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Hierarchies of Higgs Field and Theoretical Calculation of Higgs Particle Mass

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Abstract

A concept of isotime spin for Higgs particle and fermions is proposed in this paper. The Higgs field may be the time field, and the electroweak phase transition corresponds to the time phase transition. By describing the self-similar transformation process of the time phase transition, it is proved that the structural details of the time phase transition fully meet the requirements of the Higgs mechanism. Theoretical formulas of the Higgs mass, the mass and isotime spins of fermions are derived. The exact critical temperature of the electroweak phase transition is calculated, by using the solution for critical point and the experimental value of the Higgs particle mass. We discuss the behavior of the free Higgs particle and the saturation state of the time field containing I-bosons, point out that there is no parallel universes because weak force destroys the self-similar transformation of the time field, and the probability of the time field energy as a type of dark energy.

Keywords: higgs, hierarchies, isotime spin, phase transition, mass

1. Introduction

In 2012, two international cooperative experimental organizations, ATLAS and CMS, announced that they had found some evidence of the existence of the Higgs particle (ATLAS 2012; CMS 2012), and confirmed that the Higgs field objectively exists. Considering that fact, why are we even talking about the Higgs field? A serious question faced by researchers is whether the Higgs field is something mysterious like the aether in the late 19th and early 20th centuries, or whether it is an objective field of matter as part of the 4-dimensional spacetime. We have always believed that the spacetime composed of configuration space and time provides the basic framework for the physical world, in which all things arise and all things show. The electroweak phase transition occurs in the spacetime, and the Higgs mechanism also should exist in it. The only phase transition relating to coordinate variables is the time phase transition, and the details of the transition process of the time field basically are consistent with the Higgs mechanism, hence we have reason to think that the time field may be the Higgs field (Yougang 2016; Yougang 2017).

An obvious difference between time and other coordinate parameters is that the resultant vector of two vectors in the configuration space remains in the space, however, we cannot add any vector in the space to a time vector because their units of measure are not the same. This shows a special metric nature of time. The unit of length can be uniformly defined in the space, only because their directions are different. As a result, they constitute the 3-dimensional metric space. Although it is possible to define a length for time—time interval on a time axis, the unit of time length is different from the unit of space length. This means that time exists as a separate dimension with a different dimensional unit. Time t only relates to the space by velocity v, vt has the length unit of the space, which we have in the relativity

$$(\Delta x)^2+(\Delta y)^2+(\Delta z)^2=c^2(\Delta t)^2 \tag{1}$$

Where Δx, Δy, and Δz are displacement components, Δt is time interval, c is speed of light. In quantum field theory, it is not t, but ct that coexists as a separate independent coordinate variable with x, y, and z because they have uniform length units. In most cases $ct=t$ in natural units, which has the unit of length of space instead of the time. The Higgs field may be the time field, which may be considered a vector field. The time field, however, is mistaken for a scalar field in the space owing to the incompatibility of measurement units.

We have proposed the concept of electroweak equivalence (Yougang 2022), which occurs in the state of global time disorder, while the unity of the electroweak cannot perform. When the overall time becomes ordered, the electroweak equivalence ends and the electroweak unification begins. In this sense, the time phase transition corresponds to the electroweak phase transition. In addition to continuing to insist that the Higgs field may be the time field, this paper will revise and enrich the original statement with new content. In section 2, the lattice-Ising model with the isotime spin first is described, and the phase transition process of the time field with simple cubic structure is interpreted in detail. Then, the time phase transition process and the Higgs mechanism are compared term by term. The theoretical and the experimental values of the Higgs particle mass are compared, and the critical temperature of the electroweak phase transition is obtained with high accuracy. Application and discussion in section 3, it involves fermions, such as electron, positron, and neutrino, the mass calculation formula, the isotime spins of these particles, free Higgs particle behavior, photon isotime spin, I-boson of time field, the time field saturation state, and the time field energy referring to a type of dark energy. In the end, we predict a probability that there are no parallel universes. Section4 is conclusion.

2. Theory

2.1 Time Lattice-Ising Model

The basic idea of lattice quantum chromodynamics was introduced by K. Wilson (Wilson 1974), based on large-scale Monte-Carlo numerical calculation. The lattice field theory is very similar to the continuous phase transition of the lattice system: Many physical quantities, such as thermal capacity and susceptibility will diverge at the critical temperature, which is equivalent to the ultraviolet divergence in quantum field theory. This means the continuum limit of the quantum field theory and the critical phenomena are different language descriptions of the same process. The lattice-Ising model is the most representative example of the continuous phase transition theory, by that we can study theoretical problems in the quantum field. With this in mind, it is necessary to describe the model here.

It is well known that an electron generally has three spin components s_x, s_y, and s_z, obeying Dirac equation. A particular example, however, is the lattice-Ising model of ferromagnet, where the electrons spins only have one component s_z in its eigenvalue state. Let the location wave functions of the two nearest electrons in the model be $\Psi_1(\vec{r}_1)$ and $\Psi_2(\vec{r}_2)$, respectively; $\vec{r}_1$ and $\vec{r}_2$ be position vectors, and the absolute value $|\vec{r}_1-\vec{r}_2|$ is the nearest distance of the two electrons. The wave function of the electron with s_z on the $\vec{r}_1$ is $\Psi_1(\vec{r}_1)\varphi_1(s_z)$, where $\varphi_1(s_z)$ is the eigenfunction of the electron spin; the wave function of the electron with s_z on the $\vec{r}_2$ is $\Psi_2(\vec{r}_2)\varphi_2(s_z)$, the $\varphi_2(s_z)$ is the eigenfunction of the spins. The parallel-spins coupling energy is $-js_z^2<0$, the antiparallel-spins coupling energy is $js_z^2>0$. s_z is the eigenvalue of the spin, and $s_z=\pm 1$. j is a coupling constant (exchange integral), its definition is (Landau *et al.*, 1977)

$$j=\iint U(\vec{r}_1-\vec{r}_2)\Psi_1(\vec{r}_1)\Psi_1^*(\vec{r}_2)\Psi_2(\vec{r}_2)\Psi_2^*(\vec{r}_1)dv_1dv_2 \tag{2}$$

Where dv_1 and dv_2 are volume differentials, $U(\vec{r}_1-\vec{r}_2)$ is the interaction potential between the two electrons relating to their charges and the nearest distance, the charges and the distance are constant so that the potential is a constant, resulting in that j is constant. Obviously, j is independent of the spins. The wave functions are universal to the electrons in the lattice because the lattice system has a regular crystal structure with a definite lattice constant and a definite periodicity. The lattice-Ising model of the same lattice structure with different materials has the same critical point $K_c=j/(k_BT_c)$, where k_B is Boltzmann constant, T_c is critical temperature associated with the property of the actual material. If the critical temperature is given by the experiment, j can be obtained by the theoretical data of the critical point. As we will see in the section 2.3, j is the mass of the Higgs particle in the time lattice-Ising model.

In the following, we will propose the time field by means of lattice-Ising model to study the nature of Higgs field. Suppose each Higgs particle has no a conventional spin, and only has the isotime spin, which axis is parallel to the time axis, where the direction of the isotime spin $S_+ = 1$ is consistent with the positive direction of time, and the direction of the isotime spin $\mathrm{S}_- = -1$ is along with the opposite direction of time (in the following, the spin represents isotime spin, unless otherwise stated). Clearly, the isotime spin is one-dimensional being the same as the s_z. Each space lattice position allows one Higgs particle with a definite spin, showing the basic property of metric space in that two distinguishable nearest neighbor lattice points (particles) have independent domains that do not intersect each other. The equation (2) for definition of coupling constant is also applicable to the Higgs particles, the $U(\vec{r}_1 - \vec{r}_2)$ must have the following functions: 1. It cannot allow two Higgs particles to be in the same position, otherwise it will make j be zero. 2. It must ensure the absolute values of the spins coupling energy of all the two nearest particles are the same, i.e., j must be constant. The $U(\vec{r}_1 - \vec{r}_2)$ can be written as $U(\vec{r}_1 - \vec{r}_2) = C[1 - \delta(\vec{r}_1 - \vec{r}_2)]$, where C is a constant, and $\delta(\vec{r}_1 - \vec{r}_2) = 1$, if $\vec{r}_1 = \vec{r}_2$; $\delta(\vec{r}_1 - \vec{r}_2) = o$, if $\vec{r}_1 \neq \vec{r}_2$. The form of $U(\vec{r}_1 - \vec{r}_2)$ is also applicable to the ferromagnetic phase transitions, where the $U(\vec{r}_1 - \vec{r}_2)$ also is a constant.

For the time field, the parallel-spins coupling energy is $-jS^2 < 0$, the antiparallel-spin coupling energy is $jS^2 > 0$, where $S^2 = S_+^2 = S_-^2 = 1$. The Higgs particle's mass depends on the coupling energy, both mass and spin are constant, hence j must be constant. In the early days of the Big Bang, the universe is extremely hot and in a thermodynamic equilibrium state (Weinberg 1993), meanwhile time has both positive and negative directions by the detailed balancing principle. When the temperature drops to the critical temperature, the time phase transition takes place and the positive direction of time dominates. The system's energy state mainly is determined by the antiparallel spins coupling before the phase transition, it is a higher energy state with SU(2) symmetry of the spins. A lower energy state of the system is governed by the parallel coupling of spins, which only occurs after the phase transition, while the SU(2) symmetry of spins is spontaneously broken. These two energy states accord with the characteristics of spontaneous symmetry breaking of the Higgs mechanism.

As the conservation of momentum, space must be uniform and suitable for a simply cubic structure. The property of positive and negative directions of time shows SU(2) symmetry. Only consideration of the nearest effect indicates that the time field conform with the lattice-Ising model. The time field phase transition is required to make time uniform, resulting in the law of conservation of energy by Noether theorem. The self-similar transformation embodies the principle of maximum entropy in thermodynamic equilibrium state (Yougang 2018).

By using the unified theory and method, the exact solution for the critical points of 2-dimensional and 3-dimensional lattice-Ising models were obtained, and the cause of the critical fluctuations were revealed (You-Gang 2014). The lattice with the conventional spins in these models all were electrons, including a 2-dimensional triangle lattice, a square lattice, and a hexagonal lattice; a 3-dimenssional regular tetrahedral lattice and a simply cubic lattice. If you replace the electron with the conventional spin by the Higgs particle having the isotime spin, the theoretical result (critical point) should be the same. In the time field, however, its lattice structure only can be applied to the simple cube structure. In order to show preferably the time field may be the Higgs field, it is necessary to describe briefly the basic structure and the phase transition process of the lattic-Ising model in the simply cubic frame. For details, please read the reference (You-Gang 2014).

The important feature of the self-similar transformation is to form a local ordered structures system with the same symmetry as the original lattice system, and then to achieve the overall order of the system through hierarchical transformations. This is a renormalization process of the infinite system, which completes the spontaneous time's symmetry breaking. There are two types of lattice system in the model: a pure geometric lattice system without spins and a lattice system occupied by Higgs particles with the spins. The transformations of the two types of systems are topological isomorphism. A system of the infinite simple cubic lattice can be separated into an infinite number of small cubic lattice structures with finite sizes. Each of such structure is called block. According to topological classification, the simple cubic structure is a complex (multiply connected domain), which cannot directly become ordered (simply connected domain). If a block is to be ordered, it must be a combination of several ordered simplex structures (simply connected domains). Without consideration of the topological connectivity of these structures, a block geometrically can decomposed into four identical sub-blocks. See figure, a block is a simple cube of side length $n=7$, containing $(n+1)^3=512$ lattices. Note that $n=7$ in the figure is just a schematic example, the reference gives the specific value of n at the critical point (You-Gang 2014). Since only nearest interaction is considered, a sub-block is viewed as a simplex.

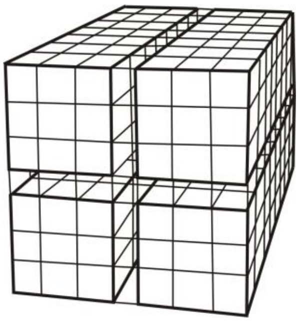

Figure 1. A block of side length *n*=7 contains four identical sub-blocks

If we consider that the sub-block and the block are both ordered structures—single connecting domains, the block spin (note that it is not the block) corresponding to the geometric block is not an arithmetic superposition of the four sub-block spins. According to the property of topologically connected spaces, the space of a simply connected block should be the product of the carrying spaces of the four simply connected sub-blocks. The phase transition of the whole system carries out through the self-similar transformation, which has hierarchical characteristics: On the first hierarchy, there are only the original lattice spins—Higgs particles. On the second hierarchy, some the original spins first form a sub-block spin, and the geometric space bearing it is a sub-block with a fractal structure. Every four sub-block spins further form a block spin, and there are an infinite number of the block spins on this hierarchy. The block spin system has the symmetry of lattice spin system on the first hierarchy, showing the self-similarity. On the third hierarchy, according to the scale invariance rule, each block spin formed on the second hierarchy is redefined as a new lattice spin, and then the transformation taken place on the second hierarchy is repeated on this hierarchy (the third hierarchy), namely, the new sub-block spins first are formed, and then a new block spin system is constructed by these new sub-block spins. With the same reason, on the 4-th hierarchy, on the 5-th hierarchy, ..., on the n-th hierarchy the self-similar transformation will take place. For a system with infinite original lattice spins, $n\to\infty$, through infinitely hierarchical transformations the whole system finally become a block spin, the system is overall order.

2.2 Comparison Between Time Phase Transition and Higgs Mechanism

In order to explain clearly the equivalence between the structural details of the time phase transition and the Higgs mechanism, we will take the comparison term by term. By the comparison, we can realize that the structural details of the phase transition fully meet the requirements of the Higgs mechanism. As follows, the Higgs mechanism is described in italics, while the time phase transition is described in plant font.

Weinberg and Salam discovered (Weinberg 1967; Salam 1979): *four scalar fields need to be added to the electroweak theory, three of which are consumed in the process of given to the* W^+*,* W^-*, and* Z^0 *particles. The remaining scalar field, which behaves as a physical particle, is the Higgs particle.* A sub-block spin is an ordered structure, can topologically shrink to a point maintaining the magnitude and direction of the sub-block spin. Therefore, from the perspective of the configuration space it is a massless scalar boson because the vector property of the isotime spin cannot show in the space. See the figure, four sub-blocks compose a block, and we can consider each sub-block spin a Nambu-Goldstone boson. The two sub-block spins are 'eaten' by particles W^+ and W^-, respectively, the remaining two sub-block spins are first linearly superimposed, and then ‘eaten’ by particle Z^0. Although the phagocysis phenomenon locally occurs and most sub-block spins still exist, the overall symmetry of the block spins has not demonstrated, which results in that the self-similar transformation cannot perform further. As a result, there is only the original lattice spins on the first hierarchy, they are the Higgs particles.

The Higgs field contains four degree of freedom, three of which become longitudinal polarization degrees of freedom of weak gauge bosons through the mechanism of eating Nambu-Goldstone bosons after spontaneous symmetry breaking. The sub-block spins along the t-axis fluctuate with the elementary excitation (You-Gang 2014), namely, there is no polarization component parallel or perpendicular to the propagation direction of the elementary-excitation wave in space. From the perspective of space, the wave appears to be a longitudinal wave. Obviously, this wave is completely different from electromagnetic wave, which behaves as a transverse wave without polarization component in the t-axis direction and only has the components perpendicular to the wave traveling directions in the space.

The sub-block spins and the block spins on the second hierarchy are the products of the self-similar transformation, but the transformation cannot sequentially carry out owing to the phagocytosis of gauge bosons. Nevertheless, the time phase transition will achieve global order through another way, which is discussed in section 3.3.

Sub-blocks are very limited in size (You-Gang 2014), and the process in which they are eaten by the gauge bosons is local, hence the weak interaction is a short-range force.

2.3 Mass Formula of Higgs Particle

It is thought that the Higgs particle mass cannot theoretically be calculated, because it is unknown what is the field. After its nature is revealed, the theoretical value of the particle mass can be obtained through the theory of phase transition for the time field. The mass of the particle can be obtained by the coupling with the nearest Higgs particle. How can mass be determined from the coupling energy? To understand this problem, it is necessary to state the concept of primitive cell for solid-state physics. Let the distance between the nearest lattices be 1, and the simple cube with side length 1 is the least repetitive unit, that is called the solid-state physics primitive cell. Each cell only contains one particle, since each particle is shared by eight nearest cells , and only one-eighth of a cell is contributed. A primitive cell has eight particles at its apex, and the total contribution of these eight particles to the cell exactly is one. The volume of a cell is the space occupied by a particle. According to this rule, and note that a Higgs particle acquires mass by coupling with its nearest Higgs particle with the energy jSS, which is just the Higgs mass m_H, and $m_H = jS_+S_+ = jS_-S_- = j$ because $S = S_+ = -S_- = 1$.

The critical point K_c of the lattice-Ising model of the simple cube is written as

$$K_c = j/(k_B T_c) \tag{3}$$

Where Boltzmann constant $k_B = 8.617\times10^{-5} eV/K$, T_c is the critical temperature of the phase transition. The theoretical exact value is $K_c = 0.2150$ (You-Gang 2014). Then, we have

$$m_H = j = (1.8527\times10^{-5} eV/K)T_c \tag{4}$$

Equation (4) is the theoretical expression for the Higgs particle mass. In his book, “The First Three Minutes”, Weinberg particularly pointed that it was Kirzhnits and Linde who calculated the phase transition temperature, which was about $3\times10^{15} K$, by using the gauge field theory (Weinberg 1993). Substituting this temperature into equation (4) gives the theoretical value of the Higgs particle mass

$$m_H = 55.58 GeV \tag{5}$$

Obviously, this value is far less than the experimental mean value $125.2 GeV$. If this experimental value is substituted into equation (4), the exact critical temperature is

$$T_c = 6.758\times10^{15}K \tag{6}$$

The two previous critical temperatures have the same order of magnitude. We expect that the gauge theory will give more accurate value of the critical temperature. At temperatures above the critical temperature, as Weinberg pointed out, the weak interactions obeyed the same sort of inverse-square law as the electromagnetic interactions, and had about the same strength, i.e., electroweak unification (Weinberg 1993).

In the following section, we can analogously discuss the calculation of the isotime spins and the mass of other fermions.

3. Application and Discussion

3.1 Isotime Spins and Mass for Fermions

Static energy is the most basic energy of matter. The fermion mass never changes because of the parallel coupling of spins between the fermion and the Higgs particle.

Although it has long been known that an electron has mass, how does it get mass?

The importance of this question is the same as the importance of asking how the gauge boson gets its mass. The main consideration of the gauge field relates to the local SU(2) symmetry, the mass question historically aims at the emergence of new three gauge bosons W^+, W^-, and Z^0. The mass of electron and the mass of neutrino are not investigated because the two particles have mass before the field equation is proposed. This shows that the channel through which fermion obtains mass has nothing to do with the gauge field, but only with the Higgs mechanism. To say the least, if we don't know the mass of electron beforehand, then the source of the mass of electron and the source of the mass of neutrino are the same problem. If we think of an electron as gaining mass by coupling to the Higgs particle, a neutrino in the same equation that coexists with the electron can also gain mass by coupling to the Higgs particle. We assume, therefore, that all fermions have their own isotime spins, and they acquire mass in the same way: There is one Higgs particle at each lattice in the space, a fermino can get mass by coupling with its nearest Higgs particle. This means wherever the fermion is, its mass is stable. A particle only has parallel coupling with the Higgs particle of S_+, an antiparticle only has parallel coupling with the Higgs particle of S_-. The spins of the particle and its antiparticle are equal in value and opposite in direction.

The definition of the coupling constant also applies to other particles. By the definition, a particle cannot gain mass from the Higgs particle which is in the same position as it is, but can gain mass by coupling with the nearest Higgs particle.

Let an electron's isotime spin be S_e and mass be m_e,

$$m_e = jS_+S_e \tag{7}$$

Taking $m_e = 0.51MeV$ and $jS_+ = 125.2GeV$ into equation (7) becomes

$$S_e = 4.1\times10^{-6} \tag{8}$$

With the same reason, for positron, its mass m_p and isotime spin S_p are

$$m_p = jS_-S_p = jS_+S_e = m_e \tag{9}$$

$$S_p = -S_e = -4.1\times10^{-6} \tag{10}$$

Similarly, the neutrino mass $m_n = 3eV$, its isotime spin is S_n and

$$S_n = 2.4\times10^{-11} \tag{11}$$

Generally, the isotime spin S_f of a fermion with mass m_f is represented as

$$S_f = m_f/(125.2\times10^9) \tag{12}$$

An antiparticle gains a positive mass, its nearest neighbors must all be spin-down Higgs particles. However, the spin of the Higgs particle, which is the closest neighbor of the Higgs (and the second nearest neighbor of the antiparticle), may be upwards. Thus, the antiparticle coupling with the spins of these Higgs particles will result in a locally high energy and an unstable energy state. Only when the antiparticle and the particle annihilate in time, and most of the spins of the Higgs particles in the local positions are in the parallel coupling state, can the low energy state reach. Because of this, the antiparticles are short-lived.

3.2 Free Higgs Particle

The coordinates of a Higgs particle are three dimensions, and its spin is along the time axis, hence it is a four-dimensional particle. When it is expelled from its original location the particle is unable to find a new place to live, because there are already the Higgs particles in other locations. We guess that it may flashily decay into other particles such as a pair of photons. As a result, there is no such thing as a long-lived free Higgs particle. If a free Higgs particle decays into a pair of photons, from the perspective of spin conservation, it is impossible for these photons to have the isotime spins, only the conventional spins with opposite direction each other. Because of this, photon has no mass. The two photons may combine into a Higgs particle and occupy the original position of the free Higgs particle. It follows that the free Higgs particle loses its isotime spin owing to decaying until the particle gets the spin again when a pair of photons form a new Higgs particle.

3.3 I -boson and Time Saturation State

As long as some sub-block spins are ‘eaten’, even though there may be sub-block spins are not ‘eaten’ in other places, the self-similar transformation of the whole system will have been destroyed because the overall structural symmetry will not be there. Under the mechanism of spontaneous symmetry breaking, the system has to find another path to the phase transition, i.e., the long-range correlation of spin states of the whole system, Landau first proposed this model in the theory of ferromagnet phase transition (Landau *et al*., 1980). For a lattice-Ising model with definite structure, its critical point and critical temperature will not change with the transition way, no matter which mode comes true. If there are no external interference the system will preferentially choose the self-similar transformation, because this mode can maintain the maximum thermodynamic entropy of the system (Yougang 2018). We emphasize here again that the phase transition for time field is exactly the same as those in the ferromagnets. Because this reason, according to the reference (You-Gang 2014), there exists an elementary excitation in the time field, and the existential wave is similar to spin wave in a ferromagnet, we call the relevant boson I-boson, in remember of Ising. At low temperature, I-bosons occur Bose-Einstein condensation and the time field is in a saturation state. Because of quantum fluctuation, there are only a handful of the Higgs particles in the state of the reverse time, while there is little chance of the antiparticles. This overall time saturation state makes the time field uniform and the law of conservation of energy applies to a wide range.

3.4 No Parallel Universes

On the second hierarchy of self-similar transformation, the block system has exactly the same symmetry as the original lattice system—the Higgs particle system on the first hierarchy, showing a overall symmetry, without the hierarchies there is no self-similar transformation. Hence, any absence of individual blocks will break the self-similar transformation.

What will happen if there is a self-similar transformation of the time field? Before the infinite hierarchy of self-similar transformation is reached, as long as the number of the hierarchies passed through the transformation is extremely large, there will be an infinite number of blocks with enormous size, each block is equivalent to a small universe, one of which is our world, namely, there are infinite parallel universes (Evertt, 1957). Moreover, according to the self-similar transformation rule, there are the both block spins parallel to the positive direction of time and the block spins parallel to the opposite direction of time, the latter correspond to antimatter universes. Such a mythical event, however, has not occurred! It is the weak force that destroys the self-similar transformation of the time field to guarantee the original lattice system structure and maintain the uniformity and unity of the spacetime. In this sense, the weak force is a manifestation of the spacetime property.

3.5 Dark Energy

The Big Bang released energy, and then there exists time because of the duality of energy and time. The time field is an inevitable product of the Big Bang. The interaction (coupling) of the isotime spins between the Higgs particles maintains the framework of three-dimensional space. Since the isotime spin cannot be recognized in the space, the energy of the time field is a type of dark energy (Hawking 2001). There are Higgs particles with small energy at all coordinate points of the space, but the universal nature of the time field makes the entire field extremely powerful. The fermions gain mass by interaction with the Higgs particles, but they do not exist at all coordinate points and have much less energy than the time field. In addition, there is an elementary excitation in the time field, the corresponding I-bosons also have energy, which cannot show in the space. The isotime spin of a fermion cannot be shown in space, its coupling energy can be detected in the form of mass because the fermion can be in the interaction with gauge forces. In contrast, the Higgs particle doesn't take part in the action with any gauge force and cannot show its property in the space.

4. Conclusion

The time field may be the Higgs field, the time phase transition associates with the electroweak phase transition. The structural details in the process of the time phase transition fully meet the requirements of the Higgs mechanism. The mass of the Higgs particle and the isotime spins of the fermions can be calculated theoretically. The saturation state of the time field makes the law of conservation of energy be in a large range. The parallel universes are impossible because of the weak force. We may say that it is the Higgs particles that construct a uniform four-dimensional spacetime in which momentum and energy are in the conservation states, providing the background for other particles and fields.

The exact theoretical value of the Higgs particle's mass is determined by two factors: the exact value of the critical point and the exact value of the critical temperature, the former has been provided by the latti-Ising model, the latter is dependent on the calculation by means of the gauge field theory, which is a more difficult task. So far, no significant progress has been reported in this field. We believe that this problem will eventually be overcome.

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