On the Brain and Cosmic Background Photons

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ABSTRACT

In this paper we present the model calculations of the normalized energy spectra of the brain and the cosmic background photons. It was shown that both spectra can be calculated with the same formula (Planck black body formula) with different temperatures. For Cosmic Background the temperature is $T=2.53 \times 10^{-4}$ eV = 2.53 K and for brain photons $T= 7.8 \times 10^{-15}$ eV = 7.8×10^{-11} K.

Key Words: Brain photons, cosmic background photons, temperature, black body

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Introduction

We realize that the title of our paper is provocative. It is aimed at providing a theory of how the physical universe and consciousness can be integrated. We will argue that the current state of affairs in addressing the multifaceted issue of consciousness requires such a theory if science is to evolve and encompass the phenomenon of consciousness. Traditionally, the underlying problem of consciousness has been excluded from science, on one of two grounds. Either it is taken as a given that it has no effect on experimental data, or if consciousness must be addressed, it is considered subjective and therefore unreliable as part of the scientific method. Therefore, our challenge is to include consciousness while still remaining within the methods of science. Our starting point is physics, which recognizes three broad approaches to studying the physical universe: classical, relativistic, and quantum. Classical Newtonian physics is suitable for most everyday applications, yet its epistemology (method of acquiring knowledge) is limited — it does not apply at the microscopic level and cannot be used for many cosmic processes. Between them, general relativity applies at the large scale of the universe and quantum theory at the microcosmic level. Despite all the attempts to unify general relativity with quantum theory, the goal is still unreached. Of the three broad approaches, quantum theory has clearly opened the door to the issue of consciousness in the measurement process, while relativity admits that observations from different moving frames would yield different values of quantities. Many of the early founders of quantum mechanics held the view that the participatory role of observation is fundamental and the underlying "stuff" of the cosmos is processes rather than the construct of some constant, underlying material substance.

However, quantum theory does not say anything specific about the nature of consciousness — the whole issue is clouded by basic uncertainty over even how to define consciousness. A firm grasp of human mental processes still remain; very elusive. We believe that this indicates a deeper problem which scientist; in general are reluctant to address: objective science is based on the dichotomy;

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between subject and object; it rests on the implicit assumption that Nature can be studied ad infinitum as an external objective reality. The role of the observer is at best, secondary, if not entirely irrelevant

2. Consciousness and Quantum Theory

The issue of observation in QM is central, in the sense that objective reality cannot be disentangled from the act of observation, as the Copenhagen Interpretation (CI) nearly states in the words of John A. Wheeler 1981, we live in an observer-participatory Universe. The vast majority of today's practicing physicists follow CI's practical prescriptions for quantum phenomena, while still clinging to classical beliefs in observer-independent local, external reality). There is a critical gap between practice and underlying theory. In his Nobel Prize speech of 1932, Werner Heisenberg concluded that the atom "*has no immediate and direct physical properties at all.*" If the universe's basic building block isn't physical, then the same must hold true in some way for the whole. The universe was doing a vanishing act in Heisenberg's day, and it certainly hasn't become more solid since (Schild, 2012).

This discrepancy between practice and theory must be confronted; because the consequences for the nature of reality are far-reaching an impressive body of evidence has been building to suggest that reality is non-local and undivided. Non-locality is already a basic fact of nature, first implied by the Einstein-Podolsky-Rosen thought experiment despite the original intent to refute it, and later explicitly formulated in Bell's Theorem

Moreover, this is a reality where the mindful acts of observation play a crucial role at every level. Heisenberg again: "*The atoms or elementary particles themselves . . . form a world of potentialities or possibilities rather than one of things or facts.*" He was led to a radical conclusion that underlies our own view in this paper: "*What we observe is not nature itself, but nature exposed to our method of questioning*." Reality, it seems, shifts according to the observer's conscious intent. There is no doubt that the original CI was subjective (Schild, 2012).

Quantum theory is not about the nature of reality, even though quantum physicists act as if that is the case. To escape philosophical complications, the original CI was pragmatic: it concerned itself with the epistemology of quantum world (how we experience quantum phenomena), leaving aside ontological questions about the ultimate nature of reality. The practical bent of CI should be kept in mind, particularly as there is a tendency on the part of many good physicists to slip back into issues that cannot be tested and therefore run counter to the basic tenets of scientific methodology.

3. The Model

In order to put forward the classical theory of the brain waves we l quantize the brain wave field. In the model (Marciak-Kozlowska and Kozlowski, 2012) we assume that;

(i) The brain is the thermal source in local equilibrium with temperature T.

(ii) The spectrum of the brain waves is quantized according to formula $E=h\nu$ where E is the photon energy in eV, $\hbar$=Planck constant, ν-is the frequency in Hz.

(iii) The number of photons emitted by brain is proportional to the (amplitude)^2 as for classical waves. The energies of the photons are the maximum values of energies of waves for the emission of black body brain waves we propose the well know formula for the black body radiation (Baierlein, 1998).

The energy density within a blackbody is independent of the material from which the blackbody is made. We will assume that this thermodynamic law holds as well for neutrino emitters as for photon emitters. This thermodynamic relation greatly simplifies the task of calculating the energy density. The standard technique is to make the blackbody out of $nothing$. Enclosure walls at a temperature T are used to surround a vacuum. Emission from the walls fills the vacuum to the energy density required of a black-body at the wall temperature. The energy *density per* unit volume and per unit frequency range is then calculated. The number of modes per unit volume and frequency is most easily obtained by assuming a rectangular enclosure of smooth, almost perfectly reflecting walls. A minute amount of absorption is necessary to insure that the walls and radiation are in thermal contact. This situation is easy to achieve experimentally for photons. A spatial

mode of the field is simply a particular space pattern that satisfies a particular boundary condition, for example, for our case the field is zero at the wall. In the standard technique, an integral number of half wavelengths must fit between opposite walls in one direction. Counting the number of spatial three-dimensional modes per unit volume and frequency is then standard and gives

$$4\pi\nu^2c^{-3}$$

for any wave field satisfying the boundary conditions. The actual modes present for a particular wave-field will be larger than the space count because each space mode may harbor a number of internally different fields. Since photons come in two circular polarizations (left and right handed we have

$$2x(4\pi\nu^2c^{-3}) = (8\pi\nu^2c^{-3})$$

for photons. In thermodynamics we consider Planck type formula for probability ρ for the emission of the particle (photons as well as particles with m≠0) with energy (E, E+dE)) by unit energy by the source with temperature T is equal to

$$\rho = (\frac{8\pi\nu^2}{c^3})\frac{1}{Exp\left(\frac{h\nu}{kT}\right)-1} \quad (1)$$

For very low temperature, i.e., for

$$\frac{h\nu}{kT} \gg 1 \quad (2)$$

From formula (1) we obtain for probability emission ρ

$$\rho = \left(\frac{8\pi\nu^2}{c^3}\right)Exp\left(\frac{-h\nu}{kT}\right) \quad (3)$$

Formula (3) is black body emission formula (Planck formula) for the vacuum emission. For the emission into surrounding matter we modify formula (3) as

$$P(E)dE = BE^2\, e^{(-E/kT)}\, dE \quad (4)$$

where we introduce the normalization constant B. The new constant describes interaction of the photons with surrounding matter. With formula (4) we can calculate the normalized to the experimental data the photon energy distribution. In formula (4) E=total energy=$(h\nu)^2$, k = Boltzmann constant=1.3x10^{-23} JK^{-1}. K is for Kelvin degree. However in many applications in nuclear and elementary particles physics kT is recalculated in units of energy. To that aim we note that for 1K, kT is equal kx1K = K x 1.3x10^{-23} J x K^{-1}= 1.3 10^{-23} Joule or kT for 1K is equivalent to 1.3x10^{-23} Joule= 1.3x10^{-23} /(1.6x10^{-19}) eV = 0.8x10^{-4} eV. Eventually we obtain 1K= 0.8x10^{-4} eV, and 1eV= 1.2x10^4 K

$$\frac{dN}{dE} = BE^2_{\max}e^{(-\frac{E_{\max}}{T})} \quad (5)$$

The function dN/dE describes the energy spectrum of the emitted brain photons. In Figure 1 the calculated energy spectrum, formula (2) is presented. We present the result of the comparison of the calculated and observed spectra of the brain waves. The calculated spectra are normalized to the maximum of the measured spectra. The calculated spectrum is for temperature of brain source T= 0.8x10^{-14} eV. The obtained temperature is the temperature for the brain source in the thermal equilibrium. The source is thermally isolated (adiabatic well). However in very exceptional cases the spectrum is changed – by the tunneling to the quantum potential well. The temperature 1 eV ≅ 10^4 K then brain wave thermal spectra T=0.8x10^{-14} eV= 0.8x10^{-10} K. In Figure 2 we present the calculation of the energy spectrum for the Cosmic Background Radiation (CBR) (Durrer, 2008). The formula (5) was used for the model calculation. The normalized theoretical spectrum describes very well the observed CBR. The calculated temperature T=2.53 K, which is in excellent agreement with experimentally verified values. It must be stressed that in a paper we abandon the idea that every physical object is either a wave or a particle. Neither it is possible to say that particles "become" waves in the quantum domain and conversely that waves are "transformed "into particles. It is therefore necessary to acknowledge that we have here a different kind of an entity, one that is specifically quantum. For this reason Levy-Leblond and Balibar developed the name quanton, (Levy-Leblond, Balibar, 1990). Following that idea the human brain emits *quantons* with energies $E = \hbar\omega$ formula (5). The brain *quantons* are the quantum objects that follows all quantum laws: tunneling, the superposition and Heisenberg uncertainty rule. For the wave length of the *quantons* is of the order of Earth radius the quantum nature of the brain will be manifested in the Earth scale.

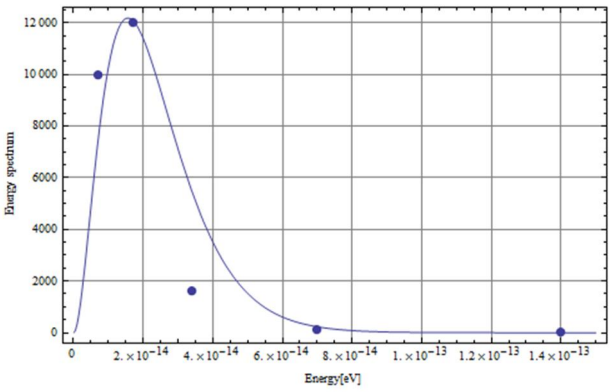

Figure 1. Model calculations for energy spectra of brain photons. The temperature of the source, T= 7.8 10^{-11} K.

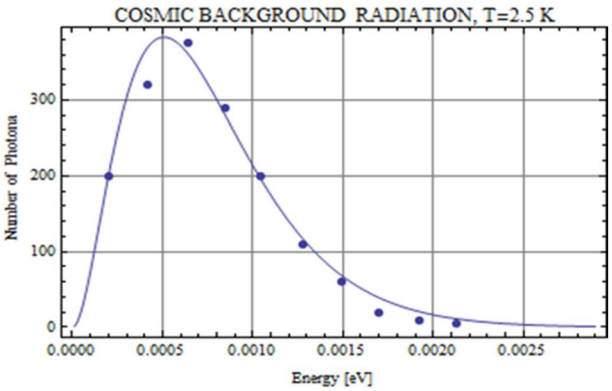

Figure 2. Model calculations for energy spectra of Cosmic Background Radiation Temperature of the source T= 2.35 K

Conclusions

In this paper for the first time the CB photons spectra and human brain photons spectra were calculate on the same footing. It is obvious that consciousness is not located in space. According to *special relativity* theory all physically observed phenomena are located in 4D space-time. In conclusion the consciousness not exist in time also, is *timeless*. The brain photons are the effect of the interaction of the timeless consciousness with human brain. The final results of this interaction are the*: alpha, beta, delta and theta* waves. In the paper we calculated the temperature of the source of the photons located in human brain. It is well known that our space time is filled with Cosmic Background Radiation. It was interesting to calculate the temperature of the CBR source with the same model as for brain photons. As the result the shape of temperature was calculated, temperature was obtained T=2.53 K, which is in very good agreement with observed value. One can conclude by analogy that our space with background radiation was created in the interaction of the timeless conscious with void

References

Schild R. Cosmology of Consciousness, Quantum Physics & Neuroscience of Mind, Cosmology Science Publishers, Cambridge, 2012.

Baierlein R. Thermal Physics, Cambridge University Press, 1999.

Marciak-Kozlowska J, Kozlowski M. Heisenberg's Uncertainty Principle and Human Brain. NeuroQuantology 2013; 11(1): 47-51.

Kozlowski M, Marciak-Kozlowska J. Brain Photons as the Quanta of the Quantum String. NeuroQuantology 2012; 10(3): 453-461.

Durrer R. The Cosmic Background. Cambridge University Press, 2008.

Levy-Leblond J, Balibar F. Quantics. Elsevier Publisher, 1990.