

ANNUAL REPORT
OF THE
MICHIGAN STATE UNIVERSITY
NATIONAL SUPERCONDUCTING CYCLOTRON
LABORATORY
FOR THE PERIOD
JANUARY 1, 1996, TO DECEMBER 31, 1996

Preface

This Annual Report describes the activities of the National Superconducting Cyclotron Laboratory (NSCL) from January 1, 1996, to December 31, 1996. Major efforts of the laboratory were focused on:

- operating the NSCL as a national user facility and carrying out a research program in nuclear science, accelerator physics, and related instrumentation R&D,
- completing and commissioning the S800 magnetic spectrograph,
- performing R&D and prototyping for the coupled "K500⊗K1200" cyclotron project.

In 1996, construction of the superconducting S800 magnetic spectrograph and its high-acceptance beamline was completed, and first experiments with the S800 were conducted in the Fall. The Lab's helium refrigeration capacity was nearly doubled by installing and commissioning a used helium refrigerator (capable of producing approximately 200 l/hr) in the new high bay. In addition, the NSCL's mechanical workshop was upgraded by adding three computer controlled HURCO machining centers (with funds from MSU).

In November, the K500⊗K1200 upgrade project was approved by the National Science Board. With the completion of the S800 spectrograph, the K500⊗K1200 project has become the NSCL's highest priority. Necessary changes in staffing were initiated and partly implemented by the end of 1996. During the first half of the year, a high-intensity injection beam line into the K500 was constructed and successfully tested with performance exceeding the specifications for the K500⊗K1200 project. During the second half of 1996, the K500 was disassembled in the new high bay and refurbishing was begun. Significant progress has been made in finalizing the optical design of the A1900 beam analysis system and in the engineering of the A1900 beam line magnets.

Reliability of K1200 operation remained high (89.58%), though slightly lower than in previous years due to an aggressive operating schedule and reduced availability of manpower for maintenance due to budgetary constraints.

Pressure for beam time continues to be high, and the NSCL continues to be oversubscribed. PAC 20 (January 1996) and PAC 21 (July 1996) received combined requests for 7,048 hours of beam time; 4,708 hours were approved for research. As in previous years, about 3/4 of the approved experiments were collaborations between outside groups and NSCL staff.

During 1996, the research productivity of the NSCL remained high, and a large number of exciting new results in reaction dynamics and in the understanding of nuclei far from stability emerged. Much of this research and of the ongoing technical work is summarized in this annual report.

We welcome advice and suggestions from all readers on how the contents of this Annual Report could be made more useful or what could be done to make the NSCL a more supportive place to do research within the existing severe financial constraints.

C. Konrad Gelbke, Director

NSCL USERS EXECUTIVE COMMITTEE

Members of the Users Executive Committee serve three-year terms, beginning November 1 (formerly two-year terms beginning October 1). Members are elected each year from the general membership of the Users Group, and a non-voting liaison representative from MSU is appointed by the Director of the NSCL. Committees to date are:

July 1, 1982 - September, 1982

F. Becchetti -- University of Michigan
A. Galonsky -- Michigan State University
J. Huizenga -- University of Rochester
Vic Viola -- Indiana University
G.M. Crawley -- MSU, Liaison

October 1, 1982 - September 30, 1983

F. Becchetti -- University of Michigan, Chair
J. Kolata -- Notre Dame University
V. Viola -- Indiana University
D. Youngblood -- Texas A&M University
A. Galonsky -- MSU, Liaison

October 1, 1983 - September 30, 1984

J. Kolata -- Notre Dame University, Chair
F. Prosser -- University of Kansas
R. Tickle -- University of Michigan
D. Youngblood -- Texas A&M University
A. Galonsky -- MSU, Liaison

October 1, 1984 - October 31, 1985

J. Kolata -- Notre Dame University
L. Lee -- SUNY, Stony Brook
F. Prosser -- University of Kansas
R. Tickle -- University of Michigan, Chair
A. Galonsky -- MSU, Liaison

November 1, 1985 - October 31, 1986

D. Kovar -- Argonne National Laboratory
L. Lee -- UNY, Stony Brook
F. Prosser -- University of Kansas, Chair
R. Tickle -- University of Michigan
A. Galonsky -- MSU, Liaison

November 1, 1986 - October 31, 1987

D. Kovar -- Argonne National Lab, Chair
K. Kwiatkowski -- Indiana University
L. Lee -- SUNY, Stony Brook
J. Saladin -- University of Pittsburgh
A. Galonsky -- MSU, Liaison

November 1, 1987 - October 31, 1988

D. Kovar -- Argonne National Laboratory, Chair
K. Kwiatkowski -- Indiana University
J. Saladin -- University of Pittsburgh
L. Sobotka -- Washington Univ. at St. Louis
A. Galonsky -- MSU, Liaison

November 1, 1988 - October 31, 1989

T. Awes -- Oak Ridge National Laboratory
K. Kwiatkowski -- Indiana University
J. Saladin -- University of Pittsburgh
L. Sobotka -- Washington Univ. at St. Louis, Chair
A. Galonsky -- MSU, Liaison

November 1, 1989 - October 31, 1990

T. Awes -- Oak Ridge National Laboratory
A. Nadasen -- University of Michigan
L. Sobotka -- Washington Univ. at St. Louis, Chair
G. Wozniak -- Lawrence Berkeley Lab
A. Galonsky -- MSU, Liaison

November 1, 1990 - October 31, 1991

T. Awes -- Oak Ridge National Laboratory
J. Kolata -- Notre Dame
A. Nadasen -- University of Michigan
G. Wozniak -- Lawrence Berkeley Lab, Chair
A. Galonsky -- MSU, Liaison

November 1, 1991 - October 31, 1992

J. Kolata -- Notre Dame
A. Nadasen -- University of Michigan
U. Schroeder -- Univ. of Rochester
G. Wozniak -- Lawrence Berkeley Lab, Chair
A. Galonsky -- MSU, Liaison

November 1, 1992 - October 31, 1993

F. Bertrand - Oak Ridge National Laboratory
J. Kolata -- Notre Dame, Chair
U. Schroeder -- Univ. of Rochester
R. Vandenbosch - University of Washington
N. Anantaraman - MSU, Liaison

November 1, 1993 - October 31, 1994

F. Bertrand - Oak Ridge National Laboratory
U. Schroeder -- Univ. of Rochester, Chair
R. Vandenbosch - University of Washington
M. Wiescher - Univ. of Notre Dame
N. Anantaraman - MSU, Liaison

November 1, 1994 - October 31, 1995

F. Bertrand - Oak Ridge National Laboratory
R. Boyd - Ohio State University, Chair
R. Vandenbosch - University of Washington
M. Wiescher - Univ. of Notre Dame
N. Anantaraman - MSU, Liaison

November 1, 1995 - October 31, 1996

R. Boyd - Ohio State University, Chair
K. Kemper, Florida State University
R. Warner, NSCL/Oberlin College
M. Wiescher - Univ. of Notre Dame
N. Anantaraman - MSU, Liaison

November 1, 1996 - October 31, 1997

R. Boyd - Ohio State University
K. Kemper, Florida State University, Chair
W. Loveland, Oregon State University
R. Warner, NSCL/Oberlin College
N. Anantaraman - MSU, Liaison

MEETINGS AND MEMBERS OF THE NSCL PROGRAM ADVISORY COMMITTEE

PAC-1	February 1982	PAC-11	March 3-5, 1991
PAC-2	September 30, 1983	PAC-12	October 27-29, 1991
PAC-3	July 2, 1984	PAC-13	May 3-5, 1992
PAC-4	January 13-14, 1985	PAC-14	November 8-10, 1992
PAC-5	July 28-29, 1985	PAC-15	May 2-4, 1993
PAC-6	April 6-7, 1986	PAC-16	December 5-7, 1993
PAC-7	October 26-27, 1986	PAC-17	June 26-28, 1994
PAC-8	May 3-4, 1987	PAC-18	January 16-17, 1995
PAC-9	September 18-20, 1988	PAC-19	July 24-25, 1995
PAC-10	April 29-May 1, 1990	PAC-20	January 29, 1996

PAC MEMBERS

Members serve for about six PAC Meetings with one member leaving the PAC after each meeting. The Director of the NSCL is Convenor of the Committee. PAC Members to date and the meetings at which they have served are:

Britt, H.C.	LANL	1,2
Cline, D.	Rochester	1,2,3,4,5
Koonin, S.E.	Caltech	1,2,3,4,5,6
Paul, P.	Stony Brook	1,2
Scott, D.K.	MSU/NSCL	1,2,3
Cramer, J.	Washington	3,4,5,6,7
Viola, V.	Indiana	3,4,5,6,7,8
Benenson, W.	MSU/NSCL	4,5,6,7,8,9
Siemens, P.	Texas A&M	5,6,7,8,9,10,13
Stephens, F.	LBL	6,7,8,9,
Vary, J.	Iowa State	7,8,9,10,11,12
Young, G.	ORNL	8,9,10,11,12,13
Natowitz, J.	Texas A&M	9,10,11,12,13,14

Hardy, J.	Chalk River	10,11,12,13,14,15
Kashy, E.	MSU/NSCL	10,11,12,13,14,15,16
Randrup, J.	LBL	11,12,14,15,16,17
Haxton, W.	Univ. of Washington	13,14,15,16,18,19
Datz, S.	ORNL	14,15,16,17,18,19
Henning, W.	Argonne	14,15,16,17,18,19,20
Wozniak, G.	LBL	15, 16,17,18,19,20
Mueller, A.	IPN Orsay	16,17,18,19,20
Crawley, G.	MSU/NSCL	17, 18,19,20
Friedman, W.	Univ. of Wisconsin	18,19,20
Nazarewicz, W.	ORNL	20,21,22
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