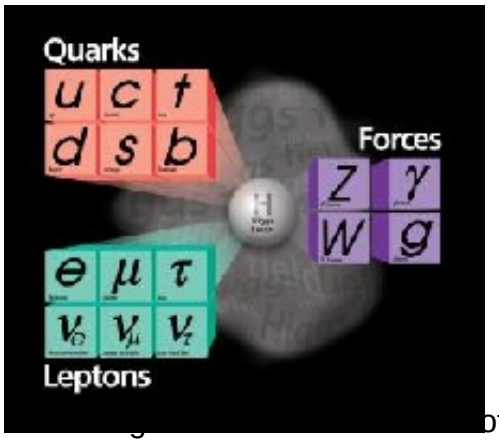
Physicists Closing In On Mysterious Missing Particle That Gives Matter Mass

2008-03-19 23:30:48 by Southern

University of Toronto researchers are now closer to answering contemporary physics' most pressing question: where is the missing particle that gives matter mass, known as Higgs-boson? The breakthrough comes after researchers discovered that the mass of another subatomic particle -- the W boson -- is slightly heavier than previous measurements, pointing them in a new direction.



of particles and forces, the Higgs mechanism gives mass to particles. Measuring the mass of the top quark and the mass of the W boson, scientists can restrict the allowable mass range of the not-yet-observed Higgs boson. (Image courtesy of Fermilab)

So far, the Higgs-boson only exists in mathematical formulas and has stumped physicists since it was theorized by Peter Higgs in 1964. It is the missing link that will complete the standard model of particle physics, which studies the basic elements of matter and radiation, including other observable subatomic particles such as quarks and leptons.

Working at the Department of Energy's Fermi National Accelerator Laboratory, the team of researchers made the world's most precise measurement of the mass of the W-boson and found that it is somewhat heavier than previously measured, which in turn lowers the target mass for the Higgs-boson.

"What happens is that the Higgs-boson interacts with other subatomic particles, causing drag -- the heavier the particle, the more drag the Higgs-boson applies," says Professor William Trischuk of the Department of Physics and team leader. "From precise measurements of the W-boson, we can then infer the mass of the Higgs-boson. The W-boson, being among the heaviest particle in the standard model, is the current limitation in being able to pin down the Higgs."

Trischuk predicts that if the Higgs-boson exists, researchers will find it in the next couple of years and the importance of the discovery cannot be overstated. "While the observation of a Higgs, at just the mass indicated by current precision measurements of the W mass might close the standard model, an inconsistency between the two would lead to the much more interesting prospect of starting us down the path to particle physics beyond the current paradigm."

Adapted from materials provided by University Of Toronto.

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