TRIUMF NEWSLETTER
News from Canada's National Laboratory for Particle and Nuclear Physics

TRIUMF AND UBC HONOURED AT CECR CELEBRATIONS

TRIUMF, its new non-profit affiliate Advanced Applied Physics Solutions (AAPS), and UBC were honoured at a ceremony March 11 for their success in the Centres of Excellence for Commercialization and Research (CECR) competition in the Networks of Centres of Excellence programme (NCE). On hand were (from left): Ann Fong (AAPS); Jean Saint-Vil (CECR); Ed Odishaw (AAPS Chair); Jean-Claude Gavrel (NCE); Suzanne Fortier (NSERC president); Jean-Michel Poutissou (TRIUMF); Nigel Lockyer (TRIUMF Director); Pierre Chartrand (CIHR president); Phil Gardner (AAPS CEO); Wayne Swim (AAPS); and Doug Bryman (UBC).

A VISION FOR 2010-2015: TRIUMF CRAFTS ITS FUTURE

The majority of TRIUMF's operations are supported in five-year cycles via a contribution through the National Research Council. The present plan directs TRIUMF's operations until 2010. Together with the scientific community, TRIUMF is preparing its next five-year plan through a public and transparent process. The process promises to focus the plan on key initiatives that exploit TRIUMF's strengths and deliver great value to Canada.

The planning process started in 2007 with a meeting of the TRIUMF Users' Group where many potential future options for TRIUMF were discussed. Since then, one-page folios were prepared for every potential activity, including science justification, estimates of the resources required, and analysis of the scientific and broader impacts for Canada. TRIUMF's external Policy and Planning Advisory Committee offered guidance about the relative priorities. This preliminary analysis was in turn examined by an internal TRIUMF committee and by the TRIUMF Users Group as well as several external groups of experts. All of these reports are published on the TRIUMF website at http://admin.triumf.ca/facility/5yp/overview.php.

Combining all of this input and analysis is no easy task. The full draft of the five-year plan will be available in early summer 2008. The written report will be quite long and it will be structured so that the first few chapters will be publishable as a stand-alone document for a much broader audience. The chief elements of the plan will expand and enhance TRIUMF's rare-isotope beam program with a new beam line for actinide targets, a complementary driver based on a superconducting electron linear accelerator with photofission capabilities, and a transformation of the laboratory's nascent program in nuclear medicine. The vision is ambitious but within reach if we fully exploit the present moment.• *T.I. Meyer*

IN BRIEF

- *TRIUMF is developing its next five-year vision*
- *This vision builds on TRIUMF's superb international scientific reputation*
- *It proposes to catapult TRIUMF to the next level of performance and impact*

WHAT'S INSIDE

Research Developments 2
FEBIAD
Outreach Update
Facility Developments 3
TITAN
Back Page 4
40 Years On
Upcoming Dates
Contact Information

RESEARCH DEVELOPMENTS

MULTI-STAGE COMMISSIONING YIELDS NEW EXOTIC-ION SOURCE

TRIUMF's ISAC facility (Isotope Separator and Accelerator) creates many types of exotic short-lived atoms by shattering heavy elements with a high-energy proton beam. These atoms must be charged by stripping off electrons ("ionization") before being manipulated in the separator, which filters out a particular ion for delivery to an experiment. Different atoms require different electron-stripping energies, necessitating various "ion sources" to create all the exotic atoms demanded by experimenters. TRIUMF recently commissioned a new type of ion source which will add greatly to the menu of exotic atoms available to ISAC scientists.

IN BRIEF

- *Exotic atoms produced at ISAC must be ionized to be manipulated*
- *Different groups of atoms require different ionization techniques*
- *The new FEBIAD ion source greatly increases exotic atoms available at ISAC*

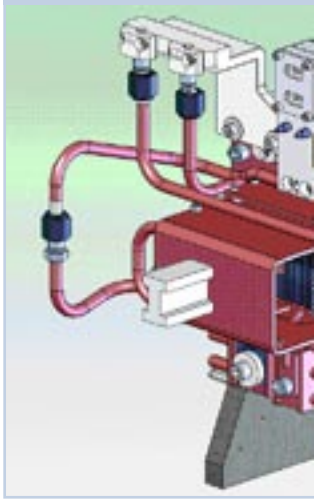
The existing surface and laser ion sources are not suitable to ionize elements having a large electron ionization potential (> 5 eV), but sources relying on electron bombardment are up to the task. Consequently, TRIUMF is developing a Forced Electron Beam Induced Arc Discharge (FEBIAD) source. The near-term physics motivation is the production of the fluorine and neon isotopes necessary for the study of important nuclear astrophysics reactions.

The FEBIAD is a very compact design combining aspects of previous types developed at GSI and CERN in Europe, which can be housed in the existing space at ISAC. The biggest challenge in designing ion sources for ISAC is the extremely high radiation field at the target, making it very difficult to predict the behaviour of insulator materials. For this reason a series of prototypes were built for online testing.

In November 2006 the first prototype composite titanium-carbide/graphite (TiC) target was installed. The main goal was to test the behaviour of the FEBIAD source under real conditions, so the TiC target was operated at its maximum proton beam intensity, 70 μA. Several isotopes from ^{6}He to ^{45}Ar were produced. From this test a quick degradation of one of the boron nitrite (BN) insulators was noticed, so a modification was made and a second prototype was tested on-line in June 2007 using a high-power composite silicon-carbide/graphite (SiC) target operated at maximum intensity. Even though the BN insulator performed better, the ionization efficiency decreased with time due to insufficient cooling of the magnets which caused the axial field to degrade.

The last prototype incorporated a radiation-resistant electromagnet, a solid tantalum grid to replace the tungsten wires and a water-cooled heat shield protecting the BN insulators. The grid used 1mm tantalum foil, with computer-controlled machined slots, resulting in a grid transparency of 75%. A thick steel plate directly attached to a water-cooled copper plate acted as a heat shield between the high power

Schematic drawing show the FEBIAD ion source. T the left hand side.

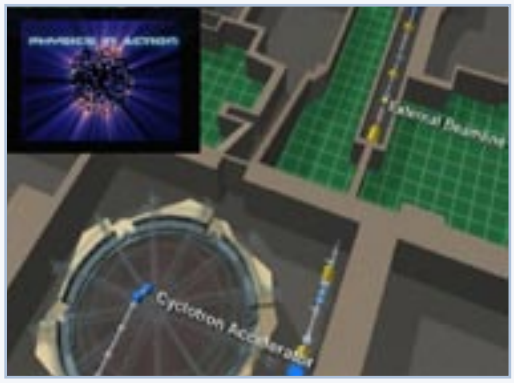


target and the FEBIAD conducted another in November 2007. The now produced almost 60 second, with good beam TUDA experiment. The ^{8}He for the high-accura with the new TITAN successes, and further ref source soon will be ISAC's arsenal of ion s range and intensities of for experimental users.•

1 R. Kirchner and E. Roeckl (1976) 187-204.

2 S. Sundell et al., Nucl. I Research B70 (1992) 160-

TRIUMF PROVIDES HIGH SCHOOL STUDENTS A NEW PERSPECTIVE ON PHY



The TRIUMF Outreach program is proud to release the second installment of its high school educational video series, dubbed "Physics in Action". The video series aims to show how various aspects of TRIUMF's experimental and technical program are related to the high school physics curriculum. The first video was released a few years ago and covered special relativity for Grade 11 physics students. The latest release is designed for Grade 12 students, where it uses different stages of TRIUMF's particle accel clear and simple explan magnetism, potential a classical mechanics and use of six animated/live-a TRIUMF is ready to distr high schools in Canada th can request a copy via the http://www.triumf.info/ph small-format flash versio can be previewed.•

TITAN COMPLETES MEASUREMENTS OF EXOTIC ATOM MASSES

The TITAN (TRIUMF's Ion Trap for Atomic and Nuclear science) is a multi-purpose, multi-component apparatus carrying out precision experiments on the most exotic isotopes available at TRIUMF's ISAC facility. It is designed to measure the masses of rare ions with half-lives as short as a few milliseconds to unprecedented accuracy and precision by quickly trapping them in a magnetic and electric field. The experiments in the TITAN program are presently finishing their first campaign of mass measurements on so-called "halo" nuclei, yielding important new results for this burgeoning field of nuclear physics.

Halo nuclei are very unusual forms of atoms which consist of very weakly bound neutrons or protons (generically called nucleons) in classically-forbidden orbits around the nuclear core. Halo investigations are of world-wide interest since these are ideally suited to test modern nuclear theory concepts such as new nucleon-nucleon interactions, or three-body interactions. A key requirement for those tests is experimental information of the nuclear size and the binding strength of the extra (one, two, or four) neutrons. The determination of the size (charge radius) and the neutron-binding demands high-quality measurements of the actual mass of the halo nucleus. In the past this was difficult due to the fact that these halo nuclei are produced in small quantities and are very short-lived (i.e. milliseconds).

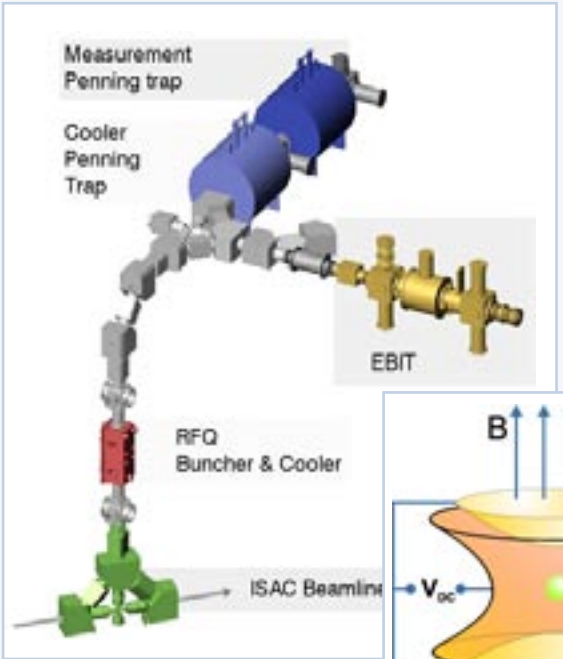
In a testament to TITAN's quality, already in the first series of experiments prior limitations on halo-nuclei mass measurements were overcome, enabling high quality mass measurements of the one, two, and four neutron halo nuclei ^{11}Be, ^{11}Li, and ^{8}He. The ^{8}He result changed the previous world average by over two standard deviations, while improving the precision by a factor 20, which had a significant impact on its charge radius determination by the Argonne group. For ^{11}Be, TITAN improved the precision by almost 2 orders of magnitude (in only 5 hours of beam time). The ^{11}Li mass measurement resolved an outstanding discrepancy between previous measurements, resulting in a reliable value for the final charge radius determination undertaken by an experiment that took place at ISAC a few years back by the GSI collaboration. The mass measurement was remarkable in itself, since it represented the shortest-lived isotope (half-life ~8.8 ms) ever measured in a Penning trap by almost a factor of 10.

With the first series of experiments the TITAN collaboration was able to achieve high-impact experimental results and break records for the lightest and shortest-lived isotopes ever measured in a Penning trap. The Halo-nuclei program will continue with neutron- and proton-halos, while later this year the first measurements on highly-charged ions from the TITAN Electron Beam Ion Trap (EBIT) are scheduled. •

J. Dilling

IN BRIEF

- *TITAN traps atoms in a magnetic and electric field called a Penning trap*
- *TITAN weighs exotic short-lived atoms living only a few milliseconds*
- *The first results have already advanced the field of "halo" nuclei*



Schematic view of the TITAN exotic-atom trap system. The EBIT portion of the system will becommissioned later this year.

Cartoon view of the electric and magnetic fields used to create a Penning Trap.

wing a section view of The target is located on

ion source. Tests were high-power SiC target e FEBIAD ion source 0 million $^{18}F^{+}$ ions per quality delivered to the source also produced cy mass measurement facility. With theses finements, the FEBIAD fully integrated into sources, expanding the rare isotopes available

P. Bricault

l, Nucl. Instr. and Method 133

ntr. and Methods in Physics 164.

YSICS

erator to demonstrate nations of electricity, and kinetic energy, forces, through the action lesson modules. ribute the DVD to any at wants one. Teachers e TRIUMF website, at ysicsinaction, where ons of the video also

M. Pavan

FORTY YEARS ON - APRIL 1968: TRIUMF FUNDING APPROVED

It was on April 16, 1968 that approval of federal funding for the TRIUMF project was announced by the Hon. Jean-Luc Pepin, Minister of Energy, Mines and Resources - about $20 million over six years. Expectations had been rising through that winter as discussions in Ottawa appeared to progress favourably, and in January we were told unofficially by AECB (our funding agency) that the $1.3 million requested for the first year of construction was to be approved, and that we could go ahead and set up a Board of Management with members appointed by the four universities.

IN BRIEF

- *Federal funding for TRIUMF was approved April 16, 1968*
- *Buildings and equipment were supported by the founding universities*
- *Significant design progress was already being made prior to announcement.*

The Board first met on March 2nd, and among its 1st decisions were the appointment of a Director (John Warren), Associate Director (Erich Vogt) and Chief Engineer (Joop Burgerjon), and the establishment of an Operating Committee to meet once a month to represent the interests of the university users. As it was a time of economic downturn, and other projects were being cut back, we considered ourselves very fortunate to have succeeded within three years of the project's conception. Perhaps comparison with Chalk River's $150-million proposal for a 65-mA 1-GeV Intense Neutron Generator did no harm!

Funding for the buildings, however, was a local responsibility, and in face of the refusal of W.A.C. Bennett's provincial government to provide direct support, we were again fortunate in being able to persuade the three B.C. universities to allocate a significant fraction of their building funds - around $4 million – to TRIUMF. The University of Alberta contributed $1.25 million in experimental equipment.

Meanwhile, the detailed design was progressing: the latest magnet model had extended the stable orbit region up to 440 MeV; tracking showed that ions emerging from the spiral inflector over a wide range of initial energies could be steered into centred orbits; measurements on a ¼ scale model cavity provided important data on rf power loss; a model vacuum chamber was under construction; and the engineering consultants had provided draft design reports on the buildings and the magnet support structure. But the best news was undoubtedly the arrival of the first cheque! • *Mike Craddock*

Important Upcoming Dates

BOM	TRIUMF Board of Management Meeting	June 20	TRIUMF
IAEA	Exotic Beams Workshop TRIUMF	June 23-29	TRIUMF
WTTC	Targetry and Target Chemistry Workshop	July 21 - 25	Seattle, WA
TSI	TRIUMF Summer Institute	Aug 4-15	TRIUMF
	Open House	Sep 6	TRIUMF
6ISR	6th International Symposium on Radiohalogens	Sep 6-10	Whistler, BC
	International Peer Review Committee Meeting (5YP) TRIUMF	Sept 24-26	TRIUMF
LINAC08	XXIV International Linear Accelerator Conference	Sep 29-Oct 3	Victoria BC

TRIUMF is funded by a contribution through the National Research Council of Canada.

Operated as a joint venture by:
University of Alberta
University of British Columbia
Carleton University
Simon Fraser University
Université de Montréal
University of Toronto
University of Victoria

Associate Members:
University of Guelph
University of Manitoba
McMaster University
Queens University
University of Regina
Saint Mary's University

The province of British Columbia provides capital funding for the construction of buildings for the TRIUMF Laboratory.

Contact Information:

TRIUMF: 4004 Wesbrook Mall,
Vancouver, B.C.
Canada V6T 2A3

Telephone……604-222-1047
Fax……604-222-1074
Website……www.triumf.info

Director:	N. Lockyer	director@triumf.ca
Associate Director/Science:	J-M. Poutissou	sciencediv@triumf.ca
Engineering Division:	E. Blackmore	engineering@triumf.ca
Accelerator Division:	P. Schmor	acceldiv@triumf.ca
Technology Transfer:	P. Gardner	ttadmin@triumf.ca
Administration and HR:	J. Hanlon	admin@triumf.ca
Finance:	S. Reeve	finance@triumf.ca
Outreach/Communications:	M.M. Pavan	outreach@triumf.ca
Student Program:	D. Giasson	student@triumf.ca

TRIUMF Beam Schedule

The current TRIUMF beam schedule is available on the Web at:

http://www.triumf.info/facility/experimenters/

Users should subscribe to the automated update notification to receive notice of changes which may be required during the period already scheduled.

The TRIUMF Newsletter is published bi-annually, and is available online at: www.triumf.info/public/news/newsletters.php
If you wish to subscribe to this newsletter in electronic or printed form, please visit: http://www.triumf.info/subscriptions
Send any Newsletter queries or comments to: newsletter@triumf.ca

Design/layout by D. Giasson