INIS-CA—0029

CA9700938

NEWSLETTER

tascc

1992 Vol. 6 No. 11

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

Printed 1992 Dec 18

Canadians at the EUROGAM spectrometer

Teams from TASCC and McMaster University pooled resources recently with a large international group led by researchers from Strasbourg, France, to perform a major experiment on the newly-completed EUROGAM spectrometer.

This Anglo-French instrument, located at NSF in Daresbury, England, is presently the world's most advanced gamma-ray spectrometer for the study of extreme nuclear states.

The November experiment was designed to have a fresh look at the special nucleus gadolinium-149 previously investigated with the 8π spectrometer at TASCC.

Gadolinium-149 provides the best example of superdeformation, in which a nucleus exists in a strongly-deformed shape for a relatively short time of about 10^{-12} seconds. The shape is similar to a football whose length is twice as long as its width.

Physicists studying the atomic nucleus, including David Ward and Gordon Ball who represented TASCC in the experiment, are greatly interested in this deformed state.

Ward and Ball report that these very successful early experiments have produced, for the first time, several billion events of four- and higher-dimensional gamma-ray coincidences at the resolution of germanium detectors. Data-tapes from the November run are now being analyzed at Strasbourg, McMaster University and at TASCC.

Although present-day computers are being pushed to their limits to analyze such data, first results show very clear confirmation of new superdeform-ed structures in gadolinium-149 which were first hinted at in 8π-spectrometer data at TASCC.

Facility report for November

Beams were provided this month for two 8π spectrometer experiments, an ISOL run, AMS measurements, RTE studies of superconductors and for development of new cyclotron beams.

These beams were produced:

Ion	*Energy MeV*
Protons	11
^{3}He	42
^{4}He	7.6 & 16
^{7}Li	210
^{14}N	420
^{18}O	94
^{28}Si	840
$^{35,36,37}Cl$	100
^{40}Ca	148-175
^{81}Br	1458
197Au	55

A strong wind-storm caused a five-hour power outage Friday the 13th, resulting in the loss of over 100 cylinders of helium gas from the cyclotron cryogenic system. Restoration of vacuum pumping of the cryostat insulation was delayed following the incident, causing the loss of cryostat vacuum, boiloff of the total cryostat volume of 630 litres of liquid helium and subsequent partial warmup of the main superconduct-ing magnet coils.

Measurements of the gas temperature surrounding the lower magnet coils indicated a maximum of 100 Kelvin was reached before cooldown could be initiated.

To determine if any movement of the coils had occurred, careful measurements were made of radial bracing-rod positions. No significant differences from previous normal values were noted.

The integrity of cyclotron systems was confirmed following the outage when three new beams were produced within 26 hours during the very next run.

The Tandem ran well throughout the month.

Cyclotron produces equivalent beams

Three new cyclotron beams were produced in a single run this month, withthe same injection and acceleration parameters. The beams were lithium-7, nitrogen-14 and silicon-28, each accelerated to 30 MeV per nucleon and developed within 26 hours of each other.

Development of these particular 'equivalent' beams was chosen because they all have the same charge-to-mass ratio, thus requiring the same Tandem voltage, beamline setup and only a very small change in cyclotron magnetic field.

During development, an equivalent beam can be used as an alternate when a particular isotope is not available, or is expensive.

As well, we can develop a beam having high current output, then switch to an equivalent beam having an output too low to be developed easily by usual methods.

Also, switchover between equivalent beams is quicker since only a few parameters need be changed.

For the first 55 beams extracted from the cyclotron, 62 others have now been identified as possible equivalents. Their characteristics will be used whenever convenient for future development and production for physics experiments.

TASCC gets reliability engineer

George Reynolds, formerly with CRL's Maintenance Engineering and Projects branch, has just joined the TASCC Accelerators and Development branch as a reliability engineer.

George's recent experience with process control instrumentation and electronics will be put to use as he develops programs to monitor and improve the reliability and maintainability of numerous TASCC operating systems and their procedures.

Previously, George worked with a major Canadian defence contractor to improve the reliability of aircraft and navigation systems.

November experiments

Experiment : Studies of the lattice structure and the electron momentum distribution in a high-Tc superconductor with the resonant-transfer-and-excitation process.
Rearchers : J.S. Forster, J.S. Geiger, G.C. Ball ***(TASCC)***; R.P. Sharma ***(North Carolina State University)***; J.A. Davies and D. Comedi ***(McMaster U)***; J.U. Andersen ***(Aarhus University)***
Beams : 7.63 MeV $^{4}He^{+2}$ and 18 MeV/u $^{81}Br^{+22}$
Duration : 6 days

Experiment : Measurements of the chlorine-36 content of 38 background samples and standards by AMS.
Researchers : R.R.J. Cornett, L.A. Chant, S.J. Kramer, G.M. Milton and J.J. Sylvestre ***(Environmental Research Branch, CRL)***; H.R. Andrews, W.G. Davies, B.F. Greiner, Y. Imahori, V.T. Koslowsky, J.W. McKay, J.C.D. Milton and L.V. Smith ***(TASCC)***
Beam : 100 MeV $^{35,36\ \&\ 37}Cl$
Duration : 3 days

Experiment : Tests of various reactions for intruder bands and collection of data for tin-113 with the 8π gamma-ray spectrometer.
Researchers : V.P Janzen, D.C. Radford, A. Galindo-Uribarri and H.R. Andrews ***(TASCC)***; G. Zwartz ***(University of Toronto)***
Beam : 94 MeV $^{18}O^{+7}$
Duration : 3 days

Experiment : Characterization of the sensitivity of a model-860 ion source to drifts in the ratio of currents of mass 35 and 37 beams.
Researchers : H.R. Andrews and V.T. Koslowsky
Beam : 100 MeV ^{35} & ^{37}Cl
Duration : 1 day

Experiment : Development and extraction of lithium-7, nitrogen-14 and silicon-28 at 30 MeV per nucleon from the superconducting cyclotron for the first time. This brings to 60 the total number of beams available from the cyclotron.
Researchers : TASCC Beam Commissioning Team
Beams : 30 MeV/u $^{7}Li^{+3}$, $^{14}N^{+6}$ and $^{28}Si^{+12}$
Duration : 2 days

Experiment : Production of gold samples for laser tests at McGill University; measurement of transport efficiency of molybdenum-93 in the helium-jet system; assessment of signal-to-noise ratio for measurements of beta transitions in two mass-38 isotopes.
Researchers : E. Hagberg, G. Savard, V.T. Koslowsky, J.C. Hardy and M.J. Watson
Beams : 55 MeV Au; 42 MeV ^{3}He; 16 MeV ^{4}He and 11 MeV protons
Duration : 3 days

Experiment : Test of various reactions leading to mass-51 nuclei, with the 8π spectrometer.
Researchers : V.P. Janzen *(**TASCC/McMaster University**)*; M. Cromaz, J. DeGraaf and G. Zwartz *(**University of Toronto**)*
Beam : 148 to 175 MeV $^{40}Ca^{+11}$
Duration : 1 day

Next month . . . . . .

- reaction tests for lead-197 & 198 with the 8π spectrometer
- AMS measurements of air, water and rock samples
- ISOL fragmentation-yield measurements
- test of elastic-recoil detector in the Ortec chamber
- search for intruder bands in N=51 nuclei with the 8π spectrometer
- facility break and maintenance December 24 until the beginning of the second week of January

Facility operating record

Elapsed Time (Year-to-date)	7848
Beam Available	
Tandem Only	3458.5
Tandem + Cyclotron	1565.5
Beam Development	1377.3
Planned Shutdown	738.9
Forced Shutdown	707.8

Editor: Larrie Thomson
Tandem Accelerator Superconducting Cyclotron Facility
AECL Research, Chalk River Laboratories
Mail Station 49A Chalk River,
Ontario, Canada K0J 1J0
Phone (613) 584-3311, extension 4131.
FAX 613-584-4024
Bitnet TASCC@CRL.AECL.CA

AECL EACL
AECL Research EACL Recherche