm Hg. Thus it will be possible to deposit clean targets and investigate them for hours before contamination develops. A new dispersion system also has been incorporated in the apparatus. This consists of an atomic beam from which photoelectrons are ejected upon soft x-ray bombardment. The photoelectron energies are analyzed by means of a  $3\pi/2$  electron spectrometer that has an Allen electron multiplier as a detector. Since almost all previous soft x-ray data have been obtained with grating spectrometers, this device will offer an entirely new means for confirming old, as well as for obtaining new, data.

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