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News about Chalk River's Tandem Accelerator Superconducting Cyclotron facility for users and potential users

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VAXstation now installed on 8π spectrometer

A VAXstation and several CAMAC controllers have now been installed to control and monitor electronics and data acquisition on the 8π spectrometer. The units have been made to work in parallel with the existing LSI 11/73 computer, enabling development work to proceed on the VAX without disrupting the LSI computer.

Programs and data files have been copied from the LSI to the VAXstation; modifications to run them on the VAX are expected to be completed in May.

TASCC staff win company awards

TASCC staff members Jim Forster and Helena Lindqvist were recently awarded AECL Research awards, consisting of a certificate and cash bonus.

Jim Forster won a Performance Award in



recognition of the initiative he showed in launching a significant, new CANDU-related study involving materials science. He spawned the idea of using TASCC beams and simulated reactor fuel to study the factors governing fission-product mobility in irradiated fuel. Just as

important, he was successful in convincing fuel materials scientists of the feasibility of such studies, and collaborated with them in initiating the studies.

Helena Lindqvist won a VIP Award, which recognizes high levels of performance over a sustained period of time. Her award is for administering cyclotron training for operators, shift supervisors and others. She gave theory lessons, individual



tutoring, extensive hands-on training and a thorough examination – and made it all fun for her “students”, whose varying levels of formal education and irregular schedules added to her challenges. The training program took 1-1/2 years to complete.

Facility report

Damage to a Tandem terminal steerer power supply caused by a vacuum leak early in the month prompted the advancement of a three-day general maintenance period by one week. A second tank opening was necessary to repair a broken resistor support. A cracked insulator on the cyclotron r.f. drive capacitor caused vacuum problems in the midplane, but a new insulator was installed within 20 hours.

Experiments performed this month included: measurement of level lifetimes in cerium; channeling studies on a high- T_c superconductor; tests of carbon foils; assessment of hafnium production; high-spin spectroscopy of lutetium; AMS measurements; a study of the forbidden beta-decay of calcium-38 and development of a new beam from the cyclotron.

Beams produced during March were:

Ion	Energy (MeV)
protons	30.5
^4He	7.6
^7Li	52, 56, 175
^{12}C	55-57
^{23}Na	125
^{27}Al	100
^{70}Ge	1575
^{127}I	64, 120

March experiments

Experiment	Measurement of lifetimes for superdeformed bands in cerium-131 and -132 by DSAM to determine the roles of intruder orbitals in fixing the deformation. Excellent data were collected for both 4n and 5n products in the reaction $^{110}\text{Pd}(^{26}\text{Mg}, \text{xn})^{131}\text{Ce}, ^{132}\text{Ce}$.
Researchers	S. Mullins and S. Flibotte (<i>McMaster University</i>); T.E. Drake, J. de Graaf and M. Cromaz (<i>U. of Toronto</i>); D. Ward, V.P. Janzen, A. Galindo-Uribarri and D.C. Radford (<i>TASCC</i>)
Beam	100 MeV ^{27}Al
Duration	4 days
Experiment	Continuation of channeling studies on the high- T_c superconductor Y Ba CuO along the $\langle 301 \rangle$ axis. A beamline vacuum problem led to failure of a Tandem terminal steerer which hindered studies of a film-type crystal of the same material.
Researchers	R.P. Sharma and J.A. Davies (<i>McMaster University</i>); J.S. Forster, G.C. Ball and J.S. Geiger (<i>TASCC</i>); N. Hecker and R. Haakenaasen (<i>Harvard University</i>)
Beam	7.6 MeV ^4He
Duration	3 days
Experiment	Development of a germanium-70 beam at 22.5 MeV per nucleon for the first time from the superconducting cyclotron. Up to 23 nA was extracted with an efficiency of 70%. This is beam #74 from the cyclotron.
Researchers	TASCC Beam Commissioning Team
Beam	22.5 MeV/u ^{70}Ge
Duration	5 days
Experiment	Tests of lifetimes of various carbon foils.
Researchers	H.R. Andrews, P. Dmytrenko and M. Moreau (<i>TASCC</i>)
Beam	120 MeV ^{127}I
Duration	1 day
Experiment	Assessment of the production of hafnium-170 and -172 with ISOL for laser experiments to be performed at McGill University.
Researchers	G. Savard, E. Hagberg, V.T. Koslowsky, J.C. Hardy and M.J. Watson (<i>TASCC</i>); J.I. Crawford (<i>McGill University Laser Group</i>)
Beam	52, 56 MeV ^7Li
Duration	1 day
Experiment	Study of the high-spin spectrum of lutetium-164 with the 8π spectrometer.
Researchers	D.M. Cullen, C.-H. Yu, X.H. Wang, R.W. Gray and M.J. Fitch (<i>University of Rochester</i>); S. Pilotte (<i>University of Ottawa</i>); L.-H. Yao and S. Mullins (<i>McMaster University</i>); D. Ward, V.P. Janzen, A. Galindo-Uribarri and D.C. Radford (<i>TASCC</i>)
Beam	125 MeV ^{23}Na
Duration	5 days
Experiment	Simulation of neutron radiolysis of water by irradiations with lithium ions.
Researchers	A.J. Elliot and D.C. Ouellette (<i>System Chemistry and Corrosion Branch, CRL</i>); V.T. Koslowsky (<i>TASCC</i>)
Beam	175 MeV ^7Li
Duration	1 day

TIME-OF-FLIGHT TECHNIQUES FOR AMS OF IODINE ISOTOPES

by V. T. Koslowsky, G. R. Mitchel and H.R. Andrews

The Chalk River AMS group is currently developing a system to measure iodine-129, a cosmogenic isotope and fission product with a half-life of 15.7 million years. This isotope is of interest as an environmental and hydrological tracer and is significant in long-term nuclear waste management.

After acceleration of an iodine beam with the TASC Tandem accelerator and mass-filtering by the high-energy beam-transport system and cross-field velocity filter, final identification of mass-129 is made by measuring particle time-of-flight (ToF) and total energy.

The ToF "start" signal is produced when a micro-channel-plate (MCP) assembly detects secondary electrons created as an energetic ion traverses a thin carbon foil. The MCP assembly incorporates a novel design that avoids the use of grids to accelerate secondary electrons. This increases transmission efficiency and eliminates energy degradation and scattering of ions.

The start detector has an efficiency of 100% for the detection of heavy ions but efforts to determine its time resolution were limited by the time response of the silicon-surface-barrier stop detector.

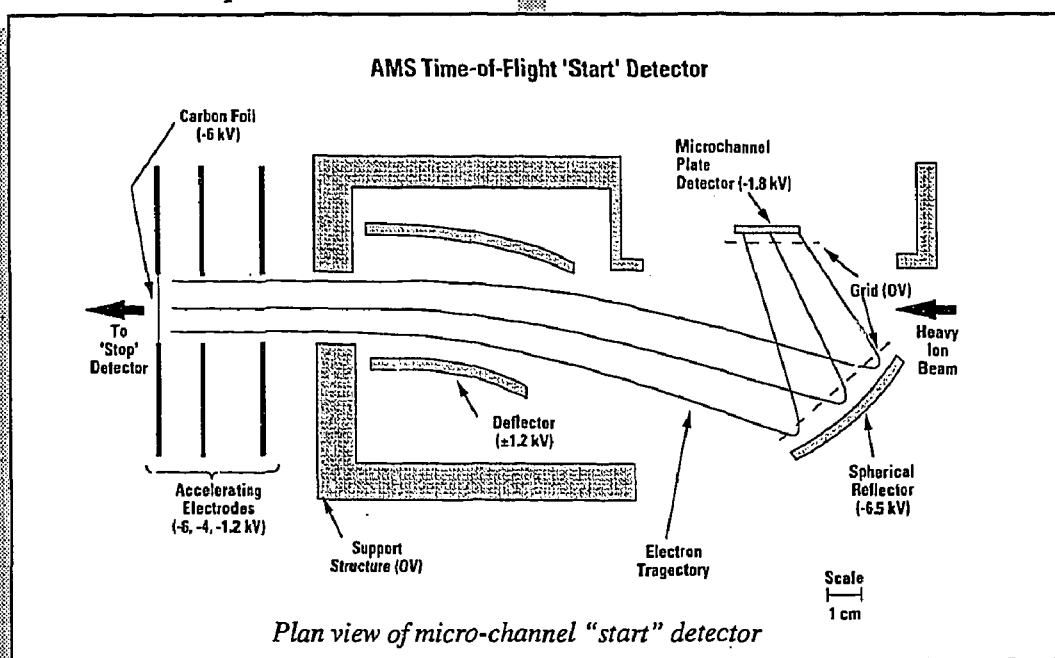
An alternative approach to determining the time resolution was tried, in which the TASC beam-pulsing system, normally intended for cyclotron injection, was used to produce a 50 nanoAmpere (electrical) bunched beam of iodine-127 at 111 MeV.

First, the beam pulse width was minimized by use of the facility beam pulse detector (BPD); at the minimum, a time waist of about 370 picoseconds (FWHM for a 250-micron radial portion of the beam) was measured.

Then, the beam was directed to the stop detector, having been attenuated after the high-energy buncher to about 50 000 particles per second. A timing resolution of about 250 picoseconds FWHM was observed against the r.f. clock.

Scanning of the beam across the sensitive area of the assembly resulted in centroid shifts of approximately ± 200 picoseconds, as expected, but the resolution remained unchanged.

The time separation between iodine-129 and -127 is about 8 nanoseconds, so the combined time resolution of the start and a comparable stop detector will be more than adequate for our AMS needs.



Experiment AMS timing tests of a transmission-type 'start' counter and measurements of the iodine-129 content in several samples.
Researchers H.R. Andrews, W.G. Davies, B.F. Greiner, Y. Imahori, V.T. Koslowsky, G.R. Mitchel and J.W. McKay (TASCC); R.J.J. Cornett, L.A. Chant, G.M. Milton and S. Kramer-Tremblay (Environmental Research Branch, CRL)
Beam 64 MeV ^{129}I
Duration 3 days

Experiment Study of the forbidden beta-decay of calcium-38 with ISOL: a search for optimum conditions.
Researchers G. Savard, E. Hagberg, V.T. Koslowsky and J.C. Hardy (TASCC)
Beams 30.5 MeV protons; 55-57 MeV ^{12}C
Duration 3 days

If you have a job without aggravations, you don't have a job.

MALCOLM FORBES

Next month

- Search for superdeformation in erbium-154 and europium-142
- High-spin spectroscopy of tin-112
- Measurement of forward elastic recoil
- Measurement of half-life of neon-19
- Intermediate mass fragment production
- CsI detector tests
- AMS measurements of Cl-36 content in samples

Facility operating record

Elapsed Time (Year-to-date)	2231 h
Beam Available	
Tandem Only	1281.4
Tandem + Cyclotron	188
Beam Development	384.9
Planned Shutdown	235
Forced Shutdown	141.7

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