About Strange Effects Related to Rotating Magnetic Systems

M. Pitkanen

Dept. of Physics, University of Helsinki, Helsinki, Finland.
Email: matpitka@rock.helsinki.fi
http://www.physics.helsinki.fi/~matpitka/.

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 manysheeted spacetime forced by this hypothesis implies numerous new physical effects including gravitational anomalies, the possibility of negative energy spacetime sheets makes possible the 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 colour 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.

Classical TGD in nutshell

Topological Geometro-Dynamics (TGD) is a unified theory of fundamental interactions, which appeared 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 to be the 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 a 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 spacetime as a submanifold of $M^4_+ \times CP_2$ leads to Poincare invariance broken only in cosmological scales and solves 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 physical 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 Explainable by TGD Based Spacetime Concept" in [2]. Manysheeted spacetime concept is especially important in TGD inspired theory of consciousness and its applications to biosystems [3,4].

Various new physics effects related to many-sheeted spacetime concept

Many-sheeted spacetime concept implies several new physical effects. Effects important in the recent context are the 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 direction of geometric past (in TGD subjective time and geometric time are two different notions).

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 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 signatures of these fields.

Two examples of new physical 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].

The effects related to rotating magnetic systems and manysheeted 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.

Gravitational anomalies and manysheeted spacetime

TGD spacetime is manysheeted 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 of 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 bonds (for illustrations see my homepage http://www.physics.helsinki.fi/~matpitka/illua.html.). The distance between the sheets is about 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

$$F_{gr} = \sum_i M_i F_{gr,i} ,$$

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 loose 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, 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.

d) 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 are not true (see the chapter "TGD and GRT" of [1]).

e) The findings of [5] suggest that at least 30 percent of gravitational flux of the rotating magnet flows 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 by Podkletnov the effective reduction of the gravitational field above the rotating superconductor could be due to the rotation of the 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 today 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.

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 Relatitivity.

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 one 'kicks' a 3-surface containing a constant magnetic field into a rotational motion, then vacuum charge density results. This is seen by considering a simple model for the imbedding of a magnetic field $Bz(\rho)$ 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

$$A_\Phi = \cos(\Theta) \qquad (1)$$

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

$$A_\mu = A_\Phi \partial_\mu \Phi \qquad (2)$$

as a projection of the component of the spinor connection to the spacetime surface. In cylindrical coordinate (t,z,ρ,ϕ) for M^4_+ one has for the imbedding of magnetic field as an induced gauge field

$$\cos(\Theta) = f(\rho)\ ,\ \Phi = n\phi\ ,\ B_z(\rho) = \partial_\rho A_\phi = n\,\partial_\rho f \qquad (3)$$

where n is integer. Note that the imbedding necessarily fails at some critical radius since cos(Q) 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

$$\cos(\Theta) = f(\rho)\ ,\quad \Phi = n(\phi - \omega t)\ , \qquad (4)$$

and an electric field

$$E_r = \partial_\rho A_t = -\omega \rho B \qquad (5)$$

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

$$\rho_{vac} = -\partial_\rho E_\rho = -\omega B \quad (h/2\pi = c = 1)\ . \qquad (6)$$

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.

Note from Faraday Lab Ltd: it is one more example of the advantage of experimental science by Faraday in front of theoretical science by Maxwell.

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 wormhole 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 (guaranteing 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 get positive compensating energy.

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 get 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. It 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

$$E_e \approx -\frac{1}{2} E_m \omega^2 r^2/c^2,$$

where $\mathbf{E_m}$ 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 the moment of inertia), that is ω increases spontaneously. This rate is given by**
$E_{rot}/dt \approx dE_e/dt + P - P_{d,}$ 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) associated with the negative energy spacetime sheet.

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

$$d\log(\omega^2)/dt \approx 2 (P - P_d)/(E_{rot} - E_e) .$$

Since E_e is negligible as compared to E_{rot}, then ω can increase only if one has $P \geq P_{d.}$ Thus for $P = 0$ spontaneous acceleration of the system is not possible. Notices 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 sends 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]).

Coronal discharge and acceleration of ions in the electric field are generated by vacuum charge density

Standard wisdom suggests that the presence of coronal discharge in the experiments by Roshchin and Godin [5] could be analogous to what happens in TV screen when electrons accelerate in electric field and loose their energy by bremsstrahlung in collision with the 'wall'. In this case the electromagnetic potential energy difference in the radial direction at the spacetime sheet not containing the magnetic field is $\Delta E = eV = e\omega B\Delta\rho^2$, and causes acceleration since the electric force is not cancelled by the magnetic force. Thus the coronal discharge could be seen as an evidence for the manysheeted spacetime concept. The objection against this mechanism is that also charged particles at the negative energy spacetime sheet should reside in negative energy states. If so, the acceleration of these charges means that they emit positive energy photons so that the observed radiation could result from this kind of process rather than from a collision with the 'wall'. A temporal mirror image of the bremsstrahlung process would be in question! Electrons and other ions, if present at the negative energy spacetime sheet, accelerate in this electric field. Depending on the sign of the charge, the acceleration occurs inwards or outwards. The sign of the acceleration is predicted to depend on the direction of rotation since the sign of the electric field depends on it. The intensity of radiation allows estimating the total number of ions present at this spacetime sheet: this number should be very small.

The maximum energy E_{max} of a photon emitted as bremsstrahlung is given by the maximal electric potential energy difference and a simple estimate gives $E_{max} \approx 3$ keV for $B = 0.85$ Tesla, $\omega = 500$ rpm and $\Delta\rho = 1$ m. Whether the bremsstrahlung type spectrum is really there could be easily tested. The charges in ionic clouds should have different signs for clockwise and counter clockwise directions of rotation since the signs of ions at the exterior boundary (and interior boundary) are opposite.

Strange magnetic field structures

In TGD framework, strange magnetic field structures observed in the experiments by Roshchin and Godin

[5] and having geometry of cylindrical shells are identiable 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: $p+\frac{1}{2}(\rho v)^2 = p_0$, where p_0 is the pressure in the region where flow velocity vanishes, holds true by energy conservation along flow lines. In magnetohydrostatics the corresponding condition reads as

$$p + \frac{1}{2}(e^2B^{2)} = p_0 = n T_0 .$$

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 as follows:

$$\Delta T/T = - \frac{1}{2} e^2B^2/ p_{0.}$$

For a magnetic field strength of order 0.05 Tesla and pressure of one atmosphere (10^5 N/m^2) the estimate for the reduction is $\Delta T/T \approx 10^{-2}$, which is of the same order of magnitude as the reported reduction of temperature $\Delta T/T \approx 6K/295 K=0.02$.

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 the 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 that is of about 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], torsion 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 by Roshchin and Godin [5] (the critical rotation velocities were different for clockwise and counter clockwise 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 by 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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