ON THE POSSIBILITY OF THE NEW COMMUNICATION METHOD AND CONTROLLING OF THE TIME COURSE

V.P. Oleinik, Yu.C. Borimsky

Department of General and Theoretical Physics,
National Technical University of Ukraine "Kiev Polytechnic Institute", Prospect Pobedy 37, Kiev, 03056, Ukraine;
e-mail: yuri@arepjev.relc.com

Yu.D. Arepjev

Institute of Semiconductor Physics, National Academy of Sciences of Ukraine, Prospect Nauky 45, Kiev, 03028, Ukraine
http://temporology.bio.msu.ru/OLEINIK/oleinik.htm.

Report at the VI International Conference
Material Science and Material Properties for Infrared Optoelectronics
Kiev, Ukraine, May 22-24, 2002

Abstract

The results of an approach based on the synthesis of standard quantum electrodynamics and of the ideas of self-organization in physical systems are briefly outlined. The quantum model of electron as an open self-organizing system is constructed, with the physical mechanism of self-organization consisting in **the back influence of the own field created by electron on the same electron.** The own field is considered as a physical property of electron, intrinsically inherent in electrically charged matter, which is included in the definition of the particle. The own field of electron endows the particle with wave properties and represents a carrier of superluminal signals, which can be used for the creation of qualitatively new communication systems. Because of the inseparability of space and time, the force in relativistic mechanics is the cause of change not only of the velocity of particle, but also of the course of time along the particle's trajectory. For this reason the flow of time in some area of space depends on the character of physical processes, occurring in it, and, therefore, **time can be controlled by slowing down or accelerating of its course by means of material processes.** The conclusions of the paper are not in conflict with the special theory of relativity (STR); they are a direct consequence of relativistic equations of motion and represent an essential development of the generally accepted notions about space and time. The physical mechanism of nuclear reactions at low energies caused by spatial extension of electron is considered. Nuclear reactions of this type represent intra-electronic processes, more precisely, the processes occurring inside the area of basic localization of electron. Distinctive characteristics of these processes are defined by interaction of the own field produced by electrically charged matter of electron with free nuclei. Because of the existence of simple mechanism of nuclear reactions at low energies, nuclear reactor turns out to be an atomic delayed-action bomb, which may blow up by virtue of casual reasons, as it has taken place, apparently, in Chernobyl. The use of cold nuclear reactions for production of energy will provide mankind with cheap, practically inexhaustible, and non-polluting energy sources. **At present all the necessary prerequisites are available, both theoretical and technical, for the practical mastering of the own fields of particles and of the physical properties of time.**

Introduction

As is known, within almost hundred years superluminal signals were tabooed in physics and everyone was confident that such signals couldn't exist in nature. But in the last ten-fifteen years the investigations on superluminal communication are carried out in many research centers of the world. Some of these centers are listed below: **Israel** (Tel Aviv University, Weizmann Institute of Science, Ben-Gurion University of the Negev) - experiments in parametrically amplifying media, **USA** (University of California, Berkley, Los Alamos National Laboratory, New Mexico, Harvard-Smithsonian Center for Astrophysics, Cambridge, Massachusetts) - experiments with photon tunneling, **Germany** (Institut fur Theoretisch Physik, Universitat zu Koeln) - experiments on the digital signal propagation in glass fiber and waveguides, **Italy** (Università a statale di Bergamo and Sezione di Milano of I.N.F.N) – theory and experiments, **India** (Indian Institute of Astrophysicsy, Koramangala, Bangalore, Bose National Centre for Basic Sciences, Salt Lake, Calcutta), **China** (Institute of Quantum Mechanics, Beijing), **Brazil** (Universidade Federal de Alagoas) - application to electronics.

A variety of mechanisms is now known to give rise to superluminal (faster-than-c) group velocities, which express the peak advancement of electromagnetic pulses reshaped by material media [1]:

1. *Near-resonant absorption.* Anomalous dispersion in the linear regime of an absorbing medium forms the basis for this superluminal reshaping mechanism.

2. *Reduced transmission or evanescent wave formation (tunneling) in passive dielectric structures.* This reshaping mechanism has been attributed to interference between multiply-reflected propagating pulse components in the structure.

3. *Soliton propagation in dissipative nonlinear structures.* Superluminal group velocities can occur in such systems via nonlinear three-wave exchanges, as in stimulated Brillouin backscattering in the presence of dissipation. They also occur in a non-linear laser amplifier.

4. *Pulse propagation in transparent (non-resonant) amplifying media.* Superluminal pulse reshaping in this regime has been attributed to either the dispersion or the boundary reflections of the amplifying medium.

Taboo is removed, at last, in analytical investigations as well. According to Drummond and Hathrell [2], in many cases the effect of vacuum polarization is to induce a change in the velocity of light to 'superluminal' speeds, i.e. **v > c**. Really, in classical electrodynamics combined with general relativity, light propagates simply along null geodesics. In quantum electrodynamics, however, vacuum polarization changes the picture and the background gravitational field becomes a dispersive medium for the propagation of photons. Now such an approach is intensively developed by many theorists.

Recent manifestations of apparently faster-than-light effects confirmed predictions that the group velocity in transparent optical media can exceed **c**. Special relativity is not violated by these phenomena. Moreover, in the electronic domain, the causality principle does not forbid negative group delays of analytic signals in electronic circuits, in which the peak of an output pulse leaves the exit port of a circuit before the peak of the input pulse enters the input port. Furthermore, pulse distortion for these "superluminal" analytic signals can be negligible in both the optical and electronic domains. An extension of these ideas to the microelectronic domain is suggested. The underlying principle is that negative feedback can be used to produce negative group delays. Such negative group delays can be used to cancel out the positive group delays due to "transistor latency" (e.g., the finite RC rise time of MOSFETS caused by their intrinsic gate capacitance), as well as the "propagation delays" due to the interconnects between transistors. Using this principle, it is possible to speed up computer systems [3].

But all these investigations on superluminal information transfer deal with optical signals (packets of electromagnetic waves). Radically new approach to superluminal information transfer is developed by the research group on quantum electrodynamics of self-organizing systems and physical properties of time (http://temporology.bio.msu.ru/OLEINIK/oleinik.htm). The results obtained were partly reported in two previous SPIE-conferences [4,5] and are summarized in the monography [6].

As is evident from the analysis of the newest development of quantum electrodynamics, at present we are on the threshold of revolution in engineering. Already now, when one is at the very beginning of the new ascension, it is possible to indicate with certainty the following trends of development in engineering in the 21st century [7].

Firstly, **there will be created the essentially new means and systems of communication working on superluminal signals whose bearers are the own fields of material bodies**. By their physical characteristics – by the speed and range of information transfer, by the capacity to penetrate through obstacles, by their reliability in service - the new communications facilities will be much superior to the now existing ones.

Secondly, **the physical properties of time**, whose existence was indicated by N. Kozyrev almost half a century ago, **will be used for practical purposes.**

Self-organizing electron, its own field, and superluminal signals

The standard formulation of QED proceeds from the assumption that electron is a structureless point particle. This assumption results in a serious difficulty – the divergence of self-energy of electron. One more difficulty of the conventional approach is that quantum mechanics is unable to explain stability of the point-like electron. Really, the wave packets, which could have a claim on the role of the wave functions describing the behavior of a free point-like electron, spread out in time, which contradicts the experimental fact of stability of the particle.

The difficulties mentioned above are very serious. According to Dirac, the difficulties of QED "in view of their fundamental character can be eliminated only by the radical change of the foundations of theory, probably, radical to the same extent as transition from the Bohr orbits theory to modern quantum mechanics" ([8], p.403). "Correct conclusion is that the basic equations are erroneous. They should be changed in such a way that divergences do not appear at all". As an analysis of the problem shows, one should abandon all attempts at using the notion of point-like electron and should take into account that the self-action of electron is the key to constructing a consistent quantum model of the particle.

New lines of approach to the problem of electron are proposed in [6,9]. The approach represents a synthesis of conventional quantum electrodynamics and the ideas of the theory of self-organization in physical systems [10]. The physical mechanism of self-organization consists in the back action of the own field created by

charged particle upon the same particle. It is described by the model of open system with the wave function belonging to indefinite metric space.

The essence of the approach developed is that the own field of electron is considered as a physical property intrinsically inherent in the particle and, when formulating the theory, the own field is included in the definition of electron from the very beginning. This means that we adopt as zero approximation not a "bare" electron, but an electron capable to create the own field and to "feel" its back influence.

Mathematically, taking into account the back action of the own field created by particle upon the same particle results in the non-linearity of dynamical equation describing the behavior of electron. Thus, electron becomes a ***self-organizing system,*** whose physical properties, geometrical shape, and linear dimensions may be determined in a self-consistent way from solutions of the basic dynamical equation. Electron is a quantum (elementary excitation) of the field of charged matter localized in a bounded region of space and subject to the Coulomb self-action.

Since electron represents a clot of electrically charged matter, creating the long-range Coulomb forces in surroundings, its environment turns into a medium, which can have a determining influence on physical properties of the particle. In view of the long-range character of the Coulomb field, electron becomes ***an open system*** inseparably bound with the environment. In a sense the whole universe takes part in the formation of electron as a physical system.

Obviously, to describe electron as an open system one should introduce into quantum mechanics a radically new point, namely: one should replace the model of isolated system described by harmonic oscillator, which is at the heart of modern physics, with the model of open system. It is pertinent to note here that the quantum particle theory based on the use of the models of isolated system is, strictly speaking, physically meaningless. Really, any observation conducted on a system represents a process of interaction of the system with the means of observation. In the case of microparticles (quantum particles) this interaction is not weak, and consequently it is inadmissible to neglect it, i.e. microparticles should be necessarily considered as open systems.

As open system has the richer physical contents in comparison with isolated system, the essentially new mathematical ideas are needed for such a system to be described. To take into account that real electron, being considered as an open system, is inseparably linked with surrounding medium, we should first of all increase the number of dynamical variables describing it. Really, real electron can be imagined as a system consisting of two components: one of them should correspond, in a sense, to the particle alone (to the "bare" particle) and the other to the surrounding medium, in which the

particle moves. Therefore, in the simplest model of open system one should double the number of dynamical variables. To each dynamical variable of the "bare" particle there should correspond two dynamical variables, which should be considered as components of the wave function describing the quantum state of particle. Besides, the system under study should be subordinated to a condition for openness expressing the fact that real electron is indissolubly bound to environment and its interaction with environment cannot be weak. The condition for openness can be formulated as follows: the open system should make sense only in the event that there are simultaneously both components – the particle alone and the environment, and these components should be equivalent.

From the action principle, the basic dynamical equation is derived taking into account the relativity principle and describing the self-acting electron as an open self-organizing system [6,11]. By its appearance this equation coincides with the usual Dirac equation for a charged particle in an external field described by 4-potential. However, in reality, it differs essentially from Dirac's equation. The distinction consists in that the equation derived is non-linear and non-local, with the non-locality being of spatial and temporal character.

As a detailed analysis shows, solutions to the basic dynamical equation of electron describe the clots of self-acting electrically charged matter, localized in space, i.e. electron is a soliton. The self-acting electron can be in different quantum states characterized by internal energy, dimensions, and geometric shape. The internal energy spectrum of electron is discrete with an infinitely large number of levels. To each value of internal energy there correspond certain linear dimensions and geometric shape of the region of localization of electron's charge. Dimensions and the number of extreme of wave function increase with increasing the value of internal energy.

The distribution of electric charge of electron in the ground state consists of the range of basic localization with the linear dimensions of the order of Bohr radius a_0 $(a_0 \sim 10^{-10} m)$ and of the tail stretching up to infinity. Owing to the non-linearity of the dynamical equation of electron, the wave function does not obey the superposition principle. In virtue of this electron acquires the properties of absolutely rigid body: the perturbation acting on electron at an instant t in the range of basic localization becomes known at the next instant $t + \varepsilon$ $(\varepsilon \to +0)$ at any distance from it [12].

According to the generally accepted point of view, the velocity of light in vacuum is the greatest possible velocity of transfer of a signal existing in nature. This conclusion was formulated by A. Einstein as a consequence of the special theory of relativity (STR) as follows: "... There is no way of sending the signals which would propagate faster than light in vacuum " (see [13],

p. 157). At the same time the astronomical observations conducted by N.A. Kozyrev and others [14-16] have shown that there exists in nature some mechanism of action-at-a-distance of one body on the other resulting in the superluminal transfer of signal.

An attempt to find in electrodynamics the physical mechanism of superluminal transfer of information is undertaken in [4,12]. It is noted here that **the physical bearer of superluminal signals is the own field of electrically charged particle**. This field is of a dual nature: on the one hand, the own field is governed by the Maxwell equations and consequently it is an electromagnetic field and, on the other, it is created by a charged particle and cannot exist when the particle is absent, i.e. it represents in some sense a constituent part of the particle. It is not surprising that the own field of particle considerably differs by its physical properties from the field of electromagnetic waves: it is of a purely classical character and cannot be reduced to the set of photons. The own field seems to be responsible for the wave properties of particle, which are manifested in experiments on diffraction of electrons. The function of the own field of a charged particle is to transform the environmental space to a physical medium with the properties of an absolutely solid body. One of the physical properties of this medium is that it is capable of transferring a signal, connected with a perturbation occurring at some point of space, instantaneously to arbitrarily large distances.

According to [4,12], **the transverse vortex electromagnetic field consists of two components** significantly different from each other by their physical characteristics - **the electromagnetic waves and the own field of charged particles**. To these components of electromagnetic field there correspond two mechanisms of transferring a signal (information): (1) the instantaneous transfer of a signal via the own field of charged particles, representing the standing waves of matter rigidly linked with particles and going from them to infinity or to other particles, the own field being capable of transferring a perturbation both with the speed of light and instantaneously; and (2) the transfer of a signal with the speed of light by means of electromagnetic waves, which are emitted by particles when they move with acceleration and then separate from the particles. It should be stressed that both mechanisms of transferring information mentioned above work simultaneously as though duplicating each other.

The existence of instantaneous signals necessarily follows from both the laws of electrodynamics and the most general considerations. As the own field of electron is inseparable from the particle, electron and its own field should be considered as a single physical system. In view of the long-range character of the own field, this system fills in the whole space. In order for such a system to be stable, a physical mechanism should exist combining its parts into a unit. The instantaneous transfer of information via the potential and vortex components of the own field of electron is, apparently, such a mechanism. In other words, the instantaneous signals are indissolubly related to the processes of self-organization, resulting in formation of the internal structure of charged particles.

To specify the physical mechanism of superluminal transfer of information, let us turn to the quantum theory taking into account self-action. According to it, electron represents a soliton - a clot of electrically charged matter having the physical properties of absolutely solid body (because of the violation of superposition principle). It is a complicated dynamical system consisting of a region of basic localization, with the sizes being of the order of Bohr radius for the ground state of particle, of a tail, extending up to infinity, and of the own field. The presence of the tail manifests itself in that the charge density of the self-acting electron proves to be distinct from zero (though rather small in magnitude) far outside the region of basic localization of particle. The oscillations of the charge density, occurring in this region, are instantaneously transferred along the tail via the own field of particle to any distances and excite the oscillations of electric and magnetic fields at each point of space. This process ensures that information about a physical event occurring at some point of space can be gained immediately from a measurement conducted at any place of the universe. It should be noted that the effect is absent for a point-like particle.

As is known, the presence of an environment capable of transferring an oscillation from one point of space to the other is a necessary condition for the existence of waves. For electromagnetic waves, such an environment is, apparently, the own field of particle. The latter is similar to the elastic strings that bind electric charges to the environmental medium and endow it with properties of an absolutely solid body. These strings are inseparable from the charged particle, they are not of photon structure and consequently they cannot be destroyed without destroying the particle, with which they are connected. When a charged particle moves with acceleration, a photon field is split out of its own field, the vortex own field of the particle being deformed and losing its axial symmetry.

Generally, the own field of particle contains four components according to the four now known types of interaction - electromagnetic, weak, strong, and gravitational. Each of these components is a classical field linking the particle to the surrounding world via superluminal signals [7].

The inference about the possibility of superluminal transfer of a signal with the help of self-field of charged particles is in the obvious contradiction with the standard point of view, which for the first time was formulated by A. Einstein as a consequence of the special theory of relativity [13]. A detailed analysis of the problem shows, however, that our conclusion is in agreement with STR. The standard point of view is true only at first sight; it cannot be proved within the

framework of STR. As is obvious from the analysis of the superluminal excitation transfer through the own field of particle [6], the statement that the transfer of signals with faster-than-light speed is impossible is in essence an additional postulate contradicting Maxwell's equations.

The generally accepted standard evidence that superluminal signals cannot exist in nature is erroneous. The fallacy of the evidence consists in that the causal relationship between two events is analyzed within the framework of kinematics without using the equations of motion. The causality problem is, however, a problem of dynamics, because the case in point is the transfer of interaction from one event to the other. Hence, it can be solved only by the analysis of solutions of dynamical equations subordinated to proper boundary conditions. Remaining in the framework of kinematics, it is impossible in principle to solve the causality problem. In the generally accepted reasoning relating to superluminal signals, dynamics is not considered at all and consequently the conclusion about impossibility of superluminal signals is not justified.

The change of the course of time in external fields

In Newtonian mechanics time is of an absolute character, it does not change as one passes from one inertial reference frame to another and represents merely a parameter, whose change, at the will of explorer, results in the change of state of a mechanical system in accordance with the equation of motion.

In relativistic mechanics time remains a parameter describing the development of system. But now time and space are intimately linked with each other to form a single whole – the 4-dimensional space-time. In going from one inertial frame of reference to another time gets entangled with spatial coordinates, so that time in one reference frame represents a "mixture" of time and coordinates in the other. Time ceases to be universal, the same in all inertial reference frames; it takes on a relative character.

The indissoluble association of time and space takes on special importance in the light of the concept of physical field, which was called by Einstein the most important discovery in physics after the times of Newton. According to this concept, the occurrence in space of a force field means that space turns into a physical environment, which is capable to interact directly with other bodies and gains, thus, physical properties, becoming an active participant of physical processes. In view of the fact that space and time are indissolubly related to each other, the presence of a force field in some area of space must necessarily result in the appearance of physical properties of time caused by the motion of body in this area.

Thus, from the synthesis of the notion of space-time and of the idea of physical field it follows with necessity that the course of time in a given region of space should depend on physical processes in this region, i.e. time, as well as space, should have physical properties [5,7,17].

It should be emphasized that in STR time and spatial coordinates are independent and formally equal in rights quantities, which determine the position of elementary events in space-time. On the other hand, time stands out in relation to spatial coordinates. The special role of time is due, from the viewpoint of geometry, to the pseudoeuclidity of geometry of the 4-dimensional space. From the physical point of view, it is associated with the dynamical principle (causality principle), according to which the state of motion of a physical system at an instant of time t uniquely defines its behavior at the next instant of time $t + 0$. The significance of dynamical principle lies in the fact that it relates the temporal evolution of system to the physical processes caused by force fields and in doing so it allows one to determine the course of time in the system, its possible dependence upon the character of physical processes, and not just the sequence of events and their duration.

The idea about the existence of the physical properties of time belongs to N. Kozyrev [14]. By introducing into mechanics an additional parameter taking into account the directivity of the course of time, Kozyrev has formulated causal (asymmetrical) mechanics from which it follows that time has physical properties. According to the results of theoretical and experimental investigations conducted by Kozyrev and his followers [14-16], events can proceed not only in time, but also with the help of time, information being transmitted not through force fields, but via a temporal channel, and the transfer of information happens instantaneously. According to [5,7,17], the conclusion that physical properties of time exist follows strictly from relativistic mechanics, without introducing any additional hypotheses. The physical properties of time are of purely dynamical nature: their existence results from dynamical principle. The availability of physical properties of time is manifested in that time has a local inhomogeneity: its course along the trajectory of motion of a point particle in a force field is continuously changed, and this change in the course of time is a result of the action upon the particle of a force field in the inertial reference frame, in which the motion is considered.

The elucidation of the physical nature of time is one of the most important problems of theoretical physics. The purpose of research on the problem of time is to study the physical properties of time, i.e. to ascertain the possible interrelation between time and material processes. In particular, it is of interest to find out

- whether the flow of time depends upon physical processes and whether the back influence exists of the change of the course of time on physical processes,

- what mechanisms of the change of the course of time exist,

- what factors are capable to speed up or to slow down the flow of time.

In our papers on the basis of Lorentz transformations relating to coordinates of points, lying on the trajectory of motion of particle in a force field, the phenomenon of local dynamical inhomogeneity of time is predicted. The main result consists in the proof that material processes occurring in a physical system under the action of a force field necessarily influence the course of time along the trajectory of motion of particle. The case in point is the change of the course of time along particle's trajectory in one inertial reference frame as compared with that in the other. Also the relationship is obtained which relates the course of time on one path section of a particle when moving in a force field to that on the other path section in the same inertial reference frame [17]. The main idea underlying the approach developed results from the analysis of Lorentz transformations and consists in that the course of time of a particle moving by inertia, i.e. not subject to the influence of a force, should be uniform.

As is well known, the existence of the dependence of the course of time on gravitational field, for example, is substantiated in the general theory of relativity (GTR). In this connection the question arises: What is new in the approach being developed?

First of all, it is pertinent to make here a quotation from [18] (see p. 303): "Already in the special theory of relativity the flow of true time is different for the clocks moving relative to each other. In the general theory of relativity (GTR) the true time flows in different ways also at different points of space in the same reference frame. This means that the interval of proper time between two events occurring at some point of space and the interval of time between the events taking place simultaneously with them at the other point of space, generally speaking, are different from each other". As "the gravitational field is nothing but the change of the space-time metrics"([18], p. 313), one can assert, apparently, that the change of the course of time is due, from the point of view of the GTR, to the change of the 4-dimensional space metrics.

In the approach being developed, the gravitational field is considered as an ordinary force field and the motion of particle is assumed to occur in the pseudo-Euclidean space-time. The formulas received describe the change of the course of time in an arbitrary force field at different points of space in the same inertial reference frame. According to the results received, the change in the course of time in a force field is by no means connected with the change of the space-time metrics. It is caused by the action of the force field on particle in inertial reference frame and follows directly from the dynamical principle underlying relativistic mechanics.

It is known, also, that the GTR predicts the red shift of spectral lines in gravitational field. As is seen from our results, the shift of spectral lines in gravitational field is connected not with the change of the space-time metrics, but with that the gravitational field is a force field. According to our approach, force is the reason of the change in the course of time and, hence, the reason of the shift of spectral lines of atoms (the case in point is merely that part of the shift which has a bearing on the change in the course of time).

It should be emphasized that, from the point of view of quantum electrodynamics, the shift of spectral lines of atoms is caused by interaction of atoms with force fields. This interaction results in the occurrence of the energy level shifts of atoms and, hence, is the reason of the shift of spectral lines. Evidently, the energy level shifts contain a component connected with the change of the course of time, and its magnitude can be calculated by our formulas.

If the force field is gravitational, the picture should remain the same: the shift of a spectral line of atom, caused by the gravitational field, should consist of two components - one of them is connected with the change of the course of time in gravitational field and the other has no bearing on this change.

The basic result of our research on the problem of time is that the strict proof is given of the Kozyrev hypothesis about the existence of physical properties of time, and a general relationship is received connecting the course of time on one path section of a particle moving in a force field with the course of time on the other in the same inertial reference frame. Briefly, basic conclusion may be formulated as follows [17]: **in relativistic mechanics, the force acting on a particle in an inertial reference frame is the reason of change of the course of time along the particle's trajectory.**

Conclusion

According to [6,7] the own field of electrically charged particles belongs among the physical fields, which are capable to transfer signals with superluminal speed. The inevitability of existence of superluminal signals is evident from quantum theory of electron treated as an open self-organizing system [6]. In conformity with this theory, taking into account the self-action of electron causes it to become a spatially extended dynamical system, namely: it consists of a region of the basic localization of electric charge, with the sizes being of the order of Bohr radius, ($\sim 10^{-10}$ m), of a tail of the distribution of electric charge extending up to infinity, and of the long-range own field. Apparently, in order that such a dynamical system can be stable, a physical mechanism should exist combining its parts into a unit. Superluminal signals are such a mechanism, making, thus, an important element of structural organization of matter that provides stability of real physical systems.

From the synthesis of the idea of unified space-time underlying special theory of relativity (STR) and the concept of physical (force) field, it follows with necessity that time, like space, has physical properties [5,17]. This

means that the course of time in some region of space depends on physical processes occurring in this region. The change in the course of time, in turn, influences physical processes. The results obtained are unambiguously indicative of the capability, on the one hand, to control the course of time in some region of space with the help of electronic processes and, on the other, to influence the behaviour of physical system by means of physical properties of time. The ability to change the course of time in the process of motion, which can be referred to as "the feeling of time", represents one of the most fundamental physical properties of any form of matter internally inherent in it by the very nature of things.

The existence of superluminal signals does not contradict STR. The conclusion that superluminal signals do not exist in nature, formulated at the beginning of the twentieth century as a consequence of STR, was drawn from purely kinematical reasoning, while the transfer of signal is a dynamical process, which can be correctly described only on the basis of the solution of dynamical equations.

The inferences obtained point to the possibility of creating qualitatively new means of communication, based on the use of superluminal signals, which by their physical characteristics (the velocity and distance of information transfer, the ability of penetrating obstacles) will be much superior to the existing ones.

Note that quantum theory of electron as an open self-organizing system is indicative of the existence of the following mechanism of nuclear reactions at low energies [19].

If there occur in the region of basic localization of free electron, whose linear sizes in the ground state of the particle are several times as large as those for hydrogen atom, two or the greater number of nuclei, each of them attracts on itself the adjoining areas of electronic cloud, resulting in compression of the electronic cloud as a whole. As a result, there appears automatically an attraction of the nuclei, which proved to be "inside" electron, on each other.

Calculation shows that the Coulomb barrier around nuclei is deformed, its height decreases and the probability of penetration through the barrier accordingly increases due to tunnel transition. Under certain conditions this process may result in fusion of nuclei. Obviously, the process in question can occur only at small energies of translational motion of the centers of mass of electron and nuclei: nuclei should be "inside" electron long enough for them to have time to come nearer to each other as a result of electron-nuclear interaction. This mechanism of nuclear fusion is of a universal character. In order for it to be realized, it is necessary to have only a stream of free electrons intensive enough, i.e. heavy electric current, and as long as sufficiently great number of free nuclei.

If heavy nuclei appear "inside" free electron, owing to their interaction with the electronic cloud there occurs polarization of nuclei. Because the own field of electron interacts with protons more strongly than with neutrons, nuclei are deformed (become extended), and this process may result in the decomposition of nuclei to fragments (in nuclear fission).

As is noted in [20], the official version of the reasons for Chernobyl accident contains serious contradictions, a number of facts concerning the accident has no convincing explanations, and this circumstance forces to search for the true reasons for the happening, since "not having understood the mechanism of the one tragedy, we sooner or later shall become witnesses of the other". The authors hypothesize that the reason of the accident was penetration into the nuclear reactor of magnetic monopoles, which have caused the decay of nuclei ^{238}U, and this has resulted in production of delayed neutrons, growth of power output of the reactor and explosion.

In our opinion, to account for the reasons for Chernobyl accident, there is no need to involve magnetic monopoles. The scenario of development of events during the accident, described in [20], seems to be quite plausible if only to understand by initiators of nuclear fission not hypothetical monopoles but free electrons, whose powerful pulse might arise as a result of electric discharge in the region of turbo-generators.

The existence of simple physical mechanism of nuclear reactions at low energies, indicated in this paper, implies that nuclear reactors are, in effect, nuclear delayed-action bombs which will blow up from time to time. Explosion of nuclear reactor may take place because of casual short circuit at an electric subcircuit, owing to which there appears an intensive stream of free electrons. This stream, having got for any reasons in nuclear reactor, may initiate explosion of the reactor. It follows from here that though nuclear stations may provide mankind with cheep energy, atomic energetics represents a very dangerous way of producing energy (as well as the energetics using controlled thermonuclear fusion). The only acceptable way of resolving the energetic problem consists in the use of nuclear reactions at low energies.

References

1. Kurizki G., Kozhekin A.E., Kofman A.G. Optical Tachyons in Parametric Amplifiers: How Fast Can Quantum Information Travel ? /VII Seminar on Quantum Optics; Raubichi, BELARUS, May 18-20, 1998;

   E-print quant-ph/ 9805040.

2. Drummond I.T. and Hathrell S. Phys. Rev. D22, 343 (1980).

3. Chiao R.Y., Hickmann J.M. and Solli D. Faster-than-Light Effects and Negative Group Delays in Optics and Electronics, and their Application,

   E-print: cs. PF/ 0103014 v1 12.

4. Oleinik V.P. Superluminal Transfer of Information in Electrodynamics. /SPIE Material Science and Material Properties for Infrared Optoelectronics, 3890, 321-328 (1998) (http://www.spie.org /).

5. Oleinik V.P., Borimsky Ju.C., Arepjev Ju.D. New Ideas in Electrodynamics: Physical Properties of Time. Semiconductor Physics, Quantum Electronics & Optoelectronics, 3, #4, 558-565 (2000).

   E-print: quant-ph/0010027.

6. Oleinik V.P. The Problem of Electron and Superluminal Signals. (Contemporary Fundamental Physics) (Nova Science Publishers, Inc., Huntington, New York, 2001), 229 p.

7. Oleinik V.P. The Problem of Electron and Physical Properties of Time: To the Electron Technologies of the 21st Century. New Energy Technologies, 1 (4), 60-66, (2002).

8. Dirac P.A.M. The Principles of Quantum Mechanics. (Nauka, Moscow, 1979) (in Russ.).

9. Arepjev Yu.D., Buts A.Yu., Oleinik V.P. To the Problem of Internal Structure of Electrically Charged Particles. Spectra of Internal Energy and Charge Distribution for the Free Electron and Hydrogen Atom. Preprint of the Inst. of Semiconductors of Ukraine, N8-91 (Kiev, 1991) 36p. (in Russ.).

10. Nicolis G., Prigogine I. Self-Organization in Non-Equilibrium Systems. (Wiley-Interscience, 1977).

11. Oleinik V.P. Quantum Theory of Self-Organizing Electrically Charged Particles. Soliton Model of Electron. Proceedings of the NATO-ASI "Electron theory and quantum electrodynamics. 100 years later." (Plenum Press, N.-Y., London, Washington, D.C., Boston, 1997), p. 261-278.

12. Oleinik V.P. Faster-than-light Transfer of a Signal in Electrodynamics. "Instantaneous Action-at-a-Distance in Modern Physics" (Nova Science Publishers, Inc., New York, 1999), p.261-281.

13. Einstein A. Relativity Principle and its Consequences in Modern Physics. Collection of Scientific Works, V.1. (Nauka, Moscow, 1965) (in Russ.).

14. Kozyrev N.A. Selected Transactions (Leningrad University Press, Leningrad, 1991) (in Russ.).

15. Lavrent'ev M.M., Eganova I.A., Medvedev V.G., Olejnik V.K., and Fominykh S.F. On Scanning of Celestial Sphere by Kozyrev's Sensor. Doklady AN SSSR, 323 (4), p.649-652 (1992) (in Russ.).

16. Akimov A.E., Kovaltchuk G.U., Medvedev B.P., Oleinik V.K., Pugatch A.F. Preliminary Results of Astronomic Observations of the Sky by the Kozyrev Procedure. Academy of Sciences of Ukraine, Central Astronomic Observatory. Preprint CAO-92-5P, 1992, p.16 (in Russ.).

17. Oleinik V.P. The Change of the Course of Time in a Force Field and Imponderability. Physics of Consciousness and Life, Cosmology and Astrophysics, 2, 20-37 (2001) (in Russ.).

18. Landau L.D. and Lifshits E.M. The Classical Theory of Field (Pergamon Press, Oxford. 1985).

19. Oleinik V.P. and Arep'ev Yu.D. To the Theory of Nuclear Reactions at Low Energies: the Physical Mechanism of Reactions. Physics of Consciences and Life, Cosmology and Astrophysics, #4, c.60-70 (2002).

20. Urutskoev L.I., Geras'ko V.N. On the Possible Mechanism of Chernobyl Accident. http://www.recom.hotmail.ru/CHER_INC_1.doc

---

Congress "The Time Machine"

Faraday Labs Ltd invite you to participate in our scientific congress, workshop and discussion on time control topics. It is planned April 2003. Main topics of the congress are the technological basis of time control experiments, practical applications of this method in medicine and other technologies. Organizing committee: PhD. Vadim A. Chernobrov (KOSMOPOISK research center) and Alexander V. Frolov (Faraday Labs Ltd).

Please, contact us **http://www.faraday.ru** or email **congress@faraday.ru** Phone/fax 7-812-380-6564

Please send this pre-registration form by post: **P.O. Box 37, St. Petersburg, Russia 193024   congress@faraday.ru**

PRE-REGISTRATION FORM for participation in the congress **"The Time Machine"**

Last name:
First name:
Title/ Function:
Company/ Organization:
Address:
Postcode:
City:
Country:
Tel.:
Fax:
e-mail:

❑   I would like to submit an oral presentation (report). (Please, enclose one-page abstract).

❑   I intend to participate as a guest

❑   I'm interested in further information.

Date   Signature