DO YOU KNOW?

HIGGS BOSON PARTICLE

What is the Higgs Boson?

In a quantum leap in physics, scientists have claimed to have spotted a sub-atomic particle "consistent" with the Higgs boson or 'God particle', believed to be a crucial building block that led to the formation of the universe. In a major milestone in the 50 year search for the elusive Higgs, that is believed to have been responsible for lending mass to the particles that eventually formed the stars and the planets after the Big Bang 13.7 billion years ago. The discovery of a particle consistent with the Higgs boson opens the way to more detailed studies, requiring larger statistics, which will pin down the new particle's properties, and is likely to shed light on other mysteries of the Universe.

Joe Incandela, the leader of CMS, one of the two teams at the world's biggest atom smasher, told a packed audience of scientists at the European Centre for Nuclear Research (CERN) that the data has reached the level of certainty needed for a "discovery". But he did not yet confirm that the new particle is indeed the tiny and elusive Higgs boson, which is believed to give all matter in the universe size and shape. A second team of physicists Atlas also claimed they have observed a new particle, probably the elusive Higgs boson but a little more time is needed to prepare these results for publication.

Why is it called 'God particle'?

The Standard Model is a hugely successful theory but has several gaps, the biggest of which is why some particles have mass but others do not.

Mooted by Higgs and several others, the boson is believed to exist in a treacly, invisible, ubiquitous field created by the Big Bang some 13.7 billion years ago. CERN uses a giant laboratory where protons are smashed together at nearly the speed of light, yielding sub-atomic debris that is then scrutinized for signs of the fleeting Higgs. The Higgs has been dubbed the "God particle" because it is powerful and everywhere, yet so hard to find. Over the years, tens of thousands of physicists and billions of dollars have been thrown into the research, gradually narrowing down the mass range where it might exist.

How was it found?

A 'Higgs boson-like particle' has been discovered at the $10bn Large Hadron Collider, 300ft underground near Geneva. LHC is designed to accelerate protons to very high speeds and then smash them together to create tiny fireballs, recreating conditions that prevailed when the universe was less than a trillionth of a second old.

Why is the finding important?

The discovery would confirm the standard Model of physics. Other particles predicted by this theory have already been detected. With the missing Higgs boson now believed to be discovered, scientists can look at other riddles of the cosmos-like the mysterious dark matter and energy, antimatter, supersymmetry etc with more surety.

What have been the life-altering experiments at CERN?

a) Medical Imaging

Particle physics experiments at CERN and other labs have paved the way for new medical imaging technologies such as Positron Emission Tomography (PET) which has stemmed from general studies of antimatter and the use of particle detectors. Several new imaging techniques are at various stages of commercialization.

b) Parallel Computing

The millions of collisions that take place inside an atom smasher generate tons of data, which requires a great deal of computing power. Parallel processing and grid computing technologies were developed to analyze this data, and later became commercially available.

c) World Wide Web

The most famous contribution of CERN is the World Wide Web, which was first proposed by Tim Berners-Lee in 1989. In 1991, it was made available to the community of high-energy physicists via the CERN library and subsequently was freely accessible on the Internet. The idea was to combine PC technologies, information network and the hypertext into one global information system.

d) Cancer Therapy

In the most recent developments in cancer therapy, accelerators using particles called hadrons have been adopted to improve results of conventional radiotherapy. The advantage of using hadrons is that they deposit all their energy in the same spot, which helps in targeting tumours without harming healthy tissues. Proton therapy is another new form of cancer treatment to selectively target and destroy tumour cells.

e) Solar Energy

Using ultra-high vacuum technology, CERN has developed and extensively tested a new type of flat panel solar collector. It is suited both for heating and for cooling, and can be used for water desalination, drying crops, and so on. These panels can actually produce electricity with efficiencies similar to those of photovoltaic cells. ❑