

IV. PHOTOEMISSION SPECTROSCOPY

Academic Research Staff

Prof. F. Read McFeely

Graduate Students

Michael R. McClellan
Michael J. Sayers
Richard P. Vasquez

Joint Services Electronics Program (Contract DAAB07-76-C-1400)

F. Read McFeely

During the past year we have completed the design of our new angle-resolving photoemission instrument and have completed 95% of the construction of it. This spectrometer will be capable of 360° rotation in the horizontal plane and 110° rotation in the vertical plane, and will incorporate a multichannel detector. This multichannel detection system, which was successfully tested over the past year, will provide a factor of 80 increase in sensitivity over conventional single-channel instruments. We have also completed construction of an ultrahigh vacuum rotatable polarizer which will provide us with polarized photons with which to perform our experiments. We have also completed the design and construction of a high-resolution electron monochromator which we shall use in conjunction with the photoemission experiments.

In addition to the design and construction of photoemission apparatus, we have completed some theoretical work in angle-resolved photoemission spectroscopy. The new model we have developed was found to be far superior to earlier equipment because of our accurate treatment of the final-state wave function in the vicinity of the atomic cores. We were also able to show, using second-order time-dependent perturbation theory, that the statistical sampling of the Brillouin zone in angle-resolved photoemission experiments could not be attributed to thermal phonons but was instead due to the nature of the final-state electronic wave functions.

