BINARY LAW of BACKGROUND RADIATION

© *V.N. Poljansky & I.V. Poljansky*, 2004

The idea of this work had appeared in 2002. At mathematical simulation of processes of mechanical resonance in classical objects of the ring form we had confronted with inexplicable effect. The computer program "drew" the graph of the smooth function with periodically iterating peaks. This function features stability of own resonance oscillations of a ring and its graph should be look, as horizontal line. In reality, the graph looks like, as shown in fig.1.

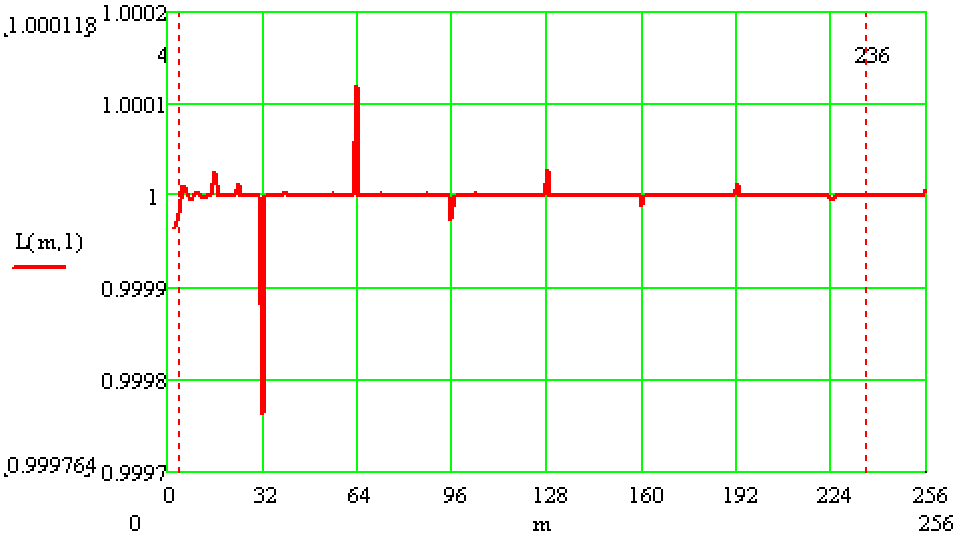

Fig.1
The graph of stability of resonance oscillations of a ring in program *Mathcad 7*
(on the abscissa axis is postponed oscillation frequency of a ring in terms of the frequency order)

This graph was made by means of program ***Mathcad 7***, at the convergence tolerance of numeric rows 10^{-3}. Recently we have executed same operation by means of program ***Mathcad 2001***, but the obtained result is not better (refer to Fig.2).

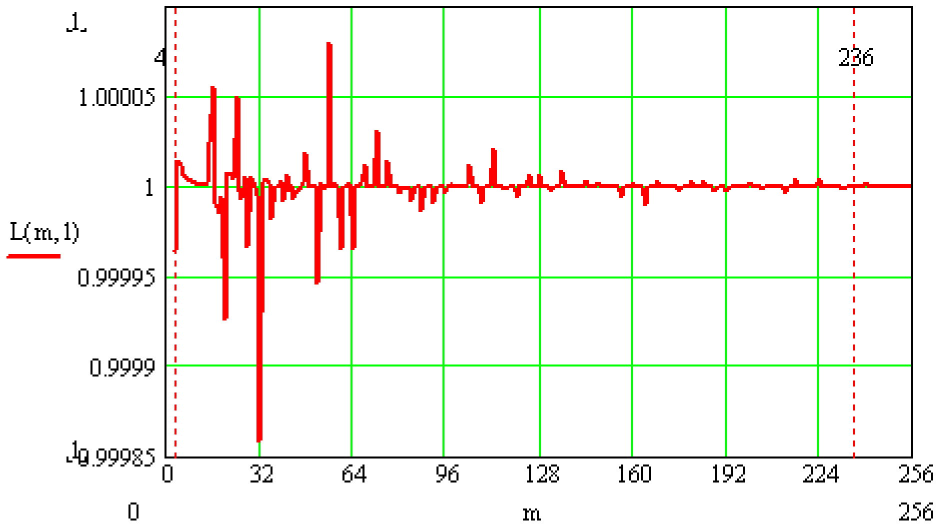

Fig.2
The graph of stability of resonance oscillations of a ring in program *Mathcad 2001*
(on the abscissa axis is postponed oscillation frequency of a ring in terms of the frequency order)

After data processing at the convergence tolerance of numeric rows 10^{-6}, we have got the graph, as shown in Fig.3.

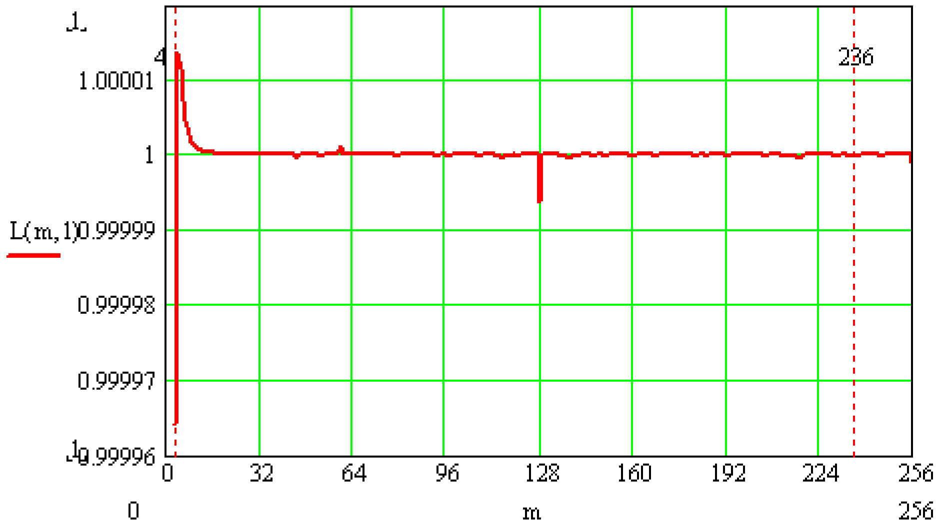

Fig.3

The shape of graphs from the figs. 1 and 2 after data processing at convergence tolerance of rows 10^{-6}

From above graphs follows, that the existent mathematical programs for computers cannot guarantee absolute accuracy at investigating of physical laws, which are describing with smooth functions. Improvement of convergence of endless row in 1000 times perfects accuracy of calculation of end function only in 5 times.

Our further examination of the atomic spectrums allows clearly recognize one more mathematical incident, which is artificially created defect of equations of quantum physics.

The Napierian base (e=2.718281828459….), i.e. transcendental number figures in the equations of quantum physics. The transcendental number in any degree (except for zero) also is transcendental number.

Remind of, the base of natural logarithms is output computation of endless numeric row

$$e = 1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \cdots + \frac{1}{n!} + \cdots$$

For instance, at calculation of number $2^8 = 256$ through e = 2.71828182845905 with maximum accuracy of program ***Mathcad 2001***, we have the following inaccuracy:

$$256 - e^{5.54517744447956} = +3.109 \cdot 10^{-15}$$

$$256 - (2.71828182845905)^{5.54517744447956} = -6.883 \cdot 10^{-15}$$

Hence, two disadvantage factors – computer and numeric, distort a mathematical interpreting of quantum processes along the scale of frequencies and can bring into fallacious deductions.

In this paper we show examples of calculation of some spectral serieses of hydrogen and helium with the help of the polytronic equations and influence of aforesaid defects on accuracy of end results.

In the previous paper "On intercoupling of some physical constants" the formula for calculation of lengths of waves of radiation of atoms is represented, when the atom is in the state of maximal ionization.

$$\lambda_p(Z, m_o, m, n_r, n_o) = \frac{h \cdot c \cdot 10^{12}}{W_t(Z, m_o, n_r) - W_t(Z, m, n_r) + W_t(Z, m, n_o)} \quad |\text{pm}| \qquad (1)$$

The energy $W_t(Z,m,n_o)$ represents background radiation from all objects, which are in a zone of experiment and which, by and large, influence the observations of sensors.

The relative amplitude (amplitude order) of background radiation n_o shortens a wave of radiation on some picometers (~10^{-3} %). Considering the fact, that measuring instruments ensure the accuracy in several hundredth shares of picometer, it is necessary to know a measure of description of background along frequency scale as possible more exactly.

The amplitude order n_o of background depends on the frequency order m and represents the binary function of a radiated frequency

$$n_o = n_s \cdot \left(2^{\frac{-m}{m_s}} \right) \qquad (2)$$

where n_s – the integral amplitude order of a background in experiment;

m_s – the long-wave frequency order of background radiation;

The radiant intensity of atoms is featured by the same law and represents probability of radiation, which corresponds to each quantum transition $m_o \rightarrow m$.

$$j = j_n \cdot \left(2^{\frac{-m}{m_n}} \right) \qquad (3)$$

where j_n – the amplitude of intensity of emission of atom in limits of given spectral series, depending from choice of units of measurements;

m_n – the short-wave frequency order of background radiation, depending on choice of units of measurements of intensity of resonance emission of atom;

In the table 1 the observable lengths of waves λ_p and λ_q and intensities j_p and j_q for ionized hydrogen H^+ – Lyman's series, are represented. These data are taken from NIST Atomic Spectra Database and Kelly Atomic Line Database.

First five lines in the table are shown as doublets. For rest lines "doubletness" is not shown, since the fission of lines is too small and cannot be measured. However, the fact of doubletness itself speaks about in the atom of hydrogen there are two oscillators of photons.

Table 1

The Element (ion)	$m_o \rightarrow m$	λ_p, pm (in vacuum)	j_p	λ_q, pm (in vacuum)	j_q
H^+	$2 \rightarrow 4$	121566.82	1000	121567.36	500
First series	$2 \rightarrow 6$	102572.23	300	102572.29	300
	$2 \rightarrow 8$	97253.68	100	97253.70	100
	$2 \rightarrow 10$	94974.30	50	94974.31	50
	$2 \rightarrow 12$	93780.34	30	93780.35	30
	$2 \rightarrow 14$	93074.80	20	93074.80	20
	$2 \rightarrow 16$	92622.60	15	92622.60	15
	$2 \rightarrow 18$	92315.0	10	92315.0	10
	$2 \rightarrow 20$	92096.3	9	92096.3	9
	$2 \rightarrow 22$	91935.1	7	91935.1	7
	$2 \rightarrow 24$	91812.9	5	91812.9	5
	$2 \rightarrow 26$	91718.1	4	91718.1	4
	$2 \rightarrow 28$	91642.9	3	91642.9	3
	$2 \rightarrow 30$	91582.4	3	91582.4	3
	$2 \rightarrow 32$	91532.9	2	91532.9	2
	$2 \rightarrow 34$	91491.9	2	91491.9	2
	$2 \rightarrow 36$	91457.6	2	91457.6	2

In Fig.4 is shown the fission of lines of Lyman's series comparatively to ideal single oscillator of photons, lines of which are calculated under formula (1).

As evident from Fig.4, the accuracy of measurement of short-wave lines is of poor quality. But it is accepted to consider, that exactly these values of lengths of waves would be with co-ordination to the generally accepted theory.

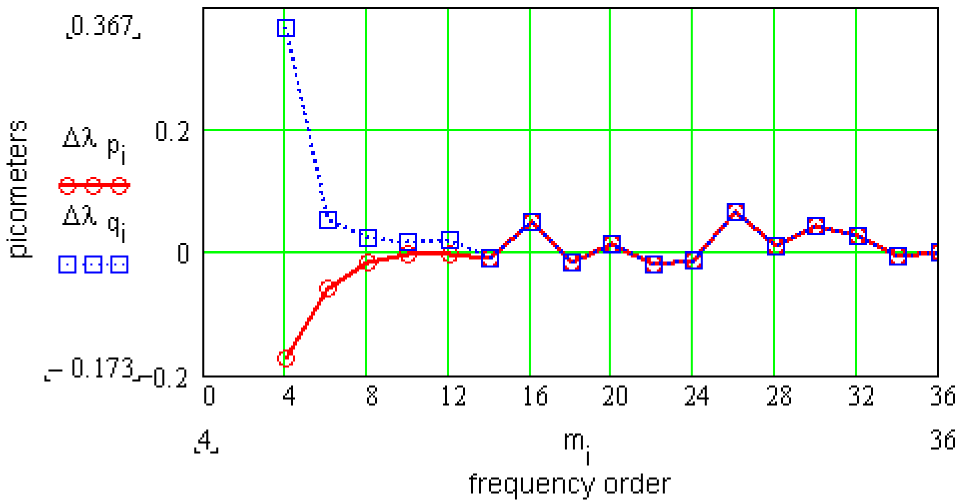

Fig.4
The fission of lines of Lyman's series into doublets

In the table 2 the observable lengths of waves λ_o and intensity j_o for double-ionized helium He^{++}, and also length of waves λ_p and intensities j_p, calculated with the help of the polytronic equations are represented.

Table 2

The Element (ion)	$m_o \rightarrow m$	λ_o, pm (in vacuum)	j_o	λ_p, pm	j_p
He^{++}	$2 \rightarrow 4$	30378.0	1000	30378.02	1000
First series	$2 \rightarrow 6$	25631.7	300	25631.75	397
n_r=0.052854907	$2 \rightarrow 8$	24302.7	100	24302.72	158
$n_o = 0.0065 \cdot \left(2^{\frac{-m}{256}}\right)$	$2 \rightarrow 10$	23733.1	50	23733.12	62.5
	$2 \rightarrow 12$	23434.7	30	23434.75	24.8
	$2 \rightarrow 14$	23258.4	20	23258.44	9.8
$j = 6350 \cdot \left(2^{\frac{-m}{1.5}}\right)$	$2 \rightarrow 16$	23145.4	10	23145.41	3.9
	$2 \rightarrow 18$	23068.6	-	23068.57	1.6
	$2 \rightarrow 20$	23013.9	-	23013.91	0.6
	$2 \rightarrow 22$	22973.6	-	22973.64	0.2
	$2 \rightarrow 24$	22943.1	-	22943.10	0.1
He^{++}	$4 \rightarrow 6$	164047.4	180	164047.35	180
Second series	$4 \rightarrow 8$	121517.1	50	121517.45	72
n_r=0.05285203	$4 \rightarrow 10$	108497.5	30	108497.76	28.5
$n_o = 0.0043 \cdot \left(2^{\frac{-m}{256}}\right)$	$4 \rightarrow 12$	102530.2	15	102530.34	11.3
	$4 \rightarrow 14$	99239.1	8	99239.21	4.5
	$4 \rightarrow 16$	97213.8	6	97213.89	1.8
$j = 2900 \cdot \left(2^{\frac{-m}{1.5}}\right)$	$4 \rightarrow 18$	95872.4	5	95872.44	0.7
	$4 \rightarrow 20$	94935.4	-	94935.40	0.3
	$4 \rightarrow 22$	94253.8	-	94253.80	0.1

The note. In the table 2 the data only for the first three series of radiation of ion of helium He^{++} are represented. The data for the subsequent series in the reference literature either are absent, or are very poor and are inexact.

Table 2 (continuation)

The Element (ion)	$m_o \rightarrow m$	λ_o, pm (in vacuum)	j_o	λ_p, pm	j_p
He^{++}	$6 \rightarrow 8$	468700.0	30	468700.07	30
Third series	$6 \rightarrow 10$	320403.8	15	320403.72	15
n_r=0.05285164	$6 \rightarrow 12$	273411.8	12	273411.85	7.5
$n_o = 0.00375 \cdot \left(2^{\frac{-m}{256}} \right)$	$6 \rightarrow 14$	251197.4	9	251197.39	3.8
	$6 \rightarrow 16$	238614.3	7	238614.34	1.9
	$6 \rightarrow 18$	230691.7	-	230691.68	1
$j = 480 \cdot \left(2^{\frac{-m}{2}} \right)$	$6 \rightarrow 20$	225339.9	-	225339.91	0.5

The formula for calculation of lengths of waves of single-ionized helium He^+ has the padding term $W_t(Z,m,n_p)$, which takes into account the pumping of energy from the level He^{++} into the level He^+.

$$\lambda_p(Z,m_o,m,n_r,n_o) = \frac{h \cdot c \cdot 10^{12}}{W_t(Z,m_o,n_r) - W_t(Z,m,n_r) + W_t(Z,m,n_p) + W_t(Z,m,n_o)} \quad |\text{pm}| \qquad (4)$$

In the table 3 the observable lengths of waves λ_o and intensity j_o for single-ionized helium He^+, and also length of waves λ_p and intensities j_p, calculated with the help of the polytronic equations are represented.

Table 3

The Element (ion)	$m_o \rightarrow m$	λ_o, pm (in vacuum)	j_o	λ_p, pm	j_p
He^+	$2 \rightarrow 4$	58433.4	1000	58433.40	1000
First series	$2 \rightarrow 6$	53703.0	400	53703.01	397
n_r=0.04333303	$2 \rightarrow 8$	52221.3	100	52220.86	158
n_p=0.03546	$2 \rightarrow 10$	51561.6	50	51561.28	62.5
	$2 \rightarrow 12$	51209.8	35	51209.55	24.8
$n_o = 0.012564 \cdot \left(2^{\frac{-m}{16}} \right)$	$2 \rightarrow 14$	50999.8	25	50999.59	9.8
	$2 \rightarrow 16$	50864.3	20	50864.14	3.9
	$2 \rightarrow 18$	50771.8	15	50771.65	1.6
$j = 2520 \cdot \left(2^{\frac{-m}{1.5}} \right)$	$2 \rightarrow 20$	50705.8	10	50705.66	0.6
	$2 \rightarrow 22$	50657.0	7	50656.94	0.2
	$2 \rightarrow 24$	50620.0	5	50619.94	0.1
	$2 \rightarrow 26$	50591.2	4	50591.17	0
	$2 \rightarrow 28$	50568.4	3	50568.36	0
	$2 \rightarrow 30$	50550.0	2	50549.98	0

The note. In the table 3 the data only for the first series of radiation of an ion of helium He^+ are represented. The calculation of the spectrums for the subsequent series is hampered by that circumstance, that in the reference literature there is no legible demarcation of spectrums in the series rank.

First two lines in the table 3 (λ_o =58433.4 pm, j_o =1000 and λ_o =537032.0 pm, j_o =400) have a greater intensity and were measured with mountain-high accuracy. Near by them are situated the weaker lines λ_o =59141.2 pm, j_o =50 and λ_o =53889.6 pm, j_o ~0.

The graph in Fig.5 shows, that first two lines in the table 3 are reduced taking into account their doubletness, whereas for following lines are brought average values of lengths of waves in the doublets.

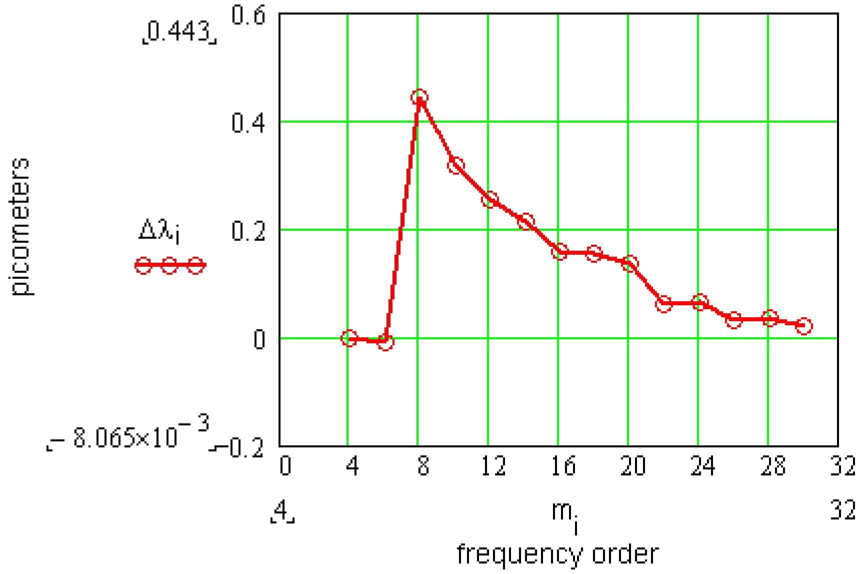

Fig.5
The calculation of first two lines of series taking into account their doubletness allows to define measurement mistake ($\Delta\lambda_i = \lambda_o - \lambda_p$) for following lines and to find proper values of lengths of waves in the doublets

In the table 4 are brought two not identifying serieses of helium He^+.

Table 4

The Element (ion)	$m_o \rightarrow m$	λ_o, pm (in vacuum)	j_o	λ_p, pm	j_p
He^+ Unknown series n_r=0.038849215 n_p=0.0365845 $n_o = 0.009037 \cdot \left(2^{\frac{-m}{8}}\right)$ $j = 30 \cdot \left(2^{\frac{-m}{1.5}}\right)$	$4 \rightarrow 5$ $4 \rightarrow 6$ $4 \rightarrow 7$ $4 \rightarrow 8$ $4 \rightarrow 9$ $4 \rightarrow 10$	361467.25 344857.68 335551.90 329772.22 325921.14 323219.80	3 2 1 0 0 0	361467.11 344857.76 335552.02 329772.14 325920.99 323219.82	3 1.9 1.2 0.7 0.5 0.3
He^+ Unknown series n_r=0.037967973 n_p=0.0188981 $n_o = 0.0364 \cdot \left(2^{\frac{-m}{3}}\right)$ $j = 8000 \cdot \left(2^{\frac{-m}{1.5}}\right)$	$4 \rightarrow 6$ $4 \rightarrow 8$ $4 \rightarrow 10$ $4 \rightarrow 12$ $4 \rightarrow 14$ $4 \rightarrow 16$ $4 \rightarrow 18$ $4 \rightarrow 20$	587724.36 447272.91 407732.38 382068.68 370605.00 363526.70 358829.20 355542.80	500 200 50 10 3 2 1 0	587724.35 447273.04 407732.11 382068.46 370605.02 363526.96 358829.02 355542.73	500 198 78.7 31.3 12.4 4.9 2 0.8

<u>The conclusion</u>
By means of polytronic equations it is possible to define a level of background in spectrums along the whole scale of frequencies.