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The Aharanov-Bohm Phase Shift and Magnetic Vector Potential "A" Could Accommodate for Optical Coupler, Digital-to-Analogue Magnetic Field Excess Correlations of Photon Emissions Within Living Aqueous Systems

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ABSTRACT

Quantitative convergence for solutions involving electron drift velocity, the magnetic A vector and phase shifts reveal an increment of energy in the range of 10^{-20} J that could relate the Aharanov-Bohm phase modulation of the orbital frequency of a Bohr atom to the electron's Compton wavelength. The universal persistence of 10^{-12} W per m^2 whose energy when the square of the hydrogen wavelength is applied solves for the energy equivalence of the rest mass of an electron could set the conditions for excess correlations between electronic systems that produce magnetic fields through optocouplers. Experimental evidence and quantitative solutions indicate variations of the Lorentz Lemma and circularly rotating magnetic fields whose phase and group velocities are uncoupled could create the conditions for excess correlations. Modification of Basharov's operator of resonance interaction for decoherence and entanglement in the radioactive decay of a diatomic system and Das and Misra's estimates for the fractal charge of a photon strongly suggests that the efficacy for optocoupler circuits to generate non-local magnetic field effects in living and non-living aqueous systems originates from a single photon wave across the circuit's p-n junctions. A review of the concepts and data indicate that excess correlations involving photons under optimal conditions are measureable within macrosystems

Indexing terms/Keywords

phase shift; magnetic A vector potential; Aharanov-Bohm effect; 10 nm; 10^{-20} J; optocoupler circuits; proton ion channels; electron phenomena, photon entanglement, p-n junctions

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INTRODUCTION

In the optimal physical world all of the properties displayed by the plasma membrane of cells, their interactions with other cells, the emissions of photons during dynamic processes, and the intercalations with appropriately patterned magnetic fields should be expressible in the equations and functions that define modern physics. Although biophysics has benefited from application of classical approaches such as Faradic induction, the quantities of energy within the organism occupying the volume within the magnetic field, and balanced Bessel functions for optimal magnetic field configurations, there are less frequently applied concepts that could reveal critical phenomena related to quantum effects [1,2].

Here we apply the relationships between the magnetic vector A, the relevance of an electron's phase shift, the energetic difference between the electron's Compton wavelength and resting radius and the point durations for experimentally generated magnetic fields to facilitate understanding of potential excess correlation of photon exchanges produced by optocouplers in critical circuits and living systems. We show that quantifications suggest some photon-based circuits may amplify the probabilities of photon quantum-entanglements.

DRIFT VELOCITY, A-VECTOR AND PHASE SHIFT COLLAPSE INTO PLASMA MEMBRANE CHANEL WIDTH

The drift velocity of an electron is related to the strength of the applied field and the mobility of the electron as expressed in $m^2 \cdot V^{-1} \cdot s^{-1}$. Usually this latter value is assumed to be around 10^{-4} $m^2 \cdot V^{-1} \cdot s^{-1}$. The magnetic vector potential A is a polar vector and is not affected by the sign of the field and is not presumably shielded. The aggregate units are $V \cdot s \cdot m^{-1}$ and is sometime represented as momentum per unit charge.

If we assume the mass of the electron ($9.1 \cdot 10^{-31}$ kg) moving at the fine structure velocity ($2.2 \cdot 10^6$ $m \cdot s^{-1}$) and this product is divided by the unit charge ($1.6 \cdot 10^{-19}$ A·s) the value is $1.25 \cdot 10^{-5}$ $V \cdot s \cdot m^{-1}$. The product of the mobility of the electron and the magnetic A vector potential for the electron results is $1.25 \cdot 10^{-9}$ m. This is remarkably proximal to the width of most ion channels in cell membranes including those which facilitate the exchange of H^+ (protons). There are a factor of a thousand more of these channels [3] than those that transport other cations and anions. In fact the proton shells near surfaces that constitute Pollack's interfacial water configurations [4] display potential differences that are comparable to those attributed to disparities of concentration for potassium and chloride. Quantitative links between plasma membrane physics and quantum-related values have practical applications [5].

We have been considering protons through proton channels as the quintessential mediator of transmembrane ion properties and that other ions, such as Na^+, K^+ or Cl^- are epiphenomena secondary to the required water molecules associated with transport of those ions through the membrane. However in a parity-based universe the proton should be matched with electron properties. We suggest that the states of matter allowing these transportations may be created by the space formed by the A vector potential and the electron drift. This occurrence could optimize the conditions for the type of photon-electron coupling associated with entanglement [6-7].

The phase shift of the Aharanov-Bohm effect can be described as:

$$\Delta\theta = qVt\,\hbar^{-1} \quad (1),$$

where q is the unit charge, V is the voltage, t is the time or duration within the voltage field and ħ is the modified Planck's constant.

If we assume the duration is either the time required for a photon moving at c within water to traverse a plasma cell membrane with a width of 10 nm which is similar to the time for an electron to complete one Bohr orbit ($1.5 \cdot 10^{-16}$ s) , the phase shift is 0.0032. It may be relevant that the angle of the beams for the experiment recently described by Giovaninni et al [8] that showed that spatially structured photons travel in free space slower than the speed of light was between 0.00225 and 0.00450. Consequently the A vector which is an essential contribution to the effect might be produced within the ion channel whose dimensions must be constrained by these values.

PHASE SHIFTS, 10^{-20} JOULES AND COMPTON ELECTRON WAVELENGTH

The photon-magnetic field research in our laboratory over the last few years [9,10] has indicated that the relationship between function increments of 10^{-20} J and the $\sim 10^{-19}$ J range of energies associated with the visible wavelength may simply reflect a phase shift of 10 nm within the latter range. Of the three major forms of electromagnetic transmission: amplitude modulation, frequency modulation and phase modulation, the later has the capacity to mediate unlimited information with little energy. This would suggest that the energy must originate within space or matter itself. Single photons, of which there would be approximately 10^{104} in the universe assuming an upper limit rest mass of $\sim 2 \cdot 10^{-52}$ kg [11] and $2 \cdot 10^{52}$ kg universe mass [12], with helical phase structures carry quantized amounts of orbital angular momentum that potentially mediate entanglement [13]. Theoretically there is no upper limit to how much quanta of orbital angular velocity can accompany a single photon.

The phase shift required to deliver $\sim 2 \cdot 10^{-20}$ J within a fundamental temporal unit, the Bohr frequency (one orbit) of an electron, is calculable. Because the energy associated with $1.5 \cdot 10^{-16}$ s is $4.36 \cdot 10^{-18}$ J, the phase shift as derived from equation (1) would be about 0.0046 ($4.6 \cdot 10^{-3}$). The circumference of the standard Bohr orbit is $3.26 \cdot 10^{-10}$ m. Consequently a phase shift of the amount required to be associated with 10^{-20} J would be ~ (1.5) $\cdot 10^{-12}$ m which is remarkably proximal to the Compton wavelength of the electron ($2.4 \cdot 10^{-12}$ m). Stated alternatively, the shift is about $1.5 \cdot 10^{-12}$ m per phase. It is the phase modulation of the orbital frequency energy required for $2 \cdot 10^{-20}$ J.

One might postulate that the Aharanov-Bohm phase modulation of the orbital frequency required for the $2 \cdot 10^{-20}$ J is the Compton wavelength for the electron. If this is veridical there may an alternative manifestation of the concept relating collapse of the wave function and matter and the implicit duality. The range of $\sim 2 \cdot 10^{-20}$ J as a coupling increment through phase modulation for the electron's Compton wavelength may accommodate the emergence of this value in the fundamental solvent of Life (water) as the solution for the ratio of the proton's magnetic moment ($1.41 \cdot 10^{-26}$ $A \cdot m^{2}$) divided by the unit charge ($1.6 \cdot 10^{-19}$ A·s) multiplied by the viscosity of water ($8.94 \cdot 10^{-4}$ $kg \cdot m^{-1} \cdot s^{-2}$) at biological temperature. When applied across the distance of two O-H bonds ($\sim 1.92 \cdot 10^{-10}$ m) the energy is $\sim 2 \cdot 10^{-20}$ J [14].

This is the same energy as the second shell hydrogen bond that is consistent empirically with measurements of proton mobility [3] and other substrates of pH. It is also the energy [15] associated with: 1) the averaged absolute shift in membrane potential during an action potential of a neuron upon a unit charge, 2) the sequestering of ligands to receptors, 3) the quanta of neurotransmitter accompanying the release of pre-synaptic vesicles, and 4) the shift from de-localized electrons that constitute the spectral power densities (SPD) of the spatial sequence of pseudopotentials for amino acids of proteins that define Cosic's Molecular Resonance Recognition solutions for cell signaling pathways [16,17]. These solutions meet the criteria for the potential "Rosetta Stone" of matter (particle) energy (electromagnetic field) translation and quantitative solutions for their equivalence. The validity of Cosic's model has been supported experimentally and quantitatively [18,19].

VOLTAGE CONVERSION FROM AHARANOV-BOHM VALUES MATCH OPTOCOUPLER EFFICACY FOR PHYSIOCHEMICAL EFFECTS

The Aharanov-Bohm phase shift can be reconstituted to solve for V if the phase shift is known. If we assume the $2 \cdot 10^{-20}$ J value and have calculated Φ as shown earlier then the V can be calculated by:

$$V=(\Phi\hbar) \cdot (qt)^{-1} \quad (2).$$

If we insert the appropriate parameters the resulting value for V is ±4.2. This is within the range of the fundamental operation of our digital-to-analogue (DAC) systems (± 5V) which operate through a unique geometry involving optocouplers with very specific parameters. As reviewed by Koren et al [20] the efficacy of weak applied magnetic fields to a variety of aqueous-based non-living and living systems that appear to be specific to this circuitry may occur because of a variant of entanglement.

Quantitative solutions [20] indicate that the photons that mediate the optocoupler connections through the Triac circuit may be also represented within the center of the three-axis magnetic field within which the chemical reaction or organism is maintained. The magnetic field, if this model is valid, facilitates the containment. Persinger [21] calculated a relationship between the divergence of radiative phenomena associated with photons and the convergence within the electrical and magnetic properties of space with each orbital rotation of an electron. He found that the order of magnitude of photon flux density ($\sim 10^{-12}$ $W \cdot m^{-2}$) that is associated with biophoton emissions in living systems when multiplied by the inverse of the product of the wave impedance applied over the hydrogen wavelength and divided by the magnetic permeability of a vacuum multiplied by the Bohr orbital frequency was $1.5 \cdot 10^{-20}$ J. Consistent with that approach is the energy per s for the more precise solution for this photon flux density ($1.9 \cdot 10^{-12}$ $W \cdot m^{-2}$) distributed over the area ($4.4 \cdot 10^{-2}$ m^{2}) of the neutral hydrogen line (21 cm). The energy ($8.36 \cdot 10^{-14}$ J) converges upon the equivalence for the rest mass of an electron.

That direction of photon fields being emitted from cells in culture can be displaced or shaped by the configuration of the applied magnetic field was shown experimentally by Dotta et al [9]. When the passive diffusion velocities of lipid molecules within the plasma membrane around the circumference of the cell was considered for its "membrane magnetic moment", the specific intensity of the applied magnetic field along a continuum that produced the largest effect resulted in the energy that was reflected by the visible wavelengths optimally measured by the photon multiplier units.

Effectively the same function that is a source equation for quantum phenomena when applied to a larger rotating aggregate produced predictable quantities of photons as a function of specific intensity weak magnetic fields. That function was the relationship between Bohr's orbital magnetic moment of $ep \cdot (2m)^{-1}$ where e and m were the charge and mass of the electron, p was the angular momentum of an electron moving in the orbit, and the quantized relationship. The quantized relationship for angular momentum (p) was $jh \cdot (2\pi)^{-1}$ where j was the magnetic quantum number and h was the traditional Planck's constant. When j is assumed to be unity the value solves for the Bohr magneton or the orbital magnetic moment of an electron.

More specifically the involvement of an Aharanov-Bohm effect indicates that for phase-modulation or phase shift to occur the average change in voltage must be near the peaks of capacity but not at the peaks of capacity. Consequently forcing the systems to its limits or maximum boundaries (-5 to +5 V), in addition to distorting the signal, would be above the narrow band pass. This has been observed in our systems. Values below the value would not be sufficient to elicit the effect. Because our signals are constructed from a series of numbers (integers) ranging from 0 through 256 (-5 to +5 V) and pass through the critical zone, perhaps the efficacy of our patterns might be re-evaluated with respect to what proportion of "time" or passes occur within the 4.1 to 4.3 V band. This could be considered a metaphor for the duration within the voltage field.

Although potentially spurious it may be relevant that the velocity of light divided by the duration in the orbit for the phase shift ($0.7 \cdot 10^{-18}$ s) is $4.2 \cdot 10^{26}$ $m \cdot s^{-2}$. If this value is divided into the entanglement velocity $2.4 \cdot 10^{23}$ $m \cdot s^{-1}$ [22] the resulting duration is about $0.5 \cdot 10^{-3}$ s. This is the duration of the action potential. If the velocity of the electron was about 50% the velocity of light (such as electrons in a copper wire) the value would be 1 ms.

More than a decade ago while pursing the conditions for an integrated neurophysics we [23] noted that:

$$\Delta s = P_L \cdot (H \cdot l)^{-1} \quad (3),$$

where P_L is Planck's Length, H is the Hubble Parameter $2.4 \cdot 10^{-18}$ s^{-1}, and l is the width of an electron. From one interpretation the time required for an electron to expand one Planck's Length would be in the order of 1 ms. Experiments involving photon flux densities from chemiluminescent reactions that shared 1 ms point duration rotating magnetic fields whose group and phase velocities were uncoupled supported this prediction [24].

Subsequent experimental measurements of excess correlation for the power density of photon emissions between two non-traditional loci strongly suggested that the point duration for such expansion when matched with the point duration for each of the values between 0 and 257 that generated the successive voltages that composed the experimental magnetic fields was consistent with involvement of discrete changes in photon emissions between electrons [25]. On the other hand 3 ms durations were more specific to reactions, particular those within plasma cell membranes, associated with the time for a proton to expand one Planck's Length [26].

PHASE SHIFT IN PHOTON WAVELENGTHS FOLLOWING ELECTRON POINT DURATION MAGNETIC FIELD EXPOSURES

There are two solutions that could lead to a convergence of the cellular and Schumann Resonance-human cerebral cortical activities discoveries that have been measured recently [27, 28]. If this effect can be generalized then a potential connection between specific resonances of weak electromagnetic fields generated over the earth surface (the spherical wave guide) and the cerebral activity might be considered. This is particularly relevant because the shared intensities and properties of the two source fields (earth-ionosphere, cerebral cortices) meet the criteria of the Lorentz Lemma [27]. Both involve variants of the A vector of the Aharonov-Bohm effect which involves the phase shift in an electron even when shielded from a magnetic field. For the voltage ($1.13 \cdot 10^{-1}$ V) for the energy associated with the movement of protons through water and "t" (the duration of one Bohr orbit, $1.52 \cdot 10^{-16}$ s), the shift in phase is 0.0259.

Murugan et al [10] employed a specific magnetic field configuration to meet the criteria of both the magnetic A potential and the Aharanov-Bohm conditions. Spring water was exposed in the dark while undisturbed mechanically to specific point duration, frequency and phase modulated magnetic fields generated by the Koren DAC circuitry before photon emissions were completed by fluorescent spectrometry. The darkness and undisturbed condition, which allows the emergence of thixotropic conditions [14], was found to be essential to produce the effect.

These experimenters found that the peak wavelength of the effect from maintained exposure to the thixotropic conditions in the dark for the patterned, frequency/phase-modulated magnetic field that simulated the Aharonov-Bohm condition was 405.5 nm. If the phase shift calculated for 10^{-20} J were applied to this wavelength, the phase shift would be ~10.5 nm. Spectral analyses of the photon counts along the 1 nm increments between 354 nm and 466 nm (the range of the sensor) indicated a peak around 10 nm [10]. If this concept is applicable the 10 nm peak would have been reflective of the phase shift of the electrons contributing to the photon effect measured from the water. This effect was only noted for spring water and was not displayed by water (double distilled) where additional ions were not present.

The second solution involves the A vector (magnetic potential) directly. The relevant property of the magnetic vector potential is that is elicits a phase difference and, potentially, interference between partial waves. The vector potential of the earth's magnetic field cannot be shielded. According to Bokkon and Salari [29] "oscillations of dephasing non-conductive (fixed) electrons could influence conductive mobile electrons" and as a result coherent transport of the mobile electron spins into surrounding semiconductor protein molecules could occur. This is consistent with Cosic's [16] delocalized electrons that maintain the coherence of the propagating electromagnetic wave of information along the backbone amino sequences of the proteins in signaling pathways.

Persinger and Saroka [29] have calculated an unexpected potential for diffusivity of specific states of brain activity through space. Although the aggregate units of the A vector are $V \cdot s \cdot m^{-1}$ (or momentum per charge) the relationship should also be equivalent to $V \cdot m^{-1}$ divided by s^{-1} or frequency. If s^{-1} is the neutral hydrogen line frequency of 1.42 GHz and a median potential difference value of 20 μV across the median ~11 cm distance of the cerebral QEEG (or $2 \cdot 10^{-4}$ $V \cdot m^{-1}$) is assumed, the A vector value is $1.4 \cdot 10^{-13}$ $[(kg \cdot m^2 \cdot A^{-1} \cdot s^{-3}) \cdot s \cdot m^{-1}]$. When multiplied by the equivalent current dipole (ECD) in A·m the result is energy.

The potential difference across the cerebrum for quantitative cerebral activity divided by resistivity produces a current gradient. The specific value of $2 \cdot 10^{-5}$ V divided by 2 Ω·m (the typical resistivity of extracellular fluid) is 10^{-5} $A \cdot m^{-1}$. When applied across the averaged length of the cerebrum the current is 10^{-6} A. The ECD over the cerebrum would be 10^{-7} A·m. Hence the product of this value and the modified A vector $1.4 \cdot 10^{-13}$ $[(kg \cdot m^2 \cdot A^{-1} \cdot s^{-3}) \cdot s \cdot m^{-1}]$ would be an energy whose quantity is ~10^{-20} J. The propagation of this energy would not be necessarily shielded by conventional impedances. When transformed to wavelengths this increment of energy is equivalent to the phase shift of a 410 to 400 nm photon wavelength. This is the range within which the peak shift in photon wavelength occurred during our [27] experimental studies when thixotropic conditions were produced while physiologically-simulated (spring) water was exposed to phase-frequency modulating weak magnetic fields.

POTENTIAL EXCESS CORRELATION

If a fundamental parameter is applicable across levels of discourse its manifestation at each level should be revealing. Through two methods and from different assumptions and estimates regarding the universe's mass (m), length (d), duration (t), electric flux density and magnetic field intensity we [22, 30] have derived a diffusivity velocity in the order of 10^{23} m·s^{-1}. Depending upon the two solutions the coefficient is 0.8 (for V·m^{-1} divided by Tesla) or 2.8 (when the variants of G, m, d, and t are employed). We have assumed that this is the latency required for entanglement to occur or once it has occurred for it to be manifested. Additional support for the validity of this "diffusion velocity" was recently calculated. The value is very similar to the "jiffy" which is the time for the velocity of light to traverse the diameter of a rest mass electron. This time divided into the neutral hydrogen wavelength (21 cm) results in a velocity of 10^{23} m·s^{-1}.

The ~10^{23} m·s^{-1} value relates the rest mass of the graviton and the rest mass of the photon [31] as intersecting phenomena that may only differ by the proportion of involvement of the entanglement velocity. The product of the upper boundary for the rest mass of a photon ($2\cdot10^{-52}$ kg, the velocity of light ($3\cdot10^{8}$ m·s^{-1}) and the entanglement velocity ($2.8\cdot10^{23}$ m·s^{-1}) is $1.7\cdot10^{-20}$ J. On the other hand the product of the upper boundary of a graviton is ~$2\cdot10^{-65}$ kg. In this case the square of the entanglement velocity derived from the electric and magnetic energy equivalents of $0.8\cdot10^{23}$ m·s^{-1} (that does not involve G) is $4.4\cdot10^{-19}$ J. This is within the range of the visible wavelength. Clearly if the actual value was 10^{-66} kg for the theoretical graviton the energy for the emergent photon and graviton would be potentially convergent. This is another support for the quantitative relationship and perhaps identity between the process labeled as Gravity and that labeled as "light" which persistently exhibits the dual properties of wave and particle [32].

Classically the time required for the electron-wave duality to traverse the interface of a p-n junction through electron tunneling is considered "instantaneous". We have assumed, based upon the diffusivity (entanglement) velocity, that the value is very fast but non-zero. If the manifestation of entanglement velocity is $2.8\cdot10^{23}$ m·s^{-1}, the time required to traverse p-n junction of ~1 μm would be $0.3\cdot10^{-29}$ s. The equivalent frequency is $3.3\cdot10^{29}$ Hz and hence the energy of the wave packet would be the multiplication by Planck's constant ($6.626\cdot10^{-34}$ J·s) or ~$22\cdot10^{-5}$ J. When divided by the rest mass of an electron ($9.1\cdot10^{-31}$ kg), the remaining value is $2.4\cdot10^{16}$ m^2·s^{-2} or $1.6\cdot10^{8}$ m·s^{-1}. This is very convergent with the velocity of light.

Hence if the tunneling duration is assumed to be a non-zero value which is the entanglement velocity the resulting energy values for an electron mass resolves within the range of the velocity of light. This may be an initial demonstration that a value involved with entanglement directly translates into an energetic quantity that reflects both the mass and velocity of the electron-wave (photon) duality.

QUANTITATIVE SUPPORT FOR ENTANGLEMENT

According to contemporary assumptions the phenomena of entanglement and excess correlation will remain within the domain of the photon. According to Afek et al [33], "entanglement is a distinctive feature of quantum mechanics that lies at the core of many new applications in the merging science of quantum information". We assume that any macro-quantum manifestation within circuits containing photocouplers should be consistent with this approach. There is evidence for this operation.

Basharov [34], while studying entangled atomic states, reiterated previous approaches that non-interacting atoms that decay in a common thermostat field first lose quantum correlations during relaxation. However this is followed by an increase in entanglement in an ensemble of non-interacting atoms. He calculated the operator of the resonance interaction between the atoms and the transverse component of an electromagnetic field. The central operation for his innovative derivation was:

$$\sqrt{[(2\pi\cdot\hbar\cdot q\cdot c\cdot M)\cdot p^{-1}]} \quad (4),$$

where ħ is the modified Planck's constant, q is the unit charge, c is the velocity of light in a vacuum, M is the magnetic moment, and p is the momentum. If we assume the values for an electron (M=$9.28\cdot10^{-24}$ A·m^2) where p is its rest mass ($9.11\cdot10^{-31}$ kg) multiplied by the fine structure velocity, then the resulting magnetic moment is $3.84\cdot10^{-22}$ A·m^2 which is J·T^{-1}.

Within a changing 1 nT magnetic field the resulting energy would be $3.84\cdot10^{-31}$ J. The value is important because after dividing by Planck's regular constant, the frequency is ~500 Hz which is ~2 ms. This within the range of 1 ms that we have assumed to be associated with expansions of the electron according to equation (3) which involves cosmological properties and the intrinsic nature of space. The 1 nT value is a consistently measured value that is inversely related with the photon flux density (~$1.9\cdot10^{-12}$ W·m^{-2}) emitted within space and from living systems [35, 36]. It may not be spurious that the product of this flux density value multiplied by the square of the wavelength of the neutral hydrogen line is ~$9\cdot10^{-31}$ kg which is within range of measurement error for the rest mass of an electron.

Within our DAC system involving the optocouplers the relevance of 1 nT is revealing. Applying the elementary relationship between the strength of the field B and the current within a cylinder, current can be obtained as:

$$I=[(B\cdot2\pi r)\cdot\mu^{-1}] \quad (5),$$

where r is the radius of the space being considered and μ is magnetic permeability ($4\pi\cdot10^{-7}$ N·A^{-2}) of space. Assuming the typical width of a p-n junction in the optocoupler is about 1 μm, the current involved with a fluctuation of 1 nT would be $2.5\cdot10^{-9}$ A. Nanoamp subthreshold flutters are expected in our circuits. In fact MEDA fluxgate magnetometers with a sensitivity of 1 nT have shown fluctuations through application solenoids not carrying any particular signal when the equipment is operating.

The relationship to photons depends upon the validity of the calculations by Das and Misra [37] who showed that a photon whose upper limit for rest mass is ~$2\cdot10^{-52}$ kg [37] displays a charge $e_r < 3\cdot 10^{-33}$ of a unit charge ($1.6\cdot10^{-19}$ A·s) , or ~10^{-52} A·s. Our previous calculations have indicated the importance of the vacuum zero point oscillations in these processes as quantitatively expressed by the Zitterbewegung (zero-point-fluctuation "jitter") of $3.23\cdot10^{43}$ s^{-1} [38] which is a variant of the inverse of Planck's time. The multiplication of the Zitterbewegung by the "charge" of a photon produces $3.2\cdot10^{-9}$ A.

One interpretation of this quantity is that the application of Basharov's [34] central formula for the decoherence and entanglement in radiative decay of a diatomic system to the optocoupler solves for the persistent entanglement of the equivalent of *one photon* that is either highly correlated with or responsible for the equivalent 1 nT fluctuations through the circuits. With only one photon which could exist simultaneously on both sides of the p-n junction or within the junction and within the magnetic field generated through optocoupler circuits to which the living volume is being exposed, excess correlation could be very likely.

CONCLUSIONS

Multiple quantitative solutions and theoretical approaches converge to support the presence of electron/photon-based excess correlation and evidence of entanglement at the level of biological systems that occupy volumes in the order of 1 to 1000 cc. Phase modulations whose energies could be expressed in the order of 10^{-20} J for energy from electron orbital frequency may represent in some conditions as the Compton wavelength for the electron. A technology based upon optocoupler circuits for generating magnetic fields with discrete point durations based upon cosmological properties that match essential electron properties operate quantitatively on the simultaneous presence of a photon within the p-n junction. The utilization of this technology more precisely could manifest entanglement typically relegated to quantum-level space to the volumes in which integrated biological systems, including human observers, exist.

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Authors' biographies with Photos

Michael A. Persinger, Ph.D. is a Full Professor at Laurentian University in Sudbury, Ontario, Canada. He is affiliated with a number of different programs including Biomolecular Sciences, Behavioural Neuroscience and Human Studies as well as the Quantum Molecular Biology Laboratory where he is examining the relationship between 10^{-20} J events within the brain and complex functions. Dr. Persinger and his colleagues have experimentally demonstrated the validity of Cosic's Molecular Resonance Recognition Model, Bokkon's Cerebral Photon Field Hypothesis and the efficacy of proton driving patterned magnetic fields that inhibit the growth of cancer cells but not normal cells. He is an interdisciplinary scientist whose primary goal is to integrate the physical sciences, social sciences and humanities according to their fundamental operations. Within the last 50 years he has published more than 500 technical articles in variety of areas that range from Astronomy to Zoology. His present experiments are focused upon understanding the relationship between the structure of space and distribution of energy, the shared dimensional equivalence of quantized gravitational and electromagnetic fields, and the empirical demonstration of an intrinsic entanglement velocity.

Stanley A. Koren is the creator of the Digital-to-Analogue (DAC) optocoulpler technology for complex magnetic field circuits and the Complex software that operates the systems. He has published extensively in the areas of physical cosmology, electronic systems analyses, and application technologies. He is trained as an Electronics Engineering Technologist and holds a degree in Mathematics and Computer Science. Professor Koren and Dr. Persinger, while at Laurentian University, have collaborated on multiple projects over the last 30 years that included the creation and disruptions of excess correlations in physical and biological systems. They developed a neurophysics model that relates the nature of the proton and electron to cosmological variables such as the Hubble parameter and their connection to the physical substrates of living matter. His favorite focus is discerning the relationship between time, Casimir phenomena, and the intrinsic nature of the neutral hydrogen line. Professor Koren has been systematically pursuing the application of quantum theory beyond the single particle. He holds a number of patents with Dr. Persinger and is a licensed radio amateur: Canadian call sign VE3PSE.