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CASIMIR VACUUM STATE OF THE RELATIVISTIC QUANTUM SCALAR FIELD SYSTEM IN LIVING CELLS

FUNDAMENTAL RELATIVISTIC QUANTUM FIELD'S INTERACTIONS BY ADDITIONAL CAUSAL AND BOUNDARY CONDITIONS AND CRYOBIOLOGICALLY SCIENTIFICS' TREATING OF THE LIVING CELLS

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Abstract

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The physical fundamental equations describing the absorption and emission of light waves by atoms are symmetric with respect to the sign of the time parameter also the principle of the detail equilibrium is in force – that is, there is no directionality of "time's arrow" at the microscopic level of this physical phenomena; it is only at the macroscopic level when following Einstein from the macro causality properties of view the irreversible character of time begins to assert itself in the classical sense of the Minkowski space-time, and then for no other reason than probability in the thermodynamically sense by the understanding of his nature. Following this thought it is to remark that the physical phenomena by the light absorption and emission has a relativistic character also the time parameter is not so gut understanding by definition in Minkowski space without Lorenz transformations between the Lorenz manifold's points of the Lorenz globally geometry whiles the gut understand thermodynamically "time's arrow" as a physical phenomena is non relativistic and the time is absolutely also the Galileo transformation between the Riemann manifold's points is in force. All that is connected with the more fine understanding of the symmetry by transformations of the vector valued functional state as the so called super symmetry as by the time inverse connected with the mutuality principles and the principle of detail equilibrium and so as the charge conjugation. For the light propagation in the vacuum at the microscopically level the geometrical understanding of this manifolds is practical from one and the same nature described by local quantum wave fields which was understanding physically very gut as phenomena but not so gut from the so called pure mathematic point of view. Furthermore following the quantum character of the causality properties of the observed physical quantum entities it is clear that the application of the usual mathematic analysis is not more sufficiently to describe this by the help of the fundamental equations. The generalized functions and more special the tempered distributions make possibly the understanding of the nature by those physical phenomena from the mathematical point of view too, e.g. without to consider the set of the zero measures i.e. by Lebesgue's integrations. The entity of the distributions consist in them that by dropping the knowledge of the function which define the Lebesgue's zero measure it is possibly to define wide class of generalized functions, included different Dirac δ-functions and his derivations.

The real massless photon as a fundamental light quantum particles of the fundamental quantum electromagnetic field is the quantum field vector valued entity of non restrained electric charge of the fundamental relativistic quantum leptons charge field's systems localized in the so called "strings" in the time like light cone of the Minkowski space coming out from the double cone of definition for the quantum electromagnetic vacuum state. The virtual leptons are the carrier of the electromagnetic field's energy at the quantum level given by the quantum electromagnetic current and intensity operators. The notion of temporal symmetry in the equations of the quantum interaction between the fundamental particles electrons and photons of the fundamental electron and quantum electromagnetic fields at this level was simply assumed, including the famous Feynman's diagrams, where the photon is virtual carriers of the interaction's force between the local quantum currents of those see particles. Then the acausal, atemporal, justification, ignoring: 1) the principle of causality; 2) the time dimension; 3) the

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gravitational field of matter; 4) the principle of entropy has disregarded the causal, temporal, and local properties of leptons and by implication, all massive particles also all that must be proven anew by the help of the mathematic-physical methods of the theoretical physics. Moreover prove of the causal properties of the Casimir world with given additional boundary conditions are necessary. Than the vacuum is called a physical vacuum and the observed physical entity must fulfilled cinematically conditions (G. Petrov, 1978).

For the gravitational field of matter to day is knowing that the aggregate energy represented by the virtual scalar particles, like other forms of energy spectra of the zero fluctuation, could exert a gravitational force, which could be either attractive or repulsive depending on physical principles that are not yet understood, e.g. there are physical phenomena not understanding from the phenomenological point of view. In this case the axiomatic-mathematical physics has his advantages so that we can make predictions for physical phenomena from the point of view of the causality properties of the fine structure of the matter with additional boundary conditions in the global Lorenz geometry induced by the geometry of the Minkowski space-time which describe the special relativistic theory too.

By the living cells as an object of the fundamental cryobiological researches i.e. the metabolisms is minimal and also it is possibly by the help of the axiomatically physic-mathematical methods of the relativistic quantum field's theory to take in the account the problem of a "time's arrow" at the microscopic level by the contemporary considerations of the quantum vacuum in the Casimir world as a ground state of anyone relativistic quantum system become a fixture by the lyophilized elementary living cells and represented by the symmetrical selfaddjoint Hamiltonian operator taken for simplicity by definition of the quantum scalar fields operator $\tilde{\Phi}$ given in the Minkowski space-time. The probability interpretation of his spectral family give as the physical interpretation of the observed entity even for the thermodynamically structure of his ground state, i.e. by the vacuum interactions in the Casimir world, e.g. the Casimir force to day is measured with 5 % exactness. Moreover the Casimir vacuum state may be not belonging in the operator definition domain of the field's operators, but fulfill the additional causal and boundary conditions for the carrier of the interaction force, the virtual fundamental scalars particles. So also the Casimir vacuum in the asymptotic past at the left of the non moved plate for this case contains from the micro causal point of view the virtual particles for an so one initial observer and in the asymptotic future at the right of this plate and the left of the moved plate the see particles for the late-time observer, e.g. the Maxwell demon, and moreover at the right of the moved plate anew the virtual particles system.

Since the 1948 the mathematical description of the so called Casimir world as a part of the physical observed space-time in the relativistic sense is to be considered by the help of the Hamiltonian quantum field's theory and furthermore it is based on the fine play between the continuity and the discrete too. The axiomatic methods of the local quantum fields theory has given the other possibility then the Lagrange quantum field's theory and rigorously mathematical way to understand the singularities and the black holes, also the dark energy and the dark matter from one uniformly point of view to describe the fundamental interactions between the anyone concrete fundamental relativistic quantum field system with other someone or with the external and innerness material objects as an external classical fields, material boundaries and everyone internal background.

Furthermore it can be set in a Casimir world given by additionally causal and boundary conditions on the Hamiltonian scalar quantum fields system with Banach vector valued one virtual field functional vacuum state and it is element of the so called Hilbert space with infinite metric so also may be not belonging to the definitions domains of the field operators but where they are without perturbation in the set of the symmetrical virtual vacuums and a infinite set of state orbits of Banach vector valued field's functional states with perturbation by his evolution in the time (oneness and infinity set) e.g. virtual vacuum fluctuations described by the help of the spectral family of the selfaddjoint Hamiltonian operator characterized the mass of the fundamental virtual particles and the vacuum ground state defined on the involutes field's operators valued algebra on the Hilbert functional spaces with infinite metric in the environment and the innerness between the two parallel plates, non moved and moved with the constant velocity v at the face to the plate at the rest and with the additional causal properties and fulfilled boundary conditions on the plates. The Casimir vacuum is not connected with anyone charge moreover his structure is no more so narrow connected to the structure of the quantum system. The set of the vacuum structure will be obtained by the thermodynamic classical definitions of the Casimir world, i.e. the global structure of the Casimir vacuum state of anyone local quantum field system, e.g. the scalar wave quantum field defined in the Minkowski space-time induced Lorenz global geometry.

Also by fulfilling of the following naturally statements defined as early as from the ancient nature-philosophy by Syrian, Egyptian and Grecian in the axiomatically sense of the unity of the opposite entities:

1. boundary and infinity
2. odd and even

3. oneness and infinity set
4. right and left
5. manly and womanly
6. unmoved and moved
7. straight and curve
8. light and darkness
9. blessing and disguise
10. square and parallelogram

it is possibly to describe the interacting quantum field's relativistic systems in the so called Casimir world (boundary and infinity) become a fixture to the environment in living cells and systems from the point of view of the usual axiomatic theory by using the idea of the vacuum as a functional ground state of the axiomatically constructed concrete fundamental relativistic quantum field's system in the Schrödinger picture with additional adiabatically and impulse effects so that from microscopically stand point of view by the quantum causality properties and localizability of the entities seeing from the observer e.g. the Maxwell's demon at the past $t > t_{-2n}$ and at the future time at $t = t_{2n}$ from the late-time observer for $n \to \infty$ the "time's arrow" can be understand micro causal without to take in to account the thermodynamically entropies character of the time as it is the case by the Einstein's macro causality i.e. the calculated Casimir force in the vacuum act on every particle as it is the case by the electron moved in the external classical electromagnetic field with a destroyed scaling behaviour of the vacuum state of the massless Dirac fundamental electron field leaded to polarisation (electron-positron pair) of the vacuum by acting of the electric force on the localized massive electron.

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 – 2012) it is hopped that by the significant form expressed e.g. by the scaling behaviours of the invariant entities in the space-time by the energy impulse tensor described the elementary living cells and systems will be possibly to describe the biological expressions at the nanophysics point of view by means the behaviour of the concrete fundamental relativistic quantum system, e.g. sea virtual quantum scalars in the physical Casimir vacuum with additional causality properties and boundary conditions on every one generic surface S too.

At the molecular level (Mitter and Robaschik, 1999) the thermodynamic behaviour is considered by quantum electromagnetic field system with additional boundary conditions 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 and non moved towards the other, i.e. also the case of so called Casimir effect under consideration in the sense of the local case when the Minkowski space-time is equally of 4-dimensional Euclidian space but without the considerations of the causality properties of the relativistic quantum entities given a share in the effect, e.g. relativistic supplement to the Casimir force.

Our interests is the more realistic relativistic Casimir effect when the one of the plates is at the rest and the other moved with a constant velocity v towards the non moved plates. So the thermodynamic behavior of the elementary living cells under consideration must be globally by the relativistic quantum systems in the so called Casimir world too.

Key words: Casimir effect, time's arrow, elementary living cells, lyophilization, nanophysics, singularities, scaling principle

Introduction

At the first we consider the 4-points $y^\mu_{2(n-\frac{1}{2}(j+1))}$, $y^\mu_{-2(n-\frac{1}{2}j)}$, $y^\mu_{2(n-\frac{1}{2}j)}$, $y^\mu_{-2(n-\frac{1}{2}(j-1))}$ from the reflections and the hyperbolical turns (odd and even, right and left) on the 4-point $y^\mu_0 = (ct_0, \bar{y})$ at the time $t = t_0$ and the 4-point $x^\mu = (ct, \bar{x})$ between the plates in the coordinate Minkowski space $\mathbf{M}^4$ induced the Lorenz globally geometry of the space-time so that the time's arrow between the manifold's points of the Lorenz global geometry can be thought micro causal for the time belonging to this geometry $t \in (t_{-2(n-\frac{1}{2}j)}, t_{2(n-\frac{1}{2}j)}]$, $n = 0,1,2, ..., j = 0,1,2,...,2n$, for $y^3_0, x^3 \in (0, d_0]$, or $y^3_0, x^3 \in [d_0, L)$, (square and parallelogram) where $\mu = 0, 1, 2,3$ and n is the reflecting number of the Minkowski space 4-point y^μ_0 seeing (light and darkness) from the demon of Maxwell (blessing and disguise) at the time $y^0_0 = ct_0$ between the unmoved and the parallel moved plate towards the plate at the rest with the constant velocity v.

Furthermore it can be defined a light like Minkowski space vector ${}^r\tilde{x}^\mu$ and ${}^l\tilde{x}^\mu$ by the distinguishing marks "l" = left and "r" = right the following relations for the see mirror 4-points $y^\mu_{\sim -2(n-\frac{1}{2}j)}$ and $y^\mu_{2(n-\frac{1}{2}j)}$ of the 4-vector y^μ_0 and the 4-vector x^μ

${}^r x^\mu = x^\mu + y^\mu_{2(n-\frac{1}{2}j)} y_0^{-2}((xy_{2(n-\frac{1}{2}j)})^2 - x^2 y_0^{2})^{\frac{1}{2}} - y^\mu_{2(n-\frac{1}{2}j)}(xy_{2(n-\frac{1}{2}j)}) y_0^{-2} =$
$x^\mu + y^\mu_{2(n-\frac{1}{2}j)}((xy_{2(n-\frac{1}{2}j)}) y_0^{-2})((1 - x^2 y_0^{2}(xy_{2(n-\frac{1}{2}j)})^{-2})^{\frac{1}{2}} - 1) =$
$x^\mu + y^\mu_{2(n-\frac{1}{2}j)} f$, for $t \in (t_{-2(n-\frac{1}{2}j)}, t_{2(n-\frac{1}{2}j)}]$ and

$f = ((xy_{2(n-½j)})y_0^{-2})((1 - x^2y_0^2(xy_{2(n-½j)})^{-2})^{½} - 1)$ and
${}^l\tilde{x}^\mu = x^\mu + y^\mu_{-2(n-½j)}y_0^{-2}((xy_{-2(n-½j)})^2 - x^2y_0^2)^{½} - y^\mu_{-2(n-½j)}(xy_{-2(n-½j)})y_0^{-2} =$
$x^\mu + y^\mu_{-2(n-½j)}((xy_{-2(n-½j)})y_0^{-2})((1 - x^2y_0^2(xy_{-2(n-½j)})^{-2})^{½} - 1) = x^\mu + y^\mu_{-2(n-½j)}f'$,
$f' = ((xy_{-2(n-½j)})y_0^{-2})((1 - x^2y_0^2(xy_{-2(n-½j)})^{-2})^{½} - 1)$,
for $t \in (t_{-2(n-½j)}, t_{2(n-½j)}]$, $n = 0,1,2, ..., j = 0,1,2, ..,2n$.

Moreover by the following relations it can be defined the non local Minkowski space time 4-vectors
$\kappa x^\mu = \tau_j{}^r\tilde{x}^\mu + ½(x + \tau_j{}^r\tilde{x})^\mu f_\kappa$ with $f_\kappa = ½y_0^{-2}(x\tau_j{}^r\tilde{x})((1 + 4\kappa^2x^2y_0^2(x\tau_j{}^r\tilde{x})^{-2})^{½} - 1)$
$\kappa' x^\mu = \tau_j{}^l\tilde{x}^\mu + ½(x + \tau_j{}^l\tilde{x})^\mu f_{\kappa'}$, with
$f_{\kappa'} = ½y_0^{-2}(x\tau_j{}^l\tilde{x})((1 + 4\kappa'^2x^2y_0^2(x\tau_j{}^l\tilde{x})^{-2})^{½} - 1)$
for $y_0^2 = y_{2(n-½j)}{}^2 = ¼(x + \tau_j{}^r\tilde{x})^2 = y_{-2(n-½j)}{}^2 = ¼(x + \tau_j{}^l\tilde{x})^2$,
$t \in (t_{-2(n-½j)}, t_{2(n-½j)}]$, $n = 0,1,2, ..., j = 0,1,2, ..,2n$,
$\kappa x^\mu = \tau_{2n-1}{}^r\tilde{x}^\mu + ½(x + \tau_{2n-1}{}^r\tilde{x})^\mu f_\kappa$ for $t \in (t_{-1}, t_1]$, $t_{-1} = t_0$,
$n = 0,1,2, ..., j = 2n-1$
$f_\kappa = ½y_0^{-2}(x\tau_{2n-1}{}^r\tilde{x})((1+4\kappa^2x^2y_0^2(x\tau_{2n-1}{}^r\tilde{x})^{-2})^{½} - 1)$
for $y_0^2 = y_1^2 = ¼(x + \tau_{2n-1}{}^r\tilde{x})^2$,

so that the following bounded open domains of double cons can be defined
${}^lD = {}^lD_{\kappa x, \tau_j{}^l\tilde{x}} = V^+_{\tau_j{}^l\tilde{x}} \cap V^-_{\kappa x}$ with the basis $S_{\kappa x, \tau_j{}^l\tilde{x}}$
and the axis $[\kappa x^\mu, \tau_j{}^l x^\mu]$,
${}^rD = {}^rD_{\kappa' x, \tau_j{}^r\tilde{x}} = V^+_{\tau_j{}^r\tilde{x}} \cap V^-_{\kappa' x}$ with the basis $S_{\kappa' x, \tau_j{}^r\tilde{x}}$
and the axis $[\kappa' x^\mu, \tau_j{}^r x^\mu]$.

Furthermore it can be set
$ct(\|\bar{x}_\perp\| + const)(1 \pm (\dot{z}/c)\cos\theta)^{½} = |x\tau_j{}^r\tilde{x}| = (x\tau_j{}^r\tilde{x})^{½}$,
$y_0^2 = (ct_0)^2 - \bar{y}^2 = (ct_0)^2 - \bar{y}_\perp^2 - y^3{}_0{}^2 \geq 0$.

If the following identity is in force
$y^\mu{}_0 = (|x\tau_j{}^r\tilde{x}|, \bar{y}_\perp, (x\tau_j{}^r\tilde{x} - y_0^2 - \bar{y}_\perp^2)^{½}) =$
$(|x\tau_j{}^r\tilde{x}|, \bar{0}_\perp, (x\tau_j{}^r\tilde{x} - y_0^2)^{½} + const)$, $\lim(-\bar{y}_\perp^2)/2(x\tau_j{}^r\tilde{x} - y_0^2)^{½} = const \in [0, 1]$,

for $(x\tau_j{}^r\tilde{x} - y_0^2)^{½} \to -0$, $\bar{y}_\perp^2 \to 0$, $\dot{z} = |\bar{x}|/t$, $\cos(\bar{x}\,\tilde{\bar{x}}) = \cos\theta$ and

$\lim \tilde{x}^{3^2}/2\|\bar{x}_\perp\| = const \in [0, 1]$, for $\tilde{x}^3 \to -\infty$, $0 < \varepsilon \leq \|\bar{x}_\perp\|$, $|\bar{y}_\perp| \leq |\bar{x}_\perp| \to \infty$, $y_0^2 \to x\tau_j{}^r\tilde{x}$ i.e. $t \in (t_{-1}, t_1]$, with the causality condition $|\bar{x}_\perp| \geq ((ct_0)^2 - y^3{}_0{}^2)^{½} = (y_0^2 + \bar{y}_\perp^2)^{½} = |\bar{y}_\perp| + const$

and
$(x\tau_j{}^r\tilde{x} - y_0^2)^{½} + const = y^3{}_0 \in (0, d_0]$, $y^3{}_0 \in [d_0, L)$. So it is possibly to consider a case where the surface S as the kind of the definition domain of the boundary test function $\alpha_\kappa(x) \in {}^lD$ is zero for $t = t_{-1}$, $x^3 \in (-\infty, 0]$ and $\alpha_\kappa(\bar{x}_\perp)_{x^3, t} = const$ on the remaining boundary kind of the domain.

Also we have to consider a so called lexicographic order for the 4- points $y^\mu_{2(n-½(j+1))}$ and $y^\mu_{-2(n-½j)}$, $y^\mu_{2(n-½j)}$ and $y^\mu_{-2(n-½(j-1))}$, $n = 0,1,2, ..., j = 0,1,2,...,2n$ and we change not the $\bar{y}_\perp$ by the reflections and the hyperbolically turns.

Furthermore by means of the following relation and fixed impulse Minkowski space 4-vector $k^\mu = (\omega/c, \bar{k}_\perp, k^3)$ where ω is the energy characterised by the spectre of the so called "zero fluctuations" and fixed $k^3 = c^{-1}(\omega^2 - k^2)^{½}$ for $|\bar{k}_\perp| \to 0$ with the so called "zero point mass" (ZPM) $m_0 = |k|c^{-1}$ given at the first by the prove of the causality properties of the formfactors by the virtual Compton effect in the deep non forward scattering of the leptons and hadrons in Bogolubov et al. (1987) and Petrov (1978) for central interacting virtual particles but with $|\bar{k}_\perp| = 0$ and $\omega/c = 0$ i.e. $|\bar{y}_\perp{}^2|$, $ct_0 \to \infty$ and fixed $k^2 = -k^{3^2} \to -\infty$ without the idea of the ZPM but after all by fixed impulse k^3, i.e. actually, the only way to extend the symmetry of the theory without renouncing to the analyticity of the theoretical entities is to prove of the so called analyticity of the quantum entities as a effect of the causality properties by fulfilled kinematical relations between the same entities, e.g. for ZPM, analogously to the formfactors too. So the extra bosonic symmetry is an effect of the causality properties of the theory, e.g. this of the S-matrix theory given rigorously in the axiomatic way by N.N. Bogolubov, and than the local quantum field theory is analytic since it is causal everywhere except for the discrete values selected by the fulfilled kinematical relations between the theoretical entities as effect of the his causal properties and describing the experiment too.

Also at the time $t \to t_{-2(n-½j)} + 0$, $n \to \infty$, $\bar{y}_\perp{}^2 \to \infty$, $y_0{}^2 \geq 0$, for $|\bar{x}_\perp| \geq ((ct_0)^2 - y^3{}_0{}^2)^{½}$ and $y^3{}_0 \in (-\infty, 0^+]$, $y^3{}_0 \in [L^+, \infty)$ it can be defined
$q_\kappa{}^\mu = {}^r\tilde{q}^\mu + k^\mu f_\kappa$ with $f_\kappa = k^{-2}(k^r\tilde{q})((1 + \kappa^{-2}q^2k^2(k^r\tilde{q})^{-2})^{½} - 1)$,
$q_{\kappa'}{}^\mu = {}^l\tilde{q}^\mu + k^\mu f_{\kappa'}$ with $f_{\kappa'} = k^{-2}(k^l\tilde{q})((1 + \kappa'^{-2}q^2k^2(k^l\tilde{q})^{-2})^{½} - 1)$

and
$q^2 = ¼(\kappa q_\kappa{}^\mu + \kappa' q_{\kappa'}{}^\mu)^2 + ¼(\kappa q_\kappa{}^\mu - \kappa' q_{\kappa'}{}^\mu)^2$, $k^\mu = ½(\kappa q_\kappa{}^\mu - \kappa' q_{\kappa'}{}^\mu) =$
$(|\kappa q_\kappa{}^\mu \kappa' q_{\kappa'\mu}|, \bar{0}_\perp, (\kappa q_\kappa{}^\mu \kappa' q_{\kappa'\mu} - k^2)^{½}) = (|\kappa q_\kappa{}^\mu \kappa' q_{\kappa'\mu}|, \bar{0}_\perp, |\kappa q_\kappa{}^\mu \kappa' q_{\kappa'\mu}| + const))$

so that for $k^2 \to -\infty$ and $(\kappa q_\kappa{}^\mu \kappa' q_{\kappa'\mu})^{½} \to \infty$, $\omega/c = |\kappa q_\kappa{}^\mu \kappa' q_{\kappa'\mu}|$, $k^3 = (\kappa q_\kappa{}^\mu \kappa' q_{\kappa'\mu} - k^2)^{½}$

is $\lim(-k^2)/2(\kappa q_\kappa{}^\mu \kappa' q_{\kappa'\mu})^{½} = const \in [0, 1]$, and ${}^l\tilde{q}^2 = {}^r\tilde{q}^2 = 0$, $q_\kappa{}^2 = \kappa^{-2}q^2$, $q_{\kappa'}{}^2 = \kappa'^{-2}q^2$, $k^2 = m_0^2c^2$, $(m_{c.m.}c)^2 = q^2$, $\omega/c = (k^2 + k^{3^2})^{½} = k^3 + const$ so that for $k^2 \to \infty$, $k^3 \to \infty$ is the $\lim k^2/2k^3 = const \in [0, 1]$.

Moreover it can be defined for fixed $q^3 = \pm k^3$,
$q^2 = (q^{0^2} - |\bar{q}_\perp|^2 - k^{3^2}) = (q^{0^2} - |\bar{q}_\perp|^2 + k^2 - \kappa q_\kappa{}^\mu \kappa' q_{\kappa'\mu}) =$
$(q^{0^2} - \omega^2/c^2 - |\bar{q}_\perp|^2 + k^2)$,

so that for $|\bar{q}_\perp| = 0$, the energy $E_0 = (c^2q^{0^2} - \omega^2)^{½} = c((m_{c.m.}c)^2 - k^2)^{½} = m_{c.m.}c^2 + const$

and where for $m_{c.m.} \to \infty$ and $k^2 \to -\infty$ the $\lim(-k^2/2m_{c.m.}) = const \in [0, 1]$ is the energy of the sea virtual particles in center of masses in the referent inertial system at the fixed time and ω is the energy of "zero fluctuations".

For $|\bar{q}_\perp - \bar{u}_\perp| \to 0$, and $f_{\kappa'}(\bar{u}_\perp, \omega, m_{c.m.}\dot{z})$ is anyone spectral function follows from the possible spectral representation for the "zero point energy" E_0 and $|k^3| \gg q^3 \neq 0$ it is

$E_0 = c(q^2 + \bar{q}_\perp^2 + k^{3^2})^{1/2} = c(q^{0^2} + k^{3^2} - q^{3^2})^{1/2} =$
$c[(q^{0^2} + k^{3^2})^{1/2} + \text{const}] =$
$\int d\omega^2 \int d\bar{u}_\perp \int d(m_{c.m.}\dot{z})^2\, \delta\, (c^2 q^{0^2} - (\bar{q}_\perp - \bar{u}_\perp)^2 - k^{3^2} +$
$(m_{c.m.}\dot{z})^2 - \omega^2)\, f_{\kappa'}(\bar{u}_\perp, \omega, m_{c.m.}\dot{z}),$
for $q^{3^2} \to \infty$, $(q^{0^2} + k^{3^2})^{1/2} \to -\infty$, $\lim (- q^{3^2})/2(q^{0^2} + k^{3^2})^{1/2}$.

So also $f_{\kappa'}(\bar{y}_\perp, \omega, m_{c.m.}\dot{z}) = \int d\bar{u}_\perp \exp(-i\, \bar{y}_\perp . \bar{u}_\perp)\, f_{\kappa'}(\bar{u}_\perp, \omega, m_{c.m.}\dot{z})$ can be considered as a solution of everyone differential equation taken from the potential theory of the spherical wave propagation.

Furthermore it can be defined the "zero point mass" m_0 at the rest by the definition
$\frac{1}{4}(\kappa q_\kappa^{\ \mu} - \kappa' q_{\kappa'}^{\ \mu})^2 = \frac{1}{2}(q^2 - \kappa q_\kappa^{\ \mu} \kappa' q_{\kappa'\mu}) =$
$\frac{1}{2}(q^{0^2} - |\bar{q}_\perp|^2 - k^{3^2} - \kappa q_\kappa^{\ \mu} \kappa' q_{\kappa'\mu}) =$
$\frac{1}{2}(q^{0^2} - |\bar{q}_\perp|^2 + k^2 - 2\kappa q_\kappa^{\ \mu} \kappa' q_{\kappa'\mu}) = (q^{0^2} - \omega^2/c^2 - |\bar{q}_\perp|^2) =$
$(m_0 c)^2 + \omega^2/c^2$
and also for $|\bar{q}_\perp| = 0$ the energy $E_0 = (c^2 q^{0^2} - \omega^2)^{1/2} = (c^2(m_0 c)^2 + \omega^2)^{1/2} = m_0 c^2 + \text{const}$,

where if the ZPM $m_0 \to \infty$ and $\omega^2 \to \infty$ the $\lim (\omega/c)^2/2m_0 = \text{const} \in [0, 1]$ where m_0 is the mass of scalar see particles (Pterophyllum scalare) at the rest and c is the light velocity in vacuum. If the ZPM is fixed and obtained from the masses as effect of the super select principle by the introduction of the "fermionic" symmetries, i.e. symmetries whose generators are anticommuting objects and called by as scalarinos so that we can speak from the super symmetric point of view about a "fermionization" and "bosonization".

The arbitrariness of the phase of vector valued one quantum field's functional state obtained by the quantization of the solutions $\varphi(x)$ of someone field's wave field equation is the usual method to obtain the reel existing interactions taken in account the invariance. This is typical for this way of the consideration. There is a dynamic equilibrium in which the mass at the rest of the virtual scalar particles stabilizes the so called Higgs boson which has a mass in a set of vacuum ground-state orbit in the Casimir world. It seems that the very stability of matter itself in this case appears to depend on an underlying sea of scalar field zero-point energy by the zero fluctuations of the Casimir vacuum state. The Casimir effect has been posited as a force produced solely by activity of the quantum vacuum field ground state in the vacuum with additional causal properties and boundary conditions. The zero fluctuations are fundamentally based upon the interaction of the quantum fundamental field system with the classical objects, which has been predicted to be "signed into law" someday soon, since no violations have so far been found. This may lead everyone to believe that though it is random, it can no longer be called "spontaneous emission" but instead should properly be labelled "stimulated emission" much like laser light is stimulated emission, even though there is a random quality to it.

Main Results

Let it be that the vector valued functional one quantum field state in the coordinate Minkowski space-time in the non local case is given by $|\varphi>$ and obtained by the acting of the scalar field operator $\tilde{\Phi}_{\alpha_\kappa}$ on the vacuum vector functional state defined by $|y^\mu_{-2(n - \frac{1}{2}(j-\kappa'))}> =$
$\tilde{\Phi}_{\alpha_{\kappa'}}(y^\mu_{-2(n - \frac{1}{2}(j-\kappa'))})|0^+> = \varphi(y^\mu_{-2(n - \frac{1}{2}(j-\kappa'))})|0^+> =$
$\int d_4 k \varphi(k) \exp[k y_{-2(n - \frac{1}{2}(j-\kappa'))}]|0^+> = |\varphi>$ or
$\int d^4 y^\mu_{-2(n - \frac{1}{2}(j-\kappa'))} \varphi(y^\mu_{-2(n - \frac{1}{2}(j-\kappa'))}) \alpha_{\kappa'}(y^\mu_{-2(n - \frac{1}{2}(j-\kappa'))})|0^+> = \varphi(\alpha_{\kappa'})|0^+>$,
where $d_4 k = d^4 k/(2\pi)^4$. Furthermore the vector valued quantum vacuum functional $|0^+>$ is a state with the positive energy E_0 defined by the positive energy of the "zero fluctuations" the so called "zero-point energy" ZPE of the vector valued one quantum field state at the fixed time given by

$t \in (t_{-2(n - \frac{1}{2}j)}, t_{2(n - \frac{1}{2}j)}]$, $n = 0,1,2, ..., j = 0,1,2,...,2n$, for $|\bar{q}_\perp| \to 0$, $q^3 = \pm k^3$, i.e. the positive energy $E_0 = (c^2 q^{0^2} - \omega^2)^{1/2} = c((m_{c.m.} c)^2 - k^2)^{1/2} = m_{c.m.} c^2 + \text{const}$, where for $m_{c.m.} \to \infty$ and $k^2 \to -\infty$, $\lim (-k^2/2m_{c.m.}) = \text{const} \in [0, 1]$ is the energy of the sea virtual particles in centre of mass of the referent inertial system and ω is the energy of "zero fluctuations" of the Casimir vacuum state, and by the definition of fixed $k^2 = (m_0 c)^2$ it is also for super symmetry consideration
$\frac{1}{4}(\kappa q_\kappa^{\ \mu} - \kappa' q_{\kappa'}^{\ \mu})^2 = \frac{1}{2}(q^2 - \kappa q_\kappa^{\ \mu} \kappa' q_{\kappa'\mu}) =$
$\frac{1}{2}(q^{0^2} - |\bar{q}_\perp|^2 - k^{3^2} - \kappa q_\kappa^{\ \mu} \kappa' q_{\kappa'\mu}) =$
$\frac{1}{2}(q^{0^2} - |\bar{q}_\perp|^2 \pm k^2 - 2\kappa q_\kappa^{\ \mu} \kappa' q_{\kappa'\mu}) =$
$(q^{0^2} - \omega^2/c^2 - \bar{q}_\perp^{\ 2}) = (m_0 c)^2 + \omega^2/c^2$
and for $|\bar{q}_\perp| \to 0$

the positive Casimir vacuum energy $E_0 = (c^2 q^{0^2} - \omega^2)^{1/2} = (c^2(m_0 c)^2 + \omega^2)^{1/2} = m_0 c^2 + \text{const}$, where for fixed $m_0 \to \infty$ and $\omega^2 \to \infty$, $\lim (\omega/c)^2/2m_0 = \text{const} \in [0, 1]$, and m_0 is the "zero-point mass" ZPM at the rest of scalar see particles (Pterophyllum scalare) obtained by the super select rules from the masses $m_{c.m}$ in the centre of mass in the referent inertial system of the scalarinos and c is the light velocity in vacuum. It is to remark that for the ZPM the identity $m_0 \equiv m_{c.m.}$ for the Casimir positive energy E_0 at the infinity except for the constants is in force.

Moreover the vector valued functional quantum one field state $|\varphi>$ with one eigen field value φ is characterized by the Ψ-functional $\Psi_{\alpha_\kappa}(\varphi, t)$ by the following relation defined
$|y^\mu_{-2(n - \frac{1}{2}(j-\kappa'))}, t> = \int |\alpha_{\kappa'}> D\alpha_{\kappa'} <\alpha_{\kappa'}|y^\mu_{-2(n - \frac{1}{2}(j-\kappa'))}, t> =$
$\int |\alpha_{\kappa'}><y^\mu_{-2(n - \frac{1}{2}(j-\kappa'))}, t||\alpha_{\kappa'}> D\alpha_{\kappa'} =$
$\int |\alpha_{\kappa'}> \Psi^*_{\alpha_{\kappa'}}(\varphi, t) D\alpha_{\kappa'}$,

where $0^+ \leq \kappa' \leq \kappa \leq 1$, $\alpha_{\kappa'} = \alpha_{\kappa'}(\bar{x}_\perp)_{y^3_{-2(n - \frac{1}{2}(j-\kappa))},\, ct_{-2(n - \frac{1}{2}(j-\kappa))}}$,
for the functional integral measure given by the usual descriptions
$D\alpha_\kappa(\kappa' x) = \prod d^2 \bar{x}_\perp,\ \bar{x}_\perp$

where $\alpha_{\kappa'}$ is the boundary test function for fixed $\kappa' x^3 = y^3_{-2(n - \frac{1}{2}(j-\kappa'))}$, $\kappa' x^0 = y^0_{-2(n - \frac{1}{2}(j-\kappa'))}$

Furthermore for $\varphi(\kappa'x) = \varphi(\alpha_{\kappa'})$, $\pi(\kappa'x) = \pi(\partial_{ct}\alpha_{\kappa'})$, $t \in (t_{-2(n-\frac{1}{2}(j-\kappa')}, t_{2(n-\frac{1}{2}(j-\kappa)}]$

and $\varphi(\kappa'x) = \varphi(\tau_j{}^{l}\tilde{x})$ for $\alpha_{\kappa'} = \alpha_{\kappa'}(\bar{x}_\perp)_{y^3_{-2(n-\frac{1}{2}(j-\kappa)}, ct_{-2(n-\frac{1}{2}(j-\kappa))}} = f^1_{\kappa'}(\bar{x}_\perp) = 0$, $\pi(\kappa'x) = \pi(\tau_j{}^{l}\tilde{x})$ for $\partial_{ct}\alpha_{\kappa'} = \partial_{ct}\alpha_{\kappa'}(\bar{x}_\perp)_{y^3_{-2(n-\frac{1}{2}(j-\kappa)}, ct_{-2(n-\frac{1}{2}(j-\kappa))}} = f^2_{\kappa'}(\bar{x}_\perp) = 0$, and $\mathbf{f}_{\kappa'}(\bar{x}_\perp) = (f^1_{\kappa'}(\bar{x}_\perp), f^2_{\kappa'}(\bar{x}_\perp)) = \bar{0}_\perp$

for the additional causality properties and boundary condition by

$t = t_{-2(n-\frac{1}{2}(j-\kappa'))}$, $\kappa'x^3 \in (-\infty, y^3_{-2(n-\frac{1}{2}(j-\kappa'))}]\ U\ (y^3_{-2(n-\frac{1}{2}(j-\kappa'))}, 0], \bar{x}_\perp = (x^1, x^2) \in \delta\Omega_t = S$

and moreover for $\bar{x}_\perp \in \Omega_t \subset \mathbf{R}^2$ follows $\bar{\partial}_\perp \mathbf{f}_\kappa(\bar{x}_\perp) = 0$ too, $\bar{\partial}_\perp = (\partial_{x^1}, \partial_{x^2})$.

Moreover if on the boundary surface S for $\kappa'x^0 = ct$, and the fulfilled additional causality condition $|\bar{x}_\perp| \geq (y^{0\,2}_0 - y^{3\,2}_0)^{\frac{1}{2}}$ can be supposed $\alpha_{\kappa'}(\bar{x}_\perp, \kappa'x^3, ct) = \text{const}$ or $\partial_{ct}\varphi(\kappa'x) = (\delta/\delta\alpha_{\kappa'})\varphi(\alpha_{\kappa'})\partial_{ct}\alpha_{\kappa'}(\bar{x}_\perp, \kappa'x^3, ct) = \pi(\partial_{ct}\alpha_{\kappa'}) = 0$ so that

$$\partial_{ct}\alpha_{\kappa'}(\bar{x}_\perp, \kappa'x^3, ct) = 0, \tag{1}$$

and the same follows for $\partial_{ct}\alpha_{\kappa'}(\bar{x}_\perp, \kappa'x^3, ct) = \text{const}$ or $\pi(\kappa'x) = \text{const}$, so that for $\kappa'x^3 = x^3$
$\partial_{ct}\pi(\kappa'x) = (\delta/\delta(\partial_{ct}\alpha_{\kappa'}))\pi(\partial_{ct}\alpha_{\kappa'})\partial^2_{ct}\alpha_{\kappa'}(\bar{x}_\perp, x^3, ct) = \Delta\varphi(\kappa'x) = 0,$

$$\partial^2_{ct}\alpha_{\kappa'}(\bar{x}_\perp, \kappa'x^3, ct) = 0. \tag{2}$$

$\bar{\partial}_\perp{}^2 + \partial_{x^3}{}^2 = \Delta$, $\partial_{ct}\alpha^+_{\kappa'}(\bar{x}_\perp, y^3_{-2(n-\frac{1}{2}(j-\kappa'))}, ct_{-2(n-\frac{1}{2}(j-\kappa')}) = \partial_{ct}\alpha_{\kappa'}(\bar{x}_\perp, y^3_{2(n-\frac{1}{2}(j+1-\kappa'))}, c\,t_{-2(n-\frac{1}{2}(j+1-\kappa')}) + v\partial_{x^3}\alpha_{\kappa'}(\bar{x}_\perp, y^3_{2(n-\frac{1}{2}(j+1-\kappa'))}, c\,t_{-2(n-\frac{1}{2}(j+1-\kappa')})$

Furthermore from the following equation for the non free simple connected vacuum surface of the relativistic quantum fields system given above from the fulfilled eq. (1) and eq. (2) and the following equation by definition

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

and

$$\partial^2_{ct}\alpha_{\kappa'}(\bar{x}_\perp, \kappa'x^3, ct) = \kappa'^2\|\pi\|^2(2(\pi(y_{-2(n-\frac{1}{2}j)})\pi(\tau\tilde{x})) + \pi^2(y_{-2(n-\frac{1}{2}j)})\partial_{ct}\alpha_{\kappa'})^{-1} - \partial_{ct}\alpha_{\kappa'}, \tag{3}$$

$\bar{x}_\perp \in \mathbf{R}^2$ and $(\tau\tilde{x})^2 = 0$, $(\kappa'x)^2 = \kappa'^2x^2$, $(\kappa x)^2 = \kappa^2x^2$, $y_{-2(n-\frac{1}{2}j)}{}^2 = y_{2(n-\frac{1}{2}(j+1))}{}^2 = y_0{}^2$, from eq. (1)

$$f^1_{\kappa'}(\bar{x}_\perp) = \alpha_{\kappa'}(\bar{x}_\perp)_{y^3_{-2(n-\frac{1}{2}(j-\kappa)}, ct_{-2(n-\frac{1}{2}(j-\kappa))}} = (\varphi(y_{-2(n-\frac{1}{2}j)})\varphi(\tau\tilde{x}))\,\varphi^{-2}\,((1 + (\kappa'^2\|\varphi\|^2\varphi(y_{-2(n-\frac{1}{2}j)})^2)(\varphi(y_{-2(n-\frac{1}{2}j)})\varphi(\tau\tilde{x}))^{-2})^{\frac{1}{2}} - 1), \tag{4}$$

and from eq; (2)

$$f^2_{\kappa'}(\bar{x}_\perp) = \partial_{ct}\alpha_{\kappa'}(\bar{x}_\perp)_{y^3_{-2(n-\frac{1}{2}(j-\kappa)}, ct_{-2(n-\frac{1}{2}(j-\kappa))}} = (\pi(y_{-2(n-\frac{1}{2}j)})\pi(\tau\tilde{x}))\,\pi(y_{-2(n-\frac{1}{2}j)})^{-2}\,((1 + (\kappa'^2\|\pi\|^2\pi^2)(\pi(y_{-2(n-\frac{1}{2}j)})\pi(\tau\tilde{x}))^{-2})^{\frac{1}{2}} - 1), \tag{5}$$

The function $\mathbf{f}_{\kappa'}(\bar{x}_\perp)$ is taken from potential theory as a solution of the equation

$$\bar{\partial}_\perp{}^2\mathbf{f}_{\kappa'}(\bar{x}_\perp) + \lambda_{\kappa'}\mathbf{f}_{\kappa'}(\bar{x}_\perp) = \bar{\partial}_\perp\varphi(\kappa'x)_{y^3_{-2(n-\frac{1}{2}(j-\kappa)}, ct_{-2(n-\frac{1}{2}(j-\kappa))}} \qquad \bar{x}_\perp \in \Omega_t, \tag{6}$$

$$\bar{\partial}_\perp\mathbf{f}_{\kappa'}(\bar{x}_\perp) = 0, \qquad \bar{x}_\perp \in \Omega_t, \tag{7}$$

$$\mathbf{f}_{\kappa'}(\bar{x}_\perp) = 0, \qquad x_\perp \in \delta\Omega_t = S, \tag{8}$$

for additional causal condition

$$|\bar{x}_\perp| \leq (y^{0\,2} - y^{3\,2})^{\frac{1}{2}}, \tag{9}$$

where $\varphi(\kappa'x)_{y^3_{-2(n-\frac{1}{2}(j-\kappa)}, ct_{-2(n-\frac{1}{2}(j-\kappa))}}$ is anyone non local scalar field function with the norm $\kappa'\|\varphi\|$, fulfilled the given additional causal and boundary condition for fixed $\kappa'x^0 = ct = y^0_{-2(n-\frac{1}{2}(j-\kappa))}$, $\kappa'x^3 = x^3 = y^3_{-2(n-\frac{1}{2}(j-\kappa))}$, so that the norm $\|\bar{\partial}_\perp\mathbf{f}_{\kappa'}\|$ is given by the double product

$$\|\bar{\partial}_\perp\mathbf{f}_{\kappa'}\|^2 = (\bar{\partial}_\perp\mathbf{f}_\kappa(\bar{x}_\perp), \bar{\partial}_\perp\mathbf{f}_\kappa(\bar{x}_\perp)) \tag{10}$$

and for the minimum of the norm $\|\mathbf{f}_{\kappa'}\|$ is the minimal value of $\lambda_{\kappa'} = \lambda_1$ by the fulfilling of the additional causality and boundary conditions (7) and (8) and by $\|\mathbf{f}_{\kappa'}\| = 1$ where $\|\mathbf{f}_{\kappa'}\|$ is the norm defined by the help of the equation

$$(\mathbf{f}_{\kappa'}, \mathbf{g}_{\kappa'}) = \int_{\Omega_{\perp, x3}}(\mathbf{f}^t_{\kappa'}, \mathbf{g}_{\kappa'})d\,\bar{x}_\perp, \tag{11}$$

included the double product

$(\bar{\partial}_\perp\mathbf{f}_{\kappa'}, \bar{\partial}_\perp\mathbf{g}_{\kappa'}) = \int_{\Omega_{t, x3}}(\bar{\partial}_\perp\mathbf{f}^t_{\kappa'} : \bar{\partial}_\perp\mathbf{g}_{\kappa'})d\,\bar{x}_\perp,$

given by the definition

$(\bar{\partial}_\perp\mathbf{f}_{\kappa'} : \bar{\partial}_\perp\boldsymbol{\alpha}_{\kappa'}) = \sum_{k, j = 1} (\partial_j f^t_{\kappa'k})(\partial_j g_{\kappa'k})$

Then we can define by $|\varphi(\tau\tilde{x})| = \|\varphi(\tau\tilde{x})\| = 0$ and $\varphi^2 = \varphi^2(y_{2(n-\frac{1}{2}j)}) \neq 0$, $\|\varphi\| = |\varphi(\kappa'x)|$ or by the Banach impulse scalar field for $\|\pi(\tau\tilde{x})\| = 0$ and $\pi^2(y_{-2(n-\frac{1}{2}j)}) \neq 0$, $\pi^2(\kappa'x) = \|\pi\|^2$

$$\varphi(\alpha_{\kappa'}) = \varphi(\kappa'x) = \varphi(\tau\tilde{x}) + \varphi(y_{-2(n-\frac{1}{2}(j)})f^1_{\kappa'}, \text{ or} \tag{12}$$

$$\pi(\partial_{ct}\alpha_{\kappa'}) = \pi(\kappa'x) = \pi(\tau\tilde{x}) + \pi(y_{-2(n-\frac{1}{2}(j)})f^2_{\kappa'} \tag{13}$$

with following equations
$|\varphi(\kappa'x)| = \kappa'\|\varphi(\kappa'x)\|$
or $|\pi(\kappa'x)| = \kappa'\|\pi(\kappa'x)\|$

where $\|\varphi\|$ and $\|\pi\|$ are norms of the real closed Schwarz space also following from $S_R(\mathbf{M}) = S^+(\mathbf{M}) \dot{+} S^-(\mathbf{M})$ given by the reduction by eq. (3) following from the fixing of the coordinates by equ. (2) for odd or even functions depending by the fixed coordinate variable x^0, x^3 and defined scalar product $(f^1_\kappa, f^1_{\kappa'})_{\acute{L}} = (\alpha_\kappa, \alpha_{\kappa'})_\varphi$ for $f^1_\kappa, f^1_{\kappa'} \in \acute{L}^+$ or $f^2_\kappa, f^2_{\kappa'} \in \acute{L}^-$ and extended by an isometric image $\acute{L}^+(\mathbf{M}) \to L_\varphi(\mathbf{R}^2) = S_R(\mathbf{R}^2)^{\|\varphi\|}$

and $\acute{L}^{-}(\mathbf{M}) \rightarrow L_{\pi}(\mathbf{R}^2) = S_R(\mathbf{R}^2)^{\|\pi\|}$ for L_{φ}, L_{π} from the Sobolev's spaces with fractional numbers of the indices.

Further if by fixing variables

$f^2_{\kappa'}(\bar{x}_{\perp}) = \partial_{ct}\alpha_{\kappa'}(\bar{x}_{\perp})_{y^3_{-2(n-½(j-\kappa)}},\ {}_{ct_{-2(n-½(j-\kappa))}} = 0$

would hold for the additional causality and boundary conditions for $\bar{x}_{\perp} \in \delta\Omega_t = S$ at the right, and by defined

$$d_t(\ ) = \partial_t(\ ) + \dot{z}\partial_{x^3}(\ ),\quad \dot{z} = \partial_t x^3 \tag{14}$$

on free surface S placed in Minkowski space-time for $ct = \kappa' x^0 = ct_{2(n-½(j+1-\kappa'))}$, $x^3 = \kappa' x^3 = y^3_{2(n-½(j+1-\kappa'))}$ and $\partial_t x^3 = \partial_t y^3_{2(n-½(j+1-\kappa'))}$ follow the impulse equations for fulfilled additional causality and boundary condition $\bar{x}_{\perp} \in \delta\Omega_t = S$ on fixed surface S from

$$\dot{z}\partial_{x^3}\alpha_{\kappa'}(\bar{x}_{\perp})_{y^3_{-2(n-½(j-\kappa)}},\ {}_{ct_{-2(n-½(j-\kappa')}} = 0. \tag{15}$$

Also from $d_{ct}\alpha_{\kappa'}(\bar{x}_{\perp})_{y^3_{-2(n-½(j-\kappa')}},\ {}_{ct_{-2(n-½(j-\kappa'))}} = d_{ct}\alpha_{\kappa'}(\bar{x}_{\perp})y^3_{2(n-½(j+1-\kappa')},\ t_{2(n-½(j+1-\kappa')}$ it is in force

$$f^{2+}_{\kappa'}(\bar{x}_{\perp}) = \partial_{ct}\alpha^{+}_{\kappa'}(\bar{x}_{\perp})_{y^3_{-2(n-½(j-\kappa')}},\ {}_{ct_{-2(n-½(j-\kappa'))}} = f^2_{\kappa'}(\bar{x}_{\perp}) + \dot{z}\partial_{x^3}\alpha_{\kappa'}(\bar{x}_{\perp})y^3_{2(n-½(j+1-\kappa')},\ t_{2(n-½(j+1-\kappa')}. \tag{16}$$

It is assumed the local quantum scalar wave field system under consideration to have a additional causality and boundary conditions on the 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 relativistic quantum system from some others vacuum state as by Casimir effect of the quantum vacuum states for the relativistic quantum fields f, 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 additional causality and boundary conditions on this local relativistic scalar quantum system with a vacuum state, described by the one field operator valued functional A(f) for the local test function $f \in \acute{L}^{+}$ or $f \in \acute{L}^{-}$ the solution of the Klein-Gordon wave equation given by covariant statement

$$\Box f(x^{\mu}) = (\partial^2_{ct} - (\Delta + m^2))f(x^{\mu}) = (\partial^2_{ct} - (\bar{\partial}_{\perp}^{\,2} + \partial^2_z + m^2))f(x^{\mu}) = 0, \tag{17}$$

with a given additional causal properties, initial and boundary conditions

$f(\bar{x}_{\perp}, x^3, ct)_{y^3_{-2(n-½(j-\kappa')}},\ {}_{ct_{-2(n-½(j-\kappa'))}} =$

$f^1_{\kappa'}(\bar{x}_{\perp}) = \alpha_{\kappa'}(\bar{x}_{\perp})_{y^3_{-2(n-½(j-\kappa)}},\ {}_{ct_{-2(n-½(j-\kappa))}},$

$\partial_{ct}f(\bar{x}_{\perp}, x^3, ct)_{y^3_{-2(n-½(j-\kappa')}},\ {}_{ct_{-2(n-½(j-\kappa'))}} =$

$f^2_{\kappa'}(\bar{x}_{\perp}) = \partial_{ct}\alpha_{\kappa'}(\bar{x}_{\perp})_{y^3_{-2(n-½(j-\kappa)}},\ {}_{ct_{-2(n-½(j-\kappa))}},\ |\bar{x}_{\perp}| \le (y^{0^2} - y^{3^2})^{½},$

by $t \in (t_{-2(n-½(j-\kappa'))}, t_{2(n-½(j-\kappa))}]$, n = 0, 1, 2, …; j = 0,1,2,…,2n,.

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

Also the ground states of the local quantum fields system defined in the Minkowski space-time fulfilled every one additional causal, initial and boundary conditions interact at the large distance with the boundary surface S by the help of the non local fundamental virtual quantum particles and so the vacuum state has a globally features, e.g. the Casimir force calculated from the energy of the vacuum "zero fluctuations"[1] and the Minkowski space-time induce the globally Lorenz geometry.

Examples of such boundary surfaces S with additional causality properties by a kind of the boundary of importance for the living cells are those in which the surface of a fixed mirror at the initial time t = 0 and is in contact with the local quantum scalar fields system with additional causality properties 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 particles in contact with the mirror parallel moved towards the fixed one – the free and localizable vacuum region, described in the non local case by the impulse Schrödinger wave functional

$\Psi_{\alpha_{\kappa}}(\varphi, t) = \Psi(\mathbf{f}_{\kappa}, t)$, by $t \in (t_{-2(n-½(j-\kappa'))}, t_{2(n-½(j-\kappa))}]$, n = 0, 1, 2, …; j = 0,1,2,…,2n,

with additional causality condition $\varepsilon \le |\bar{x}_{\perp}| \le |\bar{y}_{\perp}| \le (y^{0^2} - y^{3^2})^{½} = \text{const}$.

Moreover by given fulfilled operators equation in the case of the canonical Hamiltonian local relativistic quantum scalar field system in a statement of a equally times

$x^0 = ct = \kappa x^0 = ct_{-2(n-½j)} = ct_{2(n-½(j+1))} = (\kappa^2 x^2 + \bar{x}_{\perp}^{\,2} + (y^3_{2(n-½(j+1))})^2)^{½}$ the definition the canonical quantum local field φ(x) and impulse π(x), $x^{\mu} \in M^4$, μ = 0, 1, 2, 3, corresponding to implicit operator valued covariant field tempered functional A(f), where $f \in S_R(\mathbf{M}^4)$ is a boundary test function of this reel Swartz space, fulfilled all Whitman axioms and acting in the functional Hilbert space $\hat{H}_F$ with a Fok's space's construction, e.g. a direct sum of symmetries tensor power of one relativistic quantum field's Hilbert space $\hat{H}_1$ with infinite metric

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

can be given by the formulas,

$$\varphi(\alpha) = A(f^1) = \int \varphi(x)\alpha(x)d^4x,$$
$$\pi(\partial_{ct}\alpha) = A(f^2) = \int \pi(x)\partial_{ct}\alpha(x)d^4x,$$

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

by fulfilled Klein-Gordon equation in a covariate statement for massive and massless scalar fields

$$K_m A(f) = A(K_m f) = \int K_m \varphi(x)\alpha(x)d^4x = -\int \varphi(x)\, K_m \alpha(x)d^4x = 0$$
$$KA(f) = A(Kf) = \int K\varphi(x)\alpha(x)d^4x = -\int \varphi(x)\, K\alpha(x)d^4x = 0 \qquad (18)$$

with

$$K_m = (\Box + m^2) = -\partial^2_{ct} + (\Delta + m^2),$$
$$K = \Box = -\partial^2_{ct} + \Delta;\ \Delta = \partial^2_x + \partial^2_y + \partial^2_z \qquad (19)$$

Furthermore from the operators equations for the local quantum fields system follow for the impulse equation of the impulse operator's equation for the free vacuum state surface of the non local quantum scalar field system at the left of the free surface S placed in Minkowski space-time

$$\pi^+(\partial_{ct}\alpha(\bar{x}_\perp)y^3_{2(n - ½(\underline{j}-\kappa'))}, t_{2(n - ½(j-\kappa'))}) = A(\partial_{ct}f(\bar{x}_\perp) =$$
$$\pi(\partial_{ct} + \dot{z}\partial_{x^3})\varphi(\alpha_{\kappa'}(\bar{x}_\perp)y^3_{2(n - ½(j+1-\kappa'))}, t_{2(n - ½(j+1-\kappa'))}), \qquad (20)$$

can be given the impulse Schrödinger equation for the quantum scalar field vacuum states functional $\Psi_\alpha(\varphi, t)$ by a given generic surface S.

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 $A(\mathbf{f}_\kappa)$, where $\mathbf{f}_{\kappa'}(\bar{x}_\perp) = (f^1_{\kappa'}(\bar{x}_\perp), f^2_{\kappa'}(\bar{x}_\perp)) \in S_R(\mathbf{M}^4)$ is a boundary test function of this reel Swartz space defined in Minkowski space, fulfilled all Whitman axioms by fulfilled time product of the interacting field's operator in the functional Hilbert space $\hat{H}$ with infinite metric and a Fok's space's construction, e.g. a direct sum of symmetries tensor power by one quantum scalar fields space $\hat{H}_1$:

$$\hat{H} = \hat{H}_F(\hat{H}_1) = \bigoplus_{n=0}^{\infty} \mathrm{sym}\, \hat{H}_1^{\times n} \qquad (21)$$

and can be given for physical representation of the relativistic scalar quantum field system by the formulas,

$$\varphi(\alpha_\kappa) = A(f^1_\kappa) = \int \varphi(\kappa x)\alpha(\kappa x)d^4\kappa x\ , \qquad (22)$$

$$\pi(\partial_{ct}\alpha_\kappa) = A(f^2_\kappa) = \int \pi(\kappa x)\partial_{ct}\alpha(\kappa x)d^4\kappa x, \qquad (23)$$

by fulfilled Klein-Gordon equation with a current operator sources in a covariant statement for massive and massless scalar fields

$$K_m A(f_\kappa) = A(K_m f_\kappa) = A(J) \qquad (24)$$

$$KA(f) = A(Kf) = 0. \qquad (25)$$

Furthermore the matrix elements of the current $\langle\varphi|\, J(\tilde{q}_\tau)\, |0\rangle$, i.e. in the local case for the Wick product of the field operators

$$\langle 0|\, K_m A(\varphi.f)\, |0\rangle = \delta(x - y_{2(n - ½j)}) = \langle\varphi|\, A(J))\, |0\rangle \qquad (26)$$

have a singularities at $\tilde{q}_\tau^2 = 0$ which can be interpreted as a presence of the massless scalars Goldstones bosons in the ground state of the scalar quantum field system in the Hilbert space $\hat{H}$ and the phenomena of the action at the distance. Also from dies point of view when we have a zero temperature too the "Einstein condensation" in a ground state has on the light cone a δ-function behaviour in the impulse Minkowski space as by the ideal gas in the vacuum and by the Casimir world go over state more realistic with a interacting quantum vacuum state. But this resemblance is only formal and by going over the physical representation the scalar Goldstones bosons disappears. This is one of the indications of the Higgs-mechanisms, e.g. effect of the mass preservation from the vector fields by spontaneous destruction of the gauge group (or the scalar Goldstones bosons are "swallowing up") and so it is to show, that the Casimir force is to be obtained by quantum electromagnetic field system with a massless real photon and asymmetrical Casimir vacuum state where the scaling behaviour by the fermions as a fundamental quantum particles or by the Higgs massive boson as a fundamental scalar quantum particle in the Standard Model with the generic boundary conditions S is destroyed. That is the cause to hope to observe a massive scalar particle following the theorem of Goldstone and the Higgs mechanism.

For simplicity here we have considered a domain of space-time containing any one massless scalar field $\varphi(x)$ defined at the point of the Minkowski space-time at the fixed time t. Further a concrete massless field $\varphi(y^0, \bar{y})$ is considered as a Banach valued vector state obeying the impulse wave equation in a Banach space, defined over the space $\Omega_t \subset M^4$ at the time $ct = y^0$ and $x^3 = y^3$ in the Minkowski space-time M^4. By imposing suitable boundary conditions for any one quantum field system considered as any one relativistic quantum field $\varphi(x)$ fulfilled the Klein-Gordon equation, the total fields energy in any domain at the point (ct, x) from the Minkowski space-time can be written as a sum of the energy of the "zero fluctuations" for $t \in (t_{-2(n - ½j)}, t_{2(n - ½j)}]$, $n = 0,1,2, \ldots$, $j = 0,1,2,\ldots,2n$, so that the additional causality condition $|x_\perp| \leq. R = (y^{0^2} - y^{3^2})^{½}$ is fulfilled and the ground state of this concrete quantum field system must be conformed by those suitable boundaries and so we can modelled the interaction of the concrete relativistic quantum field system to the external classical field by means of this suitable boundaries.

Our interest is concerned to the vacuum and especially the physical Casimir vacuum conformed by the suitable boundary conditions.

Nevertheless, the idea - that the vacuum is like a ground state of any one concrete relativistic quantum field system - is enormously fruitful for the biological systems from the point of view of the nanophysics, i.e. it is to consider the time's arrow in the systems with a feedback. Moreover the Maxwell's demon has an infinite fully eigen time too, following on "allowed" world line in the Casimir world.

The obviously necessity to take in consideration the quantum field concepts by observation macroscopically objects present from infinity significant number of virtual particles and to be found by low temperatures is following from the elementary idea. Consider e.g. the obtained Casimir vacuum by reflections and hyperbolical turns at fixed times present from n stationary state level of the energy of "zero fluctuations" and occupied by j = 2n-1 virtual scalar bosons to be found in a volume V. In so one vacuum state every virtual scalar is surrounded closely from the neighbouring particles so that on his kind get a volume at every vacuum stationary energy level of the order

$$V/n \sim ((\bar{y}_\perp{}^2 + (y^3_{2(n - ½j)})^2)^{½})^3 = (y^3_{2(n - ½j)} + \mathrm{const})^3, \qquad (27)$$

$\lim\ \bar{y}_\perp{}^2/2y^3_{2(n - ½j)} = \mathrm{const} \in [0, 1]$ for $\bar{y}_\perp{}^2 \to 0$, $y^3_{2(n - ½j)} \to 0$, $j = 2n \to \infty$ and the additional causality condition $|x_\perp| \geq R = (y^{02} - y^{32})^{½}$.

Also every virtual scalar particles at the state with the smallest energy possesses sufficient energy of the "zero fluctuations" given elementary by the mass spectre characterised by this fluctuations

$$E_0 \sim (2m_0)^{-1} ((\bar{k}_\perp{}^2 + k^{32})^{½})^3 \sim (2m_0)^{-1}(y^3_{2(n - ½j)} + \mathrm{const}))^{-3} \sim (2m_0)^{-1}(n/V)^{-3}, \qquad (27)$$

for $q^3 = \pm k^3$, and $\bar{q}_\perp{}^2 \to 0$, $\bar{k}_\perp{}^2 \to 0$, $j = 0$, $n \to \infty$.

And the distance between the ground state and the first excited level of the single see massless scalar will be of the some order that is for E_0 too. It follows that if the temperature of the vacuum state of the relativistic sea quantum field system is less then the some one critical temperature T_c of the order of the temperatures of the Einstein condensation, than in the Casimir vacuum state there are not the excited one particle states. Furthermore the temperature is not from significances for Casimir force, which is the cause for expression of massless scalar Goldstones bosons.

For the Schrödinger wave functional Ψ_{α_κ} defined on the involutes operator field algebra the impulse wave functional equation is given for the Hamiltonian H and impulse operator Q defined in anyone functional Hilbert space with infinite metric by the equations

$$-i\hbar\partial_t\Psi_{\alpha_\kappa}(\varphi, t) = H(\pi, \varphi)\Psi_{\alpha_\kappa}(\varphi, t),$$
$$\text{for } t \in (t_{-2(n - ½j)}, t_{2(n - ½j)}] \qquad (28)$$

$$\Psi^+_{\alpha_\kappa{}^+}(\varphi, t_{-2(n - ½j)} + 0) = Q(\pi^+, \varphi)\Psi_{\alpha_\kappa}(\varphi, t_{2(n - ½(j+1))})$$
$$\text{for } t = t_{2(n - ½(j+1))},\ n = 0, 1, 2,\ldots, j = 0,1,2,\ldots,2n \qquad (29)$$

where $\Psi^+_{\alpha_\kappa{}^+}(\varphi, t_{-2(n - ½j)} + 0) = f^{2+}_{\kappa}\delta_{\alpha_\kappa}\Psi_{\alpha_\kappa{}^+}(\varphi, t_{-2(n - ½j)} + 0)$ and $Q(\pi^+, \varphi) = -i\hbar(\partial_t + \pi^+\delta_\varphi)$ is also the impulse Schrödinger operator valued functional for the Hamiltonian operator valued functional $H(\pi, \varphi)$ fulfilling the additional causality and boundary conditions with the field variation given by $\delta_\varphi = \delta/\delta\varphi$, So the Banach field eigen vector φ describe a quantum vacuum fluctuations in the Minkowski space-time where the impulse operator valued functional $Q(\pi^+, \varphi)$ is the energy operator of the "zero fluctuations" of the relativistic local quantum scalar field system in the statement of the equally times.

Conclusion

The supposition that by the absence of the attraction between the scalars the ground state will be total a stationary state in which all scalars "are condensate" in so one state with impulse $|\bar{k}_\perp| \to 0$, $|\bar{q}_\perp| \to 0$ and taking in the account the small attraction by the action at the large distance of the Casimir force between the scalars in vacuum state also it lead to so one stationary state of the quantum scalar field system in which in this case in c.m. of the single scalars appear the mixture of the excited states with impulse $|k^3| \gg q^3 \neq 0$.

In 1946 the shift for scalar field φ(x) = const + u(x) has been given at the first by N.N Bogolubov in the theory of microscopically supper fluidity.

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