

ANNUAL REPORT
OF THE
MICHIGAN STATE UNIVERSITY
CYCLOTRON LABORATORY
FOR THE PERIOD
JULY 1, 1977 TO JUNE 30, 1978

BY
PROJECT STAFF

OCTOBER 1978
EAST LANSING, MICHIGAN

PREFACE

This Annual Report is a composite document, covering all research carried out at the MSU Cyclotron Laboratory for the period from July 1, 1977 to June 30, 1978. We call special attention to the fact that the National Science Foundation was responsible for the construction of the Laboratory and in this way contributes substantially to the support of other agency research programs which use the facility. As is clear from Table I, the major operating support also comes from the NSF, with substantial support from Michigan State University.

The contents of this report include a staff roster (Table II), brief summaries of some of the work in progress in the Laboratory, abstracts of oral presentations to scientific meetings and of papers submitted for publication, and title pages of articles appearing in print. We caution that the work presented in the progress reports is often preliminary in nature and should be quoted only with permission of the individuals concerned.

During the period covered by this report the 50 MeV cyclotron has continued in its seven-day-a-week running mode and aside from a one-month shutdown to repair one of the extraction elements, both it and the major research support systems have been free of serious maintenance problems. There has been a significant shift toward research with heavy ions, both on the 50 MeV cyclotron and in the user mode at various laboratories, but research with light ions has remained the major effort. A modest breakthrough in ion-source techniques has occurred with the use of hafnium electrodes (rather than tantalum) yielding substantially longer source lifetimes, at least for certain heavy ions. We plan to shut down the 50 MeV cyclotron on April 1, 1979 to permit revamping of experimental areas and construction of new beamlines for the 500 Q²/A MeV superconducting cyclotron.

Superconducting cyclotron construction continues essentially on schedule. The 500 Q²/A MeV magnet is now fixed in its permanent location in the new building addition and is in routine use for ion source development. Radio-frequency (RF) components are under construction and should be ready for a major full scale test early in 1979. The design of the beam line layout is essentially complete and we plan to have a substantial array of experimental equipment ready for first experiments early in 1980. While the internal staff and members of the Sponsors Group are primarily responsible for the planning of experimental equipment, we welcome suggestions and comments from all interested parties.

A detailed design study for the 800 Q²/A MeV cyclotron has been completed and attractive designs now exist for all parts of the acceleration process including injection and extraction. Coupling with the 500 MeV cyclotron as an injector yields a system that will produce, for example, beams of uranium ions with energies of at least 40 MeV/A and lighter ions (A<40) with energies of 200 MeV/A.

Let me close by soliciting your comments on the form and contents of this document and your impressions of the general state of our program. Also, may I remind you that we welcome outside requests to use our facilities. Several significant collaborative projects with faculty and students from other institutions have been carried out during the last year with mutually satisfactory results. If you have an experiment which seems well suited to our laboratory's capabilities we would receive the suggestion enthusiastically.

Sam Austin
Associate Director

TABLE I.--Sources of support for the experimental program at the MSU Cyclotron Laboratory for the period July 1977-June 1978.

Institution or Agency		Per cent of total
National Science Foundation	Grants PHY76-02206 and PHY78-01684 (Experimental Nuclear Physics)	66.6
National Science Foundation	Grant PHY76-04912 (Experimental Nuclear Chemistry)	2.9
National Science Foundation	Grant PHY76-20097 (Theoretical Nuclear Physics)	4.7
Michigan State University		25.8

The above figures do not include the funding, essentially all for capital equipment, for the construction of the K=500 superconducting cyclotron.

TABLE II.--List of faculty, research associates, and graduate students working at the MSU Cyclotron Laboratory in the period July 1, 1977-June 30, 1978 and their principal sources of support.

Professors	supported by	Present Address	Graduate Students	supported by	Present Address
Sam M. Austin	NSF-exp, MSU		Tim Antaya	NSF-exp	
Walter Benenson	NSF-exp, MSU		Rahmat Aryaeinejad	NSF-chem	
George F. Bertsch	NSF-theory, MSU		Terry Awes	NSF-exp	
Henry G. Blosser	NSF-exp, MSU		Wayne Bentley	NSF-exp	
Jerzy Borysowicz	NSF-theory, MSU		Mary Brake	NSF-exp	
Gerard M. Crawley	NSF-exp, MSU		Jim Carr	NSF-theory, exp	
Aaron I. Gallonsky	NSF-exp, MSU		Don-Bok Cha	NSF-theory	
Morton M. Gordon	NSF-exp, MSU		Dan Coyle	NSF-chem	
Edwin Kashy	NSF-exp, MSU		Mark Curtin	NSF-exp	
Wm. H. Kelly	NSF-exp, MSU		Kurt Czuhai	NSF-exp	
Wm. C. McHarris	NSF-chem, MSU		Paul Deason	NSF-exp	
Hugh McManus	NSF-theory, MSU		Ray DeVito	NSF-exp	
Jerry A. Nolen, Jr.	NSF-exp, MSU		Marcello Distasio	NSF-chem	
Francesco Resmini*	NSF-exp, MSU		Steve Faber	NSF-exp	
B.H. Wildenthal	NSF-exp, MSU	(on leave NSF, Washington, DC)	Joe Finck	NSF-exp	Northern Mich. U.
Associate Professors			Robert Huffman	NSF-exp	
Fred Becchetti*	NSF-exp, MSU		Jung Kim	NSF-exp	
Fred M. Bernthal	NSF-chem, exp, MSU		Arno Ledebuhr	NSF-exp	
Claus-Konrad Gelbke	NSF-exp, MSU		Mike Marshall	NSF-chem	
Dan O. Riska	NSF-theory, MSU		Nobuo Matsushita	NSF-chem	
R.G.H. Robertson	NSF-exp, MSU		Robert Melin	NSF-exp	
Assistant Professors			Steve Motzny	NSF-exp	Stanford Univ.
Peggy Dyer	NSF-exp, MSU		Dave Munding	NSF-theory	
Roger Markham	NSF-exp, MSU		Janaki Narayanaswamy	NSF-exp	
Joel M. Moss**	Texas A&M	Xerox Corp., Rochester, NY	Gary Richter	NSF-theory	
Richard Pardo	NSF-exp, MSU		Lawrence Robinson	NSF-exp	
Reginald Ronningen	NSF-exp, MSU		Haitook Sarafian	NSF-exp	
Research Associates			Karen Stricker	NSF-theory	
Ulrich Berg	NSF-exp		John Yurkon	NSF-exp	
Jason Bishop	NSF-exp	Austin, Texas	Cecil Williamson	NSF-exp	
B.Alex Brown	NSF-exp	U. of Oxford, U.K.			
Jason Chai	NSF-theory				
Richard Firestone	NSF-chem				
Sydney Gales	NSF-exp				
Yoseo Iwasaki	NSF-exp				
C.M. Ko	NSF-theory	LBL, Berkeley, CA			
Esko Liukkonen	U. of Jyvaskyla				
Raymond Mackintosh	NSF-exp				
Robert Manweiler	NSF-theory	U. of Louvain, Belgium			
Claude Pirart	U. of Louvain				
David Weber	NSF-exp				
Lawrence Young	NSF-exp	J.P.L., Pasadena, CA			
Bogusław Zwięgliński	NSF-exp	Inst. for Nucl. Res., Warsaw			

* Visiting
** Adjunct

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