## Some words about fundamental problems of physics

**Supplement**

# FUNDAMENTAL PERIOD-QUANTUM OF THE DECIMAL CODE OF THE UNIVERSE AND FUNDAMENTAL PHYSICAL CONSTANTS

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The last 10th Part of the article was devoted to the dialectical numerical field - one of the ideal fields of the Material-Ideal Universe. In conclusion to that Part it was noted, in particular, that there is a relationship between the Fundamental Period-Quantum of the Decimal Code of the Universe and the spectrum of values of fundamental physical constants.

This is a very important regularity that we found. Here, in the Supplement, I show with specific examples the reality of this harmonic relationship. The depth of the latter is determined by the degree of deviations of the numerical values of the given fundamental physical constants from the nearest numerical values multiple to the fundamental period-quantum. The deviation indicates the degree of coherence (resonance) of measures of measurement of matter, space and time, accepted on the Earth, with the absolute period-quantum of the Decimal Code of the Universe. And, consequently, it testifies the degree of fundamentality and accuracy of magnitudes accepted for various physical constants.

Dimensionalities of all physical constants are appropriate to represent in objective units of *matter, space* and *time*: $g$, $cm$, and $s$ [1, 2]. This representation allows us to constantly see the physical meaning of all the dimensional quantities, to understand with what we are dealing and makes it easy, knowing the dimensionalities, to solve a number of problems, to find and correct possible errors. We follow this principle in all our works and these notes are no exception. Recall in this connection, as a bright example, the unit of electric charge *C*, *coulomb,* accepted in "modern" physics.

For the subjective name of the dimensionality of the unit of charge, *coulomb*, intricate transformations are hiding. They were performed in that time with the CGS system of units mainly in order to get rid of the fractional exponents in dimensionalities of physical quantities containing the units of matter (g) and space (cm). These transformations, which led eventually to the SI units, covered with thick fog all metrology in electromagnetism. They simulated the solution of the problem of fractional dimensionalities in the system of units, and as a result, “closed” (blocked) essentially without solving the problem on the nature of charges (for example, $e = 4.803204197 \cdot 10^{-10}\ \ g^{1/2} \cdot cm^{3/2} \cdot s^{-1}$ in the $\mathrm{CGSE}_q$ system; but in SI,

$e = 1.602176462 \cdot 10^{-19}\, C$). Thus, in result of the CGS-into-SI transformations, instead of the fractional dimensionality, $g^{1/2} \cdot cm^{3/2} \cdot s^{-1}$, we have obtained the integer dimensionality of charge, *C* (*coulomb*). However, as it turned out after thorough analysis (see [3, 4]), in the objective units of SI (*kg*, *m*, *s*), the dimensionality of *coulomb, C,* has the same fractional exponents $kg^{1/2} \cdot m^{3/2} \cdot s^{-1}$. By this reason, the "modern" physics still does not know what a charge is.

## The Fundamental Period-Quantum of the Decimal Code of the Universe

$$\Delta = 2\pi \lg e = 2{,}728752708... \tag{1}$$

The golden section of the fundamental period-quantum (FPQ), $\Delta_{golden\ ratio}$, is

$$\Delta_{golden\ ratio} = \frac{1}{\varphi}\Delta = 1.6999631245 \approx 1.70, \tag{2}$$

where $\varphi$ = 1.6180339887... is the golden section (or the golden ratio, or the golden mean), the irrational number.

The FPQ (1) determines the spectrum of absolute measures expressed by the formula

$$M = 2^k \times 3^l \times 5^m \times 7^n \Delta \tag{3}$$

where *k*, *l*, *m*, *n* are the set of integers $Z = \{...,-2,-1,\ 0,\ 1,\ 2,\ ...\}$.

For comparison with the absolute FPQ it is necessary and sufficient to take into account for all parameters only their cardinal (absolute) numerical values. The decimal order, depending on the specific dimensionalities of the unit, does not matter in this case.

## 1. An elementary quantum of the rate of mass exchange, the exchange charge of an electron («electric» charge of an electron)

$$e = 1.70269155 \times 10^{-9}\, g \cdot s^{-1} \tag{4}$$

The cardinal numerical value of the exchange charge *e* is almost identical to the value of

$$2^{-3} \times 5^1 \Delta = 1.705470443 \tag{5}$$

This magnitude is approximately equal to the golden section (2) of the FPQ,

$$\Delta_{golden\ ratio} = 1.6999631245$$

Thus, the following equality is valid:

$$e \approx \Delta_{golden\ ratio} \tag{6}$$

An equality of the cardinal number of the electron's "charge" (the elementary quantum of the rate of mass exchange) to the golden section of the FPQ shows the harmonic resonance relation of the "charge" with the FPQ, and is evidence to the true fundamentality of the given physical parameter. Obviously, the absolute coincidence of all cardinal numbers up to the last decimal places is possible only in case of absolute agreement on 100% of the units of mass (*gram*) and time (*second*), that are in the dimensionality of the elementary quantum of the rate of mass exchange ($g \times s^{-1}$), with the absolute FPQ. Standards should be in resonance with the FPQ, $\Delta$. From this it is clear in which direction one needs to carry out research in metrology for the proper selection and increasing accuracy of the standards for the units of mass and time. Thus, ideally, their cardinal numerical values must be multiple with the absolute precision to the FPQ.

## 2. The associated mass of an electron

$$m_e = 9.10938253 \times 10^{-28}\ g \tag{7}$$

The cardinal numerical value of the mass (ignoring the decimal order) is close to the value

$$3^{-1}\Delta = 9.09584236 \times 10^{-1},$$

i.e., with sufficient accuracy it is multiple to $\Delta$,

$$m_e \approx 3^{-1}\Delta \tag{8}$$

## 3. The associated mass of nucleons (proton and neutron)

$$m_p = 1.67262131 \times 10^{-24}\ g \qquad m_n = 1.67492728 \times 10^{-24}\ g \tag{9}$$

The cardinal numerical value of the associated mass of the nucleons is close to the value multiple to the golden section of the FPQ, $\Delta_{goldenratio}$:

$$3^1 \times 5^{-1}\Delta = 1.637251625 \quad \text{and} \quad \Delta_{golden\ ratio} = 1.6999631245$$

Thus,

$$m_{nucleons} \approx 3^1 \times 5^{-1}\Delta \quad \text{or} \quad m_{nucleons} \approx \Delta_{golden\ ratio} \tag{10}$$

## 4. The fundamental frequency of exchange (interaction) of elementary particles at the atomic and subatomic levels of the Universe

$$\omega_e = e / m_e = 1.869162559 \times 10^{18}\ s^{-1} \tag{11}$$

The angular frequency is inversely proportional to the period, $\omega = 2\pi / T$. In the decimal basis, the period $T = \Delta = 2\pi \lg e$. Hence, the absolute wave fundamental quantum of the angular frequency in the decimal basis is

$$\omega_\Delta = \frac{2\pi}{\Delta} = \frac{1}{\lg e} = \frac{1}{0.434294481} = 2.302585093 \qquad (12)$$

The fundamental angular frequency in the decimal basis must be a multiple of this absolute quantum in accordance with the equality

$$\omega = 2^k \times 3^l \times 5^m \omega_\Delta . \qquad (13)$$

The cardinal numerical value of the fundamental frequency of exchange $\omega_e$ (equal $1.869162559$) is a multiple of the absolute quantum of the fundamental frequency $\omega_\Delta$, because the value,

$$2^2 \times 5^{-1} \omega_\Delta = 2^2 \times 5^{-1} \frac{2\pi}{\Delta} = 1.842068074,$$

almost coincides with $\omega_e$. The value, multiple to $\Delta$, is also close to the numerical value of $\omega_e$, but in a relatively less extent:

$$2 \times 3^{-1} \Delta = 1.819168472$$

Thus, we can write the following equality,

$$\omega_e \approx 2^2 \times 5^{-1} \omega_\Delta \qquad (14)$$

## 5. The fundamental gravitational frequency of exchange (interaction) of elementary particles

$$\omega_g = \sqrt{4\pi\varepsilon_0 G} = 9.157835 \times 10^{-4}\ s^{-1}; \qquad (15)$$

where $G = 6.67384(80) \times 10^{-8}\ g^{-1} \cdot cm^3 \cdot s^{-2}$ is the gravitational constant (the CODATA data of 2010), $\varepsilon_0 = 1 g \cdot cm^{-3}$ is the absolute unit density. The magnitude of the gravitational frequency $\omega_g$ is determined by the formula (15), so the reliability of its value depends on the accuracy with which the value $G$ is determined experimentally. The cardinal number of (15) is, approximately, four-multiple to the absolute quantum of the fundamental frequency $\omega_\Delta = \frac{2\pi}{\Delta} = \frac{1}{\lg e}$,

$$2^2 \omega_\Delta = 2^2 \frac{1}{\lg e} = 9.210340372,$$

and also is multiple to the value

$$2^1 \times 3^{-1} \times 5^1 \Delta = 9.09584236 .$$

Thus, ignoring the decimal order, the following equalities are valid,

$$\omega_g \approx 2^2 \omega_\Delta \qquad \text{and} \qquad \omega_g \approx 3^{-1} \Delta \tag{16}$$

## 6. The basis (innate) speed of the wave exchange of elementary particles at the atomic and subatomic levels (equal to the speed of light in vacuum)

$$c \approx 2.99792458 \times 10^{10}\ cm \times s^{-1}. \tag{17}$$

The numerical value, ten times the value $3^{-2}\Delta = 0.303194745$, coincides with relatively high accuracy with the cardinal number of the speed *c*. Therefore, ignoring the decimal order depending on the specific dimensions of the units, the following equality is valid for cardinal numbers,

$$c \approx 3^{-2} \Delta \tag{18}$$

## 7. The fundamental wave radius of elementary particles at the atomic and subatomic levels

$$ƛ_e = c / \omega_e = 1.603886492 \times 10^{-8}\ cm \tag{19}$$

The absolute fundamental wave radius-quantum is

$$ƛ_\Delta = \frac{\Delta}{2\pi} = \lg e \tag{20}$$

This follows from comparison of the formulas,

$$\lambda = 2\pi ƛ \qquad \text{and} \qquad \Delta = 2\pi \lg e \tag{21}$$

Thus, if the wave radius $ƛ_e$ is fundamental, it must be multiple to $\lg e$ in accordance with the equality

$$ƛ = 2^k \times 3^l \times 5^m ƛ_\Delta .$$

Actually, the value

$$2^1 \times 3^2 \times 5^{-1} ƛ_\Delta = 1.563460135$$

is, approximately, equal to the cardinal number of the fundamental wave radius $ƛ_e$. The value of

$$3^1 \times 5^{-1} \Delta = 1.637251625$$

is also close to the cardinal number of the wave radius (19). Therefore, we can write that

$$ƛ_e \approx 2^1 \times 3^2 \times 5^{-1} ƛ_\Delta \qquad \text{and} \qquad ƛ_e \approx 3^1 \times 5^{-1} \Delta \tag{22}$$

## 8. The fundamental wave radius of elementary particles at the mega (gravitational) level

$$\lambda\!\!\!^{-}_{g} = c / \omega_g = 3.27352877 \times 10^{13}\ cm\,. \qquad (23)$$

With high precision $\lambda\!\!\!^{-}_{g}$ is multiple to the absolute FPQ, $\Delta$, and in a less extent, to $\lambda\!\!\!^{-}_{\Delta}$. Indeed,

$$2^1 \times 3^1 \times 5^{-1}\Delta = 3.27450325 \quad \text{and} \quad 2^2 \times 3^2 \times 5^{-1}\lambda\!\!\!^{-}_{\Delta} = 3.12692027\,.$$

Therefore,

$$\lambda\!\!\!^{-}_{g} \approx 2^1 \times 3^1 \times 5^{-1}\Delta \qquad (24)$$

## 9. The speed of an electron on the first Bohr orbit

$$\upsilon_0 = 2.187691263 \cdot 10^8\ cm \cdot s^{-1} \qquad (25)$$

The value of

$$2^2 \times 5^{-1}\Delta = 2.183002166$$

almost coincides with the cardinal number of the Bohr speed. Thus, the Bohr speed is the fundamental physical parameter [5]. The cardinal number of the speed (25) is multiple to the FPQ of the Decimal Code of the Universe,

$$\upsilon_0 \approx 2^2 \times 5^{-1}\Delta\,. \qquad (26)$$

## 10. The radius of the first Bohr orbit

$$r_0 = 0.5291772108 \times 10^{-8}\ cm \qquad (27)$$

The value of

$$2^1 \times 3^1 \times 5^{-1}\lambda\!\!\!^{-}_{\Delta} = 0.521153378\,,$$

multiple to the absolute fundamental wave radius-quantum $\lambda\!\!\!^{-}_{\Delta} = \lg e$ (20), almost coincides with the cardinal number of the Bohr radius. Hence,

$$r_0 \approx 2^1 \times 3^1 \times 5^{-1}\lambda\!\!\!^{-}_{\Delta}\,, \qquad (28)$$

i.e., the Bohr radius, like all presented above fundamental parameters-constants, is in the correlation (resonance) with the Decimal Code of the Universe.

## 11. The fundamental ratio (constant) alpha, reflecting the scale correlation of the basis and superstructure of waves (the “fine-structure constant”)

$$\alpha = \upsilon_0 / c = 7.2973525376 \times 10^{-3}. \quad (29)$$

Here $\upsilon_0$ is the limiting, or threshold, *oscillatory speed* in any point of a wave process (the parameter of the superstructure of a wave); *c* is the basis speed of a wave, i.e., the speed of propagation of oscillations (perturbation of medium). At the level of an electromagnetic field, the threshold speed of oscillations is equal the first Bohr speed, i.e., the speed of an electron on the stationary (first) Bohr orbit, $\upsilon_0 = 2.187691263 \cdot 10^8\ cm \cdot s^{-1}$.

The *basis speed c* of a wave is the fundamental speed of wave exchange at the atomic and subatomic levels of the Universe. It is equal to the speed of light in vacuum. Thus, the constant alpha (29) reflects the fundamental relationship existed between two conjugate characteristic speeds, oscillatory and wave, inherent in wave processes at any levels of the Universe [5]. The value of

$$2 \times 3^3 \times 5^1 \Delta = 7.367632312$$

almost coincides with the cardinal number of the constant $\alpha$. Accordingly, the following equality is valid

$$\alpha \approx 2 \times 3^3 \times 5^1 \Delta. \quad (30)$$

## 12. The gravitational exchange charge of a neutron (fundamental graviton)

$$q_{ng} = m_n \omega_g = 1.53392 \times 10^{-27}\ g \cdot s^{-1}. \quad (31)$$

Here $m_n = 1.674927211(84) \times 10^{-24}\ g$ is the associated mass of a neutron. The value of

$$3^{-2} \times 5^1 \Delta = 1.515973727$$

with sufficient accuracy coincides with the cardinal number of the gravitational exchange charge of a neutron $q_{ng}$, therefore,

$$q_{ng} \approx 3^{-2} \times 5^1 \Delta. \quad (32)$$

The fact of the multiplicity to the FPQ evidences about the fundamentality of the gravitational exchange charge of a neutron. The same conclusion can be drawn with respect to the gravitational exchange charge of a proton, as masses of both nucleons up to the second decimal place match.

## 13. The fundamental quantum of resistance

$$R_e = h / e^2 = 2.285514295 \times 10^{-9}\ g^{-1} \cdot cm^2 \cdot s \quad (33)$$

$$2^{-1} \times 3^{-1} \times 5^1 \Delta = 2.27396059$$

$$R_e \approx 2^{-1} \times 3^{-1} \times 5^1 \Delta \quad (34)$$

## 14. The fundamental quantum of specific electron resistance

$$\rho_e = 1/\varepsilon_0\omega_e = 5.349991157\times10^{-19}\ g^{-1}\cdot cm^3\cdot s \tag{35}$$

$$2^{-1}\times3^{-2}\times5^1\times7^1\Delta = 5.305908043$$

$$\rho_e \approx 2^{-1}\times3^{-2}\times5^1\times7^1\Delta \tag{36}$$

## 15. The fundamental quantum of specific proton resistance

$$\rho_p = \pi\lambda\!\!\!^{-3}_e / e = 7.612634088\times10^{-15}\ g^{-1}\cdot cm^3\cdot s \tag{37}$$

$$2^1\times5^{-1}\times7^1\Delta = 7.640507582$$

$$\rho_p \approx 2^1\times5^{-1}\times7^1\Delta \tag{38}$$

## 16. The electron total magnetic moment

$$\mu_e = \frac{\upsilon_0}{c}e(r_0+\delta r_0) = -6.578913944\times10^{-20}\ g\cdot cm\cdot s^{-1} \tag{39}$$

$$2^2\times3^1\times5^{-1}\Delta = 6.549006499$$

$$\mu_e \approx 2^2\times3^1\times5^{-1}\Delta \tag{40}$$

## 17. The electron proper („spin”) magnetic moment

$$\mu_s = \frac{r_e}{z_{p,q}}\sqrt{\frac{2Rh_e}{m_0c}} = -1.952506803\times10^{-25}\ g\cdot cm\cdot s^{-1} \tag{41}$$

$$5^1\times7^{-1}\Delta = 1.949109077$$

$$\mu_s \approx 5^1\times7^{-1}\Delta \tag{42}$$

## 18. The radius of electron spherical wave shell (electron radius)

$$r_e = \sqrt{\frac{m_e}{4\pi\varepsilon_0}} = 4.17052597\cdot10^{-10}\ cm \tag{43}$$

$$2^{-1}\times3^1\Delta = 4.093129062$$

$$r_e \approx 2^{-1}\times3^1\Delta \tag{44}$$

## 19. The radius of proton spherical wave shell (proton radius)

$$r_p = 0.528421703\times10^{-8}\ cm \tag{45}$$

$$2^1 \times 3^1 \times 5^{-1} \lambda\!\!\!^{-}_{\Delta} = 0.521153378$$

$$r_p \approx 2^1 \times 3^1 \times 5^{-1} \lambda\!\!\!^{-}_{\Delta} \qquad (46)$$

## 20. The magneic flux quantum

$$\Phi_0 = ch/2e = 5.833251078 \times 10^{-8}\ cm^3 \cdot s^{-1} \qquad (47)$$

$$3^1 \times 5^1 \times 7^{-1} \Delta = 5.847327231$$

$$\Phi_0 \approx 3^1 \times 5^1 \times 7^{-1} \Delta \qquad (48)$$

## 21. The conductance quantum

$$G_0 = 2e^2/h = 8.750765017 \times 10^{8}\ g \cdot cm^{-2} \cdot s^{-1} \qquad (49)$$

$$2^4 \times 5^{-1} \Delta = 8.732008666$$

$$G_0 \approx 2^4 \times 5^{-1} \Delta \qquad (50)$$

## 22. The «gravitational constant»

$$G = \frac{\omega_g^2}{4\pi\varepsilon_0} = 6.6742 \times 10^{-8}\ g^{-1} \cdot cm^3 \cdot s^{-2} \qquad (51)$$

where $\omega_g = 9.158082264 \times 10^{-4}\ s^{-1}$ is the fundamental frequency of the gravitational wave field, $\varepsilon_0 = 1 g \cdot cm^{-3}$ is the absolute density unit.

The nature of the gravitational constant, which is revealed by the formula (51), was not known till now to "modern" physics [6, 7]. For the first time it was obtained in the framework of the Dynamic Model of elementary particles [8]. This formula implies that the "gravitational constant", in the full sense of this expression, is no fundamental constant, because it is the combination of the truly fundamental physical constant $\omega_g$ (the fundamental frequency of the gravitational field) and $\varepsilon_0$. Since the cardinal number of the fundamental gravitational frequency $\omega_g$ (16) is multiple to the absolute quantum of the fundamental frequency $\omega_\Delta$,

$$\omega_g \approx 2^2 \omega_\Delta = 2^2 \frac{1}{\lg e}, \qquad (52)$$

the cardinal numerical value of the gravitational constant *G* must be multiple to $2^2 \omega_\Delta$ squared divided by $4\pi$ (in accordance with the formula (51) that is actually:

$$G \approx \frac{2^4}{4\pi} \omega_\Delta^2 = 6.750586336. \qquad (53)$$

## Conclusion

In the last 10th Part of the article it was shown that motion of the Earth and its satellite, the Moon, in the Solar System are in harmonic bond with the FPQ of the Universe, as well as the ancient measures of the mass, length, and time. Presented here, in the Supplement, the data demonstrated a relationship of the most important (known and unknown to "modern" physics) fundamental physical constants with the FPQ. All this indicates that the Decimal Code "works" like a tuning fork that sets the rhythm, to which all processes in the Universe are subjected, both material and ideal, in the animate and inanimate nature. Incidentally, the average heart rate of an adult as well as the frequency of its breathing is in resonance with the Decimal Code of the Universe. Indeed, it is considered normal if the pulse is about 68 beats per minute, and it is the value (its cardinal number) multiple to one-quarter of the fundamental period-quantum, $(1/4)\Delta = 68.22\times10^{-2}$. An adult at rest makes an average of 14 breaths per minute, and it is a multiple of half the fundamental period-quantum, $(1/2)\Delta = 13.644\times10^{-1}$. Thus, it is disclosed the action of one of the most important laws of an ideal component of the Material-Ideal World (relevant to the laws of the second kind) – the Law of the Decimal Code of the Universe.

**REFERENCES**

[1] G. P. Shpenkov, *Table of Dimensionalities for Physical Quantities*; http://shpenkov.janmax.com/ObjectiveDimensTable.pdf

[2] G. P. Shpenkov, *Fundamental Constants of Dialectical Physics*; http://shpenkov.janmax.com/FundamentalConstants.pdf

[3] G. P. Shpenkov, *What the electric charge is*; http://shpenkov.janmax.com/Elec-Charge.pdf

[4] L. G. Kreidik and G. P. Shpenkov, *Atomic Structure of Matter-Space*, Geo. S., Bydgoszcz, 2001, 584 p.; Chapter 8 "*The Physical Metric; The Units of Dialectical Physics and Crucial Faults of The Modern System of Units*", pp. 363-408; http://shpenkov.janmax.com/AtomicStructureChapter8.pdf

[5] G. P. Shpenkov, *On the Fine-Structure Constant Physical Meaning*, HADRONIC JOURNAL, Vol. 28, No. 3, 337-372, (2005); http://shpenkov.janmax.com/Fine-Structure.pdf

[6] G. P. Shpenkov, *The Wave Nature of Gravitational Fields: General Characteristics* (2007); http://shpenkov.janmax.com/Gravitation.pdf

[7] G. P. Shpenkov, *The Nature of Gravitation: a New Insight*. A PowerPoint presentation prepared for the 19th International Conference on General Relativity and Gravitation, 5-9 July, 2010 Mexico City; http://shpenkov.janmax.com/A1-36-GR19-2010.pdf

[8] L. G. Kreidik and G. P. Shpenkov, *Dynamic Model of Elementary Particles and the Nature of Mass and "Electric" Charge*, REVISTA CIENCIAS EXATAS E NATURAIS, Vol. 3, No 2, 157-170, (2001); http://www.unicentro.br/editora/revistas/recen/v3n2/trc510final.pdf

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