

The Year of the Higgs?

February 21 2011

This February, researchers will renew their search for one of the universe's most elusive mysteries, the Higgs boson--a hypothetical particle that if found would give an insight into why particles have certain mass.

The search will take place at the [Large Hadron Collider](#) (LHC) at CERN, the world's largest particle accelerator at the European Organization for Nuclear Research in Geneva, Switzerland.

The Higgs boson is the only remaining [Standard Model](#) particle that has not been observed in particle physics experiments. But using two separate and complimentary experiments, the A Toroidal LHC Apparatus (ATLAS) and Compact Muon Solenoid (CMS), scientists hope to prove its existence.

Both ATLAS and CMS are particle physics detectors. They are located on opposite sides of the 27-kilometer (17-mile) LHC ring circling the countryside on the outskirts of Geneva, buried deep below ground.

The LHC has been offline during a winter break, which temporarily halted the experiments.

"The research program over this past year was essentially to commission the accelerator and the experiments to make sure that they work and they are giving us sensible results," said physicist Aaron Dominguez of the University of Nebraska and the US CMS experiment, whose work is

supported by the National Science Foundation.

The University of Nebraska researchers played an important role in building the LHC detectors and analyzing data that comes from the experiments.

Confident that everything is functioning properly, the LHC research community recently announced a decision to delay a planned shutdown of the [particle accelerator](#) until the end of 2012. If the machine continues to function at the current level, researchers believe they can explore the entire "allowed region"--the ranges of mass in which the standard model Higgs boson could exist--by the end of 2012.

"This was one of the reasons to run in 2012 and not just this year," said Gustaaf Brooijmans of Columbia University and the US ATLAS experiment. "Our projections now say that with the 2012 run we should be able to probe about 90-95 percent of the 'allowed region' for the existence of the Higgs boson."

Brooijmans' team at Columbia develops and operates the electronics that read out part of the detector.

"If the [accelerator](#) is performing according to plan, we should have a very good first picture of this whole 'allowed range' of the standard model [Higgs boson](#)," said Dominguez.

Provided by National Science Foundation

Citation: The Year of the Higgs? (2011, February 21) retrieved 25 April 2024 from <https://phys.org/news/2011-02-year-higgs.html>

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