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Neutrino's Non-Zero Electric Potential As An Origin Of Gravitation, Domain Structure And Expansion Of The Universe.

Polievkt Perov
pperov@suffolk.edu

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Suffolk University, 8 Ashburton Pl, Boston, MA 02108

Abstract

The axial electric potentials of neutrinos as neutral composite structures, while being very small at large distances, do not vanish, and the same can be said about the neutrino "asymmetric dipoles" (paired neutrinos of not the same kind). Depending on the orientation of the "asymmetric dipole", its far-field electric potential in some direction can be positive or negative, interacting with other "dipoles" at that large distance attractively or repulsively depending on their mutual orientation. The mutual orientation of the dipoles locally (inside a galaxy) might be such that they are aligned and experience the attractive force toward the local center of the system of "dipoles", and this can be the source of attractive interaction called gravitation. The dipoles near some other local center (in some other galaxy) will be aligned in such a way that they are attracted to that local center (a galaxy) and repelled from other local centers (other galaxies). That can cause the Universe to expand. The Universe can be considered as having a domain structure where the neutral "asymmetric dipoles" are oriented toward the centers of the local domains (resulting in the attraction) while that "local alignments" in different galaxies causes a repulsion between the domains (galaxies).

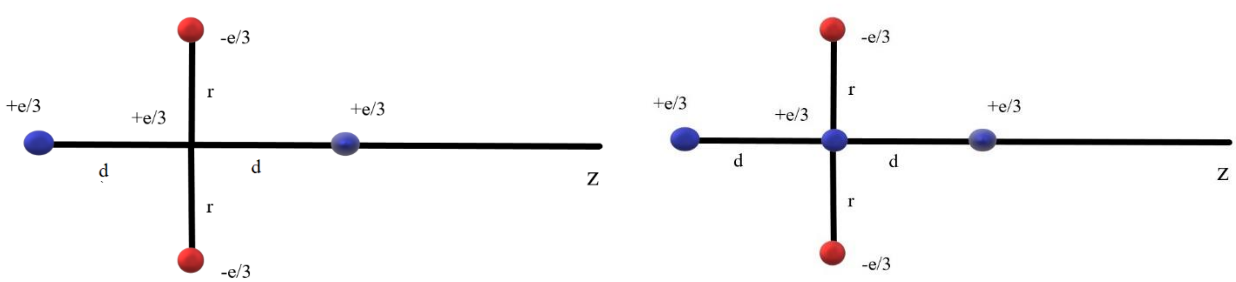
We think that such EM mechanism of attraction and repulsion of neutral matter can for the first logically explain the coexistence of the attractive local gravitation inside the galaxies and the repulsive interaction between the remote galaxies leading to the expansion of the Universe.

Introduction

We suggested in [1, 2] the models of the "elementary" particles, such as quarks, an electron, and neutrinos as being spinning composite structures each made of basic elementary particles with fractional charges +e/3 and -e/3. Among those particles, neutrinos are of special interest. By calculating the axial electric potentials of composite structures [3], including neutrinos, it was shown that the neutrinos as particles of zero total electric charge do have non-zero electric potentials that are essential at small distances from the neutrinos and are very small (but does not totally vanish) at large distances. Due to short distance electric potentials, the neutrinos with a positive potential are attracted to the ones with the negative potential and tend to form neutrino-neutrino or neutrino-antineutrino pair and structures. In this paper we describe the long-distance electric potentials of the neutrino pairs and suggest that the electric potentials of "asymmetric neutrino dipoles" can cause an attraction between relatively closely spaced neutral object (gravitational attraction) and a refusion between the far spaced objects (galaxies) causing expansion of the Universe.

1. **Neutrinos form "dipoles" and networks of "dipoles"**

In [2], two models of neutrinos as spinning composite structures were suggested: ν_2 (Fig. 1,a) 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 (Fig. 1,b) composed of three -e/3 basic charges on the axis of rotation and three revolving +e/3 basic charges.



(a) (b)

Fig. 1. Two models of neutrinos: ν_2 (Fig 1,a), with 2 basic charges +e/3 on the axis of rotation and two basic chars -e/3 revolving about the axis, and ν_3 (fig. 1,b), with 3 basic charges on the axis and 3 basic charges revolving about the axis. In these diagrams, r is the radius of orbit and d is the distance from axial charges to the center of the structure.

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The compositions of ν_2 and ν_3 can be shown as the numbers of positive and negative basic charges q 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 [3] that an axial electric potential of ν_2 neutrino is positive and an axial electric potential of ν_3 neutrino is negative.

We suggested in [4] 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 "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). Such compositions might be present everywhere in space and form networks that can be polarized by electric and magnetic fields.

We suggested in [5] 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.

Below, we will focus on the electric potentials of those two types of neutrinos at large distances from them.

2. Long-range axial electric potentials of neutrinos.

The axial electric potential of a ν_2 neutrino (Fig. 1,a) at the distance z from its center is given [4] buy the equation

$$V_{2z}(z) = \frac{q}{4\pi\varepsilon}\left(\frac{1}{|z-d|} + \frac{1}{|z+d|} - \frac{2}{\sqrt{z^2+r^2}}\right) = \frac{q}{4\pi\varepsilon z}\left(\frac{1}{\left|1-\frac{d}{z}\right|} + \frac{1}{\left|1+\frac{d}{z}\right|} - \frac{2}{\sqrt{1+\left(\frac{r}{z}\right)^2}}\right) \qquad (1)$$

The ratio r^2/d^2 for ν_2 structure was calculated in [4] as $r^2/d^2 = 3$. Using this value and expressing r/z via r/d, the equation becomes

$$V_{2z}(z) = \frac{q}{4\pi\varepsilon z}\left(2\left[1-\left(\frac{d}{z}\right)^2\right]^{-1} - 2\left[1+3\left(\frac{d}{z}\right)^2\right]^{-\frac{1}{2}}\right) \qquad (2)$$

Using the binomial series, we get for the case of z>>d

$$V_{2z}(z) \to \frac{\mathbf{5qd^2}}{\mathbf{4\pi\varepsilon z^3}} \qquad \mathbf{(3)}$$

Similarly, for a ν_3 neutrino (Fig. 1, b)

$$V_{3z}(z) = \frac{-q}{4\pi\varepsilon}\left(\frac{1}{|z-d|} + \frac{1}{|z|} + \frac{1}{|z+d|} - \frac{3}{\sqrt{z^2+r^2}}\right) = \frac{-q}{4\pi\varepsilon d}\left(\frac{1}{\left|\frac{z}{d}-1\right|} + \frac{1}{\left|\frac{z}{d}\right|} + \frac{1}{\left|\frac{z}{d}+1\right|} - \frac{3}{\sqrt{\left(\frac{z}{d}\right)^2+\left(\frac{r}{d}\right)^2}}\right) \qquad (4)$$

and, with $\frac{r^2}{d^2} = 0.79$ from [4],

$$V_{3z}(z) = \frac{-q}{4\pi\varepsilon z}\left(2\left[1-\left(\frac{d}{z}\right)^2\right]^{-1} + 1 - 3\left[1+0.79\left(\frac{d}{z}\right)^2\right]^{-\frac{1}{2}}\right) \qquad (5)$$

Using the binomial series, we get for the ν_3 neutrino at z>>d

$$V_{3z}(z) \to \frac{\mathbf{-3.19qd^2}}{\mathbf{4\pi\varepsilon z^3}} \qquad (6)$$

A $(\nu_2\nu_3)$ pair can be considered as a "asymmetric dipole" that has a positive end and a negative end. If we consider the axial electric potential of such "asymmetric dipole" at large distances from it along the direction of the common axis of rotation, we can just add equations (3) and (5) and get

$$|V_{pair\ z}(z)| = \frac{5qd^2}{4\pi\varepsilon z^3} - \frac{3.19qd^2}{4\pi\varepsilon z^3} = (1.81)\frac{qd^2}{4\pi\varepsilon z^3} \qquad (7)$$

These "asymmetric dipoles" can be continuously distributed in space, and the concentration of them can be non-uniform. Depending on the orientation of the "asymmetric dipole" relative to some selected direction, its axial electric potential at large distances can be positive or negative, interacting with the other "dipoles" at that large distance attractively or repulsively. Locally (in or near each galaxy), the "dipoles" might be aligned so they can experience the attractive force toward the local center of the system of "dipoles", and this can be the source of the attractive gravitational interaction. The "dipoles" near another local center (some other galaxy) can be oriented in such a way that they are attracted to that other local center and be repulsed from other distant local centers (other galaxies) leading to expansion of the Universe. The Universe can be considered as having a domain structure where the neutral "asymmetric dipoles" are everywhere but are oriented to be attracted toward the centers of the local domains/galaxies (resulting in the local attraction) while there is a repulsion between the distant domains (galaxies).

We think that such EM mechanism of attraction and repulsion of neutral matter can for the first time logically explain the coexistence of the attractive local gravitation inside the galaxies and the repulsive interaction between distant galaxies leading to the expansion of the Universe.

Conclusion

The electric potential of a neutrino, as a composite structure of zero total charge, is not zero. The potential can be positive or negative for different neutrino types, it can be not small at small distances from the neutrinos, therefore they can be attracted to each other and form pairs and bundles. The axial electric potential of a neutrino, while being very small at large distances, does not vanish, and the same can be said about the paired neutrinos of different kinds ("asymmetric neutrino dipoles"). Depending on the orientation of the "dipole", its far-field electric potential in some direction can be positive or negative, interacting with the other dipoles at that large distance attractively or repulsively depending on their mutual orientation. The dipoles locally (in or near each galaxy) might be aligned so they can experience the attractive force toward the local center of the system of dipoles, and this can be the source of the attractive gravitational interaction. The dipoles near some other local center (in some other galaxy) can be oriented in such a way that they are attracted to that remote local center but experience repulsion from other local centers (other galaxies). That can cause the Universe to expand.

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