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Connections of energy, time, matter, space and charge in universe (v4)

Abstract

In offered article author gives new connections between energy, time, charge, distance, volume, matter in the Universe. He finds also the quantum (minimal values) of energy, volume, time, distance, matter and charge. He applied these values for estimations of quantum volatility and estimated of some values of our Universe and received both well-known and new unknown equations.

Author offers possibly valid relations between energy, time, matter, volume, distance, and charge. That research shows: in our Universe exists only one substance – Energy. Time, matter, volume, charge, fields are evidence of this energy and they can be transformed one to other. Author gets the equations which allow calculating these relations. Some assumptions the structure of the Universe follows from these equations. Most suggested equations give results close to known data of Universe, the others allow checking up by experiment.

Keywords: universe, energy, matter, space, time, charge, volume, distance, limits of matter, pressure, temperature, intensity of fields, specific density of energy, collapse of time and space into point

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Introduction

In the theoretical physic the next fundamental constants presented in Table 1 are important.

Table 1 Fundamental physical constants

Constant	Symbol	Dimension	Value in SI units with uncertainties
Speed of light in vacuum	c	LT^{-1}	2.99792458×10^{8} ms^{-1}
Gravitational constant	G	$L^3 M^{-1} T^{-2}$	$6.67384(80)\times10^{-11}$ $m^3kg^{-1} s^{-2}$
Reduced Planck constant	$\hbar = h/2\pi$ where h is Planck constant h = 6.625 068 76(52)×10^{-34}	$L^2 M T^{-1}$	$1.054571726(47)\times10^{-34}$ Js
Coulomb constant	$(4\pi\varepsilon 0)^{-1}$ where ε_0 is the permittivity of free space ε_0 = 8.854 187 817…×10^{-12}	$L^3 M T^{-2} Q^{-2}$	$8.9875517873681764\times10^{9}$ kg m^3 $s^{-2}C^{-2}$(exact by definitions of ampere and meter)
Boltzmann constant	k_B	$L^2MT^{-2}\ \Theta^{-1}$	$1.3806488(13)\times10^{-23}$ J/K

Where are: c = light speed, G = gravitational constant, L = length, M = mass, T = time, Q = electric charge, Θ = temperature.

Universe (v4). New connections between energy, charge, matter, time, volume, and distance

The author gets unknown connections relations between main parameters in Universe. He applies his connections to Universe. The following well-known constants author use in his expressions:

$$c=2.997925\cdot10^{8}\ m/s;\quad e=1.60219\cdot10^{-19}\ C;\quad G=6.6743\cdot10^{-11}\ m^3/kg\cdot s^2;$$

$$\varepsilon_0=\frac{1}{36\pi\cdot10^{9}}=8.854188\cdot10^{-12}\ \frac{F}{m};\quad k=\frac{1}{4\pi\varepsilon_0}=8.987551787\cdot10^{9}\ \frac{kg\cdot m^3}{s^2C^2}\ \frac{Jm}{C^2};$$

$$\mu_0=4\pi\cdot10^{-7}=1.2566\cdot10^{-6}\frac{N}{A^2};\quad h=6.6261\cdot10^{-34}\ \frac{kg\cdot m^2}{s},\quad Js;\quad \hbar=h/2\pi=1.054571$$

$$\sigma=5.67032\cdot10^{-8}\ W/m^2K^4,\quad \pi=3.141592654,\quad k_B=1{,}3806503\cdot10^{-23}\ J\cdot K^{-1};\qquad(1)$$

here e - electronic charge, C; c - light speed, m/s; G - a constant of gravitation, Nm^2/kg^2; μ_o - magnetic constant, H/m; ε_o - electric constant, F/m; σ - Stefan – Boltzmann constant, W/m^2K^4 ; h - Planck constant, Js; k_B - Boltzman constant, J/K; A – ampere; F - farad; N - newton; K – kelvin.

The author assumed the following relations:

1) Relations between energy, volume, time, matter, distance, and specific density of matter:

$$T=\frac{G}{c^5}E,\quad T=\frac{G}{c^3}M,\quad T=c^{-1}v^{1/3},\quad T=\frac{R}{c},\ T=\frac{(kG)^{1/2}}{c^3}Q,\quad T=G^{-1/2}\rho_M{}^{-1/2},$$

or $T=2.755956\cdot10^{-53}E,\quad T=2.47693\cdot10^{-36}M,\quad T=2.874464\cdot10^{-26}Q,$

$T=3.33564\cdot10^{-9}R,\quad T=1.2240865\cdot10^{5}\rho^{-1/2},\qquad(2)$

here M - mass, kg; T - time in sec; E - energy in J; R is distance, m; v - volume in m^3; Q – charge C; ρ_M - specific density of matter, kg/m^3,.

(Only the first 4-5 digits are exact in all our calculations).

Below author use the dimensional theory; these relatives are gotten to within a constant. That constant may be gotten derived from test. If we use the Plank units, this factor equals 1 in many cases. This factor may to have the neglected value in cosmology and high-energy physics. But offered relations we cannot get only from dimensional theory. The dimensional theory does not contain the main physical numbers.

Equations (2) may be rewritten in form

$$E=\frac{c^5}{G}T,\quad M=\frac{c^3}{G}T,\quad v=c^3T^3,\quad R=cT,\quad Q=\frac{c^3}{(kG)^{1/2}}T,\quad \rho_M=1/(GT^2),$$

$$or\quad E=3.628505\cdot10^{52}T,\quad M=4.037256\cdot10^{35}T,\quad Q=3.4789094\cdot10^{25}T,\quad \rho=1.5\cdot10^{10}/T^2. \tag{3}$$

Some interesting facts follow from these relations. For example, time has energy. Time depends from length, mass, volume, density of matter and electric charges. If time simultaneously creates the negative and positive charges, the total charge is zero. or The energy produce time, distance, matter, volume and charge (positive and negative together). Or time can produce the energy, mass, distance, change, volume and the density of matter.

2) Relations between volumes, time, energy, distance, and matter

$$v=\frac{4\pi}{3}\left(\frac{GE}{c^4}\right)^3,\quad v=\frac{4\pi}{3}c^3T^3,\quad v=\frac{4\pi}{3}\frac{G^3}{c^9}M^3,\quad v=\frac{4\pi}{3}R^3,$$

$$or\quad v=2.2630235\times10^{-132}E^3,\quad v=1.1286275\times10^{26}T^3,\quad v=1.715109\times10^{-81}M^3, \tag{4}$$

here v - volume of 3-demantional space, m^3.

3) Families between matter, distance, time, energy, volume, charge and temperature are

$$M=\frac{c^3}{G}T,\quad M=\frac{c^2}{G}v^{1/3},\quad M=\frac{c^2}{G}R,\quad M=\frac{1}{c^2}E,\quad M=\left(\frac{k}{G}\right)^{1/2}Q,\quad M_1=\frac{k_B}{c^2}t,$$

$$M=4.0369797\times10^{35}T,\quad M=1.34659\times10^{27}v^{1/3},\quad M=1.34659\times10^{27}R,$$

$$M=1.16047\times10^{10}Q,\quad M_1=2.316404\times10^{-40}t. \tag{5}$$

here k_B - Boltzmann constant, J/K; t - temperature, K; v - volume, m^3; M_1 - mass of one atom/particle, kg.

4) Connection between distance and charge, time, matter, matter density and energy

$$T=\frac{R}{c},\quad M=\frac{c^3}{G}T=\frac{c^2}{G}R,\quad Q=\frac{c^3}{(kG)^{1/2}}T=\frac{c^2R}{(kG)^{1/2}},\quad E=\frac{c^5}{G}T=\frac{c^4R}{G},\quad \rho_M=\frac{1}{GT^2}=\frac{c^2}{GR^2}. \tag{6}$$

5) We can obtain from equations (2) - (4) the expressions for the energy from volume, time, mass, distance and charge

$$E=\frac{c^5}{G}T,\quad E=\frac{c^4}{G}v^{1/3},\quad E=\frac{c^4}{G}R,\quad E=\left(\frac{k}{G}\right)^{1/2}c^2Q,\quad E=c^2M,\quad E_1=k_Bt.$$

$$E=3.62825745\cdot10^{52}T,\quad E=1.21022562\cdot10^{44}v^{1/3},\quad E=1.2102562\cdot10^{44}R,$$

$$E=1.04297\cdot10^{27}Q,\quad E=8.98755\cdot10^{16}M,\quad E_1=1\cdot38066\cdot10^{-23}t. \tag{7}$$

Here E – energy, J; v - volume, m^3; t - temperature, K; E_1 - energy of one atom/particle, J.

Fifth expression in (7) is the well-known comparative between matter and energy. This relative follows from (2)–(4) as special events. This indirectly checks the accuracy of the expressions (2)–(6) as a special event.

6) The connections between energy, the density of matter, and are time (frequency), charge next:

$$\rho_M=\frac{1}{G}\frac{1}{T^2},\quad \rho_M=\frac{1}{G}\nu^2,\quad \rho_E=\frac{h}{c^3}\frac{1}{T^4},\quad \rho_E=\frac{h}{c^3}\nu^4,\quad \rho_E=\frac{hc}{R^4},$$

$$\rho_E=\frac{c^2}{GT^2},\quad \rho_Q=\left(\frac{hc}{k}\right)^{1/2}\frac{1}{T^3},\quad \rho_Q=\left(\frac{hc}{k}\right)^{1/2}\nu^3, \tag{8}$$

here ρ_M,ρ_E,ρ_Q are density of matter, energy and charge respectively, kg/m^3, J/m^3, C/m^3;ν (Greg) is frequency, 1/s.

Application to present Universe

Now we estimate the real dimensions and values of the Universe: radius, mass, density, time, etc. We can estimate them if we suitably know at least one of its values.

Thus, the most reliable value is the lifetime of Universe after Big Bang. Estimates of the radius and mass are rising all the time. Approximation of the time is about 14 billion years (13.75±0.17 billion years). Let us checkup all figures.

$$M=\frac{c^3}{G}T,\quad E=\frac{c^5}{G}T,\quad R=cT,\quad v=\frac{4}{3}\pi R^3,\quad \rho_M=\frac{1}{GT^2},$$

$$or\quad M=4.0369787\cdot10^{35}T,\quad E=3.62825745\cdot10^{52}\ J,$$

$$R\approx3\cdot10^8T,\quad \rho_M=1.5\cdot10^{10}/T^2. \tag{9}$$

Let us substitute in (9) the age of Universe $T=4.4\times10^{17}$ sec (14 billion years) we obtain:

$$M=1.78\cdot10^{53}\ kg>1.4\cdot10^{53}kg,\quad E=1.6\cdot10^{70}\ J,$$

$$R=1.32\cdot10^{26}\ m<4.4\cdot10^{26}\ m,\quad v=10^{79}\ m^3,\quad \rho_M=7.75\cdot10^{-26}\ kg/m^3>10^{-26}\ kg/m^3. \tag{10}$$

In right side of the inequality (10) we have the estimations of universal values made by other researchers. They are very dissimilar. The author took average magnitudes.

As you see the values received by offered expressions and other methods have alike values. The mass of the Universe is little more because astronomers do not see the whole Universe (only the closer stars). The estimation of radius is more than light can travel in the time since the beginning of the Universe. It is possible because the Universe in initial time had other physical laws than now. The difference of space density is probable result using of the old methods. They did not include dark matter and invisible matter.

The main fields are gravity, acceleration, photon/radiation and magnetic, electric field. Density of energy in point of these fields is calculated by relations:

$$w_a=\frac{1}{G}\frac{a^2}{2},\quad w_g=\frac{1}{G}\frac{g^2}{2},\quad w_e=\varepsilon_0\frac{E^2}{2},\quad w_m=\mu_0\frac{H^2}{2},\quad w_{en}=\frac{\varepsilon_0E^2+\mu_0H^2}{2}\quad w_r=\frac{\sigma}{c}t^4,$$

$$w_E=\frac{1}{c^2GT^2},\quad w_E=\frac{1}{c^2G}\nu^2,\quad w_E=hc\frac{1}{R^4},\quad \rho_Q=\left(\frac{h}{kc^5}\right)^{1/2}\frac{1}{T^3},\quad \rho_Q=\left(\frac{h}{kc^5}\right)^{1/2}\nu^3. \tag{11}$$

here w_a - density of acceleration energy, J/m^3; w_e - density of electric energy, J/m^3; w_g - density of gravitation energy, J/m^3; w_{em} is density of beam energy J/m^3; w_m is density of magnetic energy, J/m^3; w_E is time energy density, J/m^3; w_r is density of radiation energy, J/m^3; ρ_Q is time charge density, Q/m^3; g is gravitation, m/s^2; a is acceleration, m/s^2; E is electric intensity, V/m or N/C; $\sigma=5.67032\times10^{-8}$ is Stefan–Boltzmann constant, T (tesla) or Vs/m^2 or Wb/m^2; W/m^{2}K^4; H is magnetic intensity; T is time, sec; t is temperature, K.

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The equations show the energy density depends from time and temperature: R is distance to singular point, m.

We find full energy, W, by integration of density to a full volume.

$$W = \int_v w dv$$

We can make these calculations for to simple geometric figures, for example, the spherical forms of fields.

Note: In many suitcases, the speed of light "c" in the equations (2)-(11) may be changed by the conventional speed V. In this case we can verify the expressions (2)-(11) and find the right constant factor.

Quanta of energy, volume, time, charge, distance and matter.

The photon energy is:

$$E_q = h\nu, \quad h = 6,626068 \cdot 10^{-34} \quad Js: \quad \hbar = h/2\pi = 1.0541571 \cdot 10^{-34} \ Js \quad (12)$$

here ν is frequency, 1/s (frequency has $\nu = 1, 2, 3, 4, \ldots$). We have the minimal quantum of photon energy for $\nu = 1$,

$$E_q = 6.62606810^{-34} \ J. \quad (13)$$

We substitute (13) into (2)-(11). We get the quanta of mass, time, volume, length and charge:

$$T_q = \frac{G}{c^5} E_q = 1.82624 \cdot 10^{-86} \ s, \quad M_q = \frac{E_q}{c^2} = 7.37249 \cdot 10^{-51} \ kg,$$

$$R_q = \frac{G}{c^4} E_q = 8.62713 \cdot 10^{-45} \ m, \quad v_q = R_q^3 \ m^3,$$

$$Q_q = \left(\frac{G}{k}\right)^{1/2} \frac{1}{c^2} E_q = 6.330261 \cdot 10^{-61} \ C, \quad (14)$$

here v_q is quantum of volume, m^3.

Heisenberg uncertainty principle

Heisenberg uncertainty principle is

$$\Delta I \cdot \Delta R \geq \hbar/2, \quad \Delta E \cdot \Delta T \geq \hbar/2, \quad \hbar = h/2\pi, \quad (15)$$

here ΔI, ΔE, ΔR, ΔT are uncertainty of momentum, energy, length and time respectively.

Let us substitute in (14) the quanta (15). We get the next uncertainties of the chief quants (15)

$$\Delta T_q = \frac{h}{2E_q} = \frac{1}{2} \ s, \quad \Delta R_q = \frac{h}{2\Delta I} = \frac{h}{2c \cdot \Delta M_q} = \frac{hc^2}{2cE_q} = \frac{1}{2} c \ m \quad (16)$$

The uncertainties of quants are great. The maximum values ΔE, ΔR, appear when we substitute in the first quantum of time T_q. The values ΔM, ΔQ not appear yet. They are equivalent the given ΔE. The probability record of inequality (15) is normal. If we take (15) in the form

$$\Delta I \cdot \Delta R \geq h, \quad \Delta E \cdot \Delta T \geq h, \quad (17)$$

the multiplier 1/2 in expressions (16) equal 1 and $\Delta R = c$. That means the speed in the first quantum of time equals the speed of light.

Note: For getting the values (2)-(17) we also used the dimension theory and some values may be defined as constants. The constant equals 1 in many suitcases, if we use as base the Planck's units.

Main results and discussion

Key result of work #4 is correction of equations in the works.[1–3] This result is: energy can be the chief general substance of Universe (see Eq. (7)). Energy can create time, volume, mass, and charge. The same role/issue also can be time (see Eq. (2)). All chief components of Universe (volume, size, time, matter, energy, charge) can be transformed from one to another. That means in the Universe is ONE substance, which creates our World.

The reader can ask question: How can we transfer time to energy? I can ask a counter question: The expression $E = Mc^2$ (here M is mass) was discovered about hundred years ago. In earlier time any man could ask: How to convert the matter in the enormous energy? Only later the scientists unlocked that nuclei of atoms can be converted one to another. Their mass is changed and emits or absorb of energy. The author suggested the method which converts any matter to energy.[5–6]

Only time and experiments can confirm or deny the offered relations. The authors other works closest to this topic are presented in references.[1–8]

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None

Conflicts of interest

Authors declare there is no conflicts of interest.

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