



Review Article

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Absoluteness And Relativity of the Coulomb Force

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Abstract

Redefinition of the Magnetic Field required an in-depth analysis and Foundations of Electrostatics. It was revealed that its Phenomenology for stationary Charges as a flow of sub particles flowing out of the Charge, determines its Static Picture and, thus, the Classical Absoluteness of Coulomb's Law. But when Charges move, the Absoluteness is violated. And taking into account the Principle of Relativity, both for Mass and for Charge, leads to the emergence of Longitudinal Inertia, which determines a specific, polariton-like addition to their value at rest. But, as follows from the Analysis, this longitudinal addition alone is not enough for a strict Definition of the Magnetic Field. For a complete Definition of the Magnetic Field, it is necessary to take into account the Forces Orthogonal to the Absolute Force of Coulomb.

Keywords: Logarithmic Relativity; Dualism; Field Distortion; Longitudinal Inertia; Orthogonal Force

Preamble

Modern Mathematics, using an unlimited number of parameters and computers, allows, in principle, to describe any physical processes. Especially if the mathematical apparatus is supplemented with Artificial Intelligence. But at the same time, the Rule is often violated - the Basic Model, describing the Phenomenon Phenomenon correctly, describes the main Effects in the First Order, and not with the help of parametric corrections, which, in principle, describe small deviations from the Basic Effects by the Parameter of Smallness (Landau). So only Basic Models, in principle, can be used to build a Unified Picture of the Description of Nature. But there are social and mathematical Problems/Obstacles to approaching the Unified Picture. The social Problem is that the illusion of the triumph of modern Physics (and Science, in general) is based precisely on abstruse multi-parameter calculations and no less abstruse ignorant bluff-assumptions like Graphene. And only in exceptional cases do they refuse them. So, former military pilot Neil Armstrong,

as he told my friend Yuri Kuchiev, when they were returning from the Moon to Earth, switched to manual flight control, because on automatic, in his practical assessment, they would have missed the Earth. The automatic landing was carried out according to a strictly verified, at that time, program, but as the Chinese have now shown, even to calculate the orbit of a satellite around the Earth, it is necessary to take into account its rotation around the common center of mass of the Earth and the Sun, especially for a flight from the Moon to Earth. And the mathematical Problem of constructing a Unified Picture of the Description of Nature is based on the abstract Gödel Theorem on the Incompleteness of any Axiomatic Description. Leading theoreticians, in fact schizophrenics, who adjust the Description of Nature to theoretical piecewise continuous models, actually hide their Misunderstanding of the Basis of Physics behind this Theorem. But here again the social question arises. As Grisha Perelman showed, even the correct mathematical calculation cannot be made without ethics. And the founders of Quantization Max

Planck with Albert Einstein were actually repressed by “scientists” when they doubted the Correctness of the Schrödinger equation. Gödel’s Abstract Theorem is akin to the Paradox of Set Theory about the absence of a Unified Logic of Description, erroneously attributed to Russell [1]. But it is only an instant snapshot of the Numerical System, which does not reflect its Dynamics and does not resolve the Liar’s Paradox. Prigogine’s Thermodynamics of Flows in Nature is fully applicable to the Space of Knowledge about Nature. The primitive, phenomenologically erroneous Theory of Magnetism [2] went through a tragic path during its construction, worthy of Shakespeare’s pen. Magnetic Force, “described” by the ancient Chinese as the Force of DAO, was transformed into Descartes’ “gimlets”. But the Law of Magnetic Force, as well as the Law of Electric Force, in the first approximation was completely correctly constructed for “Magnetic Charges”. the same Coulomb But on the wave of inspiration of the discovered connection of Magnetism with Electric Current (quite justified - by the indirect characteristic of the Ampere Force, the speed of light was first determined!), Coulomb’s magnetic Law was not supplemented/expanded, but considered erroneous. So theorists, simply replacing Descartes’ “gimlets” with a rotor, piled up a lot of “Theories” built on the mystical “Rule of the Right Hand”, on a “gimlet” that appeared out of nowhere, wrote off their Misunderstanding of the fundamentals to the Insufficiency of the Classics for describing Magnetism. But this is not entirely true, or rather, as follows from this work, it is not true at all.

The absoluteness of the Law of Force

The Principle of Logarithmic Relativity, which manifests itself primarily in the Scale form (alternation of reliably established classical models on large and small scales) and in the Frequency-Energy form (alternation of similar series of resonances for energies of different scales), also manifests itself in the Order-Operator form (quasiparticles in the space of speeds are described by the same laws as particles in the coordinate space). According to this Principle, all Phenomena in Nature can be laid out on two “Shelves”: Fields and Particles, which, like steps of a ladder, allow one to move both in depth and in breadth in the Description of Nature. Thus, Fields, with a deeper description, themselves can be described by a collective of subparticles. And the Description on each “Shelf” strives to bring to a strictly self-consistent - Complete and Independent View of Nature, which led to their formal antagonism - Dualism. And although the still blind mathematician Pontryagin “saw”

that this Dualism is just two ways of describing related (in the simplest case, by the Fourier transform) congruent functional sets. We will not go into details of this issue here, as in the work “Dualism of Newton’s Elementary Particle” [3,4]. But we will dwell on the main Characteristic of the Field (Continuous, as opposed to Discrete for particles) Description - on the Force. It is the Force that is usually considered acting on the Particle - a single test Charge, called Tension for any Field, including the Electric Field. And the dependence of this Force on the distance to its Source (Charge) is called the Law of Force. So, Electrostatics itself is fully characterized (and in the first approximation strictly described) by the Classical Coulomb Law - the Law of interaction of two Charges through their corresponding Electrostatic Fields:

$$F_C = k_e \frac{|q_1| |q_2|}{r_{12}^2} \quad (1)$$

And for motionless (for a long enough time), “frozen” Charges, this “frozen” Coulomb Law actually describes all Electrostatics. And just like the “frozen” Newton’s Law of Universal Gravitation, it describes all Classical Mechanics [5]. So, there is no Ground even for the assumption that this Law of Electric Force is conditional and that it needs to be adjusted taking into account the curvature of Space. But, on the other hand, it describes the Space around the Charge in a field, continuous way, as a Flow of Force, i.e. actually a Flow of Subparticles of another, next (within the field) scale, Subparticles flowing from the Charge into our 3-dimensional space. So that from Mysticism (immeasurable by us) in Electrostatics there remain only Subparticles flowing from the Charge and, unknown (to us) how, returning to it. Or the Cloud of “Vapor (evaporation)” formed around the Charge from Subparticles, but we have not yet learned to measure the Forces of interaction of Subparticles (their “internal” Fields) necessary for its formation. Nevertheless, the Interaction of a Particle with its associated Field gives the Absolute Law of Force. And this Law is determined by the dimensionality of the Space in which this Field exists. And the Field, as Academician Alexandrov said, is what we can Measure. But due to the non-strict use of the Ostrogradsky-Gauss theorem without taking into account the dimensionality of the source of the Electrostatic Field, a small but quite fundamental error has crept into Electrostatics. So if during the integration of the Force of point Charges of an infinite, uniformly charged line on a given Charge (Figure 1).

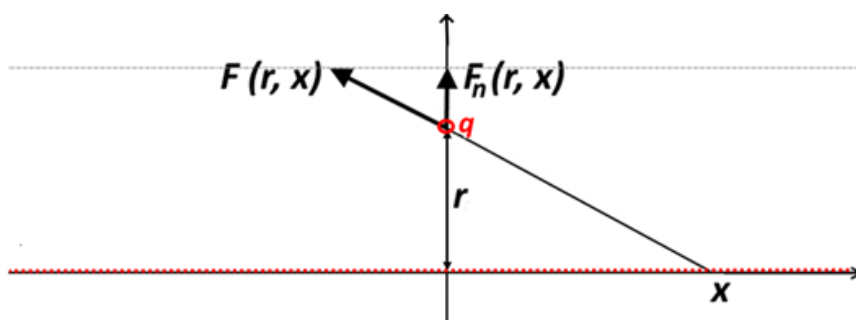


Figure 1: Partial contribution from each point on a charged line to the force of repulsion of the charge from the line.

We get that Coulomb's Law, which is inversely proportional to the second power of the distance, gives a decrease in the Electrostatic Field with distance from the line that is inversely proportional to the first power of the distance:

$$F_n(0, r) = \int_{-\infty}^{\infty} \left(1 / (r^2 + x^2) \right) \left(r / \sqrt{r^2 + x^2} \right) dx = 2 \sqrt{\frac{1}{r^2}} = 2 \frac{1}{r} \quad (2)$$

Therefore, the Electric Field Strength of a charged line, as well as in Magnetism, the Ampere Force of a current line - due to not taking into account the dimensionality of the Charge source, is only an indirect, not a direct characteristic of the Magnetic Field [6, 7]. In both cases, the Force integrated over the coordinate of the line

forms cylindrical Equipotentials around the Charge line. Integration of the Force of point Charges of an infinite, uniformly charged plane even gives the absolutely correct Independence of their Electrostatic Field from the distance when moving away from the plane. This trivial result is used in all capacitors. But the integration of the Force of point Charges of a charged sphere was considered in electrostatics in a simplified way, only around the sphere, and not inside it. So in fact, this is only when considering a sphere completely identical to a point. But if the charged sphere is three-dimensional, then its elementary comfortable transformation gives both the internal distribution of Electric Tension and Electric Potential, completely similar to their external distributions (Figure 2).

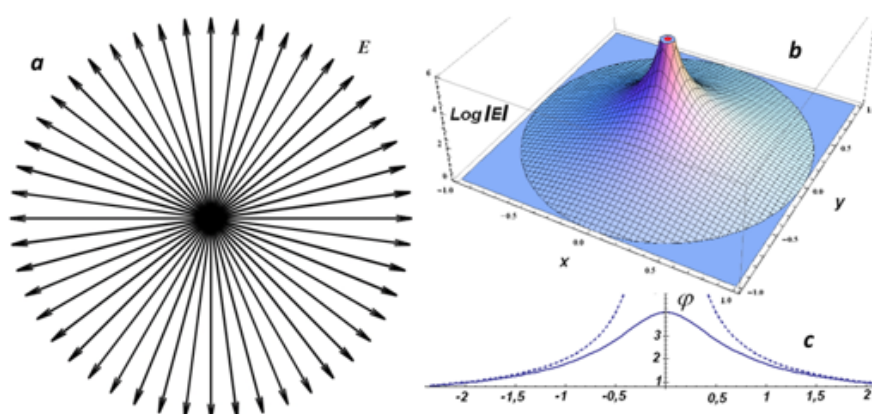


Figure 2: The lines of force of a point charge (a) thicken as they approach its center, which means both an increase in the electric field strength E in any direction and the conversion of its total strength to zero at the center (b) and the tendency of the Electric Potential to a maximum.

That is, we have the maximum concentration of the Flow of Force in the center of the sphere [8, 9], which, so far, we simply have not learned to use. So, in principle, it is possible, taking into account

the amendment made to the application of the Ostrogradsky-Gauss theorem, to use the Electric Field in the sphere for extreme impact on materials (Figure 3).

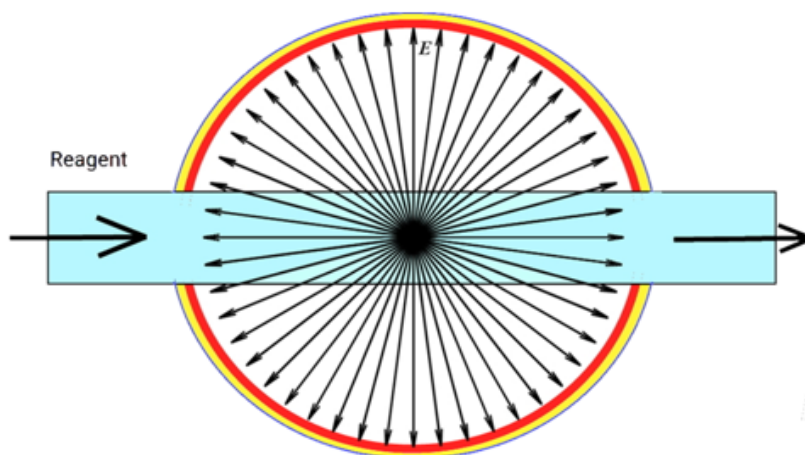


Figure 3: Scheme of generation-registration of longitudinal electric pulses (a) and the basic scheme of "cold thermonuclear fusion" in the electrostatic sphere.

Although for a charged cylinder, the concentration of the electric field on the axis of the cylinder has long been used in electrostatic lenses without deep science. And so, the Absoluteness of the Law of Force, both Gravitational and Electrical, as already noted, gives a Static Picture of the distribution of Forces and in this regard, does not need correction. But, as will be shown below, a simple dynamic distortion of the Static Picture does not give a complete Description. Some experimental data indicate that the Static Picture of the Field is incomplete!

Relativity of the Coulomb Force

Relativity in Kinematics, including Charges, corresponds to taking into account movement and, thus, in principle, going beyond the Static Model. In fact, this is a clarification in Kinematics of the first approximation - the linear dependence of Impulse on speed. Phenomenologically, this is, on the one hand, similar to the transition from Boltzmann Thermostatistics, in which all dynamics is built relatively to an ideal (non-existent in Nature) Thermostat. To Prigogine's Thermodynamics of Flows, which, in essence, is equilibrating on a continuously changing Nature - on Local Effects of different scales. And on the other hand, as in Thermodynamics, so in Kinematics, a correct description taking into account Local Effects requires, in principle, taking into account an additional Generalized Force [10]. But in this work we will not consider this aspect, although, as follows from it, taking into account an additional Orthogonal Force, as in Thermodynamics, is necessary. But at the beginning of this cycle of research, after finishing the combing and correction of the foundations of Quantization [11, 12], I hoped to immediately proceed, within the framework of the consideration of standard Forces, to the combing of the well-known standard foundations of the Theory of Relativity (Einstein) [13]. But I immediately encountered the fact that the Magnetic Field, included in Maxwell's equation and, as a consequence, in the Theory of Relativity, does not have a single strict, consistent definition. And in general, these "Definitions" do not fit with the Kuri Theorem. And it became clear that this circumstance drew Einstein himself to the mystical use of complexity, borrowed from Schrödinger, whom he criticized. But in fact, Mysticism was originally embedded in Maxwell's equations, which prompted Schrödinger (with Niels Bohr) to use it. Internal dissatisfaction with Mysticism prompted him to turn to Termen with a request to voice Elementary Geometric Figures. So, for me personally - simply the redefinition of the Magnetic Field, on the one hand, has already resulted in 5 publications, on the other hand, prompted a more careful analysis from the very Beginning, from the initial, above-described absoluteness of the Coulomb Force and only with the subsequent transition to its relativity.

The absoluteness of the Law of Force for stationary Sources of Force (Particles) determines, as was shown above, the dimensionality of Space and the dimensionality of the Source of Force. The relativity of the Law of Force determines the Principle of Causality, from which it follows that the displacement of a Particle cannot

lead to an instantaneous change in the Field created by it at an infinite distance from the Particle.

The above classical consideration of the Absolute Coulomb Law was purely static, as if an instantaneous snapshot of the Electrostatic Field for a Charge stationary relative to the observer. For a moving Charge, as follows from the above, the spatial distribution of its Electrostatic Field cannot change instantaneously at infinity. As a consequence, due to the time lag, which we will traditionally consider to be determined by the speed of light, a distortion of the spatial distribution of the Equipotential surfaces occurs, corresponding to the constancy of the Coulomb Force on this surface.

In this case, the relativity of the Coulomb Force corresponds to the formation of a certain Soliton in the Electrostatic Field of the Charge around the moving charge. We will not consider the far-fetched distortion of the mental Scale Grid, which I associate with the Physical Space, in which the distortions of the Fields occur. The environment in which this Soliton arises is the Charge Field itself. In the simplest case, the speed of the Soliton is determined by the phase velocity of this environment, which corresponds to the experimentally observed speed of light. The case that is naturally associated with the approach of the speed of the Charge to the speed of light, when it itself, decaying, begins to generate new harmonics, as when overcoming the sound barrier in the air; we will also not consider for now. And so, as shown in the works [14, 15], the Equipotentials on the leading edge of the moving charge are compressed (an analogue of a breaker arises), and on the trailing edge they are stretched (an analogue of a pit), the occurrence of which, in fact, determines the force of longitudinal inertia during charge acceleration. In this case, since the body exciting the wave moves with a constant speed, then in the direction of movement it catches up with the wave, and in the diametrically opposite direction it runs away from the wave created by it. Thus, formally, relative to the moving Charge itself, the speed of propagation of the waves created by it in the direction of its movement (in front of the Charge) is equal to the difference in the phase velocity of the wave in the medium (in the Field) and the velocity of the Charge, and in the opposite direction (behind the Charge), the speed of propagation of the waves created by it is equal to the sum of the phase velocity of the wave in the medium (in the Field) and the velocity of the Charge. This distortion of the Electrostatic Field in the plane passing through the Charge during its uniform movement can be described in parametric form:

$$Parametric F \{x, y\} = \{n \cos[u] + e^{-n}, n \sin[u]\}, \{u, 0, 2\pi\} \quad (3)$$

where n - the Equipotential number, equal to the distance to it, if the distance to the first Equipotential is taken to be equal to one. In this case, in the direction of movement, it is described (with good accuracy and consistently) by an exponential decrease in the distance between Equipotentials (Figure 4).

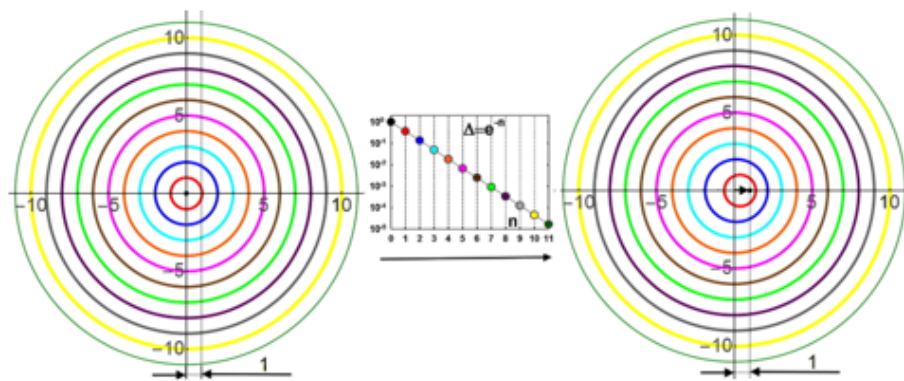


Figure 4: Sections of the Equipotential plane of a stationary Charge (left) and their displacement with a lag from the displacement of the Charge (in the center) by the delay time (right).

Thus, from the Principle of Causality it follows that relatively to a moving Charge its Equipotentials have Eccentricity (Figure 5, left).

$$ParametricF\{x, y\} = \{n \cos[u] + e^{-n} - 1, n \sin[u]\}, \{u, 0, 2\pi\} \quad (4)$$

s

where and for shifted Equipotentials n is the corresponding ordinal number of the Equipotential equal to its radius with the dis-

tance between neighboring Equipotentials for a stationary Charge taken as a unit.

In this case, the distance between Equipotentials near the Charge in front of the moving Charge decreases, and behind it increases (Figure 5, top)

$$\Lambda_{1\{n-(n-1)\}} = 1 - v^* \text{Sign}[n] e^{-Abs[n]} \quad (5)$$

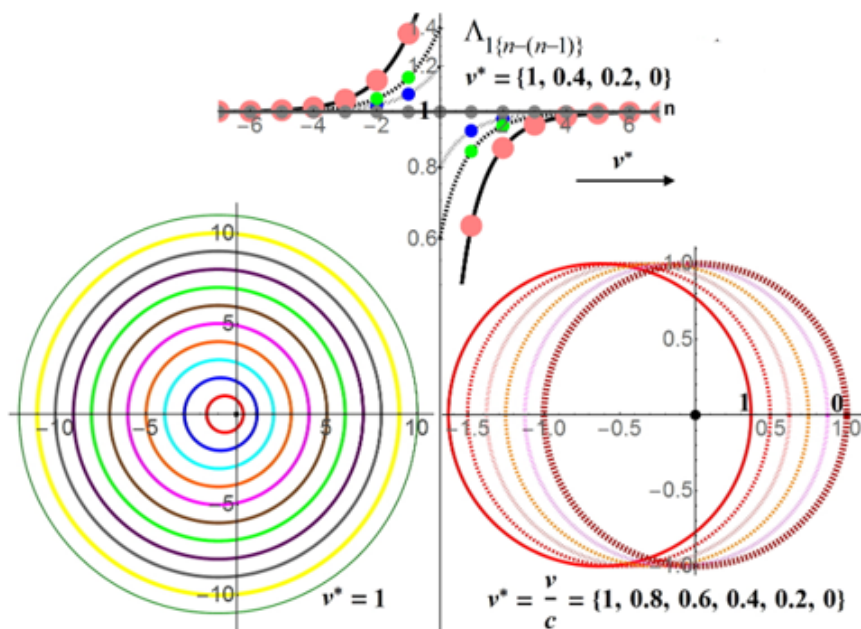


Figure 5: Maximum Eccentricity (left) - change in the distance between Equipotentials (top) during the shift of the first Equipotentials of the Charge moving at the speed of light and the Eccentricity of the first Equipotential for different relative velocities (right).

The Eccentricity value shown in Figure 4 (left) is selected based on the calculation of the Charge shift by one unit at the maximum speed. This Eccentricity, naturally, depends on the speed of the Charge: it is equal to zero for a stationary Charge and is maximum, equal to one unit, for a Charge whose speed tends to the speed of light. So the Eccentricity arising during the Charge movement can

be taken into account in the first approximation using the factor relative speed (Figure 5, right). And, naturally, the delay time for each Equipotential and, consequently, its Eccentricity are determined by the ratio of the speed of the charge to the speed of light (Figure 5, right).

$$ParametricF\{x, y\} = \left\{ n \cos[n] + \frac{v}{c}(e^{-1} - 1), n \sin[u] \right\}, \{u, 0, 2\pi\} \quad (6)$$

The transformation of the Equipotentials of the Coulomb Field shown in Fig. 5 is similar, as already noted above, to a breaker in front of the ship with a depression behind the ship, and/or a "gravitational oar" in the case where the source of the Gravitational Field is the Mass. In fact, this is hydrodynamic resistance, only if for the

surface of the water it is determined by the difference in potential energies in the breaker and the depression generated by the movement of the ship, then for the Gravitational Field - "elasticity", associated with the fact that there is a positive addition in front, and a negative addition behind to the potential energy of the field:

$$\int_0^\infty v^* \text{Sign}[x] e^{-Abs[x]} dx = v^*, \int_{-\infty}^0 V^* \text{Sign}[x] e^{-Abs[x]} dx = -v^* \quad (7)$$

And for the Electric Field, as well as for the Gravitational Field, this Longitudinal Inertia manifests itself similarly [16]. But the

Charge, in principle, is easy to change and screen and, thus, to register, as shown in Fig. 6, the Longitudinal Waves of its Field.

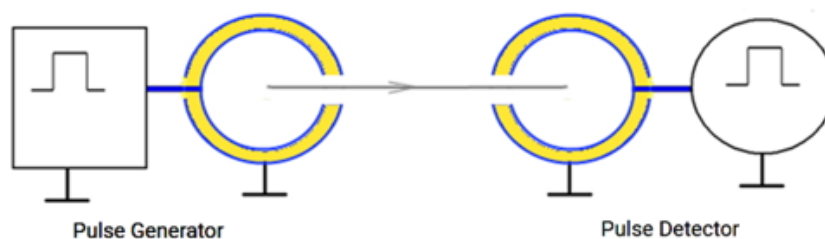


Figure 6: Scheme of generation-registration of longitudinal electric pulses.

The scheme presented in Figure 6 is constructed taking into account the amendment made for Absoluteness to the Ostrogradsky-Gauss theorem. Such a scheme of registration of longitudinal electric waves raises the question of measurability and integrity of Charges. From the functional similarity of the Gravitational and Electric Fields, Einstein's Relativistic Correction can be applied to both Mass and Charge.

$$m_R = \frac{m_0}{\sqrt{1-(v^*)^2}} \Rightarrow q_R = \frac{q_0}{\sqrt{1-(v^*)^2}} \quad (8)$$

The Relativistic Correction, like any correction, is strictly applicable only for small changes in the rest parameters - near zero relative velocity. And when approaching the speed of light, the correction gives a non-physical divergence (infinity). Apparently because the linear approximation at high speeds simply does not

work, especially since, as follows from expressions (7), the jump in the relative potential energy of the Field of a moving particle for the speed of light tends not to infinity, but to two. But this addition can be considered based on the fact that the moving particle excites the Soliton shown in Fig. 5, which, as is known, has an effective mass. And its behavior is similar to the finite polariton increase in the Mass and Charge of the particle. Then, in the Law of Conservation of Momentum, the Soliton momentum must be added to the Particle Momentum. And in the Law of Conservation of Energy, the Soliton energy must also be taken into account. Then the well-known formula for the relationship between Energy and mass breaks down into two correct components of Kinetic Energy

$$E = mc^2 = \frac{m_{particle}}{2} + \frac{m_{soliton}c^2}{2} \Rightarrow m_{particle} = m_{soliton} \quad (9)$$

But, as already noted, the additions to the Mass that follow from the consideration of the Longitudinal Inertia of the Particle are quite expected as additions to the moving Charge. The introduced assumption about the exponential decay of the Equipotential displacement is, in principle, a reasonable approximation for the maximum speed. Although, strictly speaking, it requires solving a differential equation and it is impossible to completely exclude the presence of a feature that is affected by Einstein's Relativistic Correction.

Conclusion

And so, the Analysis, started, as already noted above, from the foundations of the Theory of Relativity, led, on the one hand, to the necessity of redefining the Magnetic Field. And the Analysis of the Magnetic Field, at this stage, returned to the foundations of Relativity for a moving Charge - to Relativity based on the Absolute Coulomb Law, described by Longitudinal Inertia due to the compression/extension of Equipotentials in Space, and not the fictitious compression/extension of the coordinate grid used to describe it, which was mistakenly taken for Space itself. At the same time, it became phenomenologically clear that the usual Polariton Effect corresponds to the Cross Effect between mass and charge, while Einstein's relativistic correction affects the Direct Effect - an increase in the Effective Mass of a moving Particle due to the compression/extension of the Gravitational Field in Space. Similarly, we have the Direct Effect for Charges-an increase in the effective Charge of a moving Charge due to the compression/stretching of the Coulomb Field. But at the same time, we must still take into account that no symmetrical distortion of the Field by a rectilinearly moving Mass or Charge occurs when considering the Longitudinal Inertia in the plane perpendicular to the velocity of the Particle, but the shown asymmetrical distortion of the Field in Space along the velocity arises, which, if integrated over the entire (infinite) volume, we obtain an additional Effective Mass/Charge dependent on the relative velocity. And this addition is not some kind of mysticism, it is a characteristic parameter of the Polariton excited by a moving particle in its own Field. But, as was previously evident from the Analysis of the Magnetic Field, the Inertia of the Charge (and Mass) also requires taking into account the Orthogonal Force [17]. And this became visible when analyzing the behavior of the Charges, because the specific Electrostatic Forces are gigantic (42 orders of magnitude greater than Gravitational Forces), and on the other hand, in many cases, unlike Gravitational Forces, they can be screened in the first approximation by Charges of the opposite Sign, as, for example, when current flows in metals. At the same time, a not at all small correction to electrostatics "crawls out" due to Motion - Relativity, which, in turn, exhibits "anomal" symmetrical

properties!

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