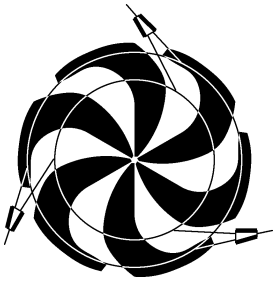
# TRIUMF



# ANNUAL REPORT
# SCIENTIFIC ACTIVITIES
# 1998

CANADA'S NATIONAL MESON FACILITY
OPERATED AS A JOINT VENTURE BY:

MEMBERS:

UNIVERSITY OF ALBERTA
SIMON FRASER UNIVERSITY
UNIVERSITY OF VICTORIA
UNIVERSITY OF BRITISH COLUMBIA

ASSOCIATE MEMBERS:

UNIVERSITY OF MANITOBA
UNIVERSITÉ DE MONTRÉAL
UNIVERSITY OF TORONTO
UNIVERSITY OF REGINA
CARLETON UNIVERSITY
QUEEN'S UNIVERSITY

UNDER A CONTRIBUTION FROM THE
NATIONAL RESEARCH COUNCIL OF CANADA

APRIL 1999

*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.*

# TECHNOLOGY TRANSFER DIVISION

## INTRODUCTION

Technology Transfer is the TRIUMF division responsible for the commercial interactions of the laboratory. It is comprised of a small group dedicated to ongoing technology transfer, plus the Applied Technology group that is responsible for the operations of the on-site commercial cyclotrons on behalf of MDS Nordion.

## TECHNOLOGY TRANSFER

The mandate of the Division is the pursuit of all financially and technically viable opportunities for commercializing the technologies evolving from research at TRIUMF, in any appropriate manner that will enhance the Canadian economy.

The current Contribution Agreement between the National Research Council (NRC) and TRIUMF includes the requirement for TRIUMF to enhance its impact on the economies of western Canada. Specifically, there is an emphasis on providing benefits to small and medium-sized businesses in the western provinces, both through the TRIUMF purchasing practices, and through the transfer of technical knowledge and skills. The NRC has commissioned both Western Economic Diversification (WED) and the Industrial Research Assistance Program (IRAP) to provide assistance in this effort.

As the arm of TRIUMF responsible for this activity, the objectives of the Division are:

1. To transfer TRIUMF technical knowledge and skills to the Canadian economy, in particular the western Canadian economy; and

2. To generate income for TRIUMF, for further research and development.

The crucial first step to commercializing new or innovative technologies from a research laboratory is to generate disclosures of such innovations. To this end, 18 potentially commercial disclosures have been documented this past year, and 5 of those have been funded by TRIUMF for further development.

In keeping with the focus on western Canadian small to medium-sized businesses, TRIUMF has, with the help of WED, organized 4 industry supplier shows in each of the western provinces this past year. The purpose of these shows was to acquaint industry representatives with TRIUMF's activities, to present procurement opportunities, and to establish contacts.

Our contract administrator is also ensuring that there is a conscious effort made to attract bids from as many eligible western Canadian companies as is reasonably possible. To date, the results of this effort have shown a steadily increasing success.

TRIUMF's strength lies in the unique aspects of the facilities, combined with the scientific excellence of the staff and the research conducted here. The Division has established a network of contacts with many commercialization offices and facilities throughout North America and the world, and constantly utilizes those contacts in its own activities. The Division is also responsible for patent protection at TRIUMF, but it must be noted that although it can be important in identifying a novel technology, at this level of scientific discovery, merely patenting cannot be relied on as a long-term shield from competitive alternatives.

New technology such as that emanating from TRIUMF is, by definition, a high-risk venture. Although projects may appear to have promising potential, from experience it can be predicted that not all of them will actually fulfil expectations. The Division always takes a conservative approach in projecting current opportunities into future commercial activities.

## APPLIED TECHNOLOGY GROUP

### 500 MeV Isotope Production Facility

During this year the 500 MeV irradiation facility received 119 mAh. Eight Mo targets were irradiated to produce $^{82}$Sr/$^{82}$Rb for MDS Nordion. In collaboration with LAMPF, we also irradiated a KCl target to produce $^{32}$Si. This target was shipped to LAMPF for chemical processing.

### CP42 Facility

The total beam delivery for this year was 0.61 Ah. The weekly beam delivery graph is shown in Fig. 165, the (quarterly) time evolution of the beam delivery is displayed in Fig. 166, and the downtime and maintenance statistics are analyzed in Fig. 167 and compared with the TR30.

The main power transformer of the rf anode power supply shorted out and had to be repaired. Several other high voltage components were also broken as a consequence of a major spark that went through the system. As a result, the CP42 was down for 3 weeks in August/September.

Work is proceeding on the upgrade to the CP42 control system and replacement of the power supplies. The new main magnet and ion source supplies had arrived on-site by year end. Installation will proceed in early 1999.

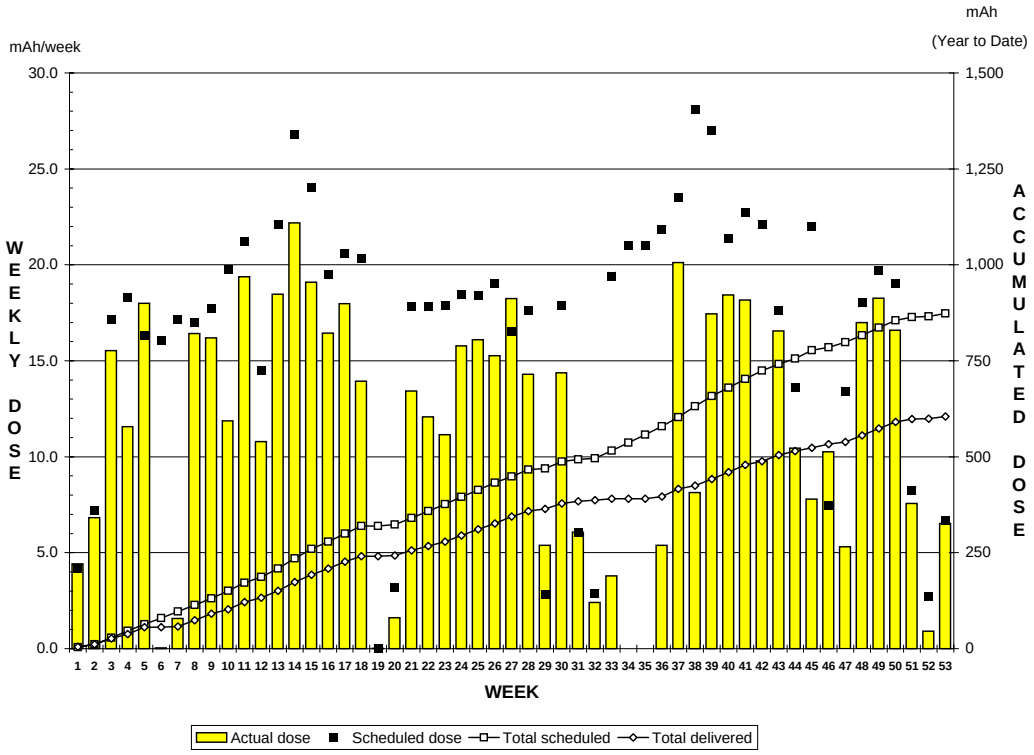



Fig. 165. Weekly beam delivery for the CP42.

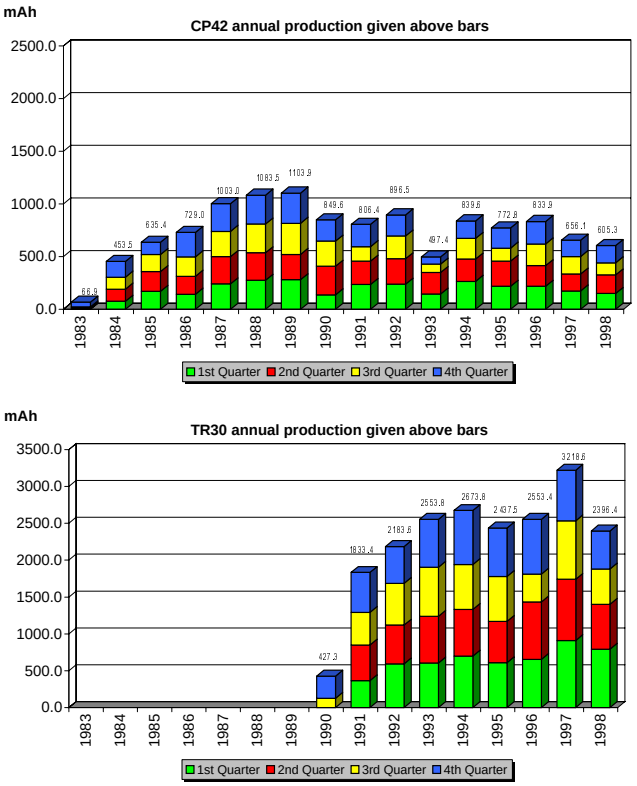



Fig. 166. Quarterly time evolution of the beam delivery for the CP42 (top) and TR30 (bottom).

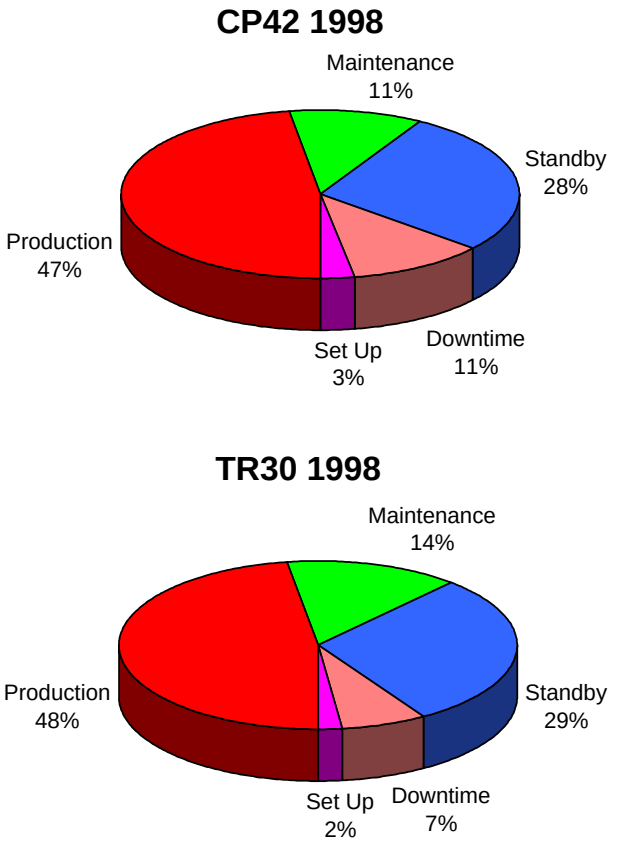



Fig. 167. Breakdown of downtime and maintenance for the CP42 (top) and TR30 (bottom) during operational hours.

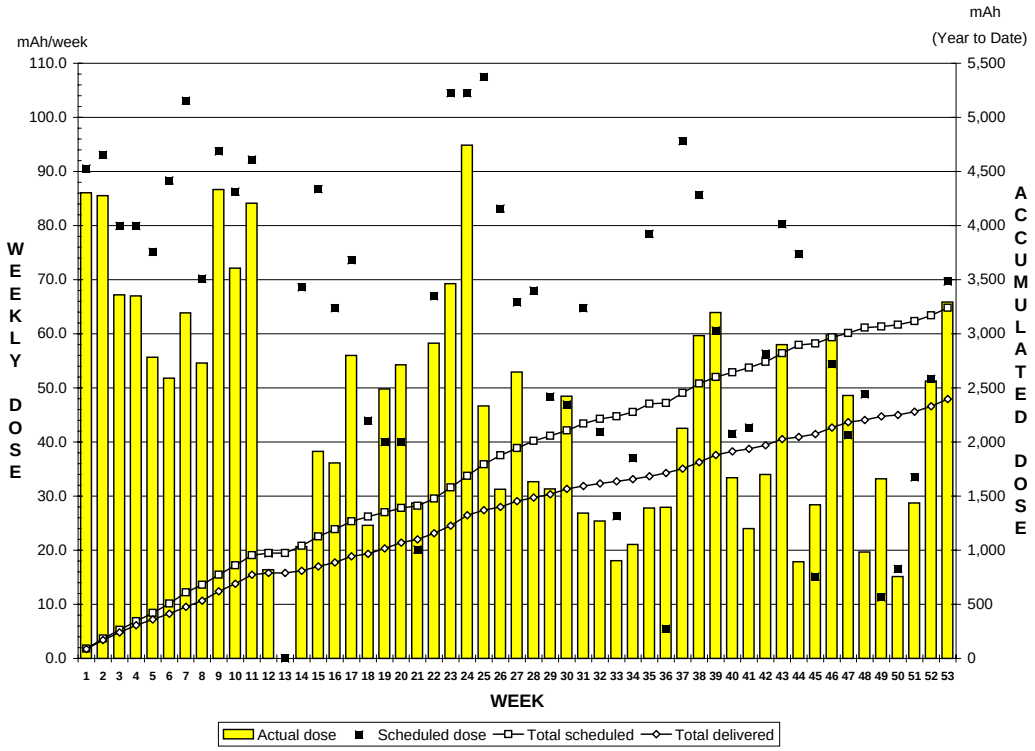



Fig. 168. Weekly beam delivery for the TR30.

### TR30 Facility

The total beam delivery for this year was 2.40 Ah. The weekly beam delivery graph is shown in Fig. 168, the (quarterly) time evolution of the beam delivery is displayed in Fig. 166, and the downtime and maintenance statistics are analyzed in Fig. 167 and compared with the CP42.

The TR30 cooling tower was replaced with a compressor-based chiller system. This has improved the beam stability (which is water temperature dependent) and the ability of the TR30 to run at full power even on very hot days.

### ATG Research Projects

During 1998 ATG members were actively involved with organizing workshops and conferences. These activities included organizing the Second Workshop on Accelerator Operations (WAO98) at UBC. This workshop attracted over 140 operations personnel from research and commercial accelerators all over the world. ATG personnel presented two oral papers and a poster paper in addition to chairing the workshop. ATG personnel also organized the Sixth Canadian Isotope Symposium at the University of Ottawa.

The ATG made extensive improvements to the design of the solid target systems that includes a dynamic braking system, magnetic orientation of the targets, and a positive locking mechanism for holding the targets in the shuttles during transportation within the pneumatic system. Another project involved evaluating potential improvements to the TR30 ion source and injection system by experimenting on the centre region cyclotron. These two major projects each employed a co-op student resulting in useful technical reports.

## RADIOISOTOPE PROCESSING (MDS NORDION)

During 1998, MDS Nordion shipped large quantities of short-lived medical isotopes produced using the TR30 and CP42 cyclotrons. The main contributors to sales were iodine-123 and thallium-201, used around the world for nuclear medicine studies.

The TRIUMF cyclotron was used to produce large-scale batches of strontium-82 whose daughter product, rubidium-82, is used in PET studies. As well, work continued on the development of new isotopes and applications in cooperation with TRIUMF.

A TRIUMF-led project to upgrade Nordion's CP42 cyclotron was approved and work started during the year. The Atomic Energy Control Board approved a licence amendment to allow sustained high current irradiations. The TR30 remains the most powerful isotope production cyclotron in the world.