New Results in Particle and Nuclear Physics-3

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Introduction

This is a presentation of my 30-year-long independent research in systems theory and theoretical physics. The research initiates the reform of modern physics and paves the way to the reform of modern science in general. The presentation consists of:

Poster 1: Ether and its characteristics
Poster 2: Spontaneous generation of particles
Poster 3: Nuclear structure and dynamics

Method

The method is based on the dialectical logic; it may be called 'the method of the self-developing analysis and the suggested mathematical description'. The method takes into account all to-date achievements, digests them and solves problems beyond the reach of modern physics.

Results presented in Poster 3

- the nature of nuclear interaction;
- the nuclear structure of the atom;
- nuclear dynamics;
- the origin of neutrinos.

Model of the H-atom

With its positive nucleus and negative electronic shell, the H-atom presents a spherical capacitor and can be modeled, in rough representation, by a simple RC circuit, as shown on Fig.1, where C_o models its capacitance, R_o its exchange interaction with ether, e(t) pulse excitation by ether. The dynamics of this model is described by the equation:

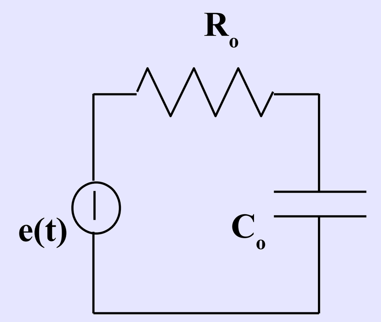


Fig. 1 The rough model of the H-atom

$$R_o \frac{dq(t)}{dt} + \frac{1}{C_o} q(t) = e(t)$$

Its response to pulse excitation:

$$q(t) \propto \exp\left(-\frac{t}{\tau_C}\right)$$

Its Laplace transform:

$$Q(p) = \frac{C_o}{p\tau_C + 1}, \qquad \tau_C = R_o C_o$$

Its radiation spectrum:

$$|Q(i\omega)|^2 \propto \frac{1}{1+x^2}; \quad x = \omega\tau_c$$

In exact model, Fig.2, we take into account the magnetic properties of the electron modeled by inductor L_1. Its response,

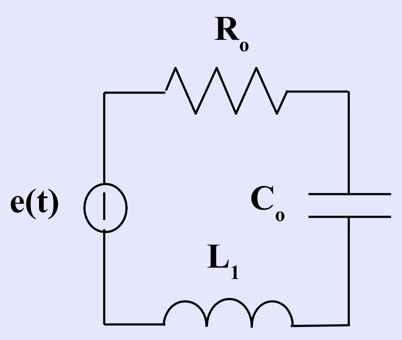


Fig. 2 The exact model of the H-atom

$$q(t) \propto \exp(p_1 t) - \exp(p_2 t),$$

$$p_1 \approx -\frac{1}{R_o C_o}, \quad p_2 \approx -\frac{R_o}{L_1},$$

is identical to the correlation function of ether in high energy region.

Model of the neutron

With its intrinsic magnetic field, the neutron can be modeled, in a rough representation, by a simple LR-circuit shown in Fig.3, where L_O represents an inductor while R_O

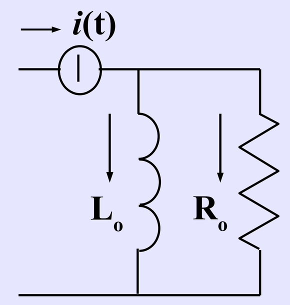


Fig. 3 Rough model of the neutron

$$\frac{L_o}{C_o} = \frac{L_1}{C_1} = R_o^2$$

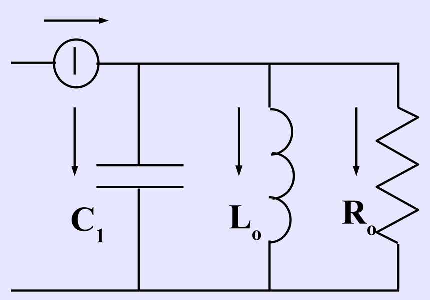


Fig. 4 Exact model of the neutron

while R_O models its exchange interaction with ether. Its response to magnetic excitation: $i_L(t) \propto \exp(-t/\tau_L)$, where $\tau_L = L_o / R_o$. In exact representation, Fig.4, we take into account the electric properties of the neutron modeled by capacitor C_1. The response to magnetic excitations is similar to that in the H-atom in respect to electric ones. These models expose the H-atom and the neutron as thoroughly dual entities.

Deuterium (D-atom)

Under proper conditions, the H-atom and the neutron merge into the atom of deuterium (D-atom). Its process is modeled, in rough representation, by two circuits for electric and magnetic excitations, respectively, Fig.5.

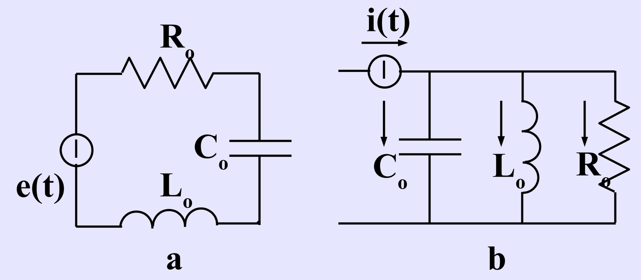


Fig. 5 Rough models of the D-atom:
(a) electric excitation,
(b) magnetic excitation

Structural efficiency of the D-atom

The D-atom can be either in the phase of electric excitation or that of magnetic excitation. So each of these circuits contains only three components as compared with four components in total of their constituents. It is the evidence of higher structural efficiency of the D-atom resulting in a more efficient mode of energy conservation.

Response to excitation

The pulse response presented below is similar for both phases.

$$i(t) \propto e^{-\alpha t}\left(\cos\sqrt{3}\alpha t - \frac{1}{\sqrt{3}}\sin\sqrt{3}\alpha t\right); \quad \alpha = \frac{R_o}{2L_o}$$

It is of oscillation character and its damping exponential factor $\boldsymbol{\alpha}$ is half of those for separate H-atom and neutron.

Essence of nuclear interaction

It is the conservation of energy by means of alternate transformation of electric energy to magnetic one and vice versa in the D-atom, the nest of nuclear interaction.

The He-atom

With their one-sidedness, under proper conditions, D-atoms unite in pairs giving birth to He-atoms. The model of the He-atom in the rough representation is shown in Fig.6. Because of its symmetry, it has the property of transparency and is receptive both to electric and magnetic excitations, which makes the He-atom a physical model of ether and the foundation of nuclear structure in general.

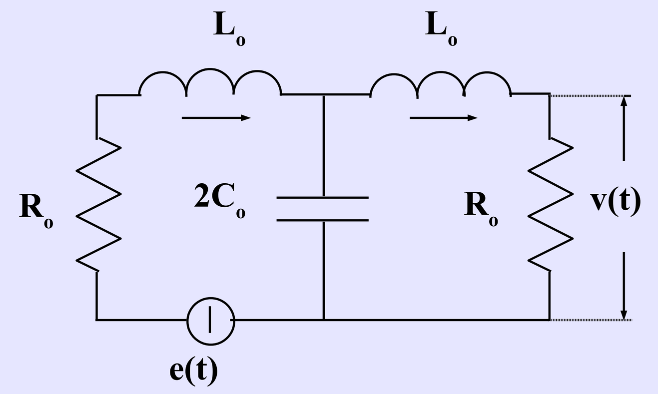


Fig. 6 Rough model of the He-atom

Properties of the model

Response to excitations and the spectrum of radiation:

$$v(t) \propto e^{-2\alpha t} + e^{-\alpha t}\left(\frac{1}{\sqrt{3}}\sin\sqrt{3}\alpha t - \cos\sqrt{3}\alpha t\right)$$

$$|Q(i\omega)|^2 \propto \frac{1}{1+x^6}; \quad x = \omega R_o C_o$$

Parameters of the models

Electric parameters:

$$L_o = 4.17\times10^{-22}\,H, \quad C_o = 2.94\times10^{-27}\,F,$$
$$L_1 = 2.09\times10^{-23}\,H, \quad C_1 = 1.48\times10^{-28}\,F.$$

Fundamental frequency of the D-atom:

$$f_o = \frac{1}{2\pi\sqrt{L_o C_o}} = 1.44\times10^{23}\,Hz$$

Its quantum energy:

$$E = hf_o \approx 9.54\times10^{-11}\,J \approx 5.95\times10^{8}\,eV.$$

Spectral characteristics of the models and ether

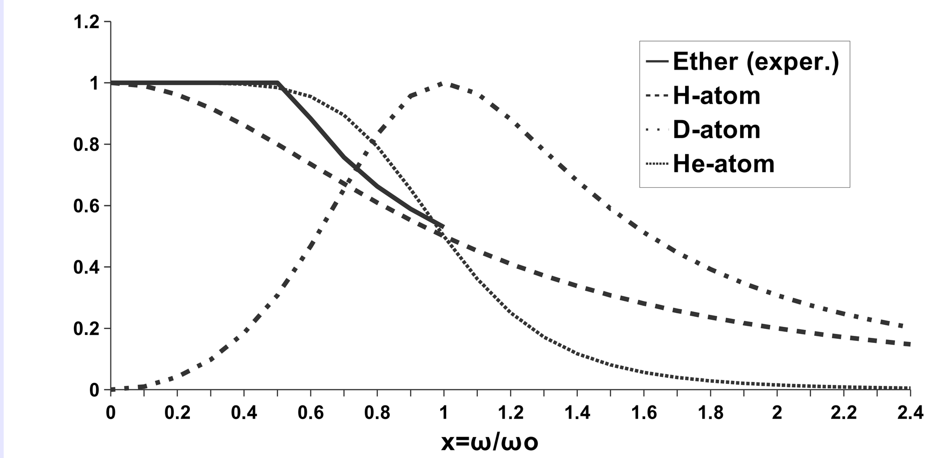
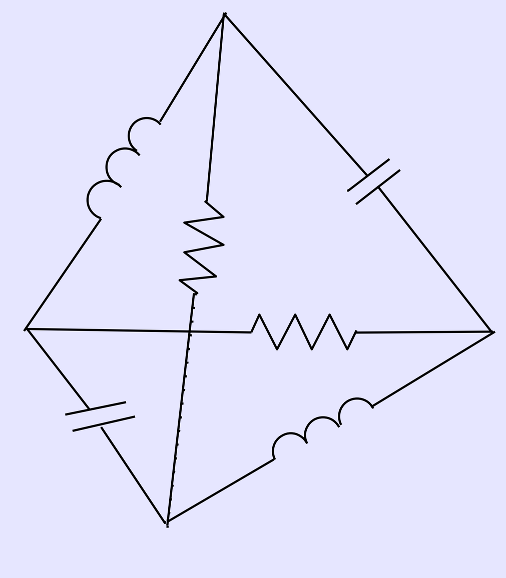


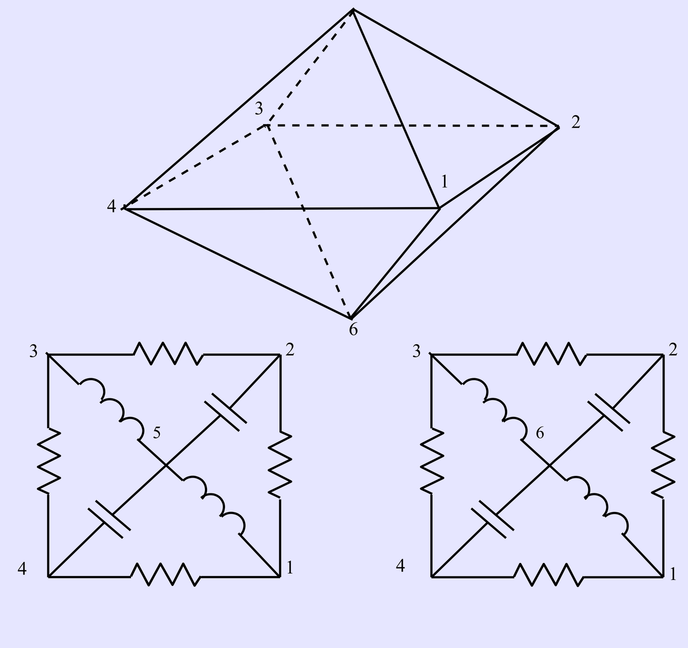
Fig.7 Spectral functions of the atoms

As shown in Fig.7, the spectrum of the H-atom follows the spectrum of ether beyond the cut-off energy; the spectrum of the D-atom has a resonance character, while the spectrum of the He-atom outlines in rough the spectrum of ether, including its cut-off region. All that implies it is He and other higher atoms that are responsible for the formation of the cut-off region.

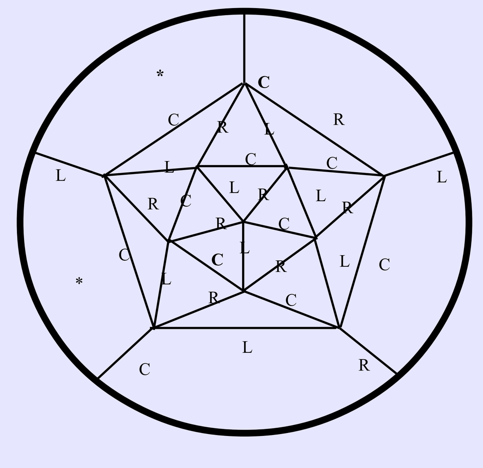
Nuclear shells and their interaction



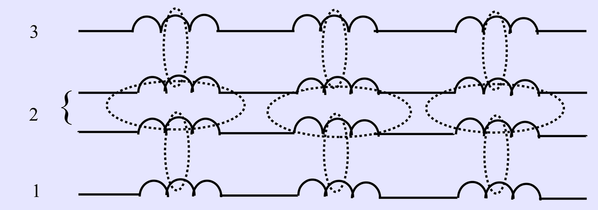
The tetrahedral shell



The octahedral shell



The icosahedral shell



Interaction of the 18-shells:
1- the internal 18-shell;
2- the central 36-shell;
3 – the external 18-shell.

Nuclear structure of the atom

It evolves by nuclear shells, the D-atom being its basic element; there are seven shells: the He-shell (2-shell), the ctahedral shell (8-shell), the icosahedral shell (18-shell), the double-icosahedral shell (36-shell) and three respective inverse shells of 18, 8 and 2 D-atoms; the remaining neutrons perform inter-shell interaction; the electron shells are integral components of the nuclear structure.

m-atom

The atom with an atomic number *m* consists of *m* D-atoms, is represented by a network with *m* degrees of freedom and, when excited, emits its specific *m*-neutrinos.
Its vector differential equation:

$$\boldsymbol{L}\frac{d^2\boldsymbol{Q}}{dt^2} + \boldsymbol{R}\frac{d\boldsymbol{Q}}{dt} + \boldsymbol{D}\boldsymbol{Q} = 0; \quad \boldsymbol{L} = (L_{ik}),\ \boldsymbol{R} = (R_{ik}),\ \boldsymbol{Q} = \begin{pmatrix} Q_1 \\ Q_2 \\ \dots \\ Q_m \end{pmatrix}$$
$$\boldsymbol{D} = (D_{ik}),\ D_{ik} = C_{ik}^{-1};$$

Its response to excitation:

$$\boldsymbol{f}_m(t) = \sum_{k=-m}^{m} F_{mk}\boldsymbol{A}_k \exp(\lambda_k t) \ \rightarrow\ g_n(s) = \sum_{k=-n}^{n} S_k \exp(\chi_k s)$$

It is the *m*-representation of both the structural function of the H-atom and the correlation function of ether; it achieves its perfection in the U-atom, where $m \rightarrow n$, $t \rightarrow s/c$.

Conclusion

This part of the research solves one of the most fundamental problems of modern physics, that of nuclear interaction and nuclear structure, opening new horizons and paving the way to new fields and methods of research.

References

1. Igor S. Makarov. *A Theory of Ether, Particles and Atoms. Second Edition.* Open University Press, Manchester, UK, 2010. Orders: www.amazon.com, ISBN-13: 978-1441478412. Online free: http://kvisit.com/S2uuZAQ.