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Beyond Standard Model: neutrino dipoles and proto hydrogen bundles.

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Abstract

In our composite models of elementary particles as consisting of just two types of elementary basic charges, +e/3 and -e/3, the axial electric potential of any elementary particle is a function of a distance from the particle, and this function differs from the Coulomb potential of a point total charge of the particle. The electric potential of neutrinos is not zero at close distances from neutrinos. Neutrinos can form dipoles and bundles of 3 or more neutrinos. The three-neutrino bundle (a proto-hydrogen) can be converted to a hydrogen atom. As we suggested in our previous paper [4], the total numbers of basic charges of each of the two types are conserved in any nuclear reaction or conversion. That means that the basic elementary charges that are present in the reactants can join in different combinations to form the products of the reaction. In this paper, we consider the neutrino-antineutrino pairs and compositions of three neutrinos as proto-baryons and a possible origin of an electron-positron pair. We also suggest that a neutrino can "glue" two electrons to form an electron-electron pair.

Introduction

In [1-3], we suggested that the "elementary" particles, such as quarks, an electron, and neutrinos are spinning composite structures each made of several basic elementary particles with fractional charges +e/3 and -e/3. These basic elementary particles have charge and mass properties but do not have any other intrinsic properties such as spin or magnetic moment. The mass of the basic elementary particle of charge e/3 was calculated [1] to be about 1/6 of the electron rest mass. We considered composite structures with up to three elementary basic charges being on the axis of rotation and several basic particles revolving about the axis. All the composite structures in our models of elementary particles are composed similarly, so we conclude that the quarks and leptons belong to the same family of simple composite particles made of the basic +-e/3 charges and that they interact with each other via EM interaction.

The form factors of these structures were calculated [3] from the condition that the net electrostatic force on each charge located on the axis of rotation must be zero. In the list of possible spinning structures, we suggested three models of particles with a zero total charge. Two of them we called neutrinos ν_2 and ν_3. A neutral particle ν_2 is composed of two +e/3 basic charges on the axis of rotation and two -e/3 basic charges revolving about the axis, and a neutral particle ν_3 is composed of three -e/3 basic charges on the axis of rotation and three revolving +e/3 basic charges. In terms of numbers of positive and negative basic charges in the structures, ν_2 neutrino and its antiparticle $\bar{\nu}_2$ have the same $\binom{+2}{-2}$ composition and differ from each other in what basic particles (negative or positive) are on the axis of rotation. But ν_2 and $\bar{\nu}_2$ are different particles because of the different sign of the basic charges revolving about the axis. The spins of these particles are the same, but their magnetic moments point in the opposite direction to its spin in ν_2 and in the same direction to its spin in $\bar{\nu}_2$. The same can be said about $\bar{\nu}_3$ and ν_3 , both having the composition $\binom{+3}{-3}$.

One more neutral particle in our models [1] consists of a +e/3 and a -e/3 basic charges attracted to each other by an electrostatic force and spinning about each other. However, unlike ν_2 and ν_3, its magnetic moment is zero and its near-field axial electric potentials is zero, too. Hence, it can be assumed that this neutral particle does not interact electromagnetically with any other composite particles including particles of the same type. This neutral composite particle has a spin, but it might behave as not a fermion but as a boson.

In [4], we suggested that for "elementary" particles such as quarks and leptons being spinning composite structures made of basic elementary +-e/3 charges, the numbers of positive and negative basic charges should be conserved in each nuclear reaction. We suggest that the basic elementary charges are not created or destroyed in nuclear reactions,

they can just be moved between the composite particles participating in the reaction. In any nuclear reaction, the products of the reaction contain the same total numbers of positive and negative basic charges as these total numbers are in the reagents. This is like a balanced equation of a chemical reaction.

We calculated axial electric potentials for some composite particles [5, 6] as functions of distance from those structures. It was shown that electric potentials of normally neutral composite structures (neutrinos) are not zero and not small at small distances from the particles [6], so the EM interaction of neutrinos with other particles, charged or neutral, can result in different combinations including stable neutrino-neutrino and neutrino-antineutrino pairs and structures if they come close to each other.

In this paper, we will consider some possible interesting structures made of neutrinos.

1. Neutrinos form dipoles and networks of dipoles

When we modeled the elementary particles as spinning composite structures made of basic elementary charges +-e/3, two models of neutrinos were suggested: ν_2 composed of two +e/3 basic charges on the axis of rotation and two -e/3 basic charges revolving about the axis, and ν_3 composed of three -e/3 basic charges on the axis of rotation and three revolving +e/3 basic charges. The compositions of ν_2 and ν_3 can be shown as the numbers of positive and negative basic charges in the structure: $\left(\frac{+2}{-2}\right)$ for ν_2 and $\left(\frac{+3}{-3}\right)$ for ν_3. Our calculations of the axial electric potentials of ν_2 and ν_3 have shown [6] that an axial electric potential of ν_2 neutrino is positive at both ends and an axial electric potential of ν_3 neutrino is negative at both ends.

We suggest that generally neutral particles such as neutrinos and antineutrinos, when they occur at close distance from each other, can attract each other and form neutral compositions, neutrino-neutrino or neutrino-antineutrino pairs, kind of electromagnetic dipoles. In our model structures of neutrinos, each pair, having a zero total electric charge, has positive and negative electric axial potentials at two ends of the pair. While at large distances from a pair the electric potentials are very small (although not zero), these electric potentials can be significant at small distances from the pair. The pairs can come close to each other, attract each other, and form different neutral compositions of these pairs – linear, two-dimensional (like rings) or three-dimensional (like buckyballs). Neutrinos and compositions of them might constitute a bank of bounded basic elementary charges. Such compositions might be present everywhere in space, be available for different reactions between the composite particles, and form arrays that can be polarized by electric and magnetic fields.

We think that the electromagnetic interaction between neutral composite particles and between compositions made of neutral particles in a medium containing these structures and compositions is an important and promising approach that can be related to the mechanism of interaction between neutral objects, such as gravitation.

In this paper, we will consider just some examples of compositions made of neutrinos that show that neutrinos might play much more significant role than just being products of some nuclear reactions.

1.1. Neutrino-neutrino and neutrino-antineutrino pairs as dipoles.

The neutrino with a positive short-range electric potential can be attracted to a neutrino with a negative potential and form a dipole which would have a positive potential from one end and a negative potential from the other end. The examples of such pairs are $(\nu_2\bar{\nu}_2)$, $(\nu_3\bar{\nu}_3)$, $(\nu_2\nu_3)$. These pairs can participate in different decay reactions. Any such pair can also behave as a magnetic dipole. The pairs can interact with other pairs as dipoles and form different geometrical structures, like the ones water molecules form.

1.2. A three-neutrino $(\nu_3\nu_2\nu_3)$ composition as a proto-hydrogen.

The neutrinos can be attracted to each other and form composite structures of two, three, or more particles in a row. Let us consider the $(\nu_3\nu_2\nu_3)$ composition.

If we write the $(\nu_3\nu_2\nu_3)$ composition in terms of numbers of +e/3 and e/3 basic charges in ν_2 and ν_3 , we get

$$(\nu_3\nu_2\nu_3) = \left(\frac{+3}{-3}\right) + \left(\frac{+2}{-2}\right) + \left(\frac{+3}{-3}\right) \quad (1)$$

There are 8 positive and 8 negative basic charges in the composition. If, due to some intervention, some charges will be forced to move from one type of neutrino as a composite structure to some other type of a composite structure, the resulting structures will be different from the original one, but the total numbers of positive and negative basic charges will be conserved. As an example, if one positive charge is taken from ν_2 and four negative charges will be taken from two ν_3 neutrinos (two -e/3 from each), a structure with the composition of $\left(\frac{+1}{-4}\right)$ can be formed, which is an electron in our models. The leftover of the original composition of 3 neutrinos, still bounded to each other, is a structure of a proton, with its two u-quarks of composition $\left(\frac{+3}{-1}\right)$ and one d-quark with the composition of $\left(\frac{+1}{-2}\right)$:

$$(\nu_3\nu_2\nu_3) = \left(\frac{+3}{-3}\right) + \left(\frac{+2}{-2}\right) + \left(\frac{+3}{-3}\right) \rightarrow \left(\frac{+3}{-1}\right) + \left(\frac{+1}{-2}\right) + \left(\frac{+3}{-1}\right) + \left(\frac{+1}{-4}\right) = p + e^- \quad (2)$$

Hence, the original composition of three neutrinos can be a proto hydrogen. Note that in this process, the total spin of the original three-neutrino composition does not change because all the charges removed from the neutrinos were originally on the axes of the spinning structures of the neutrinos and did not contribute to the original spins of the neutrinos. Hence, the spin of the proton is the same as the spin of the three-neutrino composition. In the new particle (an electron), formed of the basic charges taken away from their axial positions, the negative basic charges are set into revolving motion about the central positive basic charge, so they do contribute to the spin of the new structure. Hence, the external interaction causing conversion of the three-neutrino composition into a proton and an electron must add the angular momentum equal to the electron spin to the original system.

2. **A two-neutrino $(\nu_3\nu_2)$ composition as a proto-neutron.**
   A $(\nu_3\nu_2)$ pair contains 5 positive and 5 negative basic charges:
   $$(\nu_3\nu_2) = \left(\frac{+3}{-3}\right) + \left(\frac{+2}{-2}\right) \quad (3)$$

A neutron is composed of two d-quarks and one u-quark. In our spinning models of the elementary particles, a d-quark is a structure where two negative basic charges spin around a positive basic charge, so the composition of a d-quark is $\left(\frac{+1}{-2}\right)$. Similarly, the u-quark is a structure where 3 positive basic charges spin about one negative basic charge, so its composition is $\left(\frac{+3}{-1}\right)$. The total numbers of positive and negative basic charges in a neutron made of three quarks, $\left(\frac{+5}{-5}\right)$, is the same as in a composite structure $(\nu_3\nu_2)$ made of two neutrinos. If an external interaction chip off one positive basic charge from its axial position in ν_2 and two negative basic charges from their axial positions in ν_3, the two negative basic charges can set into a revolving motion about the positive basic charge forming a new d-quark that can join the leftovers (a d-quark and a u-quark) of the two neutrinos and form a neutron:

$$(\nu_3\nu_2) = \left(\frac{+3}{-3}\right) + \left(\frac{+2}{-2}\right) \rightarrow \left(\frac{+3}{-1}\right) + \left(\frac{+1}{-2}\right) + \left(\frac{+1}{-2}\right) = n \quad (4)$$

3. **A two-neutrino $(\nu_3\nu_2)$ composition as a possible origin of an electron-positron pair.**

   A $(\nu_3\nu_2)$ pair contains 5 positive and 5 negative basic charges, and the total numbers of positive and negative basic charges in an electron + positron pair $\left(\frac{+4}{-1}\right) + \left(\frac{+1}{-4}\right)$ are the same as in the $(\nu_3\nu_2)$.

If a photon of large enough energy is absorbed, that can result in a mutual exchange between the neutrinos: two negative basic charges are transferred from their axial positions in ν_3 to the orbital positions in ν_2, and one positive basic charge is transferred from its axial position in ν_2 to the orbital position in ν_3. As a result, ν_3 is converted into a positron and ν_2 is converted into an electron:

$$(\nu_3\nu_2) = \left(\frac{+3}{-3}\right) + \left(\frac{+2}{-2}\right) \rightarrow \left(\frac{+4}{-1}\right) + \left(\frac{+1}{-4}\right) = e^+ + e^- \quad (5)$$

This reaction includes processes of a transfer of basic charges and a process of separation of pair into two particles. It was observed that the reverse process, the recombination of an electron and a positron, usually results in emission of a single photon, but sometimes the same energy can be released as several photons. This might indicate that there are several processes in the reaction occurring simultaneously or during a very short time interval. One might speculate that the generation of an electron-positron pair can be initiated by absorption not only of a single photon of sufficient energy but also by absorption of two different photons at about the same time, and this could be tested experimentally.

Note that in this reaction, the external interaction practically does not change the total angular momentum and the angular momenta individual particles because all the transferred basic charges were initially in the axial positions, so their initial angular momenta were zero. They do not change the angular momenta of the products in the transfers that convert the two neutrinos to a positron and an electron in the reaction (5).

4. **A neutrino as a "glue" that can pair two electrons together.**

Two electrons repel each other as two like charges. However, as shown in [3], their axial electric potentials can be small in some range of distances between them. If a neutrino ν_2 with positive axial potential at both ends is placed between two electrons, the both electrons can be bounded to the neutrino and form a structure of total charge of -2e.

Conclusion

In our composite models of elementary particles as consisting of just two types of elementary basic charges, +e/3 and -e/3, the axial electric potential of any elementary particle is a function of a distance from the particle, and this function differs from the Coulomb potential of a point total charge of the particle. The electric potential of neutrinos is not zero at close distances from neutrinos. Neutrinos can form dipoles and bundles of 3 and more neutrinos. The three-neutrino bundle (a proto-hydrogen) can be converted to a hydrogen atom. As we suggested in our previous paper [4], the total numbers of basic charges of each of the two types are conserved in any nuclear reaction or conversion. That means that the basic elementary charges that are present in the reactants can join in different combinations to form the products of the reaction. The neutrino-antineutrino pairs and compositions of three neutrinos can be considered as proto-baryons and a possible proto-structures of an electron-positron pairs. We also suggest that a neutrino can "glue" two electrons to form an electron-electron pair.

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