+International Journal of Applied Research 2015; 1(8): 670-676

ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2015; 1(8): 670-676
www.allresearchjournal.com
Received: 26-05-2015
Accepted: 28-06-2015

Leandro Meléndez Lugo
Instituto Nacional de Investigaciones Nucleares, Centro Nuclear de México, Departamento de Física, La Marquesa, Ocoyoacac, C.P. 52750 Edo. De México

Correspondence:
Leandro Meléndez Lugo
Instituto Nacional de Investigaciones Nucleares, Centro Nuclear de México, Departamento de Física, La Marquesa, Ocoyoacac, C.P. 52750 Edo. De México

On the Higgs boson and a novel theory on the inertia phenomenon

Leandro Meléndez Lugo

Abstract
The possibility of a mechanism by which a particle such as the Higgs boson can provide mass to some particles of the Standard Model and the existence of the force-carrying particles are discussed. Alternatively, a mathematical analysis within the established physics, which explains that the property called the mass of bodies, is the product of the interaction of fields rather than a property that can hold a body is diligently presented. Simply put, the opposition to freely accelerate a charged body, i.e., the inertial force, is directly related to the pressure generated by the interacting fields, the charge´s own field and an external field. Finally, it can be seen that the field is a very important part in the genesis of matter, the mass.

Keywords: Higgs boson, Standard Model, inertia, force-carrying boson, electric pressure, energy density.

1. Introduction

On July 4, 2012 at CERN, the discovery of the Higgs boson was officially announced [1-3]. This was not just a success for CERN, or for physics; this was a success for the human race, it was said [1-3]. This misnamed God particle (after the book by Leon Lederman) had for many years been absent, proving particularly elusive despite the great efforts of researchers to find it [4]. This proclamation came after approximately nine billion dollars were invested in the experiments, decades of efforts and the work of more than 6,000 researchers at the CERN facilities [1]. The prelude and the announcement itself have been embellished, and not just calling it the God particle but also adorning it with phrases like: the particle that gives meaning to our lives. One of the phrases that is repeated is: Without the Higgs, electrons and quarks would not have mass as photons, the particles of light [1-3]. The birth of this hunt, for particles whose existence is postulated, cannot be set accurately in time. The particle fever trend in scientific research, which resulted in the Standard Model of particle physics [3], began with the idea of Democritus: the structure of matter is based on a building block, a fundamental partition (atom) from which any known and unknown substance is configured, and until now has not reached its end. At the very beginning, the Standard Model consisted of one or two particles, which were multiplying; today, with more than 60 particles, which are different atoms of Democritus, the Standard Model seems entangled and, in short, is getting out of hand. The need even to include the theory of super symmetry, to round out the part covered by the Standard Model, even without including gravity, makes things seem even more complicated. For some researchers, finding evidence for the existence of the Higgs boson, rather than a breakthrough, is considered a negative issue for scientific research in the sense that now, instead of something new, you have more of the same [5]. With these results, the insistence of some researchers, who claim that particle physics has a problem, is increasing. The negative results in terms of a new physics begin to produce, if not a complete breakdown in particle physics, at least a widespread panic [5]. Furthermore, it is said that scientific research has become an industry where more and more researchers (typically organized in large workgroups), some with more technological resources and more money, are producing small gains or becoming less important and making fewer outstanding discoveries for society [6]. All this turns out to be a small part of the so called post-boson crisis. It is very likely that this will lead to a thorough review of what it really means to do scientific research and not, as some researchers suspect, that these facts mean somehow a return to the past, to the time of divination, the unreal and chimerical notions.

The idea of the Higgs boson or the so-called Higgs mechanism (the mechanism by which the Higgs field gives the particle mass) had its origin in the works published by Peter W. Higgs and other researchers in the 60´s [7-10]. The greatest virtue of the Higgs boson is that it gives mass, not to all, but to a much of the set of elementary particles [7-10]. In a peculiar way, just as Albert Einstein replaced the ether by so-called space-time and in the same manner the so-called Dirac sea was invented, Peter W. Higgs gave his name to the Higgs field, which forms a sort of ethereal pervasive molasses that produces the effect of mass by interacting selectively with some elementary particles [11, 12]. Furthermore, the Higgs boson is not just the missing piece of the puzzle. Finding the Higgs and determining its characteristics leaves many issues of physical properties still to be understood. For example, gravity, a force of nature that cannot adequately reconcile the demands of quantum mechanics and the Higgs boson, is not likely to help with anything to solve this problem [1-4].

In this paper I seek to establish a number of limitations that this molasses would have in producing the effect of mass in different particles. Furthermore, I aim to provide provocatively a decisive explanation of the phenomenon of inertia and the concept of the mass of particles, without resorting to intermediate particles, where the concepts of force and energy will play a key role, considering this not as a universal thesis but as an alternative explanation to be put on the table for discussion.

2. Science and pseudoscience

The sensible thing, when starting to talk about a specific topic, is first of all to define it.

Below, as a reminder, the established definition of science and pseudoscience is transcribed. Science, from the Latin scientia, means knowledge. It is a systematic activity that builds and organizes knowledge in the form of testable explanations and predictions about the universe. Pseudoscience is a systematic activity that builds and organizes knowledge in the form of explanations and predictions that are usually non-verifiable (postulates) about the universe (astrology, UFO, levitation phenomenon, the occult and quantum healing). A postulate is a proposal that is accepted without proof.

It is worth noting that integrating postulates in a theory is a risk that can be fatal to the theory. A better theory is one in which it is not necessary to include postulates at all. Contrary to what we have been taught, when a scientific activity includes postulates the risk of making this scientific activity seem to be pseudoscientific is increased. The theory of special relativity shows two postulates ostensibly and explicitly [13].

In practice, it is extremely difficult to differentiate between what is truly a science and what might be a pseudoscience. In large part, this is due to the adapted arguments with which some people usually try to establish a pseudoscience as a true science. In addition to this difficulty, in modern times you can notice a trend in the scientific community, to try to explain something new, including inexplicable phenomena in the discussion. The clearest examples of this are the introduction of dark matter and dark energy into the theory of the expanding universe, i.e. the dark side of the universe [1, 12], [14-17]. In scientific research, according to the scientific method it is valid to make risky propositions but only when looking for some consistency with what is established, in addition to the line with the philosophical underpinnings of the theory. Without this consistency, it is likely that progress will require the rigor of the scientific method but research tends to get bogged down and, in this particular case, to find something that seems non-existent, the dark side of the universe that it has not been possible to discern [12, 14-17].

Because of these difficulties elucidating the difference between science and pseudoscience, it is appropriate and wise to think about the argument put forward by the Nobel laureate Richard Feynman: Science is the belief in the ignorance of experts. Keeping a balance between respect and disrespect, learn about science that you must doubt the experts [18].

With this in mind and according to the above definitions, theories like string theory and super string theory would properly be pseudo sciences since - at least as they are raised today - they are not verifiable.

3. The Standard Model and the Higgs boson

The Standard Model of particle physics first attempts to explain the existence and classification of particles, but also affirms the existence of intermediate particles, giving meaning to the action of the three forces that the model itself includes [19-21]. In this model, for different reasons, it has not been possible to include the smallest of the known forces, gravity [21]. This seems to be the reason for its name: the Standard Model. The hierarchy in science reads in order: laws, theories and models. The lowest level is for models. They are usually only part of the theory and somehow contain an idealization, such as the model of the simple pendulum in classical mechanics. The simple pendulum model, being a very small part of theory and with an idealization that is to consider that the pendulum string is mass-less, sets up the most elemental part of this hierarchy. In this scientific classification, the highest rank is possessed by laws.

Aristotle stated that matter could only influence the place where it was. The idea of action at a distance was inconceivable. According to him, in any interaction there should mediate something material [22]. It is likely that the proposition of the existence of the mediating particles of the Standard Model comes from the Aristotelian conception that matter acts only where it is. It seems that the idea of remote interaction is still difficult to incorporate.

Meanwhile, Isaac Newton was for some time hesitant about the concept of action at a distance. But Newton´s opinion, although he perhaps held it only for a short period of time, is often invoked against scientists' own concept of simultaneous mutual attraction between material particles. Newton's friend, Richard Bentley, persuaded Roger Cotes, another fellow of Trinity College, to write the preface to the second edition of Newton's Principia. This preface became the clearest defense of action at a distance and had the approval of Newton. However, twenty years before this, Newton wrote in a private letter to Bentley [22]:

It is inconceivable that innate brute matter should (without the mediation of anything else which is not material) operate upon and affects other matter without mutual contact, as it must if gravitation in the sense of Epicurus be essential and inherent in it. And this is one reason why I desired you would not ascribe innate gravity to me. That gravity should be innate, inherent and essential to matter, so that one body may act upon another at a distance through a vacuum, without the mediation of anything else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man who has in philosophical matters any competent faculty and thinking can ever fall into it [22].

Albert Einstein himself subscribed to the Aristotelian principle that matter cannot act where it is not. This is known as the Einstein's principle of local action. According to this view, the apple falls toward the centre of the earth as it moves along a curved groove of the famous space-time that put pressure on it, to follow the path predicted by the geodesic equation [22]. In other words, Albert Einstein, with some Aristotelian influence, found it necessary to replace the so-called ether by the famous space-time with extraordinary properties such as to make the particles themselves, without being influenced by a force, follow geodesic paths. That is, he gave life to what he called space-time, which in his theory surrounds all bodies, the purpose of which was to have something between them carrying the interaction [13].

In the Standard Model, with the inclusion of a force-carrying particle in an interaction, involving the effect of a force, between say two quarks (gluon), a complication is generated. This is because in principle, once the idea of the gluon is introduced, now another boson must be included that mediates the interaction between a quark and a gluon, and so on, if we want to maintain consistency with mediator bosons. This can be continued to infinity.

The Standard Model is far from conclusive, among other things, by not including the weakest force in the universe, but is the first that had a convincing explanation, containing this Aristotelian requirement, the force-carrying particle. As will be described later in the explanation of the force of inertia, it really is not required.

There were always questions about what the model itself did not explain, as was the case of the electric charge and the mass (inertia) of the particles [23, 24]. For many years, the principle of Mach remained as an explanation for the mass of material bodies, involved in the manifestation of the force of inertia that must be overcome when it comes to speeding them up. The hypothesis of an instant connection between the distant universe and objects that you see, when acceleration is produced, is usually called the Mach principle [22]. This idea in Mach's principle implies that the distant matter in the universe would have to act instantly on the bodies to avoid their free acceleration under the influence of some external force. Remote interaction has always been a thorny problem, but instantaneous remote interaction is really unacceptable.

At first, the Standard Model was fine. In this way, some realized that things really did not work so well, some said that they were confronted with an oddity, that something adverse seems to be acting in the universe, something that seems to spring from space, which fills all and in which planets, stars and galaxies are immersed. This adversity, which appears when trying to accelerate a body, should have an explanation according to the Standard Model, which was, however unaware of its existence. This adversity is the force of inertia.

The need for the existence of the Higgs boson approach seems to arise from the Standard Model; there must be a mediating particle that carries the force of inertia between the vacuum or the ether and material bodies [19, 20, 25]. This seems to be a mixture of the Aristotelian idea and the Newtonian explanation of the force of inertia [22]. Newton explained the inertial force as a force exerted on a body by the vacuum; this force appeared every time they tried to accelerate it (visinsita). This fact was never physically demonstrated. Moreover, this idea of the force between the vacuum and the bodies strictly contradicts Newton's first law, precisely the law of inertia. Given the existence of such a force, between emptiness and bodies, moving bodies will eventually be arrested; this friction would work negatively on the bodies.

In other words, in the explanation of the inertial force by the Higgs mechanism, the principle of Mach is discarded and the Newtonian interpretation is strengthened. It attempts to explain the force of inertia of the material bodies as a force between the vacuum and the body (visinsita), through the intermediary of a force-carrying particle, which happens now to be the Higgs boson.

According to the idea of intermediary particles, there should be a boson mediating between these inter-acting parts, the bodies and empty space [25]. The inertial force would thus have an explanation, although this idea implies the presence of an additional force in the model, beside the four known natural forces. This additional force does not seem to have anything to do with the gravitational force. The number of forces in nature should extend to five. In other words, the influence of the fifth force would be represented by the Higgs boson, as an intermediate particle. Indeed, the Higgs boson in the Standard Model appears as a postulate [4]. Lederman himself, in his book, *The God Particle*, says that Democritus asked him what physical evidence had yet been gathered of the existence of the Higgs particle. He answered none. Zero. "Actually, if it were not for pure reason, the evidence would convince the most sensible physicists that the Higgs does not exist". Lederman also says "it's as if to some particles the Higgs field is a kind of heavy oil through which they move sluggishly, seeming to be massive. To other particles the Higgs is like water, and to still others, such as photons and perhaps neutrinos, it is invisible" [4].

This idea of water, heavy oil or molasses mentioned earlier has the great disadvantage that a massive particle travelling at a given speed, free from external forces, eventually slows its movement due to the action of this fifth force. That is, there appears the old idea of Aristotle that to maintain the speed of a body always requires something to push the body. Newton's first law contradicts the idea of the molasses. According to this law, a body remains at rest or motion unless a force appears to change its status. The Higgs boson should not provide mass in this way. The friction always means that energy is dissipated and then movement is arrested. This was the reason why Newton's idea on the inertial force did not succeed: the vacuum frictional force exerted on the material particles would eventually stop their movement, which means that everything that moves would tend to come to rest. Some researchers involved with this Higgs mechanism argue that the interaction of bodies with the Higgs field is such that, once a body starts to increase its velocity, interaction is reduced and the body avoids losing energy by friction. This contradicts Einstein´s relativity, because this theory proclaims that mass increases with speed, so that the interaction with the Higgs boson should be intensified, with increasing speed, to take into account the increase of relativistic mass. Furthermore, these researches do not consider that the opposition to the body´s acceleration is manifested not only at low speed but is the same at higher speed.

4. Experimentation

The theoretical and experimental research carried out to discover the Higgs boson has been a very complicated process. You cannot avoid raising yours eyebrows when experiments are described [1]:

In the LHC, collisions between relatively large groups of protons reach about 20 million collisions in a relatively short time. Taking into account that two beams of protons are sent in opposite directions intersecting at some point on the path of travel, each cross produces millions of collisions. Thus, in practice, there are hundreds of millions of collisions each second. If all this information is stored, you would be saturating thousands of computer disks per second. The storage capacity of the world's largest data acquisition system pertains to the World Data Center for Climate in Germany [1]. If we recorded all the information created in the LHC, a database of that size would overflow in a couple of seconds. It's really important to emphasize that the overwhelming majority of the data collected by researchers at the LHC is discarded instantly. In fact, there is no feasible form in which to keep all the information generated. To discriminate this inordinate amount of information instantaneously, the Trigger system is used. The Trigger is a combination of highly specialized hardware and software. At one level, the Trigger sees if it has found anything of potential interest. Around ten thousand events from among the billions that occur are recorded and preserved and taken further [1]. On a second level, a sophisticated piece of the data acquisition system retains only several hundred events of those many millions produced every second, which are supposedly the most interesting. Naturally one may wonder and worry about whether or not some relevant data is being discarded in all the unused information [1].

Another disappointment that follows from the experimental results in the LHC is to talk formally about what it means to "see" the Higgs boson. However, this formality is far from reality. The actual fact is that you can never see the Higgs boson. The Higgs boson survives (manifests) for one ten-billionth of a trillionth of a second, which is too short to be captured directly or indirectly before its decay time [1]. Faced with this period of time, it is a great temptation to say that, if something exists for such a short time, it may be suitable to discuss whether it does not really exist at all. Or, ultimately: How can it give mass to some particles, something whose identity or manifestation lasts such a short time, under conditions that are so extremely difficult to achieve, even with all this technology and experimental research?

These two experimental details, one relating to what is ultimately recorded in this paraphernalia to capture information that is to be analyzed, and the other experimental result, that relates to something that has such a small temporary manifestation, in extreme experimental conditions, perplex anyone studying or even wanting to imagine what is really happening in the research team.

Moreover, it is a fact of experimental physics that increasing the energy of the colliding particles can produce new particles at the expense of the increased energy, with relatively large masses, where these new particles are formed with this additional energy and nothing else. It is not precisely that these new particles are emerging from nowhere, emptiness or somewhere else.

In all this confusion, it would be really sensible to find an alternative way to explain the force of inertia. In the following sections, the existence of the opposition to changing the particle's state of rest or motion (inertia), without entering into all that paraphernalia, which leaves too many questions and many things unclear, mathematically with some physical concepts restructured, the existence of the inertia phenomenon is proved.

5. Another way to explain the force of inertia

At this stage of this work, to give an alternative explanation of inertia, it is necessary and very important to restructure and flesh out some ideas and concepts of physics such as work and energy, electric field, electric pressure and the energy density. This will allow that, within a new theory about an old physical phenomenon, the inertia concept can be conclusively handled.

It is sometimes said that the most important contribution made to science by Isaac Newton was enunciating the concept of force, which was established in the so-called Newton's second law. In plain words, this law says that force is anything that can cause acceleration. This definition seems to be incomplete; defining an object by saying what it does may be useful, but does not say much about the object itself. In this paper, the definition of force is different and is related to the concept of pressure. Although pressure is defined as the force per unit area, here the starting point will be the energy rather than force. In other words, in nature and in different experimental situations, what really exists is the field, for example, the electric field surrounding an electric charge. From the field, we can say that force is what represents the action of the field on other bodies. The importance of the field can be seen in the example of a baseball bat hitting a ball. At the moment of impact the bat and the ball are deformed. However, we can say that molecules in both are not in direct contact, but that really their electromagnetic fields are mutually interacting, repelling each other. The contact, in physical reality, finally turns out to be an interaction of fields. This field is the operational base to be associated with other concepts such as the energy density concept.

To recap, the field concept is fundamental. The field is what modifies the space such that there can be some other body experiencing a force. Moreover, the concept of energy turns out to be derived from the field concept. It turns out to be invented by man; it does not exist directly in nature as a body property, instead it is constructed by man as a concept itself. What actually does exist is the field, and in the case of an electric charge, it is the electric field $\bar{E}$. The energy density associated with the field $\bar{E}$, with three degrees of freedom, is defined as [26-28]:

$$\mathbb{E}_E = 3\varepsilon_0 E^2/2 \qquad (1)$$

The 3/2 factor is because, obviously, the energy density obeys the principle of equipartition of energy. Nature or experimental conditions provide the field. Man squared the field and got what is called energy density. The custom is to define energy as that which can do work. Provided that there is a region of space with a field, we can say that there also exists an energy density, given by the above expression. How can something with the above expression perform work?

In a region where there is a field, for example, an electric field, there is also a pressure, in this case, electric pressure. The expression for the electric pressure is [26-28]:

$$\mathbb{P}_E = 3\varepsilon_0 E^2/2 \qquad (2)$$

Comparing the last two expressions, it is found that whenever there is a field, the energy density that can be built by squaring the value of the field turns out to be identical to the pressure. This conclusion explains why the energy can produce work. A pressure difference can cause a body to accelerate, to change its state of rest or movement.

For example, a charge q uniformly distributed in the volume of a non-conducting sphere with radius a, immersed in a uniform external electric field $\bar{E}_0$, is pressed and subjected to acceleration, as in Figure 1.

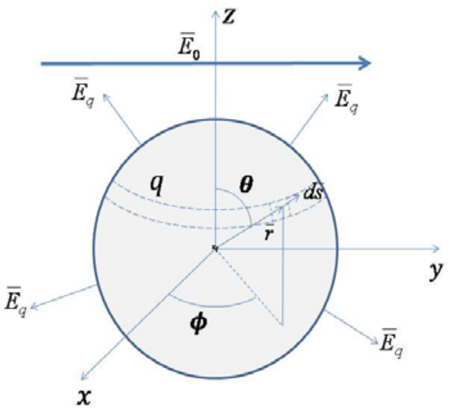

Fig 1: *An electric charge* q *is immersed in a uniform external field* $\bar{E}_0$. $\bar{E}_q = q/\left(4\pi\varepsilon a^2\right)\hat{r}$, *is the radial electric field of the charge itself.*

The radial electric field associated with the electric charge q, and added to the external field, is

$$\bar{E} = (q/4\pi\varepsilon r^2)\hat{\mathbf{r}} + E_0\hat{\mathbf{j}} \qquad (3)$$

Here $\hat{r}$ is a radial unit vector in a spherical coordinate system (r, θ, φ) concentric with the sphere, so that

$$\hat{\boldsymbol{r}} = \sin\theta\cos\phi\,\hat{\imath} + \sin\theta\sin\phi\,\hat{\jmath} + \cos\theta\,\hat{k} \qquad (4)$$

Thus, the resulting total electric field by substituting the expression (4) in (3) is

$$\bar{E} = (q/4\pi\varepsilon r^2)\sin\theta\cos\phi\,\hat{\imath} + (E_0 + (q/4\pi\varepsilon r^2)\sin\theta\sin\phi)\hat{\jmath} + (q/4\pi\varepsilon r^2)cos\theta\,\hat{k} \qquad (5)$$

It should be noted that, according to this expression, we are dealing with a problem with three degrees of freedom.

Then the square of the electric field of equation (5) becomes

$$E^2 = (q/4\pi\varepsilon r^2)^2 + E_0^2 + 2(q/4\pi\varepsilon r^2)E_0 sin\theta\sin\phi \qquad (6)$$

The electrical pressure can be expressed as

$$\mathbb{P}_E = 3\varepsilon/2[(q/4\pi\varepsilon r^2)^2 + E_0^2 + 2(q/4\pi\varepsilon r^2)E_0 sin\theta\sin\phi] \qquad (7)$$

Due to the configuration of the charge radial field, added to the external field $\bar{E}_0$, according to Coulomb's law, the charge tends to move in the direction of the external field, $\hat{\jmath}$. Note that on the right hand side of the charge in Figure 1, the electric field and the resulting pressure are of greater magnitude than on the diametrically opposite side. That is, the charge accelerates to where the pressure is greater, to the positive side of the y axis, in the direction of the unit vector $\hat{\jmath}$ (Figure 1). Therefore, the pressure is greater to where the charge speeds up. An unexpected result is that the electrical pressure is a suction pressure, since the charge accelerates towards the high pressure regions.

Pressure values in the $\hat{\jmath}$ direction and in the direction - $\hat{\jmath}$, that is, the front and back of the charge for different values of r in diametrically opposite points (r, π / 2, π / 2) and (r, π / 2, -π / 2) of Figure 1, are respectively:

$$\mathbb{P}_E = 3\varepsilon/2[(q/4\pi\varepsilon r^2)^2 + E_0^2 + 2(q/4\pi\varepsilon r^2)E_0] \qquad (8)$$

$$\mathbb{P}_E = 3\varepsilon/2[(q/4\pi\varepsilon r^2)^2 + E_0^2 - 2(q/4\pi\varepsilon r^2)E_0] \qquad (9)$$

The charge acceleration occurs due to the pressure difference between the front and rear of the charge distribution. If the pressure were the same in these two directions, the electric charge would not be accelerated. The resulting acceleration is proportional to the pressure difference.

In Figure 2 the pressure profiles, outlined, are shown schematically.

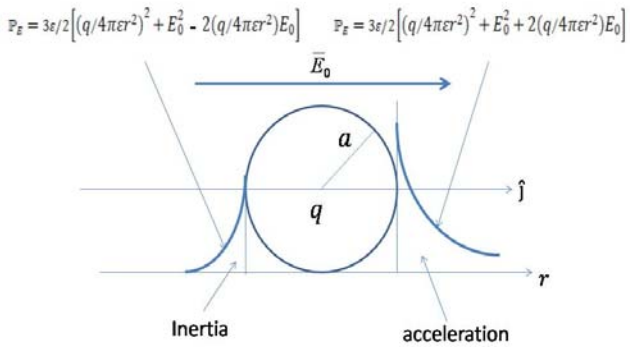

Fig 2: *An electric charge q immersed in a uniform external electric field* $\bar{E}_0$. *The charge radial electric field is not shown. The pressure profiles are just outlined for clarity. The profile parts that are involved in the inertial force and also the part that corresponds to the acceleration are indicated.*

You can see that to accelerate a body, the external field alone is not enough; the body itself must have its own field. Also, if you only have the radial field of the charge itself, i.e., if $\bar{E}_0 = 0$, the pressure difference is not generated at all. There should be the contribution of the two fields, and only then is the acceleration generated. A strong conclusion is the fact that there is always a pressure in the back, with respect to the movement, which implies that this pressure must be overcome to obtain acceleration. In theory, this represents the inertial force: the pressure in the back is in opposition to the free acceleration of a body.

By integrating the pressure over the entire surface of the sphere, we always have the force that accelerates the force of Coulomb's law and this is obtained as [27, 28]:

$$\bar{F} = q\bar{E}_0 \qquad (10)$$

Calculating the total force on the charged particle, the distinction between opposition and acceleration is lost [27], [28]. However, as it was shown, through the concept of pressure the opposition against acceleration always appears, i.e., the inertia effect becomes evident.

6. The effect due to the velocity of the charged particle

To the scenario discussed above is now added the fact that the particle travels at a speed$\bar{v}$, and therefore its electric field is now no longer uniformly radial. At high speeds with respect to that of light, the electric field increases transversely while being diluted forwards and backwards, relative to the direction of the velocity [28-31].

Suppose $\bar{v} = v\hat{j}$. Then the radial own electric field of the charge is [28-31]

$$\bar{E} = \left[(q/4\pi\epsilon r^2)\gamma/(sin^2\theta cos^2\phi + \gamma^2 sin^2\theta sin^2\phi + cos^2\theta)^{3/2}\right]\hat{r} \qquad (11)$$

where$\gamma = 1/\sqrt{1 - \frac{v^2}{c^2}}$.

In Equation (11) it is not difficult to see that when $v = 0$, the field is that of a charge q at rest. Substituting equation (4) in (11) and adding this to the external field $\overline{E_0} = E_0\hat{j}$, the resulting field is the total electric field on the non-conductive charged sphere of radius a, moving with velocity $\bar{v}$

$$\bar{E} = \left[(q/4\pi\epsilon r^2)\,\gamma\, sin\theta\, cos\phi \,/(sin^2\theta\, cos^2\phi + \gamma^2 sin^2\theta\, sin^2\phi + cos^2\theta)^{3/2}\right]\hat{\imath} + \left[(q/4\pi\epsilon r^2)\,\gamma\, sin\theta\, sin\phi \,/(sin^2\theta\, cos^2\phi + \gamma^2 sin^2\theta\, sin^2\phi + cos^2\theta)^{3/2} + E_0\right]\hat{\jmath} + \left[(q/4\pi\epsilon r^2)\,\gamma\, cos\theta/(sin^2\theta\, cos^2\phi + \gamma^2 sin^2\theta\, sin^2\phi + cos^2\theta)^{3/2}\right]\hat{k} \qquad (12)$$

Squaring this expression, the electric pressure according to Equation (2) is obtained as

$$\mathbb{P}_E = \frac{3\epsilon}{2}[E_0^2 + (q/4\pi\epsilon r^2)^2\gamma^2/(sin^2\theta\, cos^2\phi + \gamma^2 sin^2\theta\, sin^2\phi + cos^2\theta)^3 + 2(q/4\pi\epsilon r^2)E_0\, \gamma sin\theta sin\phi/(sin^2\theta\, cos^2\phi + \gamma^2 sin^2\theta\, sin^2\phi + cos^2\theta)^{3/2} \qquad (13)$$

At this point, I must make two observations: first, with regard to pressure, the expressions of Equation (13) are in diametrically opposite points $(r, \pi/2, \pi/2)$and$(r, \pi/2, 3\pi/2)$, the front and rear of movement, i.e.

$$\mathbb{P}_E = \frac{3\epsilon}{2}[E_0^2 + (q/4\pi\epsilon r^2)^2/\gamma^4 + 2\left(\frac{q}{4\pi\epsilon r^2}\right)E_0/\gamma^2] \qquad (14)$$

And

$$\mathbb{P}_E = \frac{3\epsilon}{2}[E_0^2 + (q/4\pi\epsilon r^2)^2/\gamma^4 - 2\left(\frac{q}{4\pi\epsilon r^2}\right)E_0/\gamma^2] \qquad (15)$$

Respectively, these differ by an amount

$$\Delta\mathbb{P}_E = \frac{3\epsilon}{2}[4(q/4\pi\varepsilon r^2)E_0/\gamma^2] \qquad (16)$$

At this angle, besides others, this pressure difference is part of that speeding up the charged particle. There is always the back pressure of Expression (15) representing the inertial force. At very high speed compared to that of light, γ in Equation (16) maintains this relatively small differential pressure between the right and left hemispheres; in fact, it will be equal to zero in the limit $v = c$. However and even shortly before this limit, the pressure that is opposed to the free acceleration, expression (15) is maintained, commonly known as inertial force.

A second observation related to the dynamics is as follows: According to Equation (16), when the electric field of the moving charge, in the direction of its velocity, is reduced and also on the back side, the amount of external field required to produce the same pressure gradient would have to be increased, and also γ increases with speed, so it is much more difficult to accelerate the particle in this speed limit. This represents the effect of increased mass, with the enhanced speed, in the theory of relativity. It is significantly clear in this theory that this effect is not a real increase in mass but specifically it becomes more difficult to continue to accelerate the particle, due to a reduction in the values of the total field forward and at the back of the moving particle.

7. Conclusions

After an insightful analysis, a questionable problem involving the possibility that both the Higgs boson and the Higgs mechanism would have some kind of power to give mass to some but not all particles of the standard model is to some extent established. The arguments of some researchers on this issue to explain this possibility are greatly entangled and too complicated. The Higgs mechanism, at the very least, seems very intricate for selectively providing mass to only a part of the fundamental particles. The existence of a kind of universal molasses, which hinders at low speed the acceleration of some particles of the Standard Model, and at high speed is virtually inoffensive, completely contradicts Newton's first law (does not exist that kind of friction) and Albert Einstein's theory of relativity (that there does not exist an absolute reference system. Mass enhances as speed increases). If the interaction of the particle with the Higgs field were speed-dependent, i.e., intense at low speed and mild at high speed, this would imply the existence of an absolute reference frame that would be the molasses or the Higgs field itself. This contradicts the theory of relativity.

In this work, using part of the established physics, starting at the concept of pressure and energy density; that the property known as the mass of particles, has to do mostly with the field concept, has been proven mathematically. From the first principles, the energy density and pressure are concepts derived from the field. After this, the field happens to be the fundamental concept in nature, not precisely the mass. This is a new theory about the phenomenon of inertial force and ultimately an explanation of the mass of particles. In this theory, mass turns out not to be another property of matter but a manifestation and interpretation of a particle's own field interacting with an external field, even when this field belongs to another particle. In other words, instead of something which gives or provides mass to some fundamental particles, the inertia that appears when trying to accelerate a body is the product of the superposition of fields. You can accelerate a body possessing its own field only by applying another external field. To accelerate a body you need to capture it with something, and this something is just another field.

In conclusion, the fundamental part of all this is the field. The mass, energy and particularly the pressure are concepts derived from the configuration of the field itself.

Furthermore, you can see that in this whole procedure it was not necessary to introduce the action of a mediator in the particle interaction. In the case of the mediator boson, after that, it would be necessary explain the interaction between a force-carrying boson and the particle itself. This complicates the explanation of the simple interaction between elemental particles.

Yet this analysis is not intended to establish a universal thesis. Its purpose is only to put it on the table for discussion.

8. Acknowledgements

The work was carried out with the support of SNI-CONACyT, Mexico, through Grant No. 10793

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