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NEWSLETTER

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tascc

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

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Jim Geiger now Researcher Emeritus

After 38 years of service to AECL, the last eight as manager of TASCC's Nuclear Physics branch, Jim Geiger is retiring. Although officially retired, Jim will still be seen around TASCC; he has been appointed Researcher Emeritus. As such he will develop TASCC-based applied research programs and continue his participation in atomic physics experiments.

Jim's many contribution to physics include: basic nuclear-structure research using beta- and gamma-ray spectroscopic techniques; inertial-confinement fusion studies; laser isotopic separation; and, most recently, atomic physics with heavy-ion beams. He was also Nuclear Physics Coordinator for phase 1 of TASCC construction.

In 1976 and 1977, Jim was a visiting scientist at the University of Rochester, helping direct laser research; afterwards he continued as a consultant to the Canadian National Fusion Program.

He was elected a Fellow of the American Physical Society in 1985 for "his contributions to the understanding of weak interactions, and of nuclear and atomic spectroscopy through an



extraordinary variety of meticulous experiments."

A formal retirement dinner is being planned to commemorate Jim's retirement.

In keeping with AECL's streamlining policy, TASCC Director John Hardy has

Facility report

Experiments during July included: four 8π experiments, an RT2E feasibility study, β -decay studies, measurements of stripping-foil charge-states and cyclotron tests.

A short power outage July 23 briefly delayed beam development, with minimal effect on the schedule. A further outage occurred July 28, interrupting the beam for one hour.

The Tandem operated well throughout the month, including a period with terminal voltages up to 14.7 megavolts shortly after a tank opening during which two Ti-ball vacuum pumps were replaced.

Tests of the cyclotron main magnetic field and injection steerer magnets were made and a new cyclotron beam, bismuth-209 at 8 MeV per nucleon, was produced.

Beams produced during July were:

Ion	Energy (MeV)
^1H	7.5
^3He	16-48
^{23}Na	120
^{28}Si	125
^{32}S	145
^{36}S	160
^{40}Ca	168-170
^{48}Ti	864
^{79}Br	100
^{81}Br	1458
^{209}Bi	1129, 1327, 1672, 2090

assumed Jim's role as manager of Nuclear Physics Branch, in addition to his director's duties, with substantial assistance from five "function leaders" chosen from senior staff.

New coulomb excitation results reported

The 8π -spectrometer group has reported at a regular Tuesday TASCSC meeting the results of a new coulomb-excitation experiment done in July.

In the past, coulomb-excitation studies with the heaviest beams have used particle- γ coincidence techniques with thin target foils. In this way, Doppler broadening of the γ -ray lineshapes can be corrected.

In the recent experiment at TASCSC, the group bombarded a thick uranium target foil with a bismuth-209 beam in the 8π spectrometer and exploited the power of γ - γ coincidence techniques.

As expected, a much higher sensitivity was achieved than in any previous experiment for states with lifetimes longer than a few picoseconds, where Doppler broadening is not a problem. Surprisingly, states were seen up to spins as high as, or even higher than, previous studies in U-238, where lifetimes are appreciably less than a picosecond and lineshapes are very broad.

In the yrast band the group saw peaks to spin 30^+ , confirming earlier work by GSI, but in the $K=0^-$

octupole band it saw four cascades above the previous best result, to spin 31^- . In addition, six new bands were placed in U-238. Typically, these bands were seen up to spin ≈ 24 , with intensities of approximately 0.5–1% of the yrast band.

At the bombarding energies for this experiment (6.35 MeV per nucleon) reactions involving nucleon transfer with coulomb excitation were expected, and in fact the known yrast band in U-234 was seen. Its intensity was approximately 0.3% of the U-238 yrast band. Presumably U-236 was also present but its yrast band cascades are identical with those of U-238 within the resolution of germanium detectors.

TASCSC's David Ward, speaking on behalf of the 8π collaboration, says, "We are very encouraged by the results of this technique; it appears to be a promising new tool for spectroscopy and exploits unique features of TASCSC: namely, a powerful γ -ray spectrometer and the availability of the heaviest beams."

Randy Mcleod leaves

Physicist/computer-programmer Randy Mcleod left Nuclear Physics Branch this month to pursue his career with a private computer company in Ottawa.

Randy joined TASCSC in October 1990 after completing an M.Sc. at Queen's University, Kingston.



He played a major role in developing software for data acquisition, analysis and display of physics results from experiments at TASCSC. In particular, his work on the on-line analysis package OLGA, described in the 1993 September newsletter, is much appreciated by researchers. Randy was

also responsible for porting David Radford's Radware programs from VMS to UNIX.

Wayne Perry retires

Nuclear Physics technologist Wayne Perry retired from TASCSC this April. Wayne was an important member of the ISOL team for 20 years, having helped build and commission the instrument with John Hardy and Hermann Schmeing. Since then he has continued to be responsible for the smooth operation of ISOL.

"Wayne was reliability itself... and a pleasure to work with," recalls John Hardy.

Prior to joining the ISOL group, Wayne worked with R.L. (Bob) Graham on the beta-ray spectrometer, where he prepared sources, analyzed data and constructed and maintained electronic equipment.

In 1992 June, Wayne's work was interrupted by illness, but he returned to work in November of that year and continued part-time until his retirement.



July experiments

Experiment DSAM measurements of the deformed band in praseodymium-129 with the 8π spectrometer. A band was discovered in cerium-129 with characteristics similar to those of the enhanced deformation bands seen in heavier cerium isotopes. Observation of this band in a nucleus with $N < 72$ is at odds with theory.

Researchers A. Galindo-Uribarri, V.P. Janzen, D.C. Radford and D. Ward (*TASCC*); S.M. Mullins and S. Flibotte (*McMaster University*)

Beams 125 MeV ^{28}Si ; 145 MeV ^{32}S

Duration 4 days

Experiment 8π -spectrometer study of the giant-dipole resonance γ rays for two dissimilar reactions leading to samarium-140 to identify entrance-channel effects. Preliminary analysis indicates there is a clear difference in the γ -ray yields for the two reactions.

Researchers S. Flibotte, J. Rodriguez, S. Marshall and J. Jonkman (*McMaster University*); D. Ward, A. Galindo-Uribarri and V.P. Janzen (*TASCC*)

Beams 7.5 MeV protons; 160 MeV ^{36}S ; 168 and 170 MeV ^{40}Ca

Duration 7 days

Experiment Validation of consistency of the cyclotron main magnetic field over the previous two years by comparison of radial scans of 18 MeV-per-nucleon bromine-81; development of a new beam, bismuth-209 at 8 MeV per nucleon; confirmation of the ability of injection steerer magnets to inject bismuth-209 at 10 MeV per nucleon.

Researchers TASCC Beam Commissioning Team

Beams 18 MeV/A ^{81}Br ; 8 and 10 MeV/A ^{209}Bi

Duration 4 days

Experiment Assessment of feasibility of measuring two-electron excitation (RT2E) in titanium-48 charge-20 ions channeled along the $\langle 100 \rangle$ axis of a silicon crystal.

Researchers J.S. Forster, G.C. Ball and J.S. Geiger (*TASCC*)

Beam 18 MeV/A ^{48}Ti

Duration 1 day

Experiment High-spin study of tin-112 with the 8π spectrometer. The structure of the known intruder bands was extended to spin $30\hbar$.

Researchers J. DeGraaf, M. Cromaz and T.E. Drake (*University of Toronto*); S. Pilotte (*University of Ottawa*); V.P. Janzen (*TASCC*); G. Hackman (*McMaster University*)

Beam 120 MeV ^{23}Na

Duration 3 days

Experiment Study of charge-state distributions produced by composite stripping-foils.

Researchers H.R. Andrews, P. Dmytrenko and M. Moreau (*TASCC*)

Beam 100 MeV ^{79}Br

Duration 1 day

Experiment Study of decay of titanium-40 & -42 and nickel-54 & -55 with ISOL. Results indicate these short tests provided the most sensitive experimental data so far available for these nuclei; new decay branches were seen in some cases and some "known" ones were refuted.

Researchers E. Hagberg, G. Savard, V.T. Koslowsky and J.C. Hardy (*TASCC*); K.S. Sharma (*University of Manitoba*)

Beam 16-48 MeV ^3He

Duration 2 days

Experiment Measurement of coulomb-excitation (Coulex) spectra of uranium-238 excited by very heavy ions. (See item in this newsletter for details.)

Researchers D. Ward, H.R. Andrews, G.C. Ball and A. Galindo-Uribarri (*TASCC*); T.E. Drake and J. DeGraaf (*University of Toronto*); S. Pilotte (*University of Ottawa*)

Beams 5.4 and 6.35 MeV/A ^{209}Bi

Duration 6 days

"An expert is a person who chooses to be ignorant about many things so that he may know all about one."
SCHATTSCHEIDER, E.E., "The Semi-Sovereign People"

Next month

- AMS development of iodine-129 technology and measurement of chlorine-36 samples
- measurement of carbon-10 branching ratio
- tests of solar cell detectors
- spectroscopy of holmium-155

Facility operating record

Elapsed Time (Year-to-date) 5087 h

Beam Available	
Tandem Only	2655.6
Tandem + Cyclotron	421
Beam Development	1103.4
Planned Shutdown	609
Forced Shutdown	298

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