

INTRODUCTION

April 1, 2001 - March 31, 2002

This volume presents a summary of progress in research and operations at the Texas A&M Cyclotron Institute for the period 1 April 2001 - 31 March 2002. Reports on individual research projects are presented in Sections I-IV. Operation and development activities are reviewed in Section V. The last two sections summarize publications and oral presentations and present additional information on the personnel and activities of the Institute during the report period. *Some of the results and conclusions presented in this report are based upon preliminary analyses of data. Until this research is published, these results and conclusions should not be cited without express consent of the investigators involved.*

The period covered by this report was a particularly fruitful one for all of the Institute research programs as evidenced by the reports herein. A few of the noteworthy recent achievements include:

1. Experimental and theoretical studies expanding the applicability of the Asymptotic Normalization Coefficient technique to new problems of great interest in nuclear astrophysics.
2. The super-allowed beta decay group's measurement of the half-life of ^{34}Cl , obtaining a precision of 0.03%, a factor of two improvement over any previous measurement.
3. The collection and analysis of extensive data on giant resonances with a much improved defining slit system that significantly reduces slit scattering in heavy nuclei and

allows measurements of larger angles with the spectrometer at 0° .

4. The analysis of nuclear caloric curve data to determine the critical temperature of infinite nuclear matter.
5. A study of neutron-rich isotope production in deep-inelastic reactions between heavy nuclei around the Fermi energy using the MARS recoil spectrometer to measure the fragment distributions near the grazing angle.
6. Systematic investigations of electron capture and electron loss cross sections carried out by the Atomic Physics Group.
7. Precise studies of fission potential energy surfaces using measurements of fragment asymmetry associated gamma and neutron multiplicities.
8. Extensive theoretical investigations of beta decay, collective nuclear dynamics, hot nuclei and relativistic collisions.
9. The almost completed installation of the University of Michigan BigSol 7 Tesla Superconducting Solenoid for use as a spectrometer and for rare beam production.

As in the past, a number of Institute personnel are also involved in preparation and execution of experimental programs at other national and international facilities. At TRIUMF collaborative measurements of the Michel parameter in normal : decay (the TWIST collaboration) and of half lives and branching ratios for super-allowed beta emitters in $A > 60$ nuclei (the E-823 collaboration) continue. Mass measurements using the

Canadian Penning Ion Trap at Argonne have been initiated. At RHIC local efforts in both the BRAHMS Collaboration and the STAR Collaboration continued during the year. Institute scientists collaborated in the first measurements of multiplicity distributions over a wide rapidity region at $\sqrt{s_{NN}} = 200$ GeV. Work on the construction of parts for the EMC end cap for the spin physics program with STAR has progressed.

The major applications utilization of the facility continues to be the use of the K500 beams to simulate cosmic radiation effects for single event upset testing. A variety of government and industrial users now employ approximately 20% of the scheduled beam time for this purpose.

In this report period, three of our graduate students completed their theses and received their degrees from Texas A&M University. They are A. Makeev, A. Ruangma and X. Tang.

Finally, I wish to express my sincere gratitude to Cathy Heaslet and Y. -W. Lui for their invaluable efforts in the preparation of this report.

IN MEMORIAM

On September 11, 2001 one of our former students, Lee Adler, died in the terrorist attack on the World Trade Center. Lee, who received his Ph.D. in Nuclear Chemistry in 1984, was a cheerful, outgoing and energetic individual. He is missed. He leaves behind his wife, Alice, who is a former member of the Institute staff, and his young daughter, Lauren.

We share in their loss and their grief.

J. B. Natowitz
September, 2002