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SCALE WITHOUT CONFORMAL INVARIANTS IN THE NON-LOCAL RELATIVISTIC QUANTUM FIELD SYSTEMS IN LIVING CELLS

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Abstract

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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 while the Casimir force was stated. The axiomatic-physical 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. Then it is possible 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.

It is also not only a question of mathematical but also philosophical-ideological problem too if it is at stake by nature systems. From the same nature is the problem connected with the "time's arrow". The same understanding must exist by the social scientifically, economical, mathematical and informatics systems. It is groundless this to be renounced or disguised. It is senseless that for the mathematic Scientifics there is not given the Nobel price from pure ideological and historical grounds and there is a price for piece from ideological point of view. However, the living cells are wiser then us.

By the living cells as an object of the fundamental cryobiological researches i.e. the metabolisms is minimal and also by the help of the axiomatic-physical methods given by the relativistic quantum fields theory it is possible to be taken 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 becomes a fixture by the lyophilized elementary living cells.

It can be represented by the symmetrical selfaddjoint Hamiltonian operator taken for simplicity by definition of the quantum scalar field's operator $\tilde{\Phi}$ defined as potentially virtual entity in the Hilbert functional space with indefinite metric. So also the possibility to be obtained the local or non-local quantum currents the carrier of the force (see virial current) of the near actions of interactions with the classical neighborhood in the Minkowski space-time is realizable. The probability interpretation of his spectral family give us the physical interpretation of the observed quantum entity even for the dynamically (not thermodynamically) fine structure of his ground state as potential state and following this as element of the Hilbert functional space with indefinite metric. By the vacuum interactions in the Casimir world, the Casimir force today is measured with 5 % exactness.

The action of this force of the molecular biology today is not clear. It knows the following fact then it is at stake of potentially force with a long-range action at the distance. Also with other words, it is asserted every experiment in this genetics domain without clearness of the role of his actions further in the living cells. That is to be taken very good under account from the point of view of the nanophysics also by distance at 10^{-9} m. May be he is the cause for non-observation of the so-called Goldstein massless bosons as it is the case by the Coulomb force. For the quantum electrodynamics the Coulomb force can be understand by the help of the carrier of the force the so-called virtual particles. Then it is to be supposed the virtual paths of these quantum entities in the Quantum Electrodynamics QED. In addition, the quantum vacuum state of the QED has virtual quantum fluctuations. Then the Casimir force is to be caused by those vacuum fluctuations.

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Moreover the Casimir vacuum state of the quantum relativistic scalar field system may be not belonging in the operator definition's domain of the field's operators, but fulfill the additional causal and boundary conditions for the carrier of the interaction force, the virtual fundamental scalar Goldstein mesons particles belonging to the domain structure of the Casimir world. So also the Casimir vacuum in the asymptotic past at the left of the non moved plate for this case from the micro causal point of view contains the virtual particles for the initial observer understanding as referent system (a map) and in the asymptotic future at the right of this plate and the left of the moved plate a few see particles for the late-time observer, e.g. the Maxwell demon, and moreover at the right of the moved plate anew the virtual relativistic quantum particles system.

Key words: Casimir effect, time's arrow, relativistic quantum field, elementary living cells, lyophilization, nanophysics, singularities, causal and scaling principle without conformal symmetries

Introduction

The scalar massless relativistic quantum field give us that his local algebras are unitary equivalent in the bounded domains of the locally algebras by the mass field and they have the some structure properties. However, there are a number of additional properties generated by the physical distinctions of the massless systems: his scale and conformal symmetries and as well infrared effects. In the dissertation's work (Petrov, 1978) it is showed that the scaling invariance can be destroyed in longitudinal orientation and conserved in the cross sections domains. In addition, the scaling invariance is not the same as the conformal invariance by the massless quantum fields and the scale invariance lead not necessarily to the conformal invariance. Furthermore, the Hilbert functional space understands by means of the space of the test functions by his completion of anyone norm of the square integrable space L^2 give us the possibility to use the Casimir quantum vacuum state over the algebra of the fields operators defined in the Hilbert functional space with the indefinite metric.

The theoretical underpinnings of scale without conformal invariance in relativistic quantum physics is given in the light of the results of the non local operator's expansion on the light cone of the Casimir vacuum state of a given relativistic scalar quantum fields systems, due to deep connections between scaling-invariant theories and the recurrent scaling behaviors of the quantum entities in the Casimir world. It can be shown that, on scaling-invariant virtual paths of the virtual quantum particles, there is a redefinition of the dilatation current that leads to virtual generators of dilatations. In addition, there is a generation of the virtual vacuum fluctuations described by the relativistic quantum fields' operators belonging to the Hilbert space without definite metric. Finally, it can be develop a systematic algorithm for the search of scaling-invariant paths of the virtual vacuum fluctuations caused by time like or non space like virtual particles with a given zero point energy ZPE in the Casimir world and broken scaling-invariant time like or non space like virtual paths too.

Following this thought, it is to remark that the physical phenomena on the light cone are relativistic in the classical sense. But in the quantum sense of view it is possible by interactions the directionality at a given domain's time's arrow e.g. space-time parameter with a broken scaling behavior and furthermore the time parameter by definition in Minkowski space-time is not so gut understand without Lorenz transformations in the sense of the Einstein special relativistic theory and the causality principle applied by the Lorenz manifold's points of the Lorenz globally geometry induced by the Minkowski space-time. The time-oriented manifold is called traditional space-time whiles the gut understanding thermodynamically "time's flow" as a physical phenomena is non-relativistic and the time is absolutely. Also the Galileo transformation between the Riemann manifold's points of the Riemann globally geometry induced by locally Euclidian space is in force.

Moreover the event points from the geometric principles of symmetry in Minkowski space-time manifold M in the locally cense with a scale units f in the fixed events 4- dimensional points $y_{2(n-j/2)}(M, f)$, $n = 0,1,2,\ldots$; $j = 0,\ldots,2n$, and understanding as a 4-dimensional radius Minkowski vector is $y_{2(n-\frac{1}{2}j)}{}^2 = y_0{}^2$ described by the special relativistic theory. Then in this points it is measured at the time $t = t_{2(n-j/2)}$ and with a given time-independent scale function, i.e. $df/dt = 0$ by $t = t_{2(n-j/2)}$, defined by the Minkowski space-time 4-dimensional points $x = (ct, \mathbf{x})$and fixed $y_{2(n-\frac{1}{2}j)} = (ct_{2(n-j/2)}, \mathbf{y}_\perp, y^3{}_{2(n-j/2)})$

$$f = ((xy_{2(n-\frac{1}{2}j)})y_0{}^{-2})((1 - x^2 y_0{}^2 (xy_{2(n-\frac{1}{2}j)})^{-2})^{\frac{1}{2}} - 1),$$

e.g. the measurements of the coordinate with respect to the initially of the coordinate system by someone scale choice or with respect to the causality principles for this points, i.e. the solution of the boundary value problem is respected without to be supposed the continuality.

Moreover it is understandable that the Lorenz manifold is induced by the Minkowski space-time M^4 in the relativistic theories or in the non relativistic theories the Riemann manifold's are induced by Euclidian space and obtained by the structure $R^1(t_{2(n-j/2)})\times R^3(y_\perp, y^3{}_{2(n-j/2)})$ by fixed scale. The Casimir world is defined by the measuring of the Casimir force. However, in the local cense the Minkowski space-time M^4 and the 4-dimensional Euclidian space R^4 are equally.

The Casimir vacuum is not connected with anyone charge moreover his structure is no more so narrow connected to the structure of the relativistic quantum system. The classes of the vacuum structure will be obtained by the dynamically classical definitions of the Casimir world by additionally causal and boundary conditions, i.e. the global structure of the Casimir vacuum state of anyone local quantum field system, e.g. the local scalar relativistic wave quantum field defined in the Minkowski space-time which induce the Lorenz global geometry too and fulfill the internal non contradictoriness. Moreover, the observer as a local coordinate referents system (a map) can be taken on the mirror at the rest or on the inertial moved mirror with constant velocity v in the space-time manifold M. The space-time interval is a dimensionless distance between two events measured in anyone units

$dI = (dy_{2(n-j/2)} \, . \, dy_{2(n-j/2)})^{½} f.$

In the case of the Minkowski space-time the distance is given by the indefinite scalar product $y_{2(n-j/2)}^{\;2} = (ct_0)^2 - \bar{y}_{\perp}^{2} - y^3_{\;0}$ with respect to the initial observer.

The equally describing by other observer following the relativistic causal principles correspond to self mapping of the space-time scales manifold conserved the interval dI. By the fixed scale in the Minkowski space-time the transformation group conserved the distance $d(x, y_{2(n-j/2)}) = (x - y_{2(n-j/2)} \, . \, x - y_{2(n-j/2)})^{½}$ by fixed points $y_{2(n-j/2)}$ is isomorphic to the half direct product $T^{3,1} \times) \, O(3,1)$ of translations group and the full homogeny Lorenz transformations on the Minkowski space-time with respect to naturally action of the O(3,1) on M.

Also then by fulfilling of the relativistic causality principles and the additional boundary conditions it follows that the solution of the boundary value problem in the relativistic sense can be obtained without to consider the initially conditions for the initial observer.

Further 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 aggregate
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 relativistic field's systems in the Casimir world (boundary and infinity) becomes a fixture to the environment in living cells and systems from the point of view of the usual axiomatic-physical theory. Then the idea of the vacuum as a functional ground state of the axiomatically constructed concrete fundamental relativistic quantum system can be used in the Schrödinger picture with additional adiabatically and impulse effects. Also from microscopically stand point of view by the quantum causality properties and localizability of the entities seeing from the observer e.g. measured by the Maxwell's demon at the past time $t > t_{-2n}$ and at the future time at $t = t_{2n}$ from the late-time observer for $n \to \infty$ the "time's arrow" is to be understand micro causal without to take in to account the thermodynamically entropies character of the time. It knows then it has his cause for the Casimir effect by the Einstein's macro causality i.e. the calculated Casimir force acts on every particle as external force. Also it is the phenomena from the same nature as by the electron moved in the external classical electromagnetic field with a broken scaling behaviour by 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.

By the light propagation in the vacuum at the microscopically level the geometrical understanding of causality Lorenz manifolds is practical from one and the same nature described by local quantum wave field systems which was understanding physically very gut as phenomena of the QED but not so gut from the pure mathematical point of view. Furthermore following the quantum character of the causality properties of the observed physical quantum entities in the domains of the high energy physics it is clear that the application of the usual mathematical analysis of the 19. century by the necessarily analyticity representation of the causality properties of the quantum entities is not more sufficiently to describe this by the help of the fundamental equations for the quantum vacuum state of the relativistic quantum systems. The fundamental equations are no more useful then the nature of the vacuum state is globally and it needs the globally Lorenz geometry by the solving of the boundary value problem also without the consideration of the initial conditions.

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 measures zero as by Lebesgue's integrations. The entity of the distributions consist in them that by dropping the knowledge of the functions which define the Lebesgue's set of measure zero it is possibly to define wide class of generalized functions, included different Dirac δ-functions and his derivations.

In addition, the physical conditions as additional causality and boundary conditions for the solution of the boundary value problem are necessary but not sufficient if there are the innerness contradictoriness bounded with the observer and the scaling problems.

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 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 (Bordag et al., 1984; Petrov, 1985; Petrov, 1989). Then the boundary value problem must be considered with respect of the additional causal conditions.

The interests represented her is the more realistic relativistic Casimir effect without the innerness contradictoriness. Then it is the case when the one of the plates is at the rest and the other moved with a constant velocity v towards the non-moved plates imbedded in the Minkowski space-time. So the thermodynamic behavior of the elementary living cells under consideration must be considered globally by the relativistic quantum systems in the so-called Casimir world too.

It has long been presumed that, under mild assumptions, scale invariance implies conformal invariance in relativistic quantum field theory. Although no proof is known in d > 2 in the flat space-time dimensions of the Lorenz manifolds, until very recently, a credible counterexample was lacking (Fortin et al., ????). In the relativistic Casimir effect the scaling behaviour of the quantum entities is not connected with the conformal invariance then the mirror boundary conditions are conformably with the Casimir quantum ground state independent from the broken scale invariance by the attractions action of the Casimir force between the mirrors. Furthermore, the arising virial current is connected directly with the dilatation current caused by the virtual fluctuations of the Casimir quantum vacuum state by non-local representations of the energy momentum field's tensor by the local invariants fulfilling relations in the Minkowski coordinate space-time.

At the first it is considerer the fixed 4-points $y^{\mu}_{2(n-½(j+1))}$, $y^{\mu}_{-2(n-½j)}$, $y^{\mu}_{2(n-½j)}$, $y^{\mu}_{-2(n-½(j-1))}$ from the reflections and the hyperbolical turns (odd and even, right and left) on the fixed 4-point $y^{\mu}_0 = (ct_0, \bar{y})$ at the time $t = t_0$ and the 4-point $x^{\mu} = (ct, \bar{x})$ where c is the light velocity 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

$t \in (t_{-2(n-½j)}, t_{2(n-½j)}]$, $n = 0,1,2, \ldots$, $j = 0,1,2,\ldots,2n$, 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-time fixed 4-point y^{μ}_0 seeing (light and darkness) from the demon of Maxwell (blessing and disguise) at the time $t_0 = c^{-1}y^0_0 = c^{-1}(y_0^2 + \bar{y}_{\perp}^2 + y^{3\,2}_0)^{½}$ between the unmoved and the parallel moved plate towards the plate at the rest with the constant velocity v so that the moved plate is placed by $L = vt_0$.

Furthermore for the mirror fixed 4-points $y^{\mu}_{-2(n-½j)}$ and $y^{\mu}_{2(n-½j)}$ of the see fixed 4-vector y^{μ}_0 and the 4-vector x^{μ} it can be defined a light like Minkowski space-time vectors ${}^{r}\tilde{x}^{\mu}$ and ${}^{l}\tilde{x}^{\mu}$ by the distinguishing marks "l" = left and "r" = right given by the following relations

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

with constant scaling function $f = ((xy_{2(n-½j)})y_0^{-2})((1 - x^2y_0^{2}(xy_{2(n-½j)})^{-2})^{½} - 1)$ for the fixed time $t = t_{2(n-½j)}$ and

$${}^{l}\tilde{x}^{\mu} = x^{\mu} + y^{\mu}_{-2(n-½j)}y_0^{-2}((xy_{-2(n-½j)})^2 - x^2y_0^{2})^{½} - y^{\mu}_{-2(n-½j)}(xy_{-2(n-½j)})y_0^{-2} = x^{\mu} + y^{\mu}_{-2(n-½j)}((xy_{-2(n-½j)})y_0^{-2})((1 - x^2y_0^{2}(xy_{-2(n-½j)})^{-2})^{½} - 1) = x^{\mu} + y^{\mu}_{-2(n-½j)}f',$$

with a constant scaling function $f' = ((xy_{-2(n-½j)})y_0^{-2})((1 - x^2y_0^{2}(xy_{-2(n-½j)})^{-2})^{½} - 1)$ for the fixed time $t \rightarrow t_{-2(n-½j)}$, and $t \in (t_{-2(n-½j)}, t_{2(n-½j)}]$, $n = 0,1,2, \ldots$, $j = 0,1,2, \ldots,2n$.

Moreover for $0 \leq \kappa' \leq \tau \leq \kappa \leq 1$ it can be defined the non local Minkowski space time 4-vectors by the following relations

$$\kappa x^{\mu} = \tau_j{}^{r}\tilde{x}^{\mu} + y_{2(n-½j)}{}^{\mu}f_{\kappa} = \tau_j{}^{r}\tilde{x}^{\mu} + ½(x + \tau_j{}^{r}\tilde{x})^{\mu}f_{\kappa}$$

with

$$f_{\kappa} = y_0^{-2}(y_{2(n-½j)}\tau_j{}^{r}\tilde{x})((1 + \kappa^2x^2y_0^{2}(y_{2(n-½j)}\tau_j{}^{r}\tilde{x})^{-2})^{½} - 1) = ½y_0^{-2}(x\tau_j{}^{r}\tilde{x})((1 + 4\kappa^2x^2y_0^{2}(x\tau_j{}^{r}\tilde{x})^{-2})^{½} - 1)$$

$$\kappa' x^{\mu} = \tau_j{}^{r}\tilde{x}^{\mu} + y_{-2(n-½j)}{}^{\mu}f_{\kappa'} = \tau_j{}^{l}\tilde{x}^{\mu} + ½(x + \tau_j{}^{l}\tilde{x})^{\mu}f_{\kappa'}$$ with $$f_{\kappa'} = y_0^{-2}(y_{-2(n-½j)}\tau_j{}^{r}\tilde{x})((1 + \kappa^2x^2y_0^{2}(y_{-2(n-½j)}\tau_j{}^{r}\tilde{x})^{-2})^{½} - 1) = ½y_0^{-2}(x\tau_j{}^{l}\tilde{x})((1 + 4\kappa'^2x^2y_0^{2}(x\tau_j{}^{l}\tilde{x})^{-2})^{½} - 1)$$ for

$$y_0^{2} = y_{2(n-½j)}{}^{2} = ¼(x + \tau_j{}^{r}\tilde{x})^2 = y_{-2(n-½j)}{}^{2} = ¼(x + \tau_j{}^{l}\tilde{x})^2,$$
$t \in (t_{-2(n-½j)}, t_{2(n-½j)}]$, $n = 0,1,2, \ldots$, $j = 0,1,2, \ldots,2n$,

$\kappa x^{\mu} = \tau_{2n-1}{}^{r}\tilde{x}^{\mu} + ½(x + \tau_{2n-1}{}^{r}\tilde{x})^{\mu}f_{\kappa}$ for $t \in (t_{-1}, t_1]$, $t_{-1} = t_0$, $n = 0,1,2, \ldots$, $j = 2n-1$

$f_{\kappa} = ½y_0^{-2}(x\tau_{2n-1}{}^{r}\tilde{x})((1+4\kappa^2x^2y_0^{2}(x\tau_{2n-1}{}^{r}\tilde{x})^{-2})^{½} - 1)$ for $y_0^{2} = y_1^{2} = ¼(x + \tau_{2n-1}{}^{r}\tilde{x})^2$.

Further in the impulse Minkowski space-time and fixed impulse four vector k^μ as by the G. Petrov 1978 by studying of the causality properties of the form factors in the non forward deep inelastic scattering by means of the following relation it can be defined.

$q_\kappa{}^\mu = {}^l\tilde{q}^\mu + k^\mu f_\kappa$ with $f_\kappa = k^{-2}(k\,{}^l\tilde{q})((1 + \kappa^{-2}q^2k^2/(k\,{}^l\tilde{q})^2)^{½} - 1)$,

$q_{\kappa'}{}^\mu = {}^rq^\mu + k^\mu f_{\kappa'}$ with $f_{\kappa'} = k^{-2}(k\,{}^rq)((1 + \kappa'^{-2}q^2k^2/(k\,{}^rq)^2)^{½} - 1)$

and where

$q^\mu = ½(q_\kappa{}^\mu + q_{\kappa'}{}^\mu)$, $k^\mu = ½(q_\kappa{}^\mu - q_{\kappa'}{}^\mu)$, ${}^l\tilde{q}^2 = {}^r\tilde{q}^2 = 0$, and for fixed $q^2 \in (-\infty, \infty)$ and κ, κ'

$q_\kappa{}^2 = \kappa^{-2}q^2 = m_\kappa{}^2$, $q_{\kappa'}{}^2 = \kappa'^{-2}q^2 = m_{\kappa'}{}^2$, so that for $q^2 \to 0$, κ, $\kappa' \to 0$, $\lim \kappa^{-2}q^2 = \lim \kappa'^{-2}q^2 = m_0{}^2$, and $|(q_\kappa{}^\mu q_{\kappa\mu})| = |(q_{\kappa'}{}^\mu q_{\kappa'\mu})| = \omega/c = (k^2 + k^{3^2})^{½}$, $k^3 = ((q_\kappa{}^\mu q_{\kappa\mu}) - k^2)^{½}$ for $\lim f_\kappa = \lim f_{\kappa'} = f$ can be defined the mass of the so-called scalar particle of the solution of the Klein-Gordon equation of "matter" local scalar field $\varphi(x)$.

It is remarkable to choose out of the special conform group invariance

$q_\kappa{}'^\mu = (q_\kappa{}^\mu - q_\kappa{}^2k^\mu)/\sigma(q_\kappa{}^\mu, k^\mu)$,

$\sigma(q_\kappa{}^\mu, k^\mu) = 1 - 2\,q_{\kappa\mu}k^\mu + q_\kappa{}^2k^2 = (1 - q_\kappa{}^2)(1 - k^2) + (q_\kappa{}^\mu - k^\mu)^2 = (1 - m_\kappa{}^2)(1 - m_0{}^2) + (q_\kappa{}^\mu - k^\mu)^2$

so that from $q_\kappa{}'^2 = q_\kappa{}^2/\sigma$ is that fulfilled for $m_\kappa{}'^2 = m_\kappa{}^2/\sigma$ too, and for $\kappa \to 0$ also

$m_0{}'^2 = m_0{}^2/\sigma$, where $\sigma = (1 - m_0{}^2)^2$.

Moreover, 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 $[\kappa x^\mu, \tau_j{}^lx^\mu]$,

${}^rD = {}^rD_{\kappa' x,\, \tau_j{}^r\tilde{x}} = V^+_{\tau_j{}^r\tilde{x}} \cap V^-_{\kappa' x}$ with the basis $S_{\kappa' x,\, \tau_j{}^r\tilde{x}}$ and the axis $[\kappa' x^\mu, \tau_j{}^rx^\mu]$,

where on compact subsets of the domain ${}^lD$ it can be defined the non local Green function

$D(\kappa x, \kappa^{-2}q^2) = \int dq_\kappa \exp[-iq_\kappa\kappa x]/(q_\kappa{}^2 - \kappa^{-2}q^2) - i\varepsilon)$

At the first it can be reviewed the circumstances for the non-local quantum field theory the scaling without conformal invariance. The most general form of the dilatation current operator $D_\mu(\kappa x)$ is given by the operator equation for the non-local operators fulfilled on the light cone, i.e. $\kappa' \to 0$

$D_\mu(\kappa x) = \kappa' x^\nu T_{\mu\nu}(\kappa x, \kappa' x) - V_\mu(\kappa x)$,

where $T_{\mu\nu}(\kappa x, \kappa' x)$ is the non local operator of a symmetric energy-momentum tensor and $V_\mu(\kappa x)$, the non local operator of the virial current.

Also for the vacuum expectation value of the tensor of the averaged energy-momentum and the virial current between the 4-points states it can be obtained

$T_{\mu\nu}(\kappa x, \kappa' x) = \langle y_{-2(n - ½j)}|{:}T_{\mu\nu}(\kappa x, \kappa' x){:}|y_{2(n - ½j)}\rangle$, and $V^\mu(\kappa x) = \langle y_{-2(n - ½j)}|{:}V^\mu(\kappa x){:}|y_{2(n - ½j)}\rangle$.

Further for consideration of the energy-momentum tensor of the scalar quantum field it can be obtained the possibility to be taken the following way of the consideration of the scalar mass field.

If it is supposed that the energy must be positive then the non-local scalar field is

$\varphi_{m_\kappa}(\kappa x) = (2\pi)^{-2}\int dq_\kappa\theta(q^0{}_\kappa)\delta(q_\kappa{}^2 - m_\kappa{}^2)\exp[-iq_\kappa\kappa\, x]\varphi(q_\kappa)$,

where $(\partial_{\kappa x}{}^2 - m_\kappa{}^2)\varphi_{m_\kappa}(\kappa x) = 0$ and also $(q_\kappa{}^2 - m_\kappa{}^2)\tilde{\varphi}(q_\kappa) = 0$

$\tilde{\varphi}(q_\kappa) = \int d\kappa x \exp[iq_\kappa\kappa\, x]\varphi_{m_\kappa}(\kappa x)$

for fixed q^2, κ, and $q^2 \in (-\infty, \infty)$.

For the positive time also as by the Casimir effect the energy cq^0 can be negative too.

$\varphi_{\kappa^2x^2}(q_\kappa) = \int d\kappa x\theta(\kappa x^0)\delta((\kappa x)^2 - \kappa^2x^2)\exp[-iq_\kappa\kappa x]\tilde{\varphi}(\kappa x)$,

$(\partial_{q_\kappa}{}^2 - \kappa^2x^2)\varphi_{\kappa^2x^2}(q_\kappa) = 0$ and

$q_\kappa{}^2 = \kappa^2x^{-2} = m_\kappa{}^2$ can be considered as a squared 4-impulse vector in Minkowski impulse space lying on the mass hyperboloid of the "matter" scalar field.

For the fixed time $t \in (t_{-2(n - ½j)}, t_{2(n - ½j)}]$, $n = 0,1,2, ..., j = 0,1,2, ..,2n$ it can be defined the scaling function for the 4-impulse q_{α_κ} in the impulse Minkowski space

$\alpha_t(q_{\alpha_\kappa}) = \int d^4y_{2(n - ½j)}\theta(y^0{}_{2(n - ½j)})\delta(y_{2(n - ½j)}{}^2 - x\tau_j{}^r\tilde{x})\exp[iq_{\alpha_\kappa}y_{2(n - ½j)}]\,\tilde{\alpha}(y_{2(n - ½j)})$,

$(\partial_{q_{\alpha_\kappa}}{}^2 - x\,\tau_j{}^r\tilde{x})\alpha_t(q_{\alpha_\kappa}) = 0$,

$|y_{2(n - ½j)}\rangle = \alpha(y_{2(n - ½j)}) = (2\pi)^{-4}\int d^4q_{\alpha_\kappa}\theta(q_{\alpha_\kappa}{}^0)\delta(q_{\alpha_\kappa}{}^2 - m_{\alpha_\kappa}{}^2)\exp[-iq_{\alpha_\kappa}y_{2(n - ½j)}]|\alpha_t(q_{\alpha_\kappa})\rangle$

and $q_{\alpha_\kappa}{}^2 = y_0{}^{-2} = m_{\alpha_\kappa}{}^2$ can be considered as a squared 4-impulse vector in Minkowski impulse space lying on the mass hyperboloid of the "matter" scalar field. Further it can be defined the heat impulse $k^\mu = ½(q_\kappa{}^\mu - q_{\kappa'}{}^\mu) = ½(q_{\alpha_\kappa}{}^\mu - q_{\alpha_{\kappa'}}{}^\mu)$.

For the non-local operator Wick's product it can be obtained

${:}\varphi(q_\kappa)\varphi(q_{\kappa'}){:} = (2\pi)^{-4}\int d\kappa x d\kappa' x \exp[-iq_\kappa\kappa x - iq_{\kappa'}\kappa' x]\ {:}\varphi(\kappa x)\varphi(\kappa' x){:}$

The Wick's non-local operator tensor of energy-momentum for the quantum vacuum scalar field also can be defined by

${:}T_{\mu\nu}(q_\kappa, q_{\kappa'}){:} = \int d\kappa x\, d\kappa' x \exp[-iq_\kappa\kappa x - iq_{\kappa'}\kappa' x]\ {:}T_{\mu\nu}(\kappa x, \kappa' x){:}$

where the non local energy momentum tensor $T_{\mu\nu}(\kappa x, \kappa' x)$ is given by the invariant entities T's and the localization for the ${:}T_{\mu\nu}(\kappa x, \kappa' x){:}$ is given for κ and κ' going to zero also the localizability must be proven for the invariant entities T's defined the averaged tensor $T_{\mu\nu}$ of the energy-momentum.

$T_{\mu\nu}(\kappa x, \kappa' x) = (g_{\mu\alpha} - \kappa x_\mu \kappa x_\alpha/(\kappa x)^2)(g_{\nu\beta} - \kappa' x_\nu \kappa' x_\beta/(\kappa' x)^2)$
$\sum_{n=0}^{\infty}\sum_{j=0}^{2n}(g^{\alpha\beta}T_0 + y_{2(n - ½j)}{}^\alpha y_{2(n - ½j)}{}^\beta T_1 + y_{-2(n - ½j)}{}^\alpha y_{-2(n - ½j)}{}^\beta T_2 + ½(y_{2(n - ½j)}{}^\alpha y_{-2(n - ½j)}{}^\beta + y_{-2(n - ½j)}{}^\alpha y_{2(n - ½j)}{}^\beta)T_3)$

so that a localizability condition in the coordinate Minkowski space-time for the energy-momentum tensor will be fulfilled if T's fulfils so called analytically conditions and are localized for the vacuum without particles by $\kappa \to 0$ and $\kappa' \to 0$ going to zero and $\kappa^2x^2 = 0$, $\kappa x^\mu = \tau_j{}^r\tilde{x}^\mu$, $\kappa' x^\mu = \tau_j{}^l\tilde{x}^\mu$ also the following conserved conditions are fulfilled on the light cone by definition following by the conditions

$(g_{\mu\alpha} - \kappa x_\mu \kappa x_\alpha/(\kappa x)^2)/((\kappa x)^2 - \kappa^2 x^2) \to (g_{\mu\alpha} - \kappa x_\mu \kappa x_\alpha/(\kappa x)^2)/(\kappa x)^2$
$\kappa' x^\nu T_{\mu\nu}(\kappa x, \kappa' x) = \kappa x^\mu T_{\mu\nu}(\kappa x, \kappa' x) = 0,$

or in the impulse Minkowski space

$\partial^\mu_{q_\kappa} T_{\mu\nu}(q_\kappa, q_{\kappa'}) = \partial^\nu_{q_{\kappa'}} T_{\mu\nu}(q_\kappa, q_{\kappa'}) = 0$

so that by averaging of the operators the non local dilation current fulfill the equation

$D_\mu(\kappa x) = -V_\mu(\kappa x).$

So the given above conditions give as the possibility to consider the non-equilibrium's physical processes and the connection between the vacuum state with the dark matter and dark energy is obvious.

Then $T_{0\nu}(q_\kappa, q_{\kappa'})$ are a 4-impulse and $T_{00}(q_\kappa, q_{\kappa'})$ is the Hamiltonian of the relativistic quantum fields system obtained by the invariant entities T's.

If for $\bar{y}_\perp^2 \to 0$ the following identity is in force

$y^\mu_0 = (|x\tau_j^r \tilde{x}|, -y_\perp, -(x\tau_j^r \tilde{x} - y_0^2 - \bar{y}_\perp^2)^{1/2}) = (|x\tau_j^r \tilde{x}|, -0_\perp, -((x\tau_j^r \tilde{x} - y_0^2)^{1/2} + \text{const})),$

by $\lim(-\bar{y}_\perp^2)/2(x\tau_j^r \tilde{x} - y_0^2)^{1/2} = \text{const} \in [0, 1]$, for $\bar{y}_\perp^2 \to 0$, $(x\tau_j^r \tilde{x} - y_0^2)^{1/2} \to -0$, $|y_\perp| \le |x_\perp| = ((ct)^2 - x_0^{3\,2} - x^2)^{1/2}$

and for $|\bar{x}_\perp| \to \infty$ and $x^2 \to 0$, $x^3 \in (0, d_0]$, $\dot{z} = |\bar{x}_\perp|/t$, $\cos(\bar{x}_\perp \bar{x}_\perp) = \cos\theta$, $y_0^2 \to x\tau_j^r \tilde{x}$ i.e. $t \in (t_{-1}, t_1]$ for $j = 2n-1$. So also there is the causality condition $ct = |x_\perp| \ge |y_\perp|$ and $y^3_0 \in (0, d_0]$, $t \in (t_{2(n-1/2j)}, t_{2(n-1/2j)}]$, $n = 0,1,2, \ldots, j = 0,1,2, \ldots, 2n$.

Moreover it is possibly to consider a case where the surface S as the kind of the domain of definition of the boundary scaling function $f(x) \in {}^lD$ is zero for $t = t_{-1}$, $x^3 \in (-\infty, -0]$ and $f(\bar{x}_\perp)_{x^3, t} = \text{const}$ by fixed x^3, t on the remaining boundary kind of the domain.

Also we have to consider a so called lexicographic order for the 4-points $y^\mu_{2(n-1/2(j+1))}$ and $y^\mu_{-2(n-1/2j)}$; $y^\mu_{2(n-1/2j)}$ and $y^\mu_{-2(n-1/2(j-1))}$, $n = 0,1,2, \ldots, j = 0,1,2, \ldots, 2n$ and without the changing of $\bar{y}_\perp$ by the reflections and the hyperbolically turns.

Furthermore by means of the following relation and fixed impulse Minkowski space-time 4-vector $k^\mu = (\omega/c, \bar{k}_\perp, k^3)$ where ω is the zero point energy (ZPE) characterised by the spectre of the energy by so called "zero fluctuations" and fixed $k^3 = c^{-1}(\omega^2 - \bar{k}_\perp^2 - k^2)^{1/2}$ for $|\bar{k}_\perp| \to \infty$ and $|\bar{y}_\perp| \to 0$ with the so called "zero point mass" (ZPM) $m_0 = c^{-1}(k^2)^{1/2}$ for $k^3 \to -\infty$ given at the first for $\omega^2 = \bar{k}_\perp^2$ and $k^2 = -k^{3\,2} = m_0^2$ in the dissertation of G. Petrov 1978 by the prove of the causality properties of the form factors by the virtual Compton effect in the deep non forward scattering of the leptons and hadrons for central interacting virtual particles i.e. $|\bar{y}_\perp| = 0$, $ct_0 \to \infty$ and fixed $(k^2)^{1/2} = |-k^3|$ for $k^3 \to -\infty$ and without the idea of the ZPM but after all by fixed impulse k^3, i.e. actually, the only in this way it is to be possible the extension of the symmetry of the theory to the super symmetry without renouncing to the analyticity of the theoretical entities to be proved 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 form factors too. So the extra boson symmetry is an effect of the causality properties of the theory, e.g. this in the relativistic S-matrix theory are defined 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 his causal properties and describing the observed quantities by the experiment too.

Also at the time $t \to t_{-2(n-1/2j)} + 0$, $n \to \infty$, $\bar{y}_\perp^2 \to 0$, $y_0^2 \ge 0$, for $|\bar{x}_\perp| \le R = ((ct)^2 - x^{3\,2})^{1/2} = |ct| + \text{const} \ge |\bar{y}_\perp|$ and $\lim(-x^{3\,2}/2ct)$, for $x^3 \to -\infty$, $t \to \infty$, $x^3 \in (-\infty, -0]$, and for $x^3 \to \infty$, $t \to -\infty$ $x^3 \in [L, \infty)$, it can be defined the square for the 4-impulse q in the centre of mass system and the zero point energy ω by the following relations

$q^2 = 1/4((\kappa q_\kappa^\mu + \kappa' q_{\kappa'}^\mu)^2 + (\kappa q_\kappa^\mu - \kappa' q_{\kappa'}^\mu)^2),$

$\omega/c = 1/2((\kappa q_\kappa^\mu + \kappa' q_{\kappa'}^\mu)^2 - (\kappa q_\kappa^\mu - \kappa' q_{\kappa'}^\mu)^2)^{1/2} = |\kappa q_\kappa^\mu \kappa' q_{\kappa'\mu}| = (\kappa q_\kappa^\mu \kappa' q_{\kappa'\mu})^{1/2},$

$k^\mu = 1/2(q_\kappa^\mu - q_{\kappa'}^\mu) = (|\kappa q_\kappa^\mu \kappa' q_{\kappa'\mu}|, -\bar{0}_\perp, -(\kappa q_\kappa^\mu \kappa' q_{\kappa'\mu} - k^2)^{1/2}) = (|\kappa q_\kappa^\mu \kappa' q_{\kappa'\mu}|, -0_\perp, -(|\kappa q_\kappa^\mu \kappa' q_{\kappa'\mu}| + \text{const})),$

by the $\lim(-k^2/2(\kappa q_\kappa^\mu \kappa' q_{\kappa'\mu})^{1/2}) = \text{const} \in [0, 1]$, for $k^2 \to \infty$ and $(\kappa q_\kappa^\mu \kappa' q_{\kappa'\mu})^{1/2} \to -\infty$, and ${}^l\tilde{q}^2 = {}^r q^2 = 0$, $q_\kappa^2 = \kappa^{-2} q^2$, $q_{\kappa'}^2 = \kappa'^{-2} q^2$, and the ZPE $\omega = c|\kappa q_\kappa^\mu \kappa' q_{\kappa'\mu}| = c(k^2 + k^{3\,2})^{1/2} = c|k^3| + \text{const}.c$, so also the $\lim(k^2/2k^3) = \text{const} \in [0, 1]$
for $k^2 \to \infty$, $k^3 \to \infty$.

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 Casimir vacuum energy

$E_c = (c^2 q^{0\,2} - \omega^2)^{1/2} = c(q^2 - k^2)^{1/2} = m_{c.m.} c^2 + \text{const}$

and where the $\lim(-k^2/2m_{c.m.}) = \text{const} \in [0, 1]$ for $k^2 \to -\infty$ and $m_{c.m.} \to \infty$. Therefore, the energy of the sea virtual particles in the inertial referent center of mass system is the Casimir vacuum energy by the fixed time.

Farther by ZPE $\omega = 0$ also $E_c = c|q^0|$ and $k^2 = -k^{3\,2}$ (Petrov, 1978) and the $\lim(k^{3\,2}/2m_{c.m.}) = \text{const} \in [0, 1]$ for $k^{3\,2} \to \infty$ and $m_{c.m.} \to \infty$ the Casimir vacuum energy also is the kinetic energy of "zero fluctuations".

For $|\bar{q}_\perp - \bar{u}_\perp|$, and if $\psi(\bar{u}_\perp, \lambda)$ is anyone spectral function considered by the possible analyticity representation of the causality conditions then for the invariant entities T_0 it can be given the spectral representation by Casimir energy of the center of the mass system at the fixed time t of scalar see particles $E_c = c|q^0|$ for the fixed impulse $q^3 = \pm k^3$ and for $\bar{q}_\perp^2 \neq 0$ and $\omega^2/c^2 + q_\perp^2 = 0$ by fulfilling of the corresponding kinematical conditions for the invariant T's the

$$T_0(q^0, \bar{q}_\perp, k^3) = \int d\lambda^2 \int d\bar{u}_\perp \delta(q^{0^2} - (\bar{q}_\perp - \bar{u}_\perp)^2 - k^{3^2} - \lambda^2)\psi(\bar{u}_\perp, \lambda^2),$$

where $\psi(\bar{y}_\perp, \lambda^2) = \int d\bar{u}_\perp \exp(-i\bar{y}_\perp \bar{u}_\perp)\psi(\bar{u}_\perp, \lambda^2)$ can be considered as a solution of everyone differential equation taken from the potential theory of the cylindrical wave propagation.

Here m_0 is the mass of scalar see particles (Pterophyllum scalare) at the rest and c is the light velocity in vacuum. By the fixed ZPE ω and obtained from the masses as effect of the super selections principle by the introduction of the "fermionic" symmetries, i.e. symmetries whose generators are anticommuting objects but neutral and called by us scalarino also furthermore it can be spoken from the super symmetric point of view about a "fermionization" and "bosonization" of scalar quantum field.

The arbitrariness of the phase of vector valued one quantum field's functional state obtained by the quantization of the field function φ(x) is the usual method to obtain the reel existing interactions taken in account the invariance. The partly ordered events can be introduced by the help of the relations given by $x^\mu > y^\mu_{2(n-½j)}$ then and only then if $x^0 > y^0_{2(n-½j)}$ and $(x - y_{2(n-j/2)} \cdot x - y_{2(n-j/2)}) > 0$, i.e. the event point x^μ is "more latest" than the event point $y^\mu_{2(n-j/2)}$ and the relative vector $(x - y_{2(n-j/2)})^\mu$ is time-like. The transformation in the time-space manifold φ(x): M → M for them the relations above means $\varphi(x) > \varphi(y_{2(n-j/2)})$ by fixed point $y_{2(n-j/2)}$ and vice versa is called causal automorphism of the space-time with respect to the local coordinate system. The causal automorphismes forms a group for them it is fulfilled the so called Zeman's theorem for the group of the full causal avtomorphismes of the Minkowski space-time the so called half direct product $T^{3,1} \times) (\Lambda\uparrow \times D)$ where Λ↑ is the orthochronic Lorenz transformations and D the dilatations group $x^\mu \to \kappa x^\mu$, for $x^\mu \in M^4$, κ belong to the multiplicity group of the reel numbers different from zero.

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 classes 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 energy by the "zero vacuum fluctuations" of the Casimir quantum field state. The Casimir effect has been posited as a force produced solely by interaction of the quantum field ground state in the vacuum with additional causal and boundary conditions. The zero vacuum fluctuations are fundamentally based upon the interaction of the quantum fundamental relativistic 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 the Hilbert vector valued functional one quantum field state in the coordinate Minkowski space-time in the local case is given by one field state |φ> and obtained by the acting of the scalar field operator $\tilde{\Phi}_{\alpha_\kappa}$ on the vacuum vector functional state of Hilbert space without definite metric defined by

$$\varphi(\alpha_{\kappa'})\rangle = |y_{-2(n-½(j-\kappa'))}\rangle = \tilde{\Phi}_{\alpha_{\kappa'}}(y_{-2(n-½(j-\kappa'))})|0^+\rangle = \varphi(y_{-2(n-½(j-\kappa'))})|0^+\rangle = \alpha_{\kappa'}\varphi(y_{-2(n-½(j))})|0^+\rangle = \int d_4k \exp[ky'_{-2(n-½(j-\kappa'))}]\varphi(k)|0^+\rangle$$

where $d_4k = d^4k/(2\pi)^4$ or $\int d^4x^\mu \varphi(x)\alpha_{\kappa'}(x)|0^+\rangle = |\varphi(\alpha_{\kappa'})\rangle$.

Furthermore the vector valued quantum vacuum functional $|0^+\rangle$ is a state with the positive energy E_0 defined by the positive energy of the "vacuum fluctuations" the so called "zero-point energy" ZPE of the Banach vector valued one quantum field state at the fixed time given by $t \in (t_{-2(n-½j)}, t_{2(n-½j)}]$, n = 0,1,2, ..., j = 0,1,2,...,2n, for $|q_\perp| \to 0$, $q^3 = \pm k^3$

Moreover the vector valued functional quantum one field state |φ> with one eigen field value φ is characterized by the Ψ-functional $\Psi_{\alpha_\kappa}(\varphi, t)$ by the following relation defined by

$$|y'^\mu_{-2(n-½(j-\kappa'))}, t\rangle = \int|\alpha_{\kappa'}\rangle D\alpha_{\kappa'}\langle\alpha_{\kappa'}|y^\mu_{-2(n-½(j-\kappa'))}, t\rangle = \int|\alpha_{\kappa'}\rangle\langle y'^\mu_{-2(n-½(j-\kappa'))}, t||\alpha_{\kappa'}\rangle D\alpha_{\kappa'} = \int|\alpha_{\kappa'}\rangle\Psi^*_{\alpha_{\kappa'}}(\varphi, t)D\alpha_{\kappa'},$$

where $0 \leq \kappa' \leq \kappa \leq 1$, $\alpha_{\kappa'} = \alpha_{\kappa'}(\bar{x}_\perp)_{y^3_{-2(n-½(j-\kappa)}, ct_{-2(n-½(j-\kappa))}}$, for the functional integral measure given by the usual descriptions

$$D\alpha_\kappa(\kappa' x) = \prod d^2\bar{x}_\perp, \; x_\perp$$

where $\alpha_{\kappa'}$ is the scale function for fixed $x^3 = y'^3_{-2(n-½(j-\kappa'))}$, $\kappa' x^0 = y'^0_{-2(n-½(j-\kappa'))}$

Furthermore there are in force for $t \in (t_{-2(n-½(j-\kappa')}, t_{2(n-½(j-\kappa)}]$ the relations

$$\varphi(\kappa' x) = \varphi(\alpha_{\kappa'}),\; \pi(\kappa' x) = \pi(\partial_{ct}\alpha_{\kappa'}),\text{ and } \varphi(\kappa' x) = \varphi(\tau_j^1\tilde{x}) \text{ for } \alpha_{\kappa'} = \alpha_{\kappa'}(x_\perp)_{y^3_{-2(n-½(j-\kappa)}, ct_{-2(n-½(j-\kappa))}} = f^1_{\kappa'}(x_\perp) = 0,\; \pi(\kappa' x) = \pi(\tau_j^1\tilde{x})$$

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

and $\mathbf{f}_{\kappa'}(\bar{x}_\perp) = (f^1_{\kappa'}(\bar{x}_\perp), f^2_{\kappa'}(\bar{x}_\perp)) = 0_\perp$ by the additional causality properties and boundary condition for

$$t = t_{-2(n-½(j-\kappa')}, \; \kappa' x^3 \in (-\infty, y^3_{-2(n-½(j-\kappa'))}] \cup (y^3_{-2(n-½(j-\kappa'))}, 0], \; \bar{x}_\perp = (x^1, x^2) \in \delta\Omega_t = S$$

and moreover for $x_\perp \in \Omega_t \subset \mathbf{R}^2$ follows

$$\bar{\partial}_\perp \mathbf{f}_\kappa(\bar{x}_\perp) = 0 \text{ too}, \quad \bar{\partial}_\perp = (\partial_{x^1}, \partial_{x^2}).$$

Moreover if on the boundary surface S for $\kappa' x^0 = ct$, and the fulfilled additional causality condition $|\bar{x}_\perp| \geq (y_0^{0\,2} - y_0^{3\,2})^{1/2}$ 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 $\kappa' x^3 = x^3$

$$\partial_{ct}\pi(\kappa' x) = (\delta/\delta(\partial_{ct}\alpha_{\kappa'}))\pi(\partial_{ct}\alpha_{\kappa'})\partial^2_{ct}\alpha_{\kappa'}(\bar{x}_\perp, x^3, ct) = \Delta\varphi(\kappa' x) = 0, \text{ i.e.}$$
$$\partial^2_{ct}\alpha_{\kappa'}(\bar{x}_\perp, \kappa' x^3, ct) = 0. \tag{2}$$

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

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

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

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

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

from eq. (1) can be obtained

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

and from eq. (2)

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

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

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

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

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

for additional causal condition

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

where $\varphi(\kappa' x)_{y^3_{-2(n-1/2(j+\kappa))},\, ct_{-2(n-1/2(j+\kappa))}}$ is anyone non local scalar field function with the norm $\kappa'\|\varphi\|$, fulfilled the given additional causal and boundary condition for fixed $\kappa' x^0 = ct = y^0_{-2-(n-1/2(j-\kappa))}$, $\kappa' x^3 = x^3 = y^3_{-2(n-1/2(j-\kappa))}$, 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

$$(\mathbf{f}_{\kappa'}, \mathbf{g}_{\kappa'}) = \int_{\Omega_{t,\,x3}}(\mathbf{f}^\iota_{\kappa'}, \mathbf{g}_{\kappa'})d\,\bar{x}_\perp, \tag{11}$$

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

given by the definition

$$(\bar{\partial}_\perp\mathbf{f}_{\kappa'} : \bar{\partial}_\perp\boldsymbol{\alpha}_{\kappa'}) = \sum_{k,\,j=1}^{2}(\partial_j f^\iota_{\kappa' k})(\partial_j g_{\kappa' k}).$$

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

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

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

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 $S_R(\mathbf{M}) = S^+(\mathbf{M}) \dotplus S^-(\mathbf{M})$ 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 $\acute{L}^-(\mathbf{M}) \to L_\pi(\mathbf{R}^2) = S_R(\mathbf{R}^2)^{\|\pi\|}$ for L_φ, L_π from the Sobolev's spaces with fractional numbers of the indices.

Further if by fixing variables

$$f^2_{\kappa'}(\bar{x}_\perp) = \partial_{ct}\alpha_{\kappa'}(\bar{x}_\perp)_{y^3_{-2(n-1/2(j-\kappa))},\, ct_{-2(n-1/2(j-\kappa))}} = 0$$

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 $ct = \kappa' x^0 = ct_{2(n-1/2(j+1-\kappa'))}$,

$x^3 = \kappa' x^3 = y^3_{2(n-½(j+1-\kappa'))}$ 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

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

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

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

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

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

with a given additional causal properties, and boundary value problem

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

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

$$|\bar{x}_\perp| \le (y^{0^2} - y^{3^2})^{½}, \text{ by } t \in (t_{-2(n-½(j-\kappa'))}, t_{2(n-½(j-\kappa))}], \; n = 0, 1, 2, \ldots; j = 0,1,2,\ldots,2n,.$$

where $\square$ 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 $x^\mu \in M^4$ $\mu = 0, 1, 2, 3$, $(x, y, z, ct) = (x^m, x^0)$ with $m = 1, 2, 3$ is a 4-point of Minkowski 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

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

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 $\varphi(x)$ and impulse $\pi(x)$, $x^\mu \in M^4$, $\mu = 0, 1, 2, 3$, 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 indefinite metric

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

can be given by the formulas,

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

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

$$K_m A(f) = A(K_m f) = \int K_m \varphi(x)\alpha(x)d^4x = -\int \varphi(x)\, K_m \alpha(x)d^4x = 0$$

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

[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.

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 operator's equations for the local quantum fields system followed 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

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

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 indefinite 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 $<\varphi|\ J(\tilde{q}_\tau)\ |0>$, i.e. in the local case for the Wick product of the field operators

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

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. However, this resemblance is only formal and by going over the physical representation the scalar massless 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 broken 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 broken. That is the cause to be observed 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 value problem 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 $(ct, \underline{x})$ from the Minkowski space-time can be written as a sum of the energy of the "vacuum 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 value problem.

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 indefinite 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 "vacuum 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

$$V/n \sim ((\bar{y}_{\perp}^{\,2} + (y^3_{2(n-\frac{1}{2}j)})^2)^{\frac{1}{2}})^3 = (y^3_{2(n-\frac{1}{2}j)} + \mathrm{const})^3 , \qquad (27)$$

$\lim\ \bar{y}_{\perp}^{\,2}/2y^3_{2(n-\frac{1}{2}j)} = \mathrm{const} \in [0, 1]$ for $\bar{y}_{\perp}^{\,2} \to \infty$, $y^3_{2(n-\frac{1}{2}j)} \to \infty$, for $j = 2n \to \infty$ and the additional causality condition $|\bar{x}_{\perp}| \le R = (y^{0^2} - y^{3^2})^{\frac{1}{2}} = y^0_{2(n-\frac{1}{2}j)} + \mathrm{const}$,

$\lim(-y^3_{2(n-\frac{1}{2}j)}/2y^0) = \mathrm{const} \in [0, 1]$ for

$y^3_{2(n-\frac{1}{2}j)} \to \infty$, $y^0 \to -\infty$, for $j = 2n \to \infty$

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

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

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

In addition, 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 $\Psi_{\alpha_{\kappa'}}$ 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 indefinite metric by the equations

$$-i\hbar\partial_t\Psi_{\alpha_{\kappa'}}(\varphi, t) = H(\pi, \varphi)\Psi_{\alpha_{\kappa'}}(\varphi, t),\quad \text{for } t \in [t_{-2(n-\frac{1}{2}j)}, t_{2(n-\frac{1}{2}j)}] \qquad (28)$$

$$\Psi^{+}_{\alpha_{\kappa'}^{+}}(\varphi, t_{-2(n-\frac{1}{2}j)} + 0) = Q(\pi^{+}, \varphi)\Psi_{\alpha_{\kappa'}}(\varphi, t_{2(n-\frac{1}{2}(j+1))})\quad \text{for } t = t_{2(n-\frac{1}{2}(j+1))},\ n = 0, 1, 2, \ldots, j = 0,1,2,\ldots,2n \qquad (29)$$

where $\Psi^{+}_{\alpha_{\kappa'}^{+}}(\varphi, t_{-2(n-\frac{1}{2}j)} + 0) = f^{2+}_{\kappa'}\delta_{\alpha_{\kappa'}}\Psi_{\alpha_{\kappa'}^{+}}(\varphi, t_{-2(n-\frac{1}{2}j)} + 0)$ 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 $|\bar{k}_{\perp}| \to 0$, $|q_{\perp}| \to 0$ and taking in to 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 then in the mass system at the rest of the single scalars appear the mixture of the see excited states with impulse $|k^3| \gg q^3 \neq 0$.

So also it can be understand better the existence of the supper symmetry by the fundamental "matter" fields with the particles the so called scalarino of the Fermi scalar non local fields with a half spin ψ(κx) so that it is possible to obtain the non local interactions by the scalar field defined the so called non local field operators appearing by the expansion on the light cone then for κ, κ' → 0

$$:\psi(\kappa x)\psi(\kappa' x): = \int dq_{\kappa} dq_{\kappa'} \exp[iq_{\kappa}\kappa x + iq_{\kappa'}\kappa' x]:\psi(q_{\kappa})\psi(q_{\kappa'}):$$

and for the interacting fields by the summation of the so called minimal interaction

$$:\bar{\psi}(\kappa x)\exp[\int_{\kappa'}^{\kappa} du(\tau\tilde{x})]\psi(\kappa' x): = :\bar{\psi}(\kappa x)\exp[\int_{\kappa'}^{\kappa} d\varphi(\tau\tilde{x})]\psi(\kappa' x): =$$

$$:\bar{\psi}(\kappa x)\exp[\int_{\kappa'}^{\kappa} d\tau\tilde{x}^{\mu}\partial_{\mu}\varphi(\tau\tilde{x})]\psi(\kappa' x):=:\bar{\psi}(\kappa x)\exp[-ie\int_{\kappa'}^{\kappa} d\tau\tilde{x}^{\mu}A_{\mu}(\tau\tilde{x})]\psi(\kappa' x):$$

for the gage vector

potential i.e. $A'_{\mu}(\tau\tilde{x}) = ieA_{\mu}(\tau\tilde{x}) + \partial_{\mu}\varphi(\tau\tilde{x})$ where $\partial_{\mu} = \partial/\partial_{\tau\tilde{x}_{\mu}}$ and by the condition $A'_{\mu}(\tau\tilde{x}) = 0$ e.g. $F'_{\mu\nu} = 0$ so that by super symmetric considerations the following condition for the quantum scalar field is fulfilled for κ, κ' → 0

$$\lim\langle 0|:\bar{\psi}(\kappa x)\psi(\kappa' x):|0\rangle = \langle 0|\varphi|0\rangle = \varphi = \mathrm{const.}$$

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

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