Series: **PHYSICS and ASTRONOMY**

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To the Question of Intranuclear Forces

Abstract

It is shown that nucleons in nuclei of elements are linked NOT by nuclear forces, but by the overall flow of electromagnetic energy circulating in the volume of the nucleus. This assumption allows us to explain some properties of the intranuclear interactions and some well-known observations.

Contents

1. Introduction

The work [1] is devoted to considering an experiment demonstrating preservation the integrity of the assembled structure in the absence of visible fastening forces. рассматривается эксперимент, It is shown that the experiment may be explained by the appearance of electromagnetic energy inside the structure. Next they consider such body shapes, for which the electromagnetic energy is stored indefinitely.

Most detailed description is given to a cube consisting of magnetically soft and dielectric material with absolute permeability μ and absolute permittivity ε. Suppose that as a result of some effects in a cube occurred an electromagnetic wave with energy W_o. There are no thermal losses in the cube, and no radiation of the cube. In particular, in order for cube not to

radiate from the surface xoy, it is necessary that the following equalities were true for all the points of this surface

$$E_x H_y = 0 \text{ и } E_y H_x = 0. \tag{1}$$

These conditions allow finding the solution of Maxwell equations. In [1] it is shown that this solution has the following form

$$E_x(x, y, z, t) = e_x \cos(\alpha x)\sin(\alpha y)\sin(\alpha z)\sin(\omega t), \tag{3}$$

$$E_y(x, y, z, t) = e_y \sin(\alpha x)\cos(\alpha y)\sin(\alpha z)\sin(\omega t), \tag{4}$$

$$E_z(x, y, z, t) = e_z \sin(\alpha x)\sin(\alpha y)\cos(\alpha z)\sin(\omega t). \tag{5}$$

$$H_x(x, y, z, t) = h_x \sin(\alpha x)\cos(\alpha y)\cos(\alpha z)\cos(\omega t), \tag{6}$$

$$H_y(x, y, z, t) = h_y \cos(\alpha x)\sin(\beta y)\cos(\alpha z)\cos(\omega t), \tag{7}$$

$$H_z(x, y, z, t) = h_z \cos(\alpha x)\cos(\alpha y)\sin(\alpha z)\cos(\omega t), \tag{8}$$

$$\sin(\alpha \cdot a) = 0, \tag{9}$$

where the origin is located in the cube's center, and

a – is the length of half cube's edge,

$e_x, e_y, e_z, h_x, h_y, h_z$ - are the constant amplitudes of the functions,

ω - is the frequency.

The former equation is the consequence of (1). From (3-8) it follows [1]:

$$
\begin{array}{|c|l|}
\hline
1. & h_z - h_y + e_x \varepsilon\omega/\alpha = 0 \\
\hline
2. & h_x - h_z + e_y \varepsilon\omega/\alpha = 0 \\
\hline
3. & h_y - h_x + e_z \varepsilon\omega/\alpha = 0 \\
\hline
4. & e_z - e_y - h_x \mu\omega/\alpha = 0 \\
\hline
5. & e_x - e_z - h_y \mu\omega/\alpha = 0 \\
\hline
6. & e_y - e_x - h_z \mu\omega/\alpha = 0 \\
\hline
\end{array}
\tag{10}
$$

The equations system (10) has several solutions. One of them has the form:

$$h_z = 0, \tag{11}$$

$$h_y = -h_x, \tag{12}$$

$$e_y = e_x, \tag{13}$$

$$e_z = -2e_x. \tag{14}$$

$$e_x = -\frac{h_x \alpha}{\varepsilon \omega}, \tag{15}$$

$$h_x = -\frac{3e_x \alpha}{\mu \omega}. \tag{16}$$

From (15, 16) it follows

$$\omega = \alpha \sqrt{\frac{3}{\mu \varepsilon}} \tag{17}$$

From (9) it follows:

$$\alpha \cdot a = k\pi, \quad k = 1,2,3,... \tag{18}$$

From (17, 18) it follows:

$$\omega = \frac{k\pi}{a}\sqrt{\frac{3}{\mu \varepsilon}}. \tag{19}$$

Thus, there exists a range of frequencies at which the conditions (3-8) are valid. We call these frequencies the natural frequencies of the cube, as they depend only on the material and size of the cube.

For the given ω, $h_z = 0$, h_x the remaining amplitudes are determined consequently from (15, 13, 14).

2. Energy, the Flow of Energy and Momentum of the Electromagnetic Field of the Cube

The full energy W_o, stored in the cube, can be found by integrating the functions (3-8) over the volume of the cube.

As the energy average over time is

$$W_o = \iiint_{x,y,z}\left(E_x^2 + E_y^2 + E_z^2 + H_x^2 + H_y^2 + H_z^2\right)dxdydz,$$

then

$$W_o = ma^3\left(e_x^2 + e_y^2 + e_z^2 + h_x^2 + h_y^2 + h_z^2\right),$$

where m – is a certain constant, or, given (15, 13, 14),

$$W_o = ma^3\left(6e_x^2 + 2h_x^2\right)$$

and next, given (15),

$$W_o = ma^3 h_x^2 \left(6 \left(\frac{\alpha}{\varepsilon \omega} \right)^2 + 2 \right)$$

and, given (17),

$$W_o = 2ma^3 h_x^2 \left(\frac{\mu}{\varepsilon} + 1 \right). \tag{20}$$

This formula is related to every frequency from the spectrum of natural frequencies with amplitude $h_x(\omega)$.

The flow of electromagnetic energy circulates along the faces of the cube by the planes perpendicular to the axis *oz*. The integral of this flow S density over the volume of the cube V is proportional to the momentum of the electromagnetic field P in the volume of a cube, because, as you know, in the SI system

$$\frac{dP}{dV} = \frac{1}{c^2} S = \frac{1}{c^2} \left[\overline{E} \times \overline{H} \right]. \tag{21}$$

By the law of conservation of momentum the cube retains its integrity (because with the change in the shape of the cube the integral of electromagnetic energy flow density also changes).

3. Integration and Disintegration of the Cube

Let us consider 4 identical cubes, each of them storing energy W_O and momentum P_o. At contact these cubes can form a single cube with twice the half-edge.

$$a' = 2a \tag{22}$$

According to (19) the frequency spectrum of the combined cube will change:

$$\omega' = \frac{k\pi}{a'} \sqrt{\frac{3}{\mu \varepsilon}} = \frac{\omega}{2}. \tag{23}$$

There will appear frequencies that were absent in the primary cube. It means that the energy flow will be passing through the contacting faces of the primary cubes. This additional flow preserves the integrity of the combined cube, because when disconnecting the primary cubes the integral of flow density of electromagnetic energy is changed and the law of conservation of momentum is violated.

The appearance of additional frequencies means also that the total momentum of the combined cube is larger than the sum of impulses of the merged cubes. This excess is equal to the momentum of forces which are uniting the cubes. The work of these forces is converted into electromagnetic

energy of the combined cube, which thus becomes larger than the total energy of primary cubes.

The inverse process is also possible – it is the disintegration of the cube into four separate cubes with preservation of their total energy. The disintegration may be caused, for instance, by the fact, that the cube got into the area of another electromagnetic wave, which disturbed the balance inside the cube. Moreover, the total momentum of disconnected cubes becomes smaller than the momentum of the combined cube. "Surplus" is released in the form of electromagnetic energy flow. Along with this, naturally, the energy is released, i.e. with the cubes disintegration there appears a certain radiation.

4. Electromagnetic Wave Holder

Thus, in the body of a certain form there may exist an electromagnetic wave with <u>a spectrum of natural frequencies</u> (determined only by the form and material of the body). This wave does not emerge beyond the body volume and does not attenuate ever in an electro conducting body, retaining the once received energy W_O and the momentum P_o. We shall denote such a body as <u>Electromagnetic Wave Holder</u> – abbreviated as EWH.

Several identical EWH may integrate in such way that in the integrated body an electromagnetic wave is created with an expanded spectrum of natural frequencies and with total energy and momentum greater than the sum of the energies and momenta of the combined EMK. We will call such a process a <u>EWH synthesis</u>.

An EWH can disintegrate into several EWH with reduced spectrum of natural frequencies and with total energy and momentum smaller than the sum of energies and momenta that is smaller than the sum of energies and momenta of the created EWH. This leads to radiation. We shall call such process <u>the disintegration of EWH</u>. Initiation of this disintegration can be caused by the fact that EWH enters the external electromagnetic field. The energy of this field can be a lot less than energy of internal electromagnetic field of EWH.

The EWH considered in [1] have the form of parallelepiped (and most detailed - cube). Probably, it is possible to find other forms. To allow for synthesis, such forms should be subject to additional restrictions. It appears that such possible forms which during the synthesis are not completely in contact, but with some gaps.

The existence of EWH is confirmed by the experiments described in [1]. In the Internet you can find many reports of metal objects sticking to the human body. This phenomenon can also be explained by the appearance of an electromagnetic wave in a limited volume of "human body - metal object."

5. Internuclear Interactions

Concerning the nuclear forces it is known, for instance, from [2], that

A. The nuclear forces are short acting (their range is of the order of 10^{-13} cm.)

B. The interaction forces of nucleons do not depend on the nucleon's charge.

C. Nuclear forces are not central (they cannot be presented as directed along the line connecting the centers of interacting nucleons).

D. Nuclear forces have the ability to saturation (this means that each nucleon in the nucleus interacts with a limited number of nucleons).

E. There exist the so-called "magic numbers" (2, 8, 20, 50, 82, 126) of nucleons in the nucleus, under which the nuclei are most resistant to nuclear decomposition.

All these facts have no explanation, which in [3] are formulated as follows: "at present there still is no complete theory of so-called nuclear forces – forces acting between nuclear particles (nucleons) and holding them together as part of an atomic nucleus.

By analogy with the above, it can be assumed that the **nucleons in nuclei of elements are linked NOT by nuclear forces, but by the overall flow of electromagnetic energy.** One must assume that in a nucleon there is an electromagnetic wave with a certain natural frequency and energy, i.e. a single nucleon - is a EWH, and the nucleus is a EWH obtained by the synthesis of EWH nucleons.

On this assumption we can explain several features of intranuclear interactions, and other phenomena.

1. Nucleons must "contact", so that their total electromagnetic wave was concentrated in total volume - see above p. A.

2. Nucleons charge does not matter - see above p. B.

3. Nuclear forces are not central (see above p. C). Generally, the interaction cannot be explained by the forces acting between nucleons.

4. The nucleons must have a certain form, to be able to "contact" with other nucleons. The number of nucleons contacting with a given nucleon, is restricted – see above p. D. The number of nucleons contacting with the given one is determined by their form and cannot be arbitrary even within certain limits – see above p. E.

5. Nuclear fusion (formation of heavier nuclei of lighter nuclei) is a synthesis of EWH. This synthesis can occur without substantial expenditure of energy, i.e. it is cold nuclear fusion. This apparently occurs in living organisms. [4] This, for example, explain that the body of hen is constantly producing calcium (for the formation of egg shell), not getting it in the food consumed, and producing it from virtually any set of substances coming from food.

6. We can assume also the existence of nuclear disintegration (formation of lighter nuclei from heavier nuclei). The facts mentioned in the previous p. 5

can be interpreted as the nuclear disintegration - it all depends on the initial and final products.

7. Nuclear decay, as the release of electromagnetic energy of EWH-nuclei , can occur without significant external energy expenditure - see above. This may explain the so-called pyrokinesis [5], in which a person for no apparent reason flares and immediately burns, although all the surrounding objects and clothes remain intact.

We return again to the question of the existence of electromagnetic waves inside nucleons and nuclei. It is known that gamma radiation source (having a frequency> $3 \cdot 10^{18}$ Hz) can be nuclei and particles, as well as the nuclear reaction and the reaction between the particles. Conversely, gamma radiation can be absorbed by atomic nuclei and is able to cause transformation of the particles [6]. Consequently, inside the core the electromagnetic wave of the same frequency must also exist. While the energy flow of these waves in closed volume of EWH-nucleus - it is stable, and the waves are not observed. EWH-nucleus stores energy. With the disintegration of this EWH-nucleus the energy is released in the form of gamma radiation. In the absorption of gamma radiation the internal energy increases and is redistributed in the volume of EWH-nucleus. This can lead to the disintegration of the nucleus into smaller nuclei.

As follows from the above, the EWH-nucleons inside the EWH-nucleus exchange by the flow of electromagnetic energy - electromagnetic waves. At high frequency of the waves, they acquire corpuscular character. Thus, EWH-nucleons inside the EWH-nucleus exchange particles. This is quite consistent with the existing theory of the exchange interaction according to which the interaction between the nucleons inside the nucleus is the result of emission and absorption of π-mesons.

6. About the spin of nucleon and nucleus

Momentum and angular momentum are linked by relation

$$J = r \times P.$$
(25)

between the momentum and angular momentum. Similarly, the bulk densities are linked by relation

$$\frac{dJ}{dV} = r \times \frac{dP}{dV}.$$
(26)

From (21, 26) follows:

$$\frac{dJ}{dV} = \frac{1}{c^2}[r \times S]$$
(27)

or

$$J = \frac{1}{c^2} \int [r \times S] dV .\qquad(28)$$

From the above it follows that in the nucleon and the nucleus there is a circular flow of electromagnetic energy. This flow determines the angular momentum (28). Probably, this angular momentum is exactly the spin of the nucleon and the nuclear spin.

References

1. Khmelnik S.I. To the Theory of Perpetual Motion Holder. "Papers of Independent Authors", publ. «DNA», ISSN 2225-6717, Israel-Russia, 2013, issue 23, ISBN 978-1-300-55019-8, printed in USA, Lulu Inc., ID 13514159; http://vixra.org/abs/1404.0086 (in Russian).
2. Savelyev I.V. General physics course (in Russian).
3. Landau L.D., Lifshitz E.M. Theoretical Physics, vol 3 (in Russian).
4. Petracovitch G.N. Nuclear reactions in a living cell, http://www.rusphysics.ru/dissertation/219/ (in Russian).
5. Pyrokinesis, http://nenosfirs.ucoz.ru/load/nepoznannoe/fenomeny/chto_takoe_pirokinez_i_kak_ne_sgoret_slovno_spichka/79-1-0-251 (in Russian).
6. Gamma radiation, http://nuclphys.sinp.msu.ru/enc/e036.htm (in Russian).