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QED Cosmic Dark Energy Density Using Schwinger-Fredkin and E-Infinity Theory

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Abstract

The present paper utilizes the similarity between the non-perturbative Julian Schwinger-Efimov-Fredkin approach and that of E-infinity Cantorian space-time theory to give an exact solution to the problem of cosmic dark energy via a golden mean scaling-super quantization of the electromagnetic field.

Keywords

Schwinger-Fredkin Method, Super Quantization, P-Adic Expansion, Electromagnetic Field, The Standard Model, Superstrings, E-Infinity Theory

1. Introduction

As is well known, there are many situations in which summing over all Feynman graphs is not only a daunting task but actually an impossibility [1]-[6]. In such cases, one of the best ways to solve the problem is to follow the non-perturbative strategy developed by the late Nobel Laureate J. Schwinger and E. Fredkin [1]-[6]. Another possibility similar in its non perturbative character is the E-infinity theory which resorts to summing over infinite hierarchal golden mean weighted dimensions [2] [3] [4] [7] [8] [9] [10]. It is the aim of the present work motivated by the Schwinger-Fredkin and E-infinity methodology [1]-[10] to see how the afore mentioned methods can be used to drive the ordinary cosmic energy as well as the dark energy density of our universe [10] [11]. Starting from QED and in particular by applying transfinite renormalization and P-Adic quantization [12] [13] [14] to the inverse electromagnetic E-infinity fine structure "constant" $\bar{\alpha} = (20)(1/\phi)^4$ where $\phi = (\sqrt{5}-1)/2$, we can determine with unheard of simplicity, the exact cosmic measurable ordinary energy density as well as its complimentary dark energy component which cannot be measured at present in a direct way [4] [11] [15] [16] [17]. Finally we discuss towards the end of this short work the deep philosophical and number theoretical meaning of the present analysis and the reason for its considerable effectiveness [15]-[27].

2. Renormalization, P-Adic Expansion and $\bar{\alpha}_o = 137 + k_o$

The most important E-infinity equation in an analogous context to a QED based vacuum energy of the Schwinger-Zymanzik-Fredkin formulation is the renormalization equation of $\bar{\alpha}_o$ [8] [10] [12], namely

$$\bar{\alpha}_o = (\bar{\alpha}_1)(1/\phi) + (\bar{\alpha}_2 = \bar{\alpha}_1/2) + (\bar{\alpha}_3 = 8+1) + (\bar{\alpha}_4 = 1) \quad (1)$$

Here $(1/\phi)$ is the transfinite Clebsh factor, $\bar{\alpha}_1 = 60$ is the ideal inverse electromagnetic coupling, $\bar{\alpha}_2 = 30$ is the inverse weak force coupling and $\bar{\alpha}_i = 1$ is the maximal quantum gravity-Planck coupling. Noting that $1/\phi$ is equal to the expectation average value corresponding to the $D = 2$ quantum path Hausdorff dimension, then we could investigate the various limits of physical meaning for $\bar{\alpha}_o$ in the light of the remarkable P-Adic expansion [12] [14]

$$\begin{aligned} \left\|\bar{\alpha}_o\right\|_2 &= \left\|2^{8-1} + 4^{4-1} + 2^{1-1}\right\| \\ &= \left\|2^7 + 2^3 + 2^0\right\| \\ &= \left\|128 + 8 + 1\right\| \\ &= \left\|137\right\|_2 = 1 \end{aligned} \quad (2)$$

This result is effectively a T-duality in the sence used by E. Witten in his M-theory [11] [12].

3. Dark Energy and Important Limits for the $\bar{\alpha}_o$ Equation

Let us look at the limit $1/\phi \to 1$. In this case we find $\bar{\alpha}_o = 100$ and that represents the normed degree of freedom or total core dimension of the E-infinity Penrose universe [8] [10] [11] [12]. This particular conclusion is highly interesting and important when we consider the maximal spacetime dimensionality 26 being 4 + 22 where 22 dimensions are compactified so that the 74 invisible dimensions left from the 100 must logically be the integer percentage of pure dark energy [17] [18]. In other words the limit $1/\phi$ of a quasi fractal "quantum path" to a classical one gives us a first accurate estimation of ordinary energy, dark matter energy and pure dark energy [8] [10] [11] [12]. In other words we can write that

$$\begin{aligned} \left|\bar{\alpha}_o\right| &= \sum_{i=1}^{4} \bar{\alpha}_i = 100 \\ &= 26 + 74 \\ &= 4 + 22 + 74 \\ &= \gamma(O) + \gamma(DM) + \gamma(PD) \\ &= \gamma(\text{total}) \end{aligned} \quad (3)$$

where $\gamma(O)$ is the ordinary energy density, $\gamma(DM)$ is the dark matter energy density and $\gamma(PD)$ is the pure dark energy density given in percentage of the normed 100 core dimension. There is one more important limit of $\bar{\alpha}_o$ which reconciles $\bar{\alpha}_4 = 1$ of the Planck energy scale with $\|\bar{\alpha}_o\| = 1$, namely when $\bar{\alpha}_1 = \bar{\alpha}_2 = \bar{\alpha}_3 = 0$ so that one finds the limit

$$\begin{aligned} \text{Lim}(\bar{\alpha}_o) &= \bar{\alpha}_4 \\ &= 1 \\ &= \|\bar{\alpha}_o\|_2 \end{aligned} \tag{4}$$

As we said earlier on, this is basically a T-duality-like statement [12] and indicates that we are indeed proceeding in the right direction. Intuitively we know that $\bar{\alpha}_o \cong 137$ is the exact complete standard model degrees of freedom [8] [10] [11]. Therefore we have the entire energy stored in it. By norming $\bar{\alpha}_o$ to $\bar{\alpha}_o = 100$ we can view $|\bar{\alpha}_o| = 100$ as the total 100% energy of the standard model while $26 + 74 = (22 + k) + (74 - k)$ where $k = \phi^3(1 - \phi^3)$. It follows then that the pure dark energy density is

$$\begin{aligned} \gamma(PD) &= 100 - (4.508497187 + 22 + k) \\ &= 100 - 26.68883708 \\ &= 73.1116292\% \end{aligned} \tag{5}$$

In fact the exact transfinite values of the three different energy densities can be found when taking on board an important ordinary energy density-pure dark matter energy duality noticed for the first time by Prof. Herman Otto [18] [19]. The duality discovery by Otto states that the ordinary energy density is equal to the inverse of the dark matter energy percentage. Since the dark matter energy percentage is clearly equal to the exact transfinite number of the compactified dimension in Heterotic strings sector then $22 + k$ of $|\bar{\alpha}_o| = 100$ means that we have $26 + k - 4 = 22 + k$ percent dark matter energy where $26 + k$ is the transfinite bosonic space dimension, $D = 4$ is Einstein's spacetime dimension and $k = \phi^3(1 - \phi^3)$ is 'tHooft's renormalon [10] [11]. It follows then that the exact ordinary energy density is equal to [10] [11] [16] [17]

$$\begin{aligned} \gamma(O) &= \frac{100}{22 + k} \\ &= 4.508497187 \end{aligned} \tag{6}$$

as per Otto's duality. That way pure dark energy density can be trivially deduced as

$$\begin{aligned} \gamma(PD) &= 100 - (4.508497187 + 22 + k) \\ &= 100 - 26.68883708 \\ &= 73.31116292\% \end{aligned} \tag{7}$$

exactly as should be [2] [10] [11].

4. Ordinary Cosmic Energy Density and Dark Energy Density from Super Quantized Electromagnetism

The next main important step is now to show how $\gamma(O)$ and $\gamma(D)$ may be found directly from the golden mean super quantized QED via $\bar{\alpha}_o = 137 + k_o$

where $\phi^5 = \phi^5(1-\phi^5)$, and ϕ^5 is the Hardy probability of quantum entanglement as proclaimed at the very beginning of this paper [2] [11]. To do that we return to the reconstruction equation of $\bar{\alpha}_o$ ad divide it into a superstring part and the rest. This leads to [10] [12] [16] [17]

$$\begin{aligned}\bar{\alpha}_o &= 10+127+k_o \\ &= (6+k)+(4-k)+127+k_o \\ &= (6+k)+130.9016994\end{aligned} \tag{8}$$

In the above form it is clear that the ordinary energy density must be the ratio of the $6+k$ to the $137+k_o$ super quantized QED value of $\bar{\alpha}_o$. This means [1] [2] [3] [4]

$$\begin{aligned}\gamma(O) &= (6+k)/(137+k_o) \\ &= 1/(22+k) \\ &= \phi^5/2 \\ &= 0.04508497 \\ &= 4.508497\%\end{aligned} \tag{9}$$

Note here that $6+k$ is the transfinite value found from the famous superstring equation $4n+2$ when setting n = 1 and adding the transfinite correction k due to the interplay of 'tHooft's renormalon [10] [11]. Similarly the total dark energy density must clearly be given by

$$\begin{aligned}\gamma(D) &= \frac{(137+k_o)-(6+k)}{137+k_o} \\ &= \frac{21+k}{22+k} \\ &= 0.95491502 \\ &= 5\phi^2/2 \\ &= 95.49150281\%\end{aligned} \tag{10}$$

in full agreement with our previous calculations based on entirely different models and theories [15] [16] [17] [18] [19].

5. Why Is the Mathematics of E-Infinity So Effective?

Having reached this stage in our mathematical-physical analysis, it is natural to ask why the present E-infinity theory is so miraculously effective [7]-[19]. It is equally natural to respond to this question by saying that the secret of it all lies clearly and squarely in the golden mean super quantization, ergo in the use of the golden mean number system [10]. Alas this natural answer begs the question. We must go on asking the same question again and again in different guises for why the golden mean system should be so effective? The real answer is that the golden mean number system is not only equivalent to super quantization but it is much more than that. It is the language of nature. Now this last sentence sounds like the sort of mystical utterance that is usually distrusted by the down to earth theoretical physicists, including the present author. Never the less we can get rid of this natural distrust by explaining what we mean with the "language of nature". The simplest way to do that is to start by directing our readers attention to the "new kind of science" valiantly championed by Stephen Wolfram's monumental effort which recognizes the intimate affinity between reality and computations [15] as well as the scientific post modernistic notion proposed repeatedly by the present author. This notion posits that at a deep fundamental strata of scientific interrogation of nature, the difference between pure mathematics, physics and theoretical logic is at a minimum blurred and in the limit non-existent and completely tautological [10] [26] [27]. Now in order to avoid over straining the patience of the pragmatic reader with what may seem as too philosophical and abstract talking, let us return quickly to the specific and nothing can be better than the following two simple examples.

The first example is that taken from the theory of phyllotaxis of plants. That way we find that the observed golden mean angles are a consequence of the stationary minimization condition of the corresponding action [21]. Generalizing this under the assumption of genericity, we surmise that the golden mean plays the same stationary condition role for the Lagrangian of quantum physics and cosmology.

The second example is the sphere packing density in four dimensions [22]. Following Ref. [28], D = 4 leads to an almost golden mean maximal density, namely $\Delta = 0.61685$. Generalizing we surmise that the golden mean is the value for which minimization will lead to the equation of motion (or equilibrium) as well as its stability by the vanishing of the first and the second variation of the corresponding functional and here we come nearer again to the method of Schwinger [1] [10] [21] [22]. Adding to these two examples, the exact solution of two particles quantum entanglement of Hardy $D = \phi^5$ it is not hard to find that our conjecture about the golden mean being lingua franca of fundamental physics is anything but a long shot [10]-[20]. We feel that the preceding golden mean conjecture will probably be proven non-constructively in the not too distant future in a similar vein to proof of the Banach-Tarski theorem for instance [28].

On the other hand our result regarding ordinary cosmic energy density $\gamma = \phi^5/2$ and dark cosmic energy $\gamma = 5\phi^2/2$ could be considered as a proof of our conjecture because it is quite close to measurement and observation [17] [18]. In fact it could mutate to the ultimate proof if it could be established with high precision measurement that the values predicted by E-infinity (see **Figure 1**) are exactly the same found in the high precision measurement [20].

Finally we must state the following important point related to Coxeter's geometry, Buckyballs nano particles and the platonic bodies which connected the role of ϕ in number system to the role of ϕ in Lie symmetry groups [22] [23] [24] [25] [26] as hinted at in the work of Heinrich Saller on operational quantum theory [22]. Consequently we can see that ϕ brings two major fields together to bear on our approach to quantum physics and cosmology in a very positive way [15] [16] [17] [18] [19].

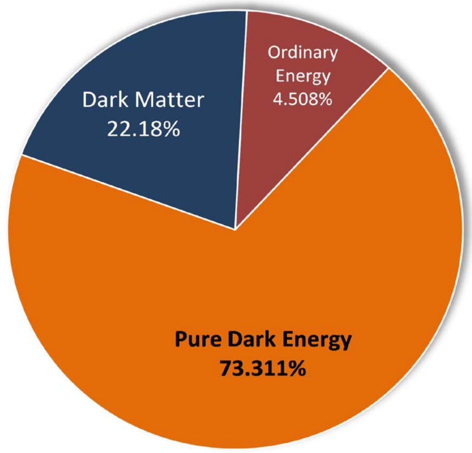

Figure 1. Graphical representation of the exact three cosmic energy sectors given by equations 2 to 5.

6. Conclusion

Drawing on various ideas going back to J. Schwinger and E. Fredkin and utilizing a variety of transfinite methods and techniques such as P-Adic quantum mechanics, Saller operational quantum theory and E-infinity super quantization, we showed how the various cosmic energy densities could be found rigorously from the electromagnetic field represented by $\bar{\alpha}_o = 137 + k_o$ while considering the dimensionality equation of string theory $4n + 2$ for $n = 1$. The results are all in complete agreement with all the previously obtained ones, both the theoretical and measuremental.

References

[1] Schwinger, J. (2000) A Quantum Legacy: Seminal Papers of Julian Schwinger. World Scientific, Singapore.

[2] El Naschie, M.S. (2015) On a Non-Perturbative Quantum Relativity Theory Leading to a Casimir-Dark Energy Nanotech Reactor Proposal. *Open Journal of Applied Science*, **5**, 313-324. https://doi.org/10.4236/ojapps.2015.57032

[3] El Naschie, M.S. (2008) Exact Non-Perturbative Derivation of Gravity G4 Fine Structure Constant, the Mass of the Higgs and Elementary Black Holes. *Chaos, Solitons & Fractals*, **37**, 346-369. https://doi.org/10.1016/j.chaos.2007.10.021

[4] El Naschie, M.S. (2017) Quantum Disentanglement as the Physics behind Dark Energy. *Open Journal of Microphysics*, **7**, 1-27. https://doi.org/10.4236/ojm.2017.71001

[5] Lee, B. and Zumino, B. (1969) Some Considerations on the Efimov Fredkin Method in Nonlinear Field Theories. *Nuclear Physics B*, **13**, 671-686. https://doi.org/10.1016/0550-3213(69)90200-4

[6] Fried, H.M. (2014) Modern Functional Quantum Field Theory—Summing Feynman Graphs. World Scientific, Singapore. https://doi.org/10.1142/8544

[7] El Naschie, M.S. (1998) Superstrings, Knots and Noncommutative Geometry in E-Infinity Space. *International Journal of Theoretical Physics*, **37**, 2935-2951. https://doi.org/10.1023/A:1026679628582

[8] El Naschie, M.S. (2004) A Review of E-Infinity Theory and the Mass Spectrum of

High Energy Particle Physics. *Chaos, Solitons & Fractals*, **19**, 209-236.
https://doi.org/10.1016/S0960-0779(03)00278-9

[9] El Naschie, M.S. (2013) The Quantum Gravity Immirzi Parameter—A General Physical and Topological Interpretation. *Gravitation and Cosmology*, **19**, 151-155.
https://doi.org/10.1134/S0202289313030031

[10] El Naschie, M. (2017) Elements of a New Set Theory Based Quantum Mechanics with Applications in High Energy Quantum Physics and Cosmology. *International Journal of High Energy Physics*, **4**, 65-74.

[11] El Naschie, M.S. (2016) On a Fractal Version of Witten's M-Theory. *Journal of Astronomy & Astrophysics*, **6**, 135-144.

[12] El Naschie, M.S. (2008) P-Adic Unification of the Fundamental Forces and the Standard Model. *Chaos, Solitons & Fractals*, **38**, 1011-1012.
https://doi.org/10.1016/j.chaos.2008.04.047

[13] Robert, A.M. (2000) A Course in A-Adic Analysis. Springer, New York.
https://doi.org/10.1007/978-1-4757-3254-2

[14] Khrennikov, A. (1997) Non-Archimedean Analysis. Kluwer Academic Publications, London. https://doi.org/10.1007/978-94-009-1483-4_3

[15] Wolfram, S. (2002) A New Kind of Science. Wolfram Media Inc., Champaign.

[16] El Naschie, M.S. (2014) From $E = mc^2$ to E = mc2/22—A Short Account of the Most Famous Equation in Physics and Its Hidden Quantum Entangled Origin. *Journal of Quantum Information Science*, **4**, 284-291. https://doi.org/10.4236/jqis.2014.44023

[17] El Naschie, M.S. (2013) What Is the Missing Dark Energy in a Nutshell and the Hawking-Hartle Quantum Wave Collapse. *International Journal of Astronomy and Astrophysics*, **3**, 205-211. https://doi.org/10.4236/ijaa.2013.33024

[18] El Naschie, M.S. (2013) Topological-Geometrical and Physical Interpretation of the Dark Energy of the Cosmos as a "Halo" Energy of the Schrodinger Quantum Wave. *Journal of Modern Physics*, **4**, 591-596. https://doi.org/10.4236/jmp.2013.45084

[19] Otto, H.H. (2017) Should We Pay More Attention to the Relationship between the Golden Mean and Archimedes' Constant. *Nonlinear Science Letters A*, **8**, 410-412.

[20] El Naschie, M. and He, J.H. (2018) Tesla's Dream from a Modern Quantum Spacetime View Point. *Nonlinear Science Letters A*, **9**, 36-43.

[21] Okabe, T. (2015) Biophysical Optimality of the Golden Angle in Phyllotaxis. *Nature Communications and Scientific Reports*, **5**, Article No. 15358.

[22] Conway, J.H. and Sloane, N.J. (1999) Sphere Packings, Lattices and Groups. Springer, New York. https://doi.org/10.1007/978-1-4757-6568-7

[23] Saller, H. (2006) Operational Quantum Theory. Vol. I & II, Springer, New York.

[24] Coxeter, H.S.M. (1973) Regular Polytopes. Dover Books, New York.

[25] El Naschie, M.S. (2007) Hilbert Space, Poincaré Dodecahedron and Golden Mean Transfiniteness. *Chaos, Solitons & Fractals*, **31**, 787-793.
https://doi.org/10.1016/j.chaos.2006.06.003

[26] El Naschie, M.S. (1992) Multi-Dimensional Cantor-Like Sets and Ergodic Behaviour. *Speculations in Science & Technology*, **15**, 138-142.

[27] El Naschie, M.S. (1992) Multi-Dimensional Cantor Sets in Classical and Quantum Mechanics. *Chaos, Solitons & Fractals*, **2**, 211-230.
https://doi.org/10.1016/0960-0779(92)90010-K

[28] El Naschie, M.S. (1995) Banach-Tarski Theorem and Cantorian Micro Spacetime. *Chaos, Solitons & Fractals*, **5**, 1503-1508.
https://doi.org/10.1016/0960-0779(95)00052-6