

Quantum Metric of Classic Physics

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Abstract. By methods of differential geometry and number theory the following has been established: All fundamental physical constants are the medians of quasi-harmonic functions of relative space and relative time. Basic quantum units are, in fact, the gradients of normal distribution of standing waves between the points of pulsating spherical spiral, which are determined only by functional bonds of transcendental numbers π and e . Analytically obtained values of rotational speed, translational velocity, vibrational speed, background temperature and molar mass give the possibility to evaluate all basic quantum units with practically unlimited accuracy. Metric of quantum physics really is two-dimensional image of motion of waves in three-dimensional space. Standard physical model is correct, but SI metric system is insufficiently exact at submillimeter distances.

1. Introduction

New SI measurement system will be introduced at the end of the year 2018 and will be based on constants derived from nature only [1]. So far, the main problem with regards to defining constants is finding the coordinated values of basic quantum units [2]. We show below that this problem can be solved not only without use of artifacts (meter, kilogram, second) but without any measurements at all. Comparison of analytically obtained units with their recommended by CODATA values is presented below:

Table 1. Comparison of measured and analytically obtained units

Unit	Measured (conventional)	Analytical
Speed of light	299792458	299792457.86759134
Background temperature	2.725	2.7252543275634558
Relative molar mass	0.012	0.0119992777505492
Kelvin	2.7316	2.7315999984590452
Fine structure	0.0072973525664(17)	0.0072973525205056
Avogadro	6.022140857(74)	6.0221410564201849*10 ⁻²³
Boltzmann	1.38064857(74)	1.3806484502310000*10 ⁻²³
Planck	6.626070040(81)	6.6260700111158522*10 ⁻³⁴
Elementary charge	1.6021766208(98)	1.6021766150248797*10 ⁻¹⁹
Newtonian gravitational	6.67408(31)	6.6740529112548490*10 ⁻¹¹



All analytically derived values lie within measurement accuracy considering the conventionally established values of speed of light and molar mass.

2. Analytic base of quantum physics

It is shown below that only five equations determine the analytic base of quantum physics.

Two equations constitute basis of electrodynamics of Maxwell-Gauss:

$$C = (R + 4\pi C/10^{18})^{64 \cdot 10^7} = 299792457.867591338433684,$$

$$R = \text{Integer}[10^8 \cdot (C/10^7)^{1/64}] / 10^8 = 1.05456978.$$

The number C is the value of rotational speed of radius-vector. The number R is the harmonic value of the inverse squared radius. The value 4π is solid 3D-angle in radians. The value $4\pi \cdot 10^{-7}$ is the Magnetic constant. The value $4\pi C \cdot 10^{-7}$ is the Impedance of free space. The value $1/(4\pi \cdot 10^{-7})/C^2$ is the Electric constant. The number C is the Speed of light in physics, but arithmetically it is simply the number of turns around a ball with radius $4\pi/10^{18}$ per unit of time. The value $1/10^{18}$ is a natural limit of accuracy of calculations of an inverse squared radius due to finite numerical length of rotational speed.

Three equations constitute basis of thermodynamics of Kelvin-Avogadro:

$$K = E + AS + BS = 2.7315999984590452.$$

$$AS = 1/100 / \sum \{ [137 + (137 - 100) \cdot n] / 10^{(3 \cdot n + 2)} \} = 0.00729 = 1/100 / (1.1111111111...) ^3.$$

$$BS = \sum [602214183 / 10^{(3 \cdot n + 8)}] = 0.00602817 = 0.00602816999999...999999397183.$$

The number K is an upper limit of inverse temperature (used in SI for calibration of the triple point of water as $100 \cdot K = 273.16$). The number E is the base of natural logarithm in mathematics but in physics it is a lower limit of inverse temperature. The word "temperature" means literally "rating of tempo" or, in other words, rating of a speed of vibrations. Instant value of translational velocity oscillates between the values of rotational and vibrational speeds [3]. The digital sequences $AS = 0.00729$ and $BS = 0.00602817$ have linked the alphabet (0...1) and the alphabet (0...9) because $1 = 0.999999...$, and $10 = 9.99999...$. The digital sequence $B = 602214183$ is the Avogadro's integer. $NB = B/(1 + 4\pi/10^8)/10^{11}$ binds numbers B and π . The sequence $E = 2.7182818284590452 = (1 + 1/n)^n$ exponentially connects 1 and infinity (by the hyperbola $1/n$). The sequence $\pi = 3.1415926535897932 = \sum \text{from } (-1) \text{ to } (+1) \text{ of } [dx/\sqrt{1-x^2}]$ links 1 and infinity (by the parabola x^2). Digital sequence $A = 136.997250372498$ connects π and E because $E^A = \pi \cdot 10^{59}$. Numbers π and E are the absolute units of Space and Time.

3. Inverse geometry

The mutual bonds of geometrical parameters of pulsing sphere can be described by the following expression:

$$[G] = 2\pi[R] \{ 1 + [A] \},$$

where $[R]$ is a matrix of relative inverse radii, $[A]$ is a matrix of relative inverse eccentricities, $2\pi[R] = [P]$ is a matrix of relative inverse perimeters. The instant values of radius R_i and eccentricity A_i are linked to each other by the parameter $\sqrt{2\pi E}$ of Gaussian function of normal distribution [4; 5]:

$$R_i = 1 + 2/100 \cdot [E + A_i \cdot (1 + \sqrt{2\pi E/100})],$$

$$A_i = [100 \cdot (R_i - 1)/2 - E] / [1 + \sqrt{2\pi E/100}].$$

The values of inverse eccentricities are concentrated near reciprocal value of squared sum of mean values (root mean square, arithmetical mean, geometrical mean and harmonic mean) of numbers PI and E:

$$1 / \{ \sqrt{[(PI^2 + E^2)/2]} + (PI + E)/2 + \sqrt{PI \cdot E} + 2 \cdot PI \cdot E / (PI + E) \}^2 = 1/136.9938985020083597.$$

The bond exponential of PI and E was illustrated by the expression $PI \cdot 10^{59} = E^{136.9972503724980956}$.

Averages of inverse values of these digital sequences begin to differ from each other starting from the 12-th decimal place [6-8]. This is the natural limit of accuracy of inverse eccentricity calculations in polar coordinates.

3.1. Calibrating Fields

There are three fields of calibration of wave fronts. Fields of rotational and vibrational speeds are generating the field of translational velocity.

Matrix of rotational speed $[CN] = (R + N \cdot PI \cdot [CN]/10^{18})^{64} \cdot 10^7$ where $N = 0, 1, 2, 4$.

TABLE 2. Field of rotational speed

Notation	Value	Description
C4	$2.9979245786759134 \cdot 10^8$	3D-speed (sphere)
C2	$2.9979242359665663 \cdot 10^8$	2D-speed (circle)
C1	$2.9979240646119366 \cdot 10^8$	1D-speed (diameter)
C0	$2.9979238932573362 \cdot 10^8$	0D-speed (point)

TABLE 3. Field of vibrational speed

Notation	Value	Description
TE	$2.9979245625727419 \cdot 10^8$	$(R+1/E/10^8)^{64} \cdot 10^7$
	$2.9979245616776434 \cdot 10^8$	Median (TA; TE)
T	$2.9979245608618159 \cdot 10^8$	Harmonic temperature (median of two medians)
TA	$2.9979245607825451 \cdot 10^8$	$[R+1/(E+AS)/10^8]^{64} \cdot 10^7$
	$2.9979245600459885 \cdot 10^8$	Median (TA; TK)
TK	$2.9979245593094320 \cdot 10^8$	$[R+1/(E+AS+BS)/10^8]^{64} \cdot 10^7$

TABLE 4. Field of translational velocity

Notation	Value	Description
C	$2.9979245786759134 \cdot 10^8$	Harmonic rotational speed (3D-speed)
	$2.9979245697688650 \cdot 10^8$	Root mean square
	$2.9979245697688646 \cdot 10^8$	Arithmetical mean
V	$2.9979245697688647 \cdot 10^8$	Harmonic translational velocity (median)
	$2.9979245697688646 \cdot 10^8$	Geometrical mean
	$2.9979245697688647 \cdot 10^8$	Harmonic mean
T	$2.9979245608618159 \cdot 10^8$	Harmonic vibrational speed (temperature)

An arithmetical mean above is less than harmonic mean. This is impossible in classic analysis. This fact shows information entropy of discrete analysis and gives the key to calibration of mathematical 2D-image of 3D-motion of wave front.

3.2. Fields of Geometrical Parameters

The inverse eccentricities are concentrated near the number $A1 = 1/137 = 0.007299270072992700729927...$. The unique endless decimal fraction $A1 = \text{Sum} [729927/10^{(8*n)}]$ has a mirror symmetry with period 10^8 and in pair with $AS = 1/\text{Sum} \{[137 + (137 - 100) * n]/10^{(3*n)}\} = 0.00729$ determines the limits [9] of the field of inverse geometrical parameters compressed around the central value $A0 = (PI * E/100)^2 = 0.0072927060593902$. The corresponding radii are as follows:

TABLE 5. Field of external radii

Notation	Value	Description
R1	1.0545719538152265	$1 + 2/100 * (E + A1 * (1 + \sqrt{2 * PI * E/100}))$
R01	1.0545718610477836	Median (R0; R1)
RP	1.0545717955420578	Median of two medians (harmonic Planck's radius)
R0S	1.0545717300363340	Median (R0; RS)
RS	1.0545716917923240	$1 + 2/100 * (E + AS * (1 + \sqrt{2 * PI * E/100}))$

$$P01 = 6.62607042270046640.$$

$$2 * PI * (R0S; R01) = 6.62607001111585250 = PP.$$

$$POS = 6.62606959953125120.$$

Values of radius RP and perimeter PP have been identified as the harmonic Planck's units.

TABLE 6. Gauge field of radii

Notation	Value	Description
RC	1.0545697837673031	$(C/10^7)^{(1/64)}$
RV	1.0545697837183468	Median (RT; RC)
RE	1.0545697836787944	$R + 1/E/10^8$
RAE	1.0545697836738746	Median (RA; RE)
RT	1.0545697836693905	Median (RAK; RAE)
RA	1.0545697836689549	$R + 1/(E + AS)/10^8$
RAK	1.0545697836649065	Median (RA; RK)
RK	1.0545697836608581	$R + 1/(E + AS + BS)/10^8$

Background temperature:

Median (E+AS; K) = 2.7285850810946404. It is upper limit of TBG.

Median of medians = 2.7252543275634558 = TBG. It is harmonic background temperature.

Median (E+AS; E) = 2.7219256081809304. It is lower limit of TBG.

Limits of gauge eccentricity:

$$\text{Lower limit } A(RT) = 0.0072224927756108 = AT.$$

$$\text{Upper limit } A(RC) = 0.0072224962396475 = AC.$$

Molar amplitude of translational velocity:

$$\text{Upper limit} = 0.01199927775072243892.$$

$[12 - (AT; AC)/10]/1000 = 0.01199927775054923709 = MM$. It is harmonic molar mass unit.

$$\text{Lower limit} = 0.01199927775037603525.$$

Molar phase of translational velocity:

$$1.3806484502840000.$$

$\cos [12 - (AT; AC)/10] - \sin [12 - (AT; AC)/10] = 1.3806484502310000 = KB$. It is harmonic Boltzmann's unit.

$$1.3806484501770000.$$

TABLE 7. Internal radial field

Notation	Value	Description
RS	1.0545716917923240	R(AS); AS = 0.00729
	1.0545707377551196	Median (RV; RS)
RV	1.0545697837183468	$(V/10^7)^{1/64}$
	1.0545670092049269	Median (RV; RX)
RX	1.0545642346951568	R(AX); AX = $5/X - 1$

Median of two above medians $1.0545688734791990 = RM$ is the harmonic value of internal radius. $X = \text{Root}[X * E^X / (E^X - 1) = 5]$ is parameter of expression for Wien wavelength displacement.

Fine structure constant is determined as the eccentricity AF connecting numbers 137 and PI:

$$AF = 1000 / \text{Integer}[\sqrt{(137^2 + \pi^2)} * 1000] = 0.0072973525205056.$$

Orbital radius:

$$RF = 1.0545718996147182.$$

Median (RF, RP) = $1.0545718475783874 = RQ$. It is harmonic value of orbital radius.

$$RP = 1.0545717955420578.$$

Orbital density of velocity field:

$$1.6021766174049711.$$

$\sqrt{AF * RP / (T; C)} = 1.6021766150248797 = Q$. It is the Elementary charge unit.

$$1.602176612644788.$$

Harmonic median density of velocity field:

$$6.6744109106473266.$$

$2 * \pi * (RM; RQ) * [1 + (AM; AQ)] = 6.6740529112548490 = G$. It is the Newtonian gravitational unit.

$$6.6736948926580828.$$

Entropy of calculations of geometrical parameters has been determined using the expressions connecting product $\pi * E$ and ratio $1/137$:

$$[Ni] = 100 \cdot \{\sqrt{[8 \cdot \pi \cdot E / (137^2 + 8 \cdot \pi \cdot E)] / (1 + 2 \cdot [Ai] / 1000) - 5 / 10^8}\}.$$

$$P1 - P0 = 4 \cdot \pi \cdot 10^{-7} \cdot [2 \cdot E / (\pi + E) - \cos(\pi/6) \cdot 10^{-4} - \tan(\pi/4) \cdot 10^{-7} + \sin(\pi/6) \cdot 10^{-9}].$$

TABLE 8. Entropy of eccentricities

Eccentricity	Value	Description
AA	0.0073189621138002	$(\pi \cdot E / 100)^2 + 4 \cdot [1/137 - (\pi \cdot E / 100)^2]$
	0.0073188455271700	Median (AD; AA)
AD	0.0073187289405399	$1/(16 \cdot \pi \cdot E)$
AN	0.0073158881634932	Median of two medians
	0.0073129313978999	Median (AD; AL)
AL	0.0073071361524362	$1/[\ln(E) + 59 \cdot \ln(10)]$

Harmonic entropy unit:

$$NB = 6.0221410732354338 = B / (1 + 4 \cdot \pi / 10^8) / 10^8.$$

Median [NB; N(AN)] = 6.0221410564201849 = NA. It is harmonic Avogadro's unit.

$$N(AN) = 6.0221410396049361.$$

3.3. Decimal Orders of Quantum Constants

The decimal orders of the quantum constants are determined from the equations of standard physical model using exponential bond expression $E^{137} = 100 \cdot \pi \cdot 10^{57}$. For NA it is $10^+ + 23$. For KB it is $10^- - 23$. For RP and PP it is $10^- - 34$. For Q it is $10^- - 19$. For G it is $10^+ + 11$. More information could be found in references [10 - 12].

3.4. Harmonic Symmetry of Quantum Physics

All quantum units are the parameters of density of the field of progressive velocity. Velocity is the relative quantity. The number C is the upper limit of progressive velocity. The harmonic velocity V was determined as the ratio of units of relative space and relative time. All quantum constants are relative units due to relativity of space and time. Harmonic symmetry of quantum physics is illustrated by Table 9.

TABLE 9. Quanta of energy

Energy quanta	Description
$m \cdot v^2 / 2 \cdot [1 + v^2 / (T \dots C)^2]$	From $(m \cdot v^2 / 2)$ to $(m \cdot C^2)$ when v approaches C; (Newton, Einstein)
$h \cdot f \cdot [1 + v^2 / (T \dots C)^2]$	From $(h \cdot f)$ to $(h \cdot f^2)$ when v approaches C; (Kotelnikov, Nyquist)
$k \cdot T / [1 + v^2 / (T \dots C)^2]$	From $(k \cdot T)$ to $(k \cdot T^2)$ when v approaches C; (Boltzmann, Shannon)
$q \cdot U / [1 + v^2 / (T \dots C)^2]$	From $(q \cdot U)$ to $(U \cdot q^2)$ when v approaches C; (Dirac, Kaufmann)

where m, v, T, h, f, k, q, U are the instant values of mass, velocity, temperature, action, frequency, phase, electric charge and voltage.

4. Conclusions

Quantum Physics is Differential metric of pulsing spherical spiral.

Quantum Physics is digital bridge between Discrete and Continual Mathematics.

Quantum Physics is Absolute calculus of Wave motion.

5. References

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