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## Humanic leverages OSC cycles, storage to study supercollider



**Project lead:** Thomas Humanic, The Ohio State University

**Research title:** K0s K0s correlations in 7 TeV pp collisions from the ALICE experiment at the LHC

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**Web site:** <http://www.physics.ohio-state.edu/~humanic/>

In huge tunnels below the Swiss-Franco border, the European Organization for Nuclear Research's Large Hadron Collider (LHC) is operating at half of its peak energy goal of 14 TeV or 'teraelectronvolts.' With the assistance of detectors built into the collider, physicists are searching for answers to questions about the birth of the universe, the existence of alternate dimensions and other key facets underlying the "Standard Model" of the fundamental forces of nature.

At the LHC, the 52-foot tall ALICE (A Large Ion Collider Experiment) detector is tracking the fleeting trails of infinitesimal particles (quarks and gluons) ejected from violent collisions of subatomic lead particles known as hadrons: protons in some experiments and nucleons (protons and neutrons) in others. Upon impact, the quarks and gluons are released from their connecting bonds for an instant, producing a miniature expanding cloud of plasma – visible to the sensitive detectors – before quickly reassembling.

During these experiments, the detectors are producing terabytes of data – at up to five gigabytes of data per second, or enough to fill 100,000 dual-layer DVDs every year. The information is quickly distributed to computers in 33 different countries through the Worldwide LHC Computing Grid. In preparation, Thomas Humanic, Ph.D., professor of physics at The Ohio State University, leads a team that has been since 2002 to help install and test the grid software at the Ohio Supercomputer Center (OSC), a Tier-2 ALICE data storage, retrieval and computation site. While Europe is home to dozens of such ALICE sites, OSC is one of only four in the United States.

"Simulated data via ALICE Physics Data Challenges have been used to test the ALICE GRID computing environment at computing centers in Europe at OSC," Humanic said. "The real test of this system is happening now with real LHC data."

Humanic also is developing and running physics Monte Carlo codes at OSC to measure the response of the ALICE detector to specific types of event signals, as well as signatures for miniature black hole production. At the international conference Quark Matter 2011 in May, Humanic presented preliminary findings of ALICE proton+proton data. He found that some of the features expected from the heavy ion collisions are, somewhat unexpectedly, being observed in the smaller proton+proton collisions at half-energy. LHC is expected to run at full energy by 2014.



Researchers can view the status of data being analyzed at ALICE GRID locations through a monitoring site called MonALISA. The Ohio Supercomputer Center is one of only four such sites in the United States.