FORMULA FOR SUPERCONDUCTIVITY

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At research of laws of the nature we actually measure only three parameters – force, length and time. Therefore, it seems rather strange, what for scientists have excluded the unit of measurements of force from the list of the basic units of measurements, and have entered the unit of measurements of mass. Let us, research this problem more scrupulously.
In the International System of Units four basic units of measurements – a mass unit |kg|, a unit of length |m|, a time unit |s| and a unit of force of current |A| are used.
In our work "On INTERCOUPLING of SOME PHYSICAL CONSTANTS" we have shown, that dimension of a unit of measurements of quantity of electricity – of coulomb, is equal to product of a root square of force multiplied by time |C| = |N1/2|×|s|.
Applying the received result to the basic and additional (derived) units of measurements in the system SI, we shall see the following picture:
Unit of measurements of force of electric current $|A| = |C|/|s| = |N^{1/2}|$;
Unit of measurements of intensity of magnetic field $|A|/|m| = |N^{1/2}|/|m|$;
Unit of measurements of magnetic constant henry/meter $|H|/|m| = |N|/|A^2| = 1$(dimensionless);
Unit of measurements of magnetic flux density tesla $|T| = |N^{1/2}|/|m|$;
Unit of measurements of inductance henry |H| = |m|;
Unit of measurements of electric capacitance farad $|F| = |C|/|V| = |s^2|/|m|$;
Unit of measurements of electric constant farad/meter $|F|/|m| = |s^2|/|m^2|$;
Unit of measurements of intensity of electric field volt/meter $|V|/|m| = |N^{1/2}|/|s|$;
Unit of measurements of induction of an electric field $|N^{1/2}|\times(|s|/|m^2|)$;
Unit of measurements of electric potential difference $|V| = |N^{1/2}|\times(|m|/|s|)$;
Unit of measurements of electric resistance ohm |Ω| = |m|/|s|.

For definition of pressure of electromagnetic wave the formula by Pointing, which directly gives the result expressed in pascals, is used $|Pa| = |N|/|m^2|$

$$\vec{\Pi} = \frac{1}{c}\cdot\left[\vec{E}\times\vec{H}\right] \quad |Pa| \qquad (1)$$

where E – intensity of electric field of wave;
H – intensity of magnetic field of wave.

Pay attention, that the volt is a product of ampere by the speed, though we have got used to that this product of an ampere by ohm. Hence, electric resistance represents the speed of some movement in substance, but not resistance to movement of electric charges.
Other fact from a series of illogicalities concerns to a technique of definition of a unit of measurements of force of electric current. The ampere is defined, as result of interaction of two infinite and parallel conductors with electric current. Such conductors in the nature do not exist. The electric current always is closed and, hence, it has concrete connection with space and time. If we shall give for an electric current to operate according to the law of the most favourable power state, it will necessarily take the shape of a ring.
The law of the most favourable power state is carried out undeviatingly in all other force interactions. Therefore ignoring of this law always results in false hypotheses and theories.
In our work "NEW INTERPRETATION of GRAVITATIONAL CONSTANT" it was summarily considered the task about electrostatic interaction of the charged rings and about magnetic interaction of ring currents.

In fig.1a the double-coil with a current $i=(q_e \cdot N_v \cdot v)/(\pi \cdot D)$ is shown

where q_e = 1.602176462×10^{-19} |C| – elementary charge;

N_v – quantity of elementary charges in a coil;

v – average speed of movement of charges;

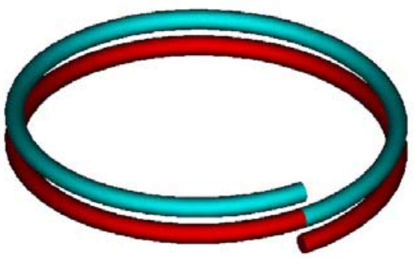
D – diameter of a coil.

Electric resistance of one coil is $R=(4 \cdot \gamma \cdot D)/d^2$

where γ – the specific electric resistance of metal in the coil;

d – diameter of a wire in the coil.

a)



b)

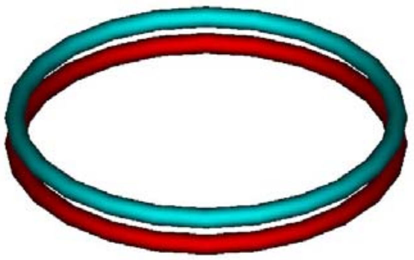


Fig.1
Transformation double-coil spirals into two isolated rings

Having the known values of a current in the coil and electric resistance of a coil we can calculate a voltage drop on each convolution of the coil

$$U = \gamma \cdot \frac{4 \cdot q_e \cdot N_v \cdot v}{\pi \cdot d^2} \quad |V| \qquad (2)$$

The formula (2) does not contain value of diameter of a coil in an obvious kind. It allows us, for simplification of calculations, to arrange all charges in one line on an axis of a wire. In this case, the potential difference between everyone two identical points of the first and second coil will be equal to a potential difference between the beginning and the end of one coil.

Thus, we can transform a double-coil spiral with the step equal d, to two isolated rings with distance between the rings, equal d as it is shown in fig. 1b.

The force of electrostatic attraction between two rings, which are located on one axis OZ on distance z from each other, can be calculated with the help of integrated expression (3).

For finding of this force it is necessary to know quantity of injected charges N_c in each ring.

$$F_e(z) = \frac{q_e^2 \cdot N_c^2 \cdot c^2}{2 \cdot \pi \cdot 10^7 \cdot D^2} \cdot \int_0^{2\pi} \frac{\left(\frac{z}{D}\right) \cdot d\varphi}{\left[\left(\frac{z}{D}\right)^2 + \cos^2\left(\frac{\varphi}{2}\right)\right]^{3/2}} \quad |N| \qquad (3)$$

Let's designate integral in the formula (3), as

$$J_E(z) = \int_0^{2\pi} \frac{\left(\frac{z}{D}\right) \cdot d\varphi}{\left[\left(\frac{z}{D}\right)^2 + \cos^2\left(\frac{\varphi}{2}\right)\right]^{3/2}} \qquad (4)$$

After replacement the formula (3) will look like

$$F_e(z) = \frac{q_e^2 \cdot N_c^2 \cdot c^2}{2 \cdot \pi \cdot 10^7 \cdot D^2} \cdot J_E(z) \quad |N| \qquad (3a)$$

For finding of value N_c it is necessary to calculate the work of moving of the injected charge $q_e \cdot N_c$ on distance from $z=d$ up to $z=\infty$, and to express this work, through potential difference U between two rings

$$W_e = \int_d^{\infty} F_e(z) \cdot dz = \frac{q_e^2 \cdot N_c^2 \cdot c^2}{2 \cdot \pi \cdot 10^7 \cdot D^2} \cdot \int_d^{\infty} J_E(z) \cdot dz = q_e \cdot N_c \cdot U \quad |J| \qquad (5)$$

Having measured a voltage drop on one convolution of the coil, and knowing the sizes of the coil and a material of a wire, we can calculate the quantity of elementary charges, which create an electric field between convolutions of the coil

$$N_c = U \cdot \frac{2 \cdot \pi \cdot 10^7 \cdot D^2}{q_e \cdot c^2 \cdot \int_d^{\infty} J_E(z) \cdot dz} \qquad (6)$$

For example, in the double-coil with diameter of coils D=1m and step $z=d$, made of a lead wire in diameter d=1mm (γ=20.648×10^{-8} Ω·m), at density of a current $j = 10^7$ A/m^2, we shall have the following characteristics:
i = 7.854 |A|; R = 0.826 |Ω|; U = 6.487 |V|; N_c = 8.532×10^8 ; F_e = 1.067×10^{-7} |N|.

For calculation of force of magnetic interaction between convolutions of the coil we shall take advantage of the formula (7), which differs from the formula (3), that contains an additional trigonometrical multiplier cos(φ).

$$F_{qm}(z,v) = \frac{q_e^2 \cdot N_v^2 \cdot v^2}{2 \cdot \pi \cdot 10^7 \cdot D^2} \cdot \int_0^{2\pi} \frac{\left(\frac{z}{D}\right) \cdot \cos(\varphi) \cdot d\varphi}{\left[\left(\frac{z}{D}\right)^2 + \cos^2\left(\frac{\varphi}{2}\right)\right]^{3/2}} \quad |N| \qquad (7)$$

The accent of the formula (7) will be, that it always gives negative result, though the same as and in case of electrostatic interaction, between convolutions of the coil the force of attraction operates. To explain this feature, we shall express a multiplier cos(φ), through function of half-angle:

$$\cos(\varphi) = 1 - 2 \cdot \sin^2\left(\frac{\varphi}{2}\right)$$

As a result of replacement, force in the formula (7) will be submitted, as a difference of two forces:

$$F_{qm}(z,v) = \frac{q_e^2 \cdot N_v^2 \cdot v^2}{2 \cdot \pi \cdot 10^7 \cdot D^2} \cdot \left[\int_0^{2\pi} \frac{\left(\frac{z}{D}\right) \cdot d\varphi}{\left[\left(\frac{z}{D}\right)^2 + \cos^2\left(\frac{\varphi}{2}\right)\right]^{3/2}} - \int_0^{2\pi} \frac{\left(\frac{z}{D}\right) \cdot 2 \cdot \sin^2\left(\frac{\varphi}{2}\right) \cdot d\varphi}{\left[\left(\frac{z}{D}\right)^2 + \cos^2\left(\frac{\varphi}{2}\right)\right]^{3/2}} \right] \quad |N| \qquad (7a)$$

The first integral in the formula (7a) is equal $J_E(z)$. Hence, the second integral is more, than the first, and, therefore, it defines a sign of force $F_{qm}(z,v)$.
Let's designate the second integral in the formula (7a), as:

$$J_H(z)=\int_0^{2\pi}\frac{\left(\frac{z}{D}\right)\cdot 2\cdot\sin^2\left(\frac{\varphi}{2}\right)\cdot d\varphi}{\left[\left(\frac{z}{D}\right)^2+\cos^2\left(\frac{\varphi}{2}\right)\right]^{3/2}} \qquad (8)$$

Thus, at an electric current through the coil, between convolutions of the coil else two forces operate in addition to electrostatic force ***F***$\boldsymbol{F_e(z)}$

$$F_q(z,v)=\frac{q_e^2\cdot N_v^2\cdot v^2}{2\cdot\pi\cdot 10^7\cdot D^2}\cdot J_E(z) \qquad |N| \qquad (7b)$$

and

$$F_m(z,v)=\frac{q_e^2\cdot N_v^2\cdot v^2}{2\cdot\pi\cdot 10^7\cdot D^2}\cdot J_H(z) \qquad |N| \qquad (7c)$$

The forces $\boldsymbol{F_q(z,v)}$ and $\boldsymbol{F_m(z,v)}$ are much more, than force $\boldsymbol{F_e(z)}$.
So, for example, in the above mentioned double-coil from a lead wire, they are equal, accordingly, 0.039 |N| and 0.078 |N|.
The total force of an attraction between convolutions of the coil is equal to the vector sum of the three forces.

$$F(z)=\frac{q_e^2\cdot N_c^2\cdot c^2}{2\cdot\pi\cdot 10^7\cdot D^2}\cdot J_E(z)-\frac{q_e^2\cdot N_v^2\cdot v^2}{2\cdot\pi\cdot 10^7\cdot D^2}\cdot J_E(z)+\frac{q_e^2\cdot N_v^2\cdot v^2}{2\cdot\pi\cdot 10^7\cdot D^2}\cdot J_H(z) \quad |N| \quad (8)$$

Using logic of laws by Ampere and Maxwell, we can tell, that the quantity of injected charges $\boldsymbol{N_c}$ depends on imressed electric voltage $\boldsymbol{U}$ to the coil and specific electric resistance of a material γ.
At the same time, product $\boldsymbol{N_v\cdot v}$ also depends on $\boldsymbol{U}$ and γ, but, besides it is function of absolute temperature $\boldsymbol{T}$.
Therefore, we can set two dimensionless functions $f_E(T)$ and $f_H(T)$, that the condition has been executed

$$F(z)=\frac{\pi\cdot q_e^2\cdot N_c^2}{2\cdot 10^7}\cdot\left(\frac{c}{\pi\cdot D}\right)^2\cdot\left[\left(1-f_E^2(T)\right)\cdot J_E(z)+f_H^2(T)\cdot J_H(z)\right] \quad |N| \qquad (9)$$

At room temperature ($T = T_R$ = 293K) the functions $f_E(T)$ and $f_H(T)$ practically do not differ from each other, and practically do not depend on temperature

$$f_E(T_R)\approx f_H(T_R)\approx\frac{U\cdot\pi\cdot d^2}{4\cdot\gamma\cdot q_e\cdot N_c\cdot c} \qquad (10)$$

The formula (9) contains parameter, which we can name as frequency of rotation of an electric wind in the coil

$$\nu_c=\frac{c}{\pi\cdot D} \quad |Hz| \qquad (11)$$

We consider, that it is more convenient characteristic for the decision of engineering tasks, than a rotor of intensity of electric field *(rot E)*.
At temperature, which is higher, than temperatures of superconductivity $\boldsymbol{T > T_c}$, the thermal fluctuations of atoms of crystal lattice cause local disturbances in an electric wind, and it results in appearance of an external electric field along a conductor and to penetration of an external magnetic field inside of a conductor. In result, vectors of electric and magnetic fields in each point on a surface of a conductor occupy such position, that vector by Pointing, which is directed inside of a conductor, turns in some angle in a direction of an electric wind. Hence, along tangents to rings there should be preferred conditions for the directed radiation of energy.

Investigating the change of a magnitude and a direction of vector by Pointing in various radio engineering radiators, it is possible to determine, that for detachment of electromagnetic wave from a radiator, it is necessary, that the magnitude of a vector by Pointing has passed through zero value, and curvature of wave front has changed a sign in opposite.
In polytronic model of atom, the function of multifrequency radiators of photons is carried out with radial polytrons. We suppose, that radial polytrons also radiate photons along tangents from concrete points on rings–polytrons.
The analysis of by-effects, which arise in cyclic accelerators and in magnetrons, confirms this assumption.
The preliminary model of photon can have the following characteristics:
1) As any quantum system, a photon has the main quantum number ***m***, which is equal to number of half waves on length of photon. The name of these half waves are quantrons, by analogy to half waves in ring radiators of energy, i.e. in polytrons.
2) All photons have the same quantum number ***m*** = 2.
3) The forward quantron represents spindle-shaped electromagnetic whirlwind, in which ring lines of magnetic field form a surface of a spindle, and lines of electric field are directed outside from a surface of a spindle.
4) The back quantron differs from forward that lines of electric field are directed inside of magnetic spindle.
5) The density of energy inside a forward quantron is higher, than density of energy inside a back quantron. Therefore, it is possible to tell, that energy of a forward quantron is positive, and energy of a back quantron is negative, concerning some basic energy level (it is possible, concerning the energy level of vacuum).
6) Proceeding from the above-described shape, the electric field of photon can be presented as an electric dipole, which is "smeared" on length of photon.
7) The ratio of length and the maximal cross-section size of photon depend on its energy. In polytronic model, the energy of quantron is proportional to its area. Hence, energy of photon also is proportional to its area, i.e. proportional to product of length of wave by the cross-section size (amplitude).
8) For example, length of wave of the Rydberg photon (91.126705nm) is 1900 times more, than its cross-section size.
Actually, these magnetic spindles represent very thin needles. Therefore, this fact is a good explanation to occurrence of the theory of strings.
9) Absorption of photons by atoms occurs according to laws of electromagnetic induction. When the photon tries to fly through a ring–polytron, the shoulders of its electric dipole start to draw together. This process of closing in of electric charges generates a pulse of ring magnetic field, which increases energy of polytron. Further, this additional energy starts to circulate in all polytrons in atom, for the time being it will find a suitable node of radial polytron to leave atom as approximately the same photon, as absorbed one.
10) The light pressure (the resonant light pressure and Compton effect, including) arises as result of change of direction of movement of the absorbed energy at its circulation in polytrons of atom, i.e. this process can be simulated, as transformation of vectors by Pointing in space and time.

Multifrequency atomic radiators of photons have two spectra of frequencies – a spectrum of own resonant oscillations and a spectrum of radiation. Both spectra are mutually connected by strict mathematical dependence by means of frequency quantum numbers ***m*** and amplitude quantum numbers ***n***.

For research of laws of radiation and absorption of photons by radial polytrons we use the period of own resonant oscillations of polytron at quantum number $\boldsymbol{m}$ – $T_p(m)$, and the period of wave of radiation at transition of radial polytron from quantum number $\boldsymbol{m_i}$ in quantum number $\boldsymbol{m_j}$ – $T_\lambda(m_i \rightarrow m_j)$.
In the mentioned below table some combinations of these periods are shown.

Table 1

The rule of selection for a wave of radiation (absorption) of atom at transition of polytron from quantum number $\boldsymbol{m_i} = 2$	The rule of selection for a wave of radiation (absorption) of atom at transition of polytron from quantum number $\boldsymbol{m_i} = 4$
$T_p(2) = 1 \times T_\lambda(2 \rightarrow \infty)$	
$T_p(4) = 3 \times T_\lambda(2 \rightarrow 4)$ $T_p(4) = 4 \times T_\lambda(2 \rightarrow \infty)$	$T_p(4) = 1 \times T_\lambda(4 \rightarrow \infty)$
$T_p(6) = 8 \times T_\lambda(2 \rightarrow 6)$ $T_p(6) = 9 \times T_\lambda(2 \rightarrow \infty)$	$T_p(6) = 2 \times T_\lambda(4 \rightarrow 12)$
$T_p(8) = 12 \times T_\lambda(2 \rightarrow 4)$ $T_p(8) = 15 \times T_\lambda(2 \rightarrow 8)$ $T_p(8) = 16 \times T_\lambda(2 \rightarrow \infty)$	$T_p(8) = 3 \times T_\lambda(4 \rightarrow 8)$ $T_p(8) = 4 \times T_\lambda(4 \rightarrow \infty)$
$T_p(10) = 24 \times T_\lambda(2 \rightarrow 10)$ $T_p(10) = 25 \times T_\lambda(2 \rightarrow \infty)$	$T_p(10) = 6 \times T_\lambda(4 \rightarrow 20)$
$T_p(12) = 27 \times T_\lambda(2 \rightarrow 4)$ $T_p(12) = 32 \times T_\lambda(2 \rightarrow 6)$ $T_p(12) = 35 \times T_\lambda(2 \rightarrow 12)$ $T_p(12) = 36 \times T_\lambda(2 \rightarrow \infty)$	$T_p(12) = 5 \times T_\lambda(4 \rightarrow 6)$ $T_p(12) = 8 \times T_\lambda(4 \rightarrow 12)$ $T_p(12) = 9 \times T_\lambda(4 \rightarrow \infty)$
$T_p(14) = 48 \times T_\lambda(2 \rightarrow 14)$ $T_p(14) = 49 \times T_\lambda(2 \rightarrow \infty)$	$T_p(14) = 12 \times T_\lambda(4 \rightarrow 28)$
$T_p(16) = 60 \times T_\lambda(2 \rightarrow 8)$ $T_p(16) = 63 \times T_\lambda(2 \rightarrow 16)$ $T_p(16) = 64 \times T_\lambda(2 \rightarrow \infty)$	$T_p(16) = 12 \times T_\lambda(4 \rightarrow 8)$ $T_p(16) = 15 \times T_\lambda(4 \rightarrow 16)$ $T_p(16) = 16 \times T_\lambda(4 \rightarrow \infty)$

We consider, that research of "rules of selection" in the field of cryogenic temperatures is of great importance for definition of a concrete kind of functions $f_E(T)$ and $f_H(T)$ for superconductivity of various kinds.
Besides, the above "rules of selection" can be used for a choice of optimum designs and operating modes of various radiators of electromagnetic energy.
The phenomenon of superconductivity is accompanied by some features, to which researchers do not give due significance. For example, experiences with superconductors of I kind are always carried out in helium bath. But nobody can tell – how helium influences on superconductivity. The answer this question can give the following experiment.
It is necessary to take a conductor, for example, from Cu and to put atop copper a layer of Pb. The copper ends of the conductor should be cleared from Pb. Then, it is necessary to cool the conductor to temperature 7K through the copper ends of conductor, but that the lead layer has been carefully isolated from helium, and investigate superconductivity in Pb under these conditions.

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