New Results in Particle

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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 that are beyond the reach of modern physics.

Results presented in Poster 2:

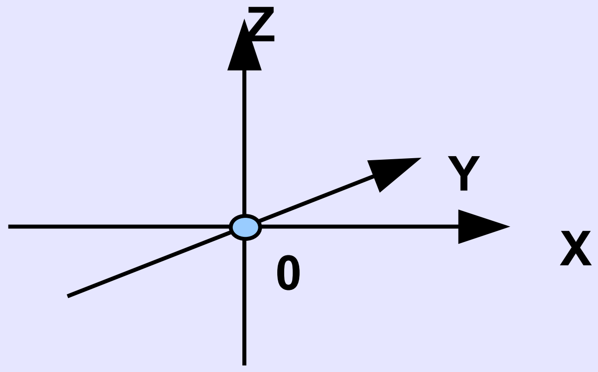
- spontaneous generation of mesons and neutrons in ether;
- mathematical description and properties of those particles;
- the process of the neutron transforming into the H-atom;
- explanation of some puzzling experimental facts.

Spontaneous generation of particles

Muon

The evolution of ether leads to separation of space and time; so we introduce a spatial frame of reference with a stochastic origin characterized by the Singularity Distribution Function φ_o.

$$\int \varphi_o dq = 1; \quad \varphi_o(q) = \varphi_o(|q|);$$
$$r = |q| = \sqrt{x^2 + y^2 + z^2};$$
$$dq = dx\, dy\, dz$$



Interaction of the processes underlying functions g and φ_o gives birth to the muon characterized by its mass density proportional to the function

$$w(q) = g^2 \otimes \varphi_o = \int g^2(|q_1|)\varphi_o(q - q_1)\, dq_{¿} \qquad (2.1)$$

The muon is a primitive material particle having no structure, which explains its weak interaction with matter.

π-meson

In the muon, the internal process acquires the form of reflection characterized by a wave function ψ(q,t), a reflection energy E_{ref} and an operator $\hat{E}_{ref}$; as a result, the muon transforms into the π-meson, characterized by the equation

$$\frac{\partial(\psi, \hat{E}_{ref}\psi)}{\partial t} = -\frac{1}{c}\left(\frac{\partial \psi}{\partial t}, W \frac{\partial \psi}{\partial t}\right) \qquad (2.2)$$

where

$$E_{ref} = (\psi, \hat{E}_{ref}\psi); \quad W(q) = w_{max} - w(q).$$

The π-meson has a primitive structure determined by $\psi(q,t)$.

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K-meson

Maintaining balance between the inflow and outflow of energy leads to division of reflection into time reflection (oscillation) and space reflection characterized by energy E_t and E_s, where

$$E_t = \frac{1}{2c^2}\left(\frac{\partial \psi}{\partial t}, \frac{\partial \psi}{\partial t}\right); \quad E_s = -\frac{1}{2}(\psi, \Delta \psi)$$

There arises the effect of self-control that transforms the π-meson into the K-meson characterized by the equation

$$\frac{1}{c^2}\frac{\partial^2 \psi}{\partial t^2} - \Delta \psi + \frac{W}{c}\frac{\partial \psi}{\partial t} = 0 \qquad (2.3)$$

The K-meson has a primitive *discrete* structure.

η-meson

To solve the equation (2.3), we present it as

$$\frac{\partial u}{\partial t} + H u = 0, \quad u = \begin{pmatrix} \frac{\partial \psi}{\partial t} \\ \psi \end{pmatrix} \qquad (2.4)$$

where $H=\begin{pmatrix} cW & -c^2\Delta \\ -I & 0 \end{pmatrix}$. Introducing $u=U\,\mathrm{e}^{\lambda t}$, we get

$$\lambda U+H\,U=0 \qquad (2.5)$$

producing a set of complex-conjugate eigenvalues and the corresponding set of eigenfunctions, $\{\lambda_k\},\{\tilde{\lambda}_k\}$, $\{U_k\},\{\tilde{U}_k\}$.

However, the solution is abstract because the value A=(g^2,1) is indefinite. To determine it, it is necessary to solve (2.5) for the extreme state that is both bound and free, a bound state of free conjugate composiums, *a free self-conjugate state*, *the state of rest.* In the latter, the reflection is determined only by the self-conjugateness and concentrated in the minimal sphere corresponding to the uncertainty sphere determined by the function φ_o. Thus we put

$$g\rightarrow g_o;\quad g_o^2=A\,\delta(q);\quad w=A\varphi_o$$

and solve (2.5) simultaneously with the equation

$$\lambda\,U+H_o U=0;\quad H\rightarrow H_o \qquad (2.6)$$

Physically that means the unification of conjugate states and the creation self-conjugate states. The K-meson transforms into the η-meson characterized by a set of self-conjugate functions

$$u_k(q\,,t)=U_k\mathrm{e}^{\lambda_k t}+\tilde{U}_k\mathrm{e}^{\tilde{\lambda}_k t}\,,k=1,2,\ldots,n$$

determining parameters of self-conjugate composiums:

$$m_k=\frac{\hbar}{c^2}\left|\Re\,\lambda_k\right|;\quad p_k=\frac{\hbar}{c}\Im\,\lambda_k;\quad \lambda=\frac{E}{\hbar};\qquad \begin{matrix} E_k=-m_k c^2+i\,p_k c \\ \tilde{E}_k=-m_k c^2-i\,p_k c \end{matrix}$$

The η-meson is a self-conjugate particle, its own antiparticle.

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Neutron

Under the influence of photon bombardment, the η-meson seeks to conform its structure with the correlation function of ether

$$G = \begin{pmatrix} g \\ g \end{pmatrix} \tag{2.7}$$

As a result, the whole structure of the η-meson undergoes the process of organization; there forms a collective, organized reflection represented by a *linear combination* of spatial wave functions

$$F = \sum_{k=1}^{n} C_k U_k + \tilde{C}_k \tilde{U}_k \tag{2.8}$$

approximating function (2.7); where

$$C_k = \frac{(V_k, G)}{(V_k, U_k)}, \qquad \tilde{C}_k = \frac{(\tilde{V}_k, G)}{(\tilde{V}_k, \tilde{U}_k)}, \tag{2.9}$$

the functions $\{V_k\}$ being the solutions of the equation

$$\lambda V + Ħ V = 0, \tag{2.10}$$

$Ħ$ being the matrix transposed to H. In doing that, the η-meson transforms into the neutron.

Correlation function of the neutron

The neutron has an organized totality of modes of reflection characterized by a 4n-component self-conjugate function,

$$f(q,t)=\sum_{k=1}^{n} C_k U_k \mathrm{e}^{\lambda_k t}+\tilde{C}_k \tilde{U}_k \mathrm{e}^{\tilde{\lambda}_k t} \qquad (2.11)$$

which describes the correlation of processes in the neutron and, therefore, can be called its *correlation function*.

High stability of the neutron

The structure of the mesons depends on the correlation function of ether which is alien to them. Contrary to them, the neutron itself models that function and stands, as it were, on its own feet, which explains its high stability.

Structural contradiction of the neutron

The spatial functions U_k(q) and $\tilde{U}_k$(q) in (2.11) describe the form of reflection, *a standing wave*; its every element *dq* carries oscillation with amplitude $C_k\,dq$ and complex frequency λ_k thus presenting oscillation of a damped harmonic oscillator with *continuously distributed* parameters and the mode of oscillation

$$\varphi_k(t)=\mathrm{e}^{\lambda_k t}$$

That mode, taken directly, corresponds to the oscillation of a damped harmonic oscillator with *lumped* parameters. Thus the structure of the neutron is internally contradictory: the continuous spatial distribution of its parameters contradicts the discrete character of its oscillation modes.

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H-atom

With the above contradiction, under the influence of photon bombardment, the structure of the neutron undergoes restructuring: there takes place the process of concentrating the continuously distributed parameters into lumped parameters. As a result, the neutron completes its self-organization and transforms into the hydrogen atom, a linear system with lumped parameters. Its orbiting electron is exactly the manifestation of the discrete character of its internal structure. At that, space consistency with ether transforms into time consistency.

Equation of the H-atom

The process of the H-atom is described by a system of linear differential equations

$$\begin{array}{l} \delta_{11}\varphi_1+\delta_{12}\varphi_2+\ldots+\delta_{1n}\varphi_n=0 \\ \delta_{21}\varphi_1+\delta_{22}\varphi_2+\ldots+\delta_{2n}\varphi_n=0 \\ ----------------- \\ \delta_{n1}\varphi_1+\delta_{n2}\varphi_2+\ldots+\delta_{nn}\varphi_n=0 \end{array} \qquad \delta_{ik}=\alpha_{ik}\frac{d^2}{dt^2}+\beta_{ik}\frac{d}{dt}+\gamma_{ik},$$

In the vector form, its equation is

$$A\frac{d^2\boldsymbol{\Phi}}{dt^2}+B\frac{d\boldsymbol{\Phi}}{dt}+\Gamma\boldsymbol{\Phi}=0; \qquad \boldsymbol{\Phi}=\begin{pmatrix}\varphi_1\\ \varphi_2\\ \cdots\\ \varphi_n\end{pmatrix} \qquad (2.12)$$

where

$$A=(a_{ik})=\begin{pmatrix} \alpha_{11} & \alpha_{12} & \dots & \alpha_{1n} \\ \alpha_{21} & \alpha_{22} & \dots & \alpha_{2n} \\ \dots\dots & \dots\dots & \dots & \dots. \\ \alpha_{n1} & \alpha_{n2} & \dots & \alpha_{nn} \end{pmatrix}, \qquad B=(\beta_{ik}), \Gamma=(\gamma_{ik})$$

The solution of (2.12) ,

$$\boldsymbol{u}(\boldsymbol{t})=\sum_{k=-n}^{n} T_k \boldsymbol{U_k} e^{\lambda_k t}, \qquad a_{-k}=\tilde{a}_k,$$

may be called the structural function of the H-atom.

Quarks and gluons

The matrices *A, B, Γ* determine the quarks, the vector functions

$\frac{d^2\boldsymbol{\Phi}}{dt^2}, \frac{d\boldsymbol{\Phi}}{dt}, \boldsymbol{\Phi}$ correspond to so-called gluons.

Conclusion

There have been obtained new results introducing a drastic change to the existing theories concerning the nature and the adequate way of description of the mesons, the neutron and the H-atom; the results shedding light on the true origin of matter.

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.

$$\frac{d\,\boldsymbol{u}}{dt} + \hat{H}\,\boldsymbol{u} = 0,$$