

About strange effects related to rotating magnetic systems

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Abstract

The basic hypothesis of topological geometrodynamics (TGD) is that spacetime is representable as a 4-surface in 8-dimensional space $M_+^4 \times CP_2$. The notion of many-sheeted spacetime forced by this hypothesis implies numerous new physics effects including gravitational anomalies, the possibility of negative energy spacetime sheets making possible overunity energy production and classical communications to the geometric past. The geometrization of the classical gauge fields in turn predicts the existence of long range color and electroweak gauge fields, in particular classical Z^0 field, which gives rise to macroscopic effects resembling those assigned usually with torsion fields. In this article the strange findings about the physics of rotating magnetic systems are discussed in order to illustrate the new physics predicted by TGD.

1 Classical TGD in nutshell

Topological Geometro-Dynamics (TGD) is a unified theory of fundamental interactions, which was born as an attempt to construct a Poincare invariant theory of gravitation [1, 2, 3, 4]. Spacetime, rather than being an abstract manifold endowed with a pseudo-Riemannian structure, is regarded as a 4-surface

in the 8-dimensional space $H = M_+^4 \times CP_2$, where M_+^4 denotes the interior of the future light cone of the Minkowski space (to be referred as light cone in the sequel) and $CP_2 = SU(3)/U(2)$ is the complex projective space of two complex dimensions [1].

The identification of the spacetime as a submanifold of $M_+^4 \times CP_2$ leads to Poincare invariance broken only in cosmological scale and solves the conceptual difficulties related to the definition of the energy-momentum in General Relativity. Sub-manifold geometry, being considerably richer in structure than the abstract manifold geometry, leads to a geometrization of all basic interactions and elementary particle quantum numbers. In particular, classical electroweak gauge fields are obtained by inducing the spinor curvature of CP_2 to the spacetime surface.

TGD approach forces a generalization of the conventional spacetime concept to what might be called manysheeted spacetime. The topologically trivial 3-space of General Relativity is replaced with a "topological condensate" containing matter as particle like 3-surfaces "glued" to the topologically trivial background spacetime sheet by connected sum operation. Spacetime sheets have outer boundaries and form a hierarchical structure. Macroscopic material bodies are identified as 3-surfaces with boundary identified as the outer surface of the macroscopic body. This implies a radical reformulation of the condensed matter physics. Spacetime sheets are connected to each other by wormhole contacts and join along boundaries bonds. Various new physics effects related to the manysheeted spacetime concept are described in four books about TGD: see for instance, the chapters "TGD and Nuclear Physics" and "Anomalies Explained by TGD Based Spacetime Concept" of [2]. Manysheeted spacetime concept is especially important in TGD inspired theory of consciousness and its applications to biosystems [3, 4].

2 Various new physics effects related to many-sheeted spacetime concept

Many-sheeted spacetime concept implies several new physics effects. The effects important in the recent context are following.

a) Topological field quantization: classical fields have kind of a Bohr orbit representation as spacetime sheets. For instance, magnetic field decomposes to magnetic flux tubes with quantized magnetic fluxes so that spacetime 'ends' at the boundaries of magnetic flux tubes.

b) Spacetime sheets can have negative time orientation and negative energies. This makes possible effective over unity energy production and classical signalling to the direction¹ past.

c) Gravitational flux from a given spacetime sheet can be distributed in several manners among larger spacetime sheets in the hierarchy and effective gravitational flux from this spacetime sheet (its effective gravitational mass) to a given spacetime sheet can thus vary: this implies gravitational anomalies and can lead to an effective variation of the gravitational coupling constant. Also the reduction of gravitational mass of rotating body becomes possible by a mechanism to be described in more detail below.

d) Vacuum can carry purely geometric charge densities: the electric potential associated with a rotating magnetic disk provides an example of this kind of

¹In TGD subjective time and geometric time are two different notions.

effect observed already by Faraday. In Maxwell's theory this charge density must be due to charged particles.

e) TGD predicts the existence of classical long range Z^0 fields above cellular length scale. In particular, Z^0 magnetic fields are possible even when system has a vanishing Z^0 charge density (neutrinos screen the Z^0 charge of atomic nuclei). The effects thought to be due to torsion fields [8, 9] could be due to classical Z^0 fields. Large parity breaking effects in long length scales are the signature of these fields.

Two examples of new physics effects not directly related to the recent context deserve to be mentioned because of their fundamental role in TGD Universe.

a) The so called 'massless extremals' (MEs) represent classical gauge fields propagating with light velocity without dispersion. The propagation of energy is channelled and the lightlike vacuum current at given point is completely non-deterministic so that classically MEs are optimal for communications. The lightlike vacuum current generates coherent photons and MEs act as quantum holograms. MEs play a key role in TGD inspired theory of consciousness [3, 4].

b) Manysheeted spacetime makes possible macroscopic quantum phases at non-atomic spacetime sheets which contain very low densities of particles and can be in extremely low temperatures. In particular, the flux tubes of Earth's magnetic field carry ionic supra phases. These macroscopic quantum phases are crucial for TGD based model of biosystems [3, 4].

3 The effects related to rotating magnetic systems and many-sheeted spacetime concept

In the sequel the effects reported by Roshchin and Godin in their article 'An experimental investigation of the physical effects in a dynamic magnetic system' [5] are discussed as a possible manifestation of various new physics predicted by TGD. A more general discussion of various anomalous effects can be found in the chapter "Anomalies explainable by TGD based spacetime concept" of [2]. The model discussed here involves also new and crucial aspects which became clear during writing of this article.

3.1 Gravitational anomalies and many-sheeted spacetime

TGD spacetime is many-sheeted surface in $H = M_+^4 \times CP_2$, which can be regarded as the future lightcone of Minkowski space with points replaced with CP_2 having size about 10^4 Planck lengths. One can visualize the spacetime sheets as almost parallel pieces of plane glued together by wormhole contacts and also connected by join along boundaries bonds². The distance between the sheets is of order CP_2 radius. This makes possible antigravitation like effects since a macroscopic object (itself a spacetime sheet containing hierarchy of smaller spacetime sheets glued to it) can feed its gravitational flux to several spacetime sheets. By modifying somehow the standard distribution of gravitational flux between various spacetime sheets, one could produce gravitational anomalies at a given spacetime sheet.

More precisely, what happens is that the gravitational force experienced by the object is replaced with

²For illustrations see my homepage <http://www.physics.helsinki.fi/~matpitka/illua.html>.

$$F_{gr} = \sum_i M_i F_{gr,i} , \quad (1)$$

where the summation over spacetime sheets is understood. This means that the simple Newtonian picture fails and the determination of the gravitational constant can give varying values.

The first idea to come into mind is that this effect might be responsible for the huge loss of weight in the experimental arrangement studied by Roshchin and Godin [5]. Part of the gravitational flux of the rotating magnet would flow to some other spacetime sheet than 'ours' so that magnet would lose part of its weight. The experiments suggest that effect can be very large (30 per cent loss of effective weight). A little thought experimentation however suggests that this mechanism very probably does not explain the observed loss of weight.

The loss of weight should relate directly to the rotation of the system and this serves as a hint about what might be involved.

a) The gravitational flux of the rotating system runs to larger spacetime sheets by two alternative mechanisms: through extremely tiny wormhole contacts with CP_2 size and via join along boundaries bonds connecting the boundary of the rotating spacetime sheet to the boundary regions of the larger spacetime sheets.

b) When the system rotates, join along boundaries bonds (in particular, gravitational flux tubes) get entangled. This relates interestingly to the orientation-entanglement relation discovered by Dirac. When one connects the corners of a cube D_1 to the corresponding corners of a larger cube D_2 containing D_1 by elastic threads and rotates D_1 , the threads get entangled. Rather remarkably, for a 2π rotation entanglement cannot be straightened out, but can be done so for a 4π rotation: thus also classically 2π rotation can be non-trivial operation physically! The reason is that the entangled threads provide a geometric representation for the homotopy group Z_2 of $SO(3)$ realized by the rotations of the smaller cube. Join along boundaries bonds carrying gauge and gravitational fluxes realize this fictive system invented by Dirac quite concretely in TGD framework.

c) One might expect that if the rotation velocity gets too high, the gravitational flux tubes are not able to straighten out their entanglement and begin to split much like the magnetic flux tubes of the solar magnetic field. The splitting generates negative and positive gravitational charges at the ends of the flux tubes. The gravitational flux entering to the external world from the rotating system is not changed but the gravitational mass of the rotating system itself gets gradually lower since it is gradually transferred to the boundary of the external world spacetime sheet where it acts like a surface charge. At the extreme situation system has neither wormhole contacts nor join along boundaries contacts to the larger spacetime sheets and has a vanishing gravitational mass (using TGD terminology, system has suffered 'topological evaporation') in accordance with the fact that closed 3-space has a vanishing gravitational mass. The system could still have an inertial mass so that equivalence principle would not hold true. The long length scale limit of TGD indeed allows also solutions for which Einstein's equations do not hold true (see the chapter "TGD and GRT" of [1]).

d) The findings of [5] suggests that at least 30 percent of gravitational flux of the rotating magnet flows along join along boundaries bonds to the larger

spacetime sheets. If magnetic flux tubes serve also as gravitational flux tubes, the splitting would generate also effective magnetic monopoles.

By its extreme generality, this mechanism might be behind all reported loss of weight phenomena, for instance, those reported in [6, 7]. In particular, in the experiment of Podkletnov the effective reduction of the gravitational field above the rotating superconductor could be due to the rotation of a mass of air above the superconductor defining a spacetime sheet and leading to the splitting of the gravitational flux tubes so that the gravitational potential is reduced. For instance, pressure gradient is not anymore balanced by gravitational force and air begins to flow upwards.

An obvious question relates to the linear friction known to be proportional to the weight of the system (, the reason for which is in fact still to day poorly understood!). If gravitational join along boundaries bonds are responsible for the friction, then the proportionality of the frictional force to gravitational force could be understood. If gravitational flux tubes split when the object slides sufficiently fast, the gravitational mass of the object should be reduced. Note however that the object put in motion along the support of a scale does not demonstrate this effect since the support receives the lost gravitational mass. What would however happen is that the nearby gravitational field generated by the object plus scale behaves anomalously since only part of object's gravitational mass would be moving.

3.2 Generation of negative energy spacetime sheets in rotating magnetic systems

The very fact that spacetime is a 4-surface means that energy momentum tensor is replaced with a collection of conserved vector currents. This makes Poincare invariance exact apart from a cosmological breaking caused by the lightcone boundary, and the notions of energy and momenta are well defined unlike in General Relativity. One important implication is that the sign of the energy depends on the time orientation of the spacetime surface and both positive energy and negative energy spacetime sheets are possible. The following argument supports the view that negative energy spacetime sheets are indeed generated by rotating magnetic systems.

TGD allows purely geometric vacuum charge densities with no elementary particles acting as charge carriers. In particular, if ones 'kicks' a 3-surface containing a constant magnetic field into a rotational motion, vacuum charge density results. This is seen by considering a simple model for the imbedding of a magnetic field $B_z(\rho)$ as an induced gauge field in $M_+^4 \times S^2$, where S^2 is a geodesic sphere of CP_2 . In spherical coordinates $(\cos(\Theta), \Phi)$ for S^2 the electromagnetic component of CP_2 spinor connection is

$$A_\Phi = \cos(\Theta) \tag{2}$$

apart from a multiplicative numerical constant. The induced em gauge potential is

$$A_\mu = A_\Phi \partial_\mu \Phi \tag{3}$$

as a projection of the component of the spinor connection to the spacetime

surface. In cylindrical coordinates (t, z, ρ, ϕ) for M_+^4 one has for the imbedding of magnetic field as an induced gauge field

$$\cos(\Theta) = f(\rho) \ , \quad \Phi = n\phi \ , \quad B_z(\rho) = \partial_\rho A_\phi = \partial_\rho f n \ , \quad (4)$$

where n is integer. Note that the imbedding necessarily fails at some critical radius since $\cos(\Theta)$ cannot be larger than one: this is nothing but topological field quantization of magnetic field to flux tubes.

When the magnetic 3-surface is 'kicked' to a rotating motion one has

$$\cos(\Theta) = f(\rho) \ , \quad \Phi = n(\phi - \omega t) \ , \quad (5)$$

and an electric field

$$E_\rho = -\partial_\rho A_t = -\omega \rho B \quad (6)$$

is generated.

The condition $E_\rho = vB = \omega \rho B$, which can be interpreted as the vanishing of the net Lorentz force locally, gives rise to a vacuum charge density

$$\rho_{vac} = \nabla \cdot E = -\omega B \quad (\text{in units } \hbar = c = 1) \ . \quad (7)$$

The sign of the vacuum charge density depends on the direction of rotation. This means a large parity breaking effect. It is very difficult to understand how the sign of the charge density could depend on the direction of rotation if charge carriers were ordinary elementary particles. Thus this effect, observed already by Faraday, seems to be in conflict with Maxwell's theory and to support TGD.

Charge conservation requires that the radial electric gauge flux of vacuum goes somewhere at the boundary of the magnet spacetime sheet. The only possibility is that a new spacetime sheet is generated parallel to the magnet spacetime sheet (unless it exists already). The electric flux runs through worm-hole contacts or join along boundaries bonds to this spacetime sheet and back in radial direction at the second spacetime sheet. If this spacetime sheet has negative time orientation (guaranteeing that the sign of the electric field as tensor component F_{0r} changes), it has also negative energy, and energy conservation requires that the rotating system gets positive compensating energy.

3.3 Negative energy spacetime sheets and over unity energy production in rotating magnetic systems

As found, rotating magnet can generate a negative energy spacetime sheet and energy conservation requires that system itself gets a compensating positive energy. This alone cannot however lead to overunity energy production reported in [5] and a more refined mechanism is needed.

What is essential is that the negative spacetime sheet defines a quantum system in which particle energies are negative: the roles of creation and annihilation operators are effectively changed. What happens that negative energy spacetime sheet begin to be filled with negative energy particles, presumably photons and gravitons and perhaps even charged particles. If the rate for the

generation of negative energy in this manner overcomes the rate of the ordinary dissipation, the rotating system begins to accelerate.

a) The electrostatic energy of the negative energy spacetime sheet is of order

$$E_e \sim -\frac{1}{2}E_m \frac{\omega^2 r^2}{c^2} , \quad (8)$$

where E_m is the ordinary magnetic energy and r the radius of the rotating magnetic system.

b) Overunity energy production requires that the rate for the change of the rotational energy $E_{rot} = I\omega^2/2$ is positive (I is moment of inertia), that is ω increases spontaneously. This rate is given by

$$\frac{dE_{rot}}{dt} \sim \frac{dE_e}{dt} + P_- - P_d , \quad (9)$$

where P_d denotes the power dissipated by friction losses and P_- denotes the rate of negative energy generation due to the filling of negative energy particle states (at least photon and graviton states) states associated with the negative energy spacetime sheet.

c) Since E_{rot} and E_e are both proportional to ω^2 , one has

$$\frac{d\omega^2}{dt} \frac{1}{\omega^2} \sim 2 \frac{P_- - P_d}{E_{rot} - E_e} . \quad (10)$$

Since E_e is negligible as compared to E_{rot} , ω can increase only if one has

$$P_- \geq P_d . \quad (11)$$

Thus for $P_- = 0$ spontaneous acceleration of the system is not possible. Notice that the splitting of the gravitational join along boundaries bonds between rotating system and external world could also reduce frictional losses and facilitate the effect.

The proposed mechanism might be called 'buy now pay later (or somewhere else)' mechanism. The negative energy could leave the system and be received by some subsystem elsewhere. Instead of sucking energy from the external world, system feeds negative energy to its surroundings or to parallel negative energy spacetime sheets. This mechanism is crucial for understanding how negative potential energy, say gravitational energy is generated (a cloud of negative energy virtual gravitons represented as spacetime sheets), and is of utmost importance in TGD inspired cosmology: without it one could not understand huge energy densities generated near the moment of big bang (see the chapter "TGD inspired cosmology" of [1]).

3.4 Topological self-referentiality and the generation negative energy spacetime sheets as bound state formation

The notion of self-referentiality is one of the deepest and most fascinating notions of mathematics but for some reason it has not caught the full attention

of physicists. I encountered the mystic variant of this notion during my 'great experience' (the idea about living system as a computer sitting at its own terminal) and a more mathematical variant of the idea for a year or two later while reading the book "Gödel, Escher, Bach" of Douglas Hofstadter. It took however more than fifteen years before I managed to identify a possible concrete realization of the notion in TGD based physics.

In the chapter "Biological Realization of Self Hierarchy" of [3] the notion of topological self-referentiality is discussed. MEs (massless extremals) and magnetic mirrors play a key role in TGD based model of living matter. The connection with standard chemistry has been however lacking. It seems that some deep principle is needed to build this connection. The hints about the big principle come from the following observations related to the topological field quantization implying what might be called Bohr orbitology for the classical fields.

a) TGD predicts the existence of negative energy spacetime sheets, in particular MEs. The prediction is based solely on the assumption that the spacetime is representable as a 4-surface.

b) One can understand gravitational binding energy only if negative energy MEs represent this energy. This suggests that binding energy of a system has a very concrete representation as a negative energy MEs.

c) Quantum entanglement has as a geometric correlate join along boundaries bonds, in particular MEs and possibly also magnetic mirrors. Only the entanglement associated with the bound states is stable against the state preparation process leading to a maximally unentangled state in each quantum jump.

d) Classical superposition for em fields could mimick quantum superposition for states. The multiples of the fundamental frequency for ME could represent the BE condensate of bosons with energy defined by the fundamental frequency $f = c/L$.

e) The phase increments of the CP_2 coordinates around closed loops could represent phase increments of spinor fields and superconducting order parameters around them as suggested in the chapter "Macroscopic Quantum Phases and Geometry of CP_2 " of [1].

f) Join along boundaries bonds can represent even half-odd integer spin topologically. The join along boundaries bonds connecting 3-surface to a larger 3-surface get entangled in 2π rotation but in 4π rotation no entanglement results : this is due to the fact that the bonds provide a representation for the homeotopy group of 3-dimensional rotation group. A good manner to visualize the situation is to think of a cube inside a larger cube with threads connecting the corresponding vertices of the cubes. An interesting question is whether also spin and statistics connection could be represented classically somehow.

These observations suggests a far-reaching generalization. Perhaps many-sheeted spacetime allows the system to represent in its own structure the theory about itself. All theoretical concepts usually thought to have rather ethereal existence would have a concrete topological representation. These representations would exist already at the elementary particle level. Not only biomolecules, but even hadrons, would be accompanied by a topological representation about their theory analogous to a written language. p-Adic-to-real transition would actualize this theory. Thus not only cognition but also symbolic representations of thoughts would be present in all length scales.

This idea of self-referentiality is actually an essential part of the basic philosophy of TGD. TGD inspired theory of consciousness implies that the Cartesian

division to a world and theory about it is an illusion. Quantum histories, which are TGD counterparts for the solutions of field equations *are* the reality, there is no need to postulate any 'real' reality behind them since conscious experience is associated between quantum jumps between quantum histories rather than the 'real' reality. 'Ontogeny recapitulates phylogeny' principle states that quantum histories have geometric and topological correlates at spacetime level. This is just what the idea about topological representation of a theory about the system as a part of the system itself means. System could consist of a hierarchy of levels such that $N + 1$:th level represents N :th level. Or perhaps more precisely, what results in the interaction of N :th level systems.

Topological self-referentiality allows to understand what happens in overunity energy production. The components of the system can bind mutually or with environment and negative energy spacetime sheets represent binding energy. Bound state energy is liberated as a usable energy. The resulting bound states correspond to spacetime sheets having typical sizes given by the p-adic length scale hypothesis and the process means basically spacetime engineering. The typical wavelength of the radiation emitted in the process gives estimate for the electromagnetic or gravitational size of the bound state. In ELF frequency range the electromagnetic size is of order Earth size.

Electrolytic processes are especially interesting from the point of view of overunity energy production. For instance, the production of hydrogen molecules in the electrolysis of water might be accompanied by the formation of large bound states of water molecules and the liberation of the binding energy as a usable energy. The signature for the process is simple: the energy liberated is larger than the energy deduced from the binding energies of water and hydrogen molecules. Rather interestingly, the hydrogen bond energy deduced from the evaporation energy per water molecule is .485 eV and is very near to the photon energy $E(167) = .4844$ eV corresponding to p-adic length scale $L(167) = 256L(151)$ for $L(151) = 10$ nm: $k = 167$ is one of the four subsequent p-adic length scales $k = 151, 157, 163, 167$ which correspond to Gaussian Mersennes. Perhaps cold fusion involves both the nuclear fusion by Trojan horse mechanism and the formation of large scale bound states.

Biology provides an important area of applications and the model of biophotons developed in the chapter "Homeopathy in Manysheeted Spacetime" of [4] leads to a concrete model for the generation of pairs of positive and negative energy MEs at DNA level. Biomolecules and cells are indeed bound states of macroscopic size. The first form of life evolved under conditions in which electrolytic processes occurred: perhaps bound state formation led to the generation of biomolecules and cells. What is nice that the development of long range order (negative energy MEs) would have been automatically accompanied by the development of metabolism (positive energy MEs!). Sol-gel transition crucial for cellular locomotion is a particular example of this process. A natural path to follow in the attempts to build new energy technologies is to try to mimic what living nature has already achieved. This kind of energy production would be also wasteless and support evolution.

3.5 Explanation of the coronal discharge

The presence of the coronal discharge in the experiments of Roshchin and Godin [5] has a characteristic pink-blue character. This suggests that the light results from atomic or molecular transitions. Gas discharge tubes and so called sprites

and elves associated with certain type of lightnings exhibit also red and blue light (see [Williams] and TGD based model of this phenomenon in the chapter "Quantum model for sensory representations" of [3]). In case of sprites red and blue light results from the electronic excitations of N_2 molecules and blue light from the collisions of electrons or N_2 molecules exciting N_2^+ ions. Similar mechanism could be at work also now. The electrons would be conduction electrons of metal drifting in the radial electric field inside magnetic system and N_2 molecules and N_2^+ ions would be ions of the surrounding air.

What happens is that the electrons and ions are accelerated in the external field and achieve drift velocity determined by the condition

$$\frac{mv^2}{2} = eEl \quad , \quad l = \frac{1}{n\sigma} \quad . \quad (12)$$

Here σ denotes the total scattering cross section for the scattering of the charged particle on molecules and l denotes the length of the average free path of the charged particle. The condition simply states that the kinetic energy gained in the field between two interactions equals to the work done by the electric field on charged particle.

This formula generalizes as such to the situation in which magnetic field is present since magnetic field does not perform work. In the situation in which drift velocity is so large that it can induce ionizations the magnetic force dominates and particle orbits have radii considerably larger than the radius of the magnetic system. This means that orbits can be approximated with straight lines.

In present case one has for the local drift velocity

$$v_d = \sqrt{\frac{2e\omega\rho B}{n\sigma}} \quad . \quad (13)$$

Numerically one has

$$\frac{v_d}{v} \sim 10^5 \sqrt{\frac{\rho_1 n_0}{\rho n}} \quad .$$

Here the estimate $\sigma \sim 10^{-20} m^2$ (geometric cross section for atom) is used. $\rho_1 = 1 m$ denotes the radius of the magnetic system and $n_0 = 10^{30}/m^3$ is order of magnitude for the density of condensed matter. Clearly drift velocity is always much larger than the rotation velocity and actually relativistic.

Ionization becomes possible when the kinetic energy is above the ionization energy E_{ion} of the molecules and atoms present at the spacetime sheet. This condition determines the critical value of the electric field as

$$eE_{cr} = 2\Delta E_{ion}n\sigma \quad . \quad (14)$$

The critical value of the electric field is proportional to the density n of the molecules. The ionization condition gives the lower bound

$$v_d \geq \sqrt{2E_{ion}/m} \quad (15)$$

for the drift velocity. For instance, the lower bound for v_d is of order $10^{-2}c$ for electron. Thus ordinary dielectric breakdown at atomic spacetime sheet can explain the pink-blue radiation.

3.6 Strange magnetic field structures

In TGD framework the strange magnetic field structures observed in the experiments of Roshchin and Godin [5] and having a geometry of cylindrical shells are identifiable as topological field quanta of the magnetic field generated by the rotating magnetic system (flux quanta could also carry Z^0 magnetic fields, see below).

One could understand the lowering of the temperature inside the magnetic flux structures in the following manner. In ordinary hydrodynamics the condition $p + \rho v^2/2 = p_0$, where p_0 is pressure in the region where flow velocity vanishes, holds true by energy conservation along flow lines. In magnetohydrostatics the corresponding condition reads as

$$p + \frac{e^2 B^2}{2} = p_0 = nT_0 \quad , \quad (\hbar = c = 1) \quad . \quad (16)$$

Here p_0 and T_0 denote the pressure and temperature outside the magnetic flux tubes and the equation $p = nT$ for ideal gas has been used. The equation implies a lowering of the temperature:

$$\frac{\Delta T}{T} = -\frac{e^2 B^2}{2p_0} \quad .$$

For a magnetic field strength of order .05 Tesla and pressure of one atmosphere (10^5 N/m^2) the estimate for the reduction is $\Delta T/T \sim 10^{-2}$, which is of the same order of magnitude as the reported reduction of temperature $\Delta T/T \simeq 6 \text{ K}/295 \text{ K} = .02$.

3.7 The classical Z^0 fields as TGD counterpart for torsion fields

TGD predicts the existence of classical Z^0 fields (Z^0 bosons are ultraheavy companions of photons responsible for neutral current weak interactions; (see the chapter "Anomalies explainable by TGD based spacetime concept" of [2]). The Z^0 charge of atomic nucleus is essentially its neutron number since proton's Z^0 charge is very small. Neutrinos screen the Z^0 charge of the condensed matter above length scales of neutrino Compton length which is of the order of cell size (see the chapter "TGD and condensed matter physics" of [2]). Under certain circumstances also Z^0 electric fields can cause detectable effects. For instance, the TGD based explanations of the tritium beta decay anomaly [10], the acceleration anomaly of spaceships in outer space [11] discovered in NASA, and the anomalous variation of the radioactive decay rates [12] involve the interaction of small sized objects with large Z^0 charges with astrophysical Z^0 electric fields.

Z^0 neutrality does not exclude the possibility of Z^0 magnetic fields: what is required that nuclei and neutrinos rotate with slightly different velocities. Thus rotating macroscopic objects could generate Z^0 magnetic fields and the claimed properties of the torsion fields [8, 9] are very much like those of Z^0 magnetic fields. In particular, also classical Z^0 field has parity breaking axial coupling to elementary particles, and large parity breaking effects are predicted (chiral selection in living matter has explanation along these lines).

The generation of classical Z^0 magnetic field might be involved with the large parity breaking observed in the experiments of Roshchin and Godin [5]

(the critical rotation velocities were different for clockwise and counterclockwise rotations). Note however that also the sign of vacuum charge density involves parity breaking effect. It is also possible that flux structures carry combination of magnetic and Z^0 magnetic fields and the strange shell like magnetic field structures could be accompanied also by Z^0 magnetic fields.

To sum up, it seems that the experimental findings of Roshchin and Godin could be satisfactorily understood at the phenomenological level in TGD framework although quantitative modelling is not possible at this stage.

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