TRIUMF
Canada's
National Laboratory
for Particle and Nuclear Physics

The
Canadian
Association
of Physicists

NEWS RELEASE

FOR IMMEDIATE RELEASE **June 13, 2006**

TRIUMF develops world's highest-powered source of short-lived atoms - opens up new vistas into the most exotic atoms in the universe

At the 61th annual Canadian Association of Physicists (CAP) Congress at Brock University in St. Catherines, Ontario, scientists announced a major breakthrough in the production of exotic short-lived atoms at TRIUMF, Canada's National Laboratory for Particle and Nuclear Physics, located in Vancouver. TRIUMF recently demonstrated reliable operation of the world's highest power exotic atom production facility, five times higher than the previous record. Coupled with the recently commissioned superconducting ISAC accelerator, the new production facility positions TRIUMF as the premier destination for scientists from around world who are investigating the properties and behaviour of the most exotic atoms in the universe. These quantum systems are dictating the ultimate fate of large stars, for example their explosions into novae or super novae. The earth is composed of materials that originated from such explosions in the distant past. These exotic atoms will also be used to push the limits of our understanding of the fundamental laws of the Universe, and for advanced materials research.

The Isotope Separation and Acceleration (ISAC) facility at TRIUMF creates beams of exotic short-lived atoms by bombarding a heavy metal target with the proton beam from the TRIUMF cyclotron. The proton beams, which is traveling at 75% of the speed of light, shatters the metal nucleus into fragments of smaller nuclei, a very small fraction of which are exotic short-lived forms of interest to scientists. A sophisticated electromagnetic “separator” filters out all but the exotic atom of interest emanating from the metal target. The production rate is proportional to the number of protons hitting the target (the beam power) so it is essential that this power be as high as possible to generate useful amounts of the most exotic atoms. The breakthrough came with the development of a target which can withstand beam powers of 50 kilowatts, about five times the capability of the previous best targets.

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under a contribution through the National Research Council of Canada

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Commenting from the Congress on the significance of the new development, CAP President Walter Davidson stated “This exciting news of the production target achieving 50 kilowatt operation, the design goal of ISAC, constitutes a remarkable breakthrough, opening up new vistas for the study of nuclear matter.”

The first beneficiary of the ground-breaking target was Professor Walter Loveland of Oregon State University, who enthusiastically reported that "This milestone in proton intensity for TRIUMF is of great value to the scientific community who look to TRIUMF to produce very intense beams of important radioactive nuclei, such as ^{11}Li. Research such as ours can be done only at TRIUMF, the only facility in the world that can furnish such intense beams of lithium."

TRIUMF's world-leading ISAC facilities have attracted immediate international attention. In the fall of 2006, a multinational team from Europe, US and Canada will exploit the capabilities of ISAC and the high-powered target in an experiment for which the European team is importing to Canada a unique half-million dollar detector.

The development of the high-powered exotic-atom production target and the ISAC superconducting accelerator were made possible by generous financial support from the Federal Government of Canada through the National Research Council of Canada, and from the B.C. Provincial Government.
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