Comprehensive Analysis of the ELEMENTARY Oscillator

Stanislav Ordin.

The Russian Academy of Sciences.

Annotation.

In the first article on the Redefinition of the Magnetic Field, “Reasons for the NECESSITY of the Redefinition of the Magnetic Field,” it is shown that the Solutions obtained by Maxwell’s Electrodynamics without the CORRECT Definition of the Magnetic Field are ERRORAL, and these were simply extended by Einstein into the Theory of Relativity in the form of EXCLUSIVITIES.

Stanislav Ordin, "Exceptionality Exclusion: Bridging Quantization and Relativity ", Global Journal of Science Frontier Research, GJSFR Volume 24 Issue 2 Version 1.0,

This article is the second part of the work "Redefining the Magnetic Field", which arose as a consequence of the elimination of a number of Quantization Exceptionalities (Restoration and Development of Planck-Einstein Quantization) and the beginning of the elimination of Einstein's Theory of Relativity Exceptionalities (which he borrowed, ironically, from the critic Schrödinger):

One of the main Exceptionalities and the Theory of Relativity was the NON-PHYSICAL (not determined by the Orthogonal Parameter of the Oscillator) IMAGINITY, borrowed from the technique of calculations on the complex plane. Whereas the advanced analysis of the ELEMENTARY REAL Oscillator, begun in the work

Stanislav Ordin, Review Article, “Non-Elementary Elementary Harmonic Oscillator”, American Journal of Materials & Applied Science(AJMAS), Volume 3 Issue 1, Published date: 03/08/2021, Pages: 003-008/, https://www.scireslit.com/MaterialScience/AJMAS-ID14.pdf

showed that its oscillations are completely described by ACTUAL Solutions.

The model of the ELEMENTARY Harmonic Oscillator is laid down both as the BASIS of any dynamic Classical Theories, and as the BASIS of the “quantum” Schrödinger equation. But as HER strict mathematical analysis showed, in the description of the oscillations of this Oscillator some terms of the Complete Solution of its differential equation were lost. In this case, both the main real resonant term, which describes both the flutter and the photoelectric effect, and the main imaginary term, which describes the contribution of the magnetic field to electric oscillations, are lost. And Descartes' gimlets, which entered the concept of a magnetic field in violation of Curie's theorem, led to the fallacy of Maxwell's equations. Taking into account the lost terms in the solutions of the Harmonic Oscillator equation allows us to eliminate many “features”, in particular the mutual exclusivity of the plasma model and the skin layer model. And the elimination of the contradiction between the optical and electromagnetic description begun by Planck was replaced by the formal, meaningless introduction of an imaginary unit into the equations of “Quantum Mechanics” and “The Theory of Relativity”, which leads to their supposed “EXCLUSIVENESS” from Classical Physics.

Comprehensive Analysis of the ELEMENTARY Oscillator.

Stanislav Ordin.

The Russian Academy of Sciences.

Abstract.

The model of the ELEMENTARY Harmonic Oscillator is laid down both as the BASIS of any dynamic Classical Theories, and as the BASIS of the "quantum" Schrödinger equation. But as HER strict mathematical analysis showed, in the description of the oscillations of this Oscillator, Newton's Particular Solution was used, in which some members of the Full Solution were lost. In this case, both the main real resonant term, which describes both the flutter and the photoelectric effect, and the main imaginary term, which describes the contribution of the magnetic field to electric oscillations, are lost. And Descartes' gimlets, which entered the concept of a magnetic field in violation of Curie's theorem, led to the fallacy of Maxwell's equations. Taking into account the lost terms in the Harmonic Oscillator equation allows us to eliminate many "features", in particular the discrepancy between the plasma model and the skin layer model. And the elimination of the contradiction between the optical and electromagnetic description begun by Planck was replaced by a formal, meaningless introduction of an imaginary unit into the equations of "Quantum Mechanics" and "The Theory of Relativity", which leads to their supposed "EXCLUSIVENESS" from Classical Physics.

Keywords: Ideal Harmonic Oscillator, real and imaginary damping.

Introduction.

People have learned to use the Harmonic Oscillator since ancient times, both when creating the first musical instruments, and when constructing a filter plug at the base of an ancient temple in a seismic area. And thanks to the light hand of Newton, who resolved some of Zeno's Aporia [1] with the help of differential calculus and used the separation of variables to approximately solve the differential equation of the Harmonic Oscillator, in Classical Physics they began to use the imaginary unit, which theorists began to insert into the description of any physical processes, simply to find solving equations on the complex plane. At the same time, unlike Newton, who attributed it to the phase meaningfully, the "developers" (pseudo-continuators) did not bother to think about the MEANING of its use in any equations, while declaring the resulting Solutions with pride, as the ultimate truth: " This is how it turns out" [2].

And with the light hand of Richard Feynman, theorists began to attribute only the Theory of Elementary Particles to modern Fundamental Physics [3], and the combing of the Classical Description was transferred to the shoulders of art critics [4]. And, thus, having canonized the often dense BASIS, they left all modern Physics and the Sciences associated with it without a Foundation. Indeed, many of the Basic Physical Models used are very outdated and the Solutions found within them are quite primitive and do not correspond to modern conditions of their use [5, 6]. So, these Models are simply of a purely declarative nature, both in monographs and dissertations. And the Solutions found within their framework do not describe, to a first approximation, modern experiments even in order of magnitude. So these "Basic Models" are supplemented with a bunch of meaningless adjustment parameters and, thus, simply an inflated set of eclectic knowledge is passed off as Science. Therefore, in practice, experimental physicists, and especially industrial workers, prefer to use not Fundamental Laws, but purely empirical Local Regularities, which leads to “catastrophes” between artisans. Planck eliminated one of these “catastrophes,” but the Problem he raised was entirely pushed aside and left unresolved to this day. Thus, the analysis of the FOUNDATIONS of Quantization revealed in modern “Quantum Mechanics” lack of rigor, which led to the loss of MEANING in it and, moving away from the Planck-Einstein Quantization, it, strictly speaking, became neither Quantum nor Mechanics. These are purely mathematical inconsistencies in the solutions of the equations used, and purely physical inconsistencies in the models used. In particular, one of these “fundamental” laxities that emerged when I began to analyze them, both in modern “Quantum Mechanics” and in the Theory of Relativity, is the formal, meaningless use of an imaginary unit [7]. And historically, this loose use of the imaginary unit began with Maxwell’s equations, which formally used Heaviside tensors, which was extended by Schrödinger into Quantum Mechanics, and Einstein into the Theory of Relativity.

And the Harmonic Oscillator, which lies in the Foundations of many Basic Physical Models, allows us to demonstrate a number of such ELEMENTARY logical Errors that lie in the Foundations of the Basic Models, in particular, the incorrect use of the imaginary unit, which only led to the Ultraviolet and Infrared “catastrophe” similar to that eliminated by Planck [8]. There are no catastrophes in Nature - catastrophes happen in its Description and in the production of something according to a catastrophic description. And Planck showed how to eliminate this catastrophicity, and his “successors,” on the contrary, looked for “catastrophes” in the Description and, instead of eliminating them, attributed them to Nature [9].

Mechanical Model.

Let's start with a REAL, without any Imaginary, one-dimensional ELEMENTARY Oscillator, for the mechanical model presented in Fig. 1

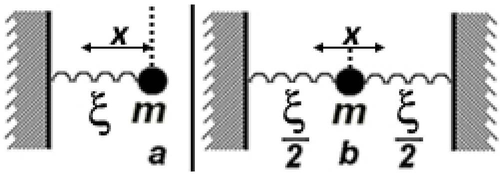

Fig.1. Ideal Mechanical Oscillator.

When the Ideal Mechanical Oscillator is excited due to the initial condition - its displacement from equilibrium by an amount A, the differential equation for the dependence of its displacements in time gives a resonant frequency determined by the inertia of the mass and the stiffness of the spring and undamped oscillations at this resonant frequency:

$$\boldsymbol{m}\frac{\boldsymbol{d}^2\boldsymbol{x}}{\boldsymbol{dt}^2}+\xi\cdot\boldsymbol{x}=0\Rightarrow\frac{\boldsymbol{d}^2\boldsymbol{x}}{\boldsymbol{dt}^2}=\boldsymbol{-\Omega^2x},\quad \boldsymbol{\Omega}=\sqrt{\frac{\xi}{\boldsymbol{m}}},\quad \boldsymbol{x}=A\mathrm{Cos}\left(\boldsymbol{\Omega}t\right) \qquad \textbf{(1)}$$

When excitation of a Non-Ideal Mechanical Oscillator due to a similar initial condition - a unit displacement of it from equilibrium, the differential equation for the dependence of its displacements, if we take the resonant frequency as unity:

$$x''\left[t\right]+\beta\cdot x'\left[t\right]+1^2\cdot x\left[t\right]=0,\quad x\left[0\right]=1,\quad x'\left[0\right]=0 \qquad (2)$$

gives an expression for oscillations that decay with time, shown for several damping parameters in Fig. 2:

$$x = e^{-\frac{t\beta}{2}}\left(\cos\left[\frac{1}{2}t\sqrt{4\Omega^2-\beta^2}\right]+\frac{\beta\sin\left[\frac{1}{2}t\sqrt{4\Omega^2-\beta^2}\right]}{\sqrt{4\Omega^2-\beta^2}}\right), \quad \leftrightarrow \quad \beta=\frac{\gamma}{m} \tag{3}$$

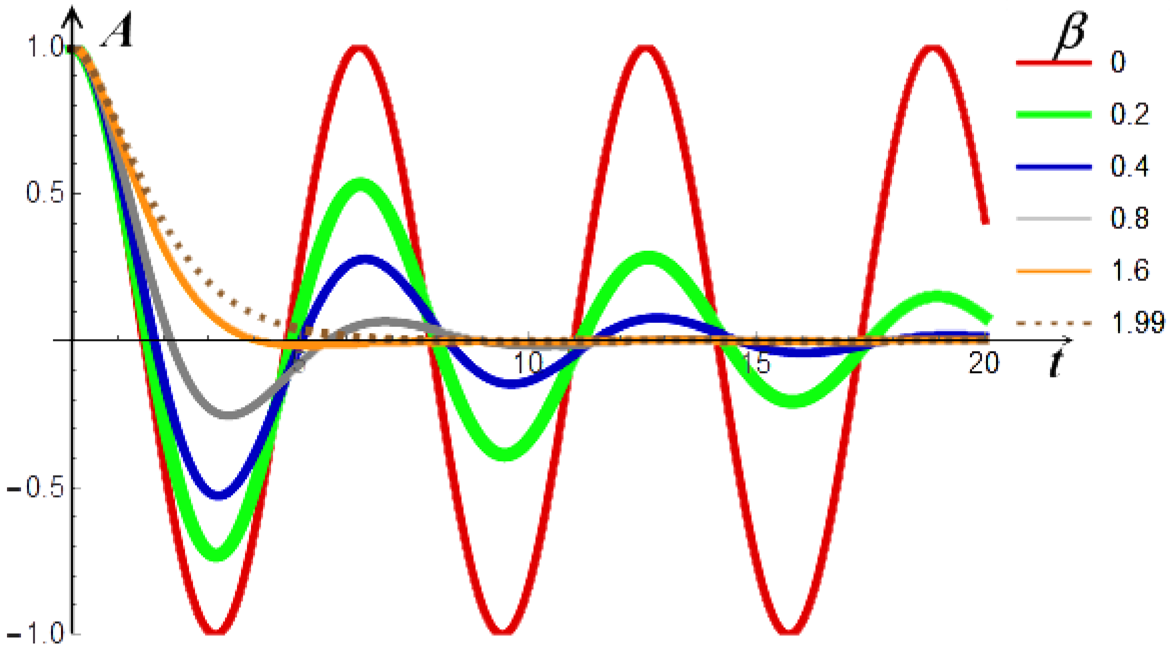

Fig.2. Dependence of the actual displacement of an ELEMENTARY Oscillator on the damping coefficient over time at a resonant frequency equal to unity.

Shown in Fig. 2 dependences of the amplitude of oscillations of an ELEMENTARY Oscillator with an increase in its attenuation clearly demonstrate both a slight decrease in the frequency (increase in the period) of resonant oscillations, and their degeneration (dashed brown line in Figure 2) when the attenuation reaches a value equal to twice the natural resonant frequency (set here to be equal to unity) . The latter, taking into account the phase speed of propagation of oscillations in space, determines the degeneration, in particular, of temperature oscillations into a temperature front.

And the Complete Solution (3), in contrast to the traditionally used Partial (1) (which will be discussed further below), gives purely real displacements, although complex numbers were virtually used to obtain it. And even without a driving force, when using a resonant frequency equal to one (3), it indicates the presence of two harmonics, the frequency characteristics of which under the influence of a driving force will be analyzed in detail below.

And when the Ideal Mechanical Oscillator is exposed to a driving force (the term in the equation highlighted in blue) and under natural zero initial conditions, oscillations only at the frequency of this force have traditionally been taken into account:

$$x''[t]+\Omega^2\cdot x[t]=\mathrm{Sin}[t\omega], \quad x[0]=0, \quad x'[0]=0 \tag{4}$$

A complete Solution to equation (2) corresponds to a partial Solution to equation (1) only if this frequency coincides with the resonant one in equation (4), and even then, partially. But, as was shown earlier [10, 11], for any frequency of the driving force it is necessary to also take into account oscillations at the frequency of its own resonance (the term highlighted in red):

$$x = \frac{\Omega \mathrm{Sin}[t\omega] - \omega \mathrm{Sin}[t\Omega]}{-\omega^2\Omega + \Omega^3} = \frac{1}{-\omega^2 + \Omega^2}\mathrm{Sin}[t\omega] + \frac{-\omega}{-\omega^2\Omega + \Omega^3}\mathrm{Sin}[t\Omega] \tag{5}$$

Moreover, the self-resonance for the Ideal Oscillator must be taken into account not as a small correction, but as shown in Fig. 3a, where for clarity, again the frequency of the self-resonance is set equal to unity and, accordingly, the frequency of the driving force f is presented in relative units:

$$\boldsymbol{x}_{\gamma \to 0} = \frac{\boldsymbol{1}}{\boldsymbol{-f^2+1}} \cdot \boldsymbol{sin}[\boldsymbol{t} \cdot \boldsymbol{f}] - \frac{\boldsymbol{f}}{\boldsymbol{-f^2+1}} \cdot \boldsymbol{sin}[\boldsymbol{t}] \tag{6}$$

must be taken into account as a first approximation. Whereas previously with an applied external force, it considered only the harmonic found by Newton from the approximate solution of the differential equation by the method of separation of variables.

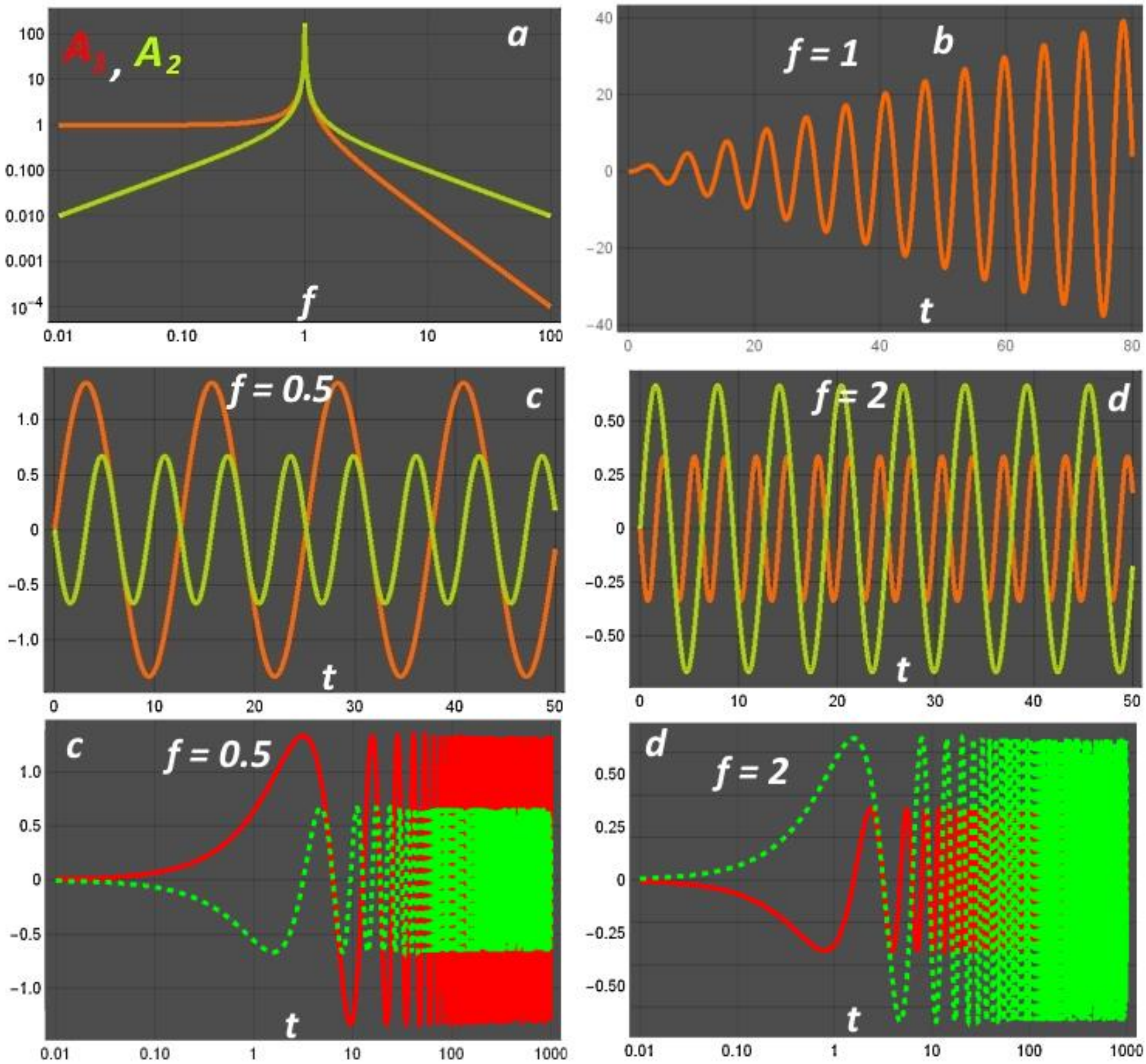

Fig.3. Oscillations of an Ideal ELEMENTARY Oscillator: a – frequency characteristics of the amplitudes of its harmonics on the frequency of the driving force, b – linear increase in the sum of two harmonics, c, e – time dependences of the harmonics at a frequency of the driving force half and half the resonant frequency. The red lines show the previously taken into account Newton's harmonic at the frequency of the driving force, the green lines show the previously not taken into account harmonic at its own resonant frequency.

As can be seen from Fig. 3, the oscillation of the Ideal Oscillator is a superposition of two harmonics, the amplitudes of which have fundamentally different frequency characteristics (Fig. 3a). As the frequency of the driving force approaches the frequency of its own resonance, the amplitudes of each of the harmonics individually tend to infinity (Fig. 3a), but due to the antiphase of the harmonics, we have a linear increase in the total oscillation at this frequency:

$$\mathit{Limit}\left[\frac{f\ Sin[t] - Sin[f\cdot t]}{-1+f^2}\right]_{f\to 1} = 1/2\,(-tCos[t] + Sin[t]) \qquad (7)$$

In contrast to the linear increase in time shown in Fig. 3b, at frequencies below the resonant one the main contribution to the total oscillation is made by Newton’s harmonic (Fig. 3c), while at frequencies above the resonant one the main contribution to the total oscillation of the Ideal Oscillator is made by oscillations at its own resonant frequency (Fig. 3.d), which were previously considered just a small correction due to attenuation (anharmonicity).

Previously, for a Non-Ideal Oscillator under the influence of a driving force and without an initial displacement, they simply added to the right side of equation (1) a term proportional to the speed, which determines the attenuation of the oscillation amplitude:

$$+\gamma\frac{dx}{dt} \Rightarrow x = \frac{1}{\mathrm{i}\gamma\omega-\omega^2+\Omega^2}\,Sin(\omega\times t) \Rightarrow A_x = \frac{1}{\mathrm{i}\gamma\omega-\omega^2+\Omega^2} \qquad (8)$$

In contrast to the linear increase in time shown in Fig. 3b, at frequencies below the resonant one the main contribution to the total oscillation is made by Newton’s harmonic (Fig. 3c), while at frequencies above the resonant one the main contribution to the total oscillation of the Ideal Oscillator is made by oscillations at its own resonant frequency (Fig. 3.d), which were previously considered just a small correction due to attenuation (anharmonicity).

Traditionally, for a Non-Ideal Oscillator under the influence of a driving force and without an initial displacement, a term proportional to the velocity was simply added to the right side of equation (1), which determines the attenuation of the oscillation amplitude:

$$+\gamma\frac{dx}{dt} \Rightarrow x = \frac{1}{\mathrm{i}\gamma\omega-\omega^2+\Omega^2}\,Sin(\omega\times t) \Rightarrow A_x = \frac{1}{\mathrm{i}\gamma\omega-\omega^2+\Omega^2} \qquad (9)$$

and, again approximately, using the method of separation of variables, only the attenuation of the amplitude ***Abs[A_x]*** (Fig. 4a) and the phase shift of oscillations ***Arg[A_x]*** (Fig. 4b) of the Newtonian harmonic at the frequency of the exciting force are calculated.

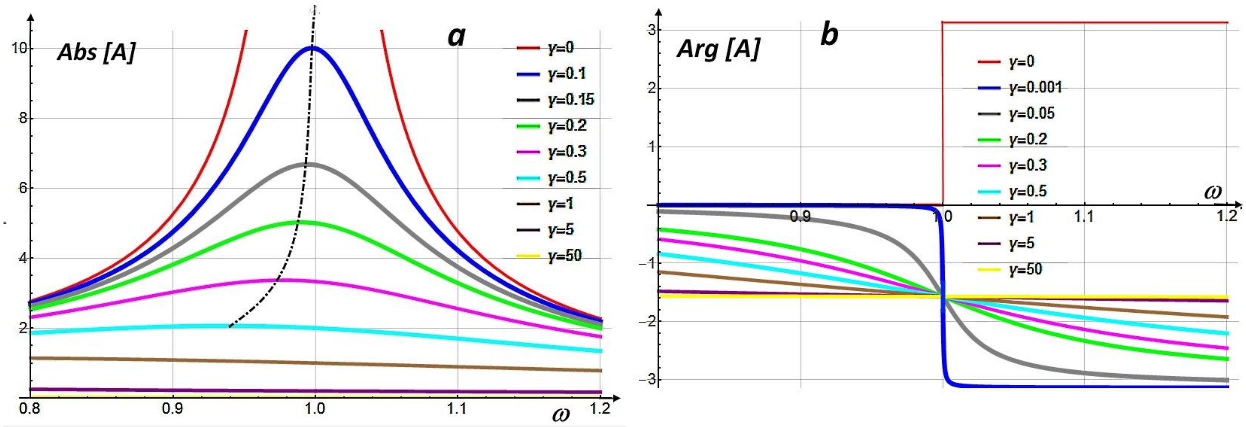

Fig.4. Calculated characteristics of oscillations of an Elementary Oscillator at the frequency of the driving force, obtained by the method of separation of variables: a – for amplitude (the dotted line shows the displacement of the maximum of the frequency dependence), b – for phase.

In this case, as can be seen from Fig. 4b, with extremely low damping, a jump in the oscillation phase was obtained, which earlier, before understanding the approximate nature of this calculation, was attributed to the impossibility of the existence of an Ideal (without damping) Oscillator in principle.

In the approximate calculation of the Oscillator, not only its own resonance, highlighted in red in equation (5), was missed, but, simply to simplify the calculations, in equation (9) a formal use of complex notation was made, which connected the imaginary unit with that shown in Fig. 4b phase only Newtonian harmonics. It is quite correct to use imaginarity in expression (9), as a way to describe an orthogonal (independent parameter), but within the framework of only the PRIMITIVE Model (1). And the pointlessness of using it exclusively for Newton's harmonics directly follows from the fact that even in the simplest case there are two harmonics. Moreover, it is possible to obtain a strict real (without an imaginary unit) Complete Solution for an ELEMENTARY Oscillator and with damping, strictly transforming, upon its limiting transition to zero, into two harmonics obtained in expression (5).

This formal substitution of the phase of only one Newtonian harmonic with an imaginary one, in the case if the particle is charged, led, as will be shown below, to the loss of the term determined by the magnetic field in the plasma model. Therefore, in order not to use quaternions - several imaginary units, both for the phases of different harmonics, and for what was previously not taken into account at all, we will analyze in detail the purely Real Complete Solution for the Oscillator with damping.

Under natural boundary conditions (at the initial moment, in contrast to equation (2), the point is completely motionless), under the influence of a single driving force

$$\boldsymbol{x''[t]+\gamma x'[t]+\Omega^2 x[t]=sin[t\omega],\quad x[0]=0,\quad x'[0]=0} \tag{10}$$

with the virtual use of complex numbers, in the allowed attenuation range we have both a decrease in the actual resonant frequency and a complete REAL Solution of two harmonics similar to (5):

$$\Omega^*=\sqrt{4\Omega^2-\beta^2}\Rightarrow \cosh\left[\frac{1}{2}ti\Omega^*\right]\Rightarrow \cos\left[\frac{1}{2}t\Omega^*\right],\quad \sinh\left[\frac{1}{2}ti\Omega^*\right]\Rightarrow \sin\left[\frac{1}{2}t\Omega^*\right] \tag{11}$$

$$x=-\frac{1}{4\sqrt{\gamma^2-4\Omega^2}\left(\gamma^2\omega^2+\left(\omega^2-\Omega^2\right)^2\right)}\cdot$$

$$(-2e^{-\frac{1}{2}t\left(\gamma+\sqrt{\gamma^2-4\Omega^2}\right)}\omega(\left(-1+e^{t\sqrt{\gamma^2-4\Omega^2}}\right)\gamma^2+2\left(-1+e^{t\sqrt{\gamma^2-4\Omega^2}}\right)(\omega-\Omega)(\omega+\Omega)+ \tag{12}$$

$$\left(1+e^{t\sqrt{\gamma^2-4\Omega^2}}\right)\gamma\sqrt{\gamma^2-4\Omega^2})+4\sqrt{\gamma^2-4\Omega^2}\left(\gamma\omega\cos[t\omega]+(\omega-\Omega)(\omega+\Omega)\sin[t\omega]\right))$$

This Complete Solution (12), naturally, describes the REAL oscillations of an ELEMENTARY Oscillator without any unspecified imaginary parameters.

In addition, this complete real solution for arbitrarily small, but non-zero attenuation (calculating the limit of expression (12) when the attenuation tends to zero), breaks down into two harmonics described above in expressions (5, 6) for the Ideal Harmonic Oscillator.

Again, for convenience/clarification, using the equality of the resonant frequency to unity, we obtain for a Non-ideal Oscillator (for finite damping) the decomposition of expression (12) at the resonant frequency into two terms, which correspond in the limit to the previously obtained undamped harmonics of the simplified expression (6).

The first term for the resonant frequency corresponds to the missed harmonic and the second term in the expression without attenuation (5):

$$G_1 = \frac{e^{-\frac{1}{2}t\left(\gamma+\sqrt{-4+\gamma^2}\right)}\omega\left(2+\gamma\left(-\gamma+\sqrt{-4+\gamma^2}\right)-2\omega^2+e^{t\sqrt{-4+\gamma^2}}\left(-2+\gamma^2+\gamma\sqrt{-4+\gamma^2}+2\omega^2\right)\right)}{2\sqrt{-4+\gamma^2}\left(1+\left(-2+\gamma^2\right)\omega^2+\omega^4\right)} \tag{13}$$

$$\textbf{\textit{Limit}}\left[G_1\right]_{\gamma\to 0} = \frac{\omega}{-1+\omega^2}\mathrm{Sin}(t)$$

The second term, more strict than the previously used expression (8), corresponds to known oscillations at the frequency of the driving force and the first term in (5):

$$G_2 = -\frac{\gamma\omega\cos[t\omega]+\left(-1+\omega^2\right)\sin[t\omega]}{1+\left(-2+\gamma^2\right)\omega^2+\omega^4} \tag{14}$$

$$\textbf{\textit{Limit}}\left[G_2\right]_{\gamma\to 0} = \frac{1}{-1+\omega^2}\mathrm{Sin}(t\omega)$$

Those we obtain the frequency characteristics of the amplitudes of the same as in Fig. 3, two harmonics - both traditionally used for oscillations at the frequency of the driving force (first term), and those not taken into account their own resonant ones, which determine the total oscillation at high frequencies (second term). In this case, the solution obtained, when the attenuation tends to zero, goes over to the one presented in Fig. 3b, and the presence of attenuation gives access to the asymptotics of the amplitude of the actual oscillation - the sum of two harmonics (Fig. 5).

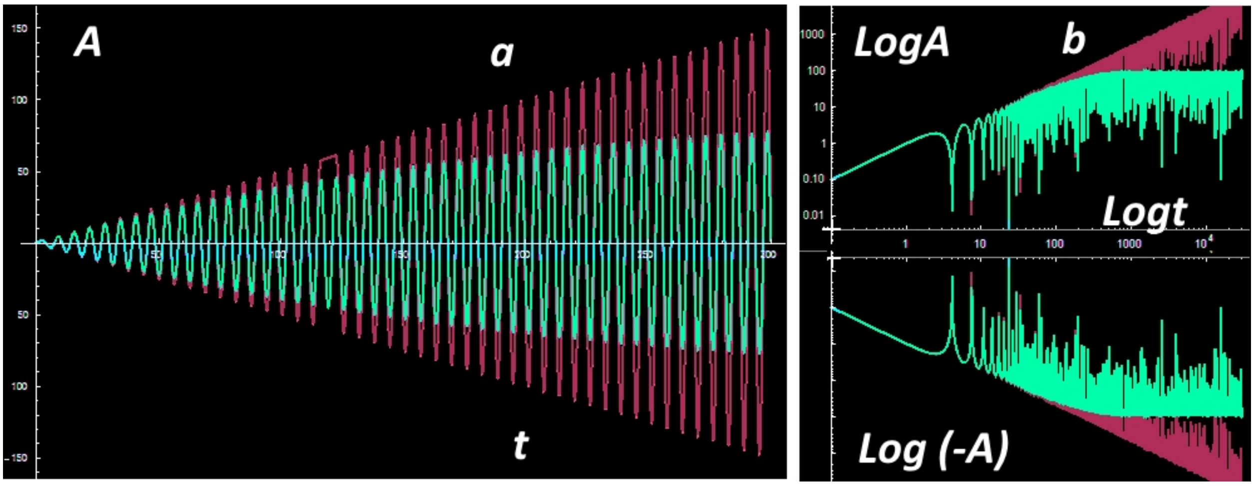

Fig. 5, Increase in time under the influence of a single driving force of the Real, completely described by the Complete Real Solution of the oscillations of an ELEMENTARY OSCILLATOR at a resonant frequency with attenuation (green), superimposed on the unlimited growth of oscillations of the Ideal Oscillator (red), previously shown in Fig. 1b

And the Complete Solution of the damped Oscillator equation (12 at a resonant frequency equal to unity, naturally coincides with the Solution of the control equation (3), in which the resonant frequency is initially set equal to unity (Fig. 5 and 6).

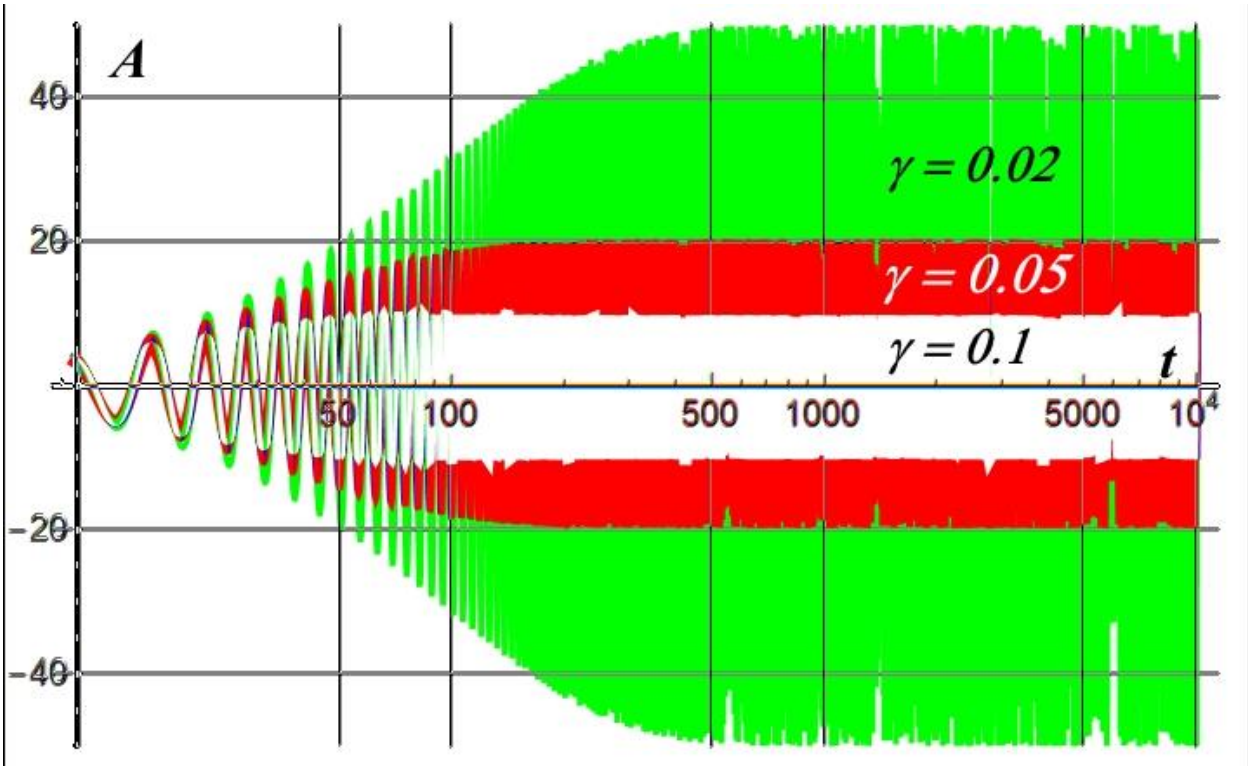

Fig.6. Total oscillations of two harmonics of the Complete Solution (expression 12). at a resonant frequency equal to unity with several attenuation coefficients

The “harmonic” terms (13) and (14) of the Complete Solution at the resonant frequency also coincide - the coincidence of the control harmonics depicted by the dotted lines with the harmonics of the Complete Solution is shown in Fig. 7.

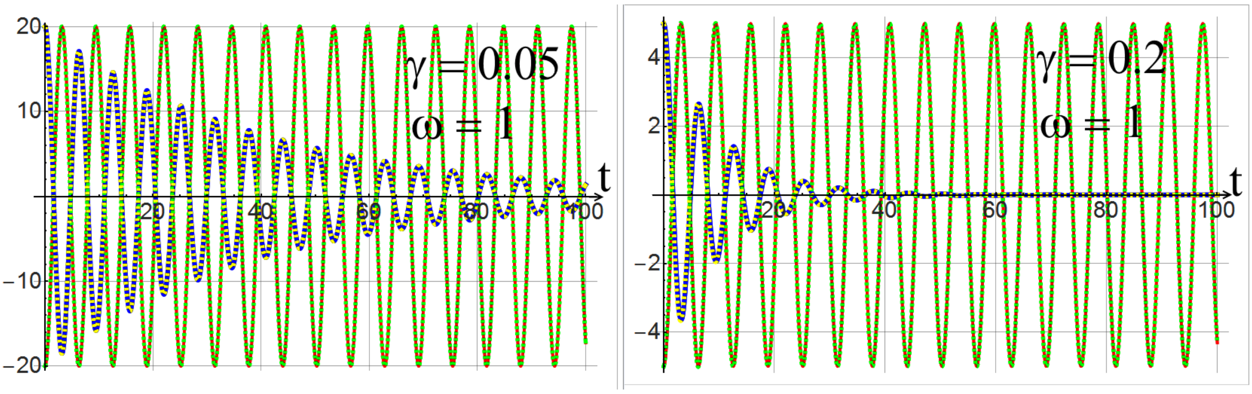

Fig.7. Harmonics of the Complete Solution of the equation of an ELEMENTARY damped Oscillator at the resonant frequency (solid lines) with control harmonics superimposed on them (dotted lines), calculated at the resonant frequency, initially assumed to be unity in the differential equation.

As can be seen from Fig. 7, harmonics that are close to antiphase arise at equal amplitudes and decrease with increasing attenuation coefficient. But over time, one of them does not change its amplitude, while the amplitude of the other tends to zero with increasing attenuation coefficient. The sum of these antiphase harmonics provides access to the asymptotics of the total signal (Fig. 6). Thus, an increase in the damping coefficient leads not only to a decrease in the amplitude of oscillations, but also to an increase in their “inertia”. Which is quite natural, a weakly damped pendulum at the resonant frequency swings more slowly and stops more slowly.

When the frequency of the driving force is reduced to two times lower than the resonant one (Fig. 8), the amplitudes of both harmonics of the damped Oscillator decrease (solid colored lines), but the inertial harmonic decreases more sharply.

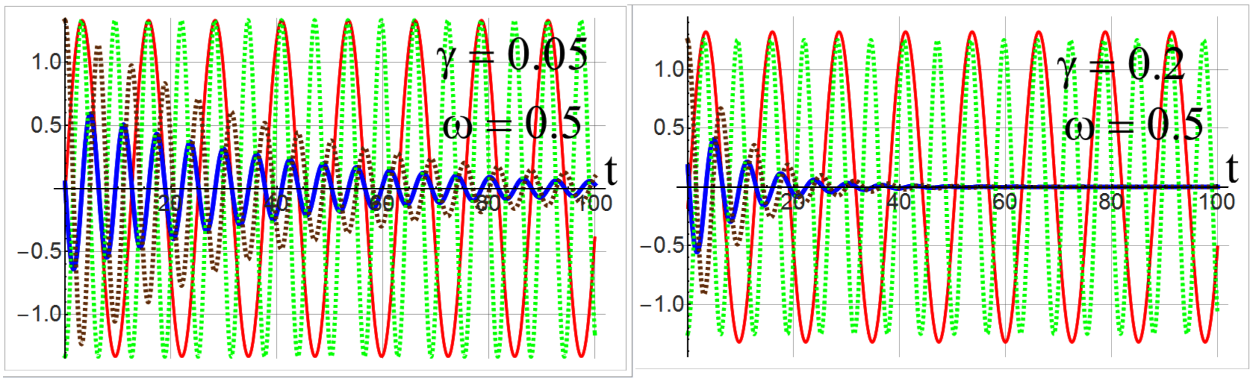

Fig.8. Change in the amplitudes of the harmonics of the damped Oscillator when the frequency of the driving force is reduced by half (the dotted lines show the control harmonics at the resonant frequency, reduced by 15 times for a damping of 0.05 and by a factor of 4 for a damping of 0.2.

And with an increase in the frequency of the driving force by 2 times (Fig. 9) and 10 times (Fig. 10) above the resonant amplitude of both harmonics, they similarly decrease (solid lines), but a greater decrease in the stable harmonic at the frequency of the driving force is clearly visible.

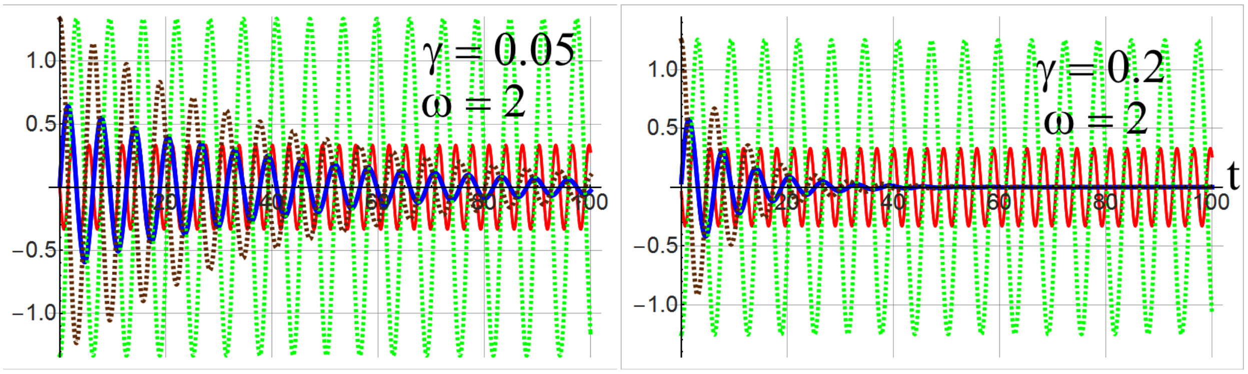

Fig.9. Change in the amplitudes of the harmonics of the damping Oscillator when the frequency of the driving force is doubled (the dotted lines show the control harmonics at the resonant frequency, reduced by 15 times for damping 0.05 and 4 times for damping 0.2).

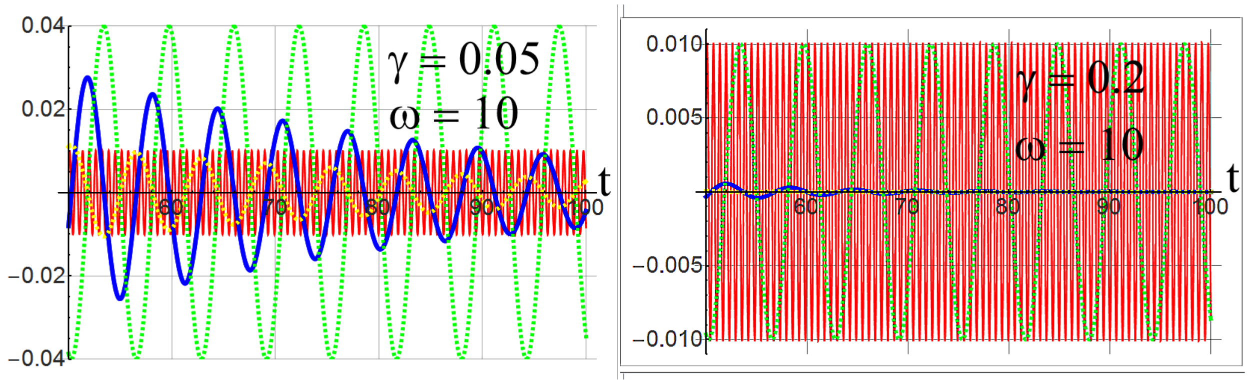

Fig. 10. Change in the amplitudes of the harmonics of the damped Oscillator when the frequency of the driving force increases tenfold (the dotted lines show the control harmonics at the resonant frequency, reduced by 15 times for a damping of 0.05 and by a factor of 4 for a damping of 0.2.

Such a detailed analysis of the ELEMENTARY Oscillator was carried out in order to strictly prove something obvious, but not taken into account in modern theories based on the ELEMENTARY Oscillator - all the characteristics of oscillations of a one-dimensional ELEMENTARY damped Oscillator, including the frequency response of the total amplitude of oscillations (Fig. 10), similar to that shown in Fig. .4a private characteristics, but corresponding to expression (12), are completely described by REAL expressions.

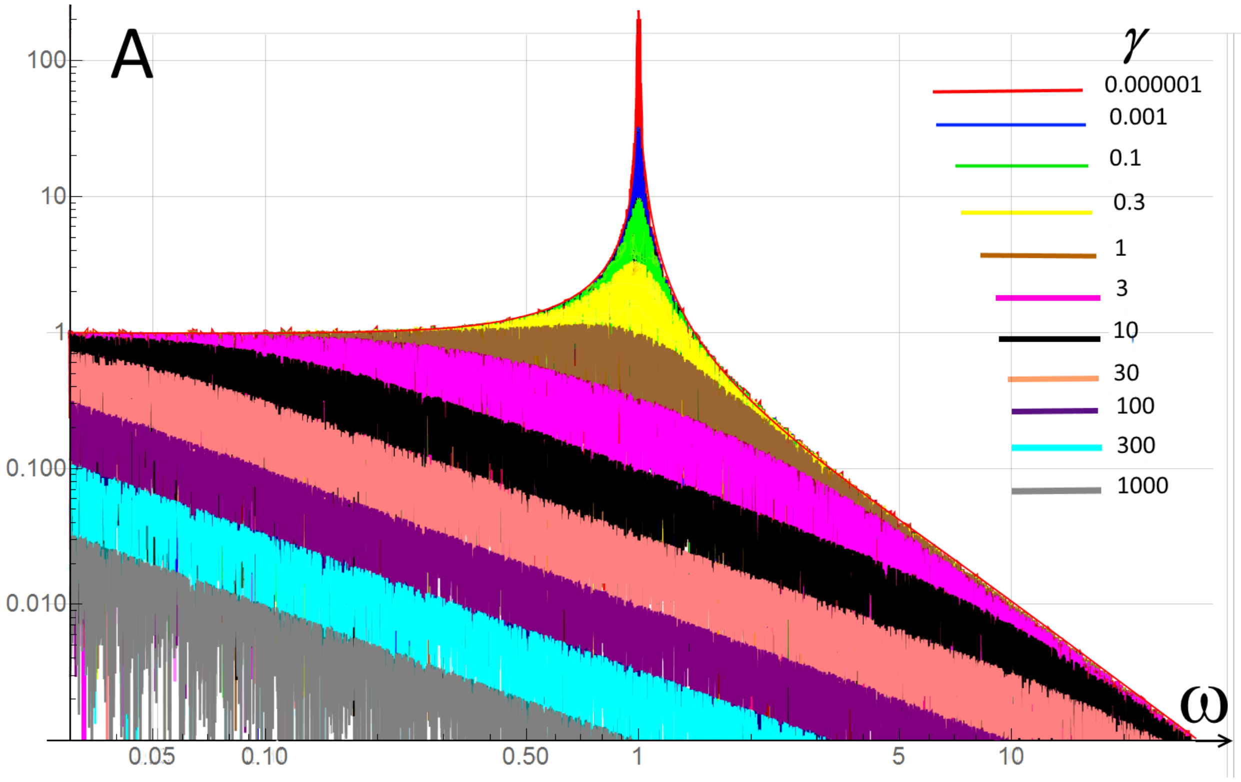

Fig. 11. Frequency characteristics of the total amplitude of oscillations of an ELEMENTARY Oscillator at various damping coefficients:

The frequency response of the Total (total) Oscillation Amplitude of an ELEMENTARY Oscillator shown in Fig. 11 differs from the private one shown in Fig. 4a not only by taking into account the resonant harmonic, but also by the fact that due to the difference in the phases of the harmonics, the total amplitude rattles in time. But the fact that the total signal naturally changes in frequency and attenuation is clearly shown by the upper limit of the oscillations shown in Fig. 10 corresponding to each specific attenuation.

Interim conclusion.

Such a detailed analysis of the ELEMENTARY Oscillator was carried out because it, as already noted, underlies all dynamic models, and as will be shown in the next part of this article, it also underlies models with higher order derivatives.

In order to do this, in this part of the article I tried to strictly prove and clearly demonstrate something obvious, but not taken into account in modern theories based on the ELEMENTARY Oscillator - all the characteristics of the oscillations of a one-dimensional ELEMENTARY damped Oscillator, including the frequency response of the total amplitude of the oscillations (Fig. 10) , similar to the private characteristic shown in Fig. 4a, but corresponding to expression (12), are completely described by REAL expressions and do not, in principle, require the use of mystical parameters, which led to fundamental errors in traditional analysis based on the Particular Solution.

References

1. .Stanislav Ordin, Aporia of Zeno-Munchausen, website of the Nanotechnological Society of Russia, 02.14.2020, 5 pages. http://rusnor.org/network/social/user/10216/blog/3833/
2. Ordin, S.V., «CHAOS – IMAGINARY OSTENSIBILITY – ORTHOGONALITY», Global Journal of Science Frontier Research - Physics & Space Science, GJSFR-A Volume 19 Issue 3 Version 1.0 p.49-58, https://globaljournals.org/GJSFR_Volume19/3-Chaos-Imaginary-Ostensibility.pdf
3. R.P. Feynman, THE THEORY OF FUNDAMENTAL PROCESSES, California Institute of Technology, W.A/ BTNJAMIN, INC., New York, 1961, 199 pp.
4. Daniel C. Mattis, The Theory of Magnetism (An Introduction to the Study of Cooperative Phenomena), Harper @ Row Publisher, New York, Evanston, London, 1965, 407 pp.
5. Stanislav Ordin, Book: "Refinement of basic physical models", Lambert, 2017, Project № 163273, ISBN: 978-3-659-86149-9, 82 pp.
6. "INTRODUCTION to Thermo-Photo-Electronics", International Journal of Physics and Mathematics, | Volume 05 | Issue 01 | April 2023, International Journal of Physics and Mathematics 2023; 5(1): 33-44,
   DOI: https://doi.org/10.33545/26648636.2023.v5.i1a.49
7. Stanislav Ordin, "Gaps and Errors of the Schrödinger Equation", Global Journal of Science Frontier Research, GJSFR Volume 22 Issue 3 Version 1.0, p 1-5. https://globaljournals.org/GJSFR_Volume22/3-Gaps-and-Errors.pdf
8. Ordin S.V., "Impedance of Skin-Plasma Effect", International Journal of Research Studies in Electrical and Electronics Engineering (IJRSEEE), Volume 6, Issue 3, 2020, PP 25-39, ID 2120011, ISSN 2454-9436 (Online), www.arcjournals.org, https://arcjournals.org/international-journal-of-research-studies-in-electrical-and-electronics-engineering/volume-6-issue-3/ ISSN: 2301-380X . DOI: http://dx.doi.org/10.20431/2454-9436.0603003
9. Stanislav Vladimirovich Ordin, Book: "FOUNDATIONS OF Planck-Einstein Quantization (Thematic collection of recent studies reviewed in scientific journals).", LAP LAMBERT Academic Publishing, 2021, ISBN 978-620-4-21066-7, 110 pp.
10. Stanislav Ordin, Review Article, "Non-Elementary Elementary Harmonic Oscillator", American Journal of Materials & Applied Science(AJMAS), Volume 3 Issue 1, Published date: 03/08/2021, Pages: 003-008/, https://www.scireslit.com/MaterialScience/AJMAS-ID14.pdf
11. Ordin, S.V., «Parametrically excited Anharmonic Oscillator», Global Journal of Science Frontier Research - Physics & Space Science, GJSFR-A Volume 19 Issue 3 Version 1.0 p.133-144, https://globaljournals.org/GJSFR_Volume19/7-Parametrically-Excited.pdf