The Notion of Wave-Genome and DNA as Topological Quantum Computer

M. Pitkänen
Email: matpitka@luukku.com.
http://tgd.wippiespace.com/public_html/.

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Abstract

Peter Gariaev and collaborators have reported several strange effects of laser light and also ordinary light on DNA. These findings include the rotation of polarization plane of laser light by DNA, phantom DNA effect, the transformation of laser light to radio-wave photons having biological effects, the coding of DNA sequences to the modulated polarization plane of laser light and the ability of this kind of light to induce gene expression in another organisms provided the modulated polarization pattern corresponds to an "address" characterizing the organism, and the formation of images of what is believed to be DNA sample itself and of the objects of environment by DNA sample in a cell irradiated by ordinary light in UV-IR range. In this article a TGD based model for these effects is discussed.

Keywords: Topological Geometrodynamics, quantum computation, genome.

1 Introduction

For about eight years ago - inspired by a representation in CASYS′2000 conference [34] - I developed a model [26, 28] for the fascinating effects of laser light on genome discovered by Peter Gariaev and his collaborators [34]. This model is somewhat obsolete since it does not involve the recent TGD inspired vision about quantum biology and DNA, and the discussions with Peter in the second Unified Theories conference 2008 in Budapest made clear the need to update this model containing also some misinterpretations.

In this article the effects of laser light on living matter are discussed only briefly with a stronger emphasis on the photographs produced by the scattering of ordinary light on DNA reported in [38]. In TGD framework these photographs could be interpreted as photographs of wormhole magnetic flux tubes containing dark matter. This would realize the dream of making directly visible the basic new structure predicted by TGD inspired quantum biology. Of course, a more conventional explanation might be found for the effect, but the proposed qualitative explanation deserves to be discussed since it fits nicely with the general vision about dark matter in TGD Universe.

1.1 The findings of Peter Gariaev and collaborators

These findings of Gariaev and collaborators include the rotation of polarization plane of laser light by DNA [34], phantom DNA effect [37], the transformation of laser light to radiowave photons having biological effects [36], the coding of DNA sequences to the modulated polarization plane of laser light and the ability of this kind of light to induce gene expression in another organisms provided the modulated polarization pattern corresponds to an "address" characterizing the organism [34], and the formation of images of what is believed to be DNA sample itself and of the objects of environment by DNA sample in a cell irradiated by ordinary light in UV-IR range [38].

Gariaev and collaborators have introduced the notion of wave genome [34] requiring the coding of DNA sequences to temporal patterns of coherent em fields forming a bio-hologram representing geometric information about the organism. Code could mean that nucleotide is represented by a characteristic rotation angle for the polarization plane of linearly polarized laser radiation scattering from it. This kind rotation is known to be induced by chromosomes by a mechanism which to my best knowledge is poorly understood. Other open questions concern the precise identification of the substrate of the bio-hologram, of the reference wave and of information carrying wave, and of the mechanism making possible (quantum) coherence in macroscopic length scales.

The reading of the DNA sequence to a radiation pattern is assumed to rely on the propagation of an acoustic soliton along DNA [34]. Whatever this process is, one should also identify the reverse process inducing the activation of the genome as the target organism receives the radiation coding for the DNA provided the "address" is correct. One should also identify the mechanism transforming laser radiation to radio-waves at various frequencies as well as the mechanism creating what is believed to be the image of DNA sample and replicated images of some instruments used in experiment.

1.2 The relevant aspects of TGD based view about living matter

The called massless extremals (MEs or topological light rays) distinguish between TGD and Maxwell's electrodynamics: they represent classically signals propagating with light velocity in a precisely targeted and dispersion free manner, and are therefore excellent candidates for the communication and control tools in the TGD based model for a living system as a conscious hologram [25, 28, 33]. The notion of magnetic/field body, which can have layers of even astrophysical size, is an essential element of the model. Magnetic body uses biological body as a sensory receptor and motor instrument and MEs mediate sensory input and control signals between the two kinds of bodies [33]. I have already earlier applied MEs and the notion of magnetic body in an attempt to understand Gariaev's findings [28].

The new element is the model for DNA as topological quantum computer (tqc) [29] based on time-like braidings of so called wormhole magnetic flux tubes connecting nucleotides to the lipids at lipid layers nuclear and cell membranes. The model leads to a wide variety of predictions about DNA itself [29], to a universal model for a tissue memory in terms of space-like braidings

of wormhole magnetic flux tubes [29], to a more detailed model of nerve pulse explaining also
the origin of EEG and its synchrony [32], to a model for the evolution of the genetic code [30],
to a model of catalyst action involving a phase transition reducing the value of Planck constant
inducing the shortening of the flux tubes connecting the reacting molecules and thus forcing them
to the vicinity of each other, and to a model of for protein folding [31] in which the presence of
wormhole magnetic flux tubes connecting bio-molecules becomes almost a definition for what it is
to be living. It is interesting to combine these new ideas with the earlier [34, 36] and more recent
[38] findings of Gariaev. Basically the challenge is to fuse the DNA as tqc model with the model
of living systems as a conscious hologram [28].

1.3   The basic assumptions of model explaining findings of Gariaev

The basic assumptions of the model to be discussed are following.

1. The hierarchy of Planck constants requires a generalization of the notion of 8-D imbedding
   space $H = M^4 \times CP_2$ obtained by gluing together almost copies of H like pages of book along
   common back. The pages of the book carry matter with various values of Planck constant and
   the particles at different pages of the book are dark relative to each other in the sense that
   they cannot appear in the same vertex of Feynman diagram. The particles at different pages
   of the book can however interact via classical fields and via the exchange of (for instance)
   photons which suffer a phase transition changing Planck constant as they leak between pages
   of the book. In principle it is therefore possible to photograph the magnetic flux tubes
   carrying dark matter, and the proposal is that this is what Gariaev and collaborators have
   actually achieved [38].

2. Braid strands realized as wormhole magnetic tubes are identified as correlates for a directed
   attention. DNA connected by strands to (say) experimental instrument directs its attention
   to the instrument. One could perhaps say that DNA "sees" the surrounding world. Also
   ordinary attention for vision and other senses could involve flux tubes connecting DNA to
   the object of perception. This explains the ability of DNA to generate images of objects
   of external world [38]. The hierarchy of Planck constants explains the transformation of
   laser light to radio waves [36] as a phase transition increasing Planck constant and thus also
   wavelength but keeping the energy of photons as such.

3. Wormhole flux tubes carrying super-conducting matter in large $\hbar$ phase are characterized
   by anomalous em charges characterizing the nucleotides [29], and thus define an excellent
   candidate for the substrate of bio-hologram. A coding of DNA nucleotides to the rotation
   of polarization plane results for photons traversing through these flux tubes if a large parity
   breaking making possible rotation of the polarization plane (Faraday effect) is assumed.
   This is possible by the large parity breaking of fractally scaled up variant of weak physics
   [27] explaining also chiral selection.

4. The model for the nerve pulse [32] leads to the model of EEG waves in which EEG rhythms
   induce a complete analog of reference waves whereas nerve pulse induces the analog of infor-
   mation carrying wave [33]. The model predicts a fractal hierarchy of EEGs (EXGs) and their
   counterparts associated with long ranged color and electro-weak gauge fields having MEs
   as classical correlates. EEG rhythms are associated with propagating soliton sequences and
   nerve pulse corresponds to a propagating perturbation associated with this soliton sequence
   rather than soliton. The model predicts automatically the synchrony and spatiotemporal
   coherence of neural firing. EEG photons correspond to a large value of Planck constant
   implying that their energies are above thermal energy at physiological temperatures so that
   their effects on living matter are not masked by thermal noise.

   This model generalizes essentially as such to the recent context: the counterparts of nerve
   pulses propagate along the complex formed by DNA connected to the nuclear or cell mem-
   brane or even to another cell nucleus by flux tubes. The prediction is that gene expression
   can be coherent in the scale of organ and even that of population. This conforms with the
   notion of super-genome stating that the sequences of DNA strands in different nuclei organize

along magnetic flux sheet like text lines at the page of a book. The notion of hyper-genome means that these books from different organisms in turn organize to a pages of a book at higher level of fractal hierarchy and give rise to a gene expression at the level of population or even biosphere.

2   TGD counterpart for wave-genetics

The wave genetic model of Gariaev involves the assumption that soliton waves propagating along DNA induce the reading of DNA sequence to a pattern of radiation. DNA is known to rotate the polarization plane but it is unclear how the coding of DNA sequence to a rotation of polarization plane could be achieved.

   Second key element is the notion of bio-hologram. It is assumed that fractality is somehow involved. The key questions are following.

1. What is the substrate of the bio-hologram assuming that it is not based on nonlinear action for electromagnetic field (four-wave mechanism)? The substrate should have size larger than wavelength so that chromosomes are too thin to act as substrate.

2. What guarantees coherence or even quantum coherence in macroscopic scales?

3. How reference wave and the wave carrying the information are represented?

2.1   The notion of bio-hologram in TGD framework

TGD based model is based on the model of living matter inspired by the model of DNA as topological quantum computer [29]. DNA is connected to other bio-molecules and also to lipid layers of nuclear and cell membrane by wormhole magnetic flux tubes providing a representation of the genetic code. Braids strands defined by the flux tubes make possible topological quantum computation with tqc programs coded by dynamical braidings of the flux tubes induced by the water flow near the vicinity of cell and nuclear membranes inducing the flow of the 2-D liquid crystal defined by the lipids of the membrane. Flux tubes are dynamical, being able to reconnect and in the case of wormhole flux tubes even disappear without breaking conservation of magnetic flux, and they serve as correlates for a directed attention at the molecular and perhaps even at higher levels. Dark matter at the flux tubes has a large value of Planck constant and therefore a slow dissipation rate. Also superconductivity is possible and the predicted exotic nuclear physics allows bosonic chemical equivalents of all biologically important ions. Long range color and electro-weak interactions implying in particular large parity breaking are possible and could explain chirality selection in living matter.

   It is easiest to introduce the model through questions and answers.

   Q: What is the substrate of the bio-hologram and how coherence is obtained?

   A: Magnetic flux tubes with large $\hbar$ define the substrate and make possible macroscopic quantum coherence. Visible photons can suffer a phase transition to large $\hbar$ variants with wavelengths scaled up like $\hbar$. The interpretation would be in terms of bio-photons and their dark variants [39].

   Q: How the Faraday effect results?

   A: Flux tubes contain charged particles in super-conducting state so that diamagnetism results. Large parity breaking makes possible different propagation velocities for the two circular polarizations and thus Faraday effect resulting via the splitting of the linearly polarized wave to two circular polarizations fusing back again at the second end of the flux tube. The magnetic field along flux tubes induces Faraday rotation and codes DNA nucleotide to the rotation angle of the polarization plane.

   Q: How coding is achieved?

   A: Coding is achieved by the different total charges associated with flux tubes implying that the rotation angles for polarization plane depend on nucleotide. This would be made possible

by anomalous em charge associated with DNA sheet of wormhole flux tube implying that the rotation of polarization plane is different for each nucleotide [29].

Q: What is the identification of reference wave and for the wave representing the information?

A: The model for nerve pulse and EEG suggests that reference waves are induced as Josephson radiation from voltage waves propagating along DNA and represent a fractal variant of EEG. The voltages waves generating reference waves correspond to propagating soliton sequences for Sine-Gordon equation describing idealized cylindrical Josephson junction having as an analog series of coupled gravitational penduli. The propagating soliton sequence along DNA with constant phase differences between subsequent penduli would generate the reference wave as Josephson radiation. The analog of nerve pulse would result as one pendulum kicked so that it begins to oscillate instead of rotating and induces an propagating localized oscillation.

Microscopically cylindrical Josephson junction decomposes into junctions defined by the flux tubes and Josephson currents between the ends of the flux tubes generate em radiation as coherent photons. Josephson radiation would therefore give rise to bio-photons and their dark variants with same photon energy but scaled up wavelength. Obviously the transformation of laser photons to radio-wave photons can be understood in terms of this mechanism and the quantization of Planck constant implies quantization of the energies involved.

2.2 How to fuse the notion of bio-hologram with the model of DNA as tqc?

In the most economical picture - inspired by what is known about ordinary computers - intronic sequences would represent the names for tqc programs constructed from basic modules and expressing their outcomes chemically. Calling of the name of tqc would activate the tqc. This would allow an extremely rich combinations of basic modules, explain why the intronic portion of DNA increases during evolution, and why organisms with essentially identical genomes can be at widely differing evolutionary levels (say humans and apes). A further nice feature is that the intronic DNA of a given organism can induce gene expression in an organism for which the genes involved are not identical so that mutations would not be fatal. The prediction is that addresses represented by introns and the portions of promoter regions representing the conjugates of these addresses should be highly conserved.

The reading of the name of tqc to a polarization modulation pattern of incoming light would generate a signal which initiates tqc program in another cell in the case that the reverse polarization to the same linear polarization along the entire length of receiving intronic piece - conjugate of the original - takes place. The resulting overall linear polarization should initiate tqc leading to the eventual gene expression. Why the condition that linear polarization is same along entire piece of the "name" is not quite clear.

Introns could be connected by flux tubes to a part of DNA initiating gene expression. One would expect that this portion of gene is conjugate of the intronic portion containing the name of submodule. This would make possible RAM type representation of tqc programs if the link to next activated part of genome is represented by this same mechanism: exactly similar mechanism realizes links electromagnetically in web. A nucleus performing tqc infects large number of nuclei to perform the same tqc. Same could occur even at the level of population since very large values of $\hbar$ are possible.

3 The effects of laser light on living matter

The effects of laser light on living matter are discussed in the following briefly from TGD point of view.

3.1 Phantom DNA effect

In phantom DNA effect [37] there is an elastic scattering of the coherent laser radiation from irradiated DNA. When one removes the DNA from the chamber containing it, and irradiates it by laser light, a weak pattern of scattered light is still produced: as if there were a kind of phantom DNA there. The pattern can last for months.

For years ago I considered an explanation of the effect based on dropping of part of DNA to larger space-time sheets characterized by larger value of p-adic prime and remaining in the vessel as visible DNA is removed [28, 26]. A variant of this explanation inspired by the dark matter hierarchy is that the anomalous scattering takes place on dark DNA at wormhole flux tubes remaining in the vessel.

The most science fictive possibility is that the flux tubes connect the vessel boundaries to the removed DNA by wormhole flux tubes which are very long and correspond to a large value of $\hbar$. In this case the scattering would involve a phase transition increasing the value of Planck constant and a travel of photons to the removed DNA and back followed by a phase transition to ordinary photons.

3.2 Effects of the polarization modulated laser light on living matter

Polarized light with a suitable temporal pattern for the modulation of polarization direction induces biological effects. The effects are not caused to arbitrary target and one can say that the part of target genome involved has an address characterized by a temporal pattern of polarization modulation resulting in the propagation of the scaled variant of nerve pulse along chromosome. DNA is known to induce a rotation of polarization plane of incoming linearly polarized light and Gariaev suggests that the address is due to the propagation of a soliton along DNA inducing the modulation [34].

TGD based model for the rotation of the polarization plane is based on Faraday effect [40].

1. Usually diamagnetic dielectric causes the Faraday effect. The effect is due to different propagation velocities of left and right circular polarizations and recombination of polarizations to linear polarization. The rotation of the polarization plane would be caused by a Faraday effect at flux tubes. Superconductivity would imply ideal diamagnetism. Dielectric property is probably not present but large parity breaking due to long range weak interactions [27] could explain why circular polarizations propagate with different velocities. Strong parity breaking could be caused by the presence of electro-weak gauge fields behaving like massless fields below the cell length scale and would explain also chiral selection. For large values of $\hbar$ the range of these fields would be scaled up accordingly.

2. The travel of the photon along a transversal flux tube starting from DNA nucleotide induces a rotation of the direction of polarization plane. The reverse rotation of polarization plane takes place as the light propagates in the reverse direction. The reverse propagation restoring the original overall linear polarization is expected to induce the biological along the portion of DNA in question. Phase conjugate light might be also involved.

3. The coding of DNA sequences to radiation patterns results since the charge Q associated with the nucleotide end of the wormhole magnetic flux tube affects Faraday rotation and is different for each nucleotide. The value of the charge is given by $Q = -2 + Q_a$, where -2 units come from phosphate and Q_a corresponds to the charge of the quark (u, d) or antiquark $\overline{u}, \overline{d})$ at the DNA space-time sheet associated with wormhole magnetic flux tube formed by a pair of space-time sheets connected by wormhole contacts having at its light-like throats quark and antiquark [29]. Hence the rotation of the polarization plane depends on the nucleotide.

3.3 PLR spectroscopy

Bio-systems could generate holograms in much more concrete sense than the wetty and hot and noisy character of this environment would suggest: even mechanisms generating laser beams could be there. The findings of Peter Gariaev and collaborators described in the article "The spectroscopy

of bio-photons in non-local genetic regulation" [36] led to a concrete model for how bio-photons affect many-sheeted DNA, and in this manner induce a generation of coherent radio waves and ELF waves [28]. The recent picture brings in the hierarchy of Planck constants and suggests a modification of this model.

3.3.1   The effect

In polarizing laser-radio wave spectroscopy (PLR-spectroscopy) laser light scatters from the target substance. In the experiments of Gariaev *et al* red light ($\lambda = 632.8$ nm, 1.9595 eV) generated by He-Ne laser is used. This energy actually corresponds very precisely to one of the fundamental metabolic energy quanta identified as liberated zero point kinetic energy of proton as it drops from certain space-time sheet to much larger space-time sheet. There are two orthogonal polarizations correlated in intensity in such a manner that the total intensity remains constant. After the interaction of one mode with the target substance, the reflected light is returned to the optical resonator, where the re-distribution of the intensity of these modes occurs. One of the laser modes, at a certain mode of generation, is able during the interaction with the target substance to induce polarization modulated radio waves of a wide spectrum correlated with the modulations of the optical modes of the laser radiation. The modulation is assumed to relate to rotational fluctuations of micro-structural components (say, domains of crystals) and of their optical activity. The PLR-spectrum is present also for in-organic materials. For biological targets there is spectral memory effect present, which means that the radio wave radiation continues even when the laser beam is not present anymore.

The frequency interval of the radio emission settles down at the 1 MHz. The PLR-spectrum is depicted in figures 1 and 2 of [36] for apofillit crystal. The frequency spectrum for the radio waves has a modulated fractal structure suggesting that spectrum is superposition of spectra which consist of harmonics $n_1 f_h - n_2 f_l$ of higher frequency f_h modulated by harmonics of scaled down frequency $f_l = x f_h$. Almost identical copies of a piece of length about

$$\Delta f \sim 100 \; Hz$$

appear in a sequence as the pictures 1 and 2 of [36] for the spectrum of apofillit crystal in 1560-1860 Hz range demonstrate. This suggests the presence of harmonics of basic frequencies perhaps shifted by a constant amount. Cyclotron and spin flip transitions in magnetic field suggest itself.

There is also gross structure consisting of peaks in scale of kHz suggesting harmonics of frequency of order kHz. For wheat seed (picture 3 of [36]) the strongly expressed frequency ranges are identified as 800-900 Hz (to my personal opinion the band is 300-900 Hz), 1700-1900 Hz, 2400-2600 Hz, 3600-3800 Hz (to my personal opinion a wider frequency range 1700-2200 Hz is strongly expressed). There is also strongly expressed frequency band below 300 Hz. Also the spectrum of high polymerization DNA sample from calf thymus (picture 4 of [36]) shows a clear peak at 2400-2600 Hz and less pronounced peaks at lower frequencies.

The radio wave radiation from DNA samples is accompanied by specific effects on bio-systems such as ab-normally fast germination and re-vitalization of seeds. Thus it seems that the radio wave radiation is able to restore the genetic control apparatus and the vitality of the seeds.

3.3.2   TGD based explanation of the effect

Dark matter hierarchy suggests the interpretation of radio-wave photons as large $\hbar$ photons with energy equal to that of the original photon. Biophotons and their dark variants could form Bose-Einstein condensates at the wormhole magnetic flux tubes. The flux tubes associated with DNA would transform laser photons to radiowave photons by inducing $\hbar$ increasing phase transition. Large value of $\hbar$ would increase the range of interactions so that they would become possible even in the scale of biosphere. In particular, coherent gene expression in the scale of organism and even population. Genetic code could be represented as radiation patterns with the charges assignable to the end of DNA space-time sheet of flux tube providing the coding.

4   The scattering of incoherent UV-IR light on DNA

The proposed model for the findings about scattering of incoherent UV-IR light from DNA lead to an amazing conclusion that the experiments make directly visible the magnetic flux tubes containing dark matter.

4.1   Basic facts

The figures of the article [38] give valuable information about what is involved. There are two experimental arrangements.

1. In the first experiment dry/dehydrated DNA is contained in a small seal containing a conical cylinder (4 cm long, .9 cm at its upper end) or 3 ml of DNA water solution 1 mg/ml. The rradiation by UV-C lamp lasts for 10 minutes: note that UV-C wavelengths are in the range 280-10 nm.

2. In the second experiment the DNA sample is in open cell and a light source known as Duna-M irradiates red light from 21 LEDS (650 nm) and IR light (920 nm) from 16 LEDs. Also UV-B lamp and Compact electronic CEST26E17 Black lamp are involved: UV-B wavelengths are in the range 315-280 nm. The light sources are turned on and off with intervals of 2-3 seconds. The exposure time is 1 second.

The basic findings are following [38].

1. The effects occur only if the sample contains DNA.

2. A large number (tens) of closely spaced replica images of nearby objects, in particular the red LED. The replicas for the image of instrument are along strictly horizontal half line (see Fig. 1).

3. The replica sequences of the instruments appear periodically suggesting that the energy of incoming photons is gradually accumulated and liberated in a burst. The interference by an external DNA source (touching by finger of DNA cell) changes the direction of the half line which disappears at the next exposure to white light.

4. Single vertical curved band like image of roughly the same height as the entire image and with more or less the same width as the distance between replicas of the instrument parts appears to the left from the instrument image (see Fig. 1). This image is not replicated in the horizontal direction. The fine structure of the band for one of the reported images (see Fig. 2) however suggests that also the band like structure consists of replicas of same size as the replicas associated with instruments. The band like structure for second method decomposes to 5 red parallel curves (see Fig. 3) for which the interpretation as images of 5 red LEDs is proposed based on the observation that these LEDs irradiate directly the DNA cell. The phantom of DNA image remains intact for some time after the irradiation.

If I have understood correctly, the interpretation proposed in [38] is following.

1. The sequence of the horizontal images of the instrument would result from a motion of single image moving during the exposures: this requires that the motion is fast in the time scale of exposure. The appearance of equally spaced replicas forces to assume that the motion occurs in discrete jumps in horizontal direction.

2. The band like structure is identified as the image of DNA sample. The band is assumed to correspond to a discrete and non-predictable motion of single image.

There are objections against the idea that the motion of single image produces the image. In particular, the discreteness of the motion looks strange. One can also wonder why the motion for the image of the instrument is strictly horizontal whereas the motion of DNA image is not horizontal and is curvilinear. One can also ask whether the an image of DNA sample is actually in question since the position of the band like structure is to left from the cell containing the DNA.
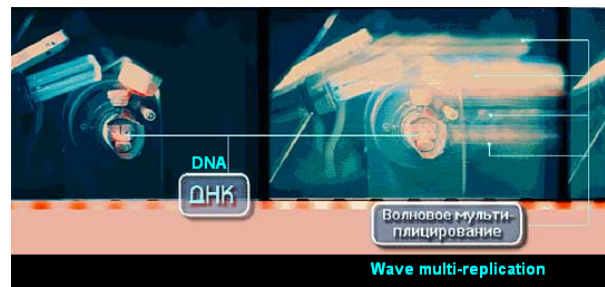
Figure 1: The left hand side figure is from [38] and represents the replica images of the instruments and the image interpreted by experimenters as a replica image of DNA sample (second method).
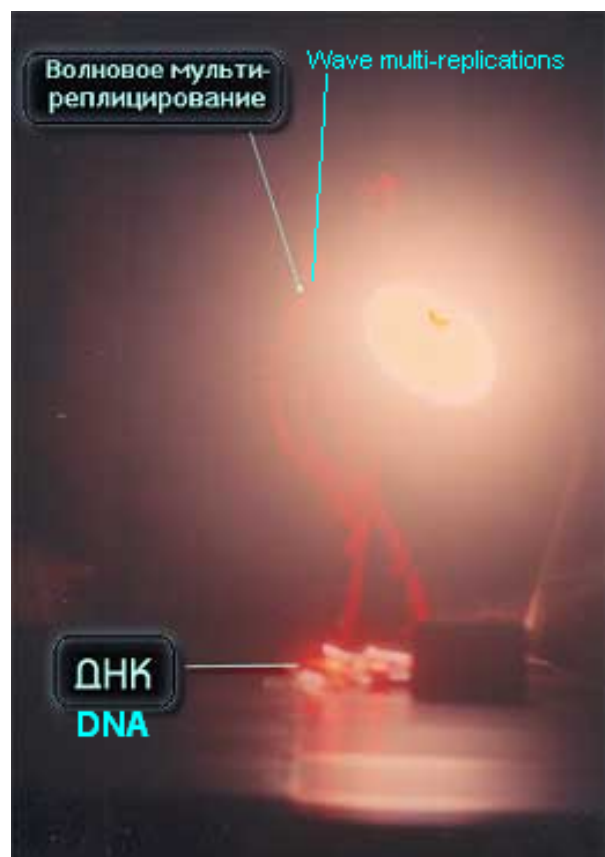

Figure 2: The picture shows the discrete replica like structure of the band like image interpreted by experimenters as replica image of DNA sample (first method).

4.2   TGD based model for the replicas

One can consider two models for the replicas. The first model assumes that the images are images of dark magnetic flux tubes. Second model assumes that in the case of instrument images diffraction is involved.

Figure 3: The picture reveals the 5-fold fine structure of the band like image interpreted by experimenters as replica image of DNA sample. The 5-fold character probably correspond to five red LEDs above the sample (second method).

4.2.1 Have wormhole magnetic magnetic flux tubes containing dark matter been photographed?

The most elegant model for the effects found hitherto relies on the assumption that both the horizontal replica sequences and the band like structures having also replica structure correspond to real structures, most naturally (wormhole) magnetic flux tubes. In the case of instrument replicas they would emanate directly from the instruments. In the case of DNA image they would emanate from a position to the left from the cell containing DNA. The presence of DNA should somehow generate the flux tubes.

1. In the case of horizontal replications of instruments the replicas would be associated with a magnetic flux tube emanating horizontally from the instruments to the right. Replicas would be obtained if a dipole distribution assignable to the surface of object and representable in terms of Fourier transform restricted to a box containing the object and having discrete momentum spectrum is extended to a periodic Fourier transform along the horizontal flux tube. Flux tube would thus represent a series of images of the geometric object and this would make possible to communicate the data through long distances.

2. Also the DNA image could be the image of a curved flux tube assignable to the cell containing the DNA. The band like structure does not however begin from the cell containing DNA being located left from it. A possible explanation is that there topological light ray connecting the

cell containing DNA to a similar sized cell at the end of the flux tube irradiating it with photons emitted from the dipole distribution at its surface. The resulting induced dipole distribution representable in terms of a discrete Fourier transform is then continued along the entire curved flux tube and would generate the replicas.

3. The replication of the dipole distribution along the entire length of the flux tube requires macroscopic quantum coherence suggesting a large value of Planck constant. If the coherence is required at least in the length scale L of the flux tube, one obtains ratio $r = \hbar/\hbar_0 \geq L/\lambda \simeq 10^6$ for $L = .5$m and $\lambda = 500$ nm. This value could correspond to the favored value $r = 2^{20}$ and thus to a favored value of Planck constant [24]. A weaker condition is obtained by replacing L with the size a of the cell giving $r \geq a/\lambda \simeq 2 \times 10^5$ for $a = .1$ m.

4. If the flux tubes correspond to large value of Planck constant, the dark photons emanating from them must transform to ordinary photons since diffractive effects are not involved.

5. The fact that the images of the flux tubes appear periodically suggests that a Bose-Einstein condensate of dark photons is gradually formed at them which bursts out as some critical number of dark photons are present and leaks to the visible sector of the 8-D imbedding space becoming ordinary photons. One can visualize the sectors of the generalized 8-D imbedding space as pages of a book characterized by different values of Planck constant so that the leakage would occur from page to another one through the back of the book.

6. The effect of touching in the second type experiment involving LEDs can be understood if the touching reverses the direction of the magnetic flux tubes assigned with the instruments. The disappearance of the replicated instrument image 5-8 seconds after the touching could relate to the instability of the right-oriented flux tubes. If the right-directed flux tube is mirror image of the left oriented flux tube, the instability might relate to a parity breaking possible in TGD Universe by the presence of scaled variants of weak interactions. The preferred orientation of the flux tube might be also determined by something in environment, say resources of metabolic energy. If the flux tubes are correlates for attention, one can even imagine that DNA with the mediation of flux tubes directs its attention to something interesting.

There are also some open questions.

1. Why the flux tube assignable to the DNA is curved and why the image of this flux tube does not emanate from the sample?

2. How the presence of DNA induces the generation of the flux tubes? The model for DNA as tqc would suggest that the thin wormhole magnetic flux tubes connecting DNA to the instruments induce the effect, and that the flux tubes explaining the image correspond to higher level structures with larger value of Planck constant and are somehow induced by the presence of DNA. They could also correspond to a larger value of p-adic prime but same value of Planck constant. Perhaps one might say that the magnetic body of DNA makes the instruments in some sense part of its biological body by directing its attention to them.

3. Why the touching chances the orientation of the flux tube?

If this model is on a right track, the findings would mean a direct observation of dark magnetic flux tubes by the em radiation of dark photons transformed to ordinary photons as they leak out from dark sectors of the imbedding space to the sector containing the matter visible to us.

4.2.2 The explanation in terms of diffraction does not work

For the sake of completeness also the interpretation of the replication of the images of the instrument and DNA cell in terms of diffraction is discussed although this explanation forces several ad hoc assumptions unlike the previous model.

1. The appearance of the replicas along horizontal half-line $x > 0$ brings strongly in mind a diffraction through a vertical slit defined by a vertical dark flux sheet attached to the

instrument and acting as a window. This requires coherence so that ordinary visible light cannot be responsible for the image whereas dark photons with a large enough value of Planck constant makes the quantum coherence possible.

2. The amplitude for a diffraction through slit behaves as $A = sin(x)/x$, $x = \pi \times (a/\lambda) \times sin(\theta)$, where θ is the angle between the normal of the slit and direction of observation. Hence the maxima of the intensity maxima correspond to the central maximum $sin(\theta) = 0$ given by geometric optics and $sin(\theta) = (n+1/2) \times \lambda/a$ so that for small angles one has $\Delta\theta = \lambda/a$ and the distance between replicas is $x = d\Delta\theta = d\lambda/a$.

3. The distance between the replicas in the image requires a wavelength longer than used in experiments. Thus dark photons with a scaled up wavelength $\lambda = r\lambda_0$, $r = \hbar/\hbar_0$, transforming by Planck constant changing phase transition to ordinary photons in camera could be in question. The value of the Planck constant can be deduced by using the geometric data, the values of wavelength, and the distance between the replicas of instrument images assuming that diffraction effectively takes place through a vertical slit with width of order size of typical replicated instrument, say seal. From $\theta \leq D/d$, where D is the size of camera aperture, and from the number n of horizontal replicas $n < 100$ one obtains the estimate $d\lambda/a \sim D/nd$. This gives $\lambda/a \sim D/nd^2$. For $D = .01$ m, $d = .5$ m, one would have $\lambda/a \sim 4 \times 10^{-4}$. For $\lambda = 4 \times 10^{-7}$ m this would give $a \sim 10^{-3}$ m. The appearance of details in the replicated image suggest that a is of the same order than the instrument size so that one has $a \geq x > 1$ cm giving $\hbar/\hbar_0 \geq 10x$. The value of λ seems to be too small to allow coherence in the required length scale.

4. The serious problem of this interpretation is that the diffraction pattern for a diffraction through slit corresponds to maxima at an entire transversal line rather than half-line. It is as if the effective vertical flux sheet attached to the left hand side of the object would contain a distribution of horizontal dipoles generating radiation interfering to zero at the left half of the half-space. This distribution should be determined by the radiation coming from the object so that a kind of induced emission process would be in question. One can also imagine is that the dark space-time sheet along which photons arrive is half-space with horizontal coordinate $x \geq 0$. What is intriguing that in p-adic physics for which the values of variables finite in real sense are always positive as real numbers so that half-lines, quadrants, octants,... are very natural objects. One must admit that this assumption looks ad hoc.

5. There is also a second problem. The evidence for the replication of same basic unit with the size of the DNA containing cell suggests that a replication of the image of cell containing the DNA along a curved band is in question with essentially the same distance between replicas as in the previous case. It is impossible to have a curved slit producing this kind of diffraction pattern. One could consider also the possibility that the band corresponds to a real structure, may be magnetic flux tube, and that Planck constant is now larger than in the case of instrument images so that only the central image of the diffraction pattern is visible in the camera. This however forces to ask whether also the replicas of instruments correspond to magnetic flux tubes so that one would end up with the first model.

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