

AETHEREAL THERMODYNAMICS

Dedicated to the bright memory of my daughter Anastasia

*True knowledge is a knowledge by causes.
Francis Bacon*

Taking as a fact [1] the presence of the ether in the Universe, united quasiisotropic, incondensable and elastic medium, being the main basic matter, the carrier of the whole energy, all processes, occurring in the Universe, and taking for the base of beliefs about it working models [2,3,4], presenting it in the manner of two-component medium - corpuscular and phase, we will consider its some thermodynamical effects caused by motion of ether in itself.

Notion of the Temperature

Under statistical study of heat chaotic moving of the matter particles, presenting itself form of kinetic energy in microscale, we address to notion of the temperature, being most available to measurement and studies by feature of such motion.

The notion of the temperature is background in thermodynamics due to its invariance to concrete forms of matter, allowing study energy of these forms, compare their thermodynamic parameters and find information on characteristics of these forms of matter even though they inaccessible for direct observation.

While energy and entropy are portioned and additive features of matter, temperature is a local point parameter, characterizing intensity of energy-informational exchange in given point [5]:

$$T = dQ/dS \text{ [J/nit]} = dQ/kdS \text{ [}^\circ\text{K]},$$

here dQ – is incrementation of heat energy [J];

dS – is incrementation of entropy [nit].

k – is Boltzmann's constant, factor of recalculation of temperature from [J/nit] into Kelvin's degrees, $1^\circ\text{K} = 1.38 \cdot 10^{-23} \text{ [J/nit]} = 2.0 \cdot 10^{-23} \text{ [J/bit]}$.

In turn heat energy as kinetic energy of particles is defined by general formula

$$Q = \sum m_i V_i^2 / 2 \text{ [J]},$$

here m_i – is a mass of i -th particle;

V_i – is a velocity of i -th particle.

Entropy of this ensembles of particles is defined by following expression

$$S = - \sum p_j \ln p_j \text{ [nit]} = - \sum p_j \log_2 p_j \text{ [bit]}, \sum p_j = 1,$$

here p_j – is probability of j -th condition of system of particles.

Since particles of matter can have absolutely different mass, but under their collisions are executed the laws of conservation of amount of motion and energy, that absolutely different velocities of particles correspond to the same temperature.

The mass of electron less than mass of molecule on four orders, efficient mass of photon ($h\nu/c^2$) usually less than masses of electron on much orders, but joined mass of particle of the

ether less than efficient mass of photon much orders. That difference entails the phenomena of existence of different temperatures, existing in the same place: the temperature of substance, the temperature of electrons, the temperature of radiation, the temperature of ether. Only after significant time these temperatures can be balanced as a result of energy-informational exchange.

As a result of thermodynamic interaction all types of matters are changed the kinetic energy of particles and entropy. Physicists can measure thermodynamic parameters of substance, electrons and electromagnetic field without problems. Can we measure the same parameters of the ether? We will show that it is possible.

Temperature of Corpuscular Ether

Corpuscular ether, as well as other types of matter, formed by it, inheres in thermodynamic balance with electromagnetic radiation. As it is shown in [1], it absorbs radiation of stars and it is source of black-body radiation, which spectrum corresponds to 2.723 ± 0.003 °K.

Attempts of measurement of ether temperature has centennial history. The first most precisions measurement, as I know, there was made by professor Erich Regener (Stuttgart, Germany) in 1933 [6]. 2.8°K , got by him, practically complies with modern value, got by means of high-priced electronic and cosmic equipment.

By the Wien's Law a wavelength of maximum of energy of black-body radiation of corpuscular ether is

$$\lambda = b / T = 0.002878 / 2.723 = 1.057 \cdot 10^{-3} \text{ [m]} \quad (1)$$

Radiational ability of ether under its usual temperature 2.723 °K is very low. As defined in [1], Hubble constant is a factor of fading the electromagnetic radiation in ether and accordingly to that a factor of its radiational ability (Kirchhoff's Law). Energy of quantum is

$$W_q = h \nu - h \nu_0 e^{-Ht}, \text{ [J]} \quad (2)$$

here h – is Planck's constant,

ν_0 – is a frequency of radiated quantum,

ν – is a frequency of received quantum,

H – is Hubble's constant (factor of absorption within ether),

$t = R/c$ – is time between radiation and acceptance of quantum on distance R .

Thence intensity of absorption of light in the ether is

$$dW_q/dt = Hh \nu, \text{ [J/s]} \quad (3)$$

The value $1/H = 13.5 \cdot 10^9$ years is time of fading the quantum on e times. Thereby thermodynamic balance between radiation and airwaves is fixed during milliards years in usual conditions.

Energy of quantum (2) presents itself two at the average equal to each other components in empty ether

$$W_q = \varepsilon_0 E^2 / 2 + \mu_0 H^2 / 2, \text{ [J]} \quad \textcircled{4}$$

here ε_0 – is dielectric permeability of ether, $8.8542 \cdot 10^{-12}$ [F/m],

μ_0 – is magnetic permeability of ether, $4\pi \cdot 10^{-7}$ [H/m],

E – is electric field strength of quantum [V/m],

H – is magnetic field strength of quantum [A/m].

While electric component is a form of potential energy of ether, magnetic component presents itself a kinetic energy of photon. Exactly last part of energy we may associate with heat energy of the ether, radiating these quanta.

For wavelength (1) this energy is

$$W_k = hc / 2\lambda = 9.3989 \cdot 10^{-23} \text{ [J]} \quad (5)$$

here c – is the velocity of light in the ether.

Presenting balance radiation of the ether as a Boze-gas of photons, it is possible to define heat energy of quantum from the same temperature

$$Q = nkT / 2 = 5 \cdot 1.38066 \cdot 10^{-23} \cdot 2.73 / 2 = 9.3989 \cdot 10^{-23} \text{ [J]}, \quad (6)$$

here $n = 5$ – is number of liberty degrees of photons Boze-gas,

k – is Boltzmann's constant,

T – is temperature.

Thereby, both from spectrum of black-body radiation, and from heat energy we got the same value, characterizing kinetic energy of corpuscular ether for interstellar Space.

Ethereal Domains

The potential energy of corpuscular ether is defined by its gravitational potential $\phi = c^2$. Thereby velocity of light is a quantum velocity of corpuscular ether elements, that is to say its values can be only zero or c . Substituting values (5) or (6) in formula of kinetic energy for mass, it is possible to get efficient mass of elementary volume of corpuscular ether, which behaves as integer, vary for adjacent volumes at the speed of light

$$W_k = m_d c^2 / 2 = 9.3989 \cdot 10^{-23} \text{ [J]}, \quad m_d = 2.092 \cdot 10^{-39} \text{ [kg]}, \quad (6)$$

This volume of corpuscular ether we will name the ethereal domain. Lets try to define its size and characteristics.

Earlier [2], the fictitious Young's modulus of corpuscular ether $E_0 = 7.5983 \cdot 10^{17} \text{ [kg/ms}^2\text{]}$ was found by author. Knowing that corpuscular ether in usual condition is liquid-crystal isotropic medium, having Poisson's ratio $\mu = 0.5$, using value of Young's modulus it is possible to find shift modulus for quick motion in corpuscular ether

$$G = E_0 / 2(1 + \mu) = 2.533 \cdot 10^{17} \text{ [kg/ms}^2\text{]}.$$

Thence it is easy to find fictitious density of corpuscular ether, defined by inertial properties of this medium

$$\rho = G / c^2 = 2.818 \text{ [kg/m}^3\text{]}.$$

If we know density and considering that efficient mass of ethereal domain (6) is joined mass of its volume, it is possible to find its semiperimeter and efficient radius accordingly [7]

$$\pi R_d = \sqrt[3]{(3m_d / 2\pi\rho)} \quad (7)$$

For calm ether, that is to say in conditions of empty Space the radius of domain is

$$R_d = 2.253 \cdot 10^{-14} \text{ [m]},$$

that is 8 classical radiuses of electron.

Having an original shell consisting of rolling particles of phase ether, including quantum electric dipoles "positrino" and "negatrino", described in [3], ethereal domain is easy electrically polarized, like domains of ferroelectrics. Consisting of amers, being ideal whirligig, about which lord Kelvin wrote more that century ago, ethereal domain is like a ferromagnetic domain.

These characteristics create the condition for existence of electromagnetic wave in ether, where its dielectric ε and magnetic μ permeabilities are linear capacity [F/m] and linear inductance [H/m], which are defined the characteristics of domains, like LC-cells of electric line of delay, shown on figure 1.

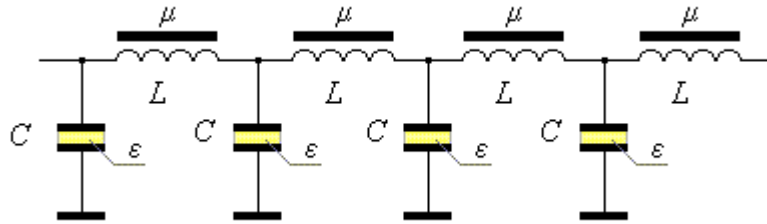


Fig. 1. The electric model of ethereal domains medium.

Accordingly that velocity of the wave propagation in ether is defined as

$$c = 1 / \sqrt{(\varepsilon_0 \mu_0)} \text{ [m/s]}$$

here $\varepsilon_0 = 1 / (R_w c)$, $\mu_0 = R_w / c$,

$R_w = 376.730 \text{ [OM]}$ – is a wave resistance (impedance) of the ether.

The last a value, undeservedly forgotten by physicists-theorists, is one of few really fundamental values, defining the image of Universe.

In according to stated stady it is becomes clear that if sizes of ethereal domains is changed by some reasons, that the local velocity of light changes. In number of these reasons can be as thermodynamic - change the temperature of corpuscular ether, so ponderomotoreal - change the form and orientation of domains.

For understandable further interpretation of thermodynamics of the ether, lets stop on fundamental physical values, where we will direct the partial order after centennial hoax in physics.

Fundamental Constants of Universe

There are few really fundamental constants. Except considered Young's modulus of the ether E_0 and wave resistance R_w , the following independent constants, which are not changed in Time and Space were used by author.

1. *Hubble Constant* $H = 73.2 \pm 0.7 \text{ [km/s Mps]}$, found on red-shift of remoted objects of far astronomy, and inverse it *Anastasia's constant* $A = 13.36 \pm 0.13 \text{ [} 10^9 \text{ years]}$, found by author in work [4] from results of processing of gravitational variations on the Earth's surfaces without using data of distant astronomy. These constants define *time constant* of corpuscular ether in absolute, evenly current, univariate time of Universe, the speed of establishing of thermodynamic balance in the ether.

2. *The velocity of light in absence of gravitation field* $c_0 = 299792963 \pm 10 \text{ [m/s]}$. It is determined by author in work [2], exceeding the velocity of light in vacuum on surfaces of

Earth on $507 +10$ [m/s]. It is a square root of gravitational and, consequently, energy potential of corpuscular ether of the Universe. It is impossible muddle this constant with local velocity of light, which, as it is shown by multiple experiments in special mediums can change from few [m/s] up to many millions [m/s].

3. *Radius of amer* – the element of corpuscular ether $R_a = 1.61606 \cdot 10^{-35}$ [m], found by author in work [3], corresponding to fundamental Planck's Length.

4. *Planck's Mass* - efficient (energy) mass of amer, $m_a = 2.17673 \cdot 10^{-8}$ [kg].

It is possible to deduct following, dependent from aboves, but also independent from Time and Spaces, fundamental physical constants.

1. *Energy of amer* $E_a = m_a c_o^2 = 1.95635 \cdot 10^9$ [J]. This energy defines density of potential energy of corpuscular ether per unit of volume

$$D_e = 3E_a / 4\pi R_a^3 = 1.11066 \cdot 10^{113} \text{ [J/m}^3\text{]}.$$

2. *Gravitational potential of corpuscular ether*, described in [2,3,4], defining characteristics of gravitational field

$$\varphi_o = c_o^2 = E_a / m_a = 8.98758 \cdot 10^{16} \text{ [J/kg], [m}^2\text{/s}^2\text{]}.$$

3. *Energy moment of the ether* $E_h = E_a R_a = 3.16159 \cdot 10^{-26}$ [J m], characterizing quantum-dynamic characteristics of the ether, and unlike Planck's Constant, not dependent from local velocity of light.

4. *Gravitational moment* $h_o = m_a R_a = 3.51773 \cdot 10^{-43}$ [kg m], defining quantum interactions, not depending unlike Planck's Constant from local velocity of light.

5. *Gravitational permeability of ether* $\gamma_o = m_a / R_a = 1.34693 \cdot 10^{27}$ [kg/m], defining macro-scale gravitational interaction, not depending from local velocity of light unlike Gravitational Newton's Constant.

6. *Maximum Temperature of the ether* $T_k = E_a / k = 1.41697 \cdot 10^{32}$ [°K], here k – is Boltzmann's Constant, introduced by Planck having the sense recalculating factor of thermodynamic temperature [J/nit] into Kelvin's degrees only. Corpuscular ether reaches this temperature, when its domains are completely destroy and each amer will move liberally.

7. *Dynamic density of the ether* $\rho = E_o / 3\varphi_o = 2.818$ [kg/m³] – the value, which defining inertional property of corpuscular ether for particles, moving inside it with velocity, commensurable with the speed of light.

8. *Stefan-Boltzmann's Radiation Constant*

$$a = \pi^2 k^4 / 15E_h^3 = 7.56558 \cdot 10^{-16} \text{ [J / m}^3 \text{°K}^4\text{]}.$$

Thermodynamic Model of the Ether

The majority of other "physical constants" are dependent from local temperature of ether. Increasing of this temperatue leads to ether "dilution", reduction of ethereal domains size, and accordingly to increase of local velocity of the light propagation.

Lets consider thermodynamic phenomenas in ether and their influence upon "old" physical constants in detail.

In previous papers of the author [2,3,4] working model of ether, consisting of identical elements - amers and two component of its medium:

- corpuscular ether, pseudo-liquid, practically - practically still medium, consisting of amers;
- phase ether, pseudo-gas, consisting of "vacancies" of corpuscular ether, opaque for electromagnetic waves and being gravitons, dullard up to the second Space Velocity.

Now, in light of quantum thermodynamics, it is possible to elaborate that model, else more simplified it. For this goal we introduce following postulate, resulting from correctness of previous calculation of the temperature of ether (Space Background Radiation).

The Postulate of quantum velocity of the ether

Only two values of velocity for elements of the ether exists: zero and local velocity of light. That is to say velocity of amer is quantum value.

In case of fairness of given postulate there is no need in the physical presence of "vacancies" of phase ether, and it can use as just synonym of amers, moving on surfaces of ethereal domains at the speed of light.

Moving the flows of phase ether from one stellar body to another at the order of Second Space Velocity of local gravitational pit is nothing else than redistribution of moving amers between ethereal domains under influence of gravity force. Herewith their individual velocity remains the equal to velocity of light.

Thereby, correction a working model of ether will be following.

The ether presents itself by identical quantum particles – amers of two velocities: zero and velocity of light. Herewith it is possible to select the following types of its conditions:

- corpuscular ether, representing itself as superliquid pseudo-liquid, collected in separate domains and practically still in the Space;
- phase ether, representing itself by amers of light velocity, moving on borders of domain of corpuscular ether, being separator of phase ether domains;
- gravitons - amers, moving through ether radially from gravitating bodies, regardless of borders of domains.

Thermodynamics of Ethereal Domains

Since in balance condition the heat energy of ether is proportional to three-dementional energy of radiation

$$\rho c_l^2 \sim aT^4,$$

here ρ – is independent from temperature dynamic density of the ether;

c_l - local velocity of light at ether temperature T ,

a – Stefan-Boltzmann's Constant,

local light velocity depends on temperature of ether by square-law.

Thereby, all physical "constants", depending from local velocity of light depends from the temperature of ether in corresponding degrees. On physical level this easy explicable by changing the characteristics of ether as medium, carrying and forming all physical processes.

With increasing of temperature, as it can be seen from (6) and (7), as well as from given electric model of domain structure of ether, sizes of domains, being carriers of ether polarization characteristics, are decreasing, and accordingly this, local velocity of light for heated area of ether is increasing also

$$R_d(t) = R_{do} T_o/T.$$

here R_{do} – radius of domain for temperature of Cosmos $T_o = 2.723$ °K,

T – local temperature of ether.

Accordingly that linear capacity and inductance of ether that is to say dielectric and magnetic permeabilities decrease by square-law from growing of the temperature of ether.

Thermodynamically Dependent Physical Constants

In connection with stated ideas the following physical constants, depending from local light velocity, that is to say from the temperature of airwaves, are not constant in different from cosmic vacuum conditions.

1. Local light velocity $c_t = c_o (T/T_o)^2$ [m/s].
2. Planck's Constant $h_t = 2\pi h_o c_t$; $h_{t=2.7} = 6.62619 \cdot 10^{-34}$ [J s].
3. Newton's Gravitational Constant $\gamma_t = c_t^2/\gamma_o$; $\gamma_{t=2.7} = 6.6726 \cdot 10^{-11}$ [$m^3 kg^{-1} s^{-2}$].
4. Dielectric ether permeability $\epsilon_t = \epsilon_o (T_o/T)^2$ [F/m].
5. Magnetic ether permeability $\mu_t = \mu_o (T_o/T)^2$ [H/m].
6. Local ether Young's modulus $E_t = E_o (T/T_o)^4$ [kg/ms²].
7. Local ether dynamic shift modulus $G_t = G_o (T/T_o)^4$ [kg/ms²].

Pieces of Evidence of Thermodynamic Model of the Ether

As already there was written at the initially, temperature of ether practically does not depend on the temperature of molecules of substance in according to big difference of atom and molecules sizes. However ethereal domain commensurable on size with electron. So, acting on domain by means of electrons it is possible to change the local temperature of ether. This is relieved that ethereal domain are easy polarizationable like domains of ferroelectrics and magnetically permeability like domains of ferromagnetics.

The fact of excess of usual light velocity in active mediums - in volume of optical active material, where electronic shells are subjected by "pumping" energy of outside source of light, is well known to laser physicists [8].

That phenomena appears when the inversion of population density of electronic levels are created inside that active medium, that is to say the thermodynamic non-balance condition, corresponding to over-maximum values of temperature of electrons is created. This condition brings about active heating the ether in inter-shell space of atoms that is to say destruction of ethereal domain occurs.

As a result electric and magnetic permeability of ether fall surrounding atoms. The last leads to according growing of local light velocity.

For example we will consider the known experiment of Wang-Kuzmich-Dogariu [9], in which the group (corpuscular) velocity reaches 310 light speeds. According to proposed theory of the ether that corresponds to ether heating on route of ray up to temperature

$$T = T_o \sqrt{310} = 50 \text{ °K.}$$

We see another picture during magnetic cooling the material, when electrons of zero pulse promote cooling the ether. Lets consider the known experiment of Hau-Harris-Dutton-Behroozi [10], in which group (corpuscular) light velocity, missed through Bose-condensate, fall down to value 17 [m/s]. Temperature of ether in this case is

$$T = T_0 \sqrt{17/c_0} = 0.00065 \text{ }^\circ\text{K}.$$

Findings

Insolvency of relativistic looks at nature of Cosmos, experimental proved by author in [1], working model of the ether and gravitational interactions in it [2] have allowed to throw light upon nature of matter [3] and to explain phenomena of gravitational variations [4], unexplained before present time.

Prepared theoretical basis has allowed to develop working model of the ether in persisting work up to possibility of using the thermodynamics in the ether theory.

Proposed thermodynamic model of the ether allows to explain the experiments, revealed change of light group velocity in greater, and in smaller side from usual value.

The true fundamental physical constants, peculiar to the Universe, are discovered. The frames of applicability of existing physical constants are determined.

The potential energy of ether, which value does not leave any doubts in that all material physical processes are only measly spume on surfaces of this ocean is determined.

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