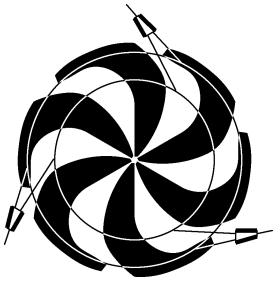
TRIUMF



ANNUAL REPORT
SCIENTIFIC ACTIVITIES
2002

ISSN 1492-417X

CANADA'S NATIONAL LABORATORY
FOR PARTICLE AND NUCLEAR PHYSICS

OPERATED AS A JOINT VENTURE

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UNDER A CONTRIBUTION FROM THE
NATIONAL RESEARCH COUNCIL OF CANADA

DECEMBER 2003

The contributions on individual experiments in this report are outlines intended to demonstrate the extent of scientific activity at TRIUMF during the past year. The outlines are not publications and often contain preliminary results not intended, or not yet ready, for publication. Material from these reports should not be reproduced or quoted without permission from the authors.

INTRODUCTION

For several years the central theme for TRIUMF development has been the ISAC facilities. Major milestones for these facilities were successfully met during the year.

The first significant nuclear physics results from the DRAGON experiment were published as a Physics Review Letter. These results tied down the production rates of ^{22}Na from stellar hydrogen burning of the radioactive nucleus ^{21}Na. They are of great interest as ^{22}Na is a gamma-ray marker for novae that the satellite INTEGRAL is searching for. This gamma-ray satellite was launched by the European Space Agency in 2002 with a mission to search for radioactive species in different stellar environments.

Various other experiments at ISAC are producing interesting and exciting results as new facilities come on line, such as the radioactive spin polarization system and the 8π gamma-ray spectrometer.

TRIUMF's next challenge is to build the ISAC-II accelerator and construct new experimental equipment required to exploit the scientific opportunities presented by ISAC-II. During the year the ISAC-II building was substantially completed and much detailed design of the superconducting accelerator cavities was undertaken. Scientifically and technically, ISAC is evolving into the premier world facility for science involving radioactive beams. TRIUMF and several Canadian universities are appointing an increasing number of young scientists specifically to work with the ISAC facilities.

TRIUMF's other scientific programs are proceeding vigorously. The μSR program is attracting an increasing number of users from within Canada and around the world. New Canadian university faculty appointments are being made to exploit the fast-developing and intriguing science of μSR. The unique sensitivity of TRIUMF's μSR program to the internal force fields of materials is attracting the attention of materials scientists worldwide.

The life sciences program continues to make an important impact towards the scientific reputation of the laboratory.

The TWIST experiment aims to measure with unprecedented accuracy the decay characteristics of the muon. The first extensive experimental data collection run for TWIST occurred during the year and the success of this run demonstrated very clearly that the TWIST experiment has the potential to fulfill all its ambitious aims.

Central to the internal activities of the laboratory, the 500 MeV cyclotron continues to function well. This success is due to the dedication of the machine staff who are always ready to give that extra effort when called upon.

TRIUMF is a national facility and has as its goal the support of the entire Canadian particle and nuclear physics community. Facilities are provided at TRIUMF but TRIUMF also provides scientific and engineering support to mount front-line experiments at other international laboratories. Over the last few years a large part of this work has revolved around the specialized equipment being built by TRIUMF and Canadian industry as Canada's contribution to the LHC at CERN as well as vital contributions of equipment and expertise to the ATLAS detector, which will form part of the LHC experimental facility. Many of the milestones for this work have been successfully passed; Canada, through TRIUMF, has established a reputation in the internationl community for excellence in design, construction, and delivery of advanced technology, on time and on budget.

TRIUMF's outreach program involves both technology transfer and education outreach. Technology transfer has many facets. One highlight is the collaboration between TRIUMF and MDS Nordion which continues to be the best known of TRIUMF's successful technology transfers to Canadian industry. During the year MDS Nordion installed a third cyclotron at TRIUMF to produce more radioisotopes for medical therapy and diagnostic purposes. Because the demand for such isotopes is rapidly growing (currently enough isotopes are produced at the TRIUMF/MDS Nordion site for over 2 million medical procedures per year), this third cyclotron will only just meet the demand.

It is important that Canadians be aware of and understand TRIUMF's mission. For many years TRIUMF has had a successful program in this area. This year a new outreach program was started specially aimed at schoolteachers. The idea is to provide teachers interaction opportunities with TRIUMF staff and involvement in experimental programs to both inspire and inform them about advanced technical and scientific technology, methods and procedures. Teachers are then able to take this information and their experiences back to their students.

A major activity during the year was the preparation of groundwork for TRIUMF's 2005–2010 Five-Year Plan. A series of workshops was held where different sections of the Canadian physics community were able to express their vision for the future. All these opinions were discussed in a town meeting at TRIUMF in September. From this meeting, a planning group was set up to take forward the ideas and construct a coherent and comprehensive plan for presentation in 2003.

In a laboratory the size of TRIUMF, staff undertake many different tasks; some jobs are highly visible, but many others, although essential, are less visible at first glance. Having now spent two years at TRIUMF, I have a greater insight into the many valuable contributions people make. I am impressed by the commitment and dedication of all staff members to TRIUMF's mission.

It has been a busy and exciting year at TRIUMF in terms of scientific output, interactions with society, and in establishing the foundation that will take TRIUMF, as a world-class laboratory, to 2010 and beyond.

A. Shotter,
Director