Bulgarian Journal of Agricultural Science, 18 (No 2) 2012, 147-152
Agricultural Academy

BOUNDARY CONDITIONS ON THE QUANTUM SCALAR FIELD SYSTEM WITH A FLUCTUATION'S IMPULSE OPERATOR OF THE VACUUM STATE IN LIVING CELLS

Theoretical field analysis of the concrete quantum field system with an impulse effect in the elementary living cells

Ts. D. TSVETKOV, G. PETROV and A. HADZHY
International Scientific Fund, Sofia, Bulgaria

Abstract

TSVETKOV, Ts. D., G. PETROV and A. HADZHY, 2012. Boundary conditions on the quantum scalar field system with a fluctuation's impulse operator of the vacuum state in living cells. *Bulg. J. Agric. Sci.,* 18: 147-152

The mathematical description of the world is based on the fine play between the continuity and discrete. The discrete is more remarkable than the continuity things as any one-wave quantum field vacuum state defined on the algebraic entities. They can be singularities, bifurcations and autoremodality of this ground state. The classical field theory is a theory of the continuity also describes the principle of the shot-range interaction in the nature. The twenty century has given the quantum field theory that is the theory of the discrete world of the quantum entities. The global effects from the quantum field theory by the interactions of the elementary particle are the appearances of a vacuums structure of every one-quantum field system, e g. the relativistic quantum field.

The question above the possibility to find the complicate appearances connected with the existence of the life and the living systems his place in the mathematical frame by the intersection between the classical and the quantum describing of the world of any one concrete quantum field theory by the contemporary ground state of the theoretical biological and nanophysics problems is open by the consideration of high topographical complementarities by the London- and Casimir forces involved importantly in the highly specific and strong but purely classical physical thermodynamically and quantum physically complexity of elementary living cells by enzymes with substrates, of antigens with antibodies, etc. From the new results by the contributions of the environmental freezing-drying and vacuum sublimation (Zwetkow, 1985; Tsvetkov and Belous 1986, Tsvetkov et al., 1989; Tsvetkov et al., 2004-2011) is hopped that by the great form expressed e.g. by the automodality (scaling) behaviors of the invariant entities by the energy impulse tensor described the elementary living cells and systems will be possibly to describe the biological expressions at the standpoint of the nanophysics by means the behavior of the concrete quantum field system, e.g. sea virtual quantum scalar particles in the physical vacuum with a boundary conditions on every one surface S too.

It is possibly that in this processes in the theory will be introduced an elements of the non locality (similar to the Coulomb forces in the Quantum electrodynamics and the Casimir force as global appearances by the interaction of the quantum electromagnetic field with the classical objects e.g. classical boundary conditions or the so called string objects in the Quantum chromo dynamics). On essential result of the perturbation theory in the relativistic quantum fields is the importance of the non-local operator's expansion on the light cone describing by the quantum chromo dynamics (understanding in the sense of quantum electrodynamics) with the concept of the automodality principle by the autoremodality of the vacuum. This can be understood by means the consideration of the micro causality conditions for the invariance entities in the sense of the maximal singularity considered by the S-matrix theory (Bogolubov et al., 1987) in the deep inelastic scattering of the lepton and hadrons without model consideration, e.g. quantum electrodynamics (Bogolubov et al., 1976).

At the molecular level (Mitter and Robaschik, 1999) the thermodynamics behavior is considered by quantum electromagnetic field system with additional boundaries as by the Casimir effect between the two parallel, perfectly conducting square plates (side L, distance d, L > d), embedded in a large cube (side L) with one of the plates at face.

Key words: Casimir effect, elementary living cells, lyophilization, nanophysics, singularities, automodality principle, vacuum state

Introduction

The mathematical description of the world is based on the fine play between the continuity state and the discrete entities. The discrete is more remarkable than the continuities things as any one-quantum fields vacuum state defined on the algebraic quantum field entities. They can be singularities, bifurcations and autoremotalities of a ground state, e.g. the vacuum energy in the case of Casimir effect. The classical field theory is a theory of the continuity. The twenty century has given the quantum field theory that is the theory of the discrete world of the quantum entities by the fulfilling of the principle in a shot-range interaction. The axiomatic algebraic quantum field methods by the description of the quantum particle physics world have important remarkable successes by the understanding of the structure of the elementary particle and the vacuum state.

Today it is clear that these particles are no more so elementary. They have a structure, as the atom has understood it. In the beginning of the twenty century was clear that it is no more not devisable as it has been toughed by the ancients Greeks and it is a particle with a structure. So we have to consider an important principle of the automodality by the describing of the world based of this fine play between the continuity and the discrete where we have to consider the singularities, the bifurcations and the restructurings of the vacuum state of every one quantum field system defined on the space-time of our world for a given boundary conditions on a generic surface S. It is clear also that the vacuum has a structure and is no more vacuum a void.

Results

It is assumed the local quantum scalar wave field system under consideration to have a boundary generic surface S for his ground state or in this case the so called vacuum, fixed or moved with a constant velocity v parallel towards the fixed one boundary, which do surgery, bifurcate and separate the singularity points in the manifold of the virtual particles of the quantum field system from some others vacuum state as by Casimir effect of the quantum vacuum states for the quantum fields, and which has the property that any virtual quantum particle which is once on the generic surface S remains on it and fulfilled every one boundary conditions on this scalar quantum system with a vacuum state, described by the field A(f) for the solution f of the Klein-Gordon wave equation given by covariant statement

$$\Box f(x^\mu) = (\partial^2_{ct} - (\Delta + m^2))f(x^\mu) = 0, \quad (1)$$

where $\Box$ is a d'Lembertian and $\Delta = \partial^2_x + \partial^2_y + \partial^2_z$ is a Laplacian differential operators and $x^\mu \in M^4$ $\mu = 0, 1, 2, 3$, $(x, y, z, ct) = (x^m, x^0)$ with $m = 1, 2, 3$ is a point of Minkowsi space M^4.

Also the ground states of the local quantum fields system defined in the Minkowski space-time fulfilled every one boundary conditions interact with the boundary surface S by the help of the non local virtual quantum particles and so the vacuum state has a globally features, e.g. virtual fluctuations[1].

Examples of such boundary surfaces S of importance for the living cells are those in which is the surface of a fixed mirror at the initial time t = 0 in contact with the local quantum scalar fields system in his simple connected vacuum region – the bottom of the sea of the virtual non local scalar quantum field particles, for example – and the generic free surface of the parallel moved mirror with a constant velocity v towards the fixed one or the free vacuum surface of the local quantum scalar wave field in contact with the mirror parallel moved towards the fixed one – the free vacuum region, described by the impulse Schrödinger wave functional $\Psi_{\alpha_\kappa}(\varphi, t) = \Psi(f_\kappa, t)$, by
$t \in (t_{-2(n - \frac{1}{2}j)}, t_{2(n - \frac{1}{2}j)}]$, $n = 0, 1, 2, \ldots; j = 0,1,2,\ldots,2n$
and by given fulfilled operators equation in the case of the canonical Hamiltonian local quantum scalar field system in a statement of a equally times

$$x^0 = ct = \kappa x^0 = ct_{-2(n - \frac{1}{2}j)} = ct_{2(n - \frac{1}{2}(j+1))^\cdot} = (\kappa^2 x^2 + \mathbf{x}_\perp^{\,2} + (y^3_{2(n - \frac{1}{2}(j+1))})^2)^{\frac{1}{2}} . \quad (2)$$

By the definition the canonical non local field $\varphi(\kappa x)$ and impulse $\pi(\kappa x)$, $\kappa x^\mu \in M^4$, $\mu = 0, 1, 2, 3$, corresponding to implicit operator valued covariant field tempered functional $A(f_\kappa)$, where $f_\kappa \in S_R(\mathbf{R}^4)$ is a test function of this reel Swartz space, fulfilled all axioms of Whitman and acting in the functional Hilbert space $\hat{H}$ with a Fok's space's construction, e.g. a direct sum of symmetrized tensor grade of one quantum field's particle space $\hat{H}_1$:

$$\hat{H} = \hat{H}_F(\hat{H}_1) = \bigtimes_{n=0}^{\infty} \text{sym } \hat{H}_1^{\times n}$$

can be given by the formulas,

$$\varphi(\alpha_\kappa) = A(f_\kappa), \quad (3)$$

$$\pi(\alpha_\kappa) = A(\partial_{ct} f_\kappa), \quad (4)$$

for $\alpha_\kappa = \alpha_\kappa(x^1, x^2, y^3_{2(n - \frac{1}{2}(j+1))}, ct_{2(n - \frac{1}{2}(j+1))})$, with $y^3_{2(n - \frac{1}{2}(j+1))} = \kappa x^3$ and $y^0_{2(n - \frac{1}{2}(j+1))} = \kappa x^0$
by fulfilled Klein-Gordon equation in a covariate statement for massive and massless scalar fields

$$K_m A(f_\kappa) = A(K_m f_\kappa) = 0)$$

$$KA(f) = A(Kf) = 0 \quad (5)$$

with

$$K_m = (\Box - m^2) = \partial^2_{ct} - (\Delta + m^2),$$

$$K = \Box = \partial^2_{ct} - \Delta,\ \Delta = \partial^2_x + \partial^2_y + \partial^2_z \quad (6)$$

and in matrix statement

$$\partial_{ct}\begin{bmatrix}\varphi(\alpha_\kappa)\\ \pi(\alpha_\kappa)\end{bmatrix} = \begin{bmatrix}A(\partial_{ct} f_\kappa)\\ A(\partial^2_{ct} f_\kappa)\end{bmatrix} = \begin{bmatrix}0 & 1\\ \Delta + m^2 & 0\end{bmatrix}\cdot\begin{bmatrix}\varphi(\alpha_\kappa)\\ \pi(\alpha_\kappa)\end{bmatrix} \quad (7)$$

for
$t \in (t_{-2(n - \frac{1}{2}j)}, t_{2(n - \frac{1}{2}j)}]$, $n = 0, 1, 2, \ldots; j = 0,1,2,\ldots,2n$

We give the impulse Schrödinger equation for the quantum scalar field vacuum states functional $\Psi_{\alpha_\kappa}(\varphi, t)$ by a given generic surface S.

If such a surface S were given, for example, by $\alpha_{\kappa'}(\kappa' x^\mu)$, an equation

$$\alpha_{\kappa'}(x^m, y^3_{-2(n - \frac{1}{2}(j))}, ct_{-2(n - \frac{1}{2}(j))}) = \text{const, or}$$

$$d_{ct}\alpha_{\kappa'}(\mathbf{x}_\perp, \kappa' x^3, ct) = \text{const} \quad (8)$$

$\mathbf{x}_\perp = (x^m)$, where $m = 1, 2$, $\kappa' x^0 = t_{-2(n - \frac{1}{2}(j))}$, $\kappa' x^3 = y^3_{-2(n - \frac{1}{2}(j))}$

then from the following equation for the non free simple connected vacuum surface of the quantum

[1] Actually, this property is a consequence of the basic assumption by local quantum wave field theory that the wave front of the local quantum wave field system by his ground state propagate on the light hyperspace in any contact space (called "dispersions relations" too) and can be described mathematically as a non local virtual topological deformation or fluctuation which depends continuously on the time t.

fields system given above and

$$ct = \kappa' x^0 = ct_{-2(n - \frac{1}{2}(j))} + 0, \text{ and } x^3 = \kappa' x^3 = y^3_{-2(n - \frac{1}{2}(j))} + 0,\ y^3_{-2(n - \frac{1}{2}(j))} = -y^3_{2(n - \frac{1}{2}(j+1))} \quad (9)$$

from the equation by definition

$$d_{ct}\alpha_{\kappa'}(\mathbf{x}_\perp, \kappa' x^3, ct) = \kappa'^2\|\varphi\|^2(2(\varphi(y_{-2(n - \frac{1}{2}(j))})\varphi(\tau x)) + \varphi^2(y_{-2(n - \frac{1}{2}(j))})\alpha_{\kappa'})^{-1} - \alpha_{\kappa'}, \quad (10)$$

$$d^2_{ct}\alpha_{\kappa'}(\mathbf{x}_\perp, \kappa' x^3, ct) = \kappa'^2\|\pi\|^2(2(\pi(y_{-2(n - \frac{1}{2}(j))})\pi(\tau x)) + \pi^2(y_{-2(n - \frac{1}{2}(j))})\partial_{ct}\alpha_{\kappa'})^{-1} - \partial_{ct}\alpha_{\kappa'}, \quad (11)$$

$\mathbf{x}_\perp \in \mathbf{R}^2$ and

$$\tau x^2 = 0,\ \kappa' x^2 = \kappa x^2 = y_{-2(n - \frac{1}{2}(j)}{}^2 = y_{2(n - \frac{1}{2}(j+1))}{}^2 = y^2,$$

from eq. (8) follows that

$$\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{-2(n - \frac{1}{2}(j))}, + 0, t_{-2(n - \frac{1}{2}(j))} + 0) = (\varphi(y_{-2(n - \frac{1}{2}(j)})\varphi(\tau x))\ \varphi^{-2}\ ((1 + (\kappa'^2\|\varphi\|^2\varphi^2)\ (\varphi(y_{-2(n - \frac{1}{2}(j)})\varphi(\tau x))^{-2})^{\frac{1}{2}} - 1),$$

or

$$\partial_{ct}\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{-2(n - \frac{1}{2}(j))}, + 0, t_{-2(n - \frac{1}{2}(j))} + 0) = (\pi(y_{-2(n - \frac{1}{2}(j)})\pi(\tau x))\ \pi^{-2}\ ((1 + (\kappa'^2\|\pi\|^2\varphi^2)\ (\pi(y_{-2(n - \frac{1}{2}(j)})\pi(\tau x))^{-2})^{\frac{1}{2}} - 1), \quad (12)$$

Then we can define by $\varphi^2(\tau x) = 0$ and $\varphi^2(y_{-2(n - \frac{1}{2}(j)}) = \varphi^2$ or by the impulse effect for $\pi^2(\tau x) = 0$ and $\pi^2(y_{-2(n - \frac{1}{2}(j)}) = \pi^2$

$$\varphi(\kappa' x) = \varphi(\tau x) + \varphi(y_{-2(n - \frac{1}{2}(j)})\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{-2(n - \frac{1}{2}(j))}, + 0, t_{-2(n - \frac{1}{2}(j))} + 0),$$

or

$$\pi(\kappa' x) = \pi(\tau x) + \pi(y_{-2(n - \frac{1}{2}(j)})\partial_{ct}\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{-2(n - \frac{1}{2}(j))}, + 0, t_{-2(n - \frac{1}{2}(j))} + 0) \quad (13)$$

with following equations

$$\varphi^2(\kappa' x) = \kappa'^2\|\varphi\|^2$$

or $\pi^2(\kappa' x) = \kappa'^2\|\pi\|^2$

where $\|\varphi\|$ and $\|\pi\|$ are Norms of the real closed Schwarz space also following from $S_R(R^4) = S^+(R^4) + S^-(R^4)$ given by the reduction following from the fixing of the points by eq. (9) for even or not even functions dependant by the variable x^0 and defined scalar product $(f_\kappa, f_{\kappa'})_{\acute{L}} = (\alpha_\kappa, \alpha_{\kappa'})_\varphi$ for $f_\kappa, f_{\kappa'} \in \acute{L}^+$ or $f_\kappa, f_{\kappa'} \in \acute{L}^-$ and extended by an isometric image $\acute{L}^+(R^4) \rightarrow L_\varphi(R^2) = S_R(R^2)^{\|\varphi\|}$ and $\acute{L}^-(R^4) \rightarrow L_\pi(R^2) = S_R(R^2)^{\|\pi\|}$ for L_φ, L_π from the Sobolev's spaces with fractional numbers of the indices, and then if by fixing variables

$$d_{ct}\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{-2(n - \frac{1}{2}(j))} + 0, t_{-2(n - \frac{1}{2}(j))} + 0) = 0$$

would hold on S at the right, and by defined

$$d_t(\ ) = (\ )_t + \partial_t x^3(\ )_{x^3}, \quad (14)$$

on free surface S placed in Minkowski space-time for $ct = \kappa' x^0 = ct_{2(n - \frac{1}{2}(j+1))}$,

$x^3 = \kappa' x^3 = y^3_{2(n - \frac{1}{2}(j+1))}$ and $\partial_t x^3 = \partial_t y^3_{2(n - \frac{1}{2}(j+1))}$

follow the impulse equations for fulfilled boundary condition on fixed surface S

$$\partial_{x^3}\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{-2(n - \frac{1}{2}(j))} + 0, t_{-2(n - \frac{1}{2}(j))} + 0) = 0. \quad (15)$$

Also it is

$$\partial_t\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{-2(n - \frac{1}{2}(j))} + 0, t_{-2(n - \frac{1}{2}(j))} + 0) = \partial_t\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{2(n - \frac{1}{2}(j+1))}, t_{2(n - \frac{1}{2}(j+1))}) + \partial_t x^3 \partial_{x^3}\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{2(n - \frac{1}{2}(j+1))}, t_{2(n - \frac{1}{2}(j+1))}), \quad (16)$$

Further from the operators, equations for the local quantum fields system given by the eq. (3) follow the impulse operator's equation for the free vacuum state surface of the local quantum scalar field system at the left of the free surface S placed in Minkowski space-time

$$\partial_t\varphi(\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{-2(n - \frac{1}{2}(j))} + 0, t_{-2(n - \frac{1}{2}(j))} + 0)) = \pi^+(\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{-2(n - \frac{1}{2}(j))} + 0, t_{-2(n - \frac{1}{2}(j))} + 0)) = \partial_t\pi(\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{2(n - \frac{1}{2}(j+1))}, t_{2(n - \frac{1}{2}(j+1))}) + \partial_t x^3\, \partial_{x^3}\pi(\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{2(n - \frac{1}{2}(j+1))}, t_{2(n - \frac{1}{2}(j+1))}) = A(Qf_{\kappa'}) = A((\partial_t f_{\kappa'}(\mathbf{x}_\perp, y^3_{2(n - \frac{1}{2}(j+1))}, t_{2(n - \frac{1}{2}(j+1))})) + \partial_t x^3 A(\partial_{x^3} f_{\kappa'}(\mathbf{x}_\perp, y^3_{2(n - \frac{1}{2}(j+1))}, t_{2(n - \frac{1}{2}(j+1))})) \quad (17)$$

or is given by an matrix statement

$$\begin{bmatrix} \varphi^+(\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{-2(n - \frac{1}{2}(j))} + 0, t_{-2(n - \frac{1}{2}(j))} + 0)) \\ \pi^+(\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{-2(n - \frac{1}{2}(j))} + 0, t_{-2(n - \frac{1}{2}(j))} + 0)) \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ \partial_t x^3 \partial_{x^3} & 1 \end{bmatrix} \cdot \begin{bmatrix} \varphi(\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{2(n - \frac{1}{2}(j+1))}, t_{2(n - \frac{1}{2}(j+1))})) \\ \pi(\alpha_{\kappa'}(\mathbf{x}_\perp, y^3_{2(n - \frac{1}{2}(j+1))}, t_{2(n - \frac{1}{2}(j+1))})) \end{bmatrix} \quad (18)$$

where the impulse operator Q is given by the matrix

$$\begin{bmatrix} 1 & 0 \\ \partial_t x^3 \partial_{x^3} & 1 \end{bmatrix}.$$

For the Schrödinger wave functional $\Psi_{\alpha_\kappa}(\varphi, t)$ the impulse wave functional equation is given for the Hamiltonian $H(\pi, \varphi)$ and impulse operator Q by the equations

$$-i\hbar\partial_t \Psi_{\alpha_\kappa}(\varphi, t) = H(\pi, \varphi)\Psi_{\alpha_\kappa}(\varphi, t), \text{ for } t \in (t_{-2(n-\frac{1}{2}j)}, t_{2(n-\frac{1}{2}j)}] \quad (19)$$

$$\Psi^{+}_{\alpha_{\kappa'}}(\varphi, t_{-2(n-\frac{1}{2}j)} + 0) = Q(\pi, \varphi)\Psi_{\alpha_{\kappa'}}(\varphi, t_{2(n-\frac{1}{2}(j+1))}) \quad (20)$$

for $t = t_{2(n-\frac{1}{2}(j+1))} = t_{-2(n-\frac{1}{2}(j))}$, $x^3(t) = y^3_{2(n-\frac{1}{2}(j+1))}(t)$

and $\partial_t x^3 = \partial_t y^3_{2(n-\frac{1}{2}(j+1))}$,

$n = 0, 1, 2, \ldots, j = 0, 1, 2, \ldots, 2n$,

where $Q(\pi, \varphi) = -i\hbar(\partial_t + \pi\delta_\varphi)$ is also the impulse Schrödinger operator with the field variation given by $\delta_\varphi = \delta/\delta\varphi$. So the field tempered distribution φ describe a vacuum fluctuations in the Minkowski space-time also the impulse operator $Q(\pi, \varphi)$ is the operator of the virtual vacuum fluctuations of the local quantum scalar field system in the statement of the equally times.

Its is clear that we can so consider the non equilibrium thermodynamics of local quantum wave field system as by the Casimir effect from the point of view of the vacuum impulse Schrödinger wave functional equation in the Hilbert space in adiabatic sense in any one coherent sector from the structure of the vacuum.

Here we have a local quantum scalar field system by given time arrow in the Minkowski space-time, e.g. the system of the virtual sea quantum scalar particles, and that can be considered as a dynamically problem for the evolution with the time arrow of one small subsystem in the any one vacuum coherent sector, e.g. the system of the sea virtual quantum scalars particles, interacted with a great box defined by the boundary conditions on a surface S for the local quantum field system with vacuum as a ground state described by the impulse Schrödinger equation for the hole vacuum sectors and conformed to the boundary conditions on a generic surface S.

So we can see that the vacuum Schrödinger functional and the impulse fluctuation's operator describes a relativistic field configuration e.g. the system of the sea quantum field scalars, conformed with the boundary conditions in one total relativistic field system + boundaries conditions on the box surface S of every hole sectors by the ground state in the any one coherent sector of the vacuum, the vacuum of this total system conformed with the physical boundaries we have remodeled also a physical vacuum as of the concrete relativistic quantum field system considered as a non thermodynamically equilibrium system, e.g. the sea virtual quantum scalars field particles farther removed from the classical physical thermodynamically equilibrium, of importance for the nanophysics and living cells and systems.

Acknowledgments

The one of the authors A.H. takes pleasure in acknowledging the help and encouragement given to him by prof. S.I. Kostadinov, University "Paisi Hilendarski", Plovdiv, for the fruitful discussions, by International Scientific Fund – Sofia in general.

References

Belaus, A.M. and Ts.D. Tsvetkov, 1985. Nauchnie Ocnovi Tehnology Sublimatsionova Konservanija. Kiev, *Naukova Dumka,* 208 pp. (Ru).

Bogolubov, N. N., A. A. Logunov, A. I. Oksak and I. T. Todorov, 1987. Obshie Prinzipi Kvantovoi Teorii Polya. 615 pp. (Ru).

Bogolubov, P. N., V. A. Matveev, G. Petrov and D. Robaschik, 1976. Causality properties of form factors. *Rept. Math. Phys*, **10:** 195 – 202.

Bordag, M., L., Kaschluhn, G. Petrov and D.Robaschik, 1983. On nonlocal light-cone expansion in QCD. *Yd. Fiz.* **37** (1): 193 – 201.

Bordag, M., G. Petrov and D. Robaschik, 1984. Calculation of the Casimir effect for scalar fields with the simplest non-stationary boundary conditions, *Yd. Fiz*., **39:** 1315 – 1320.

Geyer, B., G. Petrov and D. Robaschik, 1977. Kausalitaetseigenschaften von Formfaktoren und kinematische Bedingungen. *Wiss. Z. Karl-Matx-Univ*., Leipzig, *Math.-Naturwiss. R*. **26:** 101 – 122.

Goodwin, **B. C.,** 1963. Temporal Organisation in cells, (A Dynamik Theory of Cellular Control Processes). *Academic Press London and New York*, 251 pp.

Mitter, H. and D. Robaschik, 1999. *Eur. Phys. J. B*., **13:** 335-340.

Petrov, G., 1974. The causality of the form factors of the virtually Compton Scattering amplitude*, I. Scientific Symposium. of Bulg. students, Berlin*, 10 - 12 May.

Petrov, G., 1978. Restrictions on the light-cone singularity imposed by causality. *Karl-Marx-Univ.,* Leipzig, L. 856/78 III/8/1 767

Petrov, G., 1985. Calculation of Casimir Effect for the electromagnetic field with the Non-stationary Boundary Conditions. *Bulg. J. Phys*., **12** (4): 355 – 363.

Petrov, G., 1989. Casimir relativistic effect for massless scalar field with uniformly moving mirrors. *Rev. Roum. Phys*., **34** (5): 453 – 460.

Petrov, G., 1992. Impulsive moving mirror Model in a Schrödinger Picture with impulse Effect in a Banach space. *Dubna, JINR* E2-92-272.

Petrov, G., 1992. Impulsive moving mirror Model and Impulse differential equations in Banach space. *Dubna, JINR* E2-92-276.

Petrov, G., 2010. Non Equilibrium thermodynamics by the concrete quantum field system with a impulse effect in the nanophysics. *Agriculture and Biology Journal of North America* ISSN Print: 2151-7517, ISSN Online: 2151-7525.

Tsvetkov, Ts. D. and G. Petrov, 2004. Non equilibrium Thermodynamic and Fields Effects in the Cellular Cryobiology and Anhydrobiology. *Bulgarian Journal of Agricultural Science*, **10:** 527-538.

Tsvetkov, Ts. D., G. Petrov and P. Tsvetkova, 2005. Non equilibrium Thermodynamics by the Concrete Quantum Field Systems in the Cellular Cryobiology an Anhydrobiology. *Bulgarian Journal of Agricultural Science*, **6:** 387-403.

Tsvetkov, Ts. D., G. Petrov and P. Tsvetkova, 2005. Non equilibrium Thermodynamics by the Vacuum Waves in the Banach Space for the See Scalar's Systems in the Cellular Cryobiology an Anhydrobiology. *Bulgarian Journal of Agricultural Science*, **6:** 645 – 6602.

Tsvetkov, Ts. D., G. Petrov and P. Tsvetkova, 2006. Non equilibrium Thermodynamics for the Interactions of the see quantum scalar's system with the classical bio fields in the cellular cryobiology and anhydrobiology. *Bulgarian Journal of Agricultural Science*, **12:** 621 – 628.

Tsvetkov, Ts. D., G. Petrov and P. Tsvetkova, 2007. Non Equilibrium Thermodynamics of the Cryobiology and Quantum Field theoretical Methods in the Temporal Organization in Cells. *Bulgarian Journal of Agricultural Science*, **13:** 379-386.

Tsvetkov, Ts. D., G. Petrov and P. Tsvetkova, 2007. Causality implies the Lorenz group for cryobiological "freezing-drying" by the vacuum sublimation of living cells. *Bulgarian Journal of Agricultural Science*, **13:** 627 -634.

Tsvetkov, Ts. D., G. Petrov and P. Tsvetkova, 2008. Non Equilibrium Thermodynamics by Vacuum Energy Momentum Tensor of Interacting Quantum Fields and Living Cells. *Bulgarian Journal of Agricultural Science*, **14:** 351 – 356.

Tsvetkov, Ts. D., G. Petrov and P. Tsvetkova, 2009, Causality Properties of the
Energy-Momentum Tensor of the Living Cells by the low temperatures. *Bulgarian Journal of Agricultural Science,* **15:** 487 – 493.

Tsvetkov, Ts. D., G. Petrov and A. Hadzhy, 2011. Theoretical field analysis of the concrete quantum field system with AN impulse effect in the elementary living cells. *Bulgarian Journal of Agricultural Science,* **17:** 1-10.

Tsvetkov, T. D., L. I. Tsonev, N. M. Tsvetkova, E. D. Koynova and B. G. Tenchov, 1989. *Cryobiology,* **26:** 162-169.

Zwetkow, Zw. D., 1985. Vakuumgefriertrocknung, *VEB Fachbuchverlag* Leipzig, 245 pp.

Received December, 2, 2011; accepted for printing February, 10, 2012.