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From the Logical Foundation and the Derivation of $E = (mc^2/22) + (mc^2)(21/22) = mc^2$ to the Fractal Nature of Reality

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Abstract **– Using stringent but ordinary logic and some elementary mathematics and physics, we show in the present Letter that the famous $E=mc^2$ when written in it's two as well as three cosmic energy densities, will entail a near to completely new view of quantum physics, relativity and cosmology.**

Keywords **– Dark Energy, Fractal Spacetime, Accurate Cosmic Measurements, $E=mc^2/22$, The Nature of Reality, N. Umov.**

I. INTRODUCTION

As is well know, the discovery of accelerated cosmic expansion coupled with the previously discovered missing dark matter and the mysterious pure dark energy of the universe did cast doubt on the validity of Einstein's special and general theory of relativity in no minor measure [1-5] and led many scientists to question fundamental principles which were though for a long time to be settled [1-4]. The present author on the other hand was able to clarify the question of ordinary dark matter and pure dark energy density of the cosmos starting from the celebrated equation $E=mc^2$ where E is the energy, m is the mass and c is the velocity of light [6-10]. In doing so the author was tacitly extending the meaning of the famous special relativity equation to a maximal cosmic energy density equation [1-10]. In a sense the author was returning to the N. Umov [11, 12] form of $E=kmc^2$ and taking k = 1 for E(max) which may not be as self evident as it seemed [8].

The present Letter is intended to show how this way of interpreting $E=mc^2$ is deeply connected to the two and three quantum components partitioning of $E=mc^2$ to E(ordinary) plus E(dark) equals mc^2 and E(ordinary) plus E(dark matter) plus E(pure dark energy) equals mc^2 [5-10]. Sticking for the moment to the integer and rational energy density approximation we were able to show that E(ordinary) is equal $1/22 \cong 4.5\%$, while E(dark) is equal $21/22 \cong 95.5\%$ of the total density of $E=kmc^2$ at its maximal value, i.e. for k = 1 [5-13]. In addition E(dark) could be shown to be approximately equal to the sum of E(dark matter) of 22.2% and E(pure dark energy) of 73.3% which comes to the afore mentioned 95.5% of the dark section [1-10]. Needless to say, all these results are in excellent agreement with all the accurate cosmic measurements and observations [1-10]. Never the less this still does not fully prove the correctness of our basic assumption about E being maximum for K = 1 nor about the fractal nature of spacetime geometry and its Hausdorff non-integer dimension [2-9].

The main objective of the present paper is to cover this small but vital point and show the major consequence of its validity for our understanding of quantum physics and quantum cosmology as will be apparent from the next section.

1. The elementary logic, mathematics and physics involved in $E=mc^2$ as a maximal energy density of the cosmos.

Let us start by positing that $E=mc^2$ is not only a simple mass-energy equivalence equation [5-13] but a maximal energy density of the cosmos on average corresponding to N. Umov's $E=kmc^2$ where k = 1 [8,12]. Now following our previous analysis by requiring that every point in our spacetime is Einstein-Minkowski four dimensional, then we see that the total dimension must be $4+\phi^3$ rather than simply 4 [6-10]. Adding to that the spin half dimension one finds $4+\phi^3+1=5+\phi^3$ which corresponds to a fractal version of Kaluza-Klein spacetime theory [10]. The corresponding energy may then be found from Newton's kinetic energy or the classical potential energy as explained elsewhere in considerable detail [6-13]. Taking Newton's kinetic energy $E=(1/2)mv^2$ and setting m = m(topological + Hausdorff) = $5+\phi^3$ and $v \to c$(topological) = ϕ [5-10] one finds $E=(1/2)(5+\phi^3)(\phi)^2=(1/2)(2)=1$. This means k = 1 on average and corresponds to a maximal E equal to $E=(1)(mc^2)$ as in the well known and most recognized elegant formula of physics [8]. However here we have de facto decomposed the energy into two parts. The first is a fractal part equal to $\phi^5/2 \simeq 1/22 \cong 4.5\%$ and the second is a non-fractal part equal to $5\phi^2/2 \simeq 21/22 \cong 95.5\%$ which together lead to k = 1 [11-13]. Clearly the fractal part is what corresponds to the ordinary energy, i.e. the energy which all the cosmic measurements and observations found while the rest, 95.5% is what we refer to as the dark energy density [6-13]. Thus the logic is clear cut for if the assumption $k=1$ corresponds to maximal energy leads not only to the correct theoretical dissections but more profoundly to the correct measured quantities, then we are home, more or less. The exacting answer however is that we are slightly less but have the prospect of reaching a stage

which is far more than we hoped for, namely proving that the theoretical supposition that spacetime is a fractal manifold is a true physical reality and that E-infinity Cantorian spacetime with its golden mean basis is the golden spacetime manifold we are literally living in [6-12]. The crux of the problem is the lack of true precise exacting cosmic measurement [1-12]. To come to our "dream" conclusion it is not sufficient to find that the ordinary energy density is 4% or a little more or a little less. We must find a robust 4.5% at least, then we must improve this value to the exact or near exact theoretically irrational value we found, namely $\phi^5/2 = 4.50849717\%$. The author seriously believes that the next three digits after the point are vital for making the monumental conclusion that we live on average in a fractal Kaluza-Klein spacetime and that extra fractal spacetime dimensions are real reality and so is the Aether, being the empty set [1-10] and spacetime being a material which we could shape and extract energy from as dreamt by the visionaries like N. Tesla and others [1-10]. To be able to do just that we must make more accurate measurements which may be very costly in terms of dollars and time and in the case of a world ready to spend trillions of dollars on wars [14] but becomes cagey when it comes to fighting cancer or finding vaccines for the many maladies let alone advancing our frontiers of scientific knowledge, it may not be a first priority so the author is only cautiously optimistic and will not hold his breath to say the least. For up to date background information on the subject of the present work, we recommend careful reading of Ref. 15.

II. Conclusions

To know for sure if spacetime is a fractal we need nothing more but probably nothing less than even more exacting measurements for ordinary energy or dark matter energy to reveal the irrational number involved due to the inherent golden mean cosmic number code lurking at the very roots of our universe. This task may be much easier said than done but we will not know until we try and find out for instance that the ordinary energy density is not simply 4 percent nor 4.6 percent but exactly 4.508 percent. This same situation holds true for the second possible density to measure with comparative ease, namely that of dark matter and find that it is 73.311 percent and not simply a crude 74 percent or 71 percent. Only time and effort will tell unless there is another indirect way to find out these vital facts that eludes the author at present.

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Author's Profile

Professor **M.S. El Naschie** was born in Cairo, Egypt on 10th October 1943. He received his elementary education in Egypt. He then moved to Germany where he received his college education and then his undergraduate education at the Technical University of Hannover where he earned his (Dipl-Ing) diploma, equivalent to a Master's degree and Chartered Structural Engineer. After that he moved to the UK where he enlisted as a post graduate student in the stability research group of the late Lord Henry Chilver and obtained his Ph.D. degree in structural mechanics under the supervision of Professor J.M.T. Thompson, FRS. After his promotions up to the rank of full professor, he held various positions in the UK, Saudi Arabia and USA and was a visiting professor, senior scholar or adjunct professor in Surrey University, UK, Cornell, USA, Cambridge University, UK, Cairo University, Egypt and is presently a Distinguished Professor at the Dept. of Physics, Faculty of Science of the University of Alexandria, Egypt.

Professor El Naschie is well known for his research in structural stability in engineering as well as for his work on high energy physics and more recently for his work is cosmology and elucidation of the secret of dark energy and dark matter as well as for proposing a dark energy Casimir nanoreactor.

Professor El Naschie is the single or joint author of about one thousand publications in engineering, physics, mathematics, cosmology and political science. His current h-index is 74, his i-10 index is 755 and his citations according to Google Scholar is 31439.