The Higgs Boson and Its Significance in Advancement of Engineering And Science

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Abstract

The higgs boson was first predicted in 1965 by a scientist peter higgs. In July 2012 scientists announced existence of the higgs boson often referred to as the god's particle. Most of the research going on these days is about the higgs boson and its technological benefits. The higgs boson is a massive elementary particle that was predicted to exist by standard particle physics and discovered by experiments carried out in the large hadron collider. A boson is a force carrier with integral spin that holds the matter together. The higgs particle is a boson with no spin and electric charge. It is also very unstable, decaying into other particles almost immediately. It forms higgs field which is a scalar field with two neutral and two electrically charged components that forms a complex doublet of the weak isospin symmetry. This higgs field is present throughout the universe which causes elementary W, Z particles and all other existing particles to acquire mass. Present universe's all known forces and fields arise through successive symmetry breakings of the higgs field at phase transitions. Although the results till now are promising but the research is going on to see if the particle characteristics meet all the predictions about it. The best fit higgs mass is 126 GeV and the best fir strength is 4 sigma but the strength of the higgs' signal deviates and we can study it with the fourth fermions' generation. This deviation in higgs signal strength implies variation in higgs field and it causes change in elementary particles' behavior i.e. of electrons and protons symmetry in different elements. By controlling signal strength of higgs, an abrupt advancement in electronic devices is probable. As based upon these signal variations in the higgs, ultra high speed digitizers' designs are proposed to perform wideband monitoring and to monitor RF signals in accelerator cavities which are further to be used in the LHC for more concise results.

The boson

Among the two major classes of elementary particles, Bosons are the one class of elementary particles and the other class of elementary particles is fermions. Fermions are basic building blocks of matter and bosons hold the fermions together and collectively these two comprises all matter. The two main characteristics of bosons are:

- Bosons have integral spin.
- Two or more bosons with same energy can occupy same quantum state in space.

These two properties are related using spin statistics theorem. It states that "*the wave function of a system of identical integer-spin particles has the same value when the positions of any two particles are swapped*." The position of a particle is described by a wavefunction, or – more generally – by a vector, which is also called a "state"; if interactions with other particles are ignored, then two different wavefunctions are physically equivalent if their absolute value is equal. So, while the physical state does not change under the exchange of the particles' positions, the wavefunction may get a minus sign. Bosons are particles whose wavefunction is symmetric under such an exchange, so if we swap the particles the wavefunction does not change. Fermions are particles whose wavefunction is antisymmetric, so under such a swap the wavefunction gets a minus sign, meaning that the amplitude for two identical fermions to occupy the same state must be zero. This is the Pauli exclusion principle: two identical fermions cannot occupy the same state. This rule does not hold for bosons. As the wave function remains unchanged hence an infinite number of bosons can exist together forming a *bosonic field* which holds the matter together. **The higgs boson** is the most significant boson discovered recently.

The higgs boson

The higgs boson is a first scalar boson discovered which till now is in accordance with it characteristics predicted in standard model of physics earlier in 1964. And by March 2013 it had been proved to behave and decay in the same manner as expected in standard model of particle physics. The higgs boson was discovered at the Large Hadron Collider (LHC) where 12 trillion protons were made to collide and among them 400 collisions accounted for giving evidence of existence of the higgs boson. The higgs bosons are force carriers which acts as glue to hold the fermions and other groups of fundamental building blocks of universe together and this causes W and Z particles and all other existing particles to acquire mass. The higgs boson is confirmed to have positive parity, no electric charge and zero spin which makes it a scalar particle. The higgs bosons collectively give rise to a scalar field which is present throughout the universe known as the higg's field. This field obeys canonical commutation relations. the canonical commutation relation is the fundamental relation between canonical conjugate quantities which are related such that one is fourier transform of other.

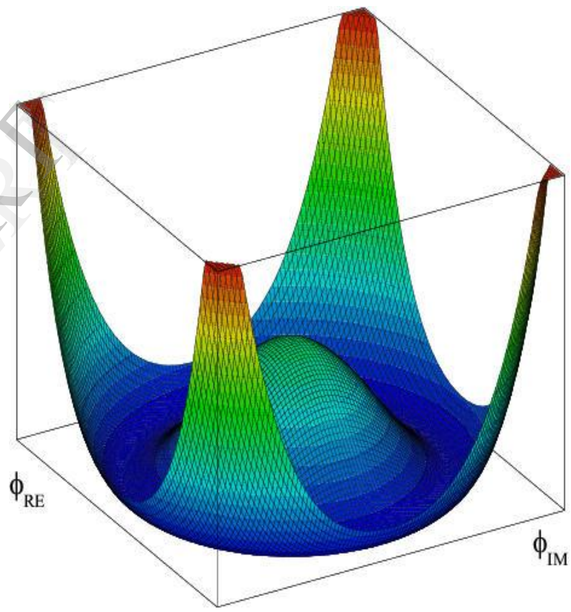
The components of the Higgs field are "absorbed" by the massive bosons as degrees of freedom, and couple to the fermions via Yukawa coupling, thereby producing the expected mass terms. In effect when symmetry breaks under these conditions, the Goldstone bosons that arise interact with the Higgs field and with other particles instead of becoming new mass less particles, the intractable problems of both underlying theories neutralize each other, and the residual outcome is that elementary particles acquire a consistent mass based on how strongly they interact with the Higgs field.

The higgs effect

As particles pass through the field they are endowed with the property of mass, much as an object passing through treacle (or molasses) will become slower. Although apparent, mass is not generated by the Higgs field, as creation of matter or energy would conflict with the laws of conservation; mass is, however, transferred to particles from the field, which contains the relative mass in the form of energy. Once the field has endowed a formerly massless particle the particle slows down because it has become heavier. If the Higgs field did not exist particles would not have the mass required to attract one another, and would simply float around freely at light-speed. The process of endowing a particle with mass is known as the Higgs Effect.

Creation of higg's effect

The Higgs effect occurs because nature wants to be at its lowest energy state. the Higgs Effect will happen because gauge bosons near a Higgs Field will want to be in their lowest energy states, and this would break at least one symmetry. The symmetry broken due to this effect is SU(2) symmetry i.e. gauge symmetry. To justify giving mass to a would-be massless particle, the vacuum must have energy (that is called higgs field) and when a particle that we think of as massive were to enter it, the energy from the vacuum would be transferred into that particle, giving it mass. When symmetry is disturbed **goldstone bosons** are produced. This is an excited or energetic form of the vacuum, which can be graphed revealing that shown above. The elevated areas are where the Nambu-Goldstone Bosons allow particles to have mass, under the energy provided by a Higgs Field.



Applications of the higg's boson in electronics and science

The higgs boson is able to change the elementary behaviour of elementary particles i.e. electrons and protons symmetry in different elements. By controlling signal strength of higgs, an abrupt advancement in electronic devices is probable.

As based upon these signal variations in the higgs, ultra high speed digitizers' designs are proposed to perform wideband monitoring. Using these ultra high speed digitizers the problem of delay occuring in analog to digital converters in voice recognition systems will resolve and it will lead to highly economical voice recogniton systems. This can lead to a new epoch in field of artificial intelligence.

the higgs boson gives mass its attributes like inertia and gravity. So, if we are able to control the mass, we can reduce the inertia. Controlling the inertia can lead to huge advancements e.g. A 200-tonne jumbo jet can be manufactured with inertia as low as that of a 20-tonne one, leading to huge savings in fuel costs.

A light weight interstellar ship that can zip across the space to make travel to Mars as convenient as the trans-Atlantic trip of today.

Dark matter : there has been a number of conflicting theories about the expansion of the universe. After it was proved that gravity is not responsible for the expansion phenomenon. It is concluded that 68% of universe is dark energy and roughly about 25% of mass of universe is dark matter. But it continues to be a mystery that what this dark matter actually is. The higg's boson is expected to shed light on the dark matter.

There is also a possibilty that we might be able to produce a new heavy charged matter that might be able to catalyze fusion.

Description of god's particle in vedic science

the god particle has described in vedic science, through the bhagavadgita sankhya in it that more than 10000 yeas ago. it is so profound that the god particle has two states of maximum and minimum values both of which are given in sankya. the *purusha* is .9149 kg mass as maximum and the *moolaprakriti* as 1.3 e minus 51 kg as minimum mass between which all phenomena operates. It is similar to the higgs boson proposed in 21st century.

Conclusion

Theoretical calculations and scientific predictions show that the higgs boson theory when illustrated and implimented thoroughly to practical apllications can lead to a new era of technological developments. The electronic behaviour can be altered using the higgs boson and it can speed up and highly enhance the efficiency of various devices.

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