

# Quantum Physics and Relativity

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**ABSTRACT:** The new outside field has been introduced in order to explain the extrude the atoms from an electric field and to describe the superfluidity. The phenomenon of the tunnelling has been explained by the existence of the additional dimensions. The relation between the ether and the existence of the tachyons has been touched once more. The sense of the "negative probability" has been explained and the condition concerning the Boltzman's distribution ( implicated by the existence of an unempty vacuum) has been imposed.

## 1. Stark's effect and superfluidity

In the phenomenon of the superfluidity the quanta ( portions ) of energy exist and one can't have an energy smaller than the smallest portion and it can be placed below the first excited state [1].

So it means an existence of certain outside field of potential in which the phenomenon of quantisation takes place.

The field is an analog of crystal lattice in the superconductivity.

It is the same field, which in the Stark's effect appears or the field connected with that field ( Obviously it isn't an electric field causing the Stark's effect directly).

The fact that in the Stark's effect (in certain quantum states) the atoms are attracted into the field and in other quantum states they are extruded from the field, is implicated by the fact that in certain quantum states the conjugation with outside field is bigger and in another state the conjugation with the unempty vacuum is bigger.

An outside arranging field isn't obviously an electric field of the Stark's effect.

The necessity of renormalisation implicated by the divergencies of the integral is a consequence of the fact that mass of particle interacts with an infinite mass of the vacuum.

The second field overlaps this field and countermands the infinities. The superposition of infinite fields with opposite signs gives the finite field. This additional field is an effect of an outside field arranging the vacuum.

The fact that the vacuum has nonzero dipol moment manifests that there exists the field arranging dipols particle- antiparticle.

The candidate for this field is the field of nondissapearing curvature of the space.

There is an unified field interacting with all types of charges so as the mass is equivalent to every type of the charge.

An extrude of the atoms from an electric field is the same effect as the repulsion of two gravitational masses with the opposite signs. The existence of the nonzero tensor of the polarization of the vacuum manifests the existence of the unempty vacuum and the existence of the outside field arranging the dipols of Dirac's see.

This field isn't an electric field generally. It can be generalized field reacting on the mass and every kind of charge.

The theories in which the divergences appear, can be correct. It means that the unempty vacuum or the tunnelling to another universe find expression.

The Lamb's shift is an effect of an interaction of the atom with the Dirac's unempty vacuum or the outside arranging field. If the particle varies structurally without an absorption of another particle or dissociation then it has an outside structure or it interacts with unempty vacuum or with outside field.

The dressing of the particles (similarly as the polarization of the vacuum) manifests an existence of unempty vacuum.

## 2. Tunnelling

The analogy of Fick's law to the Schrödinger equation:

$$\frac{\partial c}{\partial t} = D \frac{\partial^2 c}{\partial x^2}$$

and the fact that the Schrödinger's equation contains the complex coefficient mean that quantum effects and especially the tunnelling to the neighbouring atoms in the crystal are the diffusion in the dimensions perpendicular to our 4 dimensions.

The next argument is the transformation  $x \rightarrow ix$ ,  $t \rightarrow it$  transforming Fick's law into Schrödinger's equation. This, what we observe as the tunnelling along dimension  $x$ , is the projection to the axis  $x$  of the motion in the plane  $x, x'$  where  $x'$  is a complex dimension perpendicular to  $x$ . The tunnelling is a voyage in the additional dimensions which makes easier to conquer an obstacle.

The superconducting is possible when the Cooper's pairs pass to the space penetrating our space.

These penetrating spaces are 8-dimensional too, but 8 dimensions make possible the motion in the whole crystal and not only the superconductivity.

The effect of the superconductivity of the vacuum and generally of the superconductor is implicated by the passing through an obstacle in the perpendicular dimensions.

So, too, the Cooper's pairs are embedded in the mutually penetrating spaces.

## 3. Tachyons and unempty vacuum

It is possible to discover tachyons analysing the fluctuations of the velocity of light [2] (in certain interferometer between two mirrors or the series of mirrors).

The coherent laser light can be used.

The fact that the electromagnetic forces depend on velocity similarly to the forces of viscosity ( Stokes' force for example ) manifests an existence of unempty vacuum ( ether - speaking directly ).

The complex component of an amplitude of dispersion corresponds with an appearing of tachyons.

#### 4. Negative probability

The negative probability:

$$P = \int |\psi|^2 dV \quad (1)$$

$$dV = \prod_i dx_i \quad (2)$$

means that either the square of module is negative or  $dx_i$  have  $4(k + \frac{1}{2})$  complex values or an odd number of negative values.

An integral (1) isn't the probability in the mathematical sense, so the Born's interpretation of wave function contains certain inconsistency.

The Gupta's and Beuler's theory [3,4] which ( in the procedure of quantisation of an electromagnetic field ) resigns from the positively determined probability, is an argument for the existence of complex photons or for the movement of photons periodically with the velocity bigger or smaller than  $c$  ( so called velocity of light ).

#### 5. Boltzman distribution and unempty vacuum.

In order the motion along the unempty vacuum may not be detected, the condition on the Maxwell - Boltzmann distribution must be imposed:

$$f(v) = \left( \frac{m}{2\pi k_B T} \right)^{\frac{3}{2}} e^{\left( \frac{-mv^2}{2\pi k_B T} \right)} 4\pi v^2 = \text{const}$$

It is special case of an equation of fields [5] and it is the polynomial as the function of  $v^2$ , so identical considering  $v$  and  $-v$  and at the logarithmic members the coefficients are equal zero.

This equation concerns the velocities of the particles of an unempty vacuum.

## 6. Other facts

The collective effects ( statistical ) create the particle: plasmon, polaron, hole and vice-versa - the effects typically molecular create collective effects, for example the cloud of machyons ( tachyons ) around the real mass particle.

The electron-positron system is an analog of the hydrogen atom.

The electron can penetrate nucleus because of its non-zero dimensions, because only then the probability of the existence of electron on the region of proton is nonzero.

Quantum mechanics is a good theory because of the Dirac-Einstein equation, so the possibility of electron-positron annihilation means that the leptons have the nonzero dimensions.

The existence of repulsing forces of inertia manifests the existence of the negative gravitational mass connected with the negative energy of unempty vacuum.

There is no problem of the emission of the radiation by an electron in an atom, because in the quantum gravity an electron moves along the straight line, but the space-time is curved.

In other words the total exchange of energy of electron with unempty vacuum is the same in both directions.

## 7. Last but important conclusions

The accidentality ( Born's interpretation of wave function ) exists near by the determination ( Schrödinger's interpretation of wave function ). This is an analogy to resonance structures in chemistry.

The path integral makes sense because the particle is surrounded by the cloud of 'virtual' particles. They have their trajectories and therefore the real trajectory of the particle expands.

For the same real values ( components ) of generalized quaternion  $x_0, x_1, x_2, x_3$  there are different values  $n, m$ , for which an analog of square of module is bigger, or equal zero or negative [6] .

The uncertainty principle results from the fact that square of module certain expression is bigger or equal zero. Now we know that it needn't to be this way. So on an execution or nonexecution of Heisenberg's relation the additional parameters  $n$  and  $m$  decide [6] .

Perhaps the law of Nature is the fact that it is impossible to calculate theoretically the fine structure constant. It may be certain squaring the circle.

### References:

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