INTRODUCTION

1 April 1998 - 31 March 1999

This volume presents a summary of progress in research and operations at the Texas A&M Cyclotron Institute for the period 1 April 1998 through 31 March 1999. Reports on individual research projects are presented in Sections I through 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.

We are very happy to note that, in this report period, six of our graduate students, Sviatoslav Bouttchenko, Wai-shing Chung, Eric Hawker, Alexei Kolomiets, Guang Song and Youxiong Zhao graduated, and that Ruben Alfaro, who did his thesis experiment here in the Institute, received his degree from the National Autonomous University in Mexico City. We are also particularly proud that Eric Hawker received the 1999 APS Nuclear Physics Thesis Award at the APS Centennial Meeting in Atlanta, Georgia.

In September 1998, the Institute's continuation proposal to DOE was reviewed by a DOE appointed committee. The program received a strong review. As a result, a new three-year funding grant was approved and became effective 1 January 1999.

During the past year, a committee led by John Hardy held weekly meetings to discuss possible future directions for this facility. A number of invited experts participated in these discussions. In May we held a small workshop involving Institute staff and a dozen invited colleagues to consider both new technical capabilities and promising research directions for the Institute. These meetings have been extremely useful. Internal working groups are now focusing on the development of a specific plan for upgrades which should assure that the Institute maintains high quality competitive research capabilities well into the future.

A number of interesting new results have been obtained this year. The asymptotic normalization coefficient (ANC) and thus the $S_{17}(0)$ factor for the $^{7}Be(p,\gamma)^{8}B$ reaction has been determined. This was done by studying the proton transfer reactions $^{14}N(^{7}Be,^{8}B)^{13}C$ and $^{10}B(^{7}Be,^{8}B)^{9}Be$. Giant resonances have been studied in several nuclei and the splitting of the GMR and GQR in ^{154}Sm has been observed. Experiments to measure superallowed $0^{+}\rightarrow 0^{+}$ nuclear beta decay and specifically chosen to test the Coulomb correction of the weak vector coupling constant G_{v} have been initiated with the newly commissioned tape-transport system together with MARS. Isospin dependent product yields have been used to probe the degree of equilibration in heavy ion reactions. The development and application a self consistent coalescence analysis has provided a measure of the breakup density in multifragmentation. Neutron and gamma ray emission measurements have been used to study multimodal fission and fission dynamics.

The broad range of theoretical studies has continued. Institute theorists and their visiting collaborators have provided microscopic descriptions of Giant Resonance excitation, have used an isospin dependent transport model to understand elliptic flow at intermediate and relativistic energies and have explored in medium effects and possible QGP signatures at high energy densities.

Atomic physics measurements of inner shell vacancy production and the systematics of L x-ray spectra have been carried out.

The major research instrumentation development has centered about the assembly and testing of the NIMROD 4π charged particle and neutron detector for reaction dynamics studies. Although we encountered some procurement and quality control problems with several vendors this project is now near completion. The new neutron detector has been completed and tested in beam. Representative samples of each element of the charged particle array have been tested in beam and the final assembly of the entire array is in progress. Commissioning tests are scheduled in June and July and the first experiments are scheduled in August

As in the past, Institute scientists continue to collaborate in experiments at other facilities which have different or complementary capabilities. These include measurements of the anti-quark composition of the nucleon at Fermilab, Michel parameter determinations and pure Fermi decay studies at TRIUMF, pion and proton induced multifragmentation experiments at the AGS, reaction dynamics studies at RIKEN, commissioning tests of the Canadian Penning Ion trap at Argonne, HBT experiments at CERN and implementation of the BRAHMS experiment at RHIC.

In this year the accelerator group has made a very successful push to higher extracted beam intensities achieving extraction efficiencies as high as 92%. Higher extraction efficiencies have allowed us to run higher intensity beams with less risk to the deflectors. Two other important development activities for the accelerator have been pursued during the report period. The first was the creation of the software and assembly of the hardware for a new control system. This system should be completed and fully implemented by the end of this year. The second was the design of a new, higher field, multi-mode ECR source. We are currently awaiting the delivery of the permanent magnets for this source. Installation and first operation is planned for September.

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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.

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