

## Chapter 13. Potential and special applications. Hidden space energy and prediction of a new propulsion mechanism.

### 13.1 Brief summary of advantages provided by the BSM - a Supergravitation Unified Theory.

The treatise Basic Structures of Matter (BSM) is based on an original idea about physical vacuum, which has never been investigated before. It follows the recommendation of James Clerk Maxwell expressed in his "A Treatise on Electricity and Magnetism" vol. II, section "A medium necessary":

*In fact, whenever energy is transmitted from one body to another in time, there must be a medium or substance in which the energy exist after it leaves one body and before it reaches the other... Hence, all these theories lead to the conception of a medium in which the propagation takes place*

The Basic Structures of Matter (BSM), a Super Gravitation Unified Theory, unveils the relation between the forces in Nature by adopting the following framework:

- Empty Euclidian space without any physical properties and restrictions
- Two super dens fundamental particles able to vibrate and congregate
- A Fundamental law of Super Gravitation (SG) - an inverse cubic law valid in pure empty space.

An enormous abundance of these two particles, with energy beyond some critical level, are able to congregate into self-organized hierarchical levels of geometrical formations, based on the fundamental SG law. This leads deterministically to creation of space with quantum properties (known as physical vacuum) and a galaxy as observable matter. All known laws of Physics are embedded in the underlying structure of the physical vacuum and the structure of the elementary particles. The fundamental SG law is behind the gravitational, electric and magnetic fields and governs all kinds of interactions between the elementary particles in the space of physical vacuum.

The structure of the physical vacuum, called a Cosmic Lattice (CL) distinguishes from the old ether-like concept by number of features, such as: a high stiffness and pressure, quantum mechanical and space-time features and folding properties. As a result, its complex but well-defined behavior permits explanation of the enigmatic phenomena in

Particle Physics, Quantum mechanics, Relativity and Cosmology. The space-time relativistic features of the physical vacuum are result of modulation effects caused by the immersed material objects (GR effects) and by their motion (SR effects). They become apparent when analyzing the behavior of the single elements of the CL space - the CL node and the motional behavior of an elementary particle, for example the electron. Such analysis leads to definition of the basic physical parameters of the CL space: a Static CL pressure, a Dynamic CL pressure and a Partial CL pressure. The first one defines the Newtonian mass of the elementary particle (a mass equation is derived in BSM). The second one defines the Zero Point Energy (ZPE) related to the Electrical and Magnetic fields. The third one is related to the inertial properties of the elementary particles. The unveiled features allow making analysis beyond the Newton's laws about gravity and inertia and beyond the theory of Special and General Relativity. Additionally, the existence of two types of Zero Point Energy (ZPE) is revealed: a static one (ZPE-S) and a dynamic one (ZPE-D). The first one is related to the Newtonian mass and the effects of GR, while the second one - to the Electrical and Magnetic fields. One important feature of the CL nodes is their ability of self-synchronization with identified experimental signature - the Compton wavelength. This phenomenon is involved in the definition of the permeability and permittivity of the physical vacuum and it is responsible for the constancy of the velocity of light.

The Russian academician G. V. Nikolaev arrived to similar conclusions about the physical vacuum (Nikolaev, G. V, *Electrodynamics of the physical vacuum* (in Russian), Tomsk, 2004)

### 13.2. Theoretical achievements in support of emerging practical applications

The unveiled Law of Super Gravitation (SG) is the most fundamental law in Nature. Its functionality is based on the ability of the fundamental particles and their formations to possess vibrational energy (see Chapter 12). It is given by the expression

$$F_{SG} = G_0 \frac{m_{01}m_{02}}{r^3} \quad [(2.1)]$$

where:  $F_{SG}$  - SG force,  $G_0$  - intrinsic SG constant,  $m_{01}$  and  $m_{02}$  - SG (intrinsic) masses,  $r$  - distance

The Basic Structures of Matter - Super Gravitation Unified theory permits:

- (a) Understanding the fundamental relation between matter and energy
- (b) Understanding the structure of the physical vacuum - Cosmic Lattice (CL) and its static and dynamic behaviour permitting the definition of space-time concept
- (c) Understanding the physical relation between the Gravitational, Electric and Magnetic fields
- (d) Solving the boundary condition problem for the photon as a quantum wave in a structured space of the physical vacuum
- (e) Explaining the rules and effects of Quantum mechanics and General and Special relativity by a classical approach (solving a long time existing problem for the missing relation between Quantum mechanics and General and Special Relativity)
- (f) Unveiling the physical structure of the electron, its oscillation properties and quantum features.
- (g) Unveiling the physical structure of the elementary particles, the atomic nuclei and the real quantum orbits. Understanding the cause of radioactivity.
- (h) Unveiling the correct interpretation of the Einstein formulae  $E = mc^2$ .
- (i) Recognizing the existence of hidden space energy of non-electromagnetic type as a primary source of the nuclear energy
- (k) Building of alternative Cosmology without contradictions based on the new space concept and reinterpretation of the observations
- (l) Unveiling the levels of matter organization in the Universe based on geometrical formations in hierarchical orders.
- (m) Deriving expressions showing the relation between the known physical constants and unveiled structural parameters of the physical vacuum and the elementary particles including their mutual interactions
- (n) Showing that the Newton's laws (about the universal gravitation and inertia) and the Einstein's Special and General Relativity appear as special cases of the Super Gravitation Unified theory in CL space environment.

(o) Unveiling the existence of longitudinal waves and their properties

(p) The suggested model of two fundamental particles and one fundamental law allows excellent opportunity for computer modelling of the unveiled geometrical formations and their rich vibrational properties.

Let us discuss briefly some of the most important results:

**(h): Revealing the correct interpretation and use of the Einstein equation  $E = mc^2$ .**

Firstly, the Newtonian mass is not equivalent to matter. It is an attribute of formations from fundamental particles. The fundamental particles are kind of intrinsic matter that could never disappear. The mass is an attribute of a particular formation matter that might be modified or disintegrated, while the energy is embedded in such a formation. Therefore, the Einstein formula is correct above some particular level of matter organisation. Consequently, the interpretation of this formula as annihilation (disappearance) of matter is incorrect. As a result, the theoretical derivations based on such interpretation lead to a significant departure from the reality. The discrepancy between the reality and the present concepts appears quite serious in the fields of Particle Physics and Cosmology, where this formula is used as a creation or disappearance of matter. In Particle Physics, such use leads to an enormous number of particles, definition of rules and violation of rules. In Cosmology, it leads to creation of an elusive picture of the Universe, based on a Big Bang model. From the considerations and analysis presented in BSM it becomes evident that:

**The matter never annihilates, so it never converts to a pure energy. The Einstein equation is correct when applied for the mass, keeping in mind that the mass is not equivalent to matter. The correct interpretation of the Einstein equation is the following:**

$mc^2 \rightarrow E$  - destruction of mass (in particle collider experiments) or hiding of the positron's mass inside of the electron's structure (see §3.17.1, Chapter 3)

$E \rightarrow mc^2$  - creation of virtual particles in CL space, not possessing matter (corresponding to the Dirac see idea)

$E \leftrightarrow mc^2$  - valid for the nuclear binding energy as a result of small change of the CL space node distance in presence of matter - General Relativistic effect in a microscale

The above interpretations have also a bottom length scale limit, which is of the order of the CL node distance ( $\sim 1 \times 10^{-20}$ (m)).

The virtual particle (single or pair) is only a wave of charge propagating in CL space. While the photon is a quantum wave in which the two types of CL nodes are dynamically affected, the virtual particle affects only one type - positive or negative (the left-handed and right-handed formations are related to the sign of the electrical charge). It moves with a speed of light but does not possess matter, and consequently could not be a static elementary particle. Virtual particles are created either as pairs (Dirac see particles) or from a Beta radioactive decay. In the process of thermalization of such a particle from Beta decay, the latter hits a target. As a result, a low energy real particle possessing a matter is extracted (electron or positron). From the point of view of the correct concept of the physical vacuum, one important conclusion emerges: Using the Einstein equation for estimation of the "mass" from measured energy interactions and claiming that matter is created, is wrong. The particles obtained in particle colliders are either virtual particles or structural fragments of real particles. No material particles are possible to be created from a pure energy in a form of quantum wave (even from high energy gamma rays). Such "particles" are only waves, so they could never become material particles, such as proton, neutron, electron or fragments from their disintegration.

From the presented considerations (based on the analysis of all previous chapters), it is evident that real particles can be created only by some cosmological event, the condition of which could not be duplicated in any kind of laboratory. Such an event was identified by extensive analysis of different cosmological phenomena in Chapter 12, while the conclusions are in excellent agreement with the results from the Particle Physics experiments and the cosmological observations.

### (o) Longitudinal waves.

The unveiled structure of the photon wavetrain (a neutral quantum wave) was described in Chapter 2, while solving also the problem of the

boundary conditions, which are important for preservation of the photon energy during its travel. It was found also that the momentum of pointing vector is a result of the wavetrain helicity. In a normally generated EM wave, the E and H vectors have a small longitudinal component in the direction of propagation, which is in accordance with the contemporary mathematical treatment. However, in some special cases of EM generation, this longitudinal component can be increased significantly.

Accepting the existence of CL space structure means that longitudinal waves (LWs) are possible as compression-like waves, different from the ordinary EM waves. From a point of view of the Classical Electrodynamics, the existence of LWs is explainable only if using the original forms of Maxwell equations (quaternions). This is now theoretically proved by number of theoreticians (Van Vlaenderen K. J. and Waser A. (2001)).

Longitudinal waves, firstly observed by Nikola Tesla 100 years ago, are now theoretically envisioned and experimentally confirmed. There are number of theoretical treatments (related to LWs phenomenon) discussing the Ampere's law., P. T. Papas, (1983), (H, Aspden, (1985). A good source of reported experiments involving LWs is the New Energy Technology Magazine, edited by A. Frolov, www.faraday.ru).

Understanding the wavetrain structure of the photon (and EM waves) permits to guess what might be the structure of the **longitudinal waves (LWs)**. They should possess a stronger longitudinal component. One way to understand these waves is to imagine that they contain counter rotating E and H vectors. While the EM waves for example could be generated by a solenoid, one may guess what might be the configuration of the solenoid or antennae for generation of LWs.

Additional technical considerations exist for generation and reception of LWs, which will not be discussed here. LWs are naturally generated from a lightning. They cause an EM noise known as transients which has a large penetration capability. These transients contain LWs, which have a broad frequency spectrum. They may pass through EM filters and could destroying sensitive equipment.

BSM theory envisions three types of LWs depending of the way they are generated and the conditions of their propagation:

- (a) Isotropic LWs
- (b) LWs embedded in EM waves
- (c) LWs in closed magnetic lines

The isotropic LWs are propagated in close distances only.

The LWs embedded in EM waves may appear hidden for ordinary EM receiver. However, they are able to carry independent information. They are propagated with a light velocity.

The LWs in closed magnetic lines may propagate with hyperlight (superluminal) velocity.

The three types of LWs are particular useful for the special applications discussed later in this chapter.

### 13.3. Potential applications in different fields of Natural Science

The derived BSM models might have potential applications in the following fields:

- (1). Using the BSM atomic models in Structural Chemistry and biomolecules for further study of their properties (Chapters 8, 9, 11).
- (2). Unveiling the mechanism of stored energy in biomolecules and predicting the possibility for intercommunication between the DNA molecules (Chapter 11).
- (3) Using the BSM atomic models in nanotechnology (in book "Beyond the Visible Universe", Chapter 6 p.6-11 to 6-16).
- (4) Nuclear reactions: achieving fusion and transmutation of elements by proper manipulation of the structure of the physical vacuum.
- (5) Understanding the physical mechanism of the tornado and the hurricane (A large area biasing of CL space structure is likely involved. The SG law plays an important role in these phenomena).
- (6) Understanding the real danger from the nuclear explosion.

Let us consider briefly (4), (5) and (6).

**Nuclear reactions** as transmutation of elements in normal temperature and cold fusion experiments are reported in international conferences. The nuclear reactions in both cases are consequences of properly disturbed CL space. Since the methods are quite diversified, we may briefly mention only one of them which is based on generation of a shock event, for example a spark discharge in liquid. Such type of experiment has

been described firstly by Nikola Tesla 100 years ago, while experimental evidence of nuclear reactions in such conditions are confirmed in the last decade. The SG law in a normal CL space (physical vacuum) is behind both: the nuclear binding energy and the charge of the elementary particles. Consequently, if the CL space is properly disturbed, a nuclear reaction becomes possible without emission of neutrons.

The above conclusion becomes evident if examining the process of alpha emission from heavier atomic nuclei, as described by the author's article: "New vision about controllable fusion reaction" ISBN 0973051523, electronic archive AMICUS, National Library of Canada).

**(5) Understanding the physical mechanism of the tornado and the hurricane** cannot be achieved if ignoring one very essential factor: biasing of some CL space parameters in which the hidden SG energy is involved. This factor creates the necessary forces, which compensate the centrifugal forces of the rotating air mass. The air and water molecules are only a part of the system. The yearly losses from tornados and hurricanes cost billions of dollars. A significant spending for study of these events is done without a progress. If using the BSM concept about space, a fraction of this spending may lead to significant advance of our understanding about these devastating phenomena.

**(6). Understanding the real danger from the nuclear explosion is vitally important for preserving the living conditions in our planet.** Presently, the predictions of the possible consequences from a nuclear war do not provide a real picture. The predicted nuclear winter is only one of the possible outcomes. Even a single explosion in atmosphere is a potential danger for an unforeseen disaster. Let us find out what it could be.

The nuclear explosion is the most powerful pulse disturbance of the CL space (physical vacuum). The consequence is not only radiation and contamination of the atmosphere. The nuclear explosion is accompanied by a huge and strong tornado-like formation. From the adopted so far concept that the space surrounding the Earth atmosphere is void, it follows that a tornado-like formation could not be extended into space. However, such option is possible if taking into account the hidden material structure of the physical vacuum (presently, the

the missing barionic type of matter is envisioned only in the distant galaxies). Then if an atomic explosion eventually causes an extended tornado-like formation, part of the Earth atmosphere could be sucked into space. In such a fatal event, the Earth may become like Mars, which means a global extinction of the life. Extended tornado-like formations pointing outwards are observed on our Sun and they are big puzzle for the astrophysicists.

Another less dangerous, but not envisioned so far effect from an atmospheric nuclear explosion is a temporal damage of the CL space. Despite the ability of the CL space for restoration after strong disturbance, some micro-holes might exist for a long time, while drifting and decaying. (The possible existence of such holes, without explanation, has been envisioned by Wilbert Smith, Canadian researcher, 50 years ago). When a solid body passes through such holes, firstly, the chemical bonds are easily destroyed and secondly, the metallic lattice in metals gets damage. If an aircraft passes through such drifting holes, an instant structural damage will occur. This might cause an unexplainable crash of an aeroplane. The underground nuclear explosion is another danger, especially for the Earth magnetic field. Presently, its origin is not well understood. BSM puts a new light by offering a concept which is in excellent agreement with the observations (Chapter 10 and 12).

### 13.4. Special applications

The special applications are related to the most important predictions of the BSM theory.

- (1) The physical vacuum contains a hidden energy of non-EM type, which in fact is the primary source of the nuclear energy. Alternative ways for accessing this energy are possible.
- (2) The gravitational mass and inertial mass are not unchangeable properties of the atomic matter. They are possible to be changed by proper modulation of some parameters of the physical vacuum.
- (3) Two forms of supercommunication are possible with features different from the presently known type of communication: (a) With LWs propagated with a hiperlight velocity in special magnetic conditions; (b) with LWs embedded in EM waves
- (4) The biomolecules possess the ability to store energy, while the DNA is likely involved in inter-

communication between the cells of the living organism. (Chapter 11 is devoted on this issue).

#### 13.4.1. Hidden Space Energy

The energy of the physical vacuum has been discussed in Chapters 4, 5, 12 and elsewhere in BSM theory. It has been shown that the CL space contains two types of Zero Point Energy:

**ZPE-D - a dynamic Zero Point energy**

**ZPE-S - a Static Zero Point Energy**

The first type, ZPE-D, is related to the dynamical properties of the CL node. It corresponds to the parameter Dynamical CL pressure, derived in Chapter 3. Its measurable signature is the temperature 2.72K estimated by the observed Cosmic Microwave Background (CMB). The theoretical derivation of this parameter from a BSM point of view is presented in Chapter 5. ZPE-D is directly responsible for the permeability and permittivity of free space. It corresponds to the ZPE envisioned by Quantum Mechanics.

The second type, ZPE-S, is embedded in the connections between the CL nodes. The alternative CL nodes are connected by their *abcd* axes, in which the SG law is directly involved. In a normal non-disturbed CL space the SG forces are well balanced, so they are hidden for EM interactions. When an elementary particle is immersed, the CL space exercises strong SG forces on its impenetrable volume of the First Order Helical Structures (FOHS). The static energy from this pressure is related to the Newtonian mass by the Einstein equation  $E = mc^2$ . This pressure called a Static CL pressure is estimated in Chapter 3 by analysis in which the unveiled structure of the electron is used. Its estimated value is:

$$P_S = 1.3736 \times 10^{26} \text{ (N/m}^2\text{)} - \text{Static CL pressure}$$

While the obtained value of the Static CL Pressure is very large, one must take into account that it could be exercised only on the volume of the FOHS, since it contains a more dens internal lattice. For the electron, this volume,  $V_e$ , is calculated by its identified physical dimensions as a cut toroid with a large radius  $R_c$  - (Compton Radius) and a small radius  $r_e = 8.8428 \times 10^{-15} \text{ (m)}$ .

$$V_e = 2\pi^2 R_c r_e^2 = 5.96 \times 10^{-40} \text{ (m}^3\text{)}$$

According to the mass equation (3.48) derived in Chapter 3, the mass of electron is:

$$m = (P_S V_e) / c^2 = 9.109 \times 10^{-31} \text{ (kg)}$$

Using Einstein equation  $E = mc^2$  we have:

$$E = P_S V_e = 8.187 \times 10^{-14} \text{ (J)} \equiv 511 \text{ (KeV)}$$

Scaling this energy to 1 cubic meter we obtain the value of ZPE-S energy in system SI:

$$E_S = 1.3736 \times 10^{26} \text{ (J)}$$

How such enormous energy is hidden? In fact, ZPE-S is composed of two potential energies related respectively to the SG forces between the left and right-handed CL nodes, which are behind the positive and negative charge. In a non-disturbed CL space, the opposite forces are in accurate balance. It is evident from Einstein equation, that ZPE-S is accessible if the mass is changed. This in fact is the binding nuclear energy. The energy from the nuclear power stations is a result of changing the binding energy.

#### 13.4.2. How the ZPE-S energy is accessible by the nuclear reaction.

The elementary particles are formed of helical structures, which are built of prisms. The SG mass of the prisms participate in the SG law, defined by Eq. [(2.10)] in analogical way as the Newtonian masses in the Newton's law of gravitation. By analysis of the vibrational properties of the molecules in Chapter 9, the following theorem as a part of the SG law was derived:

$$C_{SG} = G_0 m_0^2 = (2h\nu_c + h\nu_c \alpha^2) (L_q(1) + 0.6455 L_p)^2 \quad [(9.24)]$$

$$C_{SG} = 5.26508 \times 10^{-33}$$

where:  $m_0$  - intrinsic (SG) mass of the proton (valid also for neutron),  $h$  - Planck constant,  $\alpha$  - fine structure constant,  $L_q(1)$  - size of first harmonic quantum orbit, 0.6455 - form shape parameter of proton,  $L_p$  - proton size (the last three parameters are derived in Chapter 3 and 7 and cross-validated elsewhere in BSM)

The product  $C_{SG}$  is verified by calculation of the nuclear binding energy of the deuteron in Chapter using only BSM models. It agrees with the experimental value within 3.6% accuracy.

The ratio between the intrinsic SG mass of the proton and its Newtonian mass is

$$C_{SG} / (G m_p^2) = 2.82 \times 10^{31}$$

The strong SG field of the larger concentration of the prisms in the internal impenetrable structure of the elementary particles modulates the CL space dynamically and statically. The dynamical modulation of the CL space from a single elementary particle creates a charge. The statical modulation affects slightly the distance between the CL nodes. A larger accumulation of closely spaced elementary particles, for example protons and neutrons in the atomic nucleus, provides a measurable effect of shrunk CL space. This effect discovered by BSM is fully consistent with the General Relativity phenomenon of Space Curvature, so it is called a space microcurvature of the atomic nucleus. The measurable signature of this effect is the nuclear binding energy. It is known that the atomic mass of every element (isotope) is smaller than the sum of embedded protons and neutrons. The nuclear binding energy is just the difference between them. (Another spectroscopic signature of this effect, discussed in Chapter 7 is the Lamb shift, which increases with the number of protons). Consequently, the **space microcurvature** in the microscale range depends on the number of the accumulated stable particles proton and neutron. Because the inverse cubic Super Gravitational law is directly involved, a very small change of the CL node distance causes a measurable change of the CL space parameters. One of most important affected parameters is the CL node resonance frequency, which together with the CL node distance defines the velocity of light. The other affected parameters are the permittivity and permeability of free space. A proof of presented concept of the nuclear binding energy was given in §6.14.1, Chapter 6, where the obtained theoretically calculated binding energy between the proton and neutron agrees with the experimentally measured one within accuracy of 3.6%.

For the nuclear reactions and radioactivity, the process of nuclear modification is quite fast. Therefore, **a fast change of the space microcurvature** occurs in both cases. As a result, the CL structure of the surrounding space is shaken. In this case, the Super Gravitational forces are directly involved and a fraction of the hidden ZPE-S is released as strong longitudinal waves. They are converted to gamma rays, which evaporate molecules and atoms and ionize and excite them so they

emit a broadband optical radiation. In the case of nuclear reactor, the radiation is converted to heat and the latter rotate the electric generators. This is what we get as a nuclear energy. Consequently:

- **The primary source of the nuclear energy is the hidden ZPE-S of the CL space (the physical vacuum).**
- **The fast nuclear reaction is a kind of physical mechanism for accessing the hidden space energy**

### 13.4.3. Alternative methods for accessing the hidden space energy

The BSM theory predicts alternative methods for accessing of the hidden ZPE-S, different from the methods of nuclear reaction. In these methods, however, usually the ZPE-D could be directly accessed, while the primary energy source ZPE-S could be accessed only indirectly as it will be explained later. ZPE-D energy is directly responsible for the  $\epsilon_0$  and  $\mu_0$  of the physical vacuum, so it could be accessed by some kind of EM interactions. The nominal value of the ZPE-D energy is supported by the ZPE waves, permanently existed in CL space. However, there is a volume and time limit on the energy debit extracted from the ZPE-D source. If a fraction of ZPE-D is taken out, a finite time will be necessary for its equalisation to a normal value (this is confirmed by the BSM analysis of the experiments of A. Chernetski and other experiments). The restoration of the normal ZPE-D will be provided by the ZPE waves, while the energy will be taken from the primary source ZPE-S.

(A). One way of tapping the ZPE-D is to access the oscillation frequencies of the CL nodes. BSM analysis unveiled the following characteristics frequencies of the CL node (Chapter 2):

$$v_R = 1.093 \times 10^{29} \text{ (Hz) CL node resonance (NRM) frequency}$$

$$v_{SPM} = v_c = 1.2356 \times 10^{20} \text{ (Hz) CL node SPM frequency}$$

In Chapter 2 it was shown that the frequency  $v_R$  and the node distance define the velocity of light, while the frequency  $v_{SPM}$  is related to its constancy. Both frequencies are quite high for direct access, but the BSM theory was helpful to find a possible way. It has been shown in Chapters 2 & 3 that the SPM frequency of the CL node is equal to the Compton frequency, measured in the Earth

gravitational field. At the same time, the first proper frequency of the oscillating electron is also equal to the Compton frequency. Consequently, we may access the ZPE-D by using electrons. Based on the discovered frequency match and the unveiled dynamical interactions between the CL nodes and the oscillating electron, a mechanism called a **heterodyne method for accessing the space energy** is suggested.

According to this method, the SPM frequency of the CL space can be accessed by invoking comparatively low frequency oscillations of electron gas with a proper spatial and geometrical arrangement in vacuum conditions. The expected interaction of the electrons with the CL space will be optimal at proper quantum velocities (discussed in Chapter 3 and the author's article about the electron, published in Physics Essays (S. Sarg (2003)). We may access the ZPE-D energy by invoking controllable quantum interactions in plasma. This method is in the category of plasma experiments. Details about experimental arrangement of this method are given in a separate monograph.

B. One additional method of accessing the ZPE involves a fast rotation of magnetic fields with properly intercepted magnetic lines. While the technical realization may have many diversified options, there is a common physical mechanism, identified by BSM analysis. How the method of rotating magnetic fields may work? In Chapter 3 and 7 the conditions for the quantum orbit has been analysed. It was found that the magnetic environment should be stable during the lifetime (excited state) of the orbiting electron. Otherwise, the electron will fall prematurely to a lower quantum level. To assure such disturbance, properly oriented magnetic fields must be rotated with a high tangential velocity. While this is still not enough, a mode of higher frequency rotating magnetic field must be obtained by assuring a stroboscopic effect between the primary magnetic fields. The system must include also a rotating inertial mass and energy phase delay. There are additional considerations for obtaining a conflict between the magnetic fields, which is understandable from the spatial features of the CL node dynamics defining the Magnetic Quasisphere (MQ) of SPM vector (Chapter 2).

Technically, the access to the ZPE-D requires a closed system comprising of: a rotating magnetic

fields, a rotating inertial mass, an electrical generator, an energy buffer and an energy phase delay. A significant amount of energy must be rotated in the closed system, in order to extract a small amount of space energy. One very important feature, not well recognised by the researchers is the energy phase delay. It should be of the order of the average lifetime of the excited states. That's why the transients play an important role. The energy buffer could be a rechargeable battery. One must keep in mind that in case of battery charge by voltage spikes a complex interaction might occur in the electrolyte, since the ions and electrons have different inertial and magnetic moments. In a proper mode of operation, the extracted power must be larger than the consumption from the battery. Such mode of operation is known by the ZPE researchers as overunity. For stable overunity operation, the energy debit must be below the limit mentioned at the beginning of this section. One of the monitoring effects for stable operation is the device temperature. The functional module should stay cool and even below the ambient temperature. This is explainable in the following way: If the excited electron falls prematurely to a lower state due to the fast changed magnetic field, the pumped CL space energy could not be emitted as a photon, but will be channelled to the electromagnetic feedback. In overunity operation, only part of this energy is spent for the battery recharge, while other is consumed by the load. Increasing the energy consumption, however, has a restriction up to some limit, because the speed of energy transfer from ZPE-S to ZPE-D has a volume and time limit as mentioned in the beginning of this section. As a result, the temperature of the magnets and coils might go below the ambient one. Obviously, a proper temperature gradient and energy debit should be observed for stable operation. Once the limit is reached, some other side effects might appear, for example a change of the gravitational mass. Near or above such a limit the energy extraction mechanism might not be stable.

The above considerations and conclusions has been reached after the analysis of a large number of reported experiments.

Some researchers relying on "search and try" experience, eventually succeeded to access the ZPE-D, but they often are not able to repeat their own result because of the lack of physical under-

standing and aware about the existed restrictions. For the plasma experiments, some additional restrictions and technical problems exist. In these experiments, the eventually obtained energy is usually as a short burst. If the integral energy of the burst is above some limit, part of the electrons may lose their internal positron (see Chapter 3). Such electrons lose their normal oscillation properties, which means that they are excluded from the quantum mechanical interactions with the ZPE-D. The restoration of their normal oscillating structure may need a long time, or in some cases, they may not be restored. As a result, the device may work sporadically or may stop to work for a long time or permanently. The mentioned effect may appear also in electromagnetic systems without rotating mass, where the energy is in a form of a burst. The unwanted effect is more easier avoided in the rotating magnetic systems mentioned in (B) with a moderate energy extraction.

The analysis of the existing experiments shows a large variety of their arrangement. In plasma experiments involving sharp discharges, a transmutation of elements (nuclear reactions) occurs on the cathode. First discovered by Thomas H. Moray, more than 50 years ago, now this is confirmed by many researchers. This agrees with the BSM concept that the protons and neutrons are held in the atomic nucleus by SG field, which is synchronised by a frequency higher than the CL node resonance frequency. Then a fast shock wave may disturb the synchronization and consequently the nuclear binding forces.

Using BSM analysis, one of the physical mechanisms discussed in (A) or (B) is identifiable in most of the successful experiments. Other mechanisms, however, are also possible. One common feature is the involvement of the SG field. The CL space is characterised by a high resonance and a Compton frequency and a short relaxation time. The ZPE could be accessed either by very fast changes or by invoking of some conflict effects in the CL node dynamics. In such aspect the following conflict situations are envisioned:

- conflict on CL node dynamics by intercepted and fast changing electrical or magnetic fields
- conflict on CL node dynamics from fast accelerated charge particles

- conflict on CL node dynamics by accelerating opposite charge particles with different masses through obstacles

In number of successful ZPE experiments or other unconventional experiments, a phenomenon of “cold electricity” is observed. This is quite interesting phenomena, firstly demonstrated by T. H. Moray, while some features have been envisioned by Nikola Tesla, when mentioning an ethereal current. According to BSM analysis the carrier of “cold electricity” are not real charge practices, but virtual ones. They are only guided by a conductor or a dielectric guide and they convert to real charge particles in the load, where the energy is dissipated. The virtual charge particles are only waves in CL space, the charge of which is not balanced like the ordinary EM waves and photons. They are similar to the charges from the radioactive Beta decay, before their thermalization (in the process of “thermalization”, according to BSM, the virtual particle converts to a real one by expelling real particles from a target).

Serious researchers may save a great amount of time and funds if understanding correctly how the energy is stored in space and the possible physical mechanisms for accessing this energy.

Another alternative way for accessing ZPE-S via ZPE-D is the cold fusion reaction. In this category fall also the methods known as nuclear transmutations. A characteristic feature of all these methods is that there is not a strong disturbance of the CL space. This means that emission of neutrons and gamma radiation should be missing. A discussion about the physics of alpha decay and a possibility for a controllable fusion reaction  $D + D \rightarrow He$  is presented in article included in Appendix D.

At the present time, the existence of ZPE-S as a primary source of the nuclear energy is not officially recognised. For this reason, the search of alternative energy from space is often met by scepticism. This leaves the researchers without a guiding theory and many of them try to build own theory. As a result, the number of such “theories” is much larger than the number of successful experiments and they of cause are not helpful. Suggesting a speculative theory for explanation of the origin of ZPE usually jeopardize the experimental results. Presently, more valuable for the scientific advance is the description of the experiment. One

of the useful publications overviewing a large number of experiments (apart of suggested theoretical explanation which are not always useful) is the book “Quest for Zero Point Energy” by Moray King. Another useful book is, “Energy from the vacuum” by Tom Bearden. Quite useful are the following periodical journals: “New Energy Technology”, edited by Alexander Frolov, “Infinite Energy Magazine” founded by the late Eugene Mallove and “Journal of New Energy”, edited by Harold Fox. Useful seminars and conferences are organised by Thomas Valone, a director of Integrity Research Institute. Another coordinator of alternative energy material and projects is PACE, Canada, directed by Andrew Michrowski.

Presently, a number of experimentally oriented laboratories are dedicated on investigation of non-conventional phenomena related to ZPE and gravity. Among them are: The Laboratory of George Hathaway in Canada; the Faraday Laboratory in St. Petersburg, Russia, directed by Alexander Frolov; the Laboratory of Jean - Louis Naudin in France. There are many other laboratories or individual researchers in different countries. Presently, extensive information about ZPE research is available in Internet, but the reliable sources must be carefully selected.

Summarizing the presented methods for accessing the hidden space energy we may claim:

- In nuclear reaction, the ZPE-S is directly accessed. This is a strong disturbance of the CL space, in which a radioactivity is present.

- In alternative methods for accessing the space energy, the ZPE-S is accessed indirectly by accessing the ZPE-D. In this case, a radioactivity may not be present. In this category are also the cold fusion experiments and the effect known as a nuclear transmutation.

The presented above methods do not exhaust the whole variety of accessing the hidden space energy. Accessing the hidden space is among the most difficult tasks. It requiring extensive knowledge about the way this energy is stored and complete understanding of the physical mechanism for successful access.

### 13.5. Hypothesis for control of the gravitational and inertial mass of a solid object

Presently, the possibility for control of the gravitational and inertial mass of a solid object is out of vision, so such issue is not discussed in the mainstream journals and media. The attempt to access this issue, while relying on the space concept adopted 100 years ago, usually leads to speculative ideas accompanied by highly abstractive mathematics but without any useful practical recommendations. Advance in this field could not be achieved unless the problem is accessed from a new concept of the physical vacuum.

BSM theory is able to provide understandable relation between the gravity and inertia and between the gravitational, electrical and magnetic fields, using the derived static and dynamical properties of the CL space. This permits to envision what parameters of the physical vacuum must be manipulated in order to affect the gravitational and inertial mass, and what kind of technical methods could be used.

In Chapter 2 it was described that the self oscillating CL nodes can be regarded as Phase Lock Loop (PLL) oscillators. Such oscillators possessing a proper frequency are easily synchronised by phase. BSM analysis envisioned the existence of ZPE waves as CL nodes synchronized by a phase propagating with a velocity of light. The average length of the ZPE waves is equal or multiple to the Compton length  $\lambda_c = 2.426 \times 10^{-12}$  (m). This is the distance that the phase of SPM vector passes with a light velocity per one SPM cycle of the CL node, the period of which is equal to the Compton time  $t_c = 0.809 \times 10^{-20}$  (s). For a stationary frame, the ZPE waves appear as continuously recombining, so they are responsible for the equalization of the ZPE-D and for the space-time properties of the physical vacuum. They are also involved in the definition of the permittivity and permeability of free space, which are responsible for the constancy of the velocity of light.

How the Newtonian gravitation of a heavy astronomical body like the Earth attracts a material object? The SG forces between the Earth and the object are propagated through the CL space structure. More specifically, the Super Gravitational field is propagated through the *abcd* axes of the CL

nodes (Chapter 2), which are always aligned and separated by automatically supported small gaps (the latter phenomenon is defined by the specific properties of the SG field, which is discussed in Chapter 12). At the same time, every CL node vibrates with its proper resonance frequency  $\nu_R$ . The SG field of the prism is characterised by the propagation of SGSPM vector, the frequency of which is obtained by division of the primary Planck's frequency (Chapter 12).

$$f_{PL} = \sqrt{\frac{2\pi c^5}{Gh}} = 1.855 \times 10^{43} \text{ (Hz)}$$

While the CL node resonance frequency is  $\nu_R = 1.09 \times 10^{29}$  (Hz), the frequency of SGSPM vector is higher (the mechanism of frequency division is based on stable frequency modes defined by stable geometrical structures, see Chapter 12). Consequently, the CL node frequency makes an attenuation effect for the long-range propagation of the SG field in CL space. This conclusion of BSM is in agreement with the theoretical derivation of H. E. Puthoff in his article "Gravity as a zero-point-fluctuation force, Phys. Rev. A, v. 39, 2333-2342, (1989). Starting from the Planck's frequency and using one hypothesis of Saharov, he derives the Newtonian gravitation when attenuating the higher frequencies.

The above considerations lead to the following conclusions:

- (A). **The long-range propagation of the inverse cubic SG field in the CL space appears as a Newtonian gravitational field, which is inverse square dependent on distance)**
- (B). **When analysing the SG propagation through the CL space, the oscillating CL nodes could be regarded as static due to their intrinsically small inertial factor (see Chapter 2 and 12)**
- (C). **The resonance frequency of the CL node imposes some attenuation effect on the propagation of the SG field through the CL space**

The feature (B) is very important for understanding the properties of the inertial frame formulated in Special Relativity. It obtains sense when referring to a local mass object. From the other hand, the discovery of this feature permitted a successful analysis and unveiling of the wavetrain shape of the photon and the structure of the magnetic lines (Chapter 2).

From features (A) and (C) it is evident that if the CL nodes between the two material objects are synchronised, the propagation of the SG field will be facilitated. In other words, the propagated SG forces will be stronger, in a case of synchronised CL nodes, in comparison to a case of not synchronised ones. In space environment with a normal ZPE-D, the ZPE waves always keep the synchronization of the CL space microdomains, which keeps the uniformity of the ZPE-D energy. The effect from this is the constancy of the light velocity. Consequently, the Newtonian gravitation regarded as a propagation of the SG field will depend on the permanent existence of the ZPE waves. Then what will happen if the synchronization of the CL nodes is disturbed? Obviously, the propagated strength of the SG field will decrease, which means a decrease of the Newtonian gravitation between the Earth and the object. This exactly is what is necessary for manipulating the gravitation.

Now let us consider how the synchronisation of the CL nodes, or in other words the ZPE waves, could be disturbed in the space surrounding the solid body, in order to decrease its gravitational (and probably inertial) mass. Without entering into details, we may envision the following methods:

- disturbing of the CL node synchronization by emission of longitudinal (scalar) waves (LWs)
- disturbing of the CL node synchronization by gamma rays
- disturbing of the CL node synchronization by invoking a conflict of magnetic line directions, based on the properties of the CL node oscillations included in the magnetic line (MQ SPM is discussed in Chapter 2).
- disturbing of the electrical field of accumulated charge by invoking a conflict of the electrical lines formed by EQ CL nodes (EQ SPM is discussed in Chapter 2).
- disturbing of the CL node synchronization by using the oscillating properties of the electrons

Considering the case of using LWs, we must keep in mind that they contain a longitudinal component resulted from a compressible effect of the CL space, in which the strong SG forces are directly involved. From one hand, the LWs interact directly with the strong hidden ZPE-S energy, so they may carry much stronger energy than the ordinary EM waves and for this reason they are very

penetrative. From the other hand, they may effectively destroy the CL node synchronization for a finite time interval, during which the following effects will occur:

- (1) a decreased gravitation between the object and the Earth
- (2) disturbed EM waves in the space surrounding the object
- (3) a blurred appearance of the object in the visible image

The effect (1) is what we need in order to manipulate the gravitational mass. At the same time, the disturbed synchronization affects the permittivity and permeability of the surrounding space, so the EM field and the propagation of the light in this zone will be also disturbed. This causes the side effects (2) and (3).

Now let us see what might happen with the inertial mass. When an elementary particle, such as proton, neutron or electron moves through the CL space, its impenetrable FOHS structures are ablated by the CL nodes (see Chapter 10). This physical phenomenon defines the inertia of the particle. All elementary particles contain FOHSs of the same type (Chapter 2, 3 and 6). Therefore, the inertial phenomenon is valid for all real particles, atoms, molecules, gas, liquids and solids. If the velocity approaches the speed of light, the elementary particle or the solid object experiences an increasing resistance. The reason for this is that the rate of separating CL nodes (converted temporally to folded) approaches the CL node resonance frequency. This effect is behind the relativistic increase of the inertial mass according to Einstein Special Relativity (the relativistic gamma factor for the electron was derived in Chapter 3, based on its structure).

From the analysis of the astronomical observations in Chapter 10 and 12, it becomes evident that the space of the Milky Way (and other galaxies) could be considered as an absolute reference frame. This is confirmed by a large number of properly arranged experiments. Among them is the laboratory experiments of Stefan Marinov (1975, 1980), who was able to detect our motion around Milky Way centre and measure the velocity. One of his experiments is repeated by E. W. Silvertooth, (1986). Even the re-estimation of the original data from the Michelson-Morley experiment by M. Consoli and E Costanzo (2003) proves this. This is

in full agreement with the BSM scenario of Alternative Cosmology presented in Chapter 12, as a consequence from the new concept of the physical vacuum. It demonstrates that the galactic redshift is not of Doppler type, while offering an explanation, which is in excellent agreement with many observed cosmological phenomena. To open a bracket, Edwin Hubble, the discoverer of the galactic redshift, did not believe in expanding Universe until the end of his life.

Understanding the existence of absolute frame of reference is important issue for further analysis of our motion through space, which helps to unveil the possible velocity restrictions.

Now let us analyse the inertial mass from a point of view of the acceleration. In Chapter 10 it was proved that the inertia of the solid object is directly related to the number of folded CL nodes and their relative momentum (the latter parameter is presented by a force moment vector). In a uniform translational motion, these two parameters are constant - there is no acceleration. In a uniform rotational motion, only the direction of force moment vector is changing, so a centrifugal acceleration is felt. In the case of linear motion with acceleration, the magnitude of the force moment vector is continuously changing, so a continuous force is felt. Normally all CL nodes which are in the path way of the translating object oblate the elementary particle to the level of their impenetrable FOHSs. Now, we must emphasize one important feature of the folded CL nodes. They do not have strong connections between themselves such as the normal nodes connected into CL structure. Then we may conclude:

**(D).** A fraction of folded nodes could be deviated and guided by a strong magnetic field with a proper configuration

**(E).** The properly deviated and guided folded nodes will cause a displacement of the object without feeling a force as in a normal acceleration (or at least - feeling a reduced force). We may call this predicted effect a **manipulated displacement**.

**(F).** If the maximal velocity in a manipulated displacement is in the range of our rotational velocity around the Milky Way centre (including the Earth orbital motion), we are sure that the equivalence between the gravitational and inertial mass will be preserved.

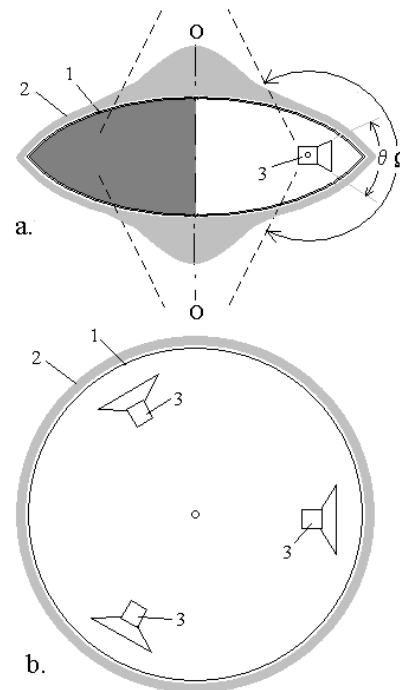
The feature (F) means that both - the inertial and the gravitational mass will appear equal but smaller during a manipulated displacement, which leads to the following important conclusions:

**(J).** In manipulative displacement the object will be able to make sharp turn or reversal of the direction without feeling an excessive acceleration

**(H).** The acceleration of the object in the case of manipulative displacement will require less force and energy

### 13.6. Hypothesis about spacecraft based on a new propulsion mechanism

Below is a briefly presented hypothetical version of a new propulsion mechanism, while focusing only on the physical principle and some secondary effects. From the considerations discussed in the previous section, it is apparent that the geometrical shape of the spacecraft is important. Figure 1 shows two views of such spacecraft. .



**Fig. 1.** Spacecraft with a new propulsion mechanism. 1 - spacecraft envelope, 2 - super-strong magnetic field, 3 - radiators of longitudinal waves,  $\theta$  - instant angle of radiation,  $\Omega$  - coverage angle (by rotation of the radiator)

The spacecraft enclosure 1, made of proper material, must transmit the LWs from the radiators

3. At the same time, it must be part of superconductor able to generate a super-strong magnetic field 2.

The restoration of the normal CL space parameters after the disturbance takes some finite time. This is theoretically envisioned by the revealed relaxation time constant in Chapter 2, which existence is apparent from the analysis of some experiments and some observed phenomena. This means that the radiators 3 may operate in short burst mode. The duration and the repetition rate of such mode must correspond to the spacecraft manoeuvre characteristics. The radiators may also rotate to cover the field angle  $\Omega$  or alternatively, a larger field angle could be achieved by proper refractive features of the spacecraft enclosure. The radiators should have also a phase and intensity control of the emitted high frequency. The super-strong magnetic field also could be guided inside of the spacecraft enclosure near the surface. Since the magnetic field and LW have some contradicting features, the researchers and designers of such spacecraft must be well acquainted with the BSM theory.

A spacecraft with properly design shape, material and propulsion system, will be capable to achieve a fast displacement (acceleration), while the crew inside will not feel the acceleration.

The trip to a planet or a distant solar system will contain three phases: an acceleration, a travel with a constant velocity and a deceleration. The maximum velocity and acceleration may have a limit, defined by the intrinsic features of the CL space (physical vacuum).

Let us consider the most conservative option, relying on our motion through the CL space of the Milky Way with a velocity about 220 km/s. Since the Earth orbital velocity is about 30 km/s we are sure that we could not have some unknown biological effect, for a velocity  $v \leq 30(km/s)$ , referenced to Earth. Obtaining of such a velocity with acceleration of 9.81 m/s will take about 41 min, so it is insignificant. At one of the closest positions to the Earth (for example in November 2005), the distance to Mars is about  $70 \times 10^6(km)$ . Then one way trip should take about 27 days.

In the above conservative option, we excluded the possibility of much faster acceleration and larger velocities because of the uncertainty about some unknown biological effects. Such restriction

may not exist, but this could be verified only by future experiments. If so, from a point of view of BSM, we may consider only one restriction, which is related to the electron velocities in quantum orbits. If taking into account that the normal human temperature is below 40 C, the electrons will be in lower level orbits. We may take the 3rd subharmonic orbit as an upper limit for which the electron energy is 1.51 eV, corresponding to a velocity of 729.7 (km/s). (Note: BSM atomic models show that the orbital electron velocities in the heavier elements are not much different from those of the hydrogen. The higher energy levels known from the atomic spectra comes not from the kinetic energy of the electron but from the SG field potential energy). Then we must consider two cases:

(a) the folded CL node velocity inside the spaceship is equal to the spaceship velocity (the crew feels the acceleration)

(b) the folded CL node velocity inside the spaceship is managed to be smaller within acceptable limit and not dependable on the spaceship velocity (the crew does not feel the extensive acceleration)

In case (a), even for an average distance to Mars about  $238 \times 10^6$  km, the acceleration (or deceleration) phase with 9.81 m/s is less than a day, while the phase with the constant velocity of 729.7 (km/s) is less than 4 days.

In case (b), the keeping of the folded node velocity within some acceptable limit depends on the spaceship design. This option is suitable for distant space travels. While the biological species might be vulnerable, robotic spacecraft may operate in conditions of higher acceleration and velocity in order to shorten the time of space travel.

Now let us discuss some of the features of the spacecraft illustrated in Fig. 1. The zone around the axis OO is a zone of interference of the emitted LWs, while the round zone between the large circular section and the axis OO is suitable for sensors monitoring the motion. The effectiveness of the manipulated displacement (achieving of larger acceleration) will be larger in a direction with a small cosine between the velocity vector and the plane of the larger sectional area of the spacecraft, since the folded nodes must be deviated at smaller angle. When moving horizontally, the spacecraft will be able to move in zigzag with a large sudden change

of direction and acceleration. For a fast acceleration, at angle in respect to the horizon, the spacecraft must be initially properly tilted and then accelerated. It is evident that a spacecraft with such a shape is suitable for distant space travels with large acceleration and velocity. For near Earth motion, a spacecraft with other shape may also work.

### 13.7. Physical effects accompanying the described propulsion mechanism

When moving in the Earth atmosphere, the spacecraft will appear blurred, especially when accelerating. The air molecules surrounding the spacecraft will be ionised and will emit a broadband radiation, the major contribution of which is from the oxygen and nitrogen). If the surrounding CL space is uniformly disturbed, a gradual lens effect will be obtained, in which the whole or part of the spacecraft may look as semitransparent. In such cases, some radars may not be able to detect the spacecraft. Radar bursts, in a way they are generated, contain some LWs embedded in the EM pulse. Radar pulses with a stronger LW component will be able to detect such spacecraft more effectively.

The disturbed synchronization of the CL nodes destroys temporally the magnetic protodomains, which in fact are embedded in the magnetic lines. Consequently, the weak magnetic field of the Earth will be locally affected. The affected space region might be significantly extended beyond the spacecraft body and it will contain fragmented domains. When the spacecraft passes away, they will get restoration for a finite time. The Earth magnetic lines get different paths trying to avoid the disturbed domain. The measuring effect will be such that a magnetic compass will be unstable and will show different directions. When the spacecraft is very close to some electronic instruments, their operation might be temporally disturbed, due to affected EM properties of the surrounding zone. Staying near outside of operating spacecraft should be avoided. The LWs may affect the energy storage mechanism of the biomolecules (discussed in Chapter 11).

A number of other not conventional microeffects may take place near the spacecraft, but they will be discussed elsewhere.

The described spacecraft does not need any atmosphere or to be near a massive astronomical object. Its propulsion mechanism might be even more effective in deep space.

### 13.8. Comparison between BSM predictions and observed physical phenomena

A large number of UFO related publications, containing description of the observed physical features has been analysed from the BSM point of view. While this issue has not been officially in the focus of the mainstream science, the author was careful in the selection of the published material. Among the reliable sources of the selected material are the proceedings of the Workshop “Physical Evidence Related to UFO Reports” held in Pocantico Conference Center, Tarrytown, N.Y., Sep 29 - Oct 4, 1997. and the book *The UFO Enigma, a new review of the physical evidence*, by Peter A. Sturrock, a distinguished astrophysicist and Emeritus Professor. The results and predictions of the BSM theory are in excellent agreement with the observed physical phenomena discussed in this book and other reliable sources. One observed case is given below.

Peter Sturrock describes one well-documented observation made by a government aeroplane mapping the coast in Costa Rica on September 4, 1971. In one of the consecutive frames, an object appears as shown in Fig. 13.2. The object is pictured from the above against an uniform background of water. The picture is accompanied by instrumental record of orientation, coordinates and local time.



**Fig. 13.2.** Picture of observed object (Adapted from P. A. Sturrock, *The UFO enigma, a new review of the physical evidence*, p. 202, Fig. 25-17)

Extracted text from the Sturrock's book.

*First, the disk image appears to possess light/dark shading that is typical of a three-dimensional object that is illuminated by sunlight.*

Second, the generally triangular dark region on the right-hand side of the disk cannot be a solar shadow cast by the (assumed) opaque disk from the right-hand side. If the disk is an opaque, flat conical section of revolution (the dark spot being the tip of the cone) and if the right side is tipped upward, then the entire surface of the disk should be dark. It is more likely that the light and dark regions are surface markings...

Forth, while the right-hand edge of the disk image is in very sharp focus, the left-hand edge is diffuse and appears to be an irregular boundary which almost transmits the light of the background in a transparent manner. It is of interest to note that the general orientation of this left-hand boundary of the image runs north and south rather than being parallel with the visible longitudinal axis of the disk.

Fifth, the entire image is in sharp focus suggesting that (a) the shutter speed was fast, (b) the disk was not moving relative to the Earth background, or both. It is known that the exposure lasted 1/500 seconds, which would "stop" a slowly moving object but not necessary a fast-moving one.

... The 4.2 mm length of the image is equivalent to an object 210 m in length, or 683 feet."

The above-cited observation is only one among the documented material gathered during the past 50 years, but the described effects are very common. From the point of view of presently adopted concept about space, they appear mysterious. As a result, many speculative "explanations" has been suggested, such as: "materialization" and "dematerialization", other dimensions, wormholes, human hallucination etc. Such explanations are completely wrong. Reliable physical records exist indicating that the UFO are real objects. What was missing so far is the physical explanation of the observed phenomena.

The BSM predictions for control of the gravitational mass are in agreement also with the observed, but explained so far Hutchison effect.

### 13.9. Supercommunication

Currently, the BSM theory predicts two new methods for a distant communication and one for micro-communication.

(A). Distant communication in a closed magnetic lines with a hiperlight velocity

(B). Distant communication with longitudinal waves embedded in EM waves

(C) Micro-communication between DNA molecules in the living organism

In case (A), the receiver and transmitter, while separated by some distance, must be connected by closed DC magnetic lines. It has been

shown in Chapter 2 that the magnetic lines are formed by linear (or curvilinear) arrangement of MQs of the CL node SPM vectors, which are phase synchronized by the speed of light. In such arrangement, all included CL nodes oscillate in phase. This removes the speed of light restriction for the propagation of the SG field. Then a properly modulated SG field may propagate with a velocity thousands times faster than the speed of light. The transmitter and receiver must be of type different from the known EM type. The connected magnetic field must not be of AC but of DC type, while the information carriers are longitudinal waves, modulated by the information that should be transmitted.

In Case (B), the DC magnetic lines are missing. The information is carried by LWs, which are embedded in ordinary EM waves. Such combination, however, might have much larger penetrative capability.

The case (C) has been extensively discussed in Chapter 11, where hypotheses are presented for energy storage mechanism in the biomolecules and the participation of the DNA in a communication process between the cells of the living organism. The micro supercommunication involves directly the genetic code embedded in DNA. It may play an important role in the immune system.

A supercommunication of type (B) using LWs is what is suitable for the distant interplanetary communications and travels. The first SETI (Search for Extraterrestrial Intelligence) project is initiated by Frank Drake in 1960. SETI program has been established also in Arecibo Observatory, PR, but then it was abandoned after a few years of unsuccessful search. (The author was acquainted with this program in 1990, when he was a visiting scientist in Arecibo Observatory, but the SETI program was not operational at this time). From a few years, SETI program has been revived in other places, but convincing results are not reported so far. The researchers expect to find eventual intelligent signals as EM type of communication. No SETI programs, so far has been looking for interstellar communications by LWs. From one hand, the SETI researchers do not envision other alternative way of communication than by EM signals. From the other hand, efforts for development of such technology are not officially made, due to misunderstanding of the physical principle. Pres-

ently, the advanced technology of communication is designed to filter out the transients, in which a potential information carried by LWs might be buried. The LW detectors must be built on a quite different principle.

### 13.10. Opportunity for interplanetary and interstellar travels.

The advantages of the suggested propulsion mechanism over the currently existed ones are overwhelming. The achieving of energy extraction directly from space might allow not only distant travels but also building of colonies in planets and satellites without atmosphere or with an atmosphere different from that of the Earth. Planets like Mars and some satellites of Jupiter and Saturn are such potential options.

The new space travel technology could be developed in the very near future, if adequate funding is allocated. Presently, many developed countries have the potential for development of such new technology. In parallel a serious research has to be conducted on the possible harmful effect of the LW radiation on the living organisms.

### 13.11. Endnote and disclaimer

The suggested Unified Theory permits to use classical methods in a real 3D space, which allows logical understanding and application of simplified mathematical modelling. At the same time, BSM does not undermine the achievement of the established theories in Modern Physics, such as, Quantum Mechanics, Special and General Relativity. From the suggested framework, they appear as special cases based on mathematical modelling, so they provide useful quantitative calculations. The methods used in BSM theory are closer to the Newtonian mechanics, because the use of a classical approach, while at the same time going beyond the Newton's law of gravity and motion. Free of unnecessary abstractness, the BSM theory has a reliable connection to different fields of natural science and technology. This book provides the fundamental base of this new approach with the necessary supporting arguments. It is written in a way to be understood by theoretically and experimentally oriented physicists, engineers and researchers. The researchers must be well acquainted

with the new BSM concept. A small but important fraction of the theory was published in the peer-reviewed journal *Physics Essays*, dedicated to fundamental questions in Physics [6]. Extracts from BSM theory (earlier version) have been published in the physics archive [12], in on-line *Journal of Theoretics* [13,14,15] and in the book "Beyond the Visible Universe", as a more popular version [16].

### Disclaimer:

The special applications are in completely new field. The longitudinal waves have been out of vision of the scholar physics. While firstly discovered by Nikola Tesla, they are only partly investigated by him and some other researchers. They may cause a harmful effects on the human body. Experiments related to special applications must be provided, by qualified researchers on their own risk. The author of this book is not responsible for any injury and loss or damage of property.

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