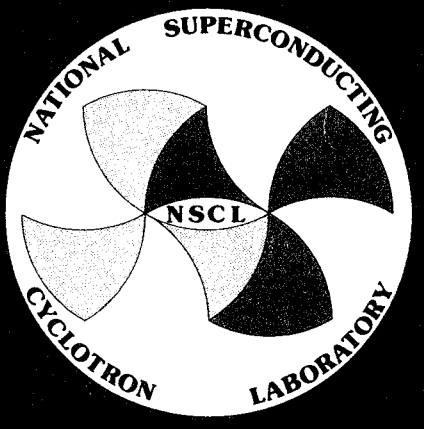
Annual Report

1981-82



Cyclotron Laboratory

Michigan State University

ANNUAL REPORT

OF THE

MICHIGAN STATE UNIVERSITY

NATIONAL SUPERCONDUCTING CYCLOTRON LABORATORY

FOR THE PERIOD

JULY 1, 1981 TO JUNE 30, 1982

BY

PROJECT STAFF

DECEMBER 1982

EAST LANSING, MICHIGAN

Preface

This Annual Report covers the activities of the National Superconducting Cyclotron Laboratory for the period July 1, 1981 to June 30, 1982. Over the year the face of the Laboratory has been transformed with the completion of the major building modifications. A description of these alterations, and a photograph of the present appearance of NSCL follows this preface.

The research described in this report used accelerator facilities at several laboratories, including Argonne, Indiana, LBL, Maryland, ORNL, Orsay and Saclay. We are grateful to these Institutions for their hospitality and help. (Shortly after the period covered by the report, the first beam was extracted from the K500 superconducting cyclotron and an experiment with a ^{12}C beam of 35 MeV/nucleon was successfully carried out.)

The research deals with the experimental and theoretical study of the interaction of light and heavy ions with target nuclei, and with the development of nuclear instrumentation and accelerator technology. A wide range of topics is encompassed by nuclear reactions, ranging from sub-Coulomb reactions to studies of pion production with relativistic heavy ion beams, anomalons, etc. A major effort is devoted to intermediate energy heavy ion reactions, which will be pursued in greater detail with the new cyclotron.

The nuclear structure studies place particular emphasis on the excitation of new giant excitation modes of nuclei, including spin-flip transitions, Gamow-Teller strength, deeply-bound hole states and giant resonances. The experimental studies are complemented by parallel theoretical research. A major effort continues in microscopic shell model and interacting Boson model studies. This report also contains an account of new experiments to measure half lives and other properties of exotic nuclei, for which detailed shell model predictions are also in progress at the Laboratory.

A major component of the report is devoted to the description of developments in nuclear instrumentation and in beamline and accelerator development, as the Laboratory moves into an operating experimental program with the K500 and continues to prepare for the future K800 coupled accelerator facility.

The activities of the year involved much preparatory work for a major event which actually occurred after the time period of this report namely, the first International Conference on Nucleus-Nucleus Collisions which met at MSU from September 26 through October 1, 1982 and which also included a ceremony marking the formal inauguration of the National Superconducting Cyclotron Laboratory. The Conference was attended by over 300 scientists from 20 different countries, and aimed to provide a broad overview of the field of nuclear collisions over the whole energy region covered by current experimental and theoretical investigations. In addition to 32 invited papers, approximately 80 papers from the 150 contributed papers were presented in Poster Sessions.

Another major event of the year was the first Program Advisory Committee meeting in February 1982 with the purpose of approving an experimental program for the first running period of the new K500 accelerator. Of the 43 submitted proposals, requesting 4,334 hours, 1,586 hours were approved divided among 34 experiments. Approved experiments involve a total of 83 users, 32 from MSU and 51 from outside the laboratory.

Approximately 60 reports and journal articles were published by NSCL scientists and collaborators during the period covered by the report. The Laboratory's important role as a training center for future scientists also continued to expand; at this time 7 Postdoctoral Research Associates, and 26 Graduate Students are utilizing the facility. In addition, more than a dozen scientists from other institutions around the world visited the Laboratory, bringing with them many fresh ideas and motivation for research.

We close this preface with the realization that the next Annual Report will be very different, dealing primarily with research conducted at NSCL with the new K500 superconducting cyclotron. We take the opportunity to thank our many colleagues around the world for providing facilities and support for our research efforts over the last few years.

David K. Scott
December 1982

Henry Blosser

Building Additions to National Superconducting Cyclotron Laboratory

Jim Easley

During this past year the construction of a major addition to the cyclotron laboratory was completed and all new areas are being utilized. (Figure 1) The total new space is approximately 38,000 square feet. Also included in the construction project were alterations to about 3,500 square feet of the existing building for expanded computer and data processing facilities.

The new space includes major extensions to the high bay on both ends of the building to house the K800 cyclotron on the west end and the S800 spectrograph along with expanded experimental areas on the east end. Both of these areas incorporated permanent concrete shielding walls up to 7 feet thick and massive foundations to support the heavy equipment and structure. The office addition includes a seminar room, conference room, individual offices, technical support work areas and a large open office area that is presently being utilized by the mechanical design group and accelerator physics personnel. A central courtyard on the western portion of the building was enclosed and finished to provide additional meeting and discussion area.

Much of the new space utilizes indirect lighting which provides high quality energy efficient lighting. The environmental conditioning of all new space utilizes heat pump units which are interconnected with a closed loop water circulating system. The circulating loop is also connected into the new helium compressors heat rejection system. This energy conserving system has the unique capability of heating all of the new space with rejected heat from the helium compressors while they are in operation.

Fig. 1. Photo of the NSCL Building from the Northeast.

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