Upgrading the CMS Detector on the Large Hadron Collider

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CURRENT RESEARCH

Putting a diamond on the largest ring in the world

July 4, 2012 is one of the most exciting dates to remember in modern science. On this day, scientists working with the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN) in Switzerland discovered a particle consistent with the characteristics of the Higgs boson particle. This particle is predicted by the Standard Model of particle physics. The model is very successful in linking measurements made with previous particle accelerators, but still leaves unanswered questions about how the universe works. The model does ignores dark matter and dark energy, and while it describes the behavior of the Higgs particle it does not predict its own mass. These mysteries indicate there must be a larger picture that includes new forces and particles, and the Standard Model is only part of it.

This is where the LHC, the world's largest and most powerful particle accelerator comes in. The LHC was first conceived in 1984, and brought online in 2008. It consists of a 27-kilometer ring of superconducting magnets with accelerating structures that boost protons to unprecedented energies beyond the reach of any previous accelerator. When they collide the energy can convert into new particles, like a smaller and more controlled replication of the Big Bang. The particle spray from such an event is registered by a large assembly of detectors surrounding the collision point. The Compact Muon Solenoid (CMS) is one of those detector assemblies. The CMS is built around a magnet that generates a magnetic...

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AFFILIATION

The University of Tennessee, Knoxville

EDUCATION

- Ph.D., Johannes Gutenberg University, Mainz, Germany

RESEARCH AREAS

Technology, Materials Science / Physics

FUNDING REQUEST

Spanier is seeking $70,000 annually to fund this project. This will cover a graduate student for one year, travel expenses to the particle beam physics laboratory, acquisition and preparation of a new detector substrate from a diamond growth process batch and one neutron irradiation in a nuclear reactor.

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