Online ISSN : 2249-4626 Print ISSN : 0975-5896 DOI : 10.17406/GJSFR

## GLOBAL JOURNAL

OF SCIENCE FRONTIER RESEARCH: A

## Physics and Space Science



VOLUME 17 ISSUE 5 VERSION 1.0

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#### GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH: A Physics & Space Science

## GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH: A PHYSICS & SPACE SCIENCE

Volume 17 Issue 5 (Ver. 1.0)

**OPEN ASSOCIATION OF RESEARCH SOCIETY** 

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#### Offset Typesetting

Global Journals Incorporated 2nd, Lansdowne, Lansdowne Rd., Croydon-Surrey, Pin: CR9 2ER, United Kingdom

#### Packaging & Continental Dispatching

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GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH: A PHYSICS AND SPACE SCIENCE Volume 17 Issue 5 Version 1.0 Year 2017 Type : Double Blind Peer Reviewed International Research Journal Publisher: Global Journals Inc. (USA) Online ISSN: 2249-4626 & Print ISSN: 0975-5896

# Possible Origins of Virtual Particles as Revealed in the Cosmic Dark Matter Fractal Field Theory

### By T. Fulton Johns DDS

Decathlon Dental, United States

*Abstract-* The CDMFF theory presented in the book "The Great Cosmic Sea" will explain how the evolution of our planet and its biosphere is actively evolving with our cosmos through a complex network of powerful morphogenetic fields at all scales. This theory explains many of the findings revealed by scientific evidence of the nature of the fabric of our cosmic sea in which we coexist with each other and other worlds, both terrestrial and extraterrestrial. Most of the concepts of this theory are now under copyright protection in a book soon to be released. However, what I am revealing in this invited paper is a new insight not currently a part of that publication. The foundations of this theory pave the way to understand a possible source of virtual particles thought to be present at the Planck scale. It is possible that virtual particles are being produced by the Hawking radiation, as well as, released as morphogenetic fields are traversing the baryonic matter/dark matter junction (BM/CDMFF/I) and striped of the atomic structure within by Planck virtual black holes(PVBH's).

GJSFR-A Classification: FOR Code: 240102

### POSSIBLE DRIGINSOFVIRTUAL PARTICLESA GREVEALE DIN THECOSMIC DARKMATTERFRACTALFIELD THEORY

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## Possible Origins of Virtual Particles as Revealed in the Cosmic Dark Matter Fractal Field Theory

T. Fulton Johns DDS

Abstract- The CDMFF theory presented in the book "The Great Cosmic Sea" will explain how the evolution of our planet and its biosphere is actively evolving with our cosmos through a complex network of powerful morphogenetic fields at all scales. This theory explains many of the findings revealed by scientific evidence of the nature of the fabric of our cosmic sea in which we coexist with each other and other worlds, both terrestrial and extraterrestrial. Most of the concepts of this theory are now under copyright protection in a book soon to be released. However, what I am revealing in this invited paper is a new insight not currently a part of that publication. The foundations of this theory pave the way to understand a possible source of virtual particles thought to be present at the Planck scale. It is possible that virtual particles are being produced by the Hawking radiation, as well as, released as morphogenetic fields are traversing the baryonic matter/dark matter junction (BM/CDMFF/I) and striped of the atomic structure within by Planck virtual black holes (PVBH's).

#### I. THE COSMIC DARK MATTER FRACTAL FIELD THEORY (CDMFFT)

ur reality is indeed illusory when taken into full context as a part of an expanse that sits almost exactly in the middle of a scalar continuum from the Planck scale to the vast visible universe and the super-massive objects known to exist there. Even more illusory when we consider that all of the matter that we can perceive through scientific inspection and even our individual sensory perceptions make up only 4% of our entire cosmos. The presence of dark matter and dark energy accounting for the other 96% leaves quite a void in our pretense to understand the cosmos. However, there are significant clues that lead to clarity when the body of scientific research is considered across multiple disciplines. That is what I have done for most of my professional years as a perpetual student of the sciences and have discovered a common thread that encompasses all forces of nature including the neglected life force. So it is not as an authority on anyone subject that I bring this theory forward for your consideration but as a student who has uncovered a concept that keeps answering questions I have pondered for decades.

The work of Dr. Rupert Sheldrake, for example, is an intensive study on morphogenetic fields and is a revealing investigation of the inner workings of our biosphere and its interaction with multiple energy fields in our environment. It is his research and years of work of many others that have provided the foundation to this theory I present in the book 'The Great Cosmic Sea'. However, the short version of the theory is that our reality at every scale is made up of a cascade of iterated fractal nested fields of influence. Sheldrake says it this way in his book:

'The Presence of the Past, Morphic Resonance and the Memory of Nature on the theory of Formative Causation':

"Morphic fields, like the known fields of physics, are nonmaterial regions of influence extending in space and continuing in time. They are localized within and around the systems they organize. When any particular organized system ceases to exist- as when an atom splits, a snowflake melts, an animal dies- its organizing field disappears from that place. But in another sense, morphic fields do not disappear: they are potential organizing patterns of influence and can appear again physically in other times and places, wherever and whenever the physical conditions are appropriate. When they do so, they contain within themselves a memory of their previous physical existences. The process by which the past becomes present within morphic fields is called morphic resonance. Morphic resonance involves the transmission of formative causal influences through both space and time. The memory within the morphic fields is cumulative, and that is why all sorts of things become increasingly habitual through repetition. When such repetition has occurred on an astronomical scale over billions of years, as it has in the case of many kinds of atoms, molecules, and crystals, the nature of these things has become so deeply habitual and effectively changeless or habitual."

This cosmic sea of which I speak is part of our environment and what I believe cosmologist now call dark matter/dark energy (DM/DE). Said another way, DM/DE represents the other 96% of your reality in the very room where you sit. It is what early investigators called another name the vacuum space, ground state or zero point field. My preference, a more descriptive name, is the cosmic dark matter fractal field (CDMFF). This is a pervasive field that surrounds you, in total and in part, at every cell interface and beyond. This field interacts with your morphogenetic field which has a literal universe of nested fractal fields that work and interact with "the total you" and that is including your Holobiome. The real you— or the whole you— is what you think of as "you," plus trillions of microbes within

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your alimentary tract, on your skin and in a cloud-like field surrounding you. In fact, 90 percent of all the cells that constitute you are nonhuman. To go a step further, 99 percent of all the genes in you are nonhuman according to the Holobiome Project. The CDMFF is a part of or actively working with DM/DE creating our reality at every level providing a type of unseen blueprint of substructure needed to direct and form atoms that make up all matter.

Consider this work done by Nobel laureate Luc Montagnier, using careful protocol proved that the DNA of virus and bacteria could emit electromagnetic signals (EMS) and transmit the information to duplicate the DNA into a separate vile of sterile water. This discovery was first rejected over ten years ago when Montagnier and his research team reported it.

These results have since been repeated by all of the different researchers you see below and even more remarkable the digitized electromagnetic signals of the DNA being sent to other labs over the internet by email. This information was then used to duplicate the results of Luc Montagnier and his team. One key element was always critical for success that the tubes of water were always exposed to the Schumann resonance between 7-8 Hz, Earths EMS pulse.

### "Transduction of DNA information through water and electromagnetic waves

Luc Montagnier <sup>a,b,</sup>, Emilio Del Giudice <sup>c\*</sup>, Jamal A<sup>°</sup>issa <sup>b</sup>, Claude Lavallee <sup>a</sup>, Steven Motschwiller <sup>d</sup>, Antonio Capolupo <sup>e, f</sup>, Albino Polcari <sup>g</sup>, Paola Romano <sup>g, h</sup>, Alberto Tedeschi <sup>i</sup> & Giuseppe Vitiello <sup>e, f</sup>

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#### II. THEORETICAL ANALYSIS

Our formerly reported experiments (Fig. 2 and ref. (Montagnier, A<sup>--</sup>issa, Lavallee, et al., 2009)) indicate that the ability of electromagnetic signal EMS production can be transmitted from tube 1 containing an emitter

DNA dilution to tube 2 of "naive" water, provided the system is excited overnight by electromagnetic waves of a minimal frequency of 7Hz.Presumably tube 1 transmits waves to the water in tube 2, which did not originally contain any trace of the DNA at the origin of the signals. In the previous Section we have reported the experimental observation that EMS can be emitted by diluted aqueous solutions of bacterial and viral DNA under proper conditions. Moreover, it has been observed that duplication of the emitting DNA segment can be obtained by using pure water exposed to the corresponding DNA EMS and, upon addition of enzymes, primers, etc., submitted to PCR (Polymerase Chain Reaction) cycles. Such a transduction process has been observed to occur also in EMS exposed living cells of tumor origin".

This groundbreaking original study presents many implications but the most important question is how did the atoms that make up the DNA in vile #2 align and form in the previous experiment by Montagnier? Water contains only two atoms hydrogen and oxygen that's a long way from deoxyribonucleic acid, however, the nucleotides added to vile #2 by the PCR enzymes provided the needed atoms but no structure or instructions for assembly. The CDMFF theory explains it this way; the field of the DNA was projected or transmitted to the second vile of water that had been tuned to a receptive resonate frequency (7 HZ), the electromagnetic pulse of this planet. The morphogenetic field of the DNA was projected from the first vile to the water of the second vile which received it presumably as a radio-like signal imprinting this transmitted DNA morphogenetic field in the water by breaking the bipolar symmetry of the water creating the coherent domain (CD) of the morphogenetic field of the DNA molecule. This allowed elemental particles to be attracted to the correct position to create the molecular bonds necessary for the nitrogen, phosphorus, and carbon atoms to be attracted to the correct position in the right orientation as needed.

This occurred through quantum electrodynamics (QED) according to the DNA field blueprint now present in the second vile presumably by way of scalar resonate coherence filling in the DNA quantum field in the required positions. This elemental particle alchemy formed through molecular phase locking of the nitrogen, phosphorus and carbon atoms in the sterile water creating the molecular form directed by the scalar CD of the DNA molecule that had been transmitted to the second vile.

This is just one of the predictions of the CDMFFT; the one I find most intriguing involves the interaction of morphogenetic fields with black holes. Black holes (BH) appear to be the incinerator of baryonic matter (BM) as they sit at the center of all galaxies and exist elsewhere at different scales known as rogue solo black holes (RSBH). The Black Hole at

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the center of our galaxy is estimated to be 3 billion solar masses. This produces extreme density of mass in the resulting BH, therefore producing extreme gravity along with what is known as an event horizon also known as the Schwarzschild radius. The Schwarzschild radius is a zone around the BH that is the point of no return once BM crosses this theorized line. The BM will be consumed within the core space-time singularity and according to the CDMFF theory changed to something else that conserves and carries the information contained within into this great vortex of immense energetic gravity and recycled as the memory of morphic fields.

There also appear to be black holes present at the Planck scale as well according to Prof. Steven Hawking and others in his October 6, 1994 paper entitled 'Virtual Black Holes' he states this in the conclusions of the paper:

"It seems that topological fluctuations on the Planck scale should give space time a foam-like structure. The wormhole scenario and the quantum bubbles picture are two forms this foam might take. They are characterized by very large values of the first and second Betti numbers respectively. I argued that the wormhole picture didn't really fit with what we know of black holes. On the other hand, pair creation of black holes in a magnetic field or in cosmology is described by instantons with topology S2 ×S2. This shows that one can interpret S2×S2 topological fluctuations as closed loops of virtual black holes".

The scale of observation can determine your perception of many things, as you sit, seemingly at rest, reading this paper you are moving in at least three different vectors (directions) at three different velocities in a corkscrew-shaped path through empty space while in constant rotation. The Earth rotates on its virtual axis toward the east at approximately 1000 mph, the Earth revolves around the Sun at approximately 66,000 mph that requires 365 days (1 year) to complete a revolution and as a part of our star centric solar system, Earth revolves around the black hole at our galactic center at about 500,000 mph requiring approximately 225,000 earth years to complete a revolution as our galaxy moves in an ever accelerating fabric of spacetime. Therefore, there is no doubt that there is plenty of motion out of our awareness contributing to the mass of our reality. This explanation of mass/gravity is described by Hal Puthoff along with Bernie Haisch of the Max Planck Institute as well as another mathematician Alfonso Rueda of the California University Long Beach collaborating on this paper that was printed in 1994 by Physical Review.

"The paper demonstrated that the property of inertia possessed by all objects in the physical cosmos was simply resistance to being accelerated through the Zero Point Field (CDMFF). In their paper they showed that inertia is what is termed a Lorentz force – a force

that slows particles moving through a magnetic field. In this instance, the magnetic field is a component of the Zero Point Field, reacting with the charged subatomic particles. The larger the object, the more particles it contains and the more it is held stationary by the field. What this was basically saying is that the corporeal stuff we call matter and to which all physicists since Newton have attributed an innate mass was an illusion. All that was happening was that this background sea of energy was opposing acceleration by gripping on to the subatomic particles whenever you pushed on an object. Mass, in their eyes, was a 'bookkeeping' device, a 'temporary place holder' for a more general quantum vacuum reaction effect."

McTaggart, Lynne. The Field Updated Ed: The Quest for the Secret Force of the Cosmos (Kindle Locations 824-825). Harper Collins. Kindle Edition.

Also, there are just as many fractal scales of reality out of our awareness but just as real and both motion and scale have a relativistic effect on our perception of reality. There is absolutely nothing in our reality that is stationary (at rest). This motion, no matter what scale, always occurs moving through and interacting with the fabric of our cosmic sea and interacting with it at the interface of baryonic matter/cosmic dark matter fractal field Interface (BM/CDMFF/I).

Just as the black hole was predicted from the mathematics of Einstein's general theory of relativity so the white hole (WH) was also predicted as a space-time reverse singularity. It is the prediction of the CDMFFT that this WH isn't a hole at all but an interface of two dissimilar worlds that occurs at the opposite end of the cosmic scale, at the Planck level of our reality. This BM/CDMFF interface, at the Planck scale is the point of creation of virtual particles (VP) which provide the subatomic particles under certain conditions, the raw material of the atoms that make up our baryonic world, the cusp of creation of (BM); the headwaters of The Great Cosmic Sea.

Prof. Steven Hawking also is famous for his theory of BH radiation also known as Hawking radiation being emitted as a function of bifurcating elementary particles as they become divided at the event horizon as anti-particles which would normally come back together and annihilate each other. This interaction present at the Planck scale could be the source of VP's as the entangled antiparticles are formed at the event horizon and separated there. One entangled twin particle proceeding into the internal core singularity and the other radiating out recoiling back into our baryonic world as Hawking radiation, as a virtual elementary particle. It is very possible that virtual particles are also being produced by the elementary particles released as morphogenetic fields are traversing the baryonic matter/dark matter BM/CDMFF/I junction and are striped of the baryonic atomic structure within by Planck virtual

black holes(PVBH's). These entangled virtual particles are then available to fill in the recycled morphogenetic fields through quantum electrodynamics in our reality.

#### III. CONCLUSION

There appears to be evidence through the work of many scientists over the past several decades that these morphogenetic fields, as described by Sheldrake and experimentally verified by Montagnier, appear to influence the form and function of our biosphere and the entire cosmos by way of formative causation, through morphic resonance which appear to be at work in the DNA transmission of Montagnier's et al. experiment. It is even plausible to see this process at work in the accretion formation of celestial objects. This ongoing process represent the unseen force behind the tenacious expression of life which has recovered from multiple extinction level events as seen in earths geologic record and the evolution of many divergent life forms in the history of our biosphere. It seems plausible that these fields are propagated not only through morphic resonance locally as in Luc Montagnier's viral DNA experiment but through and across the cosmos by the CDMFF employing virtual entangled particles from Hawking radiation as well as recycled morphogenetic field dynamics by way of Planck virtual black holes and white hole distribution action of virtual particles at the BM/DMFF/I.

https://www.facebook.com/CDMFFT/



GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH: A PHYSICS AND SPACE SCIENCE Volume 17 Issue 5 Version 1.0 Year 2017 Type : Double Blind Peer Reviewed International Research Journal Publisher: Global Journals Inc. (USA) Online ISSN: 2249-4626 & Print ISSN: 0975-5896

# A Constant Rotating Kerr-Newman Black Hole with No Net Electrical Charge

### By T. G. M. Gerlitz & W. Walden

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Abstract- A black hole solution for the rotating electrical charge gives the Kerr-Newman metric. Incorporation of the oscillating effects show to drive rotation. The model derived permits the consideration of an electrical charged BH with no net charge, which would neutralize. From the solutions a new complete set of tensor elements to modify the Kerr-Newman metric leading to the feature the squared line element can represent a black hole permanently carrying electrical charge, but not evenly distributing and spreading on the surface. Due to its properties, the black hole approached in this theory shows serrated in a kind sawtooth boosting the idea for determination of torsion effects and detect rotation. An exact representation of similar objects. The stability of the structure will be discussed.

GJSFR-A Classification: FOR Code: 029999



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2017

## A Constant Rotating Kerr-Newman Black Hole with No Net Electrical Charge

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Abstract- A black hole solution for the rotating electrical charge gives the Kerr-Newman metric. Incorporation of the oscillating effects show to drive rotation. The model derived permits the consideration of an electrical charged BH with no net charge, which would neutralize. From the solutions a new complete set of tensor elements to modify the Kerr-Newman metric leading to the feature the squared line element can represent a black hole permanently carrying electrical charge, but not evenly distributing and spreading on the surface. Due to its properties, the black hole approached in this theory shows serrated in a kind sawtooth boosting the idea for determination of torsion effects and detect rotation. An exact representation of the data together with an entire set of information can found to support further evaluation of similar objects. The stability of the structure will be discussed.

PACS Numbers:

03.30.+p Special relativity

04.20.-q General relativity

11.30.Er Charge conjugation, parity, time reversal, and other discrete symmetries.

#### I. INTRODUCTION

he involvement of the electrical field in black-hole (BH) studies in the metric of Reissner (1916) and Nordstrøm (1918), RN metric is an important aspect as well as the investigations due to torsion of electrically uncharged (Kerr, 1963; 1965), and even charged rotating BH (Newman and Janis, 1965; Newman et al., 1965; Boyer and Lindquist, 1967), in the Kerr-Newman mteric (KN) are extensively studied. A peculiar point of view is due to the electrically charged objects since they involve both types of interaction at the same time. That leads to the fact the Reissner-Nordstroem solution has two horizons, an external event horzon and an internal `Cauchy horizon' providing a convenient bridge to the study of the Kerr solution.

Incorporation of the oscillating effects show to drive rotation. The model derived allows consideration of an electrical charged BH. However, there are no cosmic objects carrying a significant net electrical charge found since those bodies are assumed probably be rapidly neutralized and, therefore the role electrical charged BH play in astrophysics is at least of a *second order*. The presented paper is a study on a BH carrying a permanent electrical charge, which will and can never neutralize.

It has recently be shown a BH can be represented consisting of an electromagnetic wave (EM) alone, which leads to an extension of this model due to an interchanging positive and negative states in the EM (Proca, 1936). Similarly, that would arrive at the phenomenon of two quantum mechanical states, positive and negative as predicted in the Dirac's theory (Dirac, 1928a; 1928b). The consideration of negative states in atom physics still bears a problem and has not be resolved in the suggestion of so-called anti-atoms, which consist of the same compounds in reversed electrical charges, but still positive mass m. Anti-matter has not been detected yet, and a positron is it either. A description of a BH model on the basis of an EM may not avoid those arguments but should incorporate both of those states together leaving a more precise model, which is the aim of the present study. In a recent study we found a model for a BH consisting exclusively of an EM (Gerlitz and Walden, 2017) leading to a Schwarzschild' description Schwarzschild, 1916a; 1916b; 1997).

#### II. Theory

A light beam travels any path it takes the shortest time and time interval. An event horizon of a BH is insurmountable for anything claiming the de Broglie formalism. The light will not become anti-light in an antiuniverse. Curvature in space is not a secret and a miracle either. It is, simplified illustrated, essential due to the "discrepancy" between circumference and radius of a sphere in presence of a force field, and nothing else. The simplest example becomes obvious in the atom and quantum physics appearing in the involvement of the factor  $\alpha$  from electrostatics (Gerlitz, 2015b), a "correction factor" revealing from the both limited speeds forming together the propagation speed of light *c* in the vacuum (see below).

The following theory is restricted to the usual Coulomb expression, since the magnetic terms involving radius dependence third and second order and are typically smaller and can be viewed as a perturbation to the spherical symmetric Coulomb term (Boyer, 1979; Carter, 2009; 2010; Melvin, 1964). It regards the diameter of the black hole (BH).

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$$d_{BH} = 2r, \qquad (1)$$

(Gerlitz and Walden, 2017) and describes the angular velocity measured relative to a reference frame at infinity

$$\omega_{\phi} = \frac{d\phi}{dt}, \qquad (2)$$

at  $\theta = \pi / 2$ , the equatorial area of the BH (see *e. g.*, Wald, 1983). From the angular frequency  $\vec{\omega} \rightarrow \omega$ , typically bold characters assigning vectors in the further, follows the angular momentum

$$\vec{J} = \vec{r} \square m \cdot \vec{\nabla} \equiv mr^2 \cdot \vec{\sigma} .$$
(3)

Though, it is mathematically acceptable to use geometrized units in general relativity to save labour it physically can represent a loss of information due to possibly entailing confusion (Wesson, 1980). Consequently, the current study deals with physical units to later give the results converted following the common geometrized scheme (e. g., Wald, 1984).

The general form of the underlying the condition of an EM is the d'Alembertian

$$\Box \Psi(\boldsymbol{r}, t) = 0, \qquad (4)$$

an operater properly entailing a metric signature (-, +, +, +), which would lead to results due to a fundamental metric tensor in a square root like  $\sqrt{+g}$  in accordance to. *e. g.*, Goedel (1949), but is in contrast to  $\sqrt{-g}$  suggested from Einstein (1916) leading to a signature at reversed signs (+, -, -, -). An equivalent use of both types leading equal-valued results at the end makes a further discussion redundant.

Due to its property the EM oscillates reversing positive and negative states (Proca, 1936) as presented in separation in the Dirac's equation twin. It has to be emphazised in this investigation one single EM is considered interacting with itself but not annihilating like particle and anti-particle as in the example

$$E = -(i\hbar c \, \boldsymbol{\alpha} \, \nabla - \beta \, m_0 c^2) \, \Psi(\boldsymbol{r}, t)$$

$$+ \frac{E}{2E} = +(i\hbar c \, \boldsymbol{\alpha} \, \nabla - \beta \, m_0 c^2) \, \Psi(\boldsymbol{r}, t)$$

$$\frac{\Psi(\boldsymbol{r}, t)}{\Phi(\boldsymbol{r}, t)} = 0$$

$$= 0$$

$$= 0$$

$$= 0$$

$$= 0$$

$$= 0$$

$$= 0$$

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$$= 0$$

$$= 0$$

the related Dirac's equations for two free particles of that kind.

With respect Due to the d'Alembertian as the underlying condition with an extension to the mechanical momentum of light neither pure electrical nor magnetic fields appear for an observer outside the EM rather electromagnetic and gravitational interactions in oscillation. It sets to reason the factors underlying the basis that for a particle with the elementary charge **e** there are two speeds limiting the speed of light (Gerlitz, 2015a). The respective maximum and minimum speeds for a bradyonic *B* and the minimal for a tachyonic *T* is close to the propagation of light *c* in the vacuum pointing as extrema to the limiting speeds

$$v_{\rm B} = (1 - \alpha^2)^{1/2} \cdot c$$
, (6)

$$v_{\rm T} = \left[2 - (1 - \alpha^2)^{1/2}\right] \cdot c$$
, (7)

with the fine-structure constant (Sommerfeld, 1916),

$$\alpha = \frac{\mathbf{e}^2}{2h\boldsymbol{\varepsilon}_0 c} \equiv \frac{\mathbf{e}^2}{4\pi\boldsymbol{\varepsilon}_0\hbar c} \tag{8}$$

theoretically always positive scalar, and an demonstrated in that context (Gerlitz, 2015b). The basis is the consideration any particle can cross the light barrier by a "jump" to converse from the subluminal character of a B into that of a superluminal T and reverse in alternating their properties. The transition entails symmetry reflection in a CPT- operation in mirroring the signs of, e.g., mass, time interval, and space, respectively. A change in sign of the particle's electrical charge entailed from the Coulomb's law is due to the change in sign of the electrical field,  $+\mathbf{E}_{B} \leftrightarrow -\mathbf{E}_{T}$ . The theory is found on the postulate that a photon is represented using permanent interchanging sub- and superluminal state by lightbarrier crossing appearing in the B-T pair of the B particle and T co- or antiparticle in accordance eq. (1) illustrated in the twin pair of Dirac's equations to describe the character of the entire system. Since always related to the propagation of light c the requirement for that phenomenon in the entire system is a permanent co-existence of T and B altogether; they behave correlated as the one can never exist without the other. The formulae (6), (7) are valid towards pure and free electrostatic interactions in the vacuum and valid for any *m* including m = 0. An eventual appearing discrepancy between their momentae does not affect their validity. That can be verfied in incorporating the two associated electrostatic potentials in the "positive" and the "negative" Dirac's equations. After a "re"-outfactorzation of them the result returns exactly to the d'Alembertian eq. (4).

The differences between the respectice speed limit and  $\boldsymbol{C}$  are the same,

$$\Delta v_{c,B} = c - v_B \equiv c - (1 - \alpha^2)^{\frac{1}{2}} c \equiv [1 - (1 - \alpha^2)^{\frac{1}{2}}] c, \qquad (9)$$

$$\Delta \mathbf{v}_{\mathrm{T,c}} = \mathbf{v}_{\mathrm{T}} - c \equiv \left[2 - (1 - \alpha^2)^{\frac{1}{2}}\right] \cdot c - c \equiv \left[1 - (1 - \alpha^2)^{\frac{1}{2}}\right] \cdot c; \quad (10)$$

that forms the "speed gap" as the "light-barrier thickness" between sub- and superluminal motion,

$$\Delta v_{B,T} = \Delta v_{c,B} + \Delta v_{T,c} \equiv 2 [1 - (1 - \alpha^2)^{\frac{1}{2}}] \cdot c$$
  

$$\approx 53.25\ 206\ 34\ 74 \cdot 10^{-6} \cdot c.$$
<sup>(11)</sup>

Those formulas are valid on any perfect even surface, even on the surface of a BH in the vacuum, where they are discussed.

The free EM in the vacuum forms the BH in performing one cycle around its center with the angular velocity

$$\omega_{\theta, \text{ free}}(\phi) \equiv \frac{d\phi}{dt} = \frac{1}{\tau}, \quad \phi \perp r, \quad (12)$$

with  $\boldsymbol{\tau}$  the time interval or respective period for one cycle (?), here still measured per second.

The above speed differences create a movement of the "knot", *i. e.*, the speed gap of the EM due to the condition the maximum of the one half wave must be exactly on the opposite side of the other. That originates the consequence a shift to the entire system, and with regard to the system's mass leads to an orbit momentum and finally rotation of the BH. Consequently, the angular velocity calculates

$$\Delta \mathbf{v} = \Delta \mathbf{v}_{c,B} + \Delta \mathbf{v}_{T,c} \quad (\equiv \Delta \mathbf{v}_{B,T})$$
$$= 2 \left[ 1 - (1 - \alpha^2)^{\frac{1}{2}} \right] \cdot c \tag{13}$$

 $\rightarrow$ 

$$\omega_{\rm BH} = \frac{\Delta v}{c} \frac{1}{dt} \equiv \frac{2\left[1 - (1 - \alpha^2)^{\frac{1}{2}}\right] \cdot c}{c} \frac{1}{\tau}$$

$$= 2 \left[ 1 - (1 - \alpha^2)^{\frac{1}{2}} \right] \cdot \frac{1}{\tau}$$
 (14)

or the angular frequency respective numerically  $\omega_{\rm BH} \approx 53.252~\mu\,{\rm Hz}$ , still valid for any direction.

Since in the following context electrostatic interaction is involved that effect needs further attention

due to the question for similar or even comparable influence as due to gravity. In that case, the Coulomb's energy above introduced comes leading to a relation between electrostatic attraction and the wave-length of the EM. If, as in the current study, the same EM is suggested to orbit a center oscillating in its electrical charge facing opposite charges in a distance d = 2r to leave

$$\frac{a\hbar c}{2r} \equiv \frac{ahc}{2\pi r} = \frac{hc}{\lambda} \left( \equiv \frac{hc}{s} \right), \quad (15)$$

a circumference  $\boldsymbol{s}$  to issue the discrepancy it will describe

$$\frac{s}{2\pi r} = \alpha \qquad \longrightarrow 1 = \frac{\alpha \cdot s}{2\pi r} \qquad (16)$$

That seems a similar effect in curving, though at the same time entailed from the Lorentz' transformation in special relativity concerning length contraction as already discussed elsewhere (Gerlitz, 2015b). It is true, the effects from the transformation equations for space and time in a gravitational field are about four times stronger compared to those from the Lorentz' transformation in the absence of gravity ... but strongly (?) degraded with increasing distance, whereas electrodynamics is a long-range effect (Eriksen and Grøn, 2004). For short distances gravitation dominates as the wave-length is reciprocal to an increase in mass, which can be assigned to the EM entailing a rise in gravitational interaction at the same time, whereas the electrostatic in the case above is not. Consequently, the latter will not determine spacetime curving albeit give essential contribution. Those evaluations illustrates the current investigation, especially the origin of the basis the BH is suggested to belong.

The properties or respective origin of both fields taken into account in the current theory,  $\mathbf{e} = \mathbf{e} (\_)$  and m = m (r) are reflected in their associated potentials explicitly appearing in

$$V_{\rm e}(r) = -\frac{1}{4\pi\epsilon_0} \frac{{\rm e}^- \cdot {\rm e}^+}{r}, \quad V_g(r) = -G \frac{m^+(r) \cdot m^+(r)}{r}$$
 (17)

Since the variables  $\lambda$  and r, respectively as parameters are freely selectable and arbitrary they are not restricted in the free space, and the above relations are valid for any sphere. However, that bears the consequence, illustrated spoken: the gravitational constant *G* can never be replaced by the electrostatic constant  $\alpha$  to give simultaneous results, and there will be no way to describe gravitational spacetime on basis of one of those effects alone disregarding the other, but all that is redundant to note.

In the next, the expression for electrostatic selfinteraction of the EM is introduced. As the BH suggests to consist of a single electromagnetic wave (EM) describing a circumference on an area around its center it interacts with itself on the opposite side. After combining the energy-mass equivalence (it is equivalent, not the same)

$$E_m = mc^2 \tag{18}$$

with the electrostatic interaction between two virtual particles with rest-mass zero ( $m_0=0$ ) of equal electric charge (q=e) in their separation distance 2r,

$$E_{\mathbf{e}} = \frac{1}{4\pi\varepsilon_0} \frac{\mathbf{e}^2}{2r} \equiv \frac{a\hbar c}{2r} , \qquad (19)$$

the result can be assigned a mass from the electrostatic term

$$m_{\rm e} = \frac{1}{4\pi\varepsilon_0} \frac{{\rm e}^2}{2\,rc^2} \equiv \frac{\alpha\hbar}{2\,rc}$$
 (20)

That "interaction" or "electrostatic mass" ... respectively can be compared to the term appearing in the Schwarzschild metric later establishing the Kerr-Newman metric (KN) in a vice-visa the kind

$$+\frac{qQ}{4\pi\varepsilon_0 \cdot 2r} \quad \rightarrow \quad -\frac{GmM}{2r} ; \qquad (21)$$

it increases due to the electrostatic field, which makes the system increase in its entire m due to the "mutual forces" between the charges (Boyer, 1979; Griffith and Owen, 1983). The negative sign in Newton's gravitation law denotes the increase in energy. An introducing of that mass as "interaction mass"  $m_i$  into the Newton's law of gravitation,

$$V_g = -G \frac{m_1 \cdot m_2}{2r} \equiv -G m_i \cdot \frac{m_g}{2r} , \quad (22)$$

and replacing  $m_i$  with eq. (20) leads to a kind gravitatoelectrostatic interaction

$$V_{eg} = -G\left(\frac{1}{4\pi\varepsilon_0}\frac{e^2}{2rc^2}\right)\frac{m_g}{r} = -\frac{e^2}{r}\left(\frac{G}{8\pi\varepsilon_0c^2}\right)\cdot\frac{m_g}{r}$$
$$= -\frac{1}{r}\left(\frac{a\hbar G}{2c}\right)\cdot\frac{m_g}{r} \qquad , (23)$$

with  $m_g$  a "test mass"; except slightly deviating by the factor  $\frac{1}{2}$  involved here, that result is not new. The property eq. (23) can be interpreted

$$m_{eg} = -\frac{e^2}{r^2} \left( \frac{G}{8\pi\epsilon_0 c^4} \right) \cdot m_g \rightarrow \equiv \frac{V_{eg}}{c^2}$$
$$= -\frac{1}{r^2} \left( \frac{a\hbar G}{2c^3} \right) \cdot m_g . \qquad (24)$$

In accordance to our recent investigation (Gerlitz and Walden, 2017), again the BH is suggested to consist of one single EM exactly completing one cycle around it – the reason the electrostatic factor  $\alpha$  is involved already and immediately, and the electrical charge here, is not arbitrary. There, a radius for a BH is obtained, though deviating in  $\frac{1}{2}$  from the Schwarzschild radius but

$$r_{\rm ph}(g) = m \cdot \frac{G}{2c^2} \equiv \pm \sqrt{\frac{\hbar G}{2c^3}}$$
 , (25)

keeping the same notation  $r_S$ , however. From isolating the radius for the  $m_i$  belonging to the electrostatic field in (19) would properly point to

$$r_{\rm ph}(e) = \pm i \sqrt{\frac{2\alpha\hbar c}{G}} \cdot \frac{G}{2c^2} = \pm i \sqrt{\frac{\alpha\hbar G}{2c^3}}$$
 (26)

The letter is not the right interpretation in consideration of its origin, which stems from

$$(-r_{\rm ph}(\mathbf{e}))(+r_{\rm ph}(\mathbf{e})) \equiv \left[-\left(\pm \sqrt{\frac{a\hbar G}{2c^3}}\right)\right]\left[+\left(\pm \sqrt{\frac{a\hbar G}{2c^3}}\right)\right]. \tag{27}$$

The form exposing a "pure" G permits comparison of both distinguished photon radii at the same time ... and is just

$$r_{\rm ph}^2(\mathbf{e}) \equiv -\frac{\alpha\hbar G}{2c^3}$$
 (28)

Due to a maximum electromagnetic attraction the extreme of both half-waves of the EM must face each other on their respective opposite sides and brings to the forth the influence of the different velocities. A special assignment due to the opposite (?) signs of the electrical charges is arbitrary, any word redundant.

Due to its basis the entire  $m_{\rm BH}$  consists exclusively of one EM, which is in accordance to the extremal principle, it can be assigned entirely concentrated within the photon radius  $r_{\rm ph}$ , and nowhere else. The final task is now to derive  $m_{\rm BH}$  to later determine the angular momentum *J* together with the associated angular (?) momentum factor  $\boldsymbol{\alpha}$ .

In the current study as well as in the results found on the KN the additional term appears due to the electrostatic mass eq. (20), whose radius dependence is, however quadratic and requires modification of our former study (Gerlitz and Walden, 2017), where only one linear term is involved to derive  $m_{\rm BH}$ . Thus, the extension requires the sum (?)

$$m = m_g + m_e \equiv m_g - \frac{\alpha \hbar G}{2 c^3 r_{\rm ph}}$$
(29)

with (?) the intention to first determine  $r_{ph}$  the calculation follows the strategy already discussed elsewhere (Gerlitz and Walden, 2017). After introducing into Newton's gravitational law eq. (22) and equating with the massenergy equivalence displays

$$c^{2} = G\left(m_{g} - \frac{\alpha\hbar G}{2c^{3}r_{ph}}\right)\frac{1}{2r_{ph}} \equiv G\frac{m}{2r_{ph}}$$

$$r_{\rm ph} = \frac{G}{2c^2} \left( m_g - \frac{a\hbar G}{2c^3 r_{\rm ph}} \right) , \qquad (30)$$

an expression entailed from gravitato-electrostatic attraction of the (entire) m assigned the EM interacting with itself. Since  $r_{\rm ph}$  describes the system it governs the following action.

As forming the basis of the current study m can be represented by  $r_{\rm ph}$  due to the equivalence

$$mc = \frac{\hbar}{r_{\rm ph}} \iff r_{\rm ph} = \frac{\hbar}{mc}$$
 (31)

it must be applied on the term in the bracket to determine  $m_{\rm g}$  . That leads to

$$m_g = \frac{2\hbar c^2 - \alpha G\hbar}{2c^3 \cdot r_{\rm ph}} \tag{32}$$

modifies eq. (25) into

$$r_{\rm ph} = \frac{G}{2c^2} \left( \frac{\hbar}{c \cdot r_{\rm ph}} \right) \tag{33}$$

and finally ends up in

$$r_{\rm ph} = \pm \sqrt{\frac{\hbar G}{2c^3}} \tag{34}$$

or, associated

$$m_{\rm EM} = \pm \sqrt{\frac{2\hbar c}{G}} \equiv m_{\rm BH}, \rightarrow M$$
 (35)

the same results as in the electrostatically "unperturbated" case, as expected. The exterior horizon results from  $r_{\rm ph}$  (Gerlitz and Walden, 2017),

$$r_{\rm H}^{+} = \frac{1}{1.47\ 615\ 81} \sqrt{\frac{\hbar G}{2\ c^3}}$$
 (36)

Since it is entailed from the orbiting EM that M can be interpreted the total mass as it includes rotational energy and an eventual electrical energy already. Hence, the total angular momentum entailed from the eqs. (14), (34), (35) points to

$$J = \pm \sqrt{\frac{2G\hbar^3}{c^5}} \cdot \frac{\left[1 - (1 - \alpha^2)^{\frac{1}{2}}\right]}{\tau} \quad (37)$$
  

$$\approx \pm 0.21 \ 408 \ 17 \ 9 \cdot 10^{-81} \cdot \mathrm{Js}$$

It has to be strongly emphazised in value and direction depending on the methods of an observer.

Under undisturbed conditions, *i. e.*, free and not interacting with any external forces the wave can spread spherical arbitrary in all directions.

Though, this theory omits incorporation of magnetic fields an external magnetic field will determine the orientation of J and the BH, respectively. It will also lead to a break down in the degeneracy of the J components at the same time. In accordance to Kerr and KN exposing  $\theta$  will, e. g., point to a

$$|J_{\theta}| > \frac{1}{\sqrt{3}} |J|, \qquad (38)$$

considered (?) in those theories. The deviation in the values of the respective r in determining the characteristics of the BH given above will not affect the results, however.

The principal difference in the current theory appears there is no electrical charge Q in a steady and even distribution on the surface of the BH rather a point charge e moving synchronically to  $\alpha$ , instead. Thus, special extended view is given to the Q-term when the current model is considered in analogy to the KN. The electric charge is represented

$$Q = \mathbf{e} \cdot \exp(i\omega t), \qquad (39)$$

with

$$\mathbf{e} \approx 1.518907 \cdot 10^{-14} \cdot \mathrm{kg}^{1/2} \mathrm{m}^{3/2} \mathrm{s}^{-1}$$

to cover the final part of the theory in the square of the line element.

#### III. Results

In the view of the properties the principal results are an evenly distributing and spreading oscillating electrical charge on the surface of the BH enforcing it to an always constant rotation.

From the current model of a BH follow in geometrized units (*e. g.,* Chandrasekhar, 1998; Wald, 1984) for the BH in free space and undisturbed from external conditions individually (?)

$$M = \pm \sqrt{\frac{2\hbar c}{G}} \frac{G}{c^2} \triangleq \pm 2.28\ 569\ 31 \cdot 10^{-35} \cdot \mathrm{m}$$
$$r_{\mathrm{ph}} = \pm \sqrt{\frac{\hbar G}{2c^3}} \triangleq \pm 1.14\ 284\ 63 \cdot 10^{-35} \cdot \mathrm{m}$$

$$r_{\rm H}^{+} = \frac{1}{1.47\ 615\ 81} \sqrt{\frac{\hbar G}{2c^3}} \triangleq 0.77\ 420\ 31\ 89 \cdot 10^{-35} \cdot {\rm m}^{*}$$
$$J = \frac{\left[1 - (1 - \alpha^2)^{\frac{1}{2}}\right]}{\tau} \cdot \sqrt{\frac{2G\hbar^3}{c^5}} \frac{G}{c^3} \triangleq -2.47\ 701\ 99 \cdot 10^{-117} \cdot {\rm m}^2$$

$$a =: J/M = \pm \frac{\left[1 - (1 - \alpha^2)^{\frac{1}{2}}\right]}{\tau} \frac{G\hbar}{c^4} \triangleq \pm 1.08\ 370\ 63 \cdot 10^{-82} \cdot \mathrm{m}$$

$$\omega = 2[1 - (1 - \alpha^2)^{\frac{1}{2}}] \cdot \frac{1}{c \tau} \triangleq 0.17763 \cdot 10^{-12} \cdot m$$

$$|Q| \equiv \mathbf{e} \rightarrow \mathbf{e}_{\text{phys}} \frac{\sqrt{G}}{c^2} \triangleq 1.38066 \cdot 10^{-36} \cdot \mathrm{m}$$

(\* Gerlitz and Walden, 2017).

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Though, following the geometrized scheme in the theory of relativity the units in the current study are deviating from those from deciding natural units in the common use, but based on the relation appropriate to the basis of this theory, instead,

$$\frac{GM}{r} \rightarrow \frac{GM}{2r_{\rm ph}}$$

Consequently, the deviations in the values for M,  $r_{ph}$ , and J are due to the current model, which refers to the distance d = 2r between two points opposite on both sides of the BH rather than based on the pure radius r from the center of the BH as in literature. For

that reason, a factor  $\sqrt{2}$  has to be counted for them, whereas  $\alpha$  remains unaffected. Due to the basis of the current theory the product  $(M \cdot r_{\rm ph})$  is, therefore comparable to  $(M \cdot r_{\rm s})$  in the KN, and in the tensor elements appear (M / 2) instead of (2M).

There is no further relativistic contribution with respect to (?) any increase in *m* or *M*, respectively, and no eventual length contraction in  $r_{ph}$  either, as this theory bases on an EM representing itself with no rest mass.

Due to the metric notation (+, -, -, -) chosen (e. g., Chandrasekhar, 1998; Wald, 1984) the square of the line element is

$$dr^{2} = \left(\frac{r_{\rm ph}r - Q^{2}}{r^{2} + a^{2}\cos^{2}\theta} - 1\right) \cdot dt^{2} + \frac{\Sigma}{\Delta} \cdot dr^{2}$$
$$+ \Sigma d\theta^{2} + \frac{\chi}{\Sigma} \cdot \sin^{2}\theta \cdot d\phi^{2} + \frac{2a \cdot (e^{2} - r_{\rm ph}r) \cdot \sin^{2}\theta}{\Sigma} \cdot dt \cdot d\phi$$

with the common abbreviations

$$\Delta := r^2 - r_{\rm ph}r + a^2 + Q^2$$
  

$$\Sigma := r^2 + a^2 \cdot \cos^2 \theta$$
  

$$\chi := (a^2 + r^2)^2 - a^2 \cdot \sin^2 \theta \cdot \Delta = (a^2 + r^2)^2 - a^2 \cdot \sin^2 \theta \cdot (r^2 - r_{\rm ph}r + a^2 + Q^2)$$
  

$$\Delta$$

 $a \coloneqq J / M$ , the angular momentum per unit mass of the BH

Here, M is assigned the mass equivalent including the energies of electrical charge and rotation of the central body, Q electrical charge given in eq. (39), J orbit momentum, and  $\alpha$  orbit-momentum parameter.

The variables Q and  $\alpha$  are the same dimension as a length, and  $r_{ph}$  is finally given in (36). The natural units M,  $\alpha$ , Q have unit lengths. The Hamiltonian for test particle motion in Kerr spacetime is separable in (t, r,  $\theta$ ,  $\phi$ ), the Boyer-Linquist coordinates (Boyer and Lindquist, 1967). In using Hamilton-Jacobi's theory the Carter's constant as a fourth constant of the motion can be derived (Carter, 1968; 2009; 2010). In accordance to the Kerr and the KN, the theory considers restricted to  $\theta = \pi / 2$  as illustrated in the equatorial plane.

The connection between the two Boyer-Lindquist coordinates forms a modified KN-metric tensor, whose elements are explicitly

$$g_{11} = \frac{r^2 + a^2 \cos^2 \theta}{r^2 + a^2 + Q^2 - Mr/2}$$
$$g_{22} = r^2 + a^2 \cos^2 \theta$$

$$g_{33} = \left[ r^{2} + a^{2} - \frac{a^{2}(e^{2} - Mr/2)\sin^{2}\theta}{r^{2} + a^{2}\cos^{2}\theta} \right] \sin^{2}\theta$$

$$g_{34} \equiv g_{43} = \frac{a(e^{2} - Mr/2)\sin^{2}\theta}{r^{2} + a^{2}\cos^{2}\theta}$$

$$g_{44} = -\left( 1 + \frac{Q^{2} - Mr/2}{r^{2} + a^{2}\cos^{2}\theta} \right)$$

It can be recognized the electrical charge is never at rest.

#### IV. DISCUSSION

The model for a black hole proposed and discussed in the present work may impress or even astonish in form and composition, but it entirely fulfills the requirements and conditions (Schwarzschild, 1916)) imposed on such an object from the foundations of the theory of general relativity. The principle demand here is the existence of a light wave circulating around a center in a photosphere, which forms the basis for the development of a new theory of its own. Though, the actual results claiming for an extraordinary tiny object of almost diminishing mass point to a "mini"-BH those circumstances are not necessarily improbable as already discussed elsewhere on quantum gravity processes (Harada, 2006), which assigns them an effect from quantum field theory in curved spacetime.

The metric found for a BH in the current theory is an extention to Kerr-Newman solution. However, found in its principle there is no net electrical charge, but electrical orientation. The advantage follows from the fact there is no fixed or respective preliminary given *M* of an anticipated huge (?) value. Further, *M* and  $r_{ph}$  are always strictly related to each other. An extreme Kerr BH is excluded due to the fixed  $\alpha$ , instead. Both of those principle results reveal the enormous stabilitity of the BH with regard (?) to an eventual loss of charge or a loss of energy due to a speed down or decrease in rotation entailed from external impairs.

A striking feature of the Kerr solution is frame dragging (e. g., Chandrasekhar, 1998), which leads the oblate like BH drag spacetime with it as it rotates arising ultimative from the off-diagonal elements  $g_{34} = g_{43}$ (Carter, 1971). The same statement is also true for a BH with evenly distributing and spreading electrical charge on the surface, which does not contribute to that effect, however. In the current study the electrical field is not even shaped, but oscillates on the surface just giving the BH a kind "serrated" or even cogged character, which indeed lets that phenomena increase. Since this model describes a BH consisting of an EM the effect is preserving, a very resilient property also in the photonsphere region, and makes the BH appear a perpetuum mobile (lat: permanently moving object). In addition, a particle dropped radially onto such a BH will acquire non-radial components of motion as it falls freely in the gravitational field.

Though, quantum vacuum fluctuations allow matter to be extracted from a BH in the form of Hawking radiation (Bardeen et al., 1973; Page, 2005) it is impossible in the case of a "classical" Schwarzschild BH, where all is concentrated within the event horizon, as is the same here. However, the existence of separate surfaces defined in the ergosphere the horizon on the other side implies the possibility of extracting rotational energy. A way for illustration is seen the feasibility of that through the Penrose process (Penrose, 1965). Here, a particle falling into the ergosphere decays into a twin: one continues on its path falling through the horizon whereas the other exists the latter to escape to infinity. In the view of that process objects can emerge from the ergosphere with more energy they entered, which is taken from the rotational energy of the BH causing the rotation slow. With regard to (?) that property the two speeds involved in the current study comes to the forth as those together determine the propagation speed c of light. That is due to the argument for the here described BH not only claiming but even requiring the condition nothing can escape as long as covered by the de Broglie theory, and otherwise superluminality would be required (?). A split into two directions can, therefore amalgamate with the above statements. Since this decay within the ergosphere is a local process (?) it may be analyzed concerning the equivalence principle arguments in a freely falling frame according to the usual rules of scattering theory. That in reverse establishes energy and momentum are conserved in the decay as their sum is at the point of decay (?). If energy (?) is extracted from a BH due to Kerr BH or respective KN via the Penrose process it will lead to the expense of the rotational energy. The reason is the captured particle adds a negative angular momentum acting in reducing angular momentum and total energy carried away from the escaping one (Thorne, 1974; Thorne and Price, 1986).

In contrast to those types of BH the current will act that kind of loss in energy, because it even consist of a quasi two energy types to face that influence in a reaction to that: If the part exhibiting positive energy was reduced by a certain absolute value the consequence would be a strengthen of the negative part of the EM in the same amount.

Since both half-waves are, however strictly connected to each other the compensate that impair in sustaining their character as an EM to in return stabilize itself, which illustrates the enormous stability in the propagation speed of light (Gerlitz, 2015a, 2015b). The effect is reasoned in the oscillatory character of EM or light, respectively due to an interpretation of an oscillating mass (Proca, 1936). Any consequence leaving a pure Schwarzschild BH due to a series of conjectured Penrose events extracting all angular momentum ... therefore is excluded in the BH suggested in this study.

The same argument holds in case of electrostatic fields alone. If a negative field stated to interact with that part of the EM exposed quite in that moment to its positive state, the EM forming the BH would loose energy but at the same time, again the same amount in form of the, then negative energy effects in return the energy balance out.

A quite different feature becomes obvious in a scenario another EM approaches the  $r_{\rm ph}$  region as further classical accessibilities to a BH can be a complex EM coupling of the electrically charged rotating BH to external accretion disks and jets and in the form gravitational energy is released in accretion onto the BH (Tolman et al., 1931). Under those conditions two objects of the same qualities can interfere (Copperstock and Faraoni, 1993). Predicted view from outside the horizon of a Schwarzschild BH lit by a thin accretion disc: within that, friction would cause angular momentum be transported outward open matter fall further inward, thus releasing potential energy while increasing temperature of the "gas" (McClintock and Remillard, 2006).

In exact investigation of the given square of the line element interpretation has to be taken with respect to a probably appearing simply summation of the squared spacetime elements in accordance to the Pythagoras into a scalar, whose square root, then also results into a scalar (Wesson, 2980). That in turn, again reveals an absolute value assigned to a real length. It is not, since it is due to the product of two intrinsic vectors separately assigned to the respective two horizons and ergopheres ( $\rightarrow$  proper word) in the solutions demonstrated in the metrics of RN, Kerr, and KN. The facts of an external event horizon and an internal 'Cauchy horizon' provides a convenient bridge to corroborate the property of the EM and substantiates the coherence of the two compartments, from whose it is created. Based on that characteristic of the EM both types of those spheres can be interpreted as always appearing in respective pairs, and one can not be separated from the other. Though, gravitational effects become obvious from the squared line element in a cycle of  $\pi$  rather than the impressionable effect of  $2\pi$ assigned to the oscillating electrostatic field, which would be a (+ / -) detected from an outside observer.

From those arguments arises the question for the time running inside those regions since any object in the ergosphere of the rotating mass will tend to start moving in the direction of rotation, *i. e.*, a drag along spacetime. For a rotating black hole, this effect is so strong near the event horizon that an object would have to move faster than the speed of light in the opposite direction, and it is argued just to stand still (Carroll, 2004). The singularity at the boundary of the Schwarzschild radius as indicating that is interpreted the boundary of a bubble in which time stopped (Finkelstein, 1958; Ruffini and Wheeler, 1971); but that is not true. Though, studies on the past--future asymmetry of the gravitational field have been worked out (Finkelstein, 1958; Goedel, 1949), time will always oscillate forward-backward between those regions rather than reach the period absolutely zero.

#### Resume

In this study a model is derived from the basic demands for a BH being the question for the limiting condition an EM can form a circumference around. In accordance with our recent study a photosphere is determined concerning electrostatics entailed from the EM. The oscillating characteristics of the EM were established to support permanent electrical charge as well as electrical polarization of the BH. On the background of the basic investigation this modification of the Kerr-Newman metric can give evidence of that charge forcing the BH to rotate due to the shift of the electrical extrema in the EM oscillating in a circumference around the BH. As a consequence, the rotation of the BH is a permanent effect as driven by the EM, therefore a consequence of its structure presented in this study as well.

In the view of the property the principal results are an evenly distributing and spreading oscillating electrical charge on the surface of the BH enforcing it to an always constant rotation.

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2017

Year



GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH: A PHYSICS AND SPACE SCIENCE Volume 17 Issue 5 Version 1.0 Year 2017 Type : Double Blind Peer Reviewed International Research Journal Publisher: Global Journals Inc. (USA) Online ISSN: 2249-4626 & Print ISSN: 0975-5896

# The Hypergeometrical Universe: Cosmogenesis, Cosmology and Standard Model

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*Abstract-* This paper presents a simple and purely geometrical Grand Unification Theory. Quantum Gravity, Electrostatic and Magnetic interactions are shown in a unified framework. Newton's Gravitational Law, Gauss' Electrostatics Law and Biot-Savart's Electromagnetism Law are derived from first principles.

Gravitational Lensing and Mercury Perihelion Precession are replicated within the theory. Unification symmetry is defined for all the existing forces. This alternative model does not require Strong and Electroweak forces.

Keywords: cosmology, inflation theory, cosmogenesis, relativity, spacetime.

GJSFR-A Classification: FOR Code: 020103

## THE HYPER GEOMETRICALUNIVERSE COSMOGENESISCOSMOLOGYAN OSTANDARDMODEL

Strictly as per the compliance and regulations of:



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### The Hypergeometrical Universe: Cosmogenesis, Cosmology and Standard Model

Marco Pereira

*Abstract*- This paper presents a simple and purely geometrical Grand Unification Theory. Quantum Gravity, Electrostatic and Magnetic interactions are shown in a unified framework. Newton's Gravitational Law, Gauss' Electrostatics Law and Biot-Savart's Electromagnetism Law are derived from first principles.

Gravitational Lensing and Mercury Perihelion Precession are replicated within the theory. Unification symmetry is defined for all the existing forces. This alternative model does not require Strong and Electroweak forces.

A 4D Shock-Wave Hyperspherical topology is proposed for the Universe which together with a Quantum Lagrangian Principle and a Dilator based model for matter result in a quantized stepwise expansion for the whole Universe along a radial direction within a 4D spatial manifold. The Hypergeometrical Standard Model for matter, Universe Topology and a new Law of Gravitation are presented. Newton's and Einstein's Laws of Gravitation and Dynamics, Gauss Law of Electrostatics among others are challenged when HU presents Type 1A Supernova Survey results. HU's SN1a results challenge current Cosmological Standard Model (L-CDM) by challenging its Cosmological Ruler d(z). SDSS BOSS dataset is shown to support a new Cosmogenesis theory and HU proposal that we are embedded in a 5D Spacetime. The Big Bang Theory is shown to be challenged by SDSS BOSS dataset. Hyperspherical Acoustic Oscillations are demonstrated in the SDSS BOSS Galaxy density. A New de-Broglie Force is proposed.

Keywords: cosmology, inflation theory, cosmogenesis, relativity, spacetime.

#### I. INTRODUCTION

Gauge Theories have shown diverse degrees of success. All theories try to keep the current conceptual framework of science. Kaluza-Klein <sup>1,2</sup> melded both Electromagnetism and Einstein Gravitational equations in a 5D metric.

Instead of concentrating in keeping the current formalism, this work concentrates on what to say, the conceptual framework of Nature instead. All the common constructs: mass, charge, color, hypercharge are dropped in favor of just dilator positions and dilaton fields, which are local metric modulators and traveling modulations, respectively. There is no need for the concepts of charge or mass. Inertial Mass is modeled as a quantity proportional to the 4D metric displacement volume at precise phases of de-Broglie cycles. These are the footprints of the dilator on our 3D Universe. Charge sign is modeled by dilator phase (sign) on those specific phases. The mapping is needed to demonstrate that the geometrical framework replicates current scientific knowledge.

As we search for more encompassing theories, they became increasingly complex and speculative. Current best candidate to explain cosmology is the Lambda-CDM (Lambda Cold Dark Matter) based on Friedmann-Lemaitre<sup>3</sup> variation of General Relativity. It is an extension of Einstein's equations to accommodate an expanding (dizzyingly inflating, accelerating, slowing down, accelerating again) Universe as perceived by Redshifted-Stellar-Candles-mapped distances. To explain such complex dynamics, Lambda-CDM equation below contains 6 parameters, excluding  $H_0$ . HU does that without a single parameter.

$$H(a) \equiv \frac{\dot{a}}{a} = H_0 \sqrt{(\Omega_c + \Omega_b)a^{-3} + \Omega_{rad}a^{-4} + \Omega_k a^{-2} + \Omega_{DE}a^{-3(1+w)}}$$
(1)

Current interpretation of type 1A Supernova distances produces an unyielding Universe where linear distances of more than 40 billion light years were observed on a 13.58 billion years old universe. Inflation Theory<sup>5</sup> was created to explain the unexpected observations. HU provides a much simpler view of events. HU proposes that Supernova distances might be overestimated by  $G^{\frac{3}{2}}$ , where G is the Gravitational Constant, due to Chandrasekhar mass G dependence.

Supernova Analysis Section presents HU Cosmology as well as the reproduction of the current view of Inflation and Expansion processes to demonstrate how the possible misreading of distances can lead to the current unexpected conclusions.

In the HU topology section the three spatial coordinates are mapped to a lightspeed expanding hyperspherical hypersurface, thus introducing a new spatial dimension – the radial dimension.

A geometric reason for redshift, the Cosmic Microwave Background<sup>4</sup> and its homogeneity is provided.

HU introduces an absolute frame of reference – the fabric of space (FS), which cannot be measured from within the 3D hypersurface. Local deformation of

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FS is associated with velocity. Only relative deformational states (relative velocities) are measurable. Local rate of deformation of FS is associated with acceleration and thus with Force. HU also provides the reason why c is the limiting velocity and why there is inertial motion.

A simple Cosmogenesis model is presented on the Cosmogenesis section.

On the Cosmological Coherence section, the consequences of the topology of the Hypergeometrical Universe and the homogeneity proposed in the Fundamental Dilator based model for matter is shown to result in a cosmological coherence, that is, the whole 3D universe expands radially at light speed and in de-Broglie (Compton) steps.

When cosmological coherence is mentioned it is within the framework of absolute time and absolute 4D space (RXYZ or  $\Phi$ XYZ). There is no sense in speaking of synchronous motion within frameworks containing proper time  $\tau$ . For simplicity, all force derivations are done considering a framework at rest with respect to the Fabric of Space.

A new Quantum Lagrangian Principle (QLP) is created to describe the interaction of dilators and dilatons, Quantum gravity, electrostatics and magnetism laws are derived subsequently as the result of simple constructive interference of five-dimensional spacetime wave overlaid on an expanding hyperspherical universe. In the electrostatics and magnetism derivation, a 4Dmass of a Hydrogen Mass a.m.u. electron or fat electron is used. This means that dilatons (5D spacetime waves driven by coherent metric modulations) are coherently produced by all phases of the dilator coherence.

The 4D-Mass will be fixed to match the 3D-Mass. This will provide us information about the anisotropy of space in the form of an effective Planck Constant for gravitational and electromagnetic dilaton fields. This sheds light on how flush and perpendicular states effect dilaton waves. Space is anisotropic due the existence of our Universe in the traveling hypershell. The tangential "spring constant" is the Planck Constant and "tangential" waves are the de-Broglie waves. Hypervolumetric waves carry Electromagnetism and Gravitation as well as Light.

Currently, we consider Black Holes to be a gravitationally induced space deformation where not even light can escape. This creates a logical flaw since Black Holes are made up by matter aggregates. Unless Matter is described in terms of space, things are not properly tied down or they might be tied down in a Rube Goldberg manner.

Among Particle Physics strongest challenges was the inability of observing single quarks out of collisional experiments. No matter how strong the collision, single quarks were nowhere to be seen. Strong-Force was introduced to explain the unexpected observation. It would grow to infinity rapidly as the quark separation increases. Quark closeness would bring asymptotic freedom.

New quantum numbers (internal dimensions) were added to accommodate unexpected new particles. Particle Physics observables<sup>5</sup> are both physical (energy, scattering angle, dipole, quadrupole moments, spin) and relational (part of a decay chain reaction or family). Quarks' existence was inferred from structured scattering, that is, scattering from which one can infer internal structure from the angular distribution of products plus the quantum number based particle taxonomy. What if the observed structure were akin to an excited state of Matter (or space if Matter is described in terms of space deformations)? One can relate to that if one considers atomic collisions. Depending on the energy of the collision, scattering will contain information about excited state orbitals. In analogy to Quarks, one cannot separate the geometric building blocks of those potential excited orbitals. Somehow when considering molecular dynamics collision, nobody proposed the existence of Molecular Quarks to explain products channels. This might seem like a facetious comment, but it is not. This is to emphasize that Quarks is not the only solution to structured scattering.

Due to the success of the Standard Model in explaining scattering events, one doesn't expect HU to start from scratch. One would expect HU to provide a simple map that would link Quarks, Hyperons to structured fluctuations (deformational coherences) of space. HU would provide guidance to modify parts of the Standard Model that are in conflict.

Since HU is derived within a Spatial Stress-Strain paradigm, there is no need for a mechanism from which to derive mass. Conversely, HU provides the mass for the four fundamental particles associated with the Fundamental Dilator (proton, electron, antiproton, positron).

Hypergeometrical Universe Theory model for matter is based on the Fundamental Dilator (FD). This is a coherence between stationary deformation states of the local metric, where "local" was used to emphasize localization.

These coherences do not extend over long distances and have in fact, very small cross-sections. FD excited states are associated with the hyperon family and they have structure or topology.

This might explain "internally" structured scattering results and the inseparability of those "internal" components. This means that HU associates "internal" composition to coherences between excited deformational states of the local metric.

The decaying of these excited states gives rise to the decay chain reactions. From assignment to simple dilator excited states (neutron, pion) and decay reactions one can stepwise build the whole taxonomy. Since particles are assigned to coherences of

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deformation of space, this fits well with a Black Hole being made of deformed space.

Coherences produce shape-shifting space deformation and thus space deformation waves (dilaton field). The agent of deformation is called a dilator. The resulting waves are the dilaton field.

This is an ongoing line of research. Very early results will be provided to show the potential of the model.

Supernova analysis provides support for the challenging of Newton's Law of Gravitation and Gauss Law of Electrostatics. It shows that Gravitation and Electromagnetism fall with the number of de Broglie cycles traversed as oppose to the distance.

A grand unification theory is a far-reaching theory and touches many areas of knowledge. Arguments supporting this kind of theory must be equally scattered. Many arguments will be presented with little discussion when they are immediate conclusions of the topology or simple logic.

#### II. The Hypergeometrical Universe Theory

#### a) Hypergeometrical Universe Topology

The universe is hypothesized to had been created by a four-dimensional explosion, a Big Bang in a Four-Dimensional Spatial Manifold. The evolution of such Big Bang is a lightspeed expanding threedimensional hypersurface on quantized de-Broglie steps. The steps have length close related to the Compton wavelength associated with the gravitational fundamental dilator (the atomic mass of a hydrogen atom). Table 1 shows 4D-Masses of Gravitational and Electromagnetic Fundamental Dilators. Detailed discussion will follow later.



*Figure 1:* Depicts cross sections of the proposed hyperspherical light speed expanding universe. These are the cross-sections X*t* and XR for the expanding universe. The universe direction along X is represented by the band. X (or Y or Z) is displayed along the perimeter of the circle. The circle radius is equal to the age of the universe times the speed of light. Also, shown in the diagram are  $\Phi$  (cosmological time), proper time *t*, radial direction R, proper radial projection r, the Cosmological Angle  $\alpha$  between two reference frames XYZ*t* and X'Y'Z'*t*', the local torsion angles  $\alpha_{t}$  and  $\alpha_{t}$ . By choosing a local metric for xyz*t* Minkowskian and having a Lorentz transformation to relate XYZ*t* and X'Y'Z'*t*' reference frames, one can assure that the theory obeys Strict Relativity.<sup>6</sup>

Dilator	4D-Mass (a.m.u.):
Electromagnetic Fundamental Dilator(EFD)	Hydrogen Mass
Gravitational Fundamental Dilator(GFD)	Hydrogen Mass x 2

#### i. Definitions

- 1. Cosmological time  $\boldsymbol{\Phi}$  represents an absolute time frame, as envisioned by Newton and Mach it is a fifth dimension in the Hypergeometrical Universe Model. It times the expansion of the Universe.
- 2. Proper time r, r' are projections of the Cosmological Time  $\phi$  (which is always along a radial direction) on the respective reference frames.
- 3. Fabric of Space (FS) is the Lightspeed traveling locus where our 3D Universe exists. This is a 3D

hypersurface of a shockwave within a 4D spatial manifold. Anything at rest with respect to the Fabric of Space would just travel radially at the speed of light. At the Big Bang, all dilators would be initially traveling at the speed of light, not only radially but also tangentially in all directions. When the Universe is a point, there is no difference between tangential and radial directions. As the Universe aged, dilators would, on average, reach equilibrium and a low (zero) velocity with respect to FS.

- 4. The radial direction is a preferential direction in 4D space. It is the radial expansion direction. This direction doubles as a direction on 4D Space and a projection of the cosmological time, since they are related by the expansion speed (lightspeed).
- $\alpha_r$  and  $\alpha_r$  represent both a direction of propagation 5. and a deformation of the local fabric of space. Since these angles point to direction of propagation, a local deformation of the fabric of space maps directly to a state of motion. Motion is the result of the relaxation process of the local FS (Hypergeometrical Universe interpretation of Newton's first law) as the FS expands.
- 6. XYZR is modeled as a Cartesian space
- xyz*τ* (proper reference frame) is modeled as a hyperbolic space and thus consistent with Strict Relativity<sup>6-8</sup> if one considers that the Lorentz transformation is a rotation on an imaginary angle equal to atan(v/c).

#### ii. Universe Expansion and the Hubble Constant

Edwin Hubble<sup>9</sup> discovered that Stars and Galaxies are receding from us at speeds that increase linearly with distance.

$$V = H_0 L \tag{2}$$

where V is the receding velocity,  $H_0$  is the Hubble constant, L is the linear distance. The associated frequency shift was modeled as a velocity-dependent Doppler shift by:

$$\frac{v}{c} = \sqrt{\frac{(1+z)^2 - 1}{(1+z)^2 + 1}} = \frac{H_0}{c} d * Hubble(z)$$
(3)

The spectral shift is represented by a factor z:

$$z = \frac{\Delta \lambda_{obs}}{\lambda_{0}} \tag{4}$$

$$1 + z = \frac{\lambda_{obs}}{\lambda_0} \tag{5}$$

From the proposed topology shown in Fig.1 one can easily ascertain the Hypergeometrical Universe model for the Hubble Constant:

$$H_0 = \frac{c}{R_0} \tag{6}$$

where c is the speed of light and  $R_0$  is the 4D Radius of the Universe (age of the Universe time the speed of light). For  $H_0$  = 72km/s/Mpc:

$$R_0 = \frac{c}{H_0} = 13.58 billion - light - years$$
(7)

Yielding the age of the Universe as 13.58 billion years.

#### iii. Hypergeometrical Universe - Viewing The Past

The proposed topology is of a light-speed expanding hyperspherical hypersurface to represent the spatial coordinates of our Universe. This means that the 3D Universe is a moving inertial frame with very specific topology, curvature (there are three curvatures one spatial and others spacetime related).

The absolute speed of light for short distances becomes  $\sqrt{2}c$ . This doesn't affect any experimental measurements since they are done within the confines of the hypersurface and within very small Cosmological Angles. A Cosmological Angle is represented in Figure 2 as alpha.



Radial Distances in Billion Light Years

Figure 2: This shows how one interprets peering into the past within the Hypergeometrical Universe Theory. We indicated two epochs - the current and the one for the 8 billion years old Universe. Light emission angle with the radial line is always 45 degrees. K-vector direction for the light that we detect is always a line-of-sight vector. The mapping of the Universe Lifeline to Cosmological Angle Alpha is given by  $[R_0,0] \rightarrow [0,\pi/4]$ 

Simple trigonometry yields:

$$\frac{\sin(\alpha)}{d'} = \frac{\sin(\frac{3}{4}\pi)}{R_0} = \frac{\sin(\frac{\pi}{4} - \alpha)}{R(t)}$$
(8)

#### Distance Versus Number of Cycles a.

HU prescribes that the dilaton field intensity (thus the light intensity) to decay with the inverse the number of cycles and not with plain distance. Below are the dilaton field equations for a probe dilator at position  $x_0$  and a large mass or amount of charge (N dilators) at position R. The full dilaton field is given by:

$$\Psi_1(x, x_0) = \frac{\cos(k_1 \cdot (x - x_0))}{(1 + f(k_1 \cdot (x - x_0)))}$$
(9)

$$\Psi_{2}(x, x_{0}) = \frac{N\cos(k_{2}.x)}{(1 + f(k_{2}.(R - x)))}$$
(10)

$$\Psi_{Total}(x, x_0) = \Psi_1(x, x_0) + \Psi_2(x, x_0) \quad (11)$$

Function f is equal to ONE for most space. The only requirement is that

$$\left. \frac{df(x)}{dx} \right|_{x=x_0} = 0 \tag{12}$$

that is, the dilaton field is created symmetrically with respect to  $x_0$ .

From these simple equations, we will derive Natural including Gravitation Laws, and Electromagnetism. Light is modeled as a spatial modulation of the dilaton field due to the transition dipole oscillator created at the moment of light emission.

Not unlike Maxwell equations, the dilaton field (Electromagnetic Field) polarizes the next hypersphere (Induced Polarization) which then creates new Electromagnetic field. This means that the radial velocity of light is fixed by the requirement of Maxwell equations and the underlying Physics.

All points in an inner hypersphere are at the same "effective distance" as the point [0, R(t)]. Line-of-sight constraint selects one point at each hypersphere for each direction x

#### b. Adjustable Dilaton Field Velocity with Angle

The dilaton field we sense is created at each de Broglie step by dilators. The Radial Velocity of the dilaton field is controlled by the radial velocity of the Polarizable Media. The polarizable media is the 3D Universe and thus the Radial Velocity of Light is always c.

The question is what happens to the tangential velocity as a photon propagates through the line-ofsight path shown in Fig. 2. That line-of-sight path shows that as the photon comes closer and closer to the observers perched on position A, the projection of the Electromagnetic waves onto our local hyperplane grows larger and larger. That shows that wavelength changes as the photons travel.

The time dimension of what is happening on that traveling photon is kept along the radial direction all the time. That means that, we would be seeing the dynamical events as if they were local. The only difference would be that all light would be redshifted.

This is the preliminary conclusion. It should be confirmed or disavowed by measurements of power spectra of distant Quasars. According to HU, the power spectra (Fourier transform of intensity light fluctuations) of Quasars should be independent upon distance.

#### c. Redshifting of Light with Travel

This also means that the absolute speed of light for photons coming from large distances accelerates as they come close to us. The reason is the increasing tilt of the Fabric of Space, easily understandable from just looking at different hyperspheres. Notice that we are considering that light was emitted and detected on relaxed FS regions. Their local proper time flows at the different rates according to the Cosmological angle alpha. The imprinted photon will carry that information in a way that erases the time flow difference.

Since we consider at short distances that the speed of light is always c, then the correct distance to be used is given by equation (13):

$$\frac{d_{HU\_epoch}}{R_0} = \frac{R_0 - R(t)}{R_0} = 1 - \sqrt{2} * \sin(\frac{\pi}{4} - \alpha) = 1 - \cos(\alpha) + \sin(\alpha)$$
(13)

This is the distance that maps to the expected distance of the current view, that is, if the speed of light were c, this would be the distance traversed at the speed of light during the time between the Supernova explosion and its observation. Considering planar waves (see Fig 2), the relationship between an observed wavelength and the 4D wavelength is such that for  $\alpha$ =0:

$$\lambda_{Obs} = \lambda_0 = \sqrt{2}\lambda_{4D} \tag{14}$$

where 4D is the wavelength traveling within the 4D spatial manifold. For any other cosmological angle  $\alpha$ , the relationship is given by:

$$\frac{\lambda_{4D}}{\lambda_{Obs}} = \sin\left(\frac{\pi}{4} - \alpha\right) \tag{15}$$

Multiplying both sides by  $\sqrt{2}$ 

$$\frac{\sqrt{2}\lambda_{4D}}{\lambda_{Obs}} = \frac{\lambda_0}{\lambda_{Obs}} = \frac{1}{(1+z)} = \sqrt{2}sin\left(\frac{\pi}{4} - \alpha\right)$$
(16)

Hence:

$$\alpha = \frac{\pi}{4} - \arcsin\left(\frac{1}{\sqrt{2}(1+z)}\right) \tag{17}$$

This is the Hypergeometrical Universe relationship between d and z, were d is projected on the current epoch. For prior epochs, one should use the sine relationship to derive:

$$d' = \sqrt{2}R_0 \sin(\alpha) = \sqrt{2}R_0 \sin\left(\frac{\pi}{4} - \arcsin\left(\frac{1}{\sqrt{2}(1+z)}\right)\right)$$
(18)

This actual distance is irrelevant for light intensity decay.

A 1 $^{\mbox{\tiny st}}$  Quadrant Supernova presenting a redshift z, travels at

$$\frac{v}{c} = 1 - \frac{4}{\pi} \arcsin\left(\frac{1}{\sqrt{2}(1+z)}\right) \tag{19}$$

Is located at angle  $\alpha$ 

$$\alpha = \frac{\pi}{4} - \arcsin\left(\frac{1}{\sqrt{2}(1+z)}\right) \tag{20}$$

and at an equivalent distance on our current 3D Hypersphere given by:

$$d = d_{HU\_epoch} = R_0 \left( 1 - \cos(\alpha) + \sin(\alpha) \right)$$
(21)

Notice that this is a different relationship between d and z than the one described on equation (2).

$$R_0 = \frac{c}{H_0} = 13.58 \, Gly \tag{22}$$

The numerical value of  $R_0$  is only used to scale Supernova Distances from the Survey. A normalized  $R_0$ is used for the trigonometric relationships.

This derivation used the Line-Of-Sight optical path. As a result, the whole visible Universe [0,1radian] is mapped to a Cosmological Angles in  $[0,\pi/4]$ .

#### d.Time Aberration

Even though light will always travel through the 4D spatial manifold, the requirement of always observing light that is emitted at 45 degrees imply that we are considering just the focus plane in our measurements. Within a given angular volume, observations can come from slight different epochs (like color aberration). This is exactly what would happen when you look at very large cosmological angles and observe a larger error on the determination of the redshift parameter z.

#### iv. Supernova Distance Analysis

Current analysis indicates that many of the Supernovae explosions take place at distances larger than the maximum distance traveled during the Universe lifetime (circa 13.58 Billion Years). This paradoxical result is the motivation for Inflation Theory<sup>10</sup>, the proposition of Dark Energy (to support the expansion) and Dark Matter to counterbalance it.

This Supernova Survey is composed of observations of Type 1A Supernova explosions. Type 1A Supernova explosions are thought to have as precursors a binary system of White Dwarfs or White Dwarf-Star. The justification for the consistency in Luminosity is that the White Dwarf steals material from the companion until it reaches the Chandrasekhar mass<sup>11</sup>. At that point, the electron Fermionic repulsion cannot keep the Dwarf from collapsing any longer. Its collapse ignites a chain reaction that consumes Carbon and Oxygen with the final product being <sup>56</sup>NI.

Now let's prove the main assertion that distances might be overestimated. We will be based our derivation on Arnett's work<sup>12</sup>: Here we will study the effect of a distinct value of G would have on the Light Curve. The Luminosity of a Supernova is given by Arnett's eq.39:

$$L(1,t) = L(1,0)\phi(t)$$
(23)

where

$$L(1,0) = K_0 \left[ \frac{R(0)}{10^{14} \, cm} \right] \left[ \frac{E_{th}(0)}{10^{51} \, ergs} \right] \left[ \left[ \frac{0.4 \, cm^2 g^{-1}}{\kappa} \right] \right] \left[ \frac{1M_{\Theta}}{M} \right]$$
(24)

$$E_{th}(0) = \int_0^{R(0)} a T^4 4\pi r^2 dr \qquad (25)$$

Chandrasekhar Radius has the following Gdependence: Substituting equations 32,26 into equations 24-25:

$$R^{Epoch}(0) = \left(\frac{G_0}{G_{Epoch}}\right)^2 R(0) = \mathcal{G}R(0) \qquad (26)$$

$$\mathcal{9} = \left(\frac{G_0}{G_{Epoch}}\right)^{\frac{1}{2}}$$
(27)

If you model a Star as to be emitting Blackbody radiation, its luminosity will be given by:

$$L = 4\pi R^2 \sigma T_s^4 \tag{28}$$

Relating two stars in different epochs facing different  $G_s$ , same temperature  $T_{Solar}$ , we obtain:

$$\frac{L_{Solar}^{Epoch}}{L_{Solar}} = \left(\frac{R_0^{Epoch}}{R_0}\right)^2 \left(\frac{T_{Solar}^{Epoch}}{T_{Solar}}\right)^4$$
(29)

#### a. Low Radiation Pressure Limit

Simple modeling of the Sun's luminosity yields<sup>13</sup>:

$$L \propto G^4 M^{-3.33} \tag{30}$$

Considering the ratio between luminosities to scale with Mass we can derive the epoch dependent Solar Mass:

$$\left(\frac{G^{Epoch}}{G_0}\right)^4 \left(\frac{M_{\Theta}^{Epoch}}{M_{\Theta}}\right)^{333} = \frac{L_{Solar}^{Epoch}}{L_{Solar}} = \left(\frac{R_0^{Epoch}}{R_0}\right)^2 \left(\frac{T_{Solar}^{Epoch}}{T_{Solar}}\right)^4 = \left(\frac{R_0^{Epoch}}{R_0}\right)^2 = 9^2$$
(31)

This Solar mass is the mass required to yield the same surface temperature given that the radius shrank accordingly to the White Dwarf Chandrasekhar radius. The approximation is that Luminosity scales with Star mass.

$$M_{\Theta} = \mathcal{9}^{-3} M_{\Theta}^{Epoch} \tag{32}$$

$$L(1,0) = K_0 \left[ \frac{\mathcal{9}^{-1} R^{Epoch}(0)}{10^{14} cm} \right] \left[ \frac{\mathcal{9}^{-3} E^{Epoch}_{th}(0)}{10^{51} ergs} \right] \left( \left[ \frac{0.4 cm^2 g^{-1}}{\kappa} \right] \right) \left[ \frac{1 \mathcal{9}^{-3} M^{Epoch}_{\Theta}}{M} \right]$$
(33)

$$L(1,0) = \mathcal{G}^{-7}K_0 \left[ \frac{R^{Epoch}(0)}{10^{14} \, cm} \right] \left[ \frac{E^{Epoch}_{th}(0)}{10^{51} \, ergs} \right] \left( \left[ \frac{0.4 \, cm^2 g^{-1}}{\kappa} \right] \right) \left[ \frac{1M_{\Theta}^{Epoch}}{M} \right]$$
(34)

Since

$$L^{Epoch}(1,0) = K_0 \left[ \frac{R^{Epoch}(0)}{10^{14} \, cm} \right] \left[ \frac{E^{Epoch}}{10^{51} \, ergs} \right] \left[ \left[ \frac{0.4 \, cm^2 g^{-1}}{\kappa} \right] \right] \left[ \frac{1M_{\Theta}^{Epoch}}{M} \right]$$
(35)

We obtain the following relationship between Absolute Peak Luminosities now and in earlier epochs:

$$L^{Epoch}(1,0) = \mathcal{G}^{7}L(1,0) = \left(\frac{G_{0}}{G_{Epoch}}\right)^{3.5}L(1,0) = \left(\frac{R_{Epoch}}{R_{0}}\right)^{3.5}L(1,0)$$
(36)

b.High Radiation Pressure Limit

For larger stars or during Supernova detonation, the radiation pressure is larger than the gas pressure in the radiation zone. Plugging in the radiation pressure, instead of the ideal gas pressure used above, yields:

$$L \propto M$$
 (37)

Considering the ratio between luminosities to scale with Mass we can derive the epoch dependent Solar Mass:

$$\left(\frac{M_{\Theta}^{Epoch}}{M_{\Theta}}\right) = \frac{L_{Solar}^{Epoch}}{L_{Solar}} = \left(\frac{R_{0}^{Epoch}}{R_{0}}\right)^{2} \left(\frac{T_{Solar}^{Epoch}}{T_{Solar}}\right)^{4} = \left(\frac{R_{0}^{Epoch}}{R_{0}}\right)^{2} = \mathcal{9}^{2}$$
(38)

This Solar mass is the mass required to yield the same surface temperature given that the radius shrank accordingly to the White Dwarf Chandrasekhar radius. The approximation is that Luminosity scales with Star mass.

$$M_{\Theta} = \mathcal{G}^{-2} M_{\Theta}^{Epoch} \tag{39}$$

Substituting equations 39,26 into equations 24-25:

$$L(1,0) = K_0 \left[ \frac{\mathcal{9}^{-1} R^{Epoch}(0)}{10^{14} \, cm} \right] \left[ \frac{\mathcal{9}^{-3} E^{Epoch}}{10^{51} \, ergs} \right] \left( \left[ \frac{0.4 \, cm^2 g^{-1}}{\kappa} \right] \right) \left[ \frac{1 \mathcal{9}^{-2} M_{\Theta}^{Epoch}}{M} \right]$$
(40)

$$L(1,0) = \mathcal{9}^{-6} K_0 \left[ \frac{R^{Epoch}(0)}{10^{14} \, cm} \right] \left[ \frac{E^{Epoch}}{10^{51} \, ergs} \right] \left( \left[ \frac{0.4 \, cm^2 g^{-1}}{\kappa} \right] \right) \left[ \frac{1M_{\Theta}^{Epoch}}{M} \right]$$
(41)

Since

$$L^{Epoch}(1,0) = K_0 \left[ \frac{R^{Epoch}(0)}{10^{14} \, cm} \right] \left[ \frac{E^{Epoch}}{10^{51} \, ergs} \right] \left[ \left[ \frac{0.4 \, cm^2 g^{-1}}{\kappa} \right] \right] \left[ \frac{1M_{\Theta}^{Epoch}}{M} \right]$$
(42)

We obtain the following relationship between Absolute Peak Luminosities now and in earlier epochs:

$$L^{Epoch}(1,0) = \mathscr{G}^{6}L(1,0) = \left(\frac{G_{0}}{G_{Epoch}}\right)^{3}L(1,0) = \left(\frac{R_{Epoch}}{R_{0}}\right)^{3}L(1,0)$$
(43)

This means that prior epochs had dimer Absolute Peak Luminosity and thus were overestimated by current Cosmology.

This means that Supernova Distances would be overestimated by  $\left(\frac{R_{Epoch}}{R_0}\right)^{1.75}$  or  $\left(\frac{R_{Epoch}}{R_0}\right)^{1.5}$  depending on the model one chooses for how the Mass of a Star would depend upon G:

$$d^{Epoch}(z) = \vartheta^{3} d(z) = \left(\frac{R_{Epoch}}{R_{0}}\right)^{1.5} d(z)$$
(44)

For the rest of the article we will use  $R_0 = G_0 = 1$ .



*Figure 3:* Here are depicted the Friedmann-Lemaitre Hubble Law (Planck15 on astropy<sup>14</sup>) the raw astronomic data (SCPUnion2.1) normalized using the full 4D radius of the Universe (13.58 Bly). Also represented are the raw data scaled-down by the  $G(d)^{-3/2}$  scaling factor and the HU predictions for the first quadrant. The Friedmann-Lemaitre curve used a 14.43 Gly Universe, so there is a slight misrepresentation, which is irrelevant in the context of this article, since the observational data points are being proposed to be scaled down. The data we will use comes from the Supernova Broad Survey Union 2.1 dataset<sup>15,16</sup>

c. Hu Predictions - Goodness of Fitting



*Figures 4:* Presents the raw data, HU, scaled raw data and Friedmann-Lemaitre results. The main point of this plot is how unexpected the raw data is. It portraits explosions as far as 2.5 times the maximum possible distance traversed by light

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Friedmann-Lemaitre fitting to different epochs provided different parameters and thus different physics. Notice HU scaled-down data consistent with the epoch-dependent Supernovas paradigm.

Below are chi-squared results for both modulus-distance and normalized distance observed-values and predicted-values.

Power-Divergence chi-square for modulus-distance (Statistic=1.33, pvalue=1.0)

Power-Divergence chi-square for normalized-distance (Statistic=2.64, pvalue=1.0)





The topological view of the Supernova explosions is presented in Fig. 6:



*Figure 6:* HU view of Supernova Explosions showcasing prior epochs as smaller hyperspheres. The red-dot correspond to a hypothesized recoilless (photon momentum amplitude is conserved). Under closer analysis this path was rejected for the transportation of redshifted Supernova photons. Yellow lines show the observed Supernova Data. Smooth line is the HU Predictions

#### d. D Perceived Acceleration

HU predictions can be used to explain the current view of the Cosmos, including the perceived acceleration, initial Inflation. The HU distance is given by:
$$D(t) = \frac{R_0 - R(t)}{R_0} = 1 - a(t)$$
(45)

where

$$a(t) = \frac{R(t)}{R_0} = \frac{ct}{R_0}$$
(46)

That L-CDM distance is overestimated by:

$$D_{obs}(t) = 1 - a_{obs}(t) = D(t) \left(\frac{R_0}{R(t)}\right)^{3/2} = (1 - a(t))a(t)^{-3/2} = a(t)^{-3/2} - a(t)^{-1/2}$$
(47)

Taking derivatives:

$$\frac{dD_{obs}(t)}{dt} = \left(-\frac{3}{2}a(t)^{-5/2} + \frac{1}{2}a(t)^{-3/2}\right)\dot{a}(t)$$
(48)

$$\frac{d^2 D_{obs}(t)}{dt^2} = \left(\frac{15}{4}a(t)^{-7/2} - \frac{3}{4}a(t)^{-5/2}\right)\dot{a}(t)^2$$
(49)

Since

$$\frac{da(t)}{dt} = \frac{c}{R_0}$$
(50)

and

$$\frac{d^2a(t)}{dt^2} = 0 \tag{51}$$

The resulting "observed" acceleration is given by:

$$\frac{d^2 a_{obs}(t)}{dt^2} = \frac{3c^2}{4R_0} a(t)^{-7/2} \left(5 - a(t)\right)$$
(52)

Below is the view of the perceived acceleration resulting from possible misreading of Supernovae distances:



Figure 7: Perceived Universe acceleration in units of  $R_0/(Billion Years)^2$ . Let panel: Inflation Period. Right Panel: Current Acceleration=  $1.6\%/(Billion Years)^2$ 

If we use units of  $\frac{R_0}{(BillionYears)^2}$  instead:

$$\frac{d^2 a_{obs}(t)}{dt^2} = \frac{3}{4(13.58)^2} a(t)^{-7/2} \left(5 - a(t)\right) = 0.4\% * a(t)^{-7/2} \left(5 - a(t)\right)$$
(53)

This means that for current times (a(T)=1), the Universe has been perceived as accelerating at

$$\frac{1.6\%}{(BillionYears)^2}$$

Notice that the acceleration becomes negative at  $R(t)=5R_0$ . All these results are likely to be artifacts of the overestimation of Supernovae distances.

v. Simple Cosmogenesis

HU proposes that the Universe came into being and was placed in motion by the Big Pop<sup>17</sup>. The Big Pop is the partial recombination of the 4D Initial Fluctuation.

In the preamble to the *Big Pop*, we propose that the Universe is uncertain, as in the Uncertainty Principle. That expresses itself during Cosmogenesis, in metric fluctuations on both dimensionality and density.

The model states that the Universe would oscillated in dimensionality and fluctuation size. For instance, fluctuations in a Zero dimensional space are just numbers of opposite sign. They will always add up to Zero. Fluctuations in a One-Dimensional Space would correspond to vectors along a line, also of opposing signs. Fluctuations in two dimensions would be the two dimensional metric deformations. An area would contain a contraction of space surrounded by a region where space would be dilated. The total effect is null, that is, if one were to measure the distance between two points outside that region, in opposing directions across the center of the fluctuation, the distance would had remained the same, undisturbed by the Fluctuation.

Similarly, a 3D space fluctuation would be a 2s-orbital-like spherical metric fluctuation. Our Universe could, in principle, be borne out of a 3D Space Fluctuation. The problem with that is that, none of the Laws of Physics would work there. The reasons for that will become clear when the Fundamental Dilator and the Quantum Lagrangian Principle are presented.

Finally, a 4D Fluctuation would be a 2s-orbitallike hyperspherical metric fluctuation. One should think about the 4D hyperspherical metric fluctuation as composed of layers, being the outermost layer a contraction. Once created, immediately, it started recombining. Layer after layer, within the hypersphere, recombined to relax space (make it flat again). That kept going until the hypersphere inside only contained one layer associated with dilation and the outermost layer (us, the Universe).

At that point, HU hypothesize that the outermost layers started a decay process, moving from a smooth metric deformation to a fragmented one. HU associated that state to the one inside a Black Hole. HU will later indicate that the density is such as to have halfhydrogen atom inside each 0.19 femtometer side cell. That yields a density of  $2.37E20 \ Kg/M^3$ . Once fragmented, the outmost layer could not recombine with the left over inside layer. Since that layer was a dilation, that set the Universe in motion at the speed of light and did that without releasing a single photon or heating up anything. That is the Big Pop. The Universe was born in the Blackholium phase – The phase with the Highest Entropy and the Highest Potential energy (FDs paired up as Neutrons).

Knowing the current mass density and the Blackholium density allow us to calculate the 4D radius of the Initial Fluctuation as being 146 light-seconds. So, the Universe was born as a 146 light-seconds radius cold Black Hole.

Once the Universe was placed in motion, the density decrease until it reached the Neutronium phase, where the density of the Universe becomes  $7.7E18Kg/M^3$  and equals the density of a Neutron Star. The radius would be 457 light-seconds. About that time, neutron started to become free and decay. Their decay released energy which feedback density oscillations (Neutronium Acoustic Oscillations or NAO).

During the course of 3012 years, NAO increased in intensity as larger and larger fractions of the Neutronium converted into Baryons (Electron, Proton and Antineutrino). That is the Baryonium Phase of the Universe.



*Figure 8:* This picture displays the mapping different phases of the Universe coming into existence to Mathematical Constructs. Top-left displays the Zero-Dimensional Universe (just numbers, adding always to zero), following by the Unidimensional Space (just equal size opposing vectors along a line) and eventually to our 5D Spacetime Universe. This is the pictorial display of equilibrium at the incipient Universe (prior to irreversible dimensional phase transition) and the Big Pop irreversible transition.

That Banging made impressions on the initial matter distribution and can be seem in the SDSS (Sloan Digital Sky Survey).



*Figure 9:* This presents the cross-sections of SDSS map along distance and Declination. Once the data was aggregated onto those two coordinates, we dropped the angular dimension and plotted density versus distance from us. It is cross-section of the HU Universe Map showing the galaxy densities along distances. This data was pre-aggregated along RA, before plotted disregarding DEC

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Figure 9 presents cross-sections of the Universe along the two angular dimensions (Declination and Right Ascension) for both North and South SDSS BOSS datasets.



*Figure 10:* It shows details of NAO depositions onto the Universe. As stationary density waves slosh around in the Universe, regions of the Universe were increased in density at each resonate

Figure 10 shows the close-up of the NAO ridge at 0.3  $R_0$ . One can see at least 36 Bangs. The usage of the word Bang emphasizes that HU rejects the Big Bang as the source of the Universe and provides the evidence in the form of NAOs (Neutronium Acoustic Oscillations). Calculations are available at the github repository<sup>18</sup>.

As density on the Neutronium Phase decreases, the effect of NAO is to seed Black Holes. Due to the hyperspherical symmetry, Gravitational field only become relevant when density decreases. The ability of NAO to seed Black Holes is inversely proportional to the Neutronium density until the total its decay into free neutrons.

The plot is the aggregation of SDSS (Sloan Digital Sky Survey), on distance (named alpha) and Declination. Later, Declination is dropped and the plot is created. Surprisingly, the effect of acoustic waves was to incrementally aggregate the seeds of the galaxies and galaxy cluster. The level of aggregation increased linearly with each resonating of the acoustic waves. That happened while the Universe was expanding at the speed of light. Simple calculation indicated that the 36 Bangs took 3012 years to happen.

In addition to these visible galaxy clusters, one would expect also Fibonacci clusters, although they should be rarer and thus more difficult to spot.

## a. How Much Energy was Released during the Many -Bangs?

During the 3012 years, there was at least 36 Bangs in a crescendo, releasing the energy of the Neutronium. Since the Neutronium was a 457 lightseconds Neutron star, one can easily calculate the number of neutrons and the energy released when they decay. That energy was equivalent to 10<sup>22</sup> Supernovae. NAO 0.3 ridge can be observed on the 3D xyz  $Map^{19}$  while the Many-Bangs can be seen in the 3D RA\_Dec  $Map^{20}$ .

## b.Non-Critical Anthropic Argument

Preceding the Big Pop there were dimensional transitions. Once the Big Pop placed the Universe in motion, the Laws of Physics went into action. The Many-Banging, provided the dilaton intensity needed to synchronize spinning through the Quantum Lagrangian Principle. Any dilator traveling faster or slower than the speed of light would be left behind or too far ahead of us to have any effect on our Universe.

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*Figure 11:* Time zero boundary conditions are shown. When the 4D macroscopic fluctuation arises and decays, a myriad dilators are created (matter and antimatter). The distribution of matter and antimatter follows a 2s hyperspherical orbital distribution (4D space). Recombination occurs at the edge between matter and antimatter. This initial recombination is what propels the whole Universe outwards traveling at the speed of light. Here is where spin quantization and tunneling frequencies plays the most import role on the Universe. From our discussion of dilators and the stroboscopic Universe interaction can only exist at specific angles, so the acceleration happens coherently even if the interaction takes place on several dilator cycles

This is a Non-Critical Anthropic argument, that is, it doesn't depend critically on anything. The only thing it depends is that there is a 4D spatial manifold and the interaction happens through 4D metric waves governed by a No-Work-by-Dilators Principle (Quantum Lagrangian Principle or Lazy Dilators Principle or Space Deformation Quantization). *Spinning phase was also synced by the same logic.* 

## c. What is the Essence of a Universe?

What makes a Universe is interaction! All laws of Physics depend upon that. To interact, particles should be within the same hypersphere and traveling at the speed of light (c). That condition allows for the working of retarded potentials, for our intermittent and yet continuous interaction. Caveat remains for the Lagging Hypersphere (LH) filled with Antimatter and moving less than a femtometer behind us. *LH is the proposed source of Dark Matter 'observed effects' within HU*. HU only considers unexplained Gravitational Lensing as valid evidence of Dark Matter. Spiral Galaxies rotational curve can be explained by the Gyrogravitation eq.175.

# d.Vacuum Fluctuations

We postulate that the spatial manifold is defectfree and that *effectively* there isn't anything ahead of us. Anything with radial velocity different from c will be too far behind or too far ahead of us to interact.

What about the paradigm of vacuum (zeropoint) fluctuations? HU considers that quantum systems have zero-point fluctuations. Empty space, has no boundaries and thus no stationary states. This is a useful paradigm when one considers scattering process and center of mass kinetic energy is used to defined the range of states available for products.

This view eliminates the paradox associated with ultraviolet catastrophe.

# e. Asymptotic Freedom

Interaction occurs at 45 degrees through retarded potentials. This means that the Quantum Lagrangian Principle will lead to smaller and smaller accelerations as the local torsional angle approaches 45 degrees. Conversely, under extreme density (e.g. inside a Black Hole), there will be a density where the Force goes to zero again.

## b) Hypergeometrical Standard Model

# i. The Fundamental Dilator

We propose that Fundamental Dilator Coherences (FDC) are the basic building block of matter. They are coherences between two metric deformation stationary states in a rotating fourdimensional double potential well. A single coherence between two 4D-space deformation states or fundamental dilator is proposed to account of all the constituents of non-exotic matter (isotopes, neutrons, protons electrons and and their antimatter counterparties) and hyper-nuclei (hyperons) on Hypergeometrical Universe Standard Model Section. This coherence is between two deformation states with 4D volumes corresponding to the electron and proton, or electron-proton coherence. Here the proton, antiproton, electron and positron are the same particle or the fundamental dilator, just four faces of the same coin.



*Figure 12:* (a)Electron (Positron) and (b)Proton (antiproton) states. The beginning of each coherence represents the nature of the particle. Not represented in this graphic is the orientation of the state which can be in phase (flushed with the 3D Hyperspherical Universe) or off-phase (perpendicular or rotated to the 3D Universe) nor the positive or negative (stretch or compression of space) phase information



*Figure 13:* (c) Neutron, (d) Electron Anti-Neutrino composed of two transmutation chords (half antineutrino). Half antineutrino transmutes an electron into a proton and vice-versa and it is named a transmutation chord. Similarly, from the assignment of pions, a half muon neutrino is a transmutation chord that converts matter to antimatter (electron into positron). By analogy, half Tau Neutrino will likely convert a proton into an antiproton.

Fig. 14 below depicts the Balls Diagrams, representing these coherences.



*Figure 14:* The 4D-mass is mapped to the 4D displacement volume of each one of those states. To understand what is a displacement volume, let's first consider a unit radius 3D sphere in a 3D spatial manifold. If space is stretched slightly along two axes and compressed along a third axis (e.g. 2/3, 2/3, -1/3 or the proton) by some very small arbitrary amount  $(2/3, 2/3, -1/3)^*A$ , the change in volume can be approximated by the sum of those coefficients  $(2/3 + 2/3 - 1/3)^*A = A$ 

Due to the inherent anisotropy of an expanding hypersphere, tangential and radial states are modeled to have approximately a unit volume while differing by an anisotropic coefficient very close to unit.

Inertial Mass = Dilator 3D Footprint!

Since we know the masses of the 3D footprints electron and proton and since each one of these particles have positive and negative footprints, the 4Dmass of a Fundamental Dilator is considered to be the

ii. Neutron and the Hydrogen Atom

same as a Hydrogen Atom in atomic mass units to extract anisotropy.

The 3D-mass is related to inertia, while the 4D mass is related to the particle ability to create dilaton waves (dilaton field). All four states have the same ability and thus the same absolute charge.

Up to now we described charged dilators. Let's now consider a neutron and a hydrogen atom.



*Figure 15:* Hydrogen atom representing two interacting dilator coherences and neutron representing a composite coherence. The circular nature of the coherence above indicates its cyclic nature. This cycling will last the lifetime of the particle



*Figure 16:* Neutron represented by a dimer, that is, two coherences composed each of two alternating chords, rotating 180° at each de-Broglie step of the 3D Universe expansion. The neutron dipole moment and energy stored in local metric deformation place constraints on the 3D Neutron radius or size

Each four balls correspond to the four states of the Fundamental Dilator Coherence. The red lines are transmutation chords (half electron-antineutrino) responsible for transmuting an electron into a proton at each de-Broglie cycle. In this model, one considers that the energy associated with tunneling could be momentarily converted into a 3D rotation while spinning continues. This means that the last state (electron Rotated) in the proton sequence would remain in the electron state, execute a rotation around an axis in the 3D Universe while rotating 90° perpendicular to R. This would place the next state as being electron flush with the hyperspherical surface, thus transmuting from proton into an electron within the coherence.



Figure 17: Neutron decays into W-Minus which subsequently decays into an electron and an electron anti-neutrino

The neutral nature of the neutron is the result of being a rotating dimer with zero net charge.

#### iii. Pions and Antimatter

Issues related to the total spin of a coherence depend upon the sum of the individual sub-coherence spins and that includes transmutations chords (half neutrinos). Pion Decay Channels are shown in Table 2.

Particle	Symbol	Mass	Decay Reaction	Spin
PionMinus	$\pi^-$	139.57018	$e^- + n_e$	1/2
PionMinus	$\pi^{-}$	139.57018	$m^{-}$ - $n_{m}$	1/2
MuonMinus	<i>m</i> -	105.7	$e^ n_e + n_m$	1/2

Table 2: Pions

Pion Model



*Figure 18:* Pion Minus Diagram showcasing both transmutation chords. This dilator is a composite dilator with an equilateral triangle topology as seen from the radial direction (perpendicular to our 3D Universe)

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Figure 19: Pion Minus decay into Muon Minus and a Muon Neutrino



*Figure 20:* Muon Minus decay onto an electron and a muon neutrino. The muon neutrino can be detected at different Glutonic States where it performs one or more electron capture. The energy of the annihilation of the electron and proton is converted into kinetic energy for the decay products. Glutonic states are states that differ by the number of EFD internal coherences (e.g. Delta Plus Plus). Internal coherences are coherences not separated by a transmutation chord, thus they add no extra torsion to the composite coherence. They will be reviewed elsewhere

The four fundamental particles (electron, proton, positron, antiproton) are modeled as different phases of the coherence between stationary deformation states of the local metric. The involved states express their nature (physical properties). Thus, at the first glance, the EFD should have a 4D-Mass identical a Hydrogen atom.

During the time taken to traverse a de-Broglie step, the dilator goes through its four phases (electron, proton, positron and antiproton) while spinning  $360^{\circ}$  around an axis perpendicular to the direction R (R is normal to our 3D Universe hypersurface). All times (proper time and Cosmological time  $\phi$ ) are made dimensional by the multiplication by the speed of light c.

Pseudo-Time Quantization/de-Broglie Stepwise Expansion of the Universe are the result of the proposed model for matter based upon the Fundamental Dilator together with the proposed topology.

## iv. Neutrinos Ghostly Nature

From the diagrams, the frequency of tunneling for neutrinos is different from the tunneling frequency between the Fundamental Dilator Coherence states. Since all known stable matter in the Universe is made up of composite coherences based on the Fundamental Dilator, interaction will be limited by the time integral of the interaction. Only a very close collision will be effective. Anything else will result in no interaction.

#### v. Particle Topology

Since the composite dilator coherences are degenerated (Fig. 19) with respect the which state is initially in phase with the Universe, a trimer would have an equilateral geometry with respect to an axis perpendicular to the 3D Universe. Below is the topology of prime composite dilator coherences (hyperon family).

- Electron/Proton/Positron/Antiproton is a point
- Neutron is a line (segment)
- Pion minus/plus is a equilateral triangle
- Delta plus/minus are pentagons
- Kaons plus/minus are heptagons
- Xis plus/minus are undecagons
- Omega plus/minus are tridecagons

More complex hyperons will be presented elsewhere.

#### vi. Electromagnetic And Gravitational Dilators

The archetypical Electromagnetic Dilator is represented by the Proton or Electron coherences presented previously. The Gravitational Dilator is represented by a spin zero Hydrogen Atom shown in Fig. 21:



*Figure 21:* Archetypical Gravitational Fundamental Dilator (GFD = zero spin Hydrogen atom) and Electromagnetic Fundamental Dilator Coherence (EFD = electron)

The first thing that comes to mind is that the Gravitational Fundamental Dilator contains two Electromagnetic Fundamental Dilators. Positive and negative phases of the dilator are positioned such as to minimize dilator work, that is, the phases are positioned to be in phase with the surrounding dilaton field. Their 3D mass or inertial mass behaves as expected. An Electrostatic Fundamental Dilator on an electron pattern has the inertial mass of an electron. A Fundamental Dilator on a proton pattern has the inertial mass of a proton.

## c) D De-Broglie Waves and the De-Broglie Force

What are de-Broglie waves? Are they the same as the dilaton field?

Electron 3D de-Broglie waves have a wavelength that is different from the wavelength of a Fat Electron (our proposed view of the 4D displacement volume representation). The solution to the conundrum is that the dilaton tunneling, spinning and interaction with the 3D hypershell generates a bitonal dilaton field (two frequencies):

- One (our 3D de-Broglie waves) dependent upon the dilator footprint (3D-mass) on 3D Universe.
- One dependent upon the 4D Mass.

There is the question about their amplitudes, how similar are they? Just from inspection, they seen to be equivalent to a super strong gravity since they can be expressed by a small number of particles or even a single particle. Unlike gravity, uncorrelated particles or matter doesn't share the same wavelength as electromagnetism and gravitation. The de-Broglie dilaton field depends upon dilator footprint and velocity.

The answer to this question has implication on bunching and focusing of particles. This is extremely relevant to the pursuit of Coherent Nuclear Energy. The creation of coherent bunching of deuteron atoms for instance, followed by focusing and hadronic phase matching might be feasible.

When one focus particles, they would be subject to this bitonal dilaton field components. If the de-Broglie field is stronger than the EFD dilaton field, that might mean that homogeneous bunching with a larger number of particles, might be easier done than one with a small number of particles, clearing the path to coherent hadronics.

De-Broglie dilaton field might be bunching and debunching depending upon which phase you consider. Both phases define a trough that might neutralize enough electrostatic repulsion to allow for phase matched nuclear reactions.

First let's derive the de-Broglie law using the proposed 4D topology. Let's consider de-Broglie waves and the dilaton field for a hydrogen atom. In the case of a Hydrogen atom, the atomic mass is Hydrogen Mass.

Let's consider a Hydrogen atom traveling at the speed of light along the 3D Universe. The vertical line points to the Radial direction (perpendicular to the 3D Universe). The line at 45° corresponds to traveling at the speed of light both radially and tangentially. The oblique line indicates the projection onto the 3D Universe. Simple geometry tells you how the actual wave gets projected onto the 3D Universe



 $\lambda_{\rm 3D}{}^{\rm deBroglie}$ 

Global Journal of Science Frontier Research (A) Volume XVII Issue V Version

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*Figure 22:* This diagram shows two consecutive de-Broglie steps of the 3D Universe expansion and their relation to a volumetric dilaton wave

The 45° projection maps into the Compton wavelength. The horizontal lines represent steps of the 3D Universe. From the Fig. 21, it is clear that the de-Broglie wavelength in 3D is twice the one seen in 4D. This creates a coincidence between the GFD dilaton field and the de-Broglie field.

The de-Broglie equations that calculate wavelength consistent with this 4D Perspective are given by:

$$\lambda_{3D}^{deBroglie} = \frac{h}{m_{3D}v}$$
(54)

$$\sin(\alpha) = \frac{\lambda_{4D}^{Vol}(\nu)}{\lambda_{3D}^{deBroglie}} = \tan(\alpha)\cos(\alpha) = \frac{\tan(\alpha)}{\sqrt{1 + \tan^2(\alpha)}}$$
(55)

$$\tan(\alpha) = \frac{v}{c} \tag{56}$$

$$\cos(\alpha) = \frac{\lambda_{4D}^{Vol}(0)}{\lambda_{3D}^{deBroglie}(v)} = \frac{1}{\sqrt{1 + \tan^2(\alpha)}}$$
(5)

$$\lambda_{4D}^{deBroglie}(v) = \lambda_{4D}^{Vol}(0)\sqrt{1 + \tan^2(\alpha)}$$
(58)

i. Hypersuperficial Mode Calculate  $\lambda_{4D}^{Vol}$  equivalent to the  $\lambda_{3D}^{de - Broglie}$ :

$$\lambda_{4D}^{Vol}(v) = \lambda_{3D}^{deBroglie} \left[ \frac{\frac{v}{c}}{\sqrt{1 + (\frac{v}{c})^2}} \right] = \frac{h}{m_{3D}v} \left[ \frac{\frac{v}{c}}{\sqrt{1 + (\frac{v}{c})^2}} \right] (59)$$

$$\frac{f_{4D}^{Vol}(v)}{c\sqrt{2}} = \frac{m_{3D}v}{h} \left[ \frac{\frac{v}{c}}{\sqrt{1 + (\frac{v}{c})^2}} \right]^{-1}$$
(60)

$$f_{4D}^{Vol}(v) = \frac{m_{3D}c^2\sqrt{2}}{h}\sqrt{1 + (\frac{v}{c})^2}$$
(61)

$$\lambda_{4D}^{Vol} \cong \frac{h}{\mathbf{m}_{3D}c}\Big|_{v < c} \tag{62}$$

$$f_{4D}^{Vol}(v) = \frac{2m_{3D}c^2}{h}\bigg|_{v=c}$$
(63)

$$\lambda_{4D}^{Vol}(v) = \frac{h}{m_{3D}v\sqrt{2}} \bigg|_{v=c}$$
(64)

#### ii. Hypervolumetric Mode

Hypervolumetric modes anisotropy is derived the vacuum permittivity on equations (116-122):

$$\lambda_{4D}(v) = \frac{0.29273h}{m_{4D}c} \sqrt{1 + \left(\frac{v}{c}\right)^2}$$
(65)

$$f_{4D}(v) = \frac{m_{4D}c^2\sqrt{2}}{0.29273h\sqrt{1+(\frac{v}{c})^2}}f_{4D}(c)$$
(66)

$$\lambda_{4D}(v) = \frac{m_{4D}c^2}{0.29273h} = \frac{m_{4D}c^2}{h^{GE}}$$
(67)

$$h^{GE} = 0.29273h \tag{68}$$

Equations 59-64. refers to the de-Broglie 3D waves and depends only on the 3D masses. It was made general to account for different velocities. The velocity is supposed to be invariant (low dispersion) between surface and volumetric dilatons. This is the equivalent hypervolumetric wavelength that is consistent with the observable 3D de-Broglie waves. One might conclude that the Electromagnetism and Gravitational dilaton field have 29.3% of the intensity of the de-Broglie dilaton field!

Equation 65-68 refers to the dilaton field created by all 4 phases of the dilaton coherence. One possible interpretation of the distinct nature of these dilaton modes is to map them to hypersuperficial (3D de-Broglie waves) and hypervolumetric (dilaton field responsible for volumetric forces - electromagnetism and gyro-gravitation). There is an inherent uncertainty between superficial and volumetric waves in the context ) of waves on a surface attached to the moving frame of reference. The distinction should be made with respect to k-vectors. A superficial wave has a k-vector on the surface, while a volumetric wave has a k-vector perpendicularly to the surface that is free to move as the surface is tilted by interaction. Due to moving reference framework it is possible to map a superficial mode to a volumetric mode.

Again, the k-vector for these dilaton waves are perpendicular to the local FS. This is necessary for creating a simple picture of the 3D de-Broglie waves. The dilaton field propagating radially outwards corresponds to a dilator with zero velocity. Since the dilator k-vector is perpendicular to the 3D hypershell, the projection wavelength is infinite. As the dilator changes velocity, the reentering dilaton field projects the original wavelength into our known matter waves.

The Hypergeometrical Universe theory recognizes this as a yet unknown Force, not unlike Gravitation or Electromagnetism. The mathematical formulation for force calculation is identical to other forces and presented in the next section. Specifics of this force as well on how to physically mold spacetime will be covered in detail elsewhere.

#### d) Hypergeometrical Universe Physics

From Fig. 1, the rate of torsion of the local FS is proportional to the force (Hypergeometrical Universe interpretation of *Newton's Second Law* is giving by:

$$F = m_{_{03D}} c^2 \frac{dtanh(\alpha_{_{T}})}{d\tau}$$
(69)

Adding the extra spatial dimension implies that:

$$F = m_{_{03D}} c^2 \frac{dtanh(\alpha_{_{\tau}})}{d\tau} = m_{_{04D}} c^2 \frac{dtan(\alpha_{_r})}{dr}$$
(70)

## i. Space Stress-Strain Paradigm

In a geometrical theory, the only relevant constructs are space, time, dilators, dilaton fields (dependent upon dilators position, velocity and space properties). A theory about the Universe based on those constructs would recast equation (69) as:

## Stress = Area4D Strain4D = Area3D Strain3D (71)

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$$Area4D = m_{04D}c^2 \tag{72}$$

$$Area3D = m_{03D}c^2 \tag{73}$$

$$Strain4D = \frac{dtan(\alpha_r)}{dr}$$
(74)

$$Strain3D = \frac{dtanh(\alpha_{\tau})}{d\tau}$$
(75)

The force between dilators can be calculated on the RXYZ frame.

From Fig. 21, it becomes evident the reason why the 4D Mass of the Fundamental Dilator is initially mapped to the mass of a hydrogen atom in atomic units.

Transmutations chords redirect energy from tunneling into rotating in the 3D Universe, thus changing which phase is flush with the 3D Universe at the subsequent state. These chords (half-neutrinos) carry angular momentum since they correspond to rotations. They also carry linear momentum since they have a footprint on the Universe and are accelerated during the dissociation process. Since they have a different frequency, they will not produce anything that might be construed as a Gravitational nor Electromagnetic field. This would mean that it is meaningless the search for the neutrino mass as a potential indicator of the matterinduced spacetime curvature.

The EFD is a charged dilator and will be used as a probe for electromagnetism. For gravitation, the Fundamental Gravitation Dilator (GFD) archetype used will be a Hydrogen atom.

The introduction of a Fundamental Dilator and the concept of 4D Masses eliminates the asymmetry between electrons and protons and allow for the derivation of Natural Laws from first principles on a 5D Spacetime.

In this theory, a force capable of moving a body corresponds to a stress capable of deforming the Fabric of Space where that body is located. Notice that the body only has footprints on the FS where the dilators are. The strains are given by:

$$\frac{d\tan(\alpha_r)}{dr} \tag{76}$$

and

$$\frac{d\tanh(\alpha_{\tau})}{d\tau} \tag{77}$$

where the angles are shown on the two cross-sections on Fig. 1. The "areas" where the strain takes place are given by  $m_{4D}{}^{0}c^{2}$  and  $m_{3D}{}^{0}c^{2}$ , respectively. They provide the extensive nature associated with mass in our current view.

Deformation of the Fabric of Space can be understood as acceleration from equation(69). Newton's Third Law also has a representation within this theory. The stress on interacting dilators (bodies) is also the same with opposing signs; this is equivalent to say that the force felt on each other is equal with opposite signs. This law is valid both on the RXYZ and in the  $\Phi$ XYZ. In addition, one can equate

Area3D(1)Strain3D(1) = Area3D(2)Strain3D(2) (78)

where the indices refer to the particles. This applies to each de-Broglie step. This recast Newton's Third Law also as Archimedes Law of Lever if one focus on a single de-Broglie step.

*Newton's fourth law* is the Natural Law of Gravitation which will be derived later from first principles. The above equations are the basis for the more fundamental theoretical development in this theory. In first analysis, it is just an extrapolation of Newton's Law, which only covers the 3D space and introduces an unknown quantity F (Force). The introduction of a fourth spatial dimension allows for the creation of a purely geometric tautology relating Stresses on the two cross-sections shown on Fig. 1.

The stress associated with interaction is then same on both cross-sections.

The strain is expressed differently in each crosssection and that permits the derivation of our fundamental laws of physics (Newton's, Gauss's, Biot-Savart's) from first principles.

Notice that the dilators will surf the XYZ on the XYZR cross-section. Our interpretation of events (dynamics) will be defined by the evolution of the dilator on xyzt manifold.

ii. Pseudo Time-Quantization and the Stroboscopic Universe

Pseudo Time-Quantization arises when one considers Newton's Law, where mass attracts mass at the direct products of their values. On the intermediate phases, the 3D overlap of the fundamental dilator with the FS goes to zero and so goes its perceived 3D mass, resulting in an intermittent interacting Universe (Stroboscopic Universe).

This pseudo-time quantization and the introduction of a fourth-spatial dimension creates inherent uncertainties in the dynamics of dilator which together with the Quantum Lagrangian Principle would result in the basis for Quantum Mechanics. At each de-Broglie step, the next position where two interacting dilators (e.g. Hydrogen atom) would be depends upon their overlapping dilaton field at specific radial positions. The wavelengths and k-vectors on XYZr depends upon velocity.

At any given step, the electron dilator should be in any one point on a circle drawn in the 3D space. That is the basis for the deterministic and yet uncertain motion in quantum mechanics. The loci of those steps should map to the probability density function. Since this theory is providing guidance for the underlying dynamics, it should be feasible to derive Schrödinger's equation from first principles.

In the past, I considered that the eigenstates would be stable in the sense of a Poincare' map, that is, one would start calculating trajectories:

- 1. Start the trajectories from an initial position from the other particle (e.g. electron at position x from proton in a Hydrogen atom).
- 2. By using 3D interferograms (to calculate the forces actuating on the dilator at any given time).
- 3. Use those forces to calculate motion on *XYZr*. Cycle back to item 2.

I expected that by starting the trajectories at different distances (different potential energies), stable Poincare' maps would naturally arise corresponding to the eigenstates. I considered that the de-Broglie field was present as an initial condition at each de-Broglie step of the Universe expansion.

After discovering the de-Broglie field (realizing that it was a real dilaton field mapped to a hypersuperficial dilaton mode), I realized that the de-Broglie field should be part of the protocol above to recover Quantum Mechanics. The reason being is the self-interaction with the de-Broglie field during the double slit experiment. If the field is there when there isn't any other potential, it should also be there when there is a potential.

This conclusion doesn't affect the derivation of Gauss, Newton and Biot-Savart Laws since they are large-body equations (non-Quantum Mechanical) that used the large N approximation in the derivation. Derivation of the Schrödinger equation or the Bohm equation is not in the scope of this work.

## iii. Quantum Lagrangian Principle

The Quantum Lagrangian Principle is nothing more than a direct result of the quantization of space deformation or metric deformation. It states that:

# Dilators Always Dilate Locally in Phase with the Surrounding Dilaton Field

Since Gravitation and everything else is described in terms of metric deformations, all fields are quantized in a sense but not in another. Gravitational/Electromagnetism fields are dependent upon dilaton fields from dilators which provide quantized dilations amplitudes and have to be at any given time on a well-defined spatial interference patterned grid, although not at quantized distances. This means that the generation of the field is quantized but the actual dilaton field is not. This means that interacting dilators (e.g. Hydrogen atom composed of electron and proton), will always be at the nearest maximum dilation (contraction) for proton (electron) at each de-Broglie step of the Universe expansion. The phase choice is arbitrary. This means that the electron (the most mobile) will have an uncertain trajectory due to the azimuthally nature of the interferometric dilaton pattern resulting from protonelectron interaction.

The motion of a dilator can be thought in the RXYZ cross-section as being the interference between a self-wave which wavelength depends upon the torsional angle of the local metric. For relaxed space (angle=zero), the wavelength of a GFD is  $\lambda_{\rm n}$ . If this dilator were accelerated to the speed of light tangentially (within the 3D), the wavelength would stretch to  $\sqrt{2}\lambda_{\rm n}$ . This condition is required to keep in phase with the 3D Universe.



*Figure 23:* This shows a de-Broglie step  $\lambda_1$  (Compton wavelength of a Hydrogen atom for GFD).  $R_0$  is the age of the Universe times the speed of light.  $\alpha_1$  ( $\alpha_0$ ) corresponds to the FS normal direction for Electrostatic (Gravitational) interaction

Due to the Quantum Lagrangian Principle, position x show in Fig. 23 is calculated from the interference pattern between the dilator self-generated field and the Cosmological Field reaching that region of the 4D spatial manifold. The math is quite simple, just add the two waves and calculate the maximum or minimum. That will be the position of the dilator in the next de-Broglie step.

QLP applied to EFD allows the local metric deformation angle to be exactly the one calculated from x and  $\lambda_1$ .

QLP applied to GFD would have the same x motion but the FS deformation would be  $\alpha_0$ . Calculations indicate the existence of an adiabatic effect, thus yielding a larger deformation than expected.

Using the known Gravitational constant at  $R_0$ , a simple elasticity parameter is calculated. This allows for the calculation of the natural frequency of gravitational waves.

#### iv. Mechanism of Attraction and Repulsion

To derive the laws of Nature, we first need a picture of what is happening during attraction or repulsion. We first write the deformational waveform for the dilaton field. This formula is valid for both electrostatic and gravitational interaction since the amplitude of each dilaton field is equal to the amplitude of the dilator at specific times of the expansion and they can be normalized to unit.





Mathematica Functions: ladder[x] = HeavisideTheta[SawtoothWave[x - 0.25] - 0.5]\*Round[Abs[x]]pulses[x] = HeavisideTheta[SawtoothWave[x - 0.25] - 0.5]

The full dilaton field is given by

$$\Psi_1(x, x_0) = \frac{\cos(k_1 \cdot (x - x_0))}{(1 + f(k_1 \cdot (x - x_0)))}$$
(79)

$$\Psi_{2}(x, x_{0}) = \frac{N\cos(k_{2}.x)}{(1 + f(k_{2}.(R - x)))}$$
(80)

$$\Psi_{Total}\left(x, x_{0}\right) = \Psi_{1}\left(x, x_{0}\right) + \Psi_{2}\left(x, x_{0}\right)$$

$$\tag{81}$$

$$f(k x) = ladder[x] \tag{82}$$

The function ladder is used to implement the dilution of the initial dilaton amplitude (unit) into the number of cycles. So the first cycle the intensity if 1, at the second it is 1/2, at the third it is 1/3,etc. The only relevant part of the dilaton field for force derivation are the peaks because dilators land there at each step of the 3D Universe expansion. The derivative of the ladder function is zero for x=0.

$$\left. \frac{df(x)}{dx} \right|_{x=0} = 0 \tag{83}$$

The pulse function was used to show only that region and not the negative part of each cycle. Plots were generated with the function below:

$$\Psi_2(x, x_0) = \frac{N.\cos[k.(R-x)] * pulse[x]}{\left(1 + \text{ladder}(N.(R-x))\right)} \approx \frac{N}{\left(1 + f(k_2.(R-x))\right)}$$

If N (number of dilators) is very large, the oscillations are extremely close to each other and the approximate version of the equation (80) is used. Notice that when  $x-x_0=R$  is a macroscopic distance:

(84)



*Figure 25:* (a) shows a probe dilator (at origin) interacting with a 4D-Mass of 15 dilators. (b) shows where the dilator would land (slightly right from zero if this is an attractive interaction or to the left if not)

Attractive or repulsive interaction are defined by the gradient of the peaks, which depends if the initial oscillation was positive or negative. In the case of Gravitation, the picture remains the same, but the amplitudes are much smaller due to countervailing actions of positive and negative dilators. The increased amplitude of the dilaton field with increasing number of dilator is the result of the Quantum Lagrangian Principle.

Dilators' amplitudes add together as opposed to averaging to zero in an ensemble. The increase in frequency is due to the physical volume from which the dilaton field emanates, thus arriving at different phases at any given point of space but adding together back properly at the right positions.

# Attraction happens when interaction reduces local metric deformation. Repulsion happens otherwise.

For Gravitation, the picture is similar. The question is how the gradient is different for matter and antimatter? Van der Walls forces are always attractive and that might be the case for Gravity since they originate from a similar process.

This theory provides a path for matter-antimatter conversion, thus opens the door for antimatter propulsion and gravity suspension. Other paths to gravity shielding will be discussed elsewhere.

v. What is the Effect of An Extra Dimension on Natural Laws (Gravitation, Light Propagation, Electromagnetism)?

Current scientific view is that a field carrying a force, spreads out onto an "area" to dilute the Force. Changing dimensionality of space, changes the "area's" dimensionality. This straightforward geometric restriction exists because of the observational dependence of forces with inverse distance squared. Without knowing how to derive Natural Laws, scientists unduly extrapolated this argument to restrict any non-compact higher dimensional theory. HU has an extra non-compact dimension (the Radial dimension).

Notice that this restriction/argument is model dependent, despite of the fact that up-to-now there was no model which could replicate reality in a higher dimensionality Universe. HU does exactly that.

HU proves that this restriction is not warranted and that the inverse distance squared dependence is recovered even when the extra radial dimension is added, if we have the dynamic framework of the observed Universe being in a light speed expanding hypersphere.

The clue to how this is accomplished it is the same as the one to photon confinement. The short answer is that HU considers Gravitation and Electromagnetism and photons are carried by metric waves (dilaton field). This dilaton field knows about the extra spatial dimension. It just doesn't care, in the sense that its work (dephasing) will only be felt by matter (dilators) contained within our hypersphere. This means that despite of the dilaton field traveling within the 4D spatial manifold, our observation of it only happens through retarded potentials leaving at 45 degrees the hypersphere and traveling through a line-of-sight path.

This means that interaction is always UNIDIMENSIONAL. The loci of Supernova explosions are the curved line shown in Fig. 6.

Any other path wouldn't ever meet a dephasing event and would arrive too early or too late for us to detect it, not satisfying the Time-Of-Arrival constraint.

The Time-of-Arrival constraint, reduces interaction dimensionality (to 1D)! Of course, the force intensity has a one-dimensional dependence. The force direction requires the full 4D spatial manifold to be characterized.

## vi. The Meaning of Spin

The Fig.26 shows the formation of ortho- and para- Hydrogen atoms.



*Figure 26:* This shows that a negative spin means time reversing the cycle of the Fundamental Dilator Coherence. Para-Hydrogen has lower energy due to the attractive interaction during the perpendicular phases. Similar considerations are applicable to Cooper Pairs in Superconductivity. In fact, in Cooper pairs, the intermediate matching is perfect. This understanding of spin will allow for the exploration of hidden Universe that is here when we momentarily don't exist (in the sense, "I interact, therefore, I exist").

## vii. The Meaning of Inertia

Inertia maps to the overlap of the dilator with FS at specific phases when the Universe interacts. At those phases, the larger the overlap, the larger the inertia will be. The reason lies on the Stress-Strain view of interaction. Interacting dilators create dilaton fields which affect the position of other dilators at subsequent de-Broglie steps. This is equivalent to changing the propagation direction within the 4D spatial manifold and thus locally deform the FS. The larger the area that should be deformed the larger the required stress (Force), thus the larger the inertia.

The intersection of this 4D dilator displacement volume with the very thin 4D Universe (Fabric of Space) multiplied by a 4D mass density corresponds to the perceived 3D mass, a familiar concept. Since both the dilator and the Fabric of Space are very thin, the intersection decreases extremely rapidly with spinning angle/phase tunneling. The interaction between dilators and dilaton fields (generated by other dilators) is directly dependent upon that footprint.

Since the footprint is non-null only at specific spinning angles, interaction is quantized and "existence" is quantized. Where existence was construed according to the following paradigm: "I interact, therefore I exist". Neutrinos have been called "Ghostly Particles" due to their very small interaction with the rest of the Universe (dilators) and different de-Broglie wavelength. Fig.13 and Fig.14 shows that neutrinos correspond to coherences with different wavelength or frequency than the Fundamental Dilator, thus resulting in alternating interactions that are only effective at very short range, thus making neutrino matter interaction cross-section very small.

## viii. Newton's First Law - Why Do Things Keep Moving?

HU equates motion to the surfing of a lightspeed expanding hyperspherical shockwave



*Figure 27:* This showcase HU paradigm of motion as surfing the Lightspeed Expanding Hyperspherical Shockwave Universe. If the Fabric of Space (FS) is relaxes, only radial motion will occur. If interaction twists FS to the left, motion will take place towards the left (normal to the local FS)

# EPPUR SI MUOVE



*Figure 28:* Here we present a dilator in motion and its position on two de-Broglie steps. The local metric is perpendicular to the direction of propagation. It shows that the angle with respect to the radial line becomes smaller (more relaxed FS) as motion takes place and asymptotically the Cosmological angle tries to reach alpha1 or the initial local metric twist angle

As time goes by, the local metric deformation described by the angle  $\alpha_1$  becomes the smaller  $\alpha_2$ , thus motion results in a more relaxed local metric. Conversely, one could say that that is the reason for inertial motion, thus providing a reason for Newton's First Law. Alpha equal zero means that the dilator would propagate along the radial direction and that the local metric would be totally relaxed. This also means that current Universe should be mostly relaxed.

Notice that the apparent motion will still exist since the fabric of space is expanding and any place in the 3D universe has a Hubble expansion velocity. Although moving relatively to its original position, the body remains static with respect to the fabric of space (alpha parallel to R). At that point, the local deformation ceases to exist and the body drifts with the expansion at the Hubble velocity. In other words, motion is a way for 4D space to relax; in the same way, a tsunami is the means for the sea to regain a common level.

## ix. Cosmological Coherence

Given that dilators obey the Quantum Lagrangian Principle, thus are never dephased by interactions, then it becomes clear that all dilators are inphase throughout the Universe, creating a Cosmological Coherence.

The existence of macroscopic coherence is the underlying reason why the concept of field can work. If one considers a field to be a property of space, then the coherent addition of dilaton fields is a requirement for the fields to be an extensive property of the number of dilators

## x. Dilator Archetypes

Before the derivation of Gauss Electrostatics and Newton's Gravitation Laws, lets discuss the

meaning of a dilaton field for a Gravitational Fundamental Dilator (GFD) and for an Electromagnetic Fundamental Dilator. The electrostatic dilaton field is easy to understand

- 1. (EFD). Fig. 21 shows the Electrostatic Fundamental Dilator going through the spinning and space deformational changes. Deforming space should create propagating deformation waves on the Fabric of Space. There is a subtle and very important difference between dilators and dilaton fields. Dilaton Fields propagate at the actual speed of light, \$\sqrt2\$c. The 3D Universe propagates at c along the radial direction. The dilator is part of the 3D Universe and thus travels at that speed. Hence, a dilator is a dilaton wave generator that travels at lower speed that the waves it creates. At each de-Broglie step the local metric displacement volume is unit. In this theory, a unit amplitude of deformation is associated with the location where the dilator lands. This is the same for both electron state and proton state because they both have the same absolute value of coherently added 4D displacement volumes.
- 2. (GFD) For the Gravitational Fundamental Dilator shown in Fig. 21, the analysis is similar. Since GFD is a Hydrogen atom, any EFD (half of a GFD) will be both attracted and repelled. This process has similarity to Van der Walls forces. The difference is that the fluctuations are not related to charge position fluctuation but to charge transmutation at each half de-Broglie step, which happens in yoctoseconds.

Since the effect of these fluctuations on EFD comprising GFDs should be null, one would expect no

effect force nor deformation of the local metric. If one starts with a relaxed local metric, the GFD should land on a place where the Fabric of Space is also relaxed. That is the support for the caption in Fig. 23. Like in the Van der Walls forces, there will be a residual effect (Gravitation), that is, there will be an effective dilaton field generated and the corresponding GFD will follow the Quantum Lagrangian Principle and move to position x on Fig. 23, independently of them being GFD or EFD. The difference will be what happens in subsequent steps. In the case of an Electrostatic Fundamental Dilator, the local metric will be twisted and the k-vector (direction where the EFD is traveling) will be changed by  $\alpha_1$ . In the case of a Gravitational Fundamental Dilator the change in k-vector is just  $\alpha_0$ .

To calculate the position x and thus the value of the Force, one needs to map charges and 3D masses to number of dilators. One Kg4D of Hydrogen contains the same number of GFD dilators as one Kg4D of electrons (or protons) EFD.

## xi. Relating Charges and 4d Masses

First let's express Gauss law in terms of two interacting bodies of N= (1000 Avogadro)/ $\chi$  of dilators separated by one-meter distance. The reason for expressing Gauss Law in term of N is to have a term of comparison with Newton's Law, that is, both Gravitational and Electrostatic laws should be measuring the effect of the same number of dilators (N electrons or N Hydrogen Atoms).

For the Electrostatic Force between two one N-EFD dilator masses:

The standard MKS equation for electrostatic force between two one Kg4D bodies of N=1000 \* Avogadro electrons (X a.m.u. "electrons" or "protons") is giving by:

$$F = \frac{1}{4 \pi \varepsilon_0} \left(\frac{Coulombs}{meter}\right)^2 \left(\frac{EFD}{Coulombs}\right)^2 \left(\frac{N EFD}{\chi Kg4D}\right)^2 \left(\frac{Kg4D}{Kg3D}\right)^2 \left(Kg3D\right)^2$$
(86)

$$F = \mathbf{G}_{Electrostatic}^{4D} \left(\frac{Kg3D}{meter}\right)^2 \tag{87}$$

We make ((Kg4D)/(Kg3D)) = 1 that is, we impose a one-to-one mapping between a 3D volume (footprint of dilators in the 3D Hypersphere and the actual effective 4D volume). This is possible since we are using an effective 4D-Mass  $\chi$  a.m.u. per dilator. This factor  $\chi$  is justified in terms of anisotropy in and perpendicular to the FS. G= gravitational constant=6.6740810<sup>-11</sup>m<sup>3</sup>kg<sup>-1</sup>s<sup>-2</sup>

 $\chi$  is the EFD effective 4D-Mass in a.m.u.

$$G_{Electrostatic}^{4D} = \frac{1}{4 \pi \varepsilon_0 (Kg3D)^2} e^2 \left(\frac{N}{\chi}\right)^2$$
(88)

For the Gravitational Force between two one Kg4D dilator masses:

$$F = G\left(\frac{1}{meter}\right)^{2} \left(\frac{\left(\frac{N}{2\chi}\right) GFD}{Kg4D}\right)^{2} \left(\frac{Kg4D}{Kg3D}\right)^{2} \left(Kg3D\right)^{2} = G_{Gravitational}^{4D} \left(\frac{Kg3D}{meter}\right)^{2}$$
(89)

$$G_{Gravitational}^{4D} = G\left(\frac{1}{2\chi}\right)^2$$
(90)

So the ratio between the forces between two N-EFD (EGD) separated by 1 meter is given by:

$$\frac{G_{Electrostatic}^{4D}}{G_{Gravitational}^{4D}} = \frac{1}{4 \pi \varepsilon_0 G} (2Ne)^2 = 5.E + 30$$
(91)

One Kg4D of GFD contains half the number of EFD in the same displacement volume.

e) Force Unification

i. Quantum Gravity and Electrostatic Interaction Let's consider:

$$\vec{r_0} = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \text{ and } \vec{R}_0 = \begin{pmatrix} R \\ 0 \\ 0 \\ 0 \end{pmatrix}$$
(92)

Vector expressed in terms of xyzR coordinates After a de-Broglie cycle ( $\lambda_1$ ):

$$\vec{r} = \begin{pmatrix} r\alpha \\ r\beta \\ r\gamma \\ \lambda_1 \end{pmatrix} \text{ and } \vec{R}_0 = \begin{pmatrix} R \\ 0 \\ 0 \\ \lambda_1 \end{pmatrix} \text{ and } \vec{r}_0(\lambda_1) = \begin{pmatrix} 0 \\ 0 \\ 0 \\ \lambda_1 \end{pmatrix} \quad (93)$$

using director cosines  $\alpha$ ,  $\beta$ ,  $\gamma$ .

 $r_0(\lambda_1)$  is the unperturbed crest of our four-dimensional dilator 1 after a de-Broglie cycle.

 $\vec{r}$  is the position of that same probe dilator under the influence of dilator 2.

To analyze the interaction between a probe dilator and a 1 Kg4D body (N= 1000\*Avogadro and 1Kg4D contains  $N/\chi$  EFD or GFD), let's express the dilaton field for a single particle as:

$$\Psi_1(x, x_0) = \frac{\cos(k_1 \cdot x)}{(1 + f(k_1 \cdot (x - x_0)))}$$
(94)

Where

$$f(\vec{k}.\vec{r}) = \left|\vec{k}.\vec{r}\right| \tag{95}$$

There is a constraint on f(x), which is that 
$$\frac{df}{dx} = 0$$
 for x=0. For any other position,  $\frac{df}{dx} = \vec{k} \cdot \hat{r} = k_x$ .

For sake of plotting, we use a stepwise constant function, implemented by the function ladder[x].

Similarly, for a N-dilator body located at position  $\vec{R}$ :

$$\Psi_{2}(x, x_{0}) = \frac{N\cos(k_{2}.x)}{(1 + f(k_{2}.(x - R)))}$$
(96)

where the effect of the 1 N-dilator mass is implicit in the k2-vector and expressed by the factor N. Later, when representing 1 Kg4D mass, we will replace N by  $N/\chi$ . The wave intensity scales up with the number of particles N.

$$|| k_2 || = N || k_1 || \tag{97}$$

calculate effect То the of gravitational/electrostatic attraction, one needs to calculate the displacement on the dilaton field maximum around each particle or body due to interaction with the dilatons generated by the other body.

This is done for the lighter particle, by calculating the derivative of the waveform and considering the extremely fast varying gravitational wave from the macroscopic body always equal to one, since the maxima of these oscillations are too close to each other and can be considered a continuum.

In the asymptotic regime, the next x will be

 $\sin(k_1.x) = \cos(k_1.x)$ 

(100)

equal to the prior  $x_0$ , thus the saturation angle will be

 $k_1 x = 45^{\circ}$ 

planar waves propagating along R and the position of

A conclusion can be derived if one considers

or

The total waveform is given by:

$$\Psi_{Total}(x, x_0) = \Psi_1(x, x_0) + \Psi_2(x, x_0) = \frac{\cos(k_1 \cdot x)}{(1 + f(k_1 \cdot (x - x_0)))} + \frac{N\cos(k_2 \cdot x)}{(1 + f(k_2 \cdot (x - R)))}$$
(98)

such that:

 $x_0$  is the position in the prior de-Broglie step of the Universe expansion.

## ii. Why is the Lightspeed C the Limiting Speed in this Universe?

The reason can be seen by taking of the derivative equation (98) with respect to x and equating it to zero. Normally we consider that  $x_0=0$  as we are considering just the first step. Here we kept  $x_0$  to determine asymptotic behavior of dilators under extreme fields.

Under extreme fields, let's consider that  $\boldsymbol{\Phi}_2$  is saturated, that is, it doesn't change with x anymore. Under those conditions,  $\partial \Psi_2 / \partial x = 0$  and

$$\frac{\partial \Psi_{istal}}{\partial x} = \frac{\partial \Psi_1}{\partial x} = \frac{\left(k_1 cos[k_1 x]\right)}{\left(1 + f\left(k_1 (x - x_0)\right)\right)^2} + \frac{\left(-k_1 sin[k_1 x]\right)}{\left(1 + f\left(k_1 (x - x_0)\right)\right)} = 0$$
(99)

the next x points to a 45° from the R direction. This is the reason why the speed of light is the limiting speed when

> this paradigm is used for acceleration of masses. That is also the reason why a Lorentz transformation and Strict Relative were created. Without

the Quantum Lagrangian Principle and this proposed Universe Topology, the requirement of an accumulation point at 45° can only be achieved using a hyperbolic XYZ $\Phi$  spacetime. The Hypergeometrical Universe Theory not only provides the reason why things move but also provides the reason why they cannot be accelerated faster than the speed of light. This also provides the basis for alternative understanding of the passage of time, space dilation etc.

## iii. Relating Speed with the Passage of Time

Since at each de-Broglie step, the  $\Delta x$  associate with interaction depends upon the actual absolute speed (torsional of the local metric), when speeds are close to the speed of light, smaller  $\Delta x$  means slower dynamics (chemical or nuclear reaction dynamics). That in turn can be understood as slower passage of time. This means that, this theory states that the passage of time is constant. The laws of Physics are what needs change with speed.

This also means that a particle lifetime depends upon the torsion of its local metric. Nuclear energy is stored in internal rotational velocity, and thus on torsion of local metric. The effect of speed is to effectively relax the local metric, thus increasing the particle lifetime.

## iv. Deriving the Grand Unification Equation

To calculate the value of x in general, we consider that space is relaxed at time zero to make calculations easier and take the derivative of the dilaton field with respect to x in the proximity of the probe dilator ( $x_0=0$ ) and equate it to zero.

Notice that there is no need for any rescaling (Gravitation is much weaker than Electromagnetic interaction) or physical dimensions. Under those conditions:

$$\Psi_{Total}(x) = \Psi_1(x) + \Psi_2(x) = \frac{\cos(k_1 \cdot x)}{(1 + f(k_1 \cdot x))} + \frac{N\cos(k_2 \cdot x)}{(1 + f(k_2 \cdot (x - R)))}$$
(101)

$$\Psi_{Total}(x) = \frac{\cos(k_1.x)}{(1+f(k_1.x))} + \frac{N}{(1+f(k_2.(x-R)))}$$
(102)

For large N.

Taking the derivative at x=0:

$$\frac{d\Psi_{Total}(x)}{dx} = -k_1 \sin(k_1 \cdot x) + \frac{N \cdot k_2}{(k_2 \cdot R)^2} = 0 \quad (103)$$

$$k_1^2 x = \frac{N}{k_2 \cdot R^2}$$
(104)

$$x = \frac{N\lambda_1^{\ 2}\lambda_2}{(2\pi)^3 R^2}$$
(105)

since

$$\frac{df(k_1 \cdot x)}{dx} = 0 \tag{106}$$

$$\frac{df(k_2.(x-R))}{dx} = k_2 \tag{107}$$

$$R >> \lambda_1$$
 (108)

Where sine function was expanded into  $k_1 x$ .

a. Grand Unification Equation Let's define  $tan(\alpha_1)$  as:

$$tan(\alpha_1) = \frac{x}{\lambda_1} \delta = \frac{\left(\lambda_1 \lambda_2 \left(\frac{N}{\chi}\right)\right)}{\left(2\pi\right)^3 R^2} \delta \qquad (109)$$

 $\boldsymbol{\delta}$  is a parameter related to the type of interaction and the elasticity of space. Now we can calculate the acceleration as:

acceleration = 
$$c^2 \frac{dtan(\alpha_1)}{dr} = \frac{c^2 tan(\alpha_1)}{\lambda_1} = \frac{c^2 \lambda_2 \binom{N}{\chi}}{(2\pi)^3 R^2} \delta$$
 (110)

Now we can calculate the electrostatic force between two 1 Kg3D mass of EFD with R=1 meter. (N  $/\chi$ ) = Number of EFD per 1 Kg4D.

Remember that we are using a mapping

$$\left(\frac{Kg4D}{Kg3D}\right) = 1$$
 (111)

By allowing the actual 4DMass of a dilator to be given by  $\chi$  a.m.u..

$$F_{Electrostatic} = 1 Kg3D * acceleration = \frac{c^2 l_2 \left(\frac{N}{c}\right)}{\left(2\rho\right)^3} d\left(\frac{1}{Kg3D}\right) \left(\frac{Kg3D}{meter}\right)^2$$
(112)

 $(\mathbf{n}_{1})^{2}$ 

$$\lambda_{14D}^{EFD} = \frac{h}{c \,\chi \left(\frac{m_{4D}}{HydrogenMass}\right)} = \left(\frac{HydrogenMass}{\chi}\right) \frac{h}{c \,m_{4D}} (120)$$

$$\lambda_{14D}^{EFD} = \frac{0.292731h}{c \,\mathrm{m}_{4D}} = \frac{h^{GE}}{c \,\mathrm{m}_{4D}} = 3.83507 * 10^{-16} \,meters \quad (121)$$

$$h^{GE} = 0.292731h \tag{122}$$

where  $m_{4D}$ =Hydrogen Mass for a EFD (electron or proton).  $h^{GE}$  is the effective Planck's Constant for Hypervolumetric Dilaton Waves (see equation 65). Since the dilaton field for Gravitation is not the same as the 3D de-Broglie matter wavelength, one might consider using equation (65) for both EFD and GFD, thus

$$\frac{\lambda_{14D}^{EFD}}{\lambda_{14D}^{GFD}} = 2 \tag{123}$$

v. De-Broglie Step Characterization

To calculate the time for GFD (us and the whole Universe) to traverse a de-Broglie step:

 $\lambda_1 = 0.292731h/(m.c) = 1.91753 * 10^{-16}$  meters where

m = 2 Hydrogen Mass

 $t_1 = \lambda_1/c = 6.39621 * 10^{-25}$  seconds is the time to traverse a de-Broglie step of  $\lambda_1 = 0.191753$  femtometers

#### vi. Effective 4d Masses

Let's write our expression for the vacuum permittivity  $\epsilon_0$ :

$$\varepsilon_0 = \frac{2\pi^2 e^2}{\lambda_2 \ c^2 (Kg3D)} \tag{124}$$

Let's define  $\boldsymbol{\delta}$  such that the angle is measure as related to Gravitation:

$$\delta = \frac{\lambda_1}{R_0} \xi \tag{125}$$

Next we will explore a scenario where the space elasticity is considered constant throughout the Universe life. Let's analyze  $\delta$  for Gravitation for 1 Kg4D of dilators.

$$F_{Gravitational} = G\left(\frac{1}{2\chi}\right)^2 = \frac{\left(c^2\lambda_2 M\left(\frac{N}{2\chi}\right)^2\right)}{\left(2\pi\right)^3} \frac{\lambda_1}{R_0} \xi \quad (126)$$

$$F_{Electrostatic} = \mathbf{G}_{Electrostatic}^{4D} \left(\frac{Kg3D}{meter}\right)^2 \quad (113)$$

$$\mathbf{G}_{Electrostatic}^{4D} = \frac{c^2 \lambda_2 \begin{pmatrix} N \\ \chi \end{pmatrix}}{\left(2\pi\right)^3} \delta\left(\frac{1}{Kg3D}\right)$$
(114)

Comparing G<sub>Electrostatic</sub><sup>4D</sup> with the previous calculated value using Gauss' Law:

$$\frac{1}{4 \pi \varepsilon_0} e^2 \left(\frac{N}{\chi}\right)^2 \frac{1}{\left(Kg3D\right)^2} = \frac{c^2 \lambda_2 \left(\frac{N}{\chi}\right)^2}{\left(2\pi\right)^3} \delta\left(\frac{1}{Kg3D}\right) (115)$$

For electrostatics, we will assign  $\delta = 1$ , that is, the local surface is totally twisted by the dilaton field. Solving the equation for  $\lambda_2$ :

$$\lambda_2 = \frac{2\pi^2 e^2}{\varepsilon_0 c^2 (Kg3D)} = 6.36737 * 10^{-43}$$
(116)

 $\lambda_2$  is the Compton wavelength of 1000\*Avogadro of 1 4D a.m.u dilator. Subsequently, we will hide the Kg3D unit for convenience, but that unit is necessary to recover  $\epsilon_0$  proper units.

For the case of a 4DMass of 1 a.m.u., one can calculate the effective electron 4DMass :

$$\frac{\lambda_2}{\frac{\lambda_1(a.m.u.)}{1000\%(d-1)}} = \frac{\left(\frac{1}{\chi}\right)}{1} \tag{117}$$

$$\lambda_{\rm n} = \frac{h}{c \ a.m.u.} = 1.3205 \ femtometer \qquad (118)$$

$$\chi = \frac{\lambda_1}{\lambda_2 * 1000 * Avogrado} = 1.70918 \text{ a.m.u.} (119)$$

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$$\xi = \frac{(2\pi)^3 GR_0}{c^2 \lambda_2 N^2 \lambda_1} = 283,087$$
(127)

G can be written as:

$$G(R) = \frac{c^2 \lambda_2 N^2}{\left(2\pi\right)^3} \frac{\lambda_1}{R} \xi$$
(128)

Let's calculate the gravitational force acting on a mass m:

$$F = m a = m c^{2} \frac{\P tan(\partial_{0})}{\P /_{1}} = (m c^{2}) \frac{\partial' x}{/_{1}^{2}} = m \frac{c^{2} \partial'}{/_{1}^{2}} x = m (2\rho f)^{2} x$$
(129)

Thus, the natural frequency of gravitational waves is:

$$f = \frac{1}{2\pi} \sqrt{\frac{c^2 \delta}{\lambda_1^2}} = \frac{c^2}{2\pi\lambda_1} \sqrt{\frac{\lambda_1 \xi}{R_0}} = 111,101 Hz$$
(130)

Notice that this is not dependent upon any masses, only dependent upon the assumption of constant space elasticity. That should be the best frequency to look for or to create gravitational waves. Of course, Hubble red shift considerations should be used to determine the precise frequency from a specific region of the universe. The complete Gravitatostatic equation is given by:

$$F_{Gravitational} = \left\{ \frac{c^2 \lambda_2 \left(\frac{N}{\chi}\right)^2}{\left(2\pi\right)^3} \frac{\lambda_1}{R_0} \xi \right\} \frac{(m1 * m2)}{R^2}$$
(131)

Later we will derive a Gyrogravitational version of this equation.

## vii. Grand Unification Supersymmetry

As the dimensional age of the universe becomes smaller, the relative strength of gravitation interaction increases. Conversely, one expects that as the universe expands gravity will become weaker and weaker. This and the four-dimensional light speed expanding hyperspherical universe topology explain the acceleration of expansion without the need of antigravitational dark matter.

We can now calculate the radius of the Universe when Gravitational and Electrostatic forces were equal. Just make  $\delta$ =1 and calculate  $R_0$ :

$$\delta = \frac{\lambda_1}{R_0} \xi \tag{132}$$

 $R_0 = \xi \ \lambda_1 = 283,087 \ \lambda_1 = 1.08566 * 10^{-10} = 1.08566 \ Angstroms$ (133)

$$t_0 = \frac{R_0}{c} = 3.62137 * 10^{-19} seconds \quad (134)$$

Thus, when  $R_0$  was smaller than 283,087 times  $\lambda_1$  (at 3.6E-19s into the Universe life), gravitational and electromagnetic interactions had equal strength. They were certainly indistinguishable when the radius of the universe was one de-Broglie wavelength long. This section is called Grand unification supersymmetry, because condition in equation (132) plays the role of the envisioned group theoretical supersymmetry of the grand unification force. Of course, it has a geometrical interpretation. At that exact radius, an elastic spring constant of the fabric of space allows for a change in the local normal such that it becomes parallel to the redirection of k-vector of a freely moving dilator.

## viii. Quantum Gravity

Quantum aspects can be recovered by not using fast oscillation approximation. It is also important to notice that equations (102) and (103) can be used to calculate the interaction between any particles or to perform quantum mechanical calculations in a manner similar to molecular dynamic simulations. The quantum character is implicit in the de-Broglie wavelength stepwise quantization. It is also relativistic as it will become clear when one analyzes magnetism next.

ix. Magnetic Interaction

a. The Derivation of the Biot-Savart Law

Let's consider two wires with currents  $i_1$  and  $i_2$  separated by a distance R. Let's consider  $i_2$  on the element of length  $dl_2$  as the result of a moving charge of mass of 1Kg4D of electromagnetic fundamental dilators. This is done to obtain the correct scaling factor.

Without loss of generality, let's consider that the distance between the two elements of current is given by:

$$r_{0} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ R \end{bmatrix} and \quad R = \frac{R}{\sqrt{3}} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \end{bmatrix} and \quad \hat{R} = \frac{1}{\sqrt{3}} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \end{bmatrix}$$
(135)

The velocities are:

$$V_{1} = \begin{pmatrix} v_{1}\alpha_{1} \\ v_{1}\beta_{1} \\ v_{1}\gamma_{1} \\ c \end{pmatrix} and V_{2} = \begin{pmatrix} v_{2}\alpha_{2} \\ v_{2}\beta_{2} \\ v_{2}\gamma_{2} \\ c \end{pmatrix}$$
(136)

Since one expects that the motion of particle 2 will produce a drag on the particle 1 along particle 2 direction of motion. Particle 1 is located at position  $R(0 \ 0 \ 0 \ 1)$ , just prior to the next de-Broglie Universe expansion step.

Particle 2 was placed at position  $\frac{R}{\sqrt{3}}\begin{pmatrix} 1 & 1 & 1 & 0 \end{pmatrix}$ and traveling at speed  $V_2 = \begin{pmatrix} \upsilon_2 \alpha_2 & \upsilon_2 \beta_2 & \upsilon_2 \gamma_2 & c \end{pmatrix}$ . The retarded potential time difference is  $\frac{R}{c} = \frac{\sqrt{2}R}{\sqrt{2}c}$  just to remind us that the actual light speed is  $\sqrt{2}c$  and it traverses  $\sqrt{2}R$  in a 4D spatial manifold at 45 degrees. The direction of the drag will be:

$$\hat{r} + \frac{\vec{V}_2}{c} = \frac{1}{N_{Factor}} \left( \left( \begin{array}{c} \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \\ -1 \end{array} \right) + \left( \begin{array}{c} \frac{V_2}{c} \alpha_2 \\ \frac{V_2}{c} \beta_2 \\ \frac{V_2}{c} \gamma_2 \\ 1 \end{array} \right) \right)$$
(137)

The force will depend upon the distance defined by  $\frac{R}{\sqrt{3}}(1 \ 1 \ 1 \ 0)$ . The drag projection on reference frame of particle 1, onto that vector should be made unit such that one can properly evaluate the force modulus. The Normalization Factor (NFactor) is given by:

$$N_{Factor} = \begin{bmatrix} \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 & -\frac{\nu_1}{c}\alpha_1 \\ 0 & 1 & 0 & -\frac{\nu_1}{c}\beta_1 \\ 0 & 0 & 1 & -\frac{\nu_1}{c}\gamma_1 \\ \frac{\nu_1}{c}\alpha_1 & \frac{\nu_1}{c}\beta_1 & \frac{\nu_1}{c}\gamma_1 & 1 \end{bmatrix} \begin{bmatrix} \frac{1}{\sqrt{3}} + \frac{\nu_2}{c}\alpha_2 \\ \frac{1}{\sqrt{3}} + \frac{\nu_2}{c}\beta_2 \\ \frac{1}{\sqrt{3}} + \frac{\nu_2}{c}\gamma_2 \\ 0 \end{bmatrix}$$
(138)

$$N_{Factor} = \begin{bmatrix} \frac{1}{\sqrt{3}} + \frac{v_1}{c}\alpha_1 & \frac{1}{\sqrt{3}} + \frac{v_1}{c}\beta_1 & \frac{1}{\sqrt{3}} + \frac{v_1}{c}\gamma_1 & 1 \end{bmatrix} \begin{bmatrix} \frac{1}{\sqrt{3}} + \frac{v_2}{c}\alpha_2 \\ \frac{1}{\sqrt{3}} + \frac{v_2}{c}\beta_2 \\ \frac{1}{\sqrt{3}} + \frac{v_2}{c}\gamma_2 \\ 0 \end{bmatrix}$$
(139)

$$N_{Factor} = 1 + \frac{V_1 \cdot \hat{R}}{c} + \frac{V_2 \cdot \hat{R}}{c} + \frac{V_1 \cdot V_2}{c^2}$$
(140)

This normalization factor will be deployed at the end of the calculation. If it is deployed at the beginning, there wouldn't be any change in phase due to interaction. Simple geometry (see Fig. 29) in 4D reveals that:

$$\alpha = atan\left(\frac{\upsilon_2 \alpha_2\left(\frac{R}{c}\right)}{R}\right) = atan\left(\frac{\upsilon_2 \alpha_2}{c}\right) \quad (141)$$

$$\cos(\alpha') = \cos\left(-\frac{\pi}{4} + \alpha\right) = \cos\left(\frac{\pi}{4}\right)\cos(\alpha) + \sin(\alpha)\sin\left(\frac{\pi}{4}\right)$$
(142)

$$\cos(\alpha') = \frac{\sqrt{2}\cos(\alpha)}{2} \left[1 + \tan(\alpha)\right] \quad (143)$$

$$\cos(\alpha') \propto 1 + \frac{\upsilon_2 \alpha_2}{c} \tag{144}$$

The last part of the identity above shows the position where Particle would be (referred from Particle

2) after the Universe expanded by R radially. This represents the maximum drag possible where Particle 1 would imitate Particle 2. The force calculation allows for Particle 1 to be pushed into that direction. The amount of drag is related to the intensity of the force between dilators.

After one de-Broglie cycle:

$$r_{0} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ R \end{bmatrix} and (r - r_{0}) = \Delta \begin{bmatrix} \left(\frac{1}{\sqrt{3}} + \frac{\nu_{2}}{c}\alpha_{2}\right) \\ \left(\frac{1}{\sqrt{3}} + \frac{\nu_{2}}{c}\beta_{2}\right) \\ \left(\frac{1}{\sqrt{3}} + \frac{\nu_{2}}{c}\gamma_{2}\right) \\ 0 \end{bmatrix}$$
(145)

( ,



*Figure 29:* Derivation of Biot-Savart law using spacetime waves. This showcase the geometry associated with the two interacting elements of current

In the case of currents, the velocities are not relativistic and one can make the following approximations to the five-dimensional rotation matrix or metric:  $cosh(\alpha_1) \approx 1$  and  $sinh(\alpha_1) \approx v_i/c$  where  $v_i$  is the velocity along the axis i. The k-vectors for the two electrons on the static reference frame are given by:

$$k_{1} = \frac{2\pi}{\lambda_{1}} \begin{bmatrix} \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 & -\frac{\nu_{1}}{c}\alpha_{1} \\ 0 & 1 & 0 & -\frac{\nu_{1}}{c}\beta_{1} \\ 0 & 0 & 1 & -\frac{\nu_{1}}{c}\gamma_{1} \\ \frac{\nu_{1}}{c}\alpha_{1} & \frac{\nu_{1}}{c}\beta_{1} & \frac{\nu_{1}}{c}\gamma_{1} & 1 \end{bmatrix}$$

(146)

$$k_{1} = \frac{2\pi}{\lambda_{1}} \left[ \frac{1}{\sqrt{3}} + \frac{v_{1}}{c}\alpha_{1} + \frac{1}{\sqrt{3}} + \frac{v_{1}}{c}\beta_{1} + \frac{1}{\sqrt{3}} + \frac{v_{1}}{c}\gamma_{1} + \frac{1}{c}\alpha_{1} + \frac{v_{1}}{c}\alpha_{1} + \frac{v_{1}}{c}\beta_{1} - \frac{v_{1}}{c}\gamma_{1} \right]$$
(147)

Similarly:

$$k_{2} = \frac{2\pi}{\lambda_{2}} \begin{bmatrix} \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 & -\frac{\nu_{2}}{c}\alpha_{2} \\ 0 & 1 & 0 & -\frac{\nu_{2}}{c}\beta_{2} \\ 0 & 0 & 1 & 0 & -\frac{\nu_{2}}{c}\beta_{2} \\ \frac{\nu_{2}}{c}\alpha_{2} & \frac{\nu_{2}}{c}\beta_{2} & \frac{\nu_{2}}{c}\gamma_{2} & 1 \end{bmatrix}$$
(148)

$$k_{2} = \frac{2\pi}{\lambda_{2}} \left[ \frac{1}{\sqrt{3}} + \frac{\nu_{2}}{c} \alpha_{2} - \frac{1}{\sqrt{3}} + \frac{\nu_{2}}{c} \beta_{2} - \frac{1}{\sqrt{3}} + \frac{\nu_{2}}{c} \gamma_{2} - 1 + \frac{\nu_{2}}{c} \alpha_{2} - \frac{\nu_{2}}{c} \beta_{2} - \frac{\nu_{2}}{c} \gamma_{2} \right]$$
(149)

The wave intensities at  $\vec{r}$  are:

$$\Psi_1(x, y, z, r, \Phi) = \frac{\cos(k_1 \cdot (r - r_0))}{(1 + f(k_1 \cdot (r - r_0)))}$$
(150)

$$\Psi_{2}(x, y, z, r, \Phi) = \frac{N \cdot \cos(k_{2} \cdot (r - R))}{(1 + f(k_{2} \cdot (r - R)))} \cong \frac{N}{(1 + f(k_{2} \cdot (r - R)))}$$
(151)

Where N= 1000 Avogadro/ $\chi$   $\lambda$  = de-Broglie wavelength of a a.m.u (atomic mass unit) particle,  $\lambda_2$ =de-Broglie wavelength of a 1Kg4D particle= $\lambda_1/N$ .

To solve this optimization problem, we will find that solves this equation:

$$\frac{d\Psi_1(\Delta)}{d\Delta} = \nabla \Psi_2(x, y, z, r, \Phi) \hat{R}$$
(152)

this is equivalent to just summing up the rows in the gradient vector on the right-side equation. Now one can calculate:

$$k_{1}.(r-r_{0}) = \left(\frac{2\pi\Delta}{\lambda_{1}}\right) \left(1 + \frac{V_{1}.\hat{R}}{c} + \frac{V_{2}.\hat{R}}{c} + \frac{V_{1}.V_{2}}{c^{2}}\right)$$
(153)

$$\frac{d(k_1.(r-r_0))}{d\Delta} = \left(\frac{2\pi}{\lambda_1}\right) \left(1 + \frac{V_1.\hat{R}}{c} + \frac{V_2.\hat{R}}{c} + \frac{V_1.V_2}{c^2}\right)$$
(154)

$$\hat{R} = \frac{1}{\sqrt{3}} \begin{bmatrix} \hat{i} & \hat{j} & \hat{k} \end{bmatrix}$$
(155)

where x[4]=0 because  $\lambda_1$  refers to the dilator wavelength which adjusts itself to match the deBroglie step.

$$\nabla f(k_1.(r-r_0)) = 0 \text{ due to } |k_1.(r-r_0)| < <2\pi$$
 (156)

Similarly:

$$k_{2}(r-R) = \frac{2\pi}{\lambda_{1}} \left[ \left( \frac{1}{\sqrt{3}} + \frac{v_{2}}{c} \alpha_{2} \right) \left( \frac{1}{\sqrt{3}} + \frac{v_{2}}{c} \beta_{2} \right) \left( \frac{1}{\sqrt{3}} + \frac{v_{2}}{c} \gamma_{2} \right) \left( 1 - \frac{v_{2}}{c} \alpha_{2} - \frac{v_{2}}{c} \beta_{2} - \frac{v_{2}}{c} \gamma_{2} \right) \right] X \quad (157)$$

$$K = \begin{pmatrix} r \left( \frac{1}{\sqrt{3}} + \frac{v_{2}}{c} \alpha_{2} \right) - \frac{R}{\sqrt{3}} \\ r \left( \frac{1}{\sqrt{3}} + \frac{v_{2}}{c} \beta_{2} \right) - \frac{R}{\sqrt{3}} \\ r \left( \frac{1}{\sqrt{3}} + \frac{v_{2}}{c} \gamma_{2} \right) - \frac{R}{\sqrt{3}} \\ 0 \end{pmatrix}$$

$$(158)$$

$$k_2.(r-R) \approx \frac{2\pi R}{\lambda_2} \left( 1 + \frac{V_2.\hat{R}}{c} \right)$$
(159)

where x[4]=0 because  $\lambda_2$  is 1/N of  $\lambda_1$  and thus there is always a very close r that matches a  $2\pi n$  condition. And:

$$\nabla f(k_2.(r-R)) \cong \nabla \left( \frac{2\pi}{\lambda_2} \left[ \left( \frac{1}{\sqrt{3}} + \frac{v_2}{c} \alpha_2 \right) \left( \frac{1}{\sqrt{3}} + \frac{v_2}{c} \beta_2 \right) \left( \frac{1}{\sqrt{3}} + \frac{v_2}{c} \gamma_2 \right) \left( \frac{1}{\sqrt{3}} - \frac{v_2}{c} \alpha_2 - \frac{v_2}{c} \beta_2 - \frac{v_2}{c} \gamma_2 \right) \right] X \right]$$
(160)

$$X = \begin{pmatrix} \frac{x}{\sqrt{3}} - \frac{R}{\sqrt{3}} \\ \frac{y}{\sqrt{3}} - \frac{R}{\sqrt{3}} \\ \frac{z}{\sqrt{3}} - \frac{R}{\sqrt{3}} \\ 0 \end{pmatrix} \nabla (f(k_2.(r-R))) \cdot \hat{R} = \frac{2\pi}{\lambda_2} \left(1 + \frac{V_2.\hat{R}}{c}\right)$$
(161)

Hence:

$$\nabla \Psi_1(\Delta, \Phi) \cdot \hat{R} = -\frac{\nabla (k_1 \cdot (r - r_0))}{(1 + f(k_1 \cdot (r - r_0)))} \sin(k_1 \cdot (r - r_0)) \cong -k_1 \cdot (r - r_0) \frac{d(k_1 \cdot (r - r_0))}{d\Delta}$$
(162)

$$\nabla \Psi_{1}(\Delta, \Phi) \hat{R} = -\left(\frac{2\pi}{\lambda_{1}}\right)^{2} \left(1 + \frac{V_{1} \hat{R}}{c} + \frac{V_{2} \hat{R}}{c} + \frac{V_{1} V_{2}}{c^{2}}\right)^{2} \Delta$$
(163)

$$\nabla \Psi_{2}(x, y, z, r, \Phi) \hat{R} = -\frac{N \cdot \nabla (k_{2} \cdot (r - R))}{\left(\frac{2\pi}{\lambda_{2}}(1 + \frac{V_{2} \cdot \hat{R}}{c})R\right)^{2}} = -\frac{N \lambda_{2}}{2\pi} \frac{\left(1 + \frac{V_{2} \cdot \hat{R}}{c}\right)}{\left(1 + \frac{V_{2} \cdot \hat{R}}{c}\right)^{2}} \frac{1}{R^{2}}$$
(164)

$$\nabla \Psi_2(x, y, z, r, \Phi) \hat{R} \cong -\frac{N\lambda_2}{2\pi R^2 \left(1 + \frac{V_2 \hat{R}}{c}\right)}$$
(165)

Here we calculate  $\Delta$  and replace it with  $\frac{\Delta}{NFactor}$ ,

$$\frac{\Delta}{NFactor} = \frac{N\lambda_1^2 \lambda_2}{(2\pi)^3 R^2} \frac{1}{\left(1 + \frac{V_1 \cdot \hat{R}}{c} + \frac{V_2 \cdot \hat{R}}{c} + \frac{V_1 \cdot V_2}{c^2}\right)^2 \left(1 + \frac{V_2 \cdot \hat{R}}{c}\right)}$$
(166)

$$\Delta = \frac{N\lambda_1^2 \lambda_2}{(2\pi)^3 R^2} \frac{1}{\left(1 + \frac{V_1 \cdot \hat{R}}{c} + \frac{V_2 \cdot \hat{R}}{c} + \frac{V_1 \cdot V_2}{c^2}\right) \left(1 + \frac{V_2 \cdot \hat{R}}{c}\right)}$$
(167)

$$\Delta \cong \frac{N\lambda_1^2 \lambda_2}{(2\pi)^3 R^2} \left\{ 1 - \frac{V_1 \cdot \hat{R}}{c} + \frac{(V_1 \cdot \hat{R})(V_2 \cdot \hat{R}) - V_1 \cdot V_2}{c^2} \right\}$$
(168)

Now we will start considering attraction or repulsion components. Negative contributions are repulsion. Positive ones are attraction. In the analysis, we should consider electron-electron and electronnuclei interactions, that is, to derive Biot-Savart Law from first principles, we should consider the dilaton waves of all components of the wire and not only the electrons. The force acting upon wire 1 is due to e1-e2 repulsion, e1-p2 attraction, p1-e2 attraction, p1-p2 repulsion, that is, there are four force components acting upon wire 1. The same is valid for wire 2. Similarly:

$$\Delta_{ee} = -\frac{N\lambda_1^2 \lambda_2}{(2\pi)^3 R^2} \left( 1 - \frac{V_1 \cdot \hat{R}}{c} + \frac{\left(V_1 \cdot \hat{R}\right)^2 + \left(V_2 \cdot \hat{R}\right)^2 + \left(V_1 \cdot \hat{R}\right)\left(V_2 \cdot \hat{R}\right) - V_1 \cdot V_2}{c^2} \right)$$
(169)

$$\Delta_{ep} = \frac{N\lambda_1^2 \lambda_2}{(2\pi)^3 R^2} \left( 1 - \frac{V_1 \cdot \hat{R}}{c} + \frac{\left(V_1 \cdot \hat{R}\right)^2}{c^2} \right) \text{ since } V_2 = 0$$
(170)

$$\Delta_{pe} = \frac{N\lambda_1^2 \lambda_2}{(2\pi)^3 R^2} \left( 1 + \frac{\left(V_2 \cdot \hat{R}\right)^2}{c^2} \right) \text{ since } V_1 = 0$$
(171)

$$\Delta_{pp} = -\frac{N\lambda_1^2 \lambda_2}{(2\pi)^3 R^2} (1) \, since \, V_1 = V_2 = 0 \tag{172}$$

$$\Delta_{total} = \Delta_{ee} + \Delta_{ep} + \Delta_{pe} + \Delta_{pp} = \frac{N\lambda_1^2\lambda_2}{(2\pi)^3R^2} \frac{(V_1.\hat{R})(V_2.\hat{R}) - V_1.V_2}{c^2}$$
(173)

Where p stands for proton and e for electron.

$$r = \frac{N\lambda_1^2 \lambda_2}{(2\pi)^3} \left( \frac{V_2 \cdot \hat{R}}{c} \frac{V_1 \cdot \hat{R}}{c} - \frac{V_1 \cdot V_2}{c^2} \right) \frac{\hat{R}}{R^2}$$
(174)

Using  $a \times (b \times c) = b(a.c)-c(a.b)$ :

$$r = \frac{N\lambda_1^2 \lambda_2}{(2\pi)^3 c^2} \Big( V_1 \otimes (V_2 \otimes \hat{R}) \Big) \frac{\hat{R}}{R^2}$$
(175)

The number of dilators can be 1000\*Avogadro/ $\chi$  for Kg4D or Kg3D, or 1/e for a Coulomb:

The force between two 1 Kg3D dilators separated by 1 meter is given by:

$$F = m_{03D}c^2 \frac{d\tan(\alpha_{\tau})}{d\tau} = (Kg3D)\left(\frac{N}{\chi}\right)c^2 \frac{r}{\lambda_1^2}$$
(176)

$$F = \left(\frac{N}{\chi}\right)^2 \frac{\lambda_2}{(2\pi)^3 (Kg3D)} \left(V_1 \otimes (V_2 \otimes \hat{R})\right) \frac{(Kg3D)^2}{(meter)^2}$$
(177)

To scale this force into the force between two Coulomb charges traveling with velocities  $v_1$  and  $v_2$  one just have to multiply the equation by  $(1C/Ne)^2$ :

$$F = \left(\frac{1Coulomb}{e}\right)c^2 \frac{r}{\lambda_1^2} = \left(\frac{1Coulomb}{e}\right)^2 \frac{\lambda_2 v_1 v_2}{(2\pi)^3} \left( \left(dl_1 \otimes (dl_2 \otimes \hat{R})\right) \right) \frac{\hat{R}}{R^2} = \left(\frac{1Coulomb}{e}\right)^2 \frac{\lambda_2 j_1 j_2 (Kg3D)}{(2\pi)^3 e^2} \left( \left(dl_1 \otimes (dl_2 \otimes \hat{R})\right) \right) \frac{\hat{R}}{R^3}$$
(178)

The Biot-Savart law can be written as:

$$dF = \frac{\mu_0 I_1 I_2}{4\pi} \frac{\left(dl_1 dl_2\right)}{\left|\vec{x}_{12}\right|^3} \vec{x}_{12}$$
(179)

Comparing the two equations one obtains:

$$\frac{\mu_0}{4\pi} = \frac{\lambda_2 (1Kg3D)}{(2\pi)^3 e^2}$$
(180)

Thus

$$\mu_0 = \frac{\lambda_2(Kg3D)}{2\pi^2 e^2}$$
(181)

Without that extra unit (Kg3D),  $\mu_0$  will not have the appropriate units. The same is valid for  $\epsilon_0$ .

From equation (124)

$$\varepsilon_0 = \frac{2\pi^2 e^2}{\lambda_2 \ c^2 (Kg3D)} \tag{182}$$

Thus

$$\mu_0 \cdot \varepsilon_0 = \frac{\lambda_2 (Kg3D)}{2\pi^2 e^2} \frac{2\pi^2 e^2}{\lambda_2 \ c^2 (Kg3D)} = \frac{1}{c^2} \quad (183)$$

Thus one recovers the relationship between  $\epsilon_0$  and  $\mu_0$ . We recovered the Biot-Savart law for infinitesimal elements of current. This was achieved by considering the many contributions of positive and negative center charges and using the low velocity approximation. All

dilators contribute to electromagnetism and not just electrons.

Within a Tokamak Nuclear Fusion device, currents are both positive and negative (hot plasma) and velocities are relativistic. Under these conditions one should use the non-approximated first half identity from equation

$$\Delta = \frac{N\lambda_1^2 \lambda_2}{(2\pi)^3 R^2} \frac{1}{\left(1 + \frac{V_1 \cdot \hat{R}}{c} + \frac{V_2 \cdot \hat{R}}{c} + \frac{V_1 \cdot V_2}{c^2}\right) \left(1 + \frac{V_2 \cdot \hat{R}}{c}\right)}$$
(184)

$$\frac{\Delta}{NF} = \frac{N\lambda_1^2 \lambda_2}{(2\pi)^3 R^2} \frac{1}{\left(1 + \frac{V_1 \cdot \hat{R}}{c} + \frac{V_2 \cdot \hat{R}}{c} + \frac{V_1 \cdot V_2}{c^2}\right)^2 \left(1 + \frac{V_2 \cdot \hat{R}}{c}\right)}$$
(185)

$$\Delta = \frac{N\lambda_1^2 \lambda_2}{(2\pi)^3 R^2} \frac{1}{\left(1 + \frac{V_1 \hat{R}}{c} + \frac{V_2 \hat{R}}{c} + \frac{V_1 V_2}{c^2}\right) \left(1 + \frac{V_2 \hat{R}}{c}\right)}$$
(186)

$$\Delta \simeq \frac{N\lambda_1^2 \lambda_2}{(2\pi)^3 R^2} \left\{ 1 - \frac{V_1 \cdot \hat{R}}{c} + \frac{(V_1 \cdot \hat{R})(V_2 \cdot \hat{R}) - V_1 \cdot V_2}{c^2} \right\} (187)$$

The force between two 1 Kg4D dilators is given by:

$$F = m_{03D}c^2 \frac{d\tan(\alpha_r)}{d_r} = (Kg3D) \left(\frac{N}{\chi}\right) c^2 \frac{r}{\lambda_1^2} \quad (188)$$

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$$F = (Kg3D) \left(\frac{N}{\chi}\right)^2 \frac{\lambda_2}{(2\pi)^3 R^2} \frac{1}{\left(1 + \frac{V_1 \cdot \hat{R}}{c} + \frac{V_2 \cdot \hat{R}}{c} + \frac{V_1 \cdot V_2}{c^2}\right) \left(1 + \frac{V_2 \cdot \hat{R}}{c}\right)} \hat{R}$$
(189)

To scale this force into the force between two Coulomb charges traveling with velocities  $v_1$  and  $v_2$  one

just has to multiply the equation by  $(\frac{1C}{Ne})^2$ :

$$F = \frac{\mu_0 c^2 C_1 C_2}{4\pi} \frac{1}{\left(1 + \frac{V_1 \cdot \hat{R}}{c} + \frac{V_2 \cdot \hat{R}}{c} + \frac{V_1 \cdot V_2}{c^2}\right) (1 + \frac{V_2 \cdot \hat{R}}{c})} \frac{\hat{R}}{R^2}$$
(190)

$$F = \frac{C_1 C_2}{4\pi\varepsilon_0} \frac{1}{\left(1 + \frac{V_1 . \hat{R}}{c} + \frac{V_2 . \hat{R}}{c} + \frac{V_1 . V_2}{c^2}\right) (1 + \frac{V_2 . \hat{R}}{c})} \frac{\hat{R}}{R^2}$$
(191)

Where C1 and C2 are charges traveling at  $v_1$  and  $v_2$  and c is the speed of light. The asymmetry

with respect to  $v_2$  is not lost in our considerations. Now, we will not dwell on it since the small velocity approximation matched Biot-Savart Law and we also recovered the Gerber<sup>21,22</sup> Potential (thus recovering the Mercury Perihelion Precession Measurements). In addition, there are experimental results by NASA (EM Drive) that indicate the possibility of propulsion based on electromagnetic fields (moving charges) and that might be related to these results.

#### x. Gyrogravitation-Electromagnetism Unification

Similarly, one can derive the Gravitational Biot-Savart equation by simple analogy to our derivation of the Gravitation Law.

The limit with zero velocity independent term corresponds to the steady state gravitational field (Newton's Law).

$$F_{Gravitational} = \left[ \left(\frac{N}{\chi}\right) \frac{\lambda_{1}c^{2}}{(2\pi)^{3}} \frac{\lambda_{1}}{R_{0}} \xi \right] M_{1}M_{2} \frac{1}{\left(1 + \frac{V_{1}\cdot\hat{R}}{c} + \frac{V_{2}\cdot\hat{R}}{c} + \frac{V_{1}\cdot V_{2}}{c^{2}}\right) (1 + \frac{V_{2}\cdot\hat{R}}{c})} \frac{\hat{R}}{R^{2}}$$
(192)

$$G = \left[ \left( \frac{N}{\chi} \right) \frac{\lambda_1 c^2}{\left(2\pi\right)^3} \frac{\lambda_1}{R_0} \xi \right]$$
(193)

$$F_{Gravitational} = \left[ \left( \frac{N}{\chi} \right) \frac{\lambda_1 c^2}{\left(2\pi\right)^3} \frac{\lambda_1}{R_0} \xi \right] M_1 M_2 \frac{\hat{R}}{R^2}$$
(194)

Notice that the value of the Gravitational Constant G is inversely proportional to the 4D Radius of the Universe  $R_0$ . This means that at earlier epochs, Gravitation was stronger and at a precise time in the life of the Universe all forces had the same strength. It also means that Stellar Candles would contain smaller masses in the past than they do at later epochs. This

means that current measurements of distances across the Universe based upon Stellar Candles might not work properly and indicate unreasonable large distance incompatible with the age of the Universe.

For non-zero relative speed, we obtain the Hypergeometrical Universe Law of Gravitation:

$$F = GM_{1}M_{2} \frac{1}{\left(1 + \frac{V_{1}\hat{R}}{c} + \frac{V_{2}\hat{R}}{c} + \frac{V_{1}V_{2}}{c^{2}}\right)\left(1 + \frac{V_{2}\hat{R}}{c}\right)} \frac{\hat{R}}{R^{2}}$$
(195)

$$F \cong GM_1M_2\frac{\hat{R}}{R^2}\left(1 - \frac{V_1.\hat{R}}{c} + \frac{\left(V_1.\hat{R}\right)^2 + \left(V_2.\hat{R}\right)^2 + \left(V_1.\hat{R}\right)\left(V_2.\hat{R}\right) - V_1.V_2}{c^2}\right)$$
(196)

Equations (190-191) express the force for two elements of charge in motion. They recover Gauss Law under conditions of rest and have identical form as equation (195). This means that a single equation describes everything we know about electrostatics, electromagnetism and gravitation.

The Force derivation uses a boundary condition where the dilator is at rest with respect to the FS. This is

equivalent to say that all forces are partial derivatives with respect to R while keeping velocity constant. This is important since the force is velocity dependent. To obtain a potential from which one can calculate dynamics, one need to integrate the equation (195) with respect to R.

$$V_{2}(R, V_{1}, V_{2}) = \frac{GM_{1}}{\left(1 + \frac{V_{1}.\hat{R}}{c} + \frac{V_{2}.\hat{R}}{c} + \frac{V_{1}.V_{2}}{c^{2}}\right)\left(1 + \frac{V_{2}.\hat{R}}{c}\right)} \frac{1}{R}$$
(197)

This equation was derived under the regimen of weak (normal) gravitational pull. It would be easy to derive the same equation for conditions in the surroundings of a Black Hole. One would just not use the derivative approximations. This means that there is Antigravity (weakening of Gravitation) right within the Law of Gravitation. If for a moment one sets the referential frame on body 1, thus having V1=0, the Gravitational Force on F2 becomes:

$$F_{2} = GM_{1}M_{2} \frac{1}{\left(1 + \frac{V_{2}.\hat{R}}{c}\right)^{2}} \frac{\hat{R}}{R^{2}} \approx GM_{1}M_{2} \frac{\hat{R}}{R^{2}} \left(1 - 2\left(\frac{V_{2}.\hat{R}}{c}\right) + 3\left(\frac{V_{2}.\hat{R}}{c}\right)^{2} - 4\left(\frac{V_{2}.\hat{R}}{c}\right)^{3}...\right)$$
(198)

This is a much more complex view of Gravitation and it is a view derived from a more fundamental model. It reduces to Newton's Law at zero relative velocity. This might be involved in the production of double jets in Black Holes.

## f) Discussion

The Hypergeometrical Universe theory nonparametrized predictions were shown to consistently reproduce the observational astronomic data better than the best current 6-parameters Friedmann- Lemaitre Cosmological Fitting. Application of this model to different region fittings yielded different set of parameters (Dark Energy/Dark Matter related parameters. That indicates that this General Relativity variant using Dark Energy as Cosmological Constant and Dark Matter as added Gravitational pull fails at large in describing the Universe.

Conversely, the reproduction of observational astronomic data by HU provides some level of support for the hypothesis that G is epoch-dependent and proportional to the inverse 4D radius and that there might be a systematic error in converting the

Luminosities into distances. The scaling up of the gravitational constant G is an integral part of the Hypergeometrical Universe rationale since it is how one derives the HU Gyrogravitational Law.

This scaling up also provides support for the hypothesis of *Epoch Covariance*.

As space contracts and G increases, stars and galaxies also contract and so do their energy output  $(G(d)^{-3}$  scaling factor). This is important otherwise astronomical observations would indicate a distorted picture of weaker Supernovas contained in unusually luminous Galaxies.

Stronger gravity also means that star/galaxy formation will occur ahead of constant-G models predictions. Since HU provides a clear description of how space expands, cosmological simulations could be simplified. Gyro-gravitation and Gyro-electromagnetism will add some complexity.<sup>23</sup>

## i. Influence of Epoch-Dependent G on Earth Natural Processes

Gravitation influences the passage of time, but its effect for Earth gravitational strength is

$$T = \frac{T_0}{\sqrt{1 - \frac{2gR}{c^2}}} \simeq T_0 \left( 1 + \frac{gR}{c^2} + \frac{3g^2R^2}{2c^4} \dots \right) = T_0 \left( 1 + 6.95E - 11g + \dots \right)$$
(199)

During Earth's existence (4.8 billion years), the effect of an epoch-dependent G was to modify Time by an extra factor of 3.3E-10, which is negligible to all

physical processes (including radioactive decay) on Earth.

## ii. Influence of Epoch-Dependent G on Solar System Celestial Dynamics

Current Solar System is explained by the Great Tack, a motion of Jupiter from an outer orbit into an inner orbit and back. The Solar System is also around 5 billion years old. During this time, Gravitation decreased in strength by 50%. That means, that Jupiter could had being created from the Sun or captured by the Sun in an inner orbit. As Gravitation weakened, Jupiter would naturally move into an outer orbit. No need for a colossal collision.

In addition, stronger G during Earth life should not appreciably had effected any chemical, radioactive or biological process.

iii. Correlation on the Microwave Cosmic Background The homogeneity of the CMB is simply

explained by the perfect symmetry of the Hypersphere.

I. CMB and BAO

BAO angular diameter distance is modeled by a diffusional process having a lump of Dark Matter. That lump is responsible for the recurrence peak on 150 Mpc on the pair density mapping. HU proposes that there might be a secondary hypersphere separated by a number of de Broglie steps, perhaps as little as half a de Broglie step.

HU also proposes that that hypersphere to be made up of a net antimatter content. The reason for that hypothesis was to explain Gamma Ray Bursts. HU proposes that give enough density of matter and dark matter overlapping on a given region of the 3D space while separated by a few femtometers on the radial direction a wormhole will be created between two hyperspheres and matter annihilation in large scale can occur. After the GRBs, the remaining matter coalesced around Dark Matter (Dark Antimatter), providing the basis for the mechanisms proposed on BAO to explain their observed secondary angular diameter distance distribution lump. HU also proposes a natural frequency of space fluctuations (111,101 Hz). That might be related to the tertiary structure of voids.

The variance of density fluctuations in the Universe might had been affected by the much stronger Gravitation at earlier epochs.

The fractions of Dark Matter, Dark Energy and Baryonic Matter derived from Friedman equations lose meaning since they were not needed to reproduce astronomical observations.

# III. Conclusions

The Hypergeometrical Universe theory, a model that considers the interference of four-dimensional wave on the hypersurface of a hyperspherical expanding universe was introduced. The complexity of the present description of the universe in our sciences<sup>1,3,4,8,24</sup> is assigned to the fact that one is dealing with four-dimensional projections of a five-dimensional process.

Our inability to realize that made the description unnecessarily complex.

These are the ingredients for a new and simple formulation of Physics:

- 1. A new quantum Lagrangian principle (QLP) was proposed.
- 2. Quantum gravity, electrostatics and electromagnetism were derived using the same equations (QLP), same framework. The theory is inherently quantum mechanical and relativistic.
- 3. A new Force of Nature (de-Broglie Force) was recognized. Strong and Weak Forces were deemed unnecessary.
- 4. The quantum version of this theory is readily achieved just by eliminating the high mass or short wavelength approximation on equation (103). It is outside the scope of this paper to implement Hypergeometrical Universe Quantum Algorithms. In a fully geometric theory, there are no energy or mass quanta. Motion is quantized by the QLP. All the other quantizations can be recovered from that.

The Hypergeometrical Universe Model provides alternative views on matter and forces by changing the paradigm under which to describe events. The model provides an alternative Standard Model, Cosmology, Cosmogenesis while maintaining compatibility with Relativity and Quantum Mechanics. The Fundamental Dilator together with the Lightspeed Expanding Universe and the Quantum Lagrangian Principle provides the basis for Quantum Mechanics.

Two fundamental parameters of the universe were calculated from the first principles (permittivity and magnetic susceptibility of vacuum). Universal Gravitational Constant G was also calculated from first principles. G was proposed to be inversely proportional to the 4D radius of the Universe and used to explain implausible Stellar Candle readings.

HU Supernova Analysis brought to light that the luminosity decay is not dependent directly solely on the Cartesian 4D distance. It is dependent on the number of cycles the dilaton field went through. That number of cycles is the same, no matter where you are within a hypersphere or epoch.

Using the Quantum Lagrangian Principle to model dynamics naturally bring about the observed speed of light as being the maximum speed in this Universe. It also explains the reason for increased inertial mass and the slowing down of time with speed (increase twisting of local FS). The larger the speed (local FS twist), the smaller the effect of subsequent interactions (accelerations) will be. This allows for a new understanding of the passage of time.

Nuclear lifetimes are also affected by the local twisting. A more detailed analysis is outside the scope of this paper and will be presented elsewhere.

The concept of the Fundamental Dilator brings about a view of a Stroboscopic Universe where

interaction is intermittent and where particle substructure is easily explained by the polymeric nature of dilator coherences. It also brings about the possibility of thinking of matter in terms of metric deformations, thus capable of beating and nonlinear hadronic processes. We proposed new experiments that might bring about Coherent Nuclear Fusion along the lines of nonlinear optical interactions. Phase matching angle for coherent hadronic processes is tuned by changing the relative interaction velocity, which is an angle or direction in the 4D spatial manifold.

Gyrogravitation and Electromagnetism Natural Laws were derived from first principles.

The theory was applied to standard tests (Precession of Mercury Perihelion, Gravitational Lensing), was used to explain the Stellar Candle paradox without the use of inflation, Hubble expansion without Dark Energy, Neutron Decay without Electroweak Interaction, Particle Substructure without quark composition and Black Hole's Double Jets with the use of Gyrogravitation. It also provides a potential solution to the Spiral Galaxy rotation problem without the need for Dark Matter.

The Fabric of Space Stress-Strain paradigm applied to the two cross-sections of the Universe (RXYZ and  $\phi$ XYZ) allowed for the derivation from first principles of natural laws (Gauss, Biot-Savart, Newton's Gravitation) and the derivation of a more general equation that applies to all forces.

Four Newton's Laws were recast in terms of Stress-Strain relationships. The theory also explains why things move inertially and why the speed of light is a limit.

Newton's Law of Gravitation and Gauss' Law of Electrostatics (also Maxwell equations) were extended to Cosmological distances where it became apparent that the field doesn't decay with distance but with Cosmological Time (number of de Broglie cycles traversed).

For not taking into consideration the HU scenario (or other variants of it) the current interpretation of this Supernova Dataset and the current use of WLR to infer Absolute Luminosities might be systematically overestimating distances. There might be a great benefit from considering epoch dependent G theories, since they challenge the current view of an Inflationary Universe full of Dark Matter and expanded through Dark Energy. The Hypergeometrical Universe Theory, offering predictions that fit the data on all z ranges, might be a good candidate.

A new paradigm for Dark Matter, antimatter from a Lagging Hypersphere was proposed.

## a) De Broglie Force, the Two-Slit Experiment and Quantum Mechanics

The theory proposes a new Force – de-Broglie force by providing a dilaton representation of matter

waves. This new force can be used to control particles in the same way as electromagnetism or gravitation, with implications on accelerator design and coherent nuclear fusion reactor architecture. It also explains the selfinterference process occurring in a two-slit experiment. The particle rides (and creates) a de-Broglie dilaton field. The particle enters one slit while the dilaton field enter both. The exiting dilaton field from both slits, interfere and guide the particle into the detector in an interferometric pattern. Thus, the electron passing through the two slits is not a good example of a Quantum Process and there is no need to invoke particle-wave duality. Instead, it is a wave-generator, wave interaction process.

This view parallels de-Broglie-Bohm theory with the distinction that wavefunctions are assigned a physical meaning (a propagating deformation of space or the Fabric of Space) and that consideration gives rise to the discovery of a new Force in Nature, so despite of similarities, the perspective unveiled in this theory is distinct and more profound. On the other hand, de-Broglie–Bohm theory dynamics equations fails to provide a comparative framework associating de-Broglie Force Field and other dilatons fields (electromagnetism). They are free particle equations.

The Hypergeometrical Universe also provides an alternative interpretation for the Quantum Mechanics wavefunction as the loci associated with each footprint of the dilators as the Universe expands.

Quantum Mechanics should be recovered from the Hypergeometrical Universe Fundamental Equation without the large-number-of-dilators approximation. It points to a new interpretation of Quantum Mechanics Wavefunctions based on Lissajous interferences in a 5D Spacetime.

## b) Summary

This is a simple theory in terms of formalism, which provides new insights, proven and testable predictions. A simple mapping from HU Fundamental Dilator based hyperons and isotopes to the Standard Model might be enough to reconcile HU to Quantum Chromodynamics. It also produced extensions of Newton's and Gauss' Laws:

$$F_{Gravitational} = G \frac{m_1 m_2}{\left(\Delta \Phi\right)^2}$$
(200)

$$F_{Electrostatic} = \frac{1}{4\pi\varepsilon_0} \frac{C_1 C_2}{\left(\Delta\Phi\right)^2} \tag{201}$$

This means that light coming from the past doesn't decay accordingly to the inverse of Cartesian 4D squared distance (see Fig. 30). It doesn't decay with distance AC. It decays with distance AB. That is consistent with HU Quantum Lagrangian Principle and HU ansatz for the dilaton field. 2017



*Figure 30:* For convenience, we reproduce here the Timeline of SN1a supernova explosions presented as crosssections of the HU Lightspeed Expanding Hyperspherical Universe

or more generalized versions:

$$F_{Gravitational} = GM_{1}M_{2} \frac{1}{\left(1 + \frac{V_{1}\hat{R}}{c} + \frac{V_{2}\hat{R}}{c} + \frac{V_{1}V_{2}}{c^{2}}\right)\left(1 + \frac{V_{2}\hat{R}}{c}\right)} \frac{\hat{R}}{\left(\Delta\Phi\right)^{2}}$$
(202)

$$F_{Electrostatic} = \frac{C_1 C_2}{4\pi\varepsilon_0} \frac{1}{\left(1 + \frac{V_1 \cdot \hat{R}}{c} + \frac{V_2 \cdot \hat{R}}{c} + \frac{V_1 \cdot V_2}{c^2}\right) (1 + \frac{V_2 \cdot \hat{R}}{c})} \frac{\hat{R}}{\left(\Delta\Phi\right)^2}$$
(203)

where  $\Delta \phi$  is the dimensionalized Cosmological Temporal Distance between the two points in the 4D Universe.

Last, but not least, The Grand Unification Equation:

$$x = \frac{N\lambda_1^2\lambda_2}{(2\pi)^3 R^2}$$
(204)

This new view of reality together with the proposition of the new de-Broglie Force might provide simple solutions to currently intractable problems.

## IV. APPENDICES

a) Appendix A - Validity Tests

i. Precession of Mercury Perihelion Let's consider equation (197) with  $v_1=0$ , that is, body 1 is not rotating. The new potential is given by:

$$V_{2}\left(R, V_{1}=0, V_{2}\right) = GM_{1}M_{2}\frac{1}{R\left(1+\frac{V_{2}.\hat{R}}{c}\right)^{2}} = GM_{1}M_{2}\frac{1}{R\left(1-\frac{1}{c}\frac{dR}{dt}\right)^{2}}$$
(205)

This is the Gerber's potential which correctly predicts the precession of Mercury perihelion (42.3 arc seconds per century).

### ii. Gravitational Lensing

To calculate Gravitational Lensing one should remember that Electromagnetic Waves are modeled as source-position modulated dilaton fields, that is, EM are dilaton fields (extremely small wavelength = Compton wavelength of a hydrogen atom) modulated by the motion of the dilators that create them. Of course, dilators slow motion yields much larger wavelengths consistent with the electromagnetic waves they generate.

To obtain the predictions of the Hypergeometrical Model for the gravitational refraction of an electromagnetic wave, one should remember that a Force is represented as a Stress in this model. Acceleration is modeled as a local deformation of the Fabric of Space. This is shown in the equation below:

$$F = m_0 c^2 \frac{d \tanh(\alpha_\tau)}{d\tau} = c \frac{d(m_0 v)}{d\tau} = c \frac{d(\hbar k)}{d\tau} = \hbar c \frac{dk}{d\tau} = \hbar c \frac{\Delta k}{\Delta \tau}$$
(206)

Where  $d\mathbf{r}$  is equal to cdt, that is, it is a dimensionalized time. The momentum of an electromagnetic wave was represented by  $\hbar k$  and its mass by this equation:

$$m = \frac{\hbar k}{c} \tag{20}$$

Light always travels at 45<sup>°</sup> with respect to the Fabric of Space. This means that Gravitation only affects the direction of propagation within the Fabric of Space. That cross-section is shown below:



Figure 31: Gravitational induced scattering due to Gravitational Force acting upon a photon.

At the position of scattering  $R=R_o$ , dv/dt=0 since one cannot increase the speed of light nor decrease it. One can only change its direction within the 3D hypersphere. The change in direction is shown in the diagram below:



Figure 32: Phase-matching condition on Gravitational Lensing event

 $\Delta r$  is the de-Broglie step in the Hypergeometrical Expansion of the Universe. The angle is given by:

$$\alpha = \frac{\Delta k R_0}{k \Delta \tau} \tag{208}$$

The Force can be written in terms of Gravitational fields as:

$$F_2(R, V_2) = -Gm_1m_2\frac{\hat{R}}{R^2}$$
(209)

The equation of motion for an electromagnetic wave is given by:

$$F = \hbar c \frac{\Delta k}{\Delta \tau} = -Gm_1m_2\frac{\hat{R}}{R^2} = -Gm_1\frac{\hbar k}{c}\frac{\hat{R}}{R^2} \quad (210)$$

From our equation of motion, we obtain:

$$\alpha = \frac{\Delta k R_0}{k \Delta \tau} = \frac{G m_1}{c^2 R_0}$$
(211)

Which is the observed Gravitational Lensing.

## Appendix B - Simple Topological Conclusions

- 1. No matter where you are, you are always at the center of your Universe.
- 2. How Big is Our Visible Universe? The Visible Universe is 13.58 Bly long. Radiation from the Visible Universe is mapped to the 1<sup>st</sup> Quadrant (in Cosmological Angle terms) due to line of sight requirements. Despite of the mapping of the whole visible Universe to the first Quadrant, due to the Universe expansion, we can only explore the first quadrant [0,  $\pi/4$ ] and not all the visible Universe [0,1Radian]. Never mind the rest of it [1 Radian,  $\pi$ ]. That part will forever stay invisible and unreachable.
- 3. How far away are we seeing right now?

The farthest type 1A Supernova in the Survey Union 2.1 is just above 70% of our Universe real 4D Radius  $(0.71R_0)$ .

- 4. The average radius of curvature of this hypersurface is exactly the speed of light times the age of the Universe, or R=13.58 billion light-years or so. This also explains why the Universe is flat and why the Cosmological constant is very small or zero.
- 5. The 3D Universe has a radius of curvature equal to the age of the Universe time the speed of light. This radius is independent of mass distribution. Simple symmetry explains why the Gravitationally induced curvature (or Einstein's Cosmological Constant) on xyz*t* is also extremely small.
- 6. The Big Bang occurred on all places at the same time. This is the basis for the non-locality of the Big Bang in a three-dimensional Universe projection. This means that in our Universe, the Big Bang occurred exactly where we are no matter where we are.
- 7. Due to the topology of a four-dimensional Big Bang, the center of the Universe is a location in the radial direction and not in 3D space.
- 8. Most galaxies are likely to be at rest with respect to the Fabric of Space, that is, large scale motion should be happening only at Hubble speed.
- 9. One can see all the way up to the Big Bang (one radian).
- 10. One can only reach (asymptotically and at the speed of light) a Cosmological angle of  $\pi/4$  (the first Quadrant) due to the Universe expansion.

- 11. The visible Universe volume is given by  $\frac{4\pi R^3}{2}$
- 12. The whole (Visible plus Invisible) Universe should have a volume of  $\frac{4\pi(\pi R)^3}{3}$ .
- 13. The actual radius of the Universe is  $\pi$ R or around 42.64 billion light-years.
- 14. Mach's non-local gravitational interaction explanation for inertia is replaced by a hypergeometrical local fabric of space distortion argument.
- 15. HU Gravitational Constant G being inversely proportional to the 4D radius of the Universe, means stronger Gravitation in the earlier epochs.
- 16. The moving frame aspect of this model requires the actual speed of light to be  $\sqrt{2}c$  since all measurements of the observed speed of light c can only be done at distances small in comparison to the 4D radius of the Universe.

## Appendix C - Coherent Nuclear Fusion

The Hypergeometrical Standard Model provide the means to envision a new process of nuclear fusion where yields are much higher. The conceptual basis for the concept of Coherent Hadronics is the direct result of the fundamental dilator and the hyperspherical expansion universe topology. The fundamental dilator model for matter implies that particles are coherences of a malleable Fabric of Space, and thus can be subject to nonlinear processes.

Current approaches to nuclear fusion uses a nuclear chemistry approach, where a barrier must be overcome for the reaction to occur. The realization that particles could be modeled as coherences, thus similar to electromagnetic waves, allows for a change in paradigm. Instead of overcoming a barrier by extremely high temperatures, we might be able to create the products by fine tuning phase matching conditions in a 4D dynamics space.

The experimental setup for coherent nuclear fusion hadronics would be composed of an accelerator with de-Broglie Force assisted bunching, and magnetic lensing for controlled focusing. Upon focusing at the phase-matching velocity, maximum nuclear fusion yields would occur and nuclear fusion products would be released at the appropriate directions and velocities.

Phase-matching velocity will require the precise measurement of Fabric of Space elasticity tensor. That information is contained in the trove of particle physics decay channels and lifetimes as well as isotope masses and lifetimes. Precise calculation of the appropriate angle will be presented elsewhere.

Another extremely important consideration is that the reactant beams should be polarized. The electromagnetic analogy is that one cannot perform nonlinear optics with scrambled polarization electromagnetic fields.

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Careful process optimization should create the same gains one have in nonlinear optics, lowering the breakeven threshold such allowing for smaller reactor and wider applications.

A coherent fusion process would result in the same revolution one had with the invention of nonlinear

optics or lasers. The only difference is that in this case it would be the birth of Coherent Nonlinear Hadronics.

Below is the Hypergeometrical Standard Model representation of Deuterium.

Out of a proton and one neutron on can create only one coherence:



Figure 33: Deuterium diagram



Figure 34: Tritium diagram

<sup>3</sup>He has the following configuration:



Figure 35: Helium 3 diagram

Let's study the following reaction:

$$D+D \rightarrow {}^{3}He(0.82MeV) + n(2.45MeV)$$

$$D+D \rightarrow T(1.01MeV) + p(3.02MeV)$$
(212)

Where D stands for deuterium and T for Tritium, p for proton. Each channel has a 50% yield under normal fusion conditions.

The advantage of having all charged particle as products is that one can use magneto-hydrodynamics energy extraction. If one can make the products to follow specific directions (directional nuclear fusion), one can use coils to extract energy by induction.

Now we can write the equations:



Figure 36: Nuclear Fusion diagram

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 $D + D \rightarrow 3He(0.82 \text{ MeV}) + n(2.45 \text{ MeV})$ 



Figure 37: Nuclear Fusion products diagram

 $D+D \rightarrow T(1.01 \text{ MeV}) + p(3.02 \text{ MeV})$ 

#### Acknowledgements

I would like to thank my Family and Friends for the support they provided throughout my Life.

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GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH: A PHYSICS AND SPACE SCIENCE Volume 17 Issue 5 Version 1.0 Year 2017 Type : Double Blind Peer Reviewed International Research Journal Publisher: Global Journals Inc. (USA) Online ISSN: 2249-4626 & Print ISSN: 0975-5896

# Operating Principle of Van De Graaff Generator, Collectorless Generators and the Multipliers of Constant Stress

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Abstract- The physical principle of the work of Van de Graaff generator, until now, is not explained, but there is only a technical oscillator circuit. There are no calculated relationships, which give the possibility to calculate this generator. In the article physical oscillator circuit and its mathematical model is represented, and it is also shown that the principle of its operation is based on the use of a law of parametric self-induction. Are obtained the calculated relationships, which make it possible to calculate the parameters of generator. Collectorless generators and multipliers of constant stress are examined.

Keywords: van de graaff generator, volt, capacity, parametric self-induction, the multiplier of constant stress, constant-potential generator.

GJSFR-A Classification: FOR Code: 249999

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Strictly as per the compliance and regulations of:



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# Operating Principle of Van De Graaff Generator, Collectorless Generators and the Multipliers of Constant Stress

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Abstract- The physical principle of the work of Van de Graaff generator, until now, is not explained, but there is only a technical oscillator circuit. There are no calculated relationships, which give the possibility to calculate this generator. In the article physical oscillator circuit and its mathematical model is represented, and it is also shown that the principle of its operation is based on the use of a law of parametric self-induction. Are obtained the calculated relationships, which make it possible to calculate the parameters of generator. Collectorless generators and multipliers of constant stress are examined.

*Keywords:* van de graaff generator, volt, capacity, parametric self-induction, the multiplier of constant stress, constant-potential generator.

### I. INTRODUCTION

An de Graaff generator (Fig. 1) long time it was the basic source of high voltages and widely it was used in the static accelerators. It and, until now, successfully is used in different laboratories in the entire world.

The first generator was developed by American physicist by Robert by Van de Graaff in 1929 the year and made it possible to obtain a potential difference to 80 the kilovolts . In 1931, 1933 they built the more powerful generators, which made it possible to reach stress in 1 million and 7 millions of volts. But, without looking the almost centenary history of this generator, the principle of its operation is not known up to now.



#### *Fig. 1:* Van de Graaff generator

Van de Graaff generator consists of dielectric (silk or rubber) tape 4, which it moves with the aid of the revolving rollers 3 and 6, moreover upper roller dielectric, and lower metallic and is connected with the earth . The upper part of the tape is located in the metallic hemisphere [1]. Two electrodes 2 and 5 in the form brushes are located at small distance from the tape and serve for the electrization of tape and removal from it of charges. The brush 5 serves for the ionization of air, high voltage on which will be given from the source 7. Resultant positive ions under the action of Coulomb force move to the grounded roller 6 and they settle on the tape. The moving tape transfers charge inside the sphere 1, where it it is removed by brush 2, under the action of Coulomb force charges they are pushed out to the surface of sphere and the field inside the sphere it is created only by booster charge on the

tape. Thus, on the external surface of sphere is accumulated electric charge. The possibility of obtaining the high voltage is limited by the corona discharge, appearing with the ionization of air around the sphere.

Contemporary Van de Graaff generators instead of the tapes use the chains, which consist of the alternating metallic and plastic it is sectional, which are called the pelletrons.

Unfortunately, the given oscillator circuit is only technical diagram, but the physical principle of its action, until now, is not explained. It is not understandable, what reasons cause an increase in the potential of the charges, located on the tape, with its motion from bottom to top. Generator will unclearly also function, if the moving tape was arranged the horizontally earth's surface. Not clearly also, how can be changed the polarity of generator. But since neither the physical nor mathematical model of generator is thus far developed, its improvement can be carried out only by the trial-and-error method. With this is connected the circumstance that his construction practically did not change from the times of the invention of Van de Graaff generator.

### II. MATHEMATICAL MODEL OF VAN DE GRAAFF GENERATOR

If there is a capacitor, whose capacity C, and this capacitor it is charged to a potential difference  $U_0$ , that the energy, accumulated in it, is determined by the relationship

$$W_C = \frac{1}{2} C U_0^2 \tag{2.1}$$

Charge Q - accumulated in the capacity, is equal

$$Q_{C,U_0} = CU_0$$
 (2.2)

From relationship (2.1) it is evident that if the charge, accumulated in the capacity, remains constant, then stress on it can be changed by changing the capacity. In this case is fulfilled the relationship

$$Q_{C,U} = CU = C_0 U_0 = const$$

where  ${\it C}$  ,  ${\it U}$  - instantaneous values, and  ${\it C}_0$  ,  ${\it U}_0$  - initial values of these parameters.

This relationship presents the law of parametric self-induction [2-5].

The stress on the capacity and the energy, accumulated in it, will be in this case determined by the relationships:

$$U = \frac{C_0 U_0}{C} = K U_0$$
 (2.3)

and the energy, accumulated in the capacitor, will be equal

$$W_{C} = \frac{1}{2} \frac{\left(C_{0}U_{0}\right)^{2}}{C} = K \frac{C_{0}U_{0}^{2}}{2}.$$
 (2.4)

Coefficient

$$K = \frac{C_0}{C} \tag{2.5}$$

let us name the transformation ratio of constant stress. It is easy this coefficient by the passing track of changing the relation of capacities.

The incremental stress, which can ensure this transformation, is determined from the relationship.

$$\Delta U_C = \left(\frac{C_0}{C} - 1\right) U_0. \tag{2.6}$$

As follows from the relationships (2.3) and (2.4) with the decrease of capacitance of capacitor on it increases not only stress, but also the energy, stored up in the Ger. This energy is selected in the mechanical source, which ensures a change in the capacity. Therefore the transformer in question can be considered, and as the converter of mechanical energy into the electrical.

An increase in the energy, accumulated in the capacitor, with a change in its capacity is determined from the relationship

$$\Delta W_{C} = \frac{1}{2} \left( C_{0} U_{0} \right)^{2} \left( \frac{1}{C} - \frac{1}{C_{0}} \right).$$
 (2.7)

Relationships (2.3-2.7) determine physics of the work of Van de Graaff generator. The moving metallic pelletrons or the sections of tape have relative to the earth a capacity, which during the motion of these sections relative to the earth changes according to the specific law. In the base of generator these sections should be loaded to the assigned potential of the specific sign. If the capacity of these sections will change relative to the earth, then will change the potential of the charges, located on them. In the upper part of the generator these sections betray charges with the high potential to sphere, charging it to the high voltage.

For calculating the generator it is necessary to know the initial potential of pelletrons and the law of variation in their capacity with respect to the earth during the motion of tape. Should be also known the distance of their displacement from the lower part of the generator, where they are charged, to its upper part, where they return their charge to sphere. Therefore in this case the main mathematical problem of calculating the generator is the presence of the dependence of the capacity of pelletrons from the distance to the earth. With the vertical position of generator this there will be one dependence, with the horizontal position - another. If tape moves in parallel to the earth, then this dependence will be absent, and generator work will not be. The precise calculation of the capacity of pelletrons relative to the earth to carry out difficultly, but a good approximation is assumption about the fact that the pelletrons present the conducting spheres, whose diameter is equal to their size. In this case it is necessary to calculate the capacity of the sphere of the intended size relative to the flat conducting surface, which is the earth. This dependence is known and is determined by formula [6]

$$C = 4\pi\varepsilon a \sum_{n=1}^{\infty} \frac{\sinh\left[\ln\left(D + \sqrt{D^2 - 1}\right)\right]}{\sinh\left[n\ln\left(D + \sqrt{D^2 - 1}\right)\right]} = 4\pi\varepsilon a \left(1 + \frac{1}{2D} + \frac{1}{4D^2} + \frac{1}{8D^3} + \frac{1}{32D^5} + \dots\right), \quad (2.8)$$

where  $D = \frac{d}{2a}$ , *a* - a radius of sphere, *d* - distance from the lower part of the generator to its upper part.

But during calculations should be considered also the capacity between the pelletrons, which it is easy to measure. In this case the capacity of pelletron with the number n with respect to the first pelletron can be calculated as n-1 the series-connected capacitors. In this case the total capacitance between the first pelletron and the pelletron with the number n will be determined by the relationship

$$\frac{1}{C_{\Sigma}} = \frac{1}{C_{1-2}} + \frac{1}{C_{2-3}} + \dots + \frac{1}{C_{(n-1)-n}}$$

The first term in the decomposition (2.8) represents the capacity of the secluded sphere and does not depend from the distance to the earth. Us they will interest only that capacity, which depends on distance.

In the case, when d it is considerably more than a in the relationship (2.8) it suffices to take only second term of expansion. In this case the dependence of the capacity of pelletron on the distance to be determined by the relationship

$$C = 4\pi\varepsilon \frac{a^2}{d} \tag{2.9}$$

In the lower position of pelletron its capacity relative to the earth comprises

$$C_0 = 4\pi\varepsilon \frac{a^2}{d_0}, \qquad (2.10)$$

where  $d_0$  the distance of pelletron to the earth in the lower position.



### Fig. 2: Oscillator circuit

The transformation ratio of potential can be found from the relationship (2.5)

$$K = \frac{d}{d_0}$$

Thus, are acquired all necessary data for calculating the generator. The practical oscillator circuit, in which are taken into account the principles examined, is represented in Fig. 2.

In contrast to the construction, given in Fig. 1, both upper and lower roller they are made from dielectric, and lower and upper brushes slide on peletronam. Each peletron, moving around the lower roller, by means of the brush is charged from the voltage source  $U_0$ . On the polarity of this source depends the polarity of the stress, manufactured by generator.

In order to increase transformation ratio, one should decrease  $d_0$ . With this purpose lower roller can be made composite. Its internal part should be carried out from the metal and grounded, and outside dressed collar from rubber or cylinder from the dielectric. In this case the thickness of collar or cylinder will be the size

 $d_0$ . It is possible to enter and differently. Roller to make completely from the metal and to ground, and on the rubber tape of peletrony to apply the way of metallization. Then the thickness  $d_0$  of belt will serve as size.

Earlier us lacked the possibility to calculate stress and power of Van de Graaff generator, now this possibility is located. For this it follows to use relationships (2.3) and (2.7).

Let us give concrete example with the following parameters of the elements of the generator: rubber tape  $d_0$  has a thickness 1 cm and a width 10 cm, which corresponds to a radius *a* of equivalent sphere 0.05 m. On this tape there are metallized square sections (pelletrons), which alternate with the same not metallized sections. The speed of belt 50 m/s, the distance between the lower and upper brushes *d* are 5 m, the voltage of the voltage source  $U_0$  is equal 10 kV.

The stress, generated by generator, will comprise with the parameters indicated.

$$U = \frac{d}{d_0} U_0 = 5 MV.$$

With the speed of belt 50 m/s the charge to sphere in second will return 250 pelletrons. Each peletron will return energy in accordance with the relationship (2.4). After using relationships (2.9) (2.10) we obtain the generatable power

$$P{=}500\pi\varepsilon\frac{a^{2}d}{d_{0}^{2}}U_{0}^{2}$$

Calculation according to this formula taking into account the given parameters gives power 174 W. This power considerably less than that power, which is necessary for the mechanical motion of tape.

Using relationships (2.1) and (2.4) it is possible to calculate the electrical efficiency of the generator, which is equal to the ratio of the manufactured energy to the energy, expended by the voltage source. In this case efficiency it will be equal

$$EFF = \frac{d^2}{d_0^2}$$

With the parameters efficiency indicated it composes the value of 2.5x10<sup>4</sup>. This high efficiency means that practically entire mechanical energy (if we do not consider energy consumption for the drive of the motion of tape) it is expended on the production of electrical energy. By this high efficiency possesses none of the existing generators. Let us give the alternative oscillator circuit of van de Graff generator which it is represented in Fig. 3.



Fig. 3: Alternative oscillator circuit of van de Graff

In the diagram thick lines designated the facings of two parallel-plate capacitors. Solid line designated the lower facing, which is general for both capacitors. Between the facings of left capacitor is located the metallic plate, at ends of which are protrusions, with the aid of which can be locked and be opened contact pairs. When plate is located in the extreme by right position, it locks the contact pair, which connects the voltage source with the upper plate of right capacitor, charging it to the potential  $U_0$ . In this position of plate the capacitance of right capacitor is maximum. When plate begins to be moved to the left, right contact pair is opened, disconnecting capacitor from the voltage source. During further motion of plate the capacitance of right capacitor begins to decrease according to the linear law and potential on it grows. In the end left situation, when plate exceeds the limits of right of capacitor, and potential on it reaches maximum

value, occurs closing left contact pair and part from the left capacitor passes charge into the right capacitor, and their potentials are equalized. Further cycle is repeated with the return of plate to the end right position. Thus, the transformation of potential in this case occurs according to the already examined above diagram.

### III. Collectorless Generators and the Multipliers of Constant Stress

Collectorless constant-potential generators are not thus far created. Be absent also the transformers of constant stress.

The schematic of the transformer of constant stress, realizing the principle examined, is represented in Fig. 4.



Fig. 4: Schematic of the transformer of constant stress

In this diagram to the variable capacitor by means of the diode the dc power supply is connected  $U_0$  The incremental stress, which can ensure this transformer, is determined from the relationship (2.6).

It should be noted that this transformer can work only in the regime of an increase in the stress, since. with the attempt to obtain the decrease of voltage across capacitor this cannot be made for that reason, that the diode ensures the straight connection of the voltage source to the capacitor and therefore voltage across capacitor decrease cannot. Properties of the transformer of constant stress can be used for creating the dc power supply, whose diagram is given in Fig. 5.



Fig. 5: Diagram of dc power supply

In this diagram is present still one diode and load resistance R.

In the initial state the capacitance of capacitor is equal  $C_0$ , and stress on it equally  $U_0$ . At this time through the load resistance the current flows

$$I_0 = \frac{U_0}{R}$$
.

In this case the energy, obtained by capacitor from the voltage source, is determined by the relationship (2.1)

As soon as capacitance of capacitor will begin to decrease, secondary stress will appear on it. Secondary stress through the right diode enters the resistances R.

In the following cycle proceeds an increase in the capacitance of capacitor from the values C to the values  $C_0$ . But stress on it cannot be less than  $U_0$ , therefore the voltage source begins to charge the being increased capacity. And up to the moment, when

capacitance value reaches value  $C_0$ , stress on it will be equal  $U_0$ . During this cycle the left voltage source will repeatedly consume the energy, determined by the relationship, (2.1). In this case complete cycle to be completed and the system returns to the initial state.

The operating principle of the generator examined is such to the operating principle of the valve water pump, whose schematic is represented in Fig. 6.



Fig. 3: Schematic of the valve water pump

With the displacement of piston downward left admission valve is opened, and water is sucked in into the cavity of pump. With the displacement of piston upward the water through the right release valve is ejected outside.

The role of valves in the schematic of the described generator diodes play, while the role of cylinder with the being moved piston performs variable capacitor.

Hence it follows that the basic problem of the creation of the proposed generator is the development of the capacitor, whose capacity changes with mechanical method. In this case the capacitor must have the great significances of initial and final capacity, also, with the large relation of these values.

### IV. CONCLUSION

The physical principle of the work of Van de Graaff generator, until now, was not finally described, but there is only a technical oscillator circuit. There are no calculated relationships, which give the possibility to calculate this generator. In the article physical oscillator circuit is represented and it is shown that the principle of its operation is based on the use of a law of parametric self-induction. Are obtained also the calculated relationships, which make it possible to calculate the parameters of generator. The calculation, carried out employing the proposed procedure, shows that the generator in guestion possesses the very high electrical efficiency, which is not accessible in the existing generators. Is examined the operating principle of the multiplier of constant stress, and also the schematic of collectorless constant-potential generator.

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GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH: A PHYSICS AND SPACE SCIENCE Volume 17 Issue 5 Version 1.0 Year 2017 Type : Double Blind Peer Reviewed International Research Journal Publisher: Global Journals Inc. (USA) Online ISSN: 2249-4626 & Print ISSN: 0975-5896

# Mende Interferometer: From the Experimental Refutation of the Lorentz Transformations and the Principles of the Invariance of the Speed of Light to New Prospects for the Development of Passive Radar

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Abstract- A new type of interferometer has been developed that uses the principle of mechanical beam division. With its help, the time constant of the wavelength of the laser beam, which does not depend on the velocity of the generator or mirror moving along the harmonic law, has been experimentally observed. The combination of this new effect with the known Doppler effect indicates the classical addition of the speed of light in this case with the speed of its source, which violates the principle of the invariance of the speed of light of the theory of relativity. Due to the detected effect, the use of a developed interferometer in passive radar opens up new prospects for its development.

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GJSFR-A Classification: FOR Code: 249999p



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Mende Interferometer: From the Experimental Refutation of the Lorentz Transformations and the Principles of the Invariance of the Speed of Light to New Prospects for the Development of Passive Radar

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Abstract- A new type of interferometer has been developed that uses the principle of mechanical beam division. With its help, the time constant of the wavelength of the laser beam, which does not depend on the velocity of the generator or mirror moving along the harmonic law, has been experimentally observed. The combination of this new effect with the known Doppler effect indicates the classical addition of the speed of light in this case with the speed of its source, which violates the principle of the invariance of the speed of light of the theory of relativity. Due to the detected effect, the use of a developed interferometer in passive radar opens up new prospects for its development.

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### I. INTRODUCTION

ichelson interferometer was invented by physicist by Albert Abrakham American Michelson. A number of important scientific and applied problems was solved with the aid of this interferometer. However, in Michaelson's experiments there were significant errors. These mistakes he made, trying to prove that the speed of light electromagnetic (EM) wavespeed are added at speed of the source emitting such a wave. It considered to the end of its life that there is an elastic medium, in which are extended EM of wave. Therefore the results of the experiments, which it conducted together with Morley [1] for the detection of this medium, were for it large unexpected contingency. Attempting to improve experiment, it attempted as the radiation source to use light of star, but still large failure here awaited it. The studies, carried out with the aid of its interferometer, showed that the measured speed of light, does not depend on the speed of star and is equal to the previously measured by it value, which corresponded to the special theory of relativity, which life it so did not recognize to the end.



Fig. 1: Schematic of Michelson interferometer

In order to understand, in than consisted Michaelson's error, let us examine the principle of the work of its interferometer [2], diagram of whom it is given in Fig. 1.

The light of star, reflected from the dividing mirror A falls on the reflecting mirror v and, being reflected from it, it falls on photodetector. The special feature of this process is the fact that the mirror v is located in the same inertial reference system (IRS), in which is located interferometer itself. This means that, whatever there was the speed EM of the wave, which arrived from the star, its speed, after reflection from the mirror v, will be equal to the speed of light in IRS of interferometer.

The second part EM of the wave, which arrived from the star, penetrating the dividing mirror A, also falls on reflective mirror s. After reflection from this mirror the wave will also have a speed equal to the speed of light in the system of interferometer. But a question consists in what speed will have the electromagnetic wave after the passage of dividing mirror indicated. The reflecting coating, with the aid of which occurs the division of ray, is substituted to the transparent glass plate.

Let us examine the flow chart of the ray through the dividing mirror, taking into account that the fact that the reflecting layer on it is substituted to the transparent of the glass- specific thickness. Since glass- is the dielectric, which possesses the dielectric constant, different from air, the trajectory of the motion of ray will depend on the refractive index of glass. This trajectory is shown in Fig. 2.



Fig. 2: Propagation of light beam through the glass plate

Light beam falls on the glass plate from the side, on which it is substituted semitransparent coating and further, refracting twice, it leaves from it in the same direction. During the reverse motion of ray its trajectory remains constant it changes only direction of its motion. In this case the ray moves in accordance with the Snel law [2], sharply changing its direction after entrance and output from the plate. But this refraction of ray is connected with the fact that the electric fields of the wave, passing through the plate, make it necessary will fluctuate the bound charges in the dielectric, which reemit these fields. And if prior to the entrance into the plate wave had a speed different from the speed of light in the frame of reference of interferometer, then after the passage of the wave through the plate its speed will be equal to the speed of light in the system of its counting. Therefore with the aid of the Michelson interferometer it is not possible to measure the speed EM of wave to its contact with dividing mirror. Michaelson did not consider these circumstance, of than consisted its error.

Were subsequently invented different modifications of Michelson interferometer [2], such as the interferometer of Znamensky, Fabry-Pero and other instruments with repeatedly divided light beams. But in all these instruments for division and separation of light rays are used the semi-transparent layers of metals, substituted to the glass plates, or interfaces between the dielectrics with different dielectric constant. Therefore all interferometers indicated suffer the same deficiencies, as Michelson interferometer.

But there is still one circumstance, which should be considered during setting of such experiments.

The phenomenon of phase aberration of light consists in the fact that with the astronomical observations this aberration leads to a change in the observed position of stars on the celestial sphere as a result of a change in the direction of the speed of the motion of the Earth. In astronomy the frame of reference, connected with the solar system, is used, since it is possible to consider it with the high accuracy inertial. Star atlases are comprised precisely in it. The diurnal aberration is small, and even angle of annual aberration is not great; its greatest value, on the condition that that the motion of the Earth is perpendicular to beam direction, it composes a total of approximately one 20,5 second. The star, which is located in the pole of the ecliptic, rays of which are perpendicular to the plane of the earth's orbit in the frame of reference of the sun, will be observed during the entire year by that being distant behind its true position for 20,5 seconds, i.e., describe a circle by diameter 41 second. This apparent way for other stars will already represent not circle, but the ellipsis. The semi major axis of this ellipsis is equal 20,5" and semi minor axis it is equal 20,5 "sin  $\beta$ , where  $\beta$  - the ecliptic latitude of the observed celestial body. If star is located on ecliptic itself, i.e. annual motion, as a result of the light aberration, will be the visible section of straight line, the being appeared arc of ecliptic on the celestial sphere, and star goes along this section first to one side, then into another. But aberration of light in a straight manner indicates the addition of velocities of light with the speed of the Earth. Let us examine this question in more detail.

In Fig. 3 is depicted the diagram of the aberration of light of the star, when it is located in the pole of the ecliptic and its rays are perpendicular to the plane of the earth's orbit. In the frame of reference of star its ray moves with the speed of light c vertically with respect to the earth's surface. If the Earth moves, as shown in figure to the right with speed  $v_0$ , the vector addition of the beam velocity of star and speed of the Earth occurs according to the summation rule of vectors, as shown in figure. This means that the summary beam velocity v will bedetermined in accordance with the relationship

 $v=\sqrt{c^2+v_0^2}$  . This speed is more than the speed of light.

In this case the summary velocity vector of ray no longer is vertical the earth's surface, but its slope angle is equal to the angle of aberration, whose tangent is defined as to the ratio of the velocity of the Earth to the speed of light. Continuing its motion in the direction indicated, ray reaches the atmosphere (in this case it is considered that the atmosphere has sharp boundary with the vacuum of space). But air of the atmosphere has dielectric constant greater than dielectric constant of vacuum, therefore on the border with the atmosphere ray experiences refraction in accordance with the law of Snel and changes its speed and direction. The beam velocity was more before the entry into the atmosphere than the speed of light in air but with the entry into the atmosphere it changes its speed in such a way that it would correspond to the speed of light in air.

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Fig. 3: Diagram of the aberration of light of the star

The transverse Doppler effect, who long ago is discussed sufficiently, until now, did not find its confident experimental confirmation. For observing the star from moving IRS it is necessary to incline telescope on the motion of motion to the angle, determined by relationship

$$tg\alpha = \frac{v_0}{c}$$

The star, observed in the zenith, is in actuality found somewhat behind through the direction of motion. but this means that this star with respect to the observer has radial velosity determined by the relationship

$$v_r = v_0 t g \alpha$$

Doppler frequency shift  $tg\alpha \cong \alpha$ ,  $\alpha = v/c$ , is equal for small angles

$$\omega_{d\perp} = \omega_0 v^2 / c^2$$

This result numerically coincides with the results of the special theory of relativity (SR), but it is principally characterized by the fact that into SR transverse Doppler effect it is considered real, and in this case this is only apparent effect. At the same time, if the Earth and star converge, or they are moved away in the beam direction, then occurs the simple vector addition, with which the beam velocity can be both more and it is less than the speed of light. In this case occurs the Doppler effect, with whom, the frequency of wave, in the observation system of the Earth, obtains the Doppler additive, whose sign depends on the relative speed of the Earth and star. This question we will discuss below.

The described phenomena it is additional obstacle on the way of checking the postulate about the invariance of the speed of light, since such measurements must be conducted either in space or in the high vacuum cameras. Numerous attempts at the measurement of the speed of light, radiated by the moving sources, are known, most characteristic of them are given in the works [3-13], but all these experiments they gave one and the same result, which confirms the postulate of the theory of relativity about the invariance of the speed of light. But another result and it could not be, since all experiments were conducted in the atmosphere, in which the speed EM of waves cannot be more, or is less than that, which is determined by the dielectric constant of air. The existing interferometers, utilized in the experiments, for these purposes are not suitable moreover.

In the article is proposed the new type of the interferometer, deprived of the deficiencies indicated, as basis of which is assumed the principle of the mechanical division of ray.

### II. Interferometer with the Mechanical Division of Laser Beam

The schematic of interferometer with the mechanical division of laser beam is shown in Fig. 4.



*Fig. 4:* Schematic of interferometer with the mechanical division of laser beam

Laser beam, whose diameter is equal d, it partially overlaps the reflecting mirror A. This mirror the part of the ray it located so that reflects in the normal direction with respect to the primary direction of the motion of ray. The second part of the ray continues to move in the previous direction with the previous speed and, falling on the reflecting mirror B, it is reflected in the vertical direction with respect to the initial direction of motion. Further rays, after passing ways indicated in the diagram, where D - the reflecting mirror, and mirror C dividing, fall on the screen, where is reproduced the picture of their interference. In the diagram examined the laser, which is radiation source, can be fixed or move with the given speed. On the spot laser also can be located the mirror, which reflects the ray of fixed laser, in this case the mirror also can be fixed or move according to the assigned law. This case is equivalent examined with the only difference that as the ray of that emitted by the moving laser it is used the ray, reflected from the moving reflective mirror. The advantage of interferometer with the mechanical division of ray is the fact that in it are not used the dividing mirrors, but the division of ray in the assigned proportion is produced by the method of its mechanical overlap.

The schematic of interferometer with the mechanical division of the ray, in which is used the fixed laser, whose ray is reflected from the fixed or moving mirror, it is depicted in Fig. 5. On this diagram the laser beam has a diameter, which is equal to the distance between the lines, which emerge from the laser.



Fig. 5: Schematic of interferometer with the reflective mirror

Let us describe the parameters of the interferometer being investigated and the method of its tuning.

Interferometer is installed on the mounting plate by the size of 75x300x1200 mm and has the following parameters: the distance between the tip of laser and the mirror B - 200 mm, distance between the mirrors A and B also D and C - 250 mm, the distance between the A and D mirrors B and C with - 200 mm. Distance from the tip of laser to the reflecting mirror -1400 mm.

In the interferometer as the laser the laser with the green flash with Green Laser Pointer the wavelength 532 nm with a power 5 mW is used. The diameter of its ray is 1.1 mm. Laser beam leaves from the tip. To this tip from the outer side is dressed the sheet reflector, in which there is an opening for the passage of the ray with a diameter of about 2 mm. At first reflecting mirrors A also in are established in such a way that they would not interfere with the passage of the straight and reflected laser beam. In this case the position of laser and reflected beam and the surface of platform would be parallel.

In the interferometer there is a vibrator, which accomplishes a fluctuating motion of the reflecting mirror. For the exception of the influence of vibrator on the work of interferometer it is established on separate mounting plate by the size of 75x300x650 mm. This plate is established on the separate table. Besides this vibrator it is located in the duct, inside which there is a brick lining from foam rubber, and ray to the reflecting mirror passes through the opening in the duct. This is done so that the acoustic wave, generated by vibrator, would not influence the work of interferometer. Vibrator ensures the harmonic oscillation of the reflecting mirror with a frequency 50 Hz. The amplitude of the fluctuations of mirror can be regulated from zero to 5 mm.

Tuning interferometer is produced in the following order. Laser beam is directed at the fixed reflecting mirror, and this mirror is established in such a way that the reflected beam would fall on screen on the tip of laser. In this case the distance from the reflection of ray on the screen to the opening in it must comprise order 2-4 mm parallel to the plane of platform direction. Then mirrors A and B are established at the angle 45 of degrees with respect to the direction of the reflected beam. Further mirror v is advanced towards to ray in such a way that it would completely overlap the reflected beam, but it did not overlap straight line. After this, it is advanced mirror A. It is advanced until to ray intensity, reflected from the mirrors A and D it is equal. Further, justifying mirrors D and C, they attain the information of rays on the screen, located on the course of ray. For an increase in the interference picture the objective,

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established on the course of ray (in the diagram it is not shown) is used. Then they include the vibration of the reflecting mirror and observe the behavior of interference picture on the screen. If it is necessary to derive the signal, given by the brought rays to the oscillograph, should be used a photodetector.

## III. The Experimental Check of the Validity of the LorenzTransformation and Principle of the Invariance of the Speed of Light

That created by Einstein and that rules in physics already more than hundred years SR [3, 4] uses the Lorenz transformation, based on the postulated in it principle of the invariance of the speed of light, which causes criticism from the side of many scientists.

Let the emission in the transparent medium with the refractive index n have in IRS K, of fixed relative to source, frequency  $\omega$  and wave number k. Then, if IRS K moves with respect to IRS K', of fixed relative to medium, with speed v, that, according to SR, frequency  $\omega'$  and wave number k' of emission in IRS K' are determined by the following conversions, which escape from the Lorenz transformation:

$$\omega' = \frac{\omega \left(1 + \frac{nv}{c}\right)}{\sqrt{1 - \frac{v^2}{c^2}}} , \qquad (3.1)$$

$$k' = \frac{\frac{n\omega}{c} \left(1 + \frac{nv}{c}\right)}{\sqrt{1 - \frac{v^2}{c^2}}} .$$
(3.2)

A simultaneous change in the frequency and the wave number upon transfer from IRS K to IRS K'occurs in such a way that the ratio of frequency to the wave number in both IRS remains equal to the speed of light on wednesday c/n. Whatever reasons led to a change in the frequency, nevertheless are fulfilled the relationships (3.1), (3.2). These reasons there can be two: a change in the oscillation frequency of fixed generator and the Doppler effect from the moving generator. From the point of view SR cannot be found true reason.

If receiver moves with the speed u relative to medium in the direction of source, then wave velocity relative to receiver is obtained by the relativistic addition of this speed with wave velocity c/n relative to the medium:

$$rac{c/n{+}u}{1{+}u/(nc)}{pprox}c/n{+}lpha u$$
 ,

where  $\alpha = 1 - 1/n^2$  – the entrainment factor. This approximation is carried out in the first order on u. IN SR partial enthusiasm of light by medium, approximately described by coefficient  $\alpha$ , is the apparent effect, caused by relativistic addition of velocities. However, the real (physical) enthusiasm of light by medium is complete. This is manifested in the fact that the speed of light on Wednesday depends on the speed of receiver relative to medium, but it does not depend on the speed of source relative to medium. This approximate equality is confirmed by Fizeau experiment. But this does not mean that the Fizeau experiment proves SR, since it has the classical explanation (within the framework the conversions of Galileo).

The classical explanation of Fizeau experiment leaves valid this approximate equality only in the case of the source, which is rested relative to receiver, but changes its interpretation. The physical enthusiasm of light by medium is already the partial, accurately described coefficient  $\alpha$ . This is manifested in the fact that the speed of light on Wednesday depends not only on the speed of receiver relative to medium, but also on the speed of source relative to medium. If receiver rests relative to medium, and source moves strictly towards the receiver with speed  $\mathcal{V}$ , that wave velocity relative to them is equal  $c/n+v-\alpha v=c/n+v/n^2$ . This speed is lower than the result of the corresponding classical addition of velocities c/n+v for the value  $\alpha v$ . But if source moves in the direction, strictly opposite to receiver, then value v is substituted to value -v, and wave velocity it proves to be equal to the value  $c/n-v/n^2$ .

Let us begin the examination of the Doppler effect from his classical theory.

Let the radiation source flat transverse EM of wave rest in selected IRS. Then, if wave is propagated along the three-dimensional axis z, and at the origin of coordinates its electric field it changes according to the law

### $E(t) = E_0 \sin \omega_0 t,$

The same value of field will be observed at any observation point z with the delay t=z/V, where V-phase wave velocity. In this case the dependence of electric field on coordinate and time of signs the form

$$E(t,z)=E_0\sin\omega_0(t-z/V).$$

The instantaneous values of phase at the observation points  $z_1$  and  $z_2$  are respectively equal

$$\varphi_{1}(t) = \omega_{0} t - z_{1} \omega_{0} / V,$$
 (3.3)

$$\varphi_2(t) = \omega_0 t - z_2 \omega_0 / V. \tag{3.4}$$

A phase difference between the points in this case indicated will comprise

$$\Delta \varphi = (z_2 - z_1) \omega_0 / V = \Delta z \omega_0 / V = \Delta z k$$

where  $\Delta z = z_2 - z_1$ - the distance between the observation points,  $k = \omega_0 / V$ - wave number.

Let now the generator move in selected IRS. Then, if at the observation point  $z_1$  the phase of wave is again determined by relationship (3.3), that at the observation point  $z_2$  the phase of wave will be as before determined by the relationship (3.4). But if for any reasons the frequency of incident wave will become equal  $\omega_1$ , that for the phase of wave will be carried out the same relationships (3.3) also (3.4) with the new value of frequency.

If the generator of wave moves with the constant velocity v, that phase waves at points  $z_1$ ,  $z_2$  will change according to the law

$$\varphi_1(t) = \omega_0 t - \frac{\omega_0}{V} (z_1 + vt), \qquad (3.5)$$

$$\varphi_2(t) = \omega_0 t - \frac{\omega_0}{V} (z_2 + vt).$$
 (3.6)

A phase difference between the observation points in this case will comprise

$$\Delta \varphi_{1-2} = \omega_0 \Delta z / V = 2\pi \Delta z / \lambda_0 \tag{3.7}$$

where  $\lambda_0 = 2\pi V/\omega_0$  - the wavelength.

A phase difference (3.7) on the speed of generator does not depend. This connected with the fact that wave velocity in the selected frame of reference is constant. However, the frequency of signal at the points indicated will change according to the law

$$\omega_1 = \partial \varphi_1(t) / \partial t = \omega_0 (1 + v/V), \qquad (3.8)$$

$$\omega_2 = \partial \varphi_2(t) / \partial t = \omega_0 (1 + \nu/V). \tag{3.9}$$

It is evident that at both observation points the frequency obtained the not depending from the distance to the generator, Doppler additive identical

$$\Delta \omega_D = \omega_0 v / V . \qquad (3.10)$$

If a phase difference (3.7) is constant during the motion of generator, then is constant wavelength. In this

case a change of the frequency in the observation points can be connected only with a change in phase wave velocity in selected IRS. This change can be determined from the relationship

$$\lambda = \frac{2\pi V}{\omega_0} = \frac{2\pi (V \pm \Delta V)}{\omega_0 (1 \mp v/V)}$$
(3.11)

from where we obtain

$$\Delta V = \mp v$$
.

This indicates the classical addition of velocities of light and speed of generator, and it means wave velocity in selected IRS it can be both more and it is less than the standard speed of light on Wednesday, including in the vacuum, which contradicts SR.

Let us further examine the relativistic theory of the Doppler effect.

Accordingly (3.1, 3.2) frequency changes simultaneously with the wave number, and it means also with a phase difference between the observation points. This phase difference depends both on the speed of generator and on the distance between these points. To frequency (3.8) or (3.9) corresponds the wave number

$$k = \omega_0 (1 + v/V)/V$$
 ,

therefore a phase difference between the observation points into SR changes according to the law

$$\Delta \varphi = \Delta z \omega_0 (1 + \nu/V) / V. \qquad (3.12)$$

From the relationship (3.12) it follows that a phase difference between the observation points will depend on the distance between this by points and on the speed of generator. However, in the classical case, as follows from the relationship (3.7), a phase difference between the observation points on the speed of generator it does not depend.

Therefore the measurement of a phase difference between the observation points for the case of the moving generator is the task of the proposed experiment. If it seems that a phase difference does not depend on the speed of the motion of generator, then this will mean that SR, Lorenz transformation and principle of the invariance of the speed of light are not accurate.

Let us examine within the framework SR case, when generator varies along the axis z according to the harmonic law with the frequency  $\Omega$ :

### $z=z_1+z_0\sin\Omega t$ ,

where  $z_1$ - the initial position of generator,  $z_0$ - the amplitude of its of fluctuations.

Then the flutter speed of generator will be determined by the relationship

$$v(t) = \partial z / \partial t = z_0 \Omega \cos \Omega t = v_0 \cos \Omega t$$
,

where  $v_0 = z\Omega$  - the amplitude of speed.

In this case Doppler additive to the frequency at both observation points will change according to the law

$$\Delta \omega_D = (\omega_0 z_0 \Omega \cos \Omega t) / V$$

and additive to the wave number will be determined by the relationship

$$\Delta k(t) = (\omega_0 z_0 \Omega \cos \Omega t) / V^2.$$

The phase difference between the observation points, caused by this additive, will comprise

$$\Delta \varphi(t) = \left( \Delta z \omega_0 z_0 \Omega \cos \Omega t \right) / V^2 . \quad (3.13)$$

To this dependence of a phase difference on the time corresponds the frequency modulated signal, whose frequency will change according to the law

$$F(t) = \omega_0 \left( 1 - \left( \Delta z x_0 \Omega^2 \sin \Omega t \right) / V^2 \right), \quad (3.14)$$

i.e. within the framework SR will be obtained the frequency-modulated signal, whose frequency changes according to the harmonious law and the amplitude of the deviation of frequency of which it is equal

$$M = \Delta z \omega_0 x_0 \Omega^2 / V^2$$

Since the last  $V{=}c/n$  , equality can be written down in the form into SR

$$M = n^2 \Delta z \omega_0 x_0 \Omega^2 / c^2$$
.

In any material medium the value M is always greater than in the vacuum,  $n^2$  once, but in air this difference can be disregarded.

Let us calculate the expected parameters of the signal, which enters from the photodetector, for the case examined. For this it is utilized the parameters of the interferometer, described above, on which were conducted studies. The distances between the mirrors A also in it was 250 mm, the frequency of the vibrations of vibrator - 50 Hz, the amplitude of the fluctuations of mirror was equal 5 mm. With these parameters (in the case of justifiability SR) the amplitude of the deviation of the frequency of the frequency of the frequency of the signal, which must be IRSlated on the photodetector, will be about 180 Hz. This signal easily yields to detection and measurement.

However, with conducting of experiment according to the diagram, represented in Fig. 5,

interference picture did not change both in the case of the fixed reflecting mirror and in the case of its fluctuations, and interference fringes remained at their places, picture was only extended on the vertical line approximately on 50%. This connected with the fact that the axis of oscillation of the reflecting mirror is slightly inclined with respect to the laser beam reflected. Separately clearly were distinguished the interference fringes, when they were located vertically. With the start of vibrator they only were lengthened. Since the interference fringes with the start of the vibration of mirror did not change their position and did not move, signal on the photodetector was absent. Since in the process of experiment frequency modulated of signal, removed from the photodetector, was not discovered, this means that the connection between the frequency and the wave number, determined by relationships (3.1) and (3.2), they are not carried out, which contradicts SR. Experimental results indicate also that in this case the conversions of Galileo are carried out, and the rate of radiation source is added to the speed of light.

Let us examine this question for the vacuum based on example of band saw (Fig. 6).



Fig. 6: Work of the band saw

From the machine tool, designated by square, with speed c leaves the band saw, whose teeth are cut in the form sinusoid. If the distance between the teeth is equal  $\,\lambda_{_{0}}$  , that the frequency of the output of teeth from the machine tool is equal  $f_0 = c/\lambda_0$ , where c - the speed of the motion of the tape of saw. A quantity of teeth is placed between two lines of observation Llocated at a distance in this case, equal  $N=L/\lambda_0$  and the speed of the motion of the teeth through the lines of observation is equal c. Let us assume that machine tool begins to move to the side of the lines of observation with the speed v. Together with it will move the moving saw. In this case the speed of the motion of teeth relative to the lines of observation will increase and will become equal c+v, but a quantity of saw teeth between the lines in this case it will remain before. The frequency of the passage of the teeth through the lines of observation also will increase and it will become equal  $\ f_{_{\mathcal{V}}}=ig(c\!+\!ar{v}ig)ig/\lambda_{_{0}}$  . Doppler additive to the frequency of the passage of the teeth through the 2017

lines in this case will comprise  $f_v - f_0 = v/\lambda_0$ . It is possible to examine another case, when machine tool remains fixed, and both lines of observation move to the side of machine tool with the speed v. Situation will be the same as during the motion of machine tool to the side of lines. Consequently, a quantity of teeth, which are been located between the lines of observation does not depend on the speed of machine tool or observers.

A similar situation occurs in the section AB in the interferometer, since proved to be valid the conversions of Galileo. Only instead of the saw teeth we deal concerning the electromagnetic wave, generated by the fixed or moving generator.

During the motion of generator in air with the speed v to the side of the reflecting mirrors in entire section AB ray moves with the speed  $c/n+v/n^2$ , while in the remaining arms of interferometer it moves with the speed c/n. Since in the process of experiment it is discovered, that a phase difference in the section AB does not depend on the speed of generator, in this section the wavelength also does not depend on the speed of generator. But this means that the Doppler frequency, fixed at the observation points, which depends on the speed of generator, is not connected with the wavelength in this section.

This fact contradicts the Lorenz transformation and the principle of the invariance of the speed of light, indicating that the rate of radiation source is added to the speed of light according to the classical rule.

But was achieved in the experiment conducted the faster-than-light (more than the rate constant c of light in the vacuum) wave propagation velocity in IRS of interferometer? No, it was not, since experiment was conducted in atmospheric air. For the exceeding with wave velocity of rate constant c of source (generator or mirror) v towards the interferometer and refractive index n must be connected with the inequality

$$c/n+v/n^2 > c$$
.

Expressing from this inequality a value v , we have:

$$v > n(n-1)c$$
.

For air (n = 0,0003) we under normal conditions obtain the astronomical speed of source v very high speed value>9 km/s. But it is possible to attain reduction in this speed due to reduction in the value n, of air achieved by the replacement by vacuum. With the assigned magnitude v the requirement for the value n takes the form

$$n < (1 + \sqrt{1 + 4v/c})/2$$

At least, mirrors A and B, the space between them and moving mirror, and mirror itself must it is found in vacuum chamber.

Let us assume that the value (n-1) is proportional to the pressure of residual gases in the camera. If we accept the speed of the mirror of the equal 1 m/s, then it suffices to decrease the pressure in the camera on six orders in order with the tenfold reserve to satisfy the condition presented. This vacuum is considered low, and its reaching is -not problem with the contemporary level of vacuum technology.

### IV. Use of an Interferometer with the Mechanical Division of the Ray for Purposes of the Passive Radar

The proposed interferometer can be used for purposes passive radar. For determining the speed of the moving generator should be determined the wavelength  $\lambda_0$  in the section AB. For this one of the mirrors must be made mobile and its displacement compared with a quantity of strips, which correspond to this displacement. According to the measured value of wavelength should be determined the frequency of the moving oscillator  $f_0 = c/\lambda_0$ . Then it is necessary to measure the frequency  $f_V$  in one of the observation points. In this case the speed of the moving generator will be determined from the relationship

$$v = (f_v - f_0)\lambda_0.$$
 (3.15)

The moving generator thus to easily distinguish of the fixed, whose frequency changes. For the fixed generator wavelength  $\lambda$ , measured between the observation points, and frequency f, measured at the observation points, they will be connected with the relationship

$$\lambda f = c. \qquad (3.16)$$

### V. Conclusion

By the empirical basis of the principle of the invariance of the speed of light SR it is customary to assume the class of the physical experiments, which use a Michelson interferometer and called Michaelson's experiences. However, a question about that until recently remained open, are explained the results of these experiences by the principle indicated or by some other reason. This caused the urgency of the improvement of means and methods of the corresponding checkings in the direction of an increase in the cleanliness of experiment, i.e., the elimination of other possible reasons for explanation.

For this purpose the authors developed the new type of interferometer with the mechanical division of laser beam and is proposed the method of checking SR with the aid of this interferometer. If following Michaelson's experiences the method proposed again confirmed SR, then it would be possible and to further improve means and methods of checkings, but in this case one should recognize the still high degree of experimental confirmation of this theory. However, the results of the experiment conducted showed that the speed of light from the moving generator is obtained by the classical addition of velocities of light relative to generator with the speed of its motion. Consequently, SR it is not accurate, of than any laboratory of peace can be convinced, after repeating our simple experiment. But indeed this indicates the beginning of the sunset of entire era in the history of physics - of era, which abolished for the high speeds of the motion of the conversion of Galileo upon transfer of one IRS to another and of that replaced with their Lorenz transformation. The experiment conducted showed the insolvency of this replacement.

In the work it is also shown, what errors previously experimenters accomplished, attempting to prove the justifiability of postulate SR about the invariance of the speed of light. Is outlined the way of overcoming the errors with the aid of the developed interferometer indicated.

The monograph of contributors 1, where within the framework ideas about not the invariance of the theorem of Gauss for the electric field of the moving [14] is introduced the new concept of scalar- vector potential, is dedicated to the new ideology of electrodynamics and entire physics, which assumes the fundamental role of the conversions of Galileo, or are proposed new conversions pour on, connected with the transformations of coordinates of Galileo. Still Maxwell used conversions of Galileo during the construction of electrodynamics. However, at that time still was not explained the fundamental role of the conversions of Galileo as the connecting beginning between the space and the time, and these conversions were disdainfully placed as if house with respect to "present" conversions separately of space and separately time. But indeed the precisely fundamental role of the conversions of Galileo predetermines existence of the effects, which is conventionally designated as relativistic, but which, as it seemed, have to the Lorenz transformation of no relation.

The authors hope that the appearance of their monograph [14] in conjunction with the represented experimental results they will impel researchers to the long ago ripened revolutionary revision of fundamental physical ideas.

The important technical application of the result of this work relates to the passive radar. IN SR principally it cannot be differed the change in the frequency, created by fixed generator, from the same change in the frequency, caused by the Doppler effect. Now a change in the frequency of the incoming signal in conjunction with the invariability of a phase difference between the observation points in the interferometer must unambiguously testify about the Doppler effect, and in conjunction with a change in the phase difference between these points – about a change in the frequency of fixed oscillator.

The experimental results, obtained in the work, became possible because of the invention of interferometer with the mechanical division of laser beam. Because of this invention SR was possible for the first time in entire history to prove the insolvency of the Lorenz transformation and to refute postulate about the invariance of the speed of light.

The authors did not find in the literature of the analogs of the interferometer examined known to them; therefore the designation, represented in the name of article, is appropriated to it.

### The appreciation

The authors express large appreciation Valery Alexandrovich Nevolnichenko for help in the production of interferometer.



Fig. 7: General view of the interferometer on which the investigations were carried out

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- Font type of all text should be Swis 721 Lt BT.
- Paper Title should be of Font Size 24 with one Column section.
- Author Name in Font Size of 11 with one column as of Title.
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- Main Text: Font size 10 with justified two columns section
- Two Column with Equal Column with of 3.38 and Gaping of .2
- First Character must be three lines Drop capped.
- Paragraph before Spacing of 1 pt and After of 0 pt.
- Line Spacing of 1 pt
- Large Images must be in One Column
- Numbering of First Main Headings (Heading 1) must be in Roman Letters, Capital Letter, and Font Size of 10.
- Numbering of Second Main Headings (Heading 2) must be in Alphabets, Italic, and Font Size of 10.

#### You can use your own standard format also. Author Guidelines:

1. General,

- 2. Ethical Guidelines,
- 3. Submission of Manuscripts,
- 4. Manuscript's Category,
- 5. Structure and Format of Manuscript,
- 6. After Acceptance.

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1. Choosing the topic: In most cases, the topic is searched by the interest of author but it can be also suggested by the guides. You can have several topics and then you can judge that in which topic or subject you are finding yourself most comfortable. This can be done by asking several questions to yourself, like Will I be able to carry our search in this area? Will I find all necessary recourses to accomplish the search? Will I be able to find all information in this field area? If the answer of these types of questions will be "Yes" then you can choose that topic. In most of the cases, you may have to conduct the surveys and have to visit several places because this field is related to Computer Science and Information Technology. Also, you may have to do a lot of work to find all rise and falls regarding the various data of that subject. Sometimes, detailed information plays a vital role, instead of short information.

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26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

**27. Refresh your mind after intervals:** Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

**28. Make colleagues:** Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

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**34.** After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

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- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

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#### Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

#### In every sections of your document

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- $\cdot$  Keep on paying attention on the research topic of the paper
- · Use paragraphs to split each significant point (excluding for the abstract)
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Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

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The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript-must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

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- Reason of the study theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including <u>definite statistics</u> if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

#### Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
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- Shield the model why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

#### Approach:

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- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

#### Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

#### Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

#### Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

#### Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper avoid familiar lists, and use full sentences.

#### What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings save it for the argument.
- Leave out information that is immaterial to a third party.

#### **Results:**

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently. You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.



Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.

• Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form. What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables there is a difference.

#### Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

#### Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

#### Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and accepted information, if suitable. The implication of result should be visibly described. generally Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

#### Approach:

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- Submit to work done by specific persons (including you) in past tense.
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Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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ISSN 9755896