About the description of rotating magnetic systems in zero energy ontology (ZEO)

M. Pitkänen
Email: matpitka6@gmail.com.
http://tgdtheory.com/.

April 18, 2020

Abstract

I have worked for decades in an attempt to understand the findings of Godin and Roschin about strange effects in rotating magnetic systems. I have also discussed the possible connections with TGD inspired quantum biology from the point of view of $h_{eff} = nh_0$ hierarchy. The developments in zero energy ontology (ZEO) and increased understanding of magnetic fields in TGD framework allow to look at the situation again. It seems that the strange findings can be understood as beining related to a macroscopic variant of "big" (ordinary) statefunction reduction in which the arrow of time is changed. I am not an engineer but more precise model might allow development of simpler systems catching just the essentials and also scaling down of the system of Godin and Roschin perhaps allowing easier testing of the model.

Contents

1 Introduction

I have worked for decades in an attempt to understand the findings of Godin and Roschin [H1, H2] about strange effects in rotating magnetic system [K1]. The possible connections with TGD inspired quantum biology are discussed from the point of view of $h_{eff} = nh_0$ hierarchy in [L1] . The developments in zero energy ontology (ZEO) and increased understanding of magnetic fields in TGD framework allow to look at the situation again. I am not an engineer but more precise model might allow development of simpler systems catching just the essentials and also scaling down of the system of Godin and Roschin perhaps allowing easier testing of the model.

1.1 Basic new ideas

The basic new ideas brought by TGD are present already in the earlier model [K1] but in less developed form.

1. Dark matter is assigned with the hierarchy of effective Planck constants $h_{eff} = nh_0$, $h = 6h_0$ [K2, K3]. The strengthening of hypothesis introduces gravitational Planck constant $\hbar_{eff} = \hbar_{gr} = GMm/v_0$ introduced originally by Nottale [E1] and assigned with flux tubes mediating gravitational interactions. h_{gr} can have so large values that $E = h_{gr}f$ for cyclotron frequencies in ELF range (say 10 Hz) are in the range of bio-photon energies in visible and UV energies. One can assign the analog of gravitational Planck constant also to flux tubes mediating electromagnetic and other interactions: for instance $h_{eff} = h_{eff} = nh_0$ would be natural in the case of of the observed flux walls.

2. Dark matter can perform macroscopic quantum jumps since various quantum scales scale up like h_{eff} (Compton lengths) or even h_{eff}^2 (atomic orbitals).

3. Magnetic body (MB) is key notion. It has as building bricks magnetic flux quanta. Typically flux tubes and flux sheeets. It consists of two kinds of flux quanta. Flux can be vanishing, which corresponds to Maxwellian case. The flux can be also non-vanishing and quantized and corresponds to monopole flux. In this case magnetic field requires no current to create it. This option is not possible in Maxwellian world. These flux tubes play a key role in TGD Universe in all scales.

   Also Earth's magnetic field with nominal value $B_E = .5$ Gauss has these two parts. Monopole part corresponds to $B_{end} = .2$ Gauss explaining strange effects of ELF em radiation to the physiology and behavior of vertebrates. The presence of this part identifiable as monopole flux explains why Earth has magnetic field: this field should have decayed long time ago in Maxwellian world since it requires currents to generate it and they disappear. Magnetic fields of permanent magnets could have a monopole part consisting of flux quanta. Electromagnets do not have it. For flux walls the magnetic field is of order $B = .05$ Tesla and much stronger than B_{end}, whose cyclotron frequencies are involved also with the rotating magnetic system so that different magnetic fields are in question.

   MB would carry dark matter as $h_{eff} = n \times h_0$ phases and act as a "boss" controlling ordinary matter [L2]. Communication to and control of biological body (ordinary matter) would be based on dark photons, which can transform to ordinary photons and vice versa. Molecular transitions would be one form of control.

4. ZEO predicts that the arrow of time changes in "big" state function reductions (BSFRs - ordinary state function reductions as opposed to the counterparts of weak measurements or "small" SFRs). This would happen at magnetic has dramatic implications. Time reverse dissipation looks like energy feed from the environment to system. Self-organization involves always energy feed and generation of structures rather than their disappearance in apparent conflict with second law. Self-organization would correspond to dissipation in reversed time direction implied by generalized second law. No specific mechanisms would be required and only metabolic energy storages- systems able to receive the energy dissipated in reversed time direction - are enough. Obviously this provides a totally new vision about energy technology.

1.2 Basic picture about rotating magnetic systems

What is observed in rotating magnetic systems is following.

1. As the rotation velocity for the roller system around stator magnet approaches to 10 Hz frequency, which is basic biorhythm, the system starts to accelerate spontaneously around 9 Hz: the critical frequency is quite not the same for opposite rotation velocities. The rotating system must extract energy and angular momentum from some source. A good candidate for the apparent source of energy is the MB of the system. There should be an exchange of energy and angular momentum to system (call it "biological body" BB in the sequel) and MB.

   Depending on the rotation direction the weight of the rotating system increases or decreases. The interpretation is as additional force due to the exchange of momentum between MB and BB. The exchanged momentum would have direction depending on the rotation direction.

2. Cylindrical magnetic walls with magnetic field strength about $B = .05$ Tesla are observed and the temperature at their position is lowered. This behavior is in conflict with standard thermodynamics but would conform with time reversed thermodynamics. This would conform with time reversed dissipation from a system identifiable as MB of the rotating system. This mechanism would be completely general mechanism of metabolism in TGD being present in all self-organizing system. This would look like cooling of the air for the observer with standard time direction. One could interpret the situation as extraction of thermal energy from environment by walls of MB and its transfer to the BB leading to cooling. Also angular momentum and momentum would be transferred.

   In ZEO this would conform with the occurrence of macroscopic BSFR - a phase transition changing the arrow of time at MB. The phase transition taking place instantaneously with respect to *subjective time* identifiable as sequence of SSFRs must be distinguished from what happens after it with reversed arrow of *geometric time*. The quantum jump would be instantaneous and completely analogous to what has been observed by Minev et al in atomic systems.

3. The air in around rotating magnetic system emits visible - maybe also UV - light which can be assigned with molecular and atomic transitions. This suggests that transformation of dark cyclotron photons in B_{end} with ELF frequencies and very large $h_{eff} = h_{gr}$ to photons identified in bio-systems as time reversed bio-photons inducing transitions of molecules to higher energy states takes place. Observer would see emission of ordinary photons generated as molecules return to the ground state. Also direct transformation to bio-photons could take place and produce diffuse background. The cyclotron photons would have energies, which do not depend on the mass of charged particle since cyclotron energies are proportional to $\hbar_{gr}/m$ and one has $\hbar_{gr} \propto m$. For 10 Hz frequency would in the range bio-photon energies (visible and UV).

4. The rotation of rollers occurs without slippage with velocity v. The rotation frequency around the central cylinder is $\Omega = 2\pi F = v/R$. The spin velocity of the rollers with of radius r around their axis $\omega = v/r$ and by a factor R/r higher than Ω. During acceleration Ω is in the range 9-10 Hz. This frequency defines fundamental biorhythm - alpha rhythm- so that the analogy with TGD inspired quantum biology suggests itself strongly. 10 Hz frequency could be critical rotation frequency for the rollers around central cylinder.

   The energy transfer between MB and BB could take place resonantly at this frequency. Other important resonance frequencies could correspond to those assignable to EEG. The cyclotron frequencies of those biologically important ions that can occur as mechanical resonance frequencies in the system are especially interesting and would represent coupling between MB and BB. In particular, proton has cyclotron frequency 300 Hz in B_{end}. The spinning frequencies of the rollers bring in additional frequencies above 10 Hz determined by their rotating velocities with respect to the central cylinder.

   The analogy with biology forces to ask whether the phase transitions generation of flux walls is central also in quantum biology: consider flux walls possibly assignable to axonal membranes.

5. The biologically important cyclotron frequencies in magnetic field $B_{end} = .2$ Gauss should correspond to rotation frequencies of the rotating magnetic system. The scaling down of the system should not be problematic. $\Omega = v/R$ means that keeping Ω constant and reducing R, reduces also v in same proportion. Note that centripetal acceleration v^2/R produces problems for too large value of R. Rotation frequencies should not change in the scaling. Since one has $\omega = v/R$ this allows reduction of the size of the system if rotation velocities are scaled in the same matter. The scaling of magnetic and electric fields need not be so simple thing.

2 Updated model for rotating magnetic systems

In the sequel the updated model of he rotating magnetic systems based on the notions of MB and ZEO is described.

2.1 What would happen in macroscopic BSFR

The observed anomalies suggest change for the arrow of time and this makes the interpretation as macroscopic BSFR at MB of the system plausible interpretation. The value of h_{eff} should increase to generate the observed effects analogous to self-organization in long scales. Quantum coherence length would increase.

2.1.1 What could happen at MB before the transition

What could happen at MB in the phase transitions? Consider first the MBs before the transition.

1. Before phase transition monopole flux tubes form MB carrying dark matter. Monopole flux tubes would be in question and this requires permanent magnet for which the monopole part of magnetic field would not require currents as sources. The magnets created by electromagnetic currents do not satisfy this condition.

2. One can of course ask whether the magnetic flux tubes of the stator magnet are really at rest. Could the interaction with the flux tubes of the rotating rollers force also them to rotate so that the two magnetic fields would form single coherent rotating structure?

3. Before the transition the flux tubes of the MBs of the rollers would rotate as a whole around the central cylinder. The flux tubes would also rotate around the axis of the roller with the rotation velocity of the rollers. Also the dark matter at the flux tubes of rollers would rotate.

2.1.2 What could happen at MB in transition

What would happen in the transition.

1. What suggests itself is that the magnetic flux tubes of the stator magnet increase in thickness and fuse to the observed magnetic walls having thickness about 5 cm and distance about .5 meters. The field strength is of order .05 Tesla. The cylinders would be closed surfaces carrying monopole flux so that torus-like configurations obtained by taking flux tube which is closed solid torus highly stretched in vertical direction rotating it around vertical axis outside it and near to the second side. This gives torus topology with flux flowing through the section with constant height. Various walls would correspond to this kind of structures inside other looking like cylinders.

2. What would happen to the flux tubes of the rotating rollers? Could also these fuse to form magnetic walls in shorter scale? What about these structures: could also these fused to larger cylindrical structures accompanying magnetic walls. There are no reports about their possible occurrence.

3. Does it make sense to speak about rotating flux walls? In Maxwellian electrodynamics this is not possible without breaking of the rotational symmetry. In TGD framework this is possible since Kähler gauge potential would be different for rotating Kähler magnetic field and correspond to different space-time surface having different induced metric. Rotating Faraday disk develops a voltage between its boundary and center giving rise to electric field $E = v \times B$. This observation is problematic from the point of view of Maxwellian theory since strong parity breaking is involved.

   On the other hand, this observation suggest that the assumption about rotation of the magnetic flux tubes of the stator magnet would not mean too strong deviation from Maxwellian view in TGD. h_{eff} hierarchy in TGD allows strong parity breaking effects, which are indeed present in living matter. Also the earlier model of the system involves parity breaking assigned with the dependence of the effect on the direction of rotation.

   As a matter of fact, the exact cylindrical symmetry is broken by the magnetic cogwheel structure of rollers (12-fold cyclic symmetry) and stator magnetic ($12 \times 12 = 144$-fold cyclic symmetry) preventing the slipping of the rollers.

The following remarks about magnetic fields and corresponding cyclotron frequencies suggest that dark electrons play an important role.

1. The magnetic field strength for stator and rotor magnets was $B_M \sim 1$ Tesla. For electron this corresponds to cyclotron wavelength $\lambda = c/f = 1$ cm. The thickness of the magnetic walls was 5-6 cm. If the monopole flux part of the magnetic field is roughly $r = 2/5$ of the measured field as in the case of B_E, the cyclotron wavelength increases by a factor 5/2 to 2.5 cm, which is roughly one half of the thickness of magnetic walls. There could be thus be a connection.

2. The magnetic field $B \sim .05$ Tesla of magnetic walls corresponds to electron's cyclotron wavelength $\lambda_c = .2$ meters. The distance between magnetic walls was $d = .5 - .6$ meters. If the value of the monopole part of the flux is 2/5 of the entire flux as for B_E, λ_c increses to $_c = .5$ meters.

2.1.3 Also endogenous magnetic field B_{end} is involved

The appearance of biologically important frequencies suggests that besides the magnetic fields associated with the magnetic walls also the endogenous magnetic field B_{end} plays an important role.

1. Also $B_{end} = .2$ Gauss could play a central role defining the monopole part of Earth's magnetic field could play a role. The transition correspond to frequencies around 10 Hz frequency of rotation around stator magnet and the transition begins around 9 Hz frequency. Around 10 Hz rotation frequency one might expect a resonance coupling of the rotating motion of the rollers to cyclotron transitions in $B_{end} = .2$ Gauss at this frequency. Iron ions have cyclotron frequency around 11 Hz in B_{end} to be distinguished from the magnetic fields of the stator magnet and rollers.

   The metal ions possible in the system would have cyclotron frequencies and these should be realizable as rotation frequencies using suitable radii for rollers. Resonance would require correlation between the radii and atomic numbers of the metals involved. A strong analogy with biologically important ions would emerge.

2. B_{end} is by factor 4×10^{-4} weaker than the magnetic field $B \sim .05$ Tesla at magnetic walls. The frequencies associated with the system cannot correspond to B. The value of $n = h_{gr}/h_0$ required by the assumption that ELF frequencies correspond to bio-photon energies is very large - the order of magnitude is of order $n \sim 10^{13}$ for 10 Hz frequency. For h_{gr} must be assigned to gravitational flux tubes carrying no monopole flux with single sheet carrying B_{end}.

3. One can of course consider the interpretation of the measured magnetic field B in many-sheeted space-time. Does the measured B correspond to the sum of identical magnetic fields B_{end} over the $n = h_{eff}/h_0$ sheets of many-sheeted space-time? Cyclotron frequencies as purely local quantities would correspond to the field B_{end} at single sheet. If the measured magnetic field is $B_{meas} = n \times B_{end}$, one would obtain the estimate $n \sim 2.5 \times 10^3$. This could be interpreted in terms of the proposed electromagnetic variant $h_{em} = nh_0$ of h_{gr} having much smaller value.

Could the important mechanical frequencies of the system are equal to cyclotron frequencies in B_{end}?

1. $F = 10$ Hz, which corresponds roughly to the cyclotron frequency f_c of Fe^{++} ion in B_{end}.

2. Proton's cyclotron frequency in endogenous magnetic field $B_{end} = .2$ Gauss is $f_c = 300$ Hz. Can one get this frequency as a mechanical frequency? There were $N_r = 23$ rollers.

   (a) The ratio r/R was integer $N \geq 12$. The frequency associated with the rotation of roller is $f_r = v/r = NF \geq 12F = 120$ Hz. $N = 30$ ($r = 5/3$ cm) would give $f_r = 300$ Hz but $N = 30$ looks too large.

   (b) The periodicity of the roller configuration implies frequency $f = N_r F = 23F = 230$ Hz for $F = 10$ Hz but allowing no identification of f as cyclotron frequency.

(c) The realization of magnetic cogwheel involves 12-fold periodicity of the roller giving frequency $12 \times 23F = 2.760$ Hz frequency. At stator one obtains $N \times 12$ fold periodicity of stator surface and $12N \times 10 \geq 1,440$ Hz frequency.

2.1.4 About the energetics of the dark matter after the transition

What happens to the dark matter at flux tubes in the phase transition? Especially interesting is the energetics of the transition. One can use observations about cooling associated with magnetic walls and molecular emission lines near rollers. The dissipation of energy by dark matter at magnetic walls and at MBs of the roller possibly fused together could could explain these observations.

1. A transfer of energy, angular momentum, and momentum must take place between the system formed by rotating rollers and MB carrying dark matter. This would happen in the phase transition/quantum jump. Dark matter at flux quanta must lose angular momentum, energy and momentum to the BB of the roller system. Most naturally the MBs of rollers are in question. This requires that roller flux tubes fuse to flux walls. About whether this occurs there is no direct experimental information.

   If also the flux tubes of stator magnet rotate they can fuse to single magnetic wall and if the dark matter comes the transfer of conserved quantities to roller system would take place. The fusion of flux tubes to flux walls would force the acceleration.

2. After the transition occurs dissipation in reversed time direction making itself visible as cooling at magnetic walls assignable to the stator magnet. In standard time direction the rotating system accelerates but in reversed time direction it loses energy and angular momentum and possibly also momentum. This would be induced by time reversal at MB. Does the time reversed dissipation occur via MB of stator magnet or directly?

   Does the cooling of environment correspond to

   (a) dissipation of the energy of the MB of stator magnet or

   (b) dissipation of the energy of rotating system via the MB of stator magnet?

   For the latter option one could say that the MB of stator magnet extracts thermal energy from environment and provides it to the rotating system. For the first option also rotating system would do this and this does not look plausible since the time scales for time reversals are much shorter for ordinary matter. For second option the time reversed classical time evolution would provide a correlate for the quantum jump in accordances with quantum classical correspondence.

3. The emission lines from molecular transitions should take place after the transition as time reversed emission of dark photons from MB transforming to counterparts of bio-photons absorbed by the molecules of air and looking like molecular emission lines in standard time direction. Since dark photons transform first to ordinary photons standard observer would see emission of ordinary photons at bio-photon energies.

   The density of excited molecules would grow as time increases in non-standard direction. For the standard observer this would look reductio of the density of excited states. If the dark photons would have energies in visible and UV range, ionization would be gradually reduced in standard time direction and seen as emissio of photos with bio-photon energies.

   Since roller MBs are nearest to rollers, the MBs of the rollers would naturally provide energy, angular momentum, and momentum to the roller system in the transition. This could occur if the flux tubes of rollers fuse to flux walls so that the dark matter at them can come to rest after fusion. Time reversed absorption of dark photons from the rollers could cause the molecular emissions.

2.1.5 The transfer of conserved quantities after the transition

The first question whether there is any classical description for the transition itself or is the only description in terms of what happens after it. If the quantum jump occurs discontinuously, this

seems to be the case. Quantum classical correspondence suggests that the classical description based on what happens after the transition is the only possibility. The observer would talk about extraction of energy from environment. Time reversed dissipation would be the description of the system itself.

Suppose that both roller flux tubes and and those of stator magnet fuse to magnetic walls and contain after transition dark ions rotating around the walls and that there is also momentum in longitudinal direction with opposite momentum in the magnetic system causing the observed change of the weight. Suppose also that dark matter rotates and there is compensating angular momentum contributing to the of the roller system.

The natural identification for the transfer of conserved quantities would be in terms of energy, momentum, and spin, and angular momentum of dark photons.

1. In the transition energy and angular momentum are transferred to the roller system instantaneously. Energy and rotational angular momentum are dissipated in reversed time direction and for the external observer the roller system seems to accelerate and gain energy.

2. Photons have also momentum. The roller system would receive momentum in the quantum jump. The dissipation of this momentum would be seen as a force meaning gradual change of weight by external observer. The simplest option is that the momenta at BB and MB of the system are opposite in the final state after which dissipation starts.

   Why the sign of weight change depends on the direction of rotations. This would suggest that large parity breaking effects characterizing also living matter are involved. Dark photons (expected to have ELF frequencies) transfer both momentum and spin and rotational angular momentum.

The states corresponding to different directions of rotation are mirror images from the behavior of magnetic field in reflection. How good approximation reflection symmetry P is?

1. If parity is not violated the behavior $p \to -p$ and $J \to J$ in reflection P implies increase or loss of weight depending on the direction of rotation as indeed observed. Acceleration of rotation would take place in *both cases* as observed. The critical rotation frequency is different so that parity violation takes place. In standard model framework parity violation is large.

   In this case the helicity of photons proportional to the inner product $p \cdot s$ and $p \cdot J$ of photon momenta would be different for the two cases. The helicities $p \cdot s$ of dark photons would be different in the two case cases and correlated with the direction of rotation.

2. Note that the generation of $E = v \times B$ for Faraday disk involves also parity violation and could take place also now for the rotating magnets. This electric field has non-vanishing divergence and the divergence giving charge density is opposite for the two rotation directions. This should give rise to the charge density of the system a contribution depending on the direction of rotation.

2.2 Is the cooling of the environment enough to explain the acceleration

The classical description of the energy transfer after the transition by standard observed would suggest that the MB of stator magnet extracts energy from the thermal energy of air leading to the lowering of the temperature by about 6 degrees. The MB of roller system fused to a single magnetic wall would extract energy from the transitions of the air molecules visible as emissions of ordinary as dark photons transform to ordinary photons and also from the air near the rollers. The energy from MBs would be transferred to the roller system.

One can make a rough estimate for the contribution of thermal energy to see whether it is significant.

1. The mass density of O_2 molecules $\rho = 1.225$ kg m^{-3} giving for the number density of O_2 molecules $n = 3.4 \times 10^{25}$ m^{-3}.

2. Temperature is $T = 290$ K and is lowered by about 6 K. Thermal energy of molecule associated with translational motion is $e_T = 3kT/2 \simeq 4.4 \times 10^{-2}$ eV at room temperature.

   The density of thermal energy $\rho_T = ne_T = 1.5 \times 10^{23}$ eV/m^3 . Energy of 1 eV corresponds to $eV = 1.6 \times 10^{-19}$ J so that one has $\rho_T = 2.4 \times 10^4$ Jm^{-3}.

   The change of thermal energy is for the reduction of temperature by 6 K equal to 6×10^{-4} eV fraction $\epsilon = 1.8 \times 10^{-2}$ of thermal energy. The energy gain per volume equals to

   $$\rho_g = \epsilon\rho_T = 4.2 \times 10^2 \mathrm{Jm}^{-3} \ .$$

3. Assume that magnetic wall associated with the stator magnet has thickness $\Delta R = .05$ meters and radius of $R_{min} = .5$ meters. Walls are reported to appear at radii $R_n \sim nR_{min}$, $n = 1, 2, ...$ No upper bound for their heights h is given. They could correspond to the return flux for the magnetic system or stator magnet.

   For a wall of height h_n (the real height is larger) the volume of the wall with radius R_n is

   $$V_n(h_n) = n \times 2\pi R_{min} \times \frac{h_n}{m} = .16n \times \frac{h_n}{m}\mathrm{m}^3 \ .$$

   This gives energy gain

   $$E_n(h_n) = nE_1 \times \tfrac{h_n}{m} \ , \quad E_1 = \rho_T V_1(h/m = 1) = .7 \times 10^2 \ \mathrm{J} \ .$$

   The total energy transferred would be

   $$E_{tot} = \sum_{n<n_{max}} E_n(h_n) = \sum_{n<n_{max}} n \times \frac{h_n}{m} \times .7 \times 10^2 \ \mathrm{J}$$

   .

   The order of magnitude looks reasonable and could explain considerable fraction of the energy needed for acceleration.

4. One can estimate from the empirically determined power feed the needed power feed if power comes from thermal energy alone. A rough estimate for the total energy transfer is as $E = \int Pdt =< P > T$, where T is the duration of the period of accelerated motion and $\langle P \rangle$ the average power. P was in the range 1-7 kJ/s. Equating the estimated total energy E with the estimate $E = \sum E_n(h)$, one obtains a rough estimate for the parameters if thermal energy alone is enough.

2.3 About the scaling of the system

The system of Roschin and Godin is rather massive and a natural question is whether it could be scaled down or made less massive otherwise.

1. Consider first the geometric scaling. If the interpretation of 10 Hz frequency as cyclotron frequency assignable to Fe ions, which can appear as dark ions in $B_{end} = 0.2$ Gauss is correct, then it would seem that the frequencies involved should scale down. This would mean geometric scaling of both radii and possibly also heights of the magnets.

   For instance, scaling by factor $x = 1/10$ would produce stator radius $R = 5$ cm and rollers with radius $r = 5/12 \simeq .42$ cm for $N = 12$. The single basic unit at roller circumference would have length $2\pi r/N = \times 10\pi/N^2 = 10\pi/144 \simeq .22$ cm, which is rather small value.

2. What about the scaling of magnetic fields? The magnetic field strength is about 1 Tesla originally. The distance between magnetic walls is about .5 m and corresponds to the radius of stator, which is very natural. On the other hand, if the monopole part of $B = .05$ Tesla for walls is 2/5 of B as in case of B_E, the distance between magnetic walls would be cyclotron wavelength .5 m of electron. If the monopole fraction of 1 Tesla magnetic field is also 2/5, cyclotron wavelength would be 2.5 cm whereas the thickness of flu walls is 5-6 cm.

If one requires that cyclotron wavelength of electron corresponds to the stator radius, then one should scale B by the the inverse of the same factor for lengths. This would for scaling factor 1/10 mean $B = 10$ Tesla not easy to realize. 1 Tesla seems to be upper bound for the field strength of commercially available magnets (`http://tinyurl.com/q286tm4`) and 50 Tesla the maximum field strength achieve in lab (`http://tinyurl.com/y9lgk6qr`). Maybe the reason for the massive size of the magnetic system is just this.

3. One might think of curing the situation by using a hollow cylindrical stator of same or even larger radius to reduce B. As argued, the structure of MB of stator could consist of very long dipole flux loops rotated by 2π to get flux walls having torus topology and located inside each other. The walls would correspond to a slicing of the stator by hollow cylinders inside each other.

   If the total flux is conserved and the number of walls is N and they have same thickness and field strength, one has

$$B\pi R^2 = B_{wall}\sum 2\pi R_n d = B_{wall}\sum_0^N n\times 2\pi R d = \frac{N(N+1)}{2}B_{wall}2\pi R d \ .$$

   This gives for the number of walls

$$N(N+1) = \frac{B}{B_{wall}}Rd \ .$$

   For $B/B_{wall} = 20$ and $R/d = 10$ this would give $N(N+1) = 200$ and $N = 1/2(-1+\sqrt{801}) \simeq 13.6$. The number N of walls would be about 13. Replacing stator with a cylinder of radius 5 cm would still give single wall at distance of .5 m.

   If the dark matter at magnetic walls extracts thermal energy from environment, the energy feed to the system would be reduced but this need not be fatal concerning if one is interested only in the demonstration and study of the effect using less massive system.

REFERENCES

Cosmology and Astro-Physics

[E1] Nottale L Da Rocha D. Gravitational Structure Formation in Scale Relativity. Available at: `http://arxiv.org/abs/astro-ph/0310036`, 2003.

Fringe Physics

[H1] Godin SM Roshchin VV. An Experimental Investigation of the Physica l Effects in a Dynamic Magnetic System. *New Energy Technologies*, 1, 2001.

[H2] Godin SM Roshchin VV. An Experimental Investigation of the Physical Effects in a Dynamic Magnetic System. *New Energy Technologies*, 1, 2001.

Books related to TGD

[K1] Pitkänen M. About Strange Effects Related to Rotating Magnetic Systems . In *TGD and Fringe Physics*. Available at: `http://tgdtheory.fi/pdfpool/Faraday.pdf`, 2006.

[K2] Pitkänen M. Criticality and dark matter. In *Hyper-finite Factors and Dark Matter Hierarchy: Part I*. Available at: `http://tgdtheory.fi/pdfpool/qcritdark.pdf`, 2019.

[K3] Pitkänen M. Quantum gravity, dark matter, and prebiotic evolution. In *Genes and Memes: Part I*. Available at: `http://tgdtheory.fi/pdfpool/hgrprebio.pdf`, 2019.

Articles about TGD

[L1] Pitkänen M. The anomalies in rotating magnetic systems as a key to the understanding of morphogenesis? Available at: http://tgdtheory.fi/public_html/articles/godin.pdf, 2016.

[L2] Pitkänen M. Quantum self-organization by h_{eff} changing phase transitions. Available at: http://tgdtheory.fi/public_html/articles/heffselforg.pdf, 2019.