New Results in Particle and Nuclear Physics-1

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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

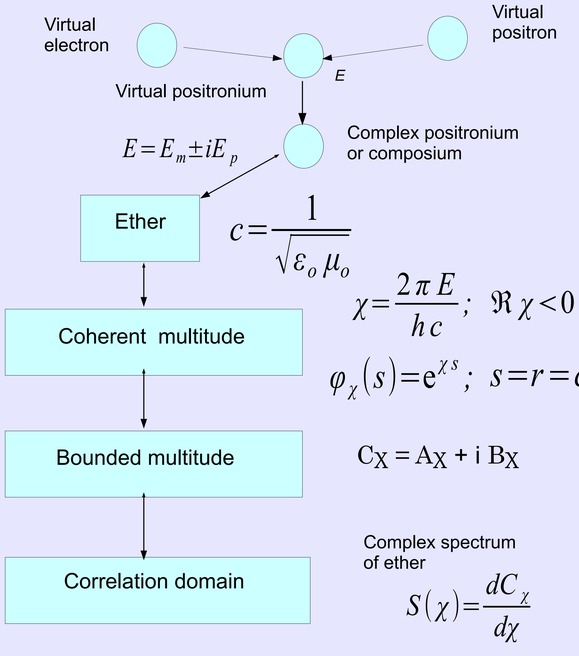
Method

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 1:

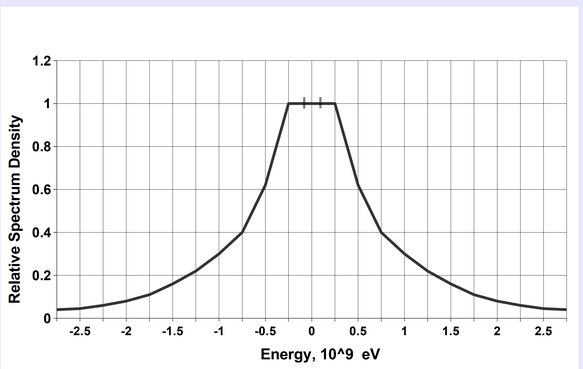
- true fundamental particles;
- discovery of ether and its composition;
- characteristics of ether;
- dimensions of subatomic particles.

Ether



Cosmic rays and ether

Experimental data on cosmic rays suggest the following spectrum of cosmic rays photons:



Spectrum of cosmic rays photons

Normalized spectrum of ether

A piece-wise approximation of the above spectrum gives the following expression of the energy spectrum of ether:

$$\log P(E_{eV}) = \begin{cases} 0; & 0 \leq \log E \leq 8.5 \\ 8.5 - \log E; & 8.5 \leq \log E \leq 9.0 \\ 15.7 - 1.8 \log E; & 9.0 \leq \log E \leq 9.5 \\ 24.06 - 2.68 \log E; & 9.5 \leq \log E \end{cases}$$

Correlation function of ether (CFE). Formulas

CFE: $g(r) = \frac{1}{2\pi i}\int_L S(z) e^{zr} dz$; $z = x + iy$; $x \geq 0$;

Spectrum of CFE:

$$S(z) = F(x,y) e^{i\varphi(x,y)},$$

$F(x,y) > 0$; $-\pi < \varphi(x,y) \leq \pi$; $\varphi(x,-y) = -\varphi(x,y)$;

$\ln S(z) = \ln F(x,y) + i\varphi(x,y)$; $f(x,y) = \ln F(x,y)$

With function ln S(z) being analytic, functions f(x,y) and φ(x,y) are harmonic and satisfy conditions:

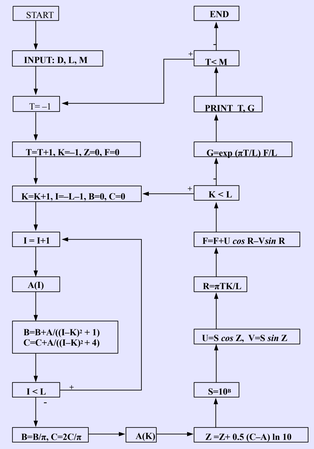
$$\frac{\partial f}{\partial x} = \frac{\partial \varphi}{\partial y}, \quad \frac{\partial f}{\partial y} = -\frac{\partial \varphi}{\partial x}$$

$$f(x_0, y_0) = \frac{x_0}{\pi}\int_{-\infty}^{\infty} \frac{f(0,y)dy}{(y-y_0)^2 + x_0^2}; \quad \varphi(x,y) = \int_{y_1=0}^{y} \frac{\partial f(x,y_1)}{\partial x} dy_1$$

With $q(E) = 10^{0.5\log P(E)}$; $f(0,y) = \ln q(y)$,

We determine first f(x,y) and φ(x,y) and then find S(z) and g(r), respectively.

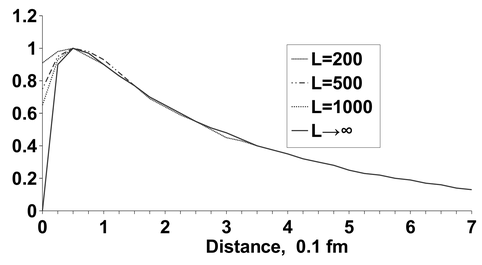
Computation of CFE



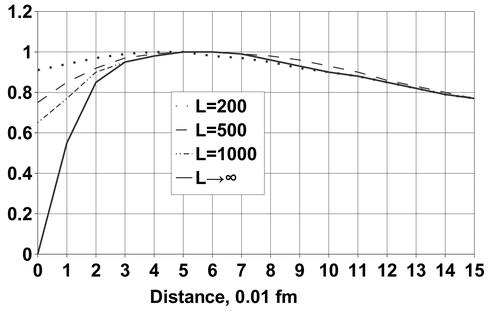
Block-program of computation

L – the number of energy steps; the energy range: 1.26×10^{10}eV, 2.52×10^{10}eV and 6.3×10^{10}eV

Results of computation



Correlation function of ether



Correlation function of ether. Detail

Characteristics of ether

The correlation function (high energy region):

$$g(r) \propto \exp(-\alpha_{et} r) - \exp(-\beta_{et} r)$$

Its radius of extrema: $r_{et} = 0.0517\ fm$

The spectrum of ether in high energy region:

$$|S(i\omega)|^2 \propto \frac{1}{(\alpha_{et}^2 c^2 + \omega^2)(\beta_{et}^2 c^2 + \omega^2)}$$

The rate of photon exchange: $\alpha_{et} = 3.18\ fm^{-1}$

The rate of corpuscular interaction: $\beta_{et} = 56.81\ fm^{-1}$

Singularity distribution function:

$$\varphi_o(q) = \frac{2\beta_{et}^3}{\pi^2}\exp(-2\beta_{et}|q|)$$

Its variance: $\sqrt{\overline{q^2}} = 1.24\times10^{-2}\ fm$

Dimensions of particles:

Electron (in modern theory $r_e \approx 2.82\ fm$):

$$\overline{R_e} = \frac{1}{2\beta_{et}} \approx 0.88\times10^{-2}\ fm; \quad \sqrt{\overline{R_e^2}} = \frac{1}{\sqrt{2}\,\beta_{et}} \approx 1.24\times10^{-2}\ fm$$

Muon: $\overline{r_m} = \frac{1}{2\alpha_{et}} \approx 0.16\ fm$; $\sqrt{\overline{r_m^2}} = \frac{1}{\sqrt{2}\,\alpha_{et}} \approx 0.22\ fm$

Neutron: $r_n \approx r_m \times 8.89^{1/3} \approx 0.46\ fm$, which is within the range of known experimental data: 0.3 – 0.5 *fm*.

Conclusion

This part of the research provides solution to the problem underlying theoretical physics, that of the existence, composition and properties of ether. This medium does exist and proves relativistic by its very nature. The quantitative analysis based on the well-known experimental data confirms the theory and seems to put an end to this most cardinal and puzzling problem of modern physics.

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: http://kvisit.com/S2uuZAQ.

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