

Could hadron collider devour the Earth?

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Particle colliders creating black holes that could devour the Earth. Sounds like a great Hollywood script. But, according to UC Santa Barbara Physics Professor Steve Giddings, it's pure fiction.

Giddings has co-authored a paper, "Astrophysical implications of hypothetical stable TeV-scale black holes," that has been accepted for publication in an upcoming edition of the peer-reviewed journal *Physical Review D*, documenting his study of the safety of microscopic black holes that might possibly be produced by the Large Hadron Collider (LHC), which is nearing completion in Europe. The paper, co-authored by Michelangelo Mangano of the European Center for Nuclear Research (CERN), which is building the world's largest particle collider, investigates hypothesized behavior of tiny black holes that might be created by high-energy collisions in the CERN particle accelerator.

If they appear at all, these black holes would exist for "about a nano-nano-nanosecond," Giddings said, adding that they would have no effect of consequence. However, the paper studies whether there could be any large-scale effects in an extremely hypothetical situation where the black holes don't evaporate.

The Giddings/Mangano study concludes that such microscopic black holes would be harmless. In fact, he added, nature is continuously creating LHC-like collisions when much higher-energy cosmic rays collide with the Earth's atmosphere, with the Sun, and with other objects such as white dwarfs and neutron stars. If such collisions posed a danger, the consequences for Earth or these astronomical objects would have

become evident already, Giddings said.

"The future health of our planet and the safety of its people are of paramount concern to us all," Giddings said. "There were already very strong physics arguments that there is no risk from hypothetical micro black holes, and we've provided additional arguments ruling out risk even under very bizarre hypotheses."

The LHC, near Geneva, Switzerland, is expected to begin operations this summer. It

will collide proton beams at levels of energy never before produced in a particle accelerator. Those results will then be studied for clues to new forces of nature, and possibly even extra dimensions of space. The first collision of beams is likely to be in September. The \$8 billion project has taken 14 years.

Two men have filed a federal lawsuit in Hawaii in an attempt to halt the LHC due to their concerns about the safety of black holes. Giddings' study has been cited by CERN as evidence of the safety of the LHC.

Giddings is a recognized expert in high-energy and gravitational physics. In 2001, he coauthored the first paper investigating black hole production at the LHC and he has authored many other papers on the subject, including an article for Scientific American. Mangano is also recognized as an expert in high-energy physics and, in particular, hadron collisions. This project, Giddings said, greatly benefited from contributions and advice of other members of UCSB's top-rated Physics Department.

Source: University of California - Santa Barbara

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