Canada's National Laboratory for Particle and Nuclear Physics
Laboratoire national canadien pour la recherche en physique nucléaire et en physique des particules

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ATLAS completion of world's largest jigsaw puzzle brings Canadian Scientists to brink of breakthroughs

(Vancouver, B.C.) – The quest to understand the mysteries of the universe took a huge step forward today as the final piece of a giant discovery machine Canada helped build was put into place. The ATLAS collaboration at CERN in Geneva, Switzerland, including over a hundred Canadian physicists, celebrates completion of the 46 metre long, 25 metre high, 7000 tonne detector. The first piece of ATLAS was installed in 2003, and thousands more have journeyed down the 100 metre shaft into the ATLAS underground cavern. Today, the last piece of this gigantic puzzle was put into place.

Known as the "small wheel," this is the final element of the ATLAS muon spectrometer. While small in comparison to the rest of the ATLAS, the small wheels are each 9.3 metres in diameter and weigh 100 tonnes. The entire detector system contains an area equal to three football fields, including 1.2 million independent particle detectors. As particles produced by CERN's Large Hadron Collider (LHC) pass through a magnetic field produced by gigantic superconducting magnets, this detector has the ability to track their paths to an accuracy of a fraction of a millimeter thus measuring their direction and energy.

"*The muon spectrometer is a mass of aluminum the size of a small cathedral, and we need to know where every part of it is to within a hair's breadth,*" says TRIUMF Scientist and ATLAS-Canada Physics Coordinator Isabel Trigger, who worked on the optical alignment system which accomplishes this astonishing task during her six years on CERN staff. In 2005, Dr Trigger was recruited back to Canada to lead TRIUMF's ATLAS physics analysis effort.

Muons, essentially heavy electrons, are the only detectable particles able to pass through the Canadian-built, calorimeters which stop other particles to measure their energies. The small wheels are located outside the massive Canadian detectors. In addition to the ATLAS detector, Canadians also made significant contributions to the LHC particle accelerator itself through TRIUMF, our national particle physics laboratory.

Comprising 450 physicists from 48 institutions, the ATLAS muon system includes members from Armenia, Belgium, China, Czech Republic, France, Germany, Greece, Israel, Italy, Japan, Netherlands, Pakistan, Russia, Serbia, Slovac Republic, Spain, Sweden, and the United States of America.

The ATLAS collaboration will focus now on commissioning work in preparation for the start-up of the LHC this summer. Experiments at the LHC will allow physicists to take a big leap on a journey that started with Newton's description of gravity. Gravity is ubiquitous since it acts on mass, but so far science is unable to explain why certain particles have the masses they have. Experiments such as ATLAS seek the answer. LHC experiments will also probe the mysterious missing "dark matter" in the Universe, investigate the reason for nature's preference for matter over antimatter and probe matter as it existed close to the beginning of time.

"Science does not tell us why humans are excited by new knowledge," says TRIUMF Director Nigel Lockyer, "It is obviously an essential survival tool. When our students get excited by the discoveries at the LHC, they will come back to Canada and want to repeat that creative excitement again and again with their own discoveries, in science, business, finance, or whatever career they choose." Lockyer himself returned to Canada in mid-2007 to assume the Directorship of TRIUMF, after more than two decades of a distinguished career leading the particle physics group at the University of Pennsylvania.

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FOR EDITORS:

ATLAS is a worldwide collaboration comprising over 2500 scientists and engineers from 178 institutions in 35 countries and regions. These are Armenia, Australia, Austria, Azerbaijan, Belarus, Brazil, Canada, China, Czech Republic, Denmark, France, Georgia, Germany, Greece, Hungary, Israel, Italy, Japan, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Taiwan, Turkey, United Kingdom and the United States of America.

CERN, the European Organization for Nuclear Research, is the world's leading laboratory for particle physics. It has its headquarters in Geneva. At present, its Member States are Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom. India, Israel, Japan, the Russian Federation, the United States of America, Turkey, the European Commission and UNESCO have Observer status. Canada has made important contributions to CERN's flagship accelerator, the Large Hadron Collider and one of its associated particle physics detectors, the ATLAS experiment.

The **LHC** is a particle accelerator which, at 27 kilometres in circumference, will be the world's largest and most complex scientific instrument when it switches on in summer 2008.

ATLAS-Canada comprises over 110 faculty members, post-doctoral fellows and students from eleven Canadian institutes: the University of Alberta, University of British Columbia, Carleton University, McGill University, Université de Montréal, University of Regina, Simon Fraser University, University of Toronto, TRIUMF, University of Victoria and York University. See http://www.atlas-canada.ca

TRIUMF is Canada's National Laboratory for Particle and Nuclear Physics. Physically located on the south Campus of the University of British Columbia, TRIUMF is owned and operated as a joint venture by a consortium of the following Canadian universities, via a contribution through the National Research Council Canada and supported by the Province of British Columbia: University of Alberta, University of British Columbia, Carleton University, l'Université de Montréal, Simon Fraser University, University of Toronto, University of Victoria. See http://www.triumf.ca