Subject: FNAL-D0 reports observation of strange b baryon
Posted by Olaf Hartmann on Fri, 15 Jun 2007 08:17:33 GMT
View Forum Message <> Reply to Message

Citing from
Interactions News Wire #30-07:

****
Source: Fermi National Accelerator Laboratory
Content: Press Release
Date Issued: 13 June 2007
****

For immediate release

Media Contacts:
Judy Jackson, Fermilab, +1 630-840-3351, jjackson@fnal.gov
Kurt Riesselmann, Fermilab, +1 630-840-5681, kurtr@fnal.gov

Graphics and photos are available at:
http://www.fnal.gov/pub/presspass/images/DZero-cascade-b.html

Fermilab physicists discover "triple-scoop" baryon

Three-quark particle contains one quark from each family.

Batavia, Ill. - Physicists of the DZero experiment at the Department of Energy's Fermi National

b") baryon, with a mass of 5.774±0.019 GeV/c2, approximately six times the proton mass.

of a down, a strange and a bottom quark. It is the first observed baryon formed of quarks from all three families of matter. Its discovery and the measurement of its mass provide new understanding of how the strong nuclear force acts upon the quarks, the basic building blocks of matter.

The DZero experiment has reported the discovery of the cascade b baryon in a paper submitted to Physical Review Letters on June 12.

"Knowing the mass of the cascade b baryon gives scientists information they need in order to develop accurate models of how individual quarks are bound together into larger particles such as protons and neutrons," said physicist Robin Staffin, Associate Director for High Energy Physics for the Department of Energy's Office of Science.

The cascade b is produced in high-energy proton-antiproton collisions at Fermilab's Tevatron. A baryon is a particle of matter made of three fundamental building blocks called quarks. The most familiar baryons are the proton and neutron of the atomic nucleus, consisting of up and down quarks. Although protons and neutrons make up the majority of known matter today, baryons composed of heavier quarks, including the cascade b, were abundant soon after the Big Bang at the beginning of the universe.

The Standard Model elegantly summarizes the basic building blocks of matter, which come in

three distinct families of quarks and their sister particles, the leptons. The first family contains the up and down quarks. Heavier charm and strange quarks form the second family, while the top and bottom, the heaviest quarks, make the third. The strong force binds the quarks together into larger particles, including the cascade b baryon. The cascade b fills a missing slot in the Standard Model.

Prior to this discovery, only indirect evidence for the cascade b had been reported by experiments at the Large Electron-Positron collider at the CERN Laboratory near Geneva, Switzerland. For the first time, the DZero experiment has positively identified the cascade b baryon from its decay daughter particles in a remarkably complex feat of detection. Most of the particles produced in high-energy collisions are short-lived and decay almost instantaneously into lighter stable particles. Particle detectors such as DZero measure these stable decay products to discover the new particles produced in the collision.

Once produced, the cascade b travels several millimeters at nearly the speed of light before the action of the weak nuclear force causes it to disintegrate into two well-known particles

travel several centimeters before ultimately decaying to a proton and a pion. Sifting through data from trillions of collisions produced over the last five years to identify these final decay products, DZero physicists have detected 19 cascade b candidate events. The odds of the observed signal being due to something other than the cascade b are estimated to be one in 30 million.

DZero is an international experiment of about 610 physicists from 88 institutions in 19 countries. It is supported by the Department of Energy, the National Science Foundation, and a number of international funding agencies. Fermilab is a national laboratory funded by the Office of Science of the U.S. Department of Energy, operated under contract by Fermi Research Alliance, LLC.

Notes for editors:

The DZero paper on the cascade b discovery is available in the hep/ex preprint location at http://arxiv.org/abs/0706.1690.

[...]