

CMS, LHC and CERN in 2008!

The world of high energy particle physics started 2008 with a lot of anticipation. After more than a decade of construction, the Large Hadron Collider (LHC) accelerator complex at the European Center for Particle Physics (CERN) in Geneva, Switzerland, was scheduled to start operating in fall 2008. The LHC will produce the highest energy ever proton-proton collisions allowing for scientific exploration of nature at an ever smaller and more fundamental level.

The Florida Tech High Energy Physics (HEP) group main particle physics effort is the Compact Muon Solenoid (CMS) experiment. Faculty **Marc Baarmand**, **Laszlo Baksay** and **Marcus Hohlmann**, research associate Igor Vodopiyarov, graduate students Samir Guragain, Himali Kalakhety, Hamit Mermerkaya and Mike Ralich, and several undergraduate students have been fully engaged in completing detector commissioning and preparing for physics analysis waiting for imminent data.

Major events in 2008, in chronological order, were:

- Early January: CMS scientists around the world celebrated the lowering of the final piece of the CMS detector into the underground collision hall at CERN. This final piece, a large disk nearly 45 feet in diameter, weighing approximately 1,430 tons and carrying many fragile detectors, was lowered at a pace of about 6 inches per minute. (See photo to right)
- September 10—LHC start-up and first beam: CERN scientists attempted for the first time to send a proton beam around the 27-kilometer-long tunnel. To join the celebrations, Baarmand organized a pajama party for protons—50 students attended this party and viewed the LHC successfully circulate its first protons. The historic event happened at CERN at 10:35 a.m. (4:35 a.m. EST) and viewed via a live webcast.
- The disappointment: Only a few days into the life of LHC, an incident caused by a malfunctioning interconnect in a superconducting dipole magnet brought the operation to a screeching halt! The repairs are under way, and the new schedule aims at LHC operation starting in October 2009, more than a year of delay!

In the meantime, the Florida Tech team has made the best use of the extra months. Two

noteworthy activities are two physics analyses: Ralich's Ph.D. analysis studies the angular and momentum correlations in top quark pair production at LHC, quark pair production at LHC and Mermerkaya's Ph.D. analysis is a study of spin correlations in top quark pair production at LHC.

The Florida Tech HEP group's research at CERN has been funded by the Office of Science in DOE since 2003. In recognition of valuable contributions to CMS and upcoming physics at LHC, DOE has now approved continued Florida Tech funding until mid 2012.

