

# Physical Quantum Vacuum is a Source of Electromagnetic Energy



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One of the most important achievements of quantum electrodynamics is the discovery of electromagnetic field, which exists in vacuum. It was experimentally proved in 40s of the XX century. Quantum electrodynamics maintains the fact that the electromagnetic field is not equal to zero even if there are no photons (i.e. in vacuum). In spite of the average density values  $\mathbf{E}$  and  $\mathbf{B}$  are equal to zero, however, there are so-called "zero-point oscillations" (fluctuations) of the electromagnetic field. This material-field-structured field fills up the infinite cosmic space capacity of the physical quantum vacuum and forms its Medium.

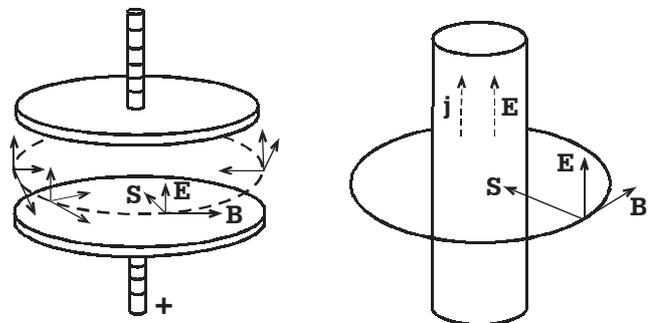
Energy character of this field shows that it is not only the source of energy, which serves for appearance, and existence of the objects of the real physical mass of the microworld of elementary particles and for the objects of the macroworld of the whole Universe. If there is organized the process of the local disturbance of the structure of this field by a matter, which executes the work at the field, then this electromagnetic field can be used as a source of the electromagnetic energy.

More precisely, the Medium of the physical quantum vacuum has been used by the mankind (and not only by it) as a source of energy. Umov-Pointing's theory proves this statement. The idea of the theory lies in the fact that for the electromagnetic field there should be the density of energy  $\mathbf{u}$  and a flow  $\mathbf{S}$ , which depend on the field of electric intensity  $\mathbf{E}$  and the field of magnetic intensity  $\mathbf{B}$ .

For the conductor, in which current runs (Fig. 1), the vector of electric density  $\mathbf{E}$  is directed along this conductor in the direction of current flow. The vector of magnetic density  $\mathbf{B}$  is directed perpendicularly to the

vector  $\mathbf{E}$  at a tangent to the conductor. Therefore, Umov-Pointing vector, which belongs to the energy flow  $\mathbf{S}$ , is perpendicular to the vectors  $\mathbf{E}$  and  $\mathbf{B}$  and directed radially inside the conductor.

According to this theory, electrons obtain energy from the flow of the energy of the outside field which is directed inside a wire. This energy is consumed by electrons to generate heat, execute work, and overcome resistance. It seems that the electron replenishes the energy due to "pressure", which propels the electron along the conductor; therefore, the energy should flow down or up at the wire. Nevertheless, the theory confirms that in fact the electron replenishes its energy consumed to generate heat, from outside electromagnetic field. This field fills up the infinite capacity of the space round the conductor. This is the energy of Medium of the space of the physical quantum vacuum. We have not realized yet the fact that the rotor of any generator executes the work at the energy field of Medium of the space of the physical quantum vacuum (PQV).



Pointing's vector  $\mathbf{S}$  is directed inside a charged capacitor, which locates close to it.

Pointing's vector  $\mathbf{S}$  is close to a conductor in which current runs.

Fig.1

Producing resistance to this work, the energy field of the PQV increases the magnetic intensity of the rotor, and produces the effect of deceleration. The amount of energy, which is involved in this process, can be expressed by the increase of the mass of the rotor at  $\Delta m$  or of the kinetic energy of the rotor at  $\Delta T$ . It occurs corresponding to the relativistic formulas:

$$m_v = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}, \quad \text{whence it follows}$$

$$\text{that } \Delta m = m_v - m_0 = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} - m_0,$$

$$\text{and } \Delta T = \Delta mc^2.$$

The magnitude of  $\Delta m$  should be observed as the relativistic rest mass, which energy equivalent is calculated by the formula of  $E = \Delta mc^2$ .

Therefore, the increase of the mass (i.e. energy) of the rotor is considered to be the appearance and increase of the potential of electric intensity at its output contacts. The circuit of a switched load unit determines the energy flow of Medium of the electromagnetic field of the PQV, which tends to neutralize an appeared local defect of the field structure of the PQV. As a result electric current appears. Overcoming the resistance of the circuit the current provides us with heat, mechanical and the other kinds of energy, which are necessary for our everyday life. The replenishment and maintaining of the intensity potential occur due to the accession of the energy of the electromagnetic field of the PQV Medium.

The simplest evaluation of  $\Delta m$  magnitude (for example for the hydrotreater of Bratskaya hydroelectric power station, which power is equal to  $N = \frac{\Delta T}{t} = 225$  thousands of kilowatts) demonstrates that the value of the appearing relativistic mass comes to  $\Delta m = \frac{\Delta T}{c^2} \approx 2 \cdot 10^{-6}$  gram/sec. Since the total weight of the turbine is equal to 800 tons then this value cannot be measured by nowadays-existent instruments. However, these micrograms determine our total existence in the medium of the infinite space of the PQV.

Umov-Pointing's theory claims to be accepted as a theory, which explains the nature of the PQV. According to the theory, **the physical quantum vacuum is a time-and-space infinite universal all-penetrating fundamental energy field which has the lowest level of state.** Actually, the infinite capacity of the cosmic space of the PQV represents a structure, which consists of electric charges  $q$  and magnetic fields, which tend to their lowest ("zero") level of state. A cell of this structure is represented in Fig. 2. The electric fields  $\mathbf{E}$  and the magnetic fields  $\mathbf{B}$  of this structure act as an impulse and coordinates. According to the principle of uncertainty, they cannot simultaneously turn into zero. Certainly, the average values of  $\mathbf{E}$  and  $\mathbf{B}$  are equal to zero; however, the density of energy is expressed by

the squares of  $\frac{E^2 + B^2}{8\pi}$ .

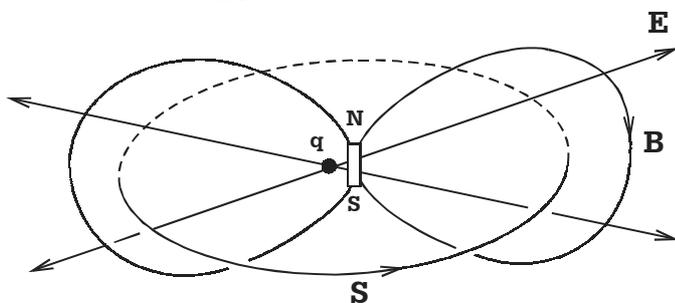


Fig. 2

The charge and the magnet produce Umov-Pointing vector of the energy flow  $\mathbf{S}$ , which circulates in a closed loop.

The theory asserts that the fields can be separated into particular electromagnetic waves. According to the linear theory, these waves are independent of each other, and every wave behaves as an oscillator, i.e. as a particle which is held in balance state by a square potential. The motion of such a particle is oscillation at certain frequency, i.e. "zero" oscillations at the minimal density of the energy. According to the classical theory, the minimum of the energy corresponds to a particle, which is rests on the lowest point. This minimum is equal to zero.

However, according to the quantum theory, the spectrum of possible states of a particle is expressed

by the formula of  $E_n = h \nu_{(n+\frac{1}{2})}$ . The lowest "zero" state

of the energy corresponds to  $n = 0$ ,  $E_0 = h \nu_{\frac{1}{2}}$ . Only this lowest state is compatible with the quantum theory and the principle of indetermining. Proceeding from the revealed fact that the basic energy level of the atom of hydrogen is displaced, i.e.  $\Delta \nu = 1062$  MHz, it is possible to calculate this lowest state of the energy. It

is equal to  $E_0 = h \nu_{\frac{1}{2}} \approx 0.55 \cdot 10^{-18} \text{ erg} \approx 0.35 \cdot 10^{-6} \text{ eV}$ .

Let us return to Fig. 2, which represents the cell of the structure of the physical quantum vacuum as a point discharge, which is located close to the centre of a magnetic bar. Since everything is at rest then the energy is not changed in time;  $\mathbf{E}$  and  $\mathbf{B}$  are constant. However, Umov-Pointing vector shows that there is the energy flow as the vector product of the cell  $\mathbf{E} \times \mathbf{B}$  is not equal to zero. The energy flow circulates round this system. Nevertheless, the energy is not changed, since every input is equal to the output. This phenomenon may be compared with the circular flow of incompressible water. Thus, in this case, which seems to be static, there is the energy flow, which has the lowest possible level of state  $E_0 \approx 0.35 \cdot 10^{-6} \text{ eV}$ . Certainly, these very elementary flows of the particular cells determine the state of the physical quantum vacuum, which is a time-and-space infinite universal all-penetrating fundamental energy field, which has the lowest level of state. This irremovable field is the primary inexhaustible source of the energy, which is used by the microworld of elementary particles and the macroworld of all the physical objects of the whole Universe. The primary task of the mankind is to learn to use this unlimited and immeasurable ocean of energy.

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