Ether Flux Theory: Integrating Gravity, Quantum Mechanics and Optics

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Abstract:

Ether Flux Theory (EFT) has been put forward to explain many physical phenomena of nature, employing a *single assumption, the existence of ether*. The theory explains gravity, inertial mass, diffraction, interference, quantum mechanics (double slit experiment), and radioactive decay. It has been developed based on logical deduction for the existence of ether (aka aether). Supportive evidence are provided, in places, by which one can verify the assumptions and axioms used in EFT. The EFT is a logical framework, a first step for any physical theory, rather than a system of equations as it is believed that a complete theory based on EFT may not be provided by a set of equations, rather a computer simulation model is thought necessary. There are also some experimentally verifiable predictions, arising from this theory, which when confirmed will provide proof for EFT. Using EFT gravity and quantum mechanics explained, with a single assumption, which has been a long standing problem in physics. It is hoped that based on EFT a more rigorous physico-mathematical theory will be developed by the physicists and mathematicians (uniting gravity and quantum mechanics) which has been a long standing problem in modern physics.

Preamble:

The scientific method has four steps [1].

1. *Observation and description of a phenomenon*. The observations are made visually or with the aid of scientific equipment.
2. *Formulation of a hypothesis to explain the phenomenon in the form of a causal mechanism* or a mathematical relation.
3. Test the hypothesis by analyzing the results of observations or by *predicting and observing the existence of new phenomena* that follow from the hypothesis.
4. Establish a theory based on *repeated verification of the results*.

In the present paper an attempt is made to construct a scientific theory based on the above steps. The important point is Step #2. *Here hypothesis is formulated to explain the observed phenomena (Step#1) in form of a logical model/framework or causal mechanism and do not necessarily provide a mathematical model*. Because logical model is always a prerequisite in order to build a full mathematical or computational model. The reason being, there are some mathematical models available for the phenomena described or that such mathematical models are not possible at all and one has to rely on generating a computational model to describe or simulate the phenomenon at hand. Thus although the theory developed in this paper does not have any equation(s) *per se* it should be considered a logical model/framework to explain natural phenomena or scientific experiments discussed. The developed logical model provides some predictions (Step#3) to be verified as proof of the theory.

Introduction:

Ether, or luminiferous Ether, was thought of as the hypothetical substance through which electromagnetic waves travel. It was proposed by the Greek philosopher Aristotle and used by several optical theories as a way to allow propagation of light, which was believed to be impossible in "empty" space. It was supposed that the ether filled the whole universe and was a stationary frame of reference that was rigid to electromagnetic waves but completely permeable to matter. Robert Hooke endorsed the idea of the existence of the ether in his work Micrographia (1665), and other several philosophers of the 17^{th} century, including Christiaan Huygens, did the same. At the time of James Clerk Maxwell's mathematical studies of electromagnetism, ether was still assumed to be the propagation medium and was associated with physical properties such as permeability and permittivity [2].

Maxwell's Electromagnetic Theory:

Maxwell in his paper on "On Physical Lines of Force" (Prop. XVI) in 1861 derived that the propagation of transverse vibrations travels at speed *c* of 310,740,000 m/s assuming a medium with elasticity and density. Maxwell always assumed a 'medium' that is required for the propagation of the electromagnetic vibrations. Later in his 1865 paper (A Dynamical Theory of Electromagnetic Field) Maxwell assumed a 'medium' for the propagation of light. This medium was aether (or ether from now on). In fact this medium was considered essential in the development of electromagnetic field theory.

Lorentz's Ether Theory (LET):

Lorentz's initial theory created in 1892-1895 was based on motionless ether. With this theory Lorentz explained the negative ether drift by introducing the "local time" and the negative results of Michaelson-Morley Experiment (MMX)(1887) by introducing the concept of length contraction in 1892. Lorentz expanded on this theory and introduced the Lorentz Transformations (corrected in 1905 by Henri Poincaré). Following are these transformations.

The Lorentz transformation (simplified for one direction x) for frames in standard configuration can be shown to be

$t' = \gamma\left(t - \frac{vx}{c^2}\right)$ {Time dilation, local time etc.}…Eq. (1)

$x' = \gamma(x - vt)$ {Length contraction}… Eq. (2)

$y' = y$ … Eq. (3)

$z' = z$ … Eq. (4)

Where,

$\gamma = \frac{1}{\sqrt{1-\beta^2}}$, and

$\beta = \frac{v}{c}$ (Velocity coefficient in *x* direction).

As we know in 1887 a crucial experiment was performed by Albert Michelson and Edward Morley in an attempt to detect the existence of the ether. The experiment, named the Michelson-Morley experiment (MMX) in honor of its authors, shocked the scientific community

by yielding results which implied the non-existence of ether. This result was later on used by Einstein to refute the existence of the ether and allowed him to develop Special Relativity (SR) without this constraint. Although later in 1920 Einstein said in a public address that space is endowed with physical qualities and space without ether is unthinkable [3]. It is important to note that Einstein derived the *same transformations* as Lorentz's in his 1905 paper for SR using the two postulates of Special Relativity discussed below.

Special Relativity (SR):

In development of SR Einstein used the following postulates:

(1) First postulate (principle of relativity)

The laws of physics are the same in all inertial frames of reference.

(2) Second postulate (invariance of *c*)

The speed of light in free space has the same value *c* in all inertial frames of reference.

The first postulate states the same principle that Galileo Galilei first described in 1632 in his Dialogue Concerning the Two Chief World Systems. However the second postulate, invariance of *c*, is of significant interest for the present discussion.

As mentioned above, we know that Lorentz's (LET) and Einstein's transformation equations (Special Relativity or SR) are the same. In fact LET is often treated as a "Lorentzian" interpretation of SR. Thus because of the same mathematical formalism it is not possible to

distinguish between LET and SR by experiments. However we know that Lorentz always considered ether to be the prevailing medium in the space in order to develop his theory.

Therefore, logically, how is it possible that two theories (of Lorentz's and Einstein's) derive the same equations (with two assumptions of which one is exactly the same in both theories "relativity principle") where one theory assumes the *ether* (one of the assumption of LET) as a space filling, motionless medium and the other theory assumes absence of ether but just the *invariance of c* (second assumption of SR). In fact after publishing SR in 1905 Einstein expresses the following in 1912:

> "...it is impossible to base a theory of the transformation laws of space and time on the principle of relativity alone. As we know, this is connected with the relativity of the concepts of "simultaneity" and "shape of moving bodies." To fill this gap, *I introduced the principle of the constancy of the velocity of light, which I borrowed from H. A. Lorentz's theory of the stationary luminiferous ether*, and which, like the principle of relativity, contains a physical assumption that seemed to be justified only by the relevant experiments (experiments by Fizeau, Rowland, etc.)" [4].

It is, therefore, quite possible that both theories convey the same information i.e. *constancy of c* equates presence of ether medium (without explicitly declaring its presence) and that light travels as a wave and not a (projectile) particle. As Richard Feynman said in his Nobel Prize lecture in 1965: "*Theories of the known, which are described by different physical ideas may be equivalent in all their predictions as are hence scientifically indistinguishable*." Therefore, the second postulate, i.e. *invariance of c*, of SR can be equated to the presence of ether and therefore has a deeper meaning and another interpretation relating to LET.

Invariance of *c*:

When a literature search was done regarding the reason for the invariance of the speed of light (*c*) I could not find any scientific paper or book explaining "Why the speed of light is

constant?" Perhaps it is a moot point to ask such a question since *c* is just a constant and an experimentally proven fact. I did find, though, something interesting about the invariance of *c*. It was Henri Poincaré who argued that *scientists have to set constancy of the speed of light as a postulate* to give physical theories the simplest form [5]. This was long before Einstein used it in SR. By the way, it was also Poincaré who corrected the Lorentz' transformation equations that Lorentz developed for his *ether theory* and gave them the final form that we know today. These Transformation Equations (also the *same equations* are found in Special Relativity theory by Einstein) are contained in Poincaré Group [6]. It is important to note that Poincaré's recommendation of using constancy of speed of light was based on the Lorentz Ether Theory (LET), where luminiferous ether, as the medium for light propagation, was the central theme. Based on this information doesn't it seem that if you assume *invariance of c* and derive the transformation equations (like Einstein did) you would get the same equations as the equations like Lorentz's / Poincaré's?

Although, there is possibly another interpretation or an answer to this unanswered question. Suppose if all the cars of the world, with very different horse powers (different frequencies of light with vast differences in energies) are travelling at exactly the same speed, say 50 km/h, we will ask the question, why? One possible explanation, however unlikely, would be that all cars produce exactly same power to weight ratio and hence travel at exactly the same speed. The other possibility is that all roads are posted with the 50 km/h speed limit. This later scenario is more likely and comprehensible. That is to say all roads are acting as a medium and all cars are moving as waves at the same speed just like photons. Now, if we consider photons as particles or cars, as per Einstein, we can ask the question, 'What is powering a photon (ejected out of the atom) as it was at rest once in the atom?' Since photon is considered massless (m=0) we know

that it will not obey Newtonian force law, $F=ma$. Another possibility is that it can be considered a particle and somehow it is thrown as a projectile form the atom. If this is true then one would find the speed of this photon dependent on the velocity of the atom throwing the photon. Hence *c* will be variable depending on the speed of the source of the light. We know that this is not the case as *c* is exactly 299 792 458 m/s in all frames of reference. We also know that Maxwell derived this constant from the dynamical electromagnetic theory. He on the other hand considered photon as an *electromagnetic (EM) disturbance*. He also considered, and stated emphatically in his paper of 1865, that ether is the medium for the propagation of this EM disturbance. Einstein used the invariance of *c* as a postulate in SR based on the discovery of Maxwell that *c* is a constant and that it is at which the EM disturbance travels in the medium ether. Thus one can say that invariance of *c* was taken out of the context and used for SR ignoring two assumptions of Maxwell (a) the light is an EM disturbance (thus a *wave* and not a particle), and (b) that ether is a prevailing medium in the universe through which this EM disturbance travels. Excerpts from Maxwell's 1864 paper [7] are given below. These excerpts shows how integral the ether medium is to the theory of electromagnetic field and propagation of light as an electromagnetic disturbance (a wave) and for the constancy of the speed of light:

Page 460, paragraph (2):

"I have therefore preferred to seek an explanation of the fact in another direction, by supposing them to be produced by action which go on in the *surrounding medium* as well as in excited bodies…"

Page 460, paragraph (6):

"We may therefore receive, as a datum derived form a branch of science independent of that with which we have to deal, the existence of a *prevailing medium*, of small but real density, capable of being set in motion, and of transmitting motion from one part to another with great, but not infinite, velocity."

Page 461, paragraph (6) continued:

"The *propagation of undulations* (i.e. wave) consists in the continual transformation of one of these …"

Page 461, paragraph (7):

"A *medium* having such a constitution…"

Page 462, paragraph (10):

"According to the theory which I (Maxwell) propose to explain, this "electromotive force" is the force called into play during the communication of motion from one part of the *medium* to another, and it is by means of this force that the motion of one part causes motion in another part."

Page 464, paragraph (15):

"It appears therefore that certain phenomena in electricity and magnetism lead to the same conclusion as those of optics, namely, that there is an *aetherial medium* prevailing all bodies, and modified only in degree by their presence; that the parts of this *medium* are capable of being set in motion by electric currents and magnets; that this motion is communicated from one part of the *medium* to another by force arising from the connexions of those parts; …"

Page 465, paragraph (20):

"The general equations are next applied to the case of a magnetic *disturbance (my comment wave)* propagated through a non-conducting field, and it is shown that the only *disturbances (waves)* which can be so propagated are those which are transverse to the direction of propagation, and that the velocity of propagation is the velocity *v*, found from experiments such as those of Webber, which express the number of electrostatic units of electricity which are contained in one electromagnetic unit.

This velocity is so nearly that of light, that it seems we have strong reason to conclude that light itself (including radiant heat and other radiations if any) is an electromagnetic disturbance in the form of waves propagated through the electromagnetic field according to electromagnetic laws. If so, the agreement between the elasticity of the *medium* as calculated from the *rapid alterations of luminous vibrations*, as found by the slow processes of electrical experiments, shows how perfect and regular the elastic properties of the medium must be when not encumbered with any matter denser than air…."

And so on there are many instances of mention of the ether as the medium as well as the wave in terms of undulations as electromagnetic disturbances.

Thus, assuming or declaring invariance of *c* as an axiom implies that there is a medium (ether) in the free space through which the propagation of EM disturbance (light/photon) travels as a wave. Furthermore, based on his Nobel Prize winning photoelectric effect paper [8] Albert Einstein declared photon as an energy quantum (particle) which is massless and travels in free space without the ether medium (as per SR). Now we have to reconcile with the following facts,

a) Invariance of *c*,

b) Wave nature of the photon and therefore assuming

c) Ether as a medium for its propagation and,

d) Particle nature of the photon (albeit massless).

First, let's consider space without the ether and constancy of *c*. At quantum level, the photon (a particle without any mass), has to be projected from a light emitting source (electron of an atom) at *exactly* the speed of 299 792 458 m/s (*c*) every time from every atom of the light source and also light (γ-ray) emitted by the nuclear process. Since the photon is massless how it is possible to eject such a particle which cannot obey Newton's first and second laws. First law: An object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force. In order for a photon particle to observe this law it has to initiate it's journey out of an atom by the action of some force from the atom. Now the Second Law: The acceleration of an object as produced by a net force is directly proportional to the magnitude of the net force, in the same direction as the net force, and inversely proportional to the mass of the object of $F=ma$. As we know the photon is massless. If that is the case then it cannot achieve any acceleration (*a*) due to a force (*F*) from the atom and hence cannot achieve any velocity (*c*) since an object will remain stationary unless acted upon by an external force. Thus in order for photon to be a particle *and* be in motion is to violate Newton's first and second laws. Therefore it is best to assume photon as a wave and not a particle which we will discuss later in this paper. Furthermore, even if the photon achieves speed *c* against Newton's laws, this *speed has to be constant* regardless of the source of the photon. For example a γ-ray, arising from the nucleus instead of the electronic shell of the atom, and produced most likely by a different mechanism as compared to electron transition, also has exactly the same speed *c*. Furthermore, if photon (a particle) can be propelled from an atom at the speed *c* this speed can also be additive if the light source is moving. In other words, one cannot maintain the invariance of *c* if photon is a projectile and that the inertial frames of reference are moving at different speeds. Thus assuming constancy of *c* and space without a medium raises some

fundamental questions which cannot be answered by classical mechanics. However, if we do assume ether as a space filling medium we can explain the propagation of light as an electrical disturbance (wave) travelling at a constant speed regardless of the mechanism of the origin of the disturbance and also regardless of the motion of the inertial frame of reference. The above discussion provides logical reasons to assume that the space if filled with ether and that light is a wave and not a particle. Additionally, we know that all of SR's predictions are confirmed experimentally. Thus if SR (which is considered a Lorentzian interpretation of LET) is proven correct and therefore constancy of *c* is correct hence there should be ether. *Thus stating invariance of c is equivalent of stating that photon is only an EM wave and that it is carried by the ether medium which is filling the space of the universe.* This assumption at the same time raises the question that if ether is filling the space (as implied by the invariance of *c*) then why it was not detected by the Nobel Prize winning Michaelson-Morley Experiment (MMX), and many other and even more sophisticated MMX type experimental attempts since, to detect the ether.

It is important to point out that Maxwell calculated the speed of light to be a *constant* and used also the same equation that Newton-Laplace used for the speed of sound (for a sound *wave* through the air *medium*). Therefore the question is "If MMX failed to show any ether would you doubt the validity of Maxwell's theory or the null results of MMX indicating absence of the ether medium, a crucial and vital element of the foundation of Maxwell's electromagnetic theory?" I think one has to consider that *something is wrong with MMX* and not with Maxwell's theory (i.e. absence of ether) as the speed constant (as predicted by Maxwell's theory) is repeatedly determined to be a fixed value at 299 792 458 m/s. Before we ask what was wrong with MMX let us consider one analogy that may help us understand the invariance of *c* better.

In this analogy we consider the surface of an ocean and as if we are living in a two dimensional world and that the whole universe is the surface of ocean in which all celestial objects are floating. Now consider three ceases. One, a person standing on an island. Second, a person sitting in a slow moving boat at speed v_1. And, third, a person sitting in a power boat travelling at speed v_2. Here v_2 is much faster than v_1 and for the person on the island $v_0=0$. Thus $v_0 << v_1 <<< v_2$. Now consider all these three individuals throw a pebble with which they create waves (disturbance) in the ocean water. We know that all waves will travel at the *same speed* (*c*) as they are just disturbances on the surface of the ocean water. Thus, this analogy indicates that the *only way c can be a constant* is due to the travel of electromagnetic disturbance (water wave) which is travelling in the ocean of ether (water). This analogy again points to the fact that there should be a medium in space (ether) for the wave to travel at a constant speed.

According to our previous arguments we arrived at a conclusion that *ether should exist*. So, the question is, "W*hy was ether not detected*? There is one very good reason for this lack of detection. All ether detection (indirect) experiments were performed only in *one configuration*. This configuration was in *horizontal plane* to the Earth's surface. That is to say two beams of light which should produce interference are travelling *horizontal to the Earth surface* in all of the ether detection experiments. Of course only this configuration had to be used because the purpose was to detect passage of Earth through the purportedly static ether. However, there is one more possible configuration that should have been examined. This configuration is in *perpendicular* direction to the Earth's surface. Following is the reason why such a configuration should have been used.

Ether Flux Theory (EFT):

Historically, a theory of ether is intimately related with light on one hand and gravity on the other. In other words ether is related with the world of small (quantum (hν)) as well as the world of very large objects governed by gravity. However, in modern physics one of the biggest problem is that the theory of small (Quantum Field Theory (QFT)) and theory of large (GR) are incompatible with each other. It is hoped that the Ether Flux Theory (EFT) that is developed in this paper will provide a missing link between these theories.

In this theory it is assumed that ether is not just a passive universe prevailing medium. Rather, it is *actively flowing into matter constantly*. This is similar to the views that of Fatio de Duillier's (1690) and Le Sage's (1748) and more importantly that of Newton's (1675), as he proposed [9] a remarkable mechanism of kinetic character of ether relating to gravity, with some important and crucial differences. Newton imagined that there is in the ether a component of a *sticky* nature, which is *continuously streaming towards the surface of the Earth*, where ***it is partly absorbed***. Here it seems that Newton is trying to describe electrostatic dipolar nature of ether which is causing attraction as "sticky" and the "streaming towards the surface of the Earth" as in *inward flux of ether*. Thus the downward ether stream which exerts upon the material bodies a force that Newton identifies with gravity [10]. Newton wrote a letter in 1675 to Henry Oldenburg, and later to Robert Boyle with the following content regarding ether and gravity: "{Gravity is the result of} "a condensation* causing a flow of ether with a corresponding thinning of the ether density associated with the increased velocity of flow." He also asserted that such a process was consistent with all his other work and Kepler's Laws of Motion. Newton's idea of a pressure drop associated with increased velocity of flow was mathematically formalized as Bernoulli's principle published in Daniel Bernoulli's book Hydrodynamica in 1738 [11].

*Note: Here condensation can be, I believe, interpreted as the loss of ether from the gaseous phase and hence this phenomenon is similar to absorption. Similar concept is used in EFT.

Bernard Riemann (1853) also had similar assumptions as I have in EFT. That gravitational ether is incompressible fluid and *normal matter represent 'sinks' in this ether*. So if the ether is destroyed or absorbed proportionately to the mass of a body, a stream arises (ether flux in EFT as discussed in later part of this paper) and carries all surrounding bodies into the direction of the central mass. Riemann speculated that the absorbed ether is transferred into another world or dimension (as discussed later in this paper regarding EFT, the massless ether is annihilated by the severe, black hole like, gravity of the nucleus) [12].

Furthermore, as late as 1900 Lorentz tried to explain gravity on the basis of the Maxwell equations [13]. He first considered a Le Sage type model and argued that there possibly exists a universal radiation field, consisting of very penetrating em-radiation and exerting a uniform pressure on all bodies. It was assumed by Lorentz that the ***incident energy was entirely absorbed by the object***. Such absorption would lead to enormous heating of the bodies. For this reason he abandoned this model.

Huygens' idea of an ether 'gas' permeating all space is incorporated here in EFT which was considered only surviving theory of ether which help explained the propagation of light according to Maxwell [14]. Some other factors that led me to consider the FLUX/FLOW model of ether as well as formation of polyethons or chain of ether particles, (as I will describe later) are based on successful theories such as Gauss' Flux Theorem of Gravity, Einstein's General Relativity (GR), and Classical Field Theory (CFT) which used the analogies and mathematics that were of flow behavior (all vector field equations are equations of flow and that the curl of a vector field is indicating circulation of the fluid) and the formation of ELASTIC ROD (to describe field in CFT, again similar to polyethons) than static behavior of the FIELD concerned.

It also led me to believe that the *field* that we consider as a physical entity in physics *is in reality the ether*. How else can we imagine how a field is formed, if not by some 'tangible' substance like ether?

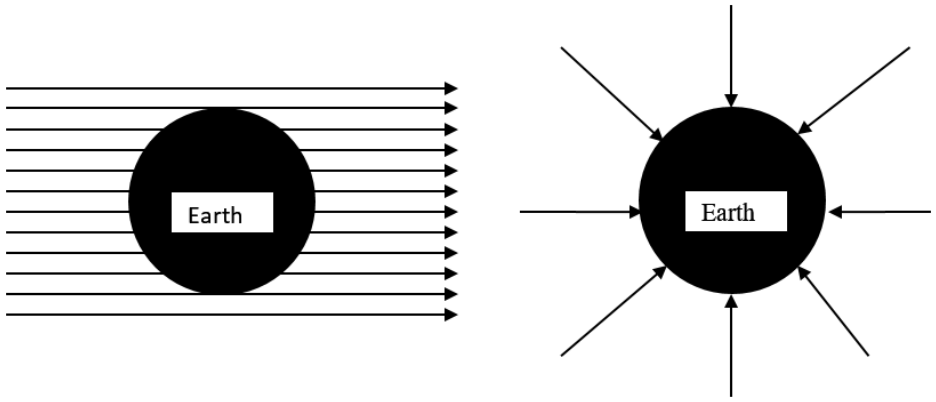
Gauss, for example, in his theory of gravity (which is considered essentially equivalent to that of Newton's Law of Universal Gravitation and more importantly for the reason of the electrostatic basis of EFT as we will see later) is mathematically similar to Gauss' law of Electrostatics which was used by Maxwell (as one of the equations describing the Dynamical Theory of Electromagnetism) [15]. In Gauss' theory the *Gravitational Flux* is a surface integral of the gravitational field over a closed surface and that this gravitational *flux is proportional to the enclosed mass*. In other words the *flow of the field* (of gravitation) *is proportional to the mass*. It is important to note that the field was considered in a state of flow and not static. Just like many of the scientists of that era thought.

Einstein's GR used the equivalency principle between the gravitational acceleration with the acceleration of a non-inertial frame (for example a rocket). Here the movement of the rocket upward is the same as if the rocket were static and the 'space' was flowing past the rocket in an accelerated fashion (by the principle of relativity). In both cases the astronaut will feel the same 'gravity'. Now consider that the space is static but there is *an accelerated downward flow of ether*. Now we can remove the rocket from this experiment and just imagine the astronaut (standing still on a platform) is showered with ether, albeit an accelerated flow of ether. The astronaut will feel the same gravity as if he was going up in the rocket. Thus we can say that the downward flow (flux) of ether is equivalent to that of an upward acceleration of the rocket or force of gravity downwards. This is a statement of principle of equivalence relating acceleration to downward flow of ether to the downward force of gravity.

A graphical difference between Static Ether Theory and Ether Flux Theory is shown in Fig. 1.

Figure 1:

Difference between Static Ether Theory and Ether Flux Theory



(a) Earth is moving left hence the apparent motion of ether is to the right. In other words ether is static or motionless in case of classical Static Ether Theory.

(b) Ether is flowing inwards radially or perpendicular to the Earth from all directions in case of Ether Flux Theory. AS Earth moves it drags all ether along with it.

The origin of the theory presented in this paper lies in the thoughts of Michael Faraday, Joseph John Thomson and James Clerk Maxwell, about the Faraday's Tubes, ether, physical lines of force and propagation of light. It was Faraday who first proposed a 'line of force' made of ***chains of polarized particles*** in a dielectric, and sometimes Faraday discussed them as having existence of their own as in stretching across a vacuum [16]. In other words that there are *dipolar/electric tubes,* connecting two bodies, which carry the electromagnetic force which is the mechanism for the 'action at a distance'. Based on Faraday's research Maxwell began working

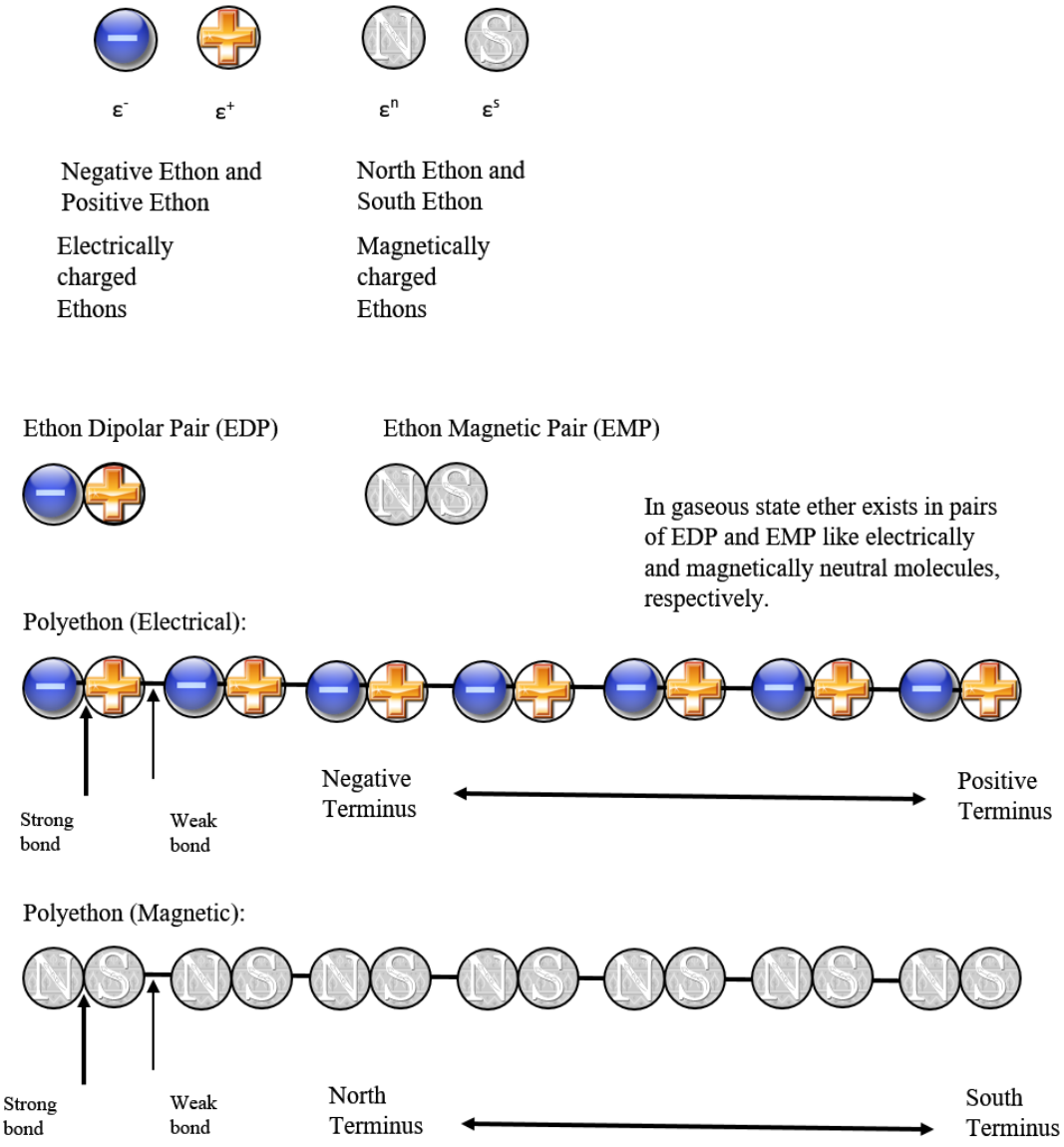
on Faraday's Lines of Force. In 1861 paper "On Physical Lines of Force" he modelled these lines of force using molecular vortices that he considered partly made of ether and partly of ordinary matter (a new word is coined here to refer to 'ordinary matter' as ***Eumatter*** or 'true matter' as we will be talking about other matters, like ether, later in the paper). He derived expressions for dielectric constant and the magnetic permeability in terms of transverse elasticity and the density of this dipolar elastic medium. He then equated the ratio of dielectric constant to the magnetic permeability with the results of Weber and Kohlrausch of 1856, and he substituted this result into Newton's equation for speed of sound (propagation of a wave requiring a medium like air) [17]. Thus the method of calculations of speed of light (similar to that for sound speed) does imply existence of ether as a medium and that light/photon as an EM disturbance moving in the ether as a wave.

First of all let's examine how these Faraday's *electric/dipolar and magnetic tubes* contained in ether (later examined by Sir J. J. Thomson and Poynting [18]) helps in propagation of light in space.

Let us suppose, for example, that there is ether and is made up of particles called *ethons*, designated by symbol ε (Greek letter epsilon) as shown in Fig. 2.

Figure 2:

Ether, its constituent Ethons, Ethon Pairs and their varieties and formation of Polyethons



These ethons come in four varieties. These are ε^+, ε^-, ε^n, and ε^s *viz.*, ethons with positive charge, negative charge, north charge and south charge, respectively. The former two are concerned with electricity and later two are concerned with magnetism. These particles are considered massless and with zero energy, however, they possess a charge. The charge can be electrical (positive (+) or negative (-)) or magnetic (north (n) or south (s)). Please note that the

word charge is used here to harmonize electric and magnetic nomenclature and behaviors of ethon particles. The n and s designation indicates type of magnetization or in other words magnetic charge. In addition it is required that theory of electromagnetism is applicable (with some modifications) and that Planck's equation (Eq. (5)) is applicable to all photons and ordinary matter (eumatter) particles based on de Broglie's theory (1924) of wave-particle duality for all matter.

$E = h\nu$ …Eq. (5)

The reason for assuming the existence of ε^+ and ε^- comes from the fact that a γ-ray photon with energy equivalent of a mass of 1.02 MeV/c^2 splits into two well-known particles electron (e^-) and positron (e^+) each with a mass of 0.501 MeV/c^2. Here it seems that by adding energy a massless photon converts into two particles of matter i.e electron and positron. Thus it is assumed that Faraday's "dipolar tube" is made of massless ε^+ and ε^- pair. These massless ethons (with positive and negative charges) converts to electrons and positrons by having vibrations (ν) to give them energy ($h\nu$ as per Planck's law) equivalent to mass of $h\nu/c^2$. A bonded unit of ε^+ and ε^- makes Ethon Dipolar Pair (EDP) designated as $\varepsilon^+\varepsilon^-$. This pair has no mass nor energy in its unexcited native form (as a 'molecule' or 'gas' of ether). This is akin to unexcited field which is not a particle in Quantum Field Theory, it turns into a particle only when the field is excited. Thus when these 'molecules' are absorbed by ordinary matter there is no gain in mass nor charge of the recipient body. Hence its absorption by eumatter does not pose any issue of mass or charge increase, heating etc. Furthermore ethons do not exhibit any friction. (In fact friction is due to electrostatic attraction existing between two bodies. If there is no attraction there is no friction and ether fluid has no viscosity). Therefore it does not cause issues related with friction such as heat generation. When this pair, EDP, gains energy *via* vibrations from a charged particle of

ordinary matter like an electron (eumatter) it converts into a photon (as per Planck's equation (Eq. (5))). However when this energy is exactly 1.02 MeV then it forms positron and an electron. Thus, there is no distinction between light, electron, positron and ordinary matter (eumatter) all are parts of a continuous energy spectrum as per the EFT. As per this assumption electron has photon like property with a frequency as shown below. Also the formation of a positron from the vacuum is similar to hole in Dirac's sea (vacuum filled with particle of negative energy) or sea of ether.

m_e = 0.510 MeV/c^2

$E = m_e c^2 = h\nu_e$ or

(It is important to note that this equivalency has been used by Louis de Broglie (1924) in developing the wave-particle duality theory for all particles not just photons)

= 0.510 x 299792458^2 x 1.609×10^{-13} = 6.626×10^{-34} ν_e

$\nu_e = 1.113 \times 10^{37}$ Hz or s^{-1}

Where,

E = energy of the electron or positron,

m_e = mass of electron or positron,

c = speed of light in vacuum,

h = Planck's constant, and

ν_e = frequency of vibrations of electron (or positron)

This is the frequency (1.113×10^{37} s^{-1}) of the electron or positron with negative and positive charge, respectively. Please note that the base particle in both cases is an ethon (ε). The only way

energy can be stored in a particle is by vibrations (ν) or by charge since two particles of different charges bind with each other with some bonding energy. Here a positive ethon and a negative ethon are bonded by attractive force of positive and negative charge. These are fundamental mechanisms how energy is locked into an ethon's charge and vibrations which converts in to particles like electrons or positrons. Again, this vibrational energy (as it is an electromagnetic disturbance) is unique in the sense that it has to be created by an *electrically charged body only* (e.g. electron (e^-) of an atom moving from a higher energy level to a lower energy level by emitting a photon or in nucleus which contains positively (u) or negatively (d) charged quarks to emit γ-ray in nuclear decay).

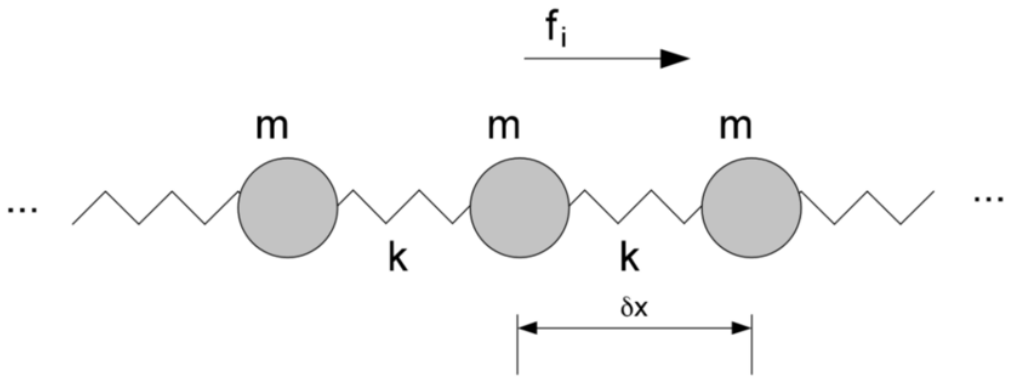
Now let us examine how these Ethon Dipolar Pairs (EDPs) are useful for the transmission of an Electromagnetic Disturbance (EMD) or a wave or a photon. Also note that we have not talked about the other ethon pair made of north and south charges (as in $\varepsilon^n\varepsilon^s$) now called Ethon Magnetic Pair (EMP). The ether is made of EDPs and EMPs. These pairs are filling the entire space of the universe (just like the classical ether) like an ideal gas. When these pairs are excited with EMD they form a loose chain of EDPs, called POLYETHON, as shown in Fig. 2. These chains are the ones which were called Physical Lines of Force by Faraday and Maxwell. Also it is analogous to the elastic rod (made of balls connected by springs) considered central in developing the field equation in Classical Field Theory (CFT). In CFT the mathematical model of the field is based on the construction of an 'elastic rod' as shown in Fig. 3(b).

Figure 3:

(a) Ball and spring model of flexible rod made up of Ethons, strong and weak springs (bonds) similar to Quantum Field Theory where the flexible rod is made of balls and springs. This is how polyethons are formed of the electrical ethons or magnetic ethons.

It is important to note that the springs are just conceptual. They represent a binding force. All ethon particle are in close contact with each other such that there is NO compression. Ethon chain can ONLY expand and in that ethon pair requires as much stronger force as compared to the attachment between the ethon pairs.

(b) The model of an 'Elastic Rod' of Classical Field Theory: A system of masses *m* joined by springs (of constant *k*), whose longitudinal displacements are $\{f_i\}$, and whose separation at rest is δx.



However, instead of the balls shown with + and – charges (as shown in Fig. 3(a)) CFT uses uncharged balls and instead of two types of springs (bonds) CFT uses only one type of spring with certain spring constant. In CFT the fabric of the space is defined by an elastic rod in one dimension, in two dimensions it is stretchable sheet. In case of EFT this flexible rod is replaced by a chain of ethons (charged) with two types of springs instead of one and called

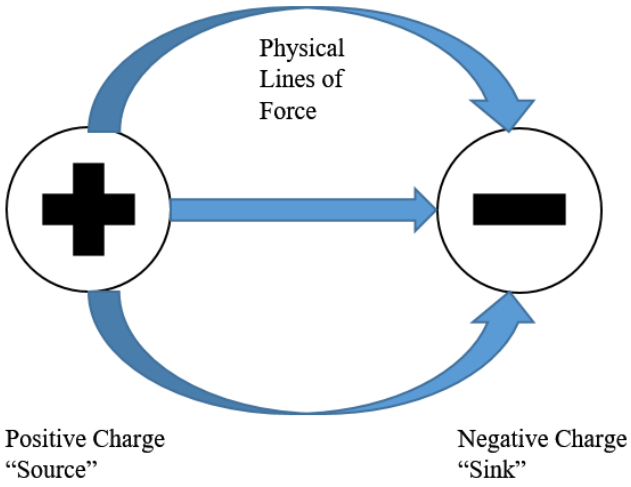
POLYETHON instead of elastic rod. However, please note that polyethon has two types of joints (springs) between the particles (balls) as shown in Fig. 3(a) with a strong bond and between positive and negative ethons and a weak bond between the EDPs making a chain of EDPs, a polyethon. The bonding force between ethons (ε^+ and ε^-) is much stronger than the bonding between one ethon pair (EDP) with the second ethon pair (EDP). It is important to note that the springs are just conceptual. They represent a binding force. All ethon particle are in close contact with each other such that there is NO compression (like Maxwell's tubes containing *incompressible fluid*).

The second joint, between the EDPs, which is made temporarily by the excitement of EDP by an EM disturbance, is very week and which probably plays the role of spring similar to the one used in CFT's elastic rod. As per chemical nomenclature the name for such a chain would be *polyethon* just like a polypeptide made of amino acids with negative C-terminal and positive N-terminal. A polyethon also has two terminals as well. One end with positive ethon (ε^+), thus positive terminus, and the other with negative ethon (ε^-), the negative terminus, as shown in Fig. 2.

Maxwell, in the EM field theory, assumed that a *positive charge is 'source'* and a *negative charge is the 'sink'* for the Physical Lines of Force or Tubes of uncompressible fluid where the fluid or *lines flow from positive charge into negative charge* as shown in Fig. 4.

Figure 4:

Flow of Physical Lines of Force or Flow of Uncompressible Fluid in Tubes as hypothesized by Maxwell

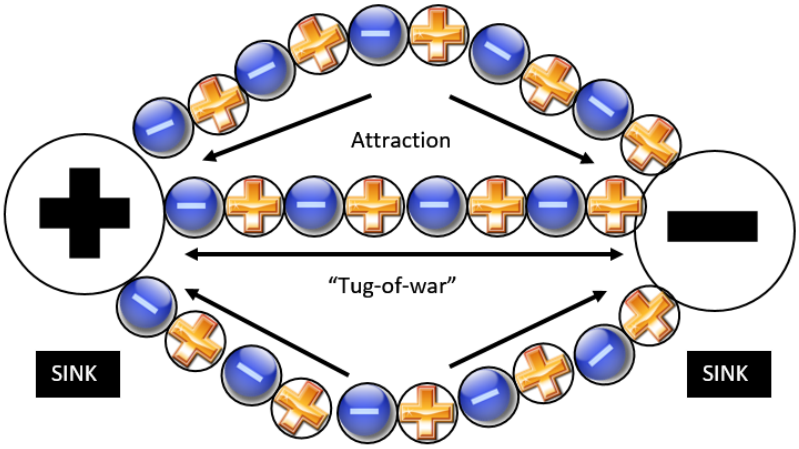


To deal with such lines of force Maxwell developed the concept of field which mediates the force/photons from positive charge to negative charge. In the present paper however, in Ether Flux Theory (EFT), a slightly different approach is taken. *Here both positive and negative charges are considered 'sinks'* (see Fig. 5(a)).

Figure 5:

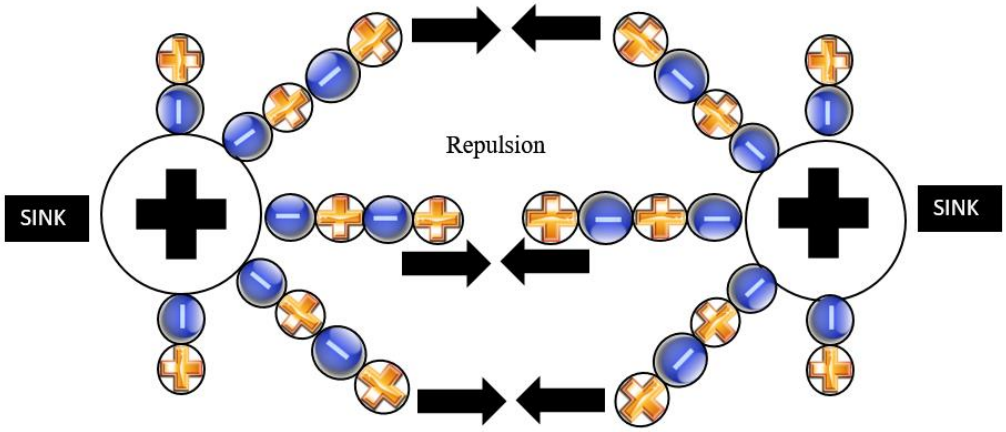
Physical Lines of Force or Ether Flux Lines as per the Ether Flux Theory:

(a) OPPOSITE CHARGES (positive and negative)



Note that polyethon chain is flowing/pulled in both direction as both charges are "sink" conditions in EFT. Thus there is a tug exhibiting attraction between the opposite charges. Also note that all positive ethons are going in negative charge and all negative ethons are going in the positive charge.

(b) SIMILAR CHARGES (both POSITIVE)



For NEGATIVE charges the scenario is reversed where positive termini of polyethons are going in the negative charges and create a repulsion between negative termini

There is no 'source'. In fact the 'source' is vast space filled with ether. The reason for the use of only 'sinks' is for the views mentioned above where many physicists have thought that the

ether is 'absorbed' (going into sink) by all masses. Thus any mass positive or negative will 'absorb' ether. The important difference is also in the way polyethons flow into the charges. The positive charge attracts the negative terminus of the polyethon and therefore flows-in with negative end first. Similarly, the negative charge attracts positive terminus of polyethon and hence flows-in with positive end first. Hence the common factor is a flux of polyethons into the charges, either positive or negative unlike Maxwell model where flow is from positive to negative charge. Thus when two positive charges are brought close to each other they repel (see Fig. 5(b)) because the exposed ends/termini of the in flowing polyethons are both positive in nature and therefore repel each other. Similarly for the negative charges where the exposed termini are negative in nature and also repel each other. Now in case of a positive and a negative charge there is attraction as shown in Fig. 5 (a). Here the positive terminus of polyethon is flowing into the negative charge while the other end of the polyethon with negative terminus is flowing into the positive charge. Thus there is a 'tug-of-war' and a pull is created. In fact, it is more like 'Lady and a Tramp' (both are sinks, one positive and one negative) eating a strand of spaghetti (polyethon). As the spaghetti gets 'eaten' from both ends (absorption of polyethon by positive and negative charges) a tug develops between their mouths (charges). In other words an attractive force is created. This mechanism at the quantum level explains the attractive and repulsive forces between electrical charges.

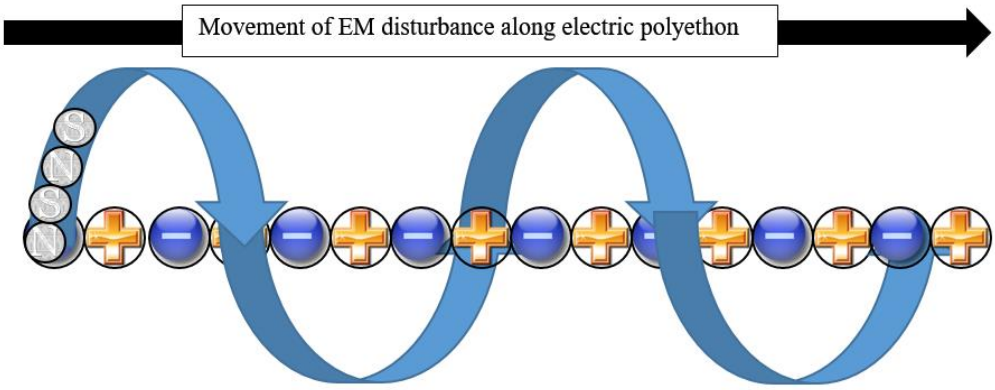
Now, let's see how an EM disturbance travels along the Lines of Force which is polyethon in nature. Let us assume an electron at a higher level of energy. This electron as we know has an influx of polyethons with their positive termini going towards the electron center. When the electron moves to a lower energy level it emits EM disturbance energy equivalent to Eq. (5). This EM disturbance travels as a sinusoidal wave along the polyethon. As mentioned

before as the EMD travels along the polyethon it grows at its far end (negative end) by the attachments of other EDPs and the process continues as long as EMD is traveling along the polyethon. A similar situation would be that the train tracks are laid down in front as long as the train is moving. Once the train comes to a stop. The tracks also end there. Once the train is gone all the tracks are also broken into individual segments (like EDPs) and dispersed (EDPs as a gas). This is also similar to the behavior exhibited by iron filings around an electromagnet. The filings are scattered randomly when there is no magnetic field. However when the electromagnet is turned on (like an excitation of EMP by electrical charge/disturbance) the filings arrange into a clear pattern superimposing on the 'Lines of Force'.

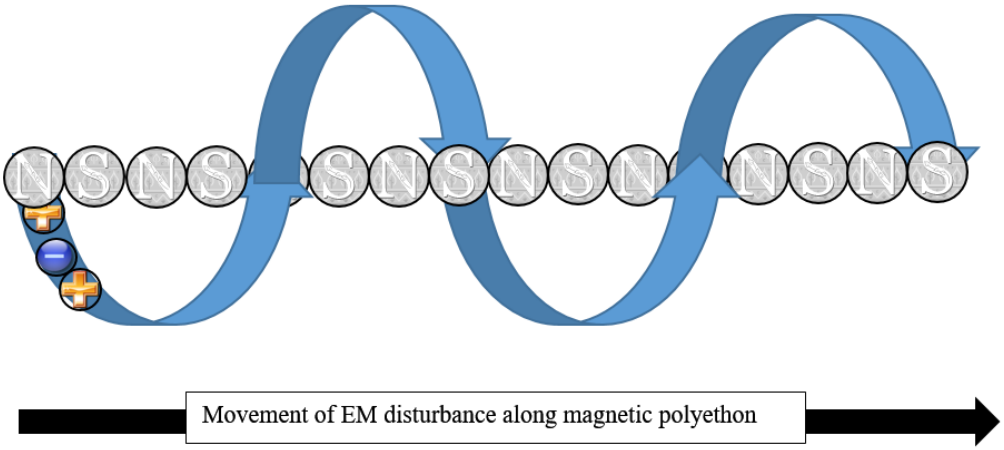
Just as the EM disturbance travels along the polyethon chain a helical formation of Magnetic Line of Force is formed around the polyethon. This is shown in Fig. 6(a).

Figure 6:

(a) Right hand rule for the motion of Magnetic Polyethon around an Electric Polyethon



(b) Left hand rule for the motion of Electric Polyethon around a Magnetic Polyethon



Here the magnetic lines are made of polyethon which in turn are made of magnetic ethon pairs EMPs. When activated they also form polyethons of EMPs ($\varepsilon^n\varepsilon^s$) just like the polyethons of EDPs. Wherever there is a moving charge (activated EDP polyethon) there is an activated EMP polyethon (magnetic line of force). This movement of a charge and magnetic field follow right-hand-rule as shown in Fig. 6(a). Also whenever there is a moving magnetic charge along a polyethon made of EMPs between magnetic 'charges' North and South (both are sinks just like the positive and negative charges) the electric polyethons, made of EMPs, move in a helical fashion around the straight magnetic polyethon made of EMPs as shown in Fig. 6(b). Here the left-hand-rule is observed. A clockwise or anticlockwise helical movement of magnetic polyethon creates the polarization of the photons. This polarization is due to the helical movement of magnetic ethons and hence the polarization of light is affected by magnetic field (Faraday's Effect) as first demonstrated by Michael Faraday in 1845.

So far we have explained the propagation of EM disturbance, its polarization and its *ray like nature* moving along the Line of Force. These *very stiff polyethon* chains also explain the very high speed of propagation of light or value of *c*. It was always thought necessary that the ether medium must be extremely rigid for the EM waves to travel, *in a transverse fashion* (this is possible now that ether makes polyethon chain) at extremely high speed which is that of the light. Just as Newton used the following equation (Eq. (6)) for the speed of sound the same type of equation was used for the speed of light by Maxwell assuming that light is just like sound and that ether is just like air, a medium for light to propagate.

$$c = \sqrt{\frac{K}{\rho}} \ldots \text{Eq. (6)}$$

Where,

c = speed of sound in air,

K = coefficient of stiffness (or the modulus of bulk elasticity of gases), and

ρ = density of the air

In case of light the same equation can be used where K will be the stiffness of the polyethon wire and ρ will be the density of the ether gas. As we know with polyethon as a string or wire the only mode of wave propagation is in the transverse fashion unlike the sound wave which is a longitudinal wave. Thus it fits the model of light very well to describe the nature of wave propagation (transverse only). However the speed of light is determined by electrical and magnetic properties of the vacuum (ether) as shown below.

$$c = \sqrt{\frac{1}{\varepsilon_0 \mu_0}} \ldots \text{Eq. (7)}$$

Where,

c = experimentally determined speed of light as 299 792 458 m/s,

ε_0 = is defined as $1/ (c^2\mu_0)$, and

μ_0 = is also a defined value as $4\pi \times 10^{-7}$ NA^{-2}

It is important to note that, just as we described the nature of ether as made of charged ethons and dipolar particles, the equation for the speed of light also uses ether's electrical (ε_0) and magnetic (μ_0) properties.

Here, the value of ε_0 is back calculated (using c and μ_0) where μ_0 is defined theoretically. Therefore the only value that we need to know is that of c, as determined experimentally. SR assumes that c is same for all inertial frames of reference. This type of definition of c (i.e. as defined by ε_0 and μ_0) leaves room for the possibility that the value of c can also be expressed as the equation of sound where stiffness (K) of the medium (ether, more precisely electrical polyethon) carrying the wave and its density ρ. This raises the question as to why both ε_0 and μ_0 are not determined experimentally. If one considers the energy density of vacuum (ρ) at 7×10^{-27} kg/m^3 (estimated based on data from WMAP) we can also back calculate the stiffness (*K, bulk modulus*) of polyethon wire as follows:

$$299\ 792\ 458 = \sqrt{\frac{K}{7\times10^{-27}}} \ldots \text{Eq. (8)}$$

Therefore,

K $= (299\ 792\ 485)^2 \times 7 \times 10^{-27}$

$= 6.2913 \times 10^{-10}\ m^2\ s^{-2}\ kg\ m^{-3}$

$= 6.2913 \times 10^{-10}$ kg m^{-1} s^{-2}

$= 6.2913 \times 10^{-10}$ Pa or N m^{-2}

This is the stiffness (*K*) (as bulk modulus) of polyethon wire made of EDPs carrying the EM disturbance moving as an undulation at speed *c*. It is very important to add here that the speed of light has been calculated by two constants ε_0 and μ_0 (although we know that one constant is theoretically defined and the other one is back calculated from the experimental value of *c*). These two constants are related to the electric and magnetic property of free space (rather ether). In which case vacuum has electric and magnetic property for what is contained in the vacuum. Does this mean that it is the ether in the vacuum whose properties are determined by electric and magnetic constants or that "emptiness or nothingness" (absence of all gross matter and other substances) of the vacuum has somehow these properties. The latter seems impossible as there is no tangible material giving properties to the emptiness of the vacuum (although it is assumed that vacuum is teaming with virtual particles). It can also be added that if the value of *c* was derived from the stiffness (*K*) and the density (ρ) then the ether would have provided such properties and again emptiness or nothingness cannot have any stiffness or for that matter any density.

Thus EFT does not deny the validity of SR (including invariance of c). However it is thought that the assumption of invariance of *c* in SR is due to the (a) presence of the ether as a medium and (b) photon is a wave and not a particle. Thus SR, LET and EFT are equivalent. Einstein could not see that he was essentially reproducing LET under invariance of *c* which really meant that *there is ether* and *photon is a wave* as thought by Lorentz. This is the reason why LET is considered as Lorentzian interpretation of SR but in reality, and in retrospect, SR is an Einsteinian interpretation of LET as LET preceded SR.

So far I have discussed that there is ether and that it flows into the charged matter such as electrons and protons which has a negative and a positive charge respectively. Thus the influx of ether in a given atom is from all the direction encompassing the atom. This pattern is shown in Figure 7(a). The influx of electric polyethons are in two ways, (a) the positive terminus is going in the negative charge of the atom (electrons), and (b) the negative terminus of polyethon is going in the positive charges. It is important to note that although the proton has single positive charge, it is made up of two of $+\frac{2}{3}$ up quarks and one $-\frac{1}{3}$ down quark. Thus positive terminus of polyethon goes in down quark and negative terminus of the polyethons go into the positively charged up quarks. Same is applicable to neutrons where there are two down quarks and one up quark. Furthermore, the flux of ether is proportional to the strength ($\frac{1}{3} < \frac{2}{3} < 1$) of the charge. However, the type of charge (+ or -) will decide which terminus (positive or negative) of the polyethon will flow in that charge. It is also apparent that there can be significant "tug" between the positive and negative charges within the atom giving a very strong nuclear bond between up and down quarks which are very close to each other as compared to the electron that is very far away. One more point to note is that the inverse square law is applicable regarding the strength of the "field" created around the point mass. Thus two point masses will have the following force law as per EFT:

$$F^* = \Gamma \frac{h^2}{c^4} \frac{q_1 \nu_1 \cdot q_2 \nu_2}{r^2} \quad \ldots \text{Eq. (9)}$$

Where,

Γ = Electromechanical universal constant (electromechanical because it is related to the electrical nature of the particle and its mechanical vibrations).This is similar to Newton's universal constant of gravitation.

h = Planck's constant,

c = speed of light,

$q_1\nu_1$ = charge times the vibrational frequency of one point mass,

$q_2\nu_2$ = charge times the vibrational frequency of second point mass,

r = distance between the point masses

**When two identical and fundamental charges (such as two electrons or two positrons) are under consideration the force (F) is positive (repulsive) otherwise it is negative indicating a pull or attraction between two particles having a combination of positive and negative charge(s) such as protons and neutrons.*

It is important to recognize that the influx of the ether (polyethons) is due to the *residual charge* or net charge remaining in a neutral atom after positive charges of the nucleus are neutralized by the electrons. It is believed that this neutralization is not complete and tiny fraction of the charge is remaining un-neutralized creating an imbalance of the electrical nature (a kind of polarization). There is complete net zero charge when a positive ethon (ε^+) binds with a negative ethon (ε^-). Any other configurations of these ethons will leave un-neutralized matter composite such as an atom (made of protons, neutrons and electrons). Thus it is this residual charge which is responsible for the attraction between two atoms. The force of attraction is 10^{-39} times weaker (indicating how small the force of attraction is of the residual charges, this will be shown later in the paper) than the electrical attraction force between a positive and a negative charge. An example showing electrical attraction due to residual charge between two neutral hydrogen atoms is shown in Figure 7(b).

A practical example of this is shown by an experiment (not scientifically rigorous) conducted on International Space Station (ISS). The experiment was conducted by Love et al. [19]. In this experiments they showed a very quick aggregation of particles of salt, sugar, coffee,

chondrules, rock fragments, acrylic and glass beads and mixture of particles in air inflated plastic bags in microgravity. According to Love et al. “In every trial using salt, sugar, and coffee, the majority of particles clumped spontaneously after a few second of thorough shaking”. As you know the types of material used are from different sources like inorganic crystals (salt), organic crystals (sugar) and plant material (coffee). The common factor perhaps is the electrostatic attraction between all types of matters. They also said “Trials using meteorite fragments, acrylic beads or glass beads did not clump at all.” Here perhaps the particle size is too large to hold the clumps together and the kinetic energy imparted to these particles is bigger than the electrostatic attractive forces. It seems that electrostatic attraction can be definitely attributed to the former case. We can also ask the question that “When the electrostatic attraction stops and ‘traditional gravity’ does takes over?”

In support of the electrostatic origin of a theory of gravity Sir Oliver Lodge said the following (circa 1921) [20]:

> “… what is really wanted for a truly Natural Philosophy is a supplement to Newtonian mechanics, expressed in terms of the medium which he suspected and sought after but could not attain, *and introducing additional facts,* ***chiefly electrical***-especially the fact of variable inertia-discovered since his time…
>
> If we could understand the *structure of the particle,* in terms of medium of which it is composed, and *if we knew the structure of the rest of the medium* also, so as to account for the potential stress at every point-that would be a splendid step, beyond anything accomplished yet” [21].

When this situation is applied to massive bodies such as Earth and Sun we can imagine ‘electrostatic’ attraction between these two very large objects. Thus the above explanation of attraction between two hydrogen atoms is the quantum level basis of a pull (or attraction) between two bodies that we call gravity. Thus, it seems, that there is no gravitational attraction between two bodies due to their masses but this could be electrostatic attraction between two partially neutralized(electrically) masses. The opposite charges of these bodies attracts each other

in proportion of the magnitude of their charges. Since these electrical charges are associated with vibrating particles or vibrating themselves we see that electrical attraction is proportional to their masses since mass is defined as follows (similar equation was used by de Broglie for his wave particle duality theory):

$$m = \frac{h}{c^2}\nu \quad \ldots \text{Eq. (10)}$$

Where,

m = mass of a particle,

h = Plank's constant,

c = Speed of light,

ν = frequency of the particle

Thus, the gravitational mass (a measure of how much an object weighs on Earth, for example) of a body is not due to gravitational attraction to Earth but how much Earth pulls the object by electrical means using downward ether flux. In other words all matter particles do not possess a mass (as is the case with the Standard Model until 1961). It is due to electrical attraction of an energy associated with electrical charge. Thus if there is no charge there is no gravitational mass. What we measure, then, is the magnitude of electrical attraction of a ***volume/amount of energy*** (traditionally called mass) by Earth. In other words there is no physical property as mass. All energies are inherently massless. These massless bodies, when are 'caught' in the flow of ether, show a property akin to gravitational mass. A good example is when two balls, made up of rubber and lead, of identical diameter weigh differently on earth. However these same balls show no difference in 'weight' when taken into outer space. This also explains why the feather and

hammer fall at the same speed (in vacuum) on Earth (or moon) because objects do not have mass, they fall because they are trapped in the downward flow/flux of the ether, caused by absorption of ether by matter, which is same for all falling objects dropped form the same height. This also leads us to assume that the flux of ether is having a constant acceleration due to the spherical geometry shown in Fig. 7(a). This is due to the fact that the volume of the fluid occupied by the outer shell when moves a distance towards the inner side of the sphere it will flow faster as per the inverse square law.

Figure 7:

(a) Influx of ether (more accurately electric polyethons) into a point mass (an atom):

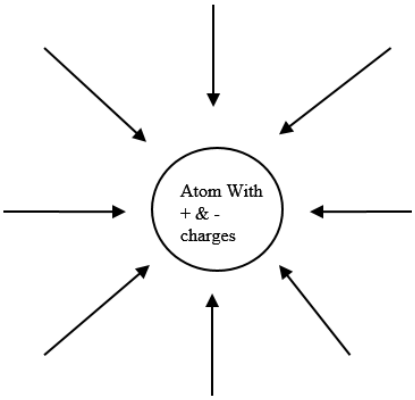
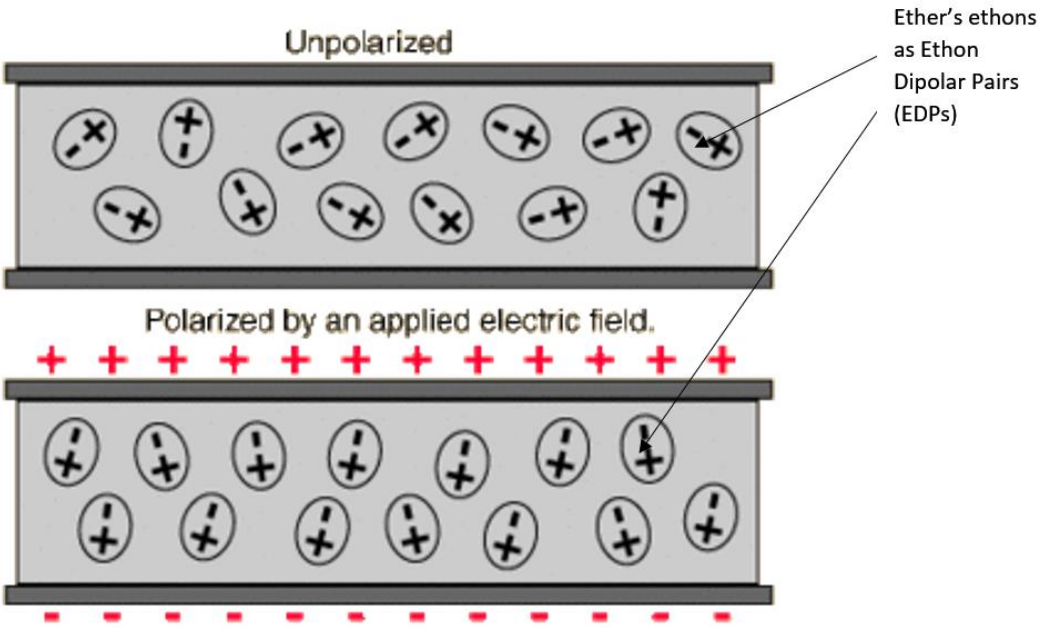
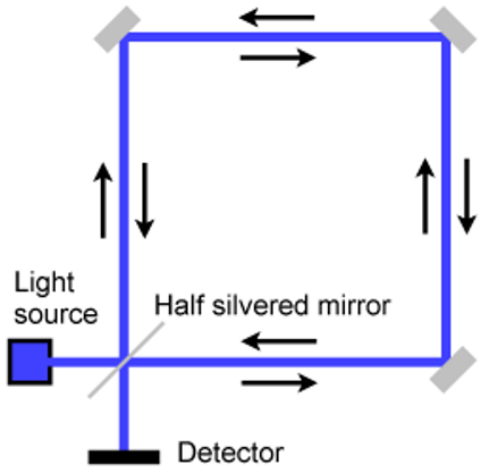


Figure 7:

(b) Orientation of dipolar ether (in perticular EDPs) when an electric field is applied.



(c) Schematics of a Sagnac Interferometer: The whole assembly is rotated at certain rotations per second to generate Sagnac Effect. Note that the assembly is horizontal to Earth and ether flow is verticaly down (i.e. perpendicular to Earth).



As mentioned above the Standard Model did not provide mass for each particle by electroweak theory of Glashow. This was until Higgs' Mechanism was introduced in 1967 when particles appear to have masses. It is also known that Higgs' Field prevails in the entire universe

and that it is necessary for giving mass to a particle. This is similar to having ether permeate the entire universe. As we know, there is one field for each type of particle for e.g. one field for photon and electron, one field for quarks, one field of Higgs for Higgs boson and one field of graviton for graviton (although gravity is everywhere the graviton is very elusive and still never seen experimentally. I think graviton does not exist as there is no such property as gravity. It is all in electrical interactions). Are there really that many fields prevailing in the entire universe. Why they do not interact with each other? Why they do not interfere with other? What are the fields? What are they made of? Apparently this is similar to the classical "orb of influence or action at distance". I believe that there is only one field (if you want to call that as a field) which is made of ideal gas of ether. This is a *tangible* (instead of *nothingness of empty space* where the field exists) material which exhibits the properties which are associated with EM field. Based on the CFT it seems that fields are imagined as an elastic rod made of balls and springs connected to each other. And the properties of this elastic rod determine the properties of the field and particle(s) associated with each field. Although fields are imagined as made of elastic rods there is always a flow property associated with these rods. For example, in electromagnetic field there is a flow from positive charge to negative charge. Also, the equations of the fields are the equations of the flow as well. So 'what' does flow in these fields? Is it not possible that the ether is the same thing as an EM field with polyethons exhibiting the properties of the elastic rod and the flow of ether is what the field equations are describing? It is also true for this reason that there are many research articles explaining the gravitational field behavior with hydrodynamics (a discipline of the study of the flow of fluids).

EFT and Vacuum Permittivity (ε_0):

As we know vacuum permittivity (ε_0) value is 8.854 187 817 6 x 10^{-12} F/m. Thus vacuum have some type of dipolar property as shown in Fig. 7(b). This property is only possible if vacuum is not empty but is filled with the medium like ether which has 'molecules' (EDPs) which are dipolar in nature as hypothesized in EFT. The existence of ε_0 value is another reason that a dipolar ether was thought to exist in the space by Michael Faraday. This is a crucial value since the speed of light (see Eq. (7)) is calculated from this value since the magnetic permeability (μ_0) is a defined value as 4π x 10^{-7} H/m. However as we know that vacuum permittivity (ε_0) is back calculated from the speed of light.

EFT and Doppler Effect:

As we know when a source of *wave* is moving towards (or away) the observer Doppler Effect (DE) is observed on the wave. As we know that DE is a *wave phenomenon only*. This is very familiar with the passage of a train near a standing observer. The sound frequency first increases for train approaching the observer and decreases when the train is receding. Similar to the sound, light also exhibits DE. The change in the frequency of the light is either towards red color (hence red shift) for objects moving away from the observer or blue color (hence blue shift) for the objects moving closer to the observer. Existence of this effect and its close similarity to sound further provides a support to the EFT in which the ether is the medium for the propagation of light as a wave. Thus DE supports the wave nature of the light and that it requires an ether like medium for the light-wave to propagate. Thus the fundamental equations for describing physics

of DE are the same for sound and light, both of which are wave phenomena and requires a medium for the wave to propagate.

EFT and Sagnac Effect:

The reason I want to discuss Sagnac Effect is because it relates to the experimental evidence for ether's existence. This effect, named after Georges Sagnac, is an interference caused by the rotation of an interferometer (shown in Fig. 7(c)) otherwise not exhibiting any interference (in stationary mode). Thus the cause of this effect is simply the rotation of device at certain rotations per second. Ideally this study should be carried out in vacuum to eliminate any effect of the air density on the speed of light (as we know refractive index is proportional to the density of medium). However we will ignore the effect of air for now.

Ring interferometer was suggested by Oliver Lodge (1897) and then by Albert Michaelson (1904) to decide between static ether through Earth is moving and the ether which was completely dragged by Earth. The first experiment to do so was performed by Georges Sagnac in 1913. His purpose was to detect relative motion of ether. He believed that his results constituted the 'proof' of the existence of stationary ether. However Max von Laue (1911) had shown that this effect is consistent with SR. Now as we know from our previous discussion if a theory is consistent with SR it has to be consistent with LET as well because we have shown that SR is just another way of interpreting LET by considering the invariance of *c*. As discussed earlier, invariance of *c* means that there is ether and that light travels as a wave. Thus it seems that Laue has already 'proven' the existence of ether (theoretically) and Sagnac 'demonstrated' the existence of ether (experimentally). Thus neither EFT, nor Laue (and hence SR) and not

Sagnac are in any disagreement. Hence, once again, we can say there is ether whose existence has been shown on the grounds of SR as well it is experimentally proven by Sagnac.

Now, the way EFT explains a 'static' ether with respect to Sagnac Interferometer (Fig. 7(c)) is that the vertically downward flow of ether on Earth will be 'static' to the light beams of the Sagnac Interferometer. However, when the interferometer is rotated at high speed, one arm will be travelling against the ether (clockwise) and the other arm (anti-clockwise) will be receding with respect to ether causing two beam paths to differ by a small famont and thus cause interference pattern. Thus Sagnac Effect is another experimental proof of ether just like the Fizeau type experiments, FX and MMFX.

Another point to take away from this section is the work of Max von Laue who showed the same effect as Sagnac using Special Relativity (SR) theory. Therefore we should consider any explanation of a physical phenomenon given by SR *implies* the existence of ether and that light travels as a wave in this ether for *c* to be constant.

Atomic Mass and Atomic Charge Correlation:

Previously we saw how electrostatic charge may replace mass in the so called 'gravity'. In order to demonstrate the dependence of mass of an object to its charge a correlation between these two properties was sought. Table I lists atoms with atomic numbers from 1 to 109 and their masses.

First of all a simple correlation was sought between Atomic Mass and Atomic Number (charge).

Linear regression of Atomic Mass to Atomic Number

The regression equation is
Atomic Mass = - 9.13 + 2.61 Atomic Num

Predictor	Coef	SE Coef	T	P
Constant	-9.1335	0.7048	-12.96	0.000
Atomic Num	2.61227	0.01112	234.86	0.000

S = 3.65373 R-Sq = 99.8% R-Sq(adj) = 99.8%

PRESS = 1496.63 R-Sq(pred) = 99.80%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	736373	736373	55160.18	0.000
Residual Error	107	1428	13		
Total	108	737801			

No replicates.
Cannot do pure error test.

Unusual Observations

Obs	Atomic Num	Atomic Mass	Fit	SE Fit	Residual	St Resid
1	1	1.000	-6.521	0.695	7.521	2.10R
2	2	4.000	-3.909	0.686	7.909	2.20R
3	3	7.000	-1.297	0.676	8.297	2.31R
4	4	9.000	1.316	0.667	7.684	2.14R
94	94	244.000	236.420	0.557	7.580	2.10R
109	109	268.000	275.604	0.695	-7.604	-2.12R

R denotes an observation with a large standardized residual.

It is apparent that there is a statistically significant (F = 55,160) and high degree of correlation (r^2 = 99.8%) between Atomic Mass and Atomic Number. Similar correlation was also carried out between Atomic Mass and Total Charge as shown below. The value of Total Charge was calculated (based on the charges of electron, up quarks and down quarks present in protons and neutrons) as follows:

prot pos = positive 2x2/3 or 4/3 charge due to u quarks in proton,

prot neg = negative 1x1/3 or 1/3 charge due to d quark in proton

neut pos = positive 1x2/3 or 2/3 charge due to u quark in neutron

neut neg = negative 2x1/3 or 2/3 charge due to d quarks in neutron

Total Charge = X * prot pos + X * prot neg + Y * neut pos + Y * neut neg + Atomic Number (i.e. number of electrons)

Nuclear Charge = Total Charge –Atomic Number

Where: X = number of protons and Y = number of neutrons

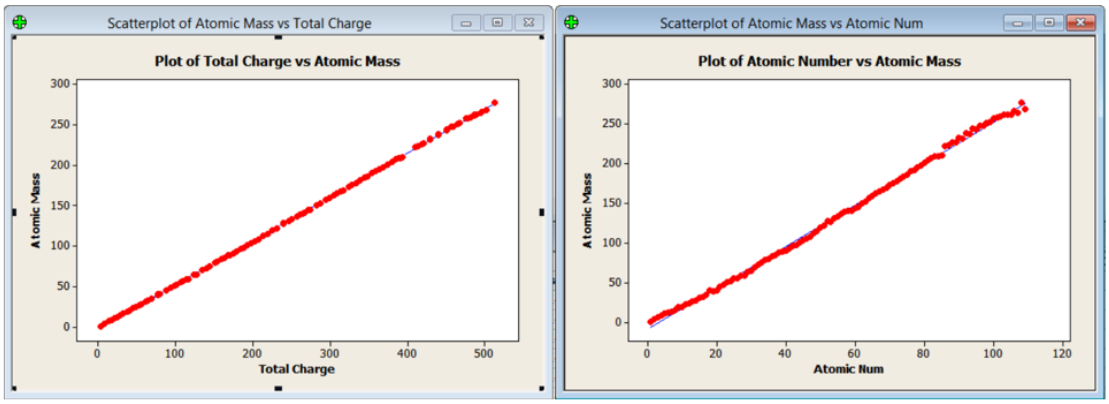
Linear regression of Atomic Mass to Total Charge

```
The regression equation is
Atomic Mass = - 2.58 + 0.543 Total Charge


Predictor         Coef   SE Coef       T      P
Constant       -2.5814    0.1883  -13.71  0.000
Total Charge  0.542584  0.000639  849.29  0.000


S = 1.01131   R-Sq = 100.0%   R-Sq(adj) = 100.0%

PRESS = 114.634   R-Sq(pred) = 99.98%


Analysis of Variance

Source           DF      SS      MS          F      P
Regression        1  737692  737692  721285.17  0.000
Residual Error  107     109       1
  Lack of Fit   101     106       1       2.11  0.174
  Pure Error      6       3       1
Total           108  737801


 97 rows with no replicates


Unusual Observations

      Total
Obs  Charge  Atomic Mass      Fit  SE Fit  Residual  St Resid
  1       3        1.000   -1.133   0.187     2.133      2.15R
  2       8        4.000    1.759   0.184     2.241      2.25R
  3      13        7.000    4.651   0.181     2.349      2.36R
  4      17        9.000    6.822   0.179     2.178      2.19R
  5      21       11.000    8.992   0.177     2.008      2.02R
 94     451      244.000  241.945   0.159     2.055      2.06R
109     503      268.000  270.159   0.187    -2.159     -2.17R

R denotes an observation with a large standardized residual.
```

As you can see the statistical significance is much better (F = 721,285) and the correlation is perfect (r^2 = 100.0%). A comparison of these plots is shown in Fig. 7(d):

Figure 7 (d):

Comparison of Atomic Mass vs. Total Charge (*left*) and Atomic Number (*right*)



It is apparent that the use of Total Charge parameter has provided a significant improvement in the correlation between Atomic Mass and its electrostatic charge. It was therefore thought that since the mass of the atom is mainly contained in the nucleus it would be better to use only nuclear charge (Total Charge – Electrons = NucC) in correlation.

Linear regression of Atomic Mass to Nuclear Charge

The regression equation is
Atomic Mass = - 0.818 + 0.685 NucC

Predictor	Coef	SE Coef	T	P
Constant	-0.81808	0.05879	-13.91	0.000
NucC	0.684592	0.000254	2694.24	0.000

S = 0.318809 R-Sq = 100.0% R-Sq(adj) = 100.0%

PRESS = 11.3910 R-Sq(pred) = 100.00%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	737790	737790	7258905.93	0.000
Residual Error	107	11	0		
Total	108	737801			

No replicates.
Cannot do pure error test.

Unusual Observations

Obs	NucC	Atomic Mass	Fit	SE Fit	Residual	St Resid
1	2	1.000	0.318	0.058	0.682	2.17R
2	6	4.000	3.289	0.057	0.711	2.27R
3	10	7.000	6.261	0.057	0.739	2.36R
4	13	9.000	8.301	0.056	0.699	2.23R
5	16	11.000	10.368	0.055	0.632	2.01R
94	357	244.000	243.349	0.051	0.651	2.07R
109	394	268.000	268.679	0.058	-0.679	-2.17R

R denotes an observation with a large standardized residual.

As you can see the statistics of fit has improved significantly (F = 7,258,906 and r^2 = 100.0%). On further trials in improvement of the fit a cubical model was tried with respect to Nuclear Charge (NucC). The results are shown in next caption. As you can see the statistics of model fit

has increased dramatically with F = 24,985,507 and s = 0.19. The t-values for the coefficients in the equation of fit are highly significant and the equation is:

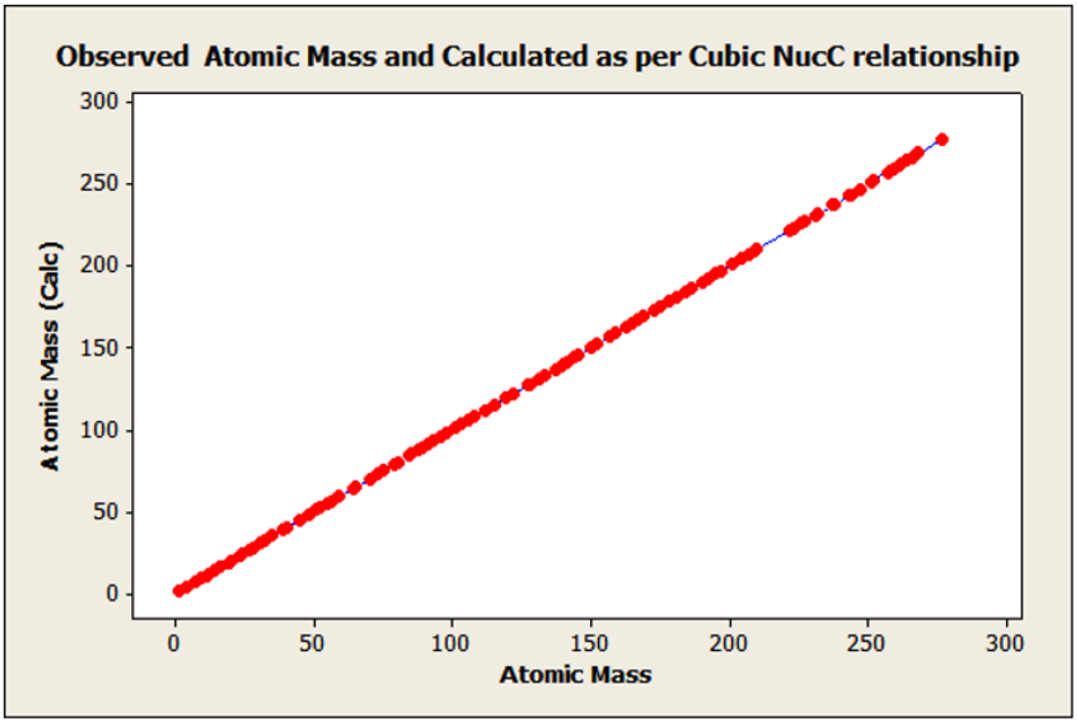
$$Atomic\ Mass = 0.665xNucC + 9.7x10^{-5}xNucC^2 - 1.3x10^{-7}xNucC^3 \quad \ldots \text{Eq. (11)}$$

And the plot of observed Atomic Mass vs. calculated Atomic Mass is shown in Fig. 7(e):

Multiple regression of Atomic Mass to Nuclear Charge

```
The regression equation is
Atomic Mass = 0.665 NucC + 0.000097 NucC^2 - 0.000000 NucC^3


Predictor          Coef     SE Coef       T      P
Noconstant
NucC           0.665486    0.000778  855.24  0.000
NucC^2       0.00009659  0.00000601   16.07  0.000
NucC^3      -0.00000013  0.00000001  -12.23  0.000


S = 0.190172

PRESS = 4.23629


Analysis of Variance

Source           DF       SS      MS            F      P
Regression        3  2710845  903615  24985506.86  0.000
Residual Error  106        4       0
Total           109  2710849


No replicates.
Cannot do pure error test.


Source  DF   Seq SS
NucC     1  2710818
NucC^2   1       21
NucC^3   1        5


Unusual Observations

Obs  NucC  Atomic Mass      Fit  SE Fit  Residual  St Resid
 85   308      210.000  210.412   0.032    -0.412     -2.20R
 92   348      238.000  237.603   0.031     0.397      2.12R
 94   357      244.000  243.521   0.033     0.479      2.56R
105   384      262.000  262.384   0.049    -0.384     -2.09R
107   388      264.000  264.655   0.052    -0.655     -3.58R
108   405      277.000  276.637   0.071     0.363      2.06RX
109   394      268.000  268.717   0.057    -0.717     -3.95RX
```

Figure 7: (e) A plot of Observed Atomic Mass vs. Calculated Atomic Mass based on relationship between Mass and cubic Nuclear Charge (NucC).



It is also important to note that use of Total Charge instead of Nuclear Charge is also highly significant. Hence one can substitute one for another with some change in statistical significance (see below).

Multiple regression of Atomic Mas to Total Charge

The regression equation is
Atomic Mass = 0.495 Total Charge + 0.000188 Tot^2 - 0.000000 Tot^3

Predictor	Coef	SE Coef	T	P
Noconstant				
Total Charge	0.495369	0.001932	256.38	0.000
Tot^2	0.00018753	0.00001173	15.99	0.000
Tot^3	-0.00000021	0.00000002	-12.16	0.000

S = 0.600073

PRESS = 42.2604

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	3	2710811	903604	2509401.72	0.000
Residual Error	106	38	0		
Lack of Fit	100	35	0	0.70	0.786
Pure Error	6	3	1		
Total	109	2710849			

97 rows with no replicates

Source	DF	Seq SS
Total Charge	1	2710547
Tot^2	1	210
Tot^3	1	53

Unusual Observations

Obs	Total Charge	Atomic Mass	Fit	SE Fit	Residual	St Resid
85	393	210.000	211.330	0.100	-1.330	-2.25R
86	411	222.000	220.804	0.097	1.196	2.02R
92	440	238.000	236.734	0.098	1.266	2.14R
94	451	244.000	242.495	0.103	1.505	2.55R
105	489	262.000	263.184	0.156	-1.184	-2.04R
107	495	264.000	266.016	0.168	-2.016	-3.50R

One may argue that if you take a sum of protons and neutrons (as in calculating Total or Nuclear Charge) you may get a good correlation any way. To settle this argument one can calculate the charge of a proton and neutron and compare those. For a proton it is two up quarks (i.e. 2 x $+\frac{2}{3}$) and a down quark (i.e. 1 x ($-\frac{1}{3}$)). Thus a total of $\left|\frac{5}{3}\right|$ charges (please note that both positive and negative charge contribute to the same extent for attraction). Similarly for a neutron 1 x ($+\frac{2}{3}$) and 2 x ($-\frac{1}{3}$) thus a total of $\left|\frac{4}{3}\right|$ charges. Thus total proton charge is more by 1/3 or

25% more than a neutron. As you can see the formula for Total or Nuclear Charge is complex and still we see a good correlation between Atomic Mass and electrostatic charge data.

One may argue that if you know the number of protons and number of neutrons one can easily calculate the atomic mass readily. However, the purpose of the above exercise is to show how *atomic mass* is *very closely* correlated to its *charge*. Hence indicating that what we may be measuring as 'mass' is really electrostatic attraction due to atom's charge. Again, point of this exercise is to show that the mass of a particle is very highly correlated with its charge and hence the question is: Are we really measuring the mass of a body under gravitation as 'weight' or is it due to the electrostatic attraction of Earth on the mass in question? Based on the prior discussion on the EFT it seems that it is the electrical attraction between an apple and the Earth that provides the 'weight' (which we will call **Electrostatic Mass** or $\boldsymbol{M_{es}}$ hence forth) and not the mass of the object *per se*. This view is similar to the view of Wilhelm Wien (1900) and Max Abraham (1902) who came to conclusion that total mass of a body is identical to its electromagnetic mass. In fact Henri Poincaré (1906) implied that no "real" mass exists if mass is the product of electromagnetic field in ether [22]. This situation then raises one more question. If there is no "real" mass or if the mass is "electrostatics" or "electromagnetic" then what is the *Inertial Mass* of a body and how is it acquired?

Inertial Mass (IM):

Based on the assumptions of EFT the Inertial Mass of a body is due to the magnitude of the influx of ether in the given body. Greater the total influx greater is the 'mass' as influx is directly proportional to the charge of a body and its energy content ($h\nu$) or vibrations. One way

of looking at this is that the body is 'pinned down' (or it is 'stuck') in the space, under a constant influx of ether from all directions, like a 'sink hole', at a given location. The situation is similar to a vortex which is sucking the fluid from the surroundings and therefore has high inertia for movement unless acted upon by an external force to move it from one location to another. This situation is also supplemented by the infinite number of 'polyethon tethers' connecting to each mass to the rest of the celestial and terrestrial masses in the universe (the polyethon tethers can extend to the farthest reaches of the universe) and holding the mass in place which provides the inertia (this is similar to what Mach thought what we call Mach's Principle [23]).

When one thinks about the units of the constant of universal gravitation (G), one can realize that the units are of an accelerated flow (m3 kg^{-1} s^{-2}) of some *volume* of fluid (m^3) per unit mass (kg) as shown in Eq. (12(a)). As discussed above and considering an equivalency between nuclear charge (NucC) and mass (kg) we can substitute nuclear charge for the mass in the following equation (Eq. 12(a)) as well. For this reason also consider Eq. 12(b) for the Coulomb's constant. For both of these constants the units are the same except where mass (kg) is in G there is charge (C) in k_e. Based on the correlation between mass and charge found above and the similarities of these constant one can assume a correlation between mass (kg) and charge(C). A ratio of ke/G would show how much mass is equivalent to a charge, thus Eq. 12(c). Since C has 6.241 x 10^{18} electric static unit charges (esu) we have Eq. 12(d) where a unit of mass is equated with electrical charge. It is easy to see from Eq. 12(d) that why electrical force is about 10^{39} times stronger than the gravitational force!

G = 6.673 84 x 10^{-11} m^3 kg^{-1} s^{-2} *or* N m^2 kg^{-2} …Eq. (12(a))

k_e = 8.987 551 787 368 176 4 x 10^9 N m^2 C^{-2} …Eq.(12(b))

k_e/G = 1.346 683 736 4 x 10^{20} C/kg …Eq.(12(c))

$k_e/G = K_p$ = 8.404 653 198 9 x 10^{38} e/kg …Eq.(12(d))

Charge Dilution Factor (CDF) per charge =

K_p /(2x 1000 x N_A) = 6.978 126 865 69 x 10^{11} …Eq.(12(e))

Eq. 12(d) somehow does not make a complete sense. The reason is as follows. Supposing you take 1 kg of H atoms. Thus there is one kilogram mole of Hydrogen. Hence there are 1000 x N_A (Avogadro's constant) number of atoms i.e. 6.02 214 13 x 10^{23}. Thus there can only be 2 x 1000 x N_A charges (one for electron and one for proton) i.e. 2 x 1000 x 6.022 141 3 x 10^{23} = 1.20442826 x 10^{27}. This is a much smaller number than K_p by a factor of 10^{11} (see Eq. 12(e)). As per EFT, following is the interpretation. Due to the close proximity of the positive (+) and negative (-) charges in an atom they are *almost neutralized* but not completely. There is still a small but *infinitesimal amount of charge* left (both + and -) that provides attractive force between the particles of matter as explained by EFT. The 'Charge Dilution Factor', thus, can be estimated as shown in Eq. 12(e). Thus each charge is diluted by CDF. Hence each electrostatic charge is reduced to 1/CDF or 1.433 049 325 77 x 10^{-12} fraction of a single electron charge. This is now called Residual Charge (RC) or e_{res}.

Just a side note: Eq. 12(d) can also be interpreted as showing how strong the electrical force is as compared to the gravitational force, by a factor of about 10^{39}, which is widely known.

EFT model states that ether flows into the interior of matter that also raises another question. This assumption is same as that of Newton's who expressed [10] that ether is *absorbed* by the matter to create gravity. What is the fate of this ether which gets absorbed by the (charged) mass? The situation is similar to a Black Hole and surrounding dust (except that the

dust has mass whereas ether does not) which flows into the BH. In this case the dust is 'compacted' and then assimilated into the BH and the weight of BH increases to maintain law of mass conservation or converted to energy which is released. The reason for such behavior is due to the extraordinarily high density (of the order of 10^{18} kg m^{-3}) of the BH which creates very strong gravitational attraction (or ether flux as per EFT). Now consider the situation of a proton and the ether fluid flowing into this proton. The proton has a mass of 1.673×10^{-27} kg and its charge radius (r) is 0.8775×10^{-15} m. Using the density = m/v formula (where $v = \frac{4}{3}\pi r^3$) the density of a proton is about 0.5911×10^{18} kg/m^3. Thus the density of a proton is similar to a BH. The only difference is that no gross matter (eumatter) particle can reach, or come close to, the proton in a neutral H atom. However ethons, being so small, perhaps of Planck length ($1.61619926 \times 10^{-35}$ m which is an assumption of EFT) can easily access not only the proton but its interior quarks too, where the mass density is even greater. Hence the proton, rather the quark, is a micro BH for the ether. Therefore the influx of ether into a proton is a phenomenon similar to that of the dust influx into a BH. In case of ether which is massless and neutral (one positive ethon and one negative ethon always exists together) there is no contribution of any mass or charge to the proton. It can be called *ether annihilation* by a vibrating charge (because $m=hc^{-2}\nu$ and ν is an expression for frequency of vibrations).

EFT and Mass-Energy Equivalence:

The mass energy equivalence was derived by Einstein in his 1905 paper. However as per EFT the 'gravitational mass' does not exists, naturally one would ask "How EFT interprets this equivalence?" We know Eq. 12(f) very well as per Einstein.

$E = mc^2$ …Eq. (12(f))

However based on the afore mentioned correlation of Mass(*m*) and Nuclear Charge (*NucC*) we can think of replacing mass by *m* by *NucC*. Therefore we can use the correlation obtained in Eq. 11 to replace m by NucC. Thus we have:

$$E = (0.655 \times NucC + 9.7x10^{-5} \times NucC^2 - 1.3x10^{-7} \times NucC^3) \times c^2 \ldots \text{Eq. (12(g))}$$

This is not very elegant equation but it is accurate. However, prior to EFT we would not even think of a mass in terms of a charge let alone replace it. Thus as per EFT there is no such property as mass and also no such force as gravity (by which we measure the mass). In EFT the mass is replaced by electrostatic charge of the body and gravity is replaced by electrostatic attraction. *The energy is massless*, however it is calculated as per Planck's law (*E=hv*). This is apparent when an object is taken into the space away from all bodies to cause any electrostatic attraction (traditionally called gravity). In this case the body 'floats' in the space regardless of its size or mass, it may be an atom or a Super Massive Black Hole they both will float in the space and would not 'fall'. This phenomenon indicates that energy does not have any mass but the electrostatic attraction caused by the associated charge with the other body, having electrostatic charge, is the cause of attraction which we call 'gravitational attraction' in fact it is an electrostatic attraction. Hence the energy mass equivalence has no meaning as per EFT as there is no such concept as mass. However the energy content of a body can be expressed by Eq. 2(f) using the charge of the body. Please note that although the mass and charge relationship as expressed in Eq. 11 is accurate it is perhaps not ultra-accurate for calculating energies. Therefor one may need to establish a sound mathematical relationship between mass and charge of the body as done by scientists of 19th century in correlating mass to electromagnetic-mass.

EFT and General Relativity (GR):

In GR the equivalence principle states that the Inertial Mass (IM) of a body is same as its Gravitational Mass (GM). Now as per EFT the GM is due to the electrical attraction between the apple and Earth (or between any two bodies) and hence it is related to the flow rate of the ether towards the Earth in radial (perpendicular to its surface) direction. As if the body without a "real" mass is trapped in the flow of ether towards the Earth and hence exhibits weight. This is the reason why ALL bodies of different masses fall at the same rate as demonstrated by Galileo a long time ago.

The first equivalence principle of GR is the equivalence of IM and GM. Einstein stated that:

"A little reflection will show that the law of the equality of the inertial and gravitational mass is equivalent to the assertion that the acceleration imparted to a body by a gravitational field is independent of the nature of the body. For Newton's equation of motion in a gravitational field, written out in full, it is:

(Inertial mass)(Acceleration) = (Gravitational mass) x (Intensity of the gravitational field)

It is only when there is numerical equality between the inertial and gravitational mass that the acceleration is independent of the nature of the body" [24].

The crucial point made by Einstein in the above statement is that "*acceleration imparted to a body by a gravitational field is independent of the nature of the body*." In case of EFT this statement if generally true *except for neutral bodies*. As per EFT neutral bodies do not exhibit mass as they are not attracted by another body electrostatically. Only bodies with electrostatic charge attract each other by the formation of polyethons and by the process of ether flux. The example of these neutral bodies are photons and neutrinos. We know that photons and neutrinos are considered massless but possess energies. This is exactly what EFT predicts for neutral bodies. This situation is a good answer to one of the difficult problem facing modern status of

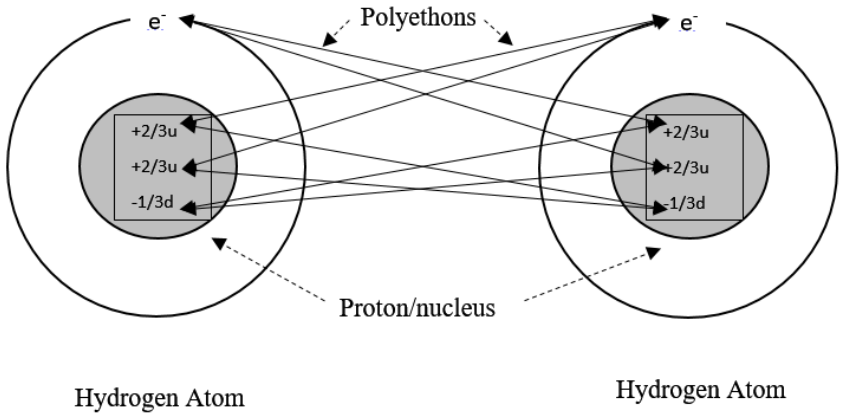
neutrino physics, the *problem of neutrino mass*. When the Standard Model of particle physics was developed in 1970s it was projected that *neutrinos have exactly zero mass*. This prediction is in complete agreement with EFT. Please note that neutron is not a neutral body as it is composed of positive up and negative down quarks. Now, if we compare EFT with GR, GR does not explain why these neutral bodies do not have mass but have energy. This is in a way violation of the Einstein's energy-mass equivalence principle but it does not violate EFT. Thus although EFT agrees with GR in the equivalence of IM and GM there is a small difference as noted above regarding neutral bodies.

The second equivalence principle of GR is that the gravitational attraction felt on Earth is equivalent to the same force felt by an observer in an accelerated (non-inertial) frame of reference (such as an elevator or rocket). The reason for such an acceleration is due to the creation of 'curvature' in the spacetime caused by the presence of a massive body (Earth). In a two dimensional situation it will create a trough just like when a massive ball is placed on a trampoline. However in three dimension this 'stretch' is inwards towards the ball. Thus a curvature leading into the mass (Earth) is created. This situation is similar to what happens in EFT. Here (in EFT) we have assumed that ether flux comes into Earth from all radial directions in a spherical geometry. Thus when a given layer of the ether around Earth (a shell) moves closer to Earth its volume remains same, as an uncompressible fluid (of Maxwell), with the consequence that *its flow rate increases towards Earth in accordance to the inverse square law*. Thus the flow of ether is accelerating from infinity (nearly zero) to the center of Earth (at the surface of the earth with same acceleration as normal gravitational acceleration of 9.8 m/s). Thus the object (which does not have 'real' mass but is 'floating' in the ether's accelerated flow towards Earth behaves as if the object is in a non-inertial (accelerated) frame and hence provides

a ‘gravitational’ pull towards the Earth (in other words Earth ‘attracts’ the object by gravity). Thus both of GR’s equivalence principles are also satisfied by the EFT. Additionally, as shown in Fig. 7(a) the polyethons first of all flow into each mass radially as well as connect the oppositely charged particles (nucleons) of the attracting bodies such that there is a “tug-of-war” type of pull caused between two bodies (apple and Earth or Earth and Sun) (see Fig. 7(f)).

Figure 7(f): Electric Polyethons flowing into electrical charges at both ends. Thus creating a pull (attraction) between apparently neutral atoms.

Note that two protons (and also neutrons) can attract each other but two electrons can never attract each other.



This is indeed akin to what Einstein commented in his communication “Concerning the Aether” [25]. In this he expressed that:

“It was shown by Maxwell’s equations that a moving, electrically charged body is surrounded by a magnetic field whose energy is, to first approximation, a quadratic function of speed. It seemed only natural to conceive of all kinetic energy as electromagnetic energy. *Thus one could hope to reduce mechanics to electromagnetism*, since efforts to reduce electromagnetic phenomena to mechanics had failed. *Indeed this looked all the more promising as it became apparent that all ponderable matter was composed of electromagnetic elementary particles.* But there were two difficulties that could not be overcome. Firstly the Maxwell-Lorentz equations could not explain how the electric charge constituting an electrical elementary particle can exist in equilibrium in spite of the forces of electrostatic repulsion. *Secondly electromagnetic theory could not give a reasonably natural and satisfactory explanation of gravitation*.”

However, as you have read above, the EFT theory is the theory of a dipolar ether at quantum level which is responsible for the attraction between two electrically ‘charged’

bodies. Here these two bodies (e.g. Earth and Sun) which are electrically neutral and still have residual charge to interact with ether and exhibit attraction towards each other (as in Fig. 7(b)), the phenomenon we call 'gravitation'. As per EFT, this 'gravitational attraction' in reality is an electrostatic attraction between Earth and Sun and hence the equation of force of gravitation is very similar to that of the force of electrostatic attraction (Coulomb's Law) between two opposite charges and we very well know and that they *both follow the same inverse square law*.

One may also ask the question: "What is the speed of this 'new gravity'?" The answer is simple and quite intuitive. Since the 'gravity' is caused by the ether links (polyethons) so when these links break the loss of 'gravity' is instantaneous (just as Newton thought but in contrast to Einstein who thought that it depends on the speed of light). If for example if the Sun were to disappear instantaneously then the Earth will be thrown out of its orbit instantaneously and not after 8m 20s as predicted by GR. As per EFT 'gravity' does not travel at the speed of light(c), it is instantaneous! It is also true that if one 'yanks' the polyethon 'tethers' connecting Sun and Earth, both these objects will move instantaneously. This is for the simple reason that ethons connect objects by a 'physical' link and the motion and positions of these objects is dependent on the strength and integrity of these polyethon links. At the same time a broken link can repair itself very fast as well since ethons can move at a speed faster than c. This finding is in complete agreement of Newton's, Laplace's and in relatively modern times Arthur Eddington's view [26] that if gravity propagated with finite velocity, planets motion around Sun would become unstable due to a torque originating from time lag of the gravitational interaction [27]. "Such an odd behavior can be found also in electromagnetism, when one computes the propagation of the electric fields generated by a

set of uniformly moving charges. As a matter of fact the Liénard-Weichert retarded potential (1898) leads to a formula indistinguishable from the one obtained by these researchers assuming that the *electric field propagates with infinite velocity*" [27].

As for the 'gravity waves', I do not think we will ever see them. Since the gravity is now interpreted as an electrostatic phenomenon rather than a mass dependent phenomenon.

Thus we can state two equivalencies which (now) also incorporates the assumptions of EFT:

1. Equivalency of

   Inertial Mass (IM) ≡ Gravitational Mass (GM) ≡ Electrostatic Mass (EM), and

2. Equivalency of

   Intensity of Gravitational Field ≡ Accelerated Frame of Reference ≡ Accelerated Ether Flux

Since these two equivalencies are common to both GR and EFT one can assume that the predictions of EFT should match (mostly except for uncharged masses) those of GR. Additionally, EFT predictions should also match those of SR due to the fact that EFT assumes the presence of ether medium in the space and that Lorentz Transformations are based on the presence of ether medium as well. Theses Transforms are identical with those of SR. Thus EFT does not contradict SR or GR yet incorporates ether as a prevailing medium in space. Perhaps we can say that *ether flow is equivalent to the curved spacetime of GR.*

This is what Einstein said in 1920 about *aether*:

"We may say that according to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, *there exists an aether*. *According to the general theory of relativity space without aether is*

unthinkable; *for in such space there not only would be no propagation of light, but also no possibility of existence for standards of space and time (measuring-rods and clocks), nor therefore any space-time intervals in the physical sense*. But *this aether may not be thought of as endowed with the quality characteristic of ponderable media*, as consisting of parts which may be tracked through time. The idea of motion may not be applied to it" [3]. Furthermore, Einstein explained that the "aether of general relativity" is not absolute, because *matter is influenced by the aether, just as matter influences the structure of the aether* [25]. He further expresses that "the aether of general relativity differs from those of classical mechanics and special relativity in that it is not 'absolute' but *determined, in its locally variable characteristics, by ponderable matter*.{Comment by HP: here you can imagine the dependence of ether flux rate on the mass of the ponderable body}"

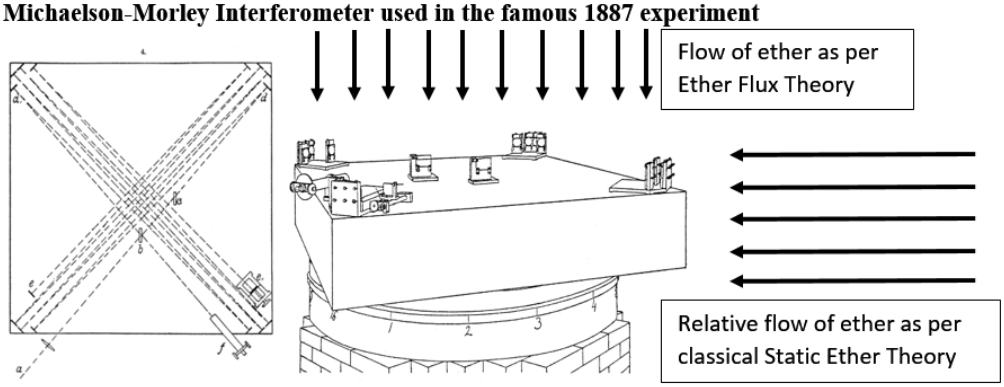
It is well known that so many predictions of SR as well as GR are confirmed experimentally and are a good support to these theories by Einstein. Since EFT does coincide with SR and GR one can assume that the predictions of EFT should also match the experimental results. So far we can say that EFT does not violate SR as well as GR even though it is based on the presence of ether medium in the space. Therefore the question is: ***"How do we determine if the assumption of vertically downward flux of ether in EFT is correct?"***

Experimental Proof for the Existence of Ether:

One of the important experimental prediction (based on the interferometers shown in Fig. 8) of EFT is that when the interference is measured between the *vertical light beam* and the *horizontal/transverse light beam* one will find a difference indicating inequality of light travel times of two arms.

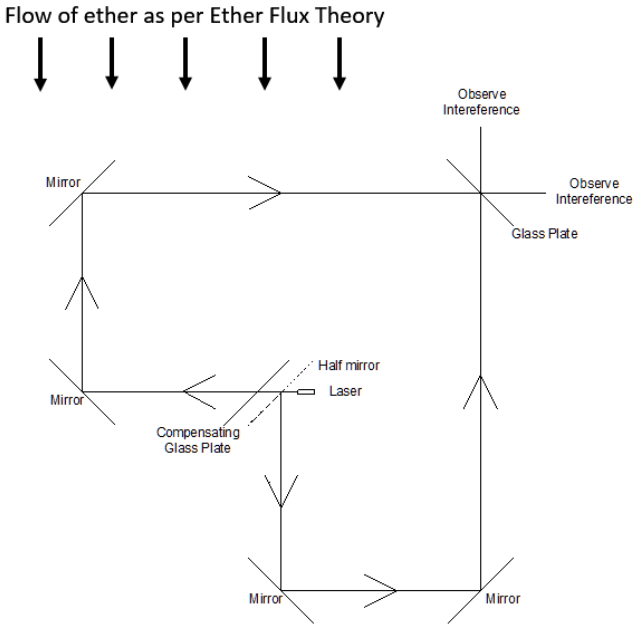
Figure 8:

(a) Michaelson-Morley Interferometer used in the famous 1887 experiment



If you rotate the left image by 45^0 clockwise then the upward arm is of the same path length as the horizontal arm. Hence the down flow of ether will cause average time spent in up (slower speed c^-) + down (faster speed c^+) direction will be same (average of c^+ and c^- is c) as compared to left (normal speed c) + right (normal speed c) is average speed c in horizontal path.

(b) A Novel Interferometer (designed specifically to detect the downward flow of ether and it is different than Mach-Zehnder and Sagnac designs):



Upward segment length is three times more than the downward segment length. Thus any downstream flow of ether will affect vertical segment of the interferometer more significantly than the horizontal segment. It is believed that this interferometer may be more sensitive in detecting ether as compared to Michaelson, Sagnac or Mach-Zhender interferometers.

Here the vertical arm is influenced by the downward flux of ether which differentiates it from the horizontal/transverse beam which is in transverse direction to the ether flux (see Fig.

8(a) and 8(b)). Based on the, assumed, downward flux of the ether in EFT a new design of the interferometer has been developed (see Fig. 8(b)). It is designed to make it more sensitive to the interference caused downward flux of ether and the horizontal arm. If one uses Michaelson type interferometer design then following are the derivations. Please note that the *longitudinal* direction of original MMX becomes *vertical* direction for the EFT experiment (EFTX) and the *transverse* direction remains *transverse* direction in EFTX. Thus we can borrow the calculations of MMX here.

For *transverse* beam:

$$T_{trans} = \frac{2L}{\sqrt{c^2 - v^2}} \approx \frac{2L}{c}\left(1 + \frac{v^2}{2c^2}\right) \text{ ...Eq. (13)}$$

For *vertical* beam:

$$T_{vert} = \frac{L}{c - v} + \frac{L}{c + v} \approx \frac{2L}{c}\left(1 + \frac{v^2}{c^2}\right) \text{ ...Eq. (14)}$$

The time difference (Δ) between T_{vert} and T_{trans} is as follows:

$$\Delta = T_{vert} - T_{trans} = \frac{2}{c}\left(\frac{L}{1 - \frac{v^2}{c^2}} - \frac{L}{\sqrt{1 - \frac{v^2}{c^2}}}\right) \text{ …Eq. (15)}$$

By multiplying with *c*, the corresponding length difference before 90º clockwise or anticlockwise rotation is:

$$\Delta_1 = 2\left(\frac{L}{1 - \frac{v^2}{c^2}} - \frac{L}{\sqrt{1 - \frac{v^2}{c^2}}}\right) \text{ …Eq. (16)}$$

And after rotation is:

$$\Delta_2 = 2\left(\frac{L}{\sqrt{1-\frac{v^2}{c^2}}} - \frac{L}{1-\frac{v^2}{c^2}} \right) \ldots \text{Eq. (17)}$$

However, in case of MMX there should be no difference between Δ_1 and Δ_2 since the *flow of ether is vertically downwards and does not affect any motion horizontal/perpendicular to it*. This is the reason why MMX showed null results for the presence of ether. However we can detect a difference (Δ) between Δ_{vert} and Δ_{trans} if the equipment is oriented vertically to the Earth's surface. Dividing Δc by the wavelength (λ) of the laser light we have a shift in *n* number of fringes:

$$n = \frac{\Delta \times c}{\lambda} \quad \ldots \text{Eq. (18)}$$

In order to get *n* fringe difference for a red laser light (λ=650x10^{-9} m) we have two unknowns, *L* (length of the light beam arm) and *v* (the velocity at which ether flows downwards. Suppose *L*=10 m. Then *v* is the only unknown as *n* can be determined experimentally. Since *v* varies with its position above the ground, because ether flows in accelerated fashion downwards, perhaps we need a new derivation for *n* in Eq. (18). Nonetheless, instead of seeing null results as in case of the *horizontal* MMX (in 1887) the *vertical* MMX or EFTX will provide a positive value for interference (*n*). A close approximation may be obtained as follows.

Suppose that ether flow acceleration is exactly as that of gravitational acceleration. Hence g_{earth} is equal to $g_{ether.}$ Therefore the average velocity of ether at the beam combination mirror (beam splitter) from a height of *L* is:

$$v = \frac{\sqrt{2g_{ether}L}}{2} \quad \ldots\text{Eq. (19)}$$

The value of v for a 10 m long arm (L) of the beam comes to 7 m/s (using g_{ether} = 9.8 m/s). By substituting the value of v from Eq.19 into Eq.15 and calculating for n we have:

$$n = \frac{\Delta \times c}{\lambda} = 2\left(\frac{L}{1-\frac{v^2}{c^2}} - \frac{L}{\sqrt{1-\frac{v^2}{c^2}}} \right) \div \lambda \quad \ldots\text{Eq. (20)}$$

Thus for a 10 m arm of beam (L) with red laser of 650 nm wavelength (λ) and velocity of ether flow at 7 m/s, we have $n \approx 0$. We know from the above discussion that there should be a small positive difference between the vertical path and the horizontal one. However, the value of n is very small and insignificant and hence cannot be measured. This makes sense since the average velocity with which ether falls down on earth is estimated to be very small, only 7 m/s from a height of 10 m for the EFTX as compared to the speed of Earth through space (irrelevant to EFTX) known to be 30,000 m/s. The speed of ether in EFTX is 4,286 times slower than that of the orbital speed of Earth. It seems that the improved design of interferometer in Fig. 8(b) will not help as well.

Now let's consider only the vertical arm. The time difference between vertically *up* journey for this arm and *down* journey is:

$$\Delta_{vert} = \frac{L}{c-v} - \frac{L}{c+v} = L\left(\frac{2v}{c^2-v^2} \right) = 2L\left(\frac{v}{c^2-v^2} \right) \quad \ldots\text{Eq. (21)}$$

Where,

v = average flow velocity of ether downward towards the Earth 7 m/s for L=10.

Substituting the value of *v* from Eq. (19) in Eq. (21) we have:

$$\Delta_{vert} = 1.5577x10^{-15}\text{s} \ldots \text{Eq. (22)}$$

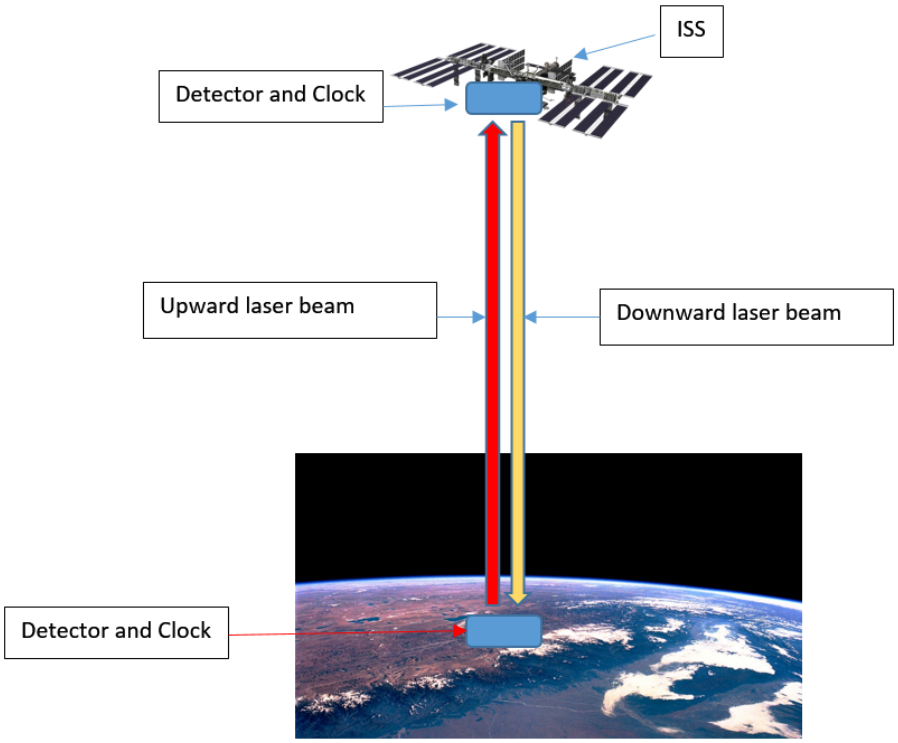
Therefore Δ_{vert} = 1.5577x10^{-15} s. This is 1.6 femtosecond (fs) which is a measurable time by a highly sensitive clock. Thus, instead of carrying out an interferometric measurement (since *v* is very small, only 7 m/s, we can consider zero difference in the transverse travel of the horizontal beam i.e. Δ_{trans}= 0) one should measure the time difference between the up travel and down travel. With the technology available today one can reliably measure a time difference of about 1.6 femtosecond (fs) with certainty to prove this difference as a scientific fact and hence prove the existence of ether [28]. The sensitivity is proportional to the length of the beam (*L*). Hence longer the beam length greater will be the difference in time.

The best way to prove the ether hypothesis is to perform a conclusive experiment as follows.

EFT and International Space Station Experiment (ISSX): A Conclusive Proof of EFT

In this experiment a mirror is placed on a location on Earth which houses a detector for laser and a laser (see Fig. 8(c)).

Figure 8(c): International Space Station Experiment



An identical laser (the same as Earth) is sent to the International Space Station (ISS). The ISS (with a reflecting mirror) is located at 400 km above the Earth's surface. Now a beam from earthbound laser is sent to ISS and is reflected back to the detector on earth. The total time travelled by this beam is t_1 by the earthbound clock. Now a laser beam is sent from the ISS using the onboard laser and time is measured t_2 by the earthbound clock. Please note that the highly sensitive clocks both on the earth and ISS are identical and synchronized at the start of the experiment. This experiment is repeated sufficient number of time to achieve a signal to noise ratio of 5σ. If the EFT is correct then the time taken by 'downward' beam is less than half of the time taken by the beam which made a complete journey. Thus,

$$\Delta t_A = \frac{1}{2} t_1 - t_2 \ldots \text{Eq. 22(a)}$$

The value of Δt_A should be positive if EFT is to be proven right. Any positive value of Δt_A will prove that the speed of laser light travelling downward from the ISS is faster than *c*. Once the *variance of c* is proven it will antagonize the second of Einstein's axiom of the SR. This will also require us to modify GR as the Einstein's Field Equations use *c* as a constant. The speed of light (*c*) is also used in many other theories based on the invariance of *c*. Thus may theories will required to be revised.

Alternatively the earth based laser sends a beam to ISS and the time required for upward beam is noted as t_3. Based on this configuration ant positive difference between t_2 and t_3 would prove the existence of ether as the downward beam of light would have traveled at a higher speed than the upward beam. Thus Δt_B should be a positive value for EFT to be correct:

$$\Delta t_B = t_2 - t_3 \quad \text{Eq…22(b)}$$

EFT and Fizeau Experiment (FX):

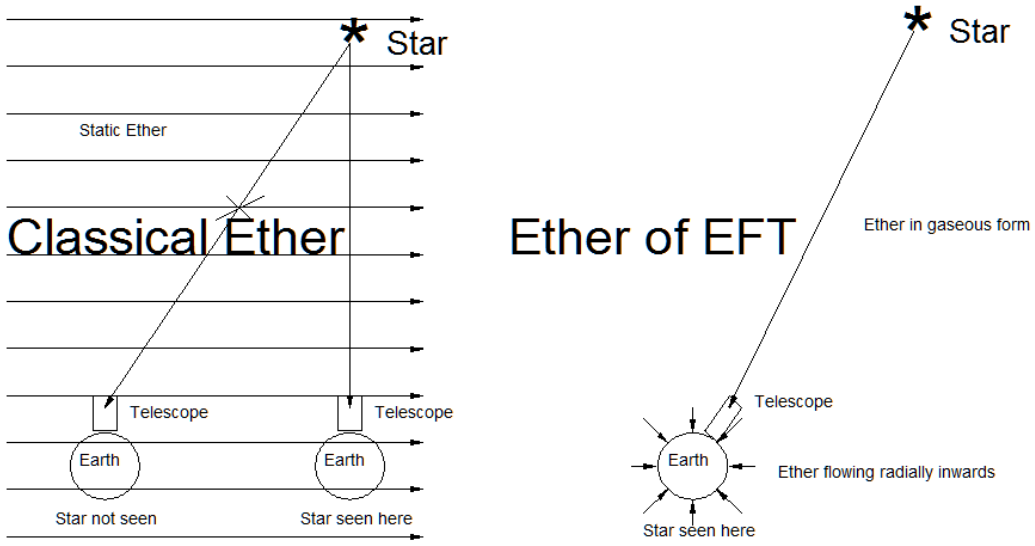
Some further, experimental, support for the presence of ether comes from the Fizeau Experiment (abbreviated as FX) (performed in 1851). FX was one of the key experimental results that shaped Einstein's thinking about SR [29]. Also, Robert S. Shankland reported some conversation with Einstein, in which Einstein emphasized the importance of FX [30]. Einstein continued to say that the experimental results which had influenced him most were the observations of (1) stellar aberration and (2) Fizeau's experiment with moving water. "They were enough", he said.

In his original experiment Fizeau showed that there is a partial drag to the motion of light due to ether carried by moving water. However there were doubts. Therefore, Michaelson and Morley (1886) conducted the Fizeau type experiment (FX) with many refinements (we will call

this MMFX) and *completely* confirmed Fizeau's results. Thus there is 'some' ether or that there is something that we do not know which is causing this phenomenon. In absence of any other factor one would conclude that it must be the ether which is causing the drag. Hence FX does prove existence of ether. Both MMX and MMFX are proving opposite things. MMX shows there is no ether and MMFX shows there is ether. So if MMFX is right and MMX is also right which of these experiments would you consider 'more' right? As pointed out earlier in this section that there is a room for doubt for the MMX as it did not consider the possibility of a downward flow of ether, which is what is hypothesized in EFT, but such doubt does not exist for MMFX. Therefore one would consider MMFX on more sound scientific ground as compared to MMX and hence leads us to believe that there is ether.

Now let's consider the second experiment that Einstein considered important (in proving absence of ether) and influenced him to develop SR. This is the Stellar Aberration Experiment (SAX). Einstein was right in not believing the complete ether drag hypothesis as it contradicted with SAX as shown in Fig. 8(d)(left) as the stellar aberration is not seen in this arrangement. However, as per EFT the ether near Earth is flawing radially downwards (see Fig. 8(d)(right)) and is also dragged along with it only in its vicinity (see the *Straight-edge Diffraction* section in this paper).

Figure 8(d): Stellar aberration Experiment with Static Ether (left) and Ether of EFT (right) around Earth



This type of ether flow should not impact any telescopic observation. Hence one would still see stellar aberration as it is an experimental fact. The rest of the space is filled with gaseous ether which is not dragged at all with the Earth. Thus the ether of EFT is more like (but not exactly) that of Fresnel's ether as confirmed by FX and MMFX and supported by positive SAX results.

EFT and Newton's Law of Universal Gravitation:

The law states that any two bodies in the universe attract each other with a force that is directly proportional to the *product of their masses* and inversely proportional to the square of the distance (*r*) between them. The equation of this law is shown in Eq. (22(a)).

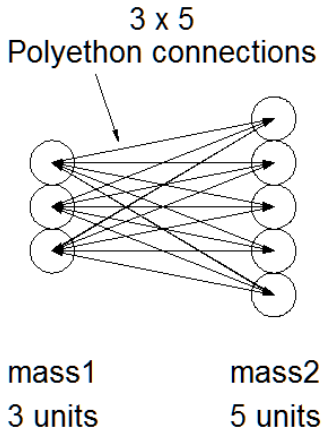
$$F = G\frac{mass_1 \times mass_2}{r^2} \quad \ldots \text{Eq. (22(a))}$$

Where,

G = Universal gravitational constant

However there are two questions. Firstly, the question is why the force is inversely proportional to the square of the distance between them? Secondly, why the function *product* of the masses is used to calculate the force and not sum or division or subtraction? The first question is simple to answer. As we have discussed, according to EFT, the flow of ether is inwards in a spherical geometry and this flow is inversely proportional to the square of the distance from the center of the mass. However the answer to the second question is not quite simple. EFT answers this question by considering the interaction between two masses as shown in Fig. 8(e).

Figure 8(e): Interaction of two masses as per Ether Flux Theory. It is the *product* of two masses that represents total number of interactions



As shown in this figure $mass_1$ has 3 mass units and $mass_2$ has 5 mass units. When these masses interact with each other *via* polyethons there are totally 3 x 5 connections for each mass. Each unit of $mass_1$ is 'binding' with 5 units of $mass_2$. Similarly each unit of $mass_2$ is 'binding' with 3 units of $mass_1$. Therefore $mass_1$ is *multiplied* by $mass_2$ and it is not simply a sum (or any other function) of two masses which represents total interactions and hence the resulting force. Indirectly, this is another support for EFT in which gravitational mass is replaced by electrostatic

mass due the electrical nature of the matter which gets connected by polyethons. This type of interaction is also apparent in Coulomb's Law. Here the interaction is between 'full' charges (positive and negative for electrostatic attraction) by polyethons just like with 'almost neutralized charges' in case of gravity. Hence Coulomb's Law's equation (as shown in Eq. (22(b))) is very similar to that of Newton's law of universal gravitation Eq. 22(a).

$$|F| = k_e \frac{|q_1 q_2|}{r^2} \quad \text{…Eq. (22(b))}$$

Where,

F = force of electrical (static) interaction,

k_e = Coulomb's constant,

q_1 & q_2 = electrical charges,

r = distance between the interacting charges

As you can see in Eq. (22(b)) the mass term of the objects holding these charges is completely ignored for the reason that electrostatic force is 10^{39} times greater than that of the gravitational force. Thus contribution to the attractive force due to gravity of two charges is very negligible. Perhaps these are the reasons why gravity and electrostatic forces are quite similar in their nature differing only in their strengths. The reason, once again, could be the difference in magnitude between the 'full charge' as in case of electrostatics and 'residual charge' as in case of gravity.

EFT and the Nature of Ether:

Ether, the medium assumed to fill the universe, has been the center of this discussion. Hence it was thought appropriate to express some thoughts on some of its properties not discussed earlier. These properties, albeit hypothesized, that the ether could have are as follows:

1. It is gaseous and follows Ideal Gas Law ($PV = nRT$)
2. It is inviscid i.e. it has no viscosity of its own as gaseous particles (EDPs and EMPs). The viscosity property is due to some attraction, adhesion or cohesion between two particles. If there is no such interaction the viscosity is zero. In case of ether both EDP and EMP are perfectly neutral and hence do no exhibit any electrical or magnetic attraction or repulsion.
3. Ethon particles have charge but they are electrically and magnetically neutral. They possess no mass and they exists in pair such as EDP and EMP.
4. Ethons can only interact with charged particles (+, - ,N & S charged particles)
5. Ethons (EDPs) get *absorbed* by vibrating charges. Here all matter particles are made of vibrating ethons hence all matter absorbs ethons except neutral vibrating EDPs.
6. Just like air molecules ethons are transparent to light.
7. The size of each ethon is possibly that of Planck length (1.616×10^{-35} m). Thus they are extremely small and can pass through even the finer structure of protons and neutrons.
8. The supply of ethons is limitless as it prevails the entire universe (and quite possibly beyond).
9. The ether gas has permeability and permittivity properties which are reflected in the electrical (ε_0) and magnetic (μ_0) constants.
10. Just like the string theory a particle of ordinary matter (eumatter) is made of vibrating ethon or a combination of ethons. The fundamental material of construction of the visible universe is ether.

11. The true ‘field’ or ‘sphere of influence’ or ‘orb of influence’ is surrounding the ethon itself. This is the true ‘action at distance’ in the entire universe. Besides this there is no action at distance. Again, this orb of ethon influence is unique. The force or influence in not proportional to the distance (unlike inverse square law). Rather, it is ‘all or none’ attraction. Within certain distance from the ethon particle the force is present and then it vanishes completely. This distance seems to be very small. This is how ε^+ pairs with ε^- (or ε^0). This orb of force is similar to the *strong nuclear force*. Just like strong nuclear force it is rather strong for the given ‘mass’ or vibrations.

EFT and Quantum Mechanics (QM):

The ***Double Slit Experiment (DSX)*** (especially when done with single photons/electrons diffraction design) is a classic thought experiment for expressing the central puzzle of quantum mechanics. Richard Feynman called it “*a phenomenon which is **impossible to explain in any classical way**, and which has in it the heart of quantum mechanics. In reality, it contains the only mystery of quantum mechanics.*” [31] He was fond of saying that all of the quantum mechanics can be gleaned from carefully thinking through the implication of this single experiment. Einstein on the other hand expressed that, while reflecting on the ether, “*This raises the question of whether it might perhaps also be possible to link the phenomena of diffraction and interference to quantum theory in such a way that the field-like concepts of the theory are presented only as expressions of the interaction between quanta, so that independent physical reality would no longer be ascribed to the fields* [25].

However, before we consider the DSX let’s consider a simple straight-edge diffraction.

Straight-Edge Diffraction:

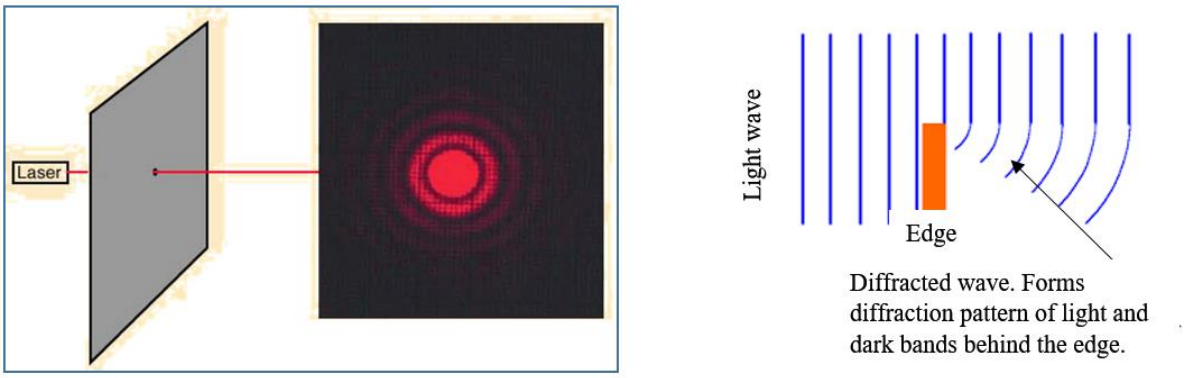
"An edge is mightier than a star!"

Because it can bend the light too, just like the gravity of the Sun.

Even before we go to Straight-edge diffraction let's consider one thought experiment first. Imagine that a collimated laser beam of 1.00 mm diameter is allowed to pass through an opaque plate having an aperture of 1.01 mm (experiment is conducted in vacuum).Here the aperture is only 0.01 mm wider than the laser beam. When this beam is projected on a screen we see diffracted laser light and formation of Airy's disc (see Fig. 9(a) left).

Figure 9:

(a) Diffraction through an aperture (left) and at an edge (right)



However, without this aperture we will see exactly a 1.00 mm spot on the screen. The question is this: "How did the light 'know', without touching the wall of the aperture, that there is an aperture and that it has to exhibit diffraction pattern?" Does the rays of light have 'tentacles' to sense the surrounding? Perhaps the simple answer is that proximity of the aperture wall around the aperture altered the physical property of the empty space inside the aperture such

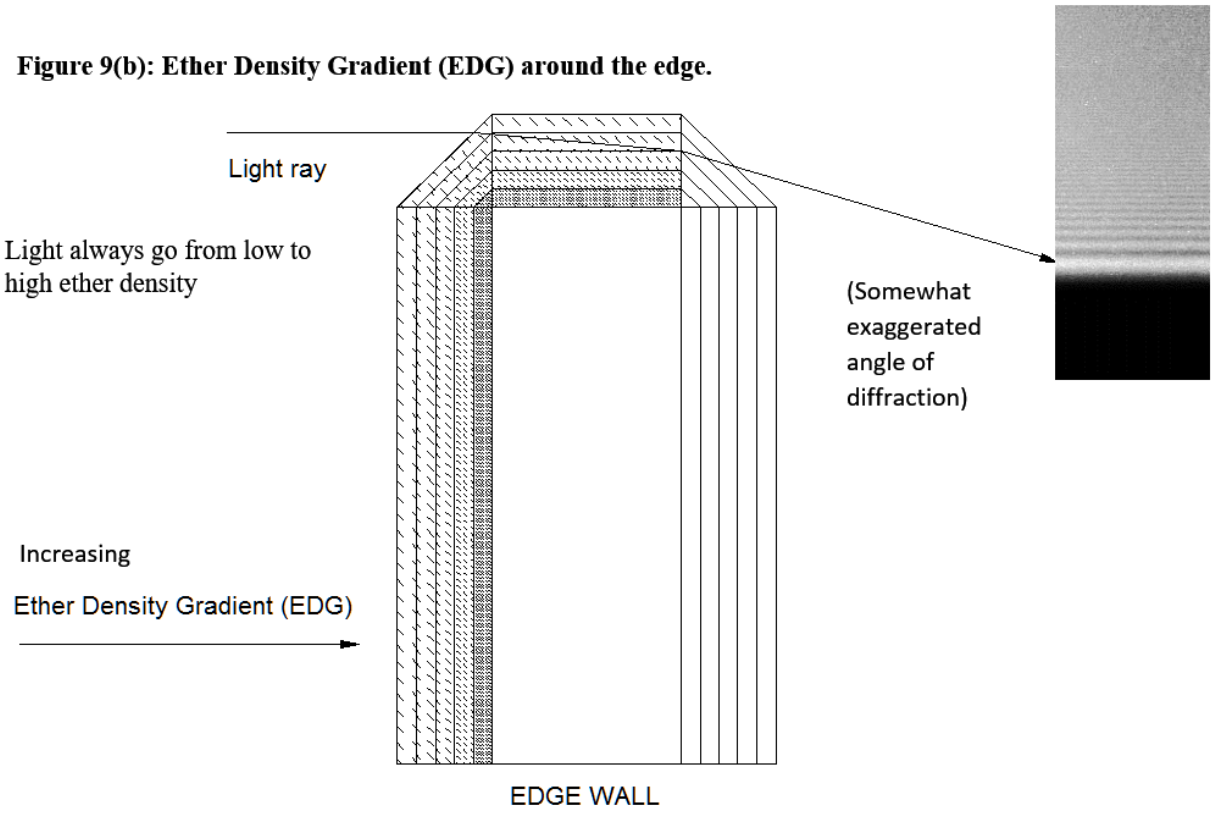
that it caused the light to diffract and exhibit interference. This result is, therefore, due to altered property of the empty space (just like curved spacetime).

This thought experiment is similar to the one discussed by Richard P. Feynman in his book, Quantum Electrodynamics [32]. In this case he uses a beam of light passing between two blocks. As the blocks are brought closer together but without touching the light beam, they alter the behavior of the beam of light. He expresses this as "*So **light doesn't really travel only in a straight line; it "smells" the neighboring paths around it,** and uses a small core of nearby space*." This is another example where the property of the space between the blocks is altered merely by reducing the gap between them. Both these experiments show something what we call an *edge effect (the edge of the aperture).*

Now let's get back to straight-edge diffraction. For this, a simple setup of experiment is shown in Fig. 9(a)(right). Here a wave front hits the edge of an object and exhibits two pathways (a) straight as expected, and (b) around the edge due to diffraction. Furthermore the diffracted wave forms diffraction pattern of light and dark bands of decreasing width as you move away from the edge. This diffraction is explained by Huygens-Fresnel Principle. According to this principle every point, which is a luminous disturbance reaches, becomes a source of spherical wave. The sum of these secondary waves determines the form of the wave at any subsequent time. Furthermore the interference of these secondary waves determine the light and dark patterns observed. The fundamental question is why every point on which light wave falls becomes a source of spherical wave? What is the physical process at quantum level that creates this effect? So far there is no quantum level explanation of this phenomenon. There is however a method of predicting the outcome of this process as given with great accuracy by Quantum Electrodynamics (QED).

EFT has following explanation. As per EFT assumption ether flows radially into every atom just as it flows vertically down on earth and all heavenly bodies. This is why there is a density gradient of ether, as well as a flux gradient, around an object. In case of a straight edge the density gradient (Ether Density Gradient or EDG) is as shown in Fig. 9(b).

Figure 9(b): Ether Density Gradient (EDG) around the edge.



The *ray of light goes from lower density to higher density, or lower flux to higher flux, of ether in the direction of the greater ether flow in case of the straight edge or wherever such a flux exists*. This is a deduction based on the flow behavior of ether and anything 'dragged' by it just as apple falls on earth trapped by the ether flux. However, the physical reason could also be that the ray of light is a polyethon with negative (-) terminus open at the tip of the ray. This partial negative charge is attracted by the strong positive (+) charge of the nucleus making the ray to bend towards the nucleus. It is just like a satellite (like Voyager) getting gravitationally

attracted by the planet and getting a 'sling shot' effect to go forward with a change in direction and an increase in speed/momentum as well. *One of the most important point to realize here is that light* ***need not be*** *in a wave form for it to be diffracted*. Only a single ray/photon//electron can diffract due to the Ether Flux Gradient (EFG) and hence Ether Density Gradient. However if it is a wavy-particle it would also exhibit the interference pattern that we see around a straight-edge.*

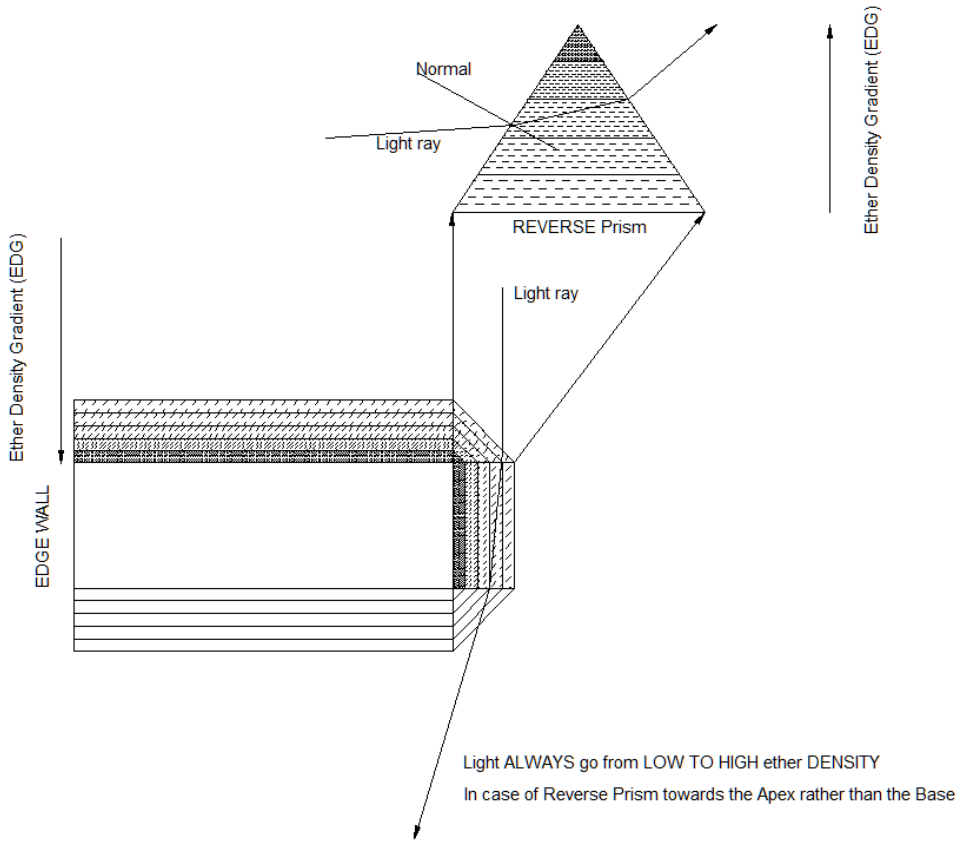
**Here I want to make a distinction between diffraction and interference pattern. Here the word diffraction is used strictly to mean 'bending of light' just like refraction through a medium. The pattern however is of interference (and more correctly of probability) and that is the second phenomenon that we see once the light has diffracted.*

As we know that it took Sun's gravity to bend the starlight in order to prove Einstein's GR in 1919 solar eclipse. Therefore it raises a question. What is as powerful as Sun's gravity in the *edge* (which is an insignificant fraction of Sun's weight) to bend the light ray? It seems that the black hole like density (0.5911×10^{18} kg m^{-3} for a single proton) of the nucleus that bends the light due to very high flux of ether in the nucleus which also changes the course of a ray of light just like a swimmer swimming across a river and experiencing very strong current.

In order to simplify thinking about the Ether Density Gradient (EDG) and Ether Flux Gradient (EFG) one can approximate this presentation by substituting it with a ***prism*** at the diffracting side of the edge as shown in Fig. 10(a).

Figure 10:

(a) **Ether Density Gradient (EDG) can be approximated by replacing it with a (imaginary) REVERSE Prism**

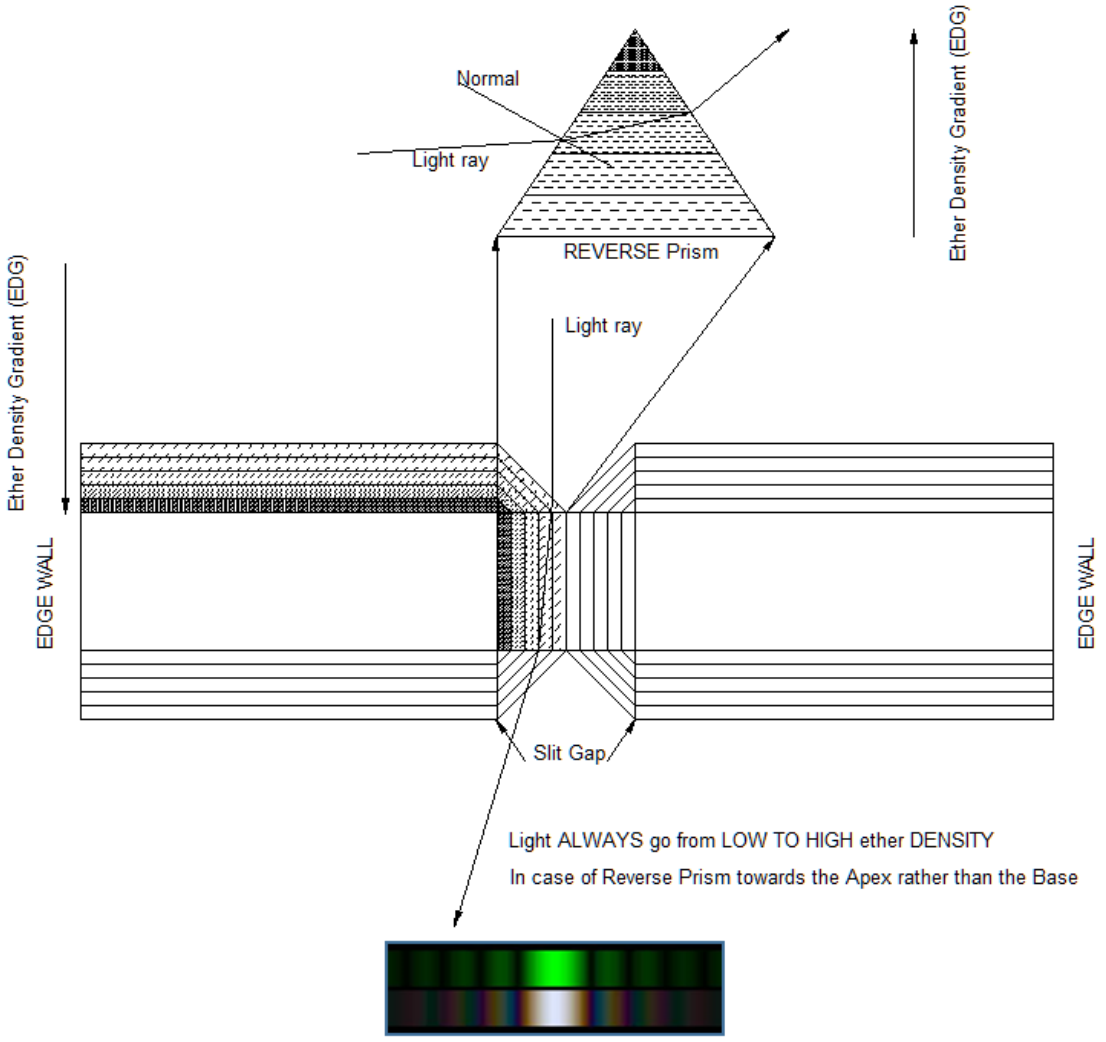


Here you can see that the light diffracts due to the ether flux towards the material of the edge or due to the EDG. Hence the analogy of EDG to a prism (in reality this is a quadrant or a quarter of a circle. However to simplify the ray tracing of the light path it is simplified to be a prism) is very close, however one should always use ether density and flux gradients for all scientific purposes. However, as we know it is important to keep the width of slit sufficiently small (usually of the order of ½ to 1 x λ of the light being studied) to cause diffraction. This requirement indicates that the narrower gap allows the EDG to fill the slit space completely to have causative influence on the beam of light. Taking this view one step further one can also

imagine a slit made of two straight edges as shown in Fig. 10(b) where the slit cross-section is shown in a top view.

Figure 10:

(b) A slit can be a 'double straight edge' and a (imaginary) prism can be a substitute for the Ether Density Gradient (EDG).



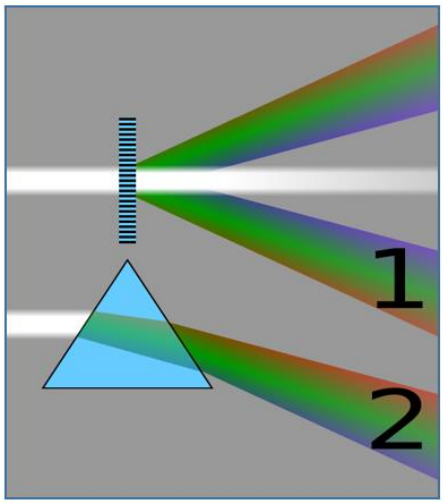
Interference pattern created by a single slit (upper with monochromatic light and lower with white light)

Here one can see two imaginary prisms at the corners of the edge filling the void between the walls of the slit. Here, again, the diffraction pattern is due to EDG/EFG, but it is well simulated

by two prisms at the corners of the edge. Here one can see the diffraction pattern produced by the slit in case of a monochromatic light (upper pattern) and white light (lower pattern). It is important to note that the blue light, in the diffraction of white light, is on the 'inner' side towards the center. One can also imagine that in a 'double slit' experiment (DSX) one is using two of these slits as presented in Fig. 10(b). On further examination of the diffraction pattern one can also think that this pattern is very similar to the one generated by a *diffraction grating* (see Fig. 10(c)). Thus one can replace the concept of EDG/EFG combined with the two of the 'Reversed Prisms' by a single Diffraction Grating as shown in Fig. 10(d).

Fig 10:

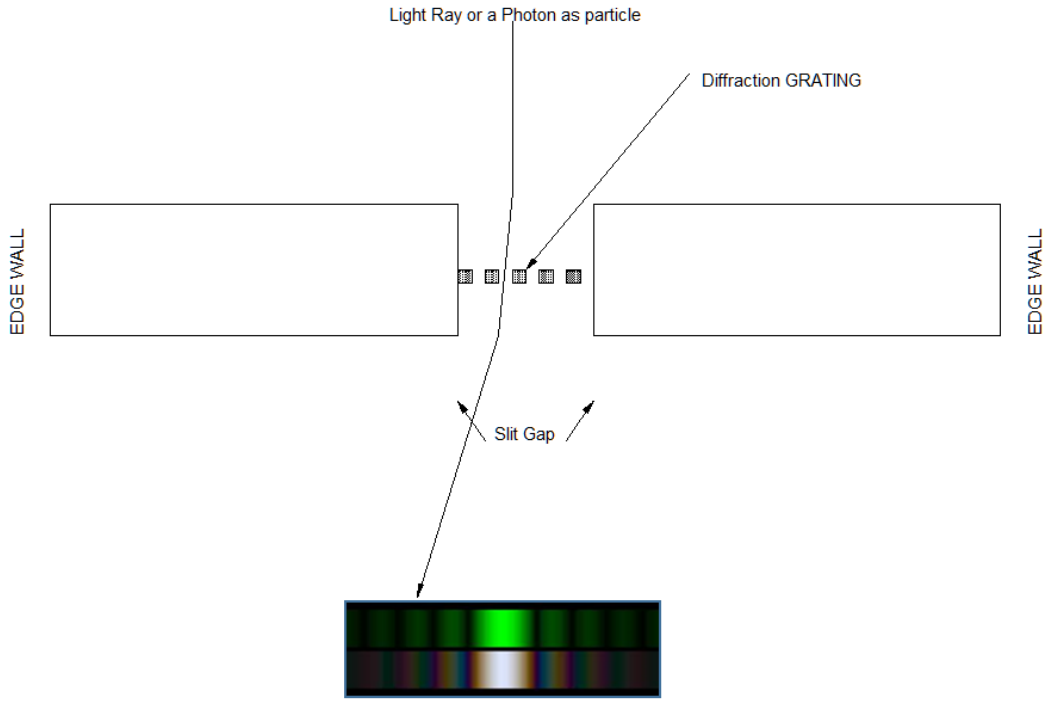
(c) A comparison of diffraction through a grating with the Refraction through a Prism.



Here an equivalence of a Prism and Diffraction Grating is shown. Note that the dispersion patterns are reversed in the prism (#2) as compared to the grating (#1). However in Fig. 11(a) we have shown that the Prism is REVERSED and hence one can expect a (reversed) and diffraction grating like pattern form the slit as well.

Source: Wikipedia

(d) The diffraction caused by the Ether Density Gradient and Reverse Prism simulates very closely what a Diffraction Grating can do. Thus one can also replace the (imaginary) Reverse Prisms by a single (imaginary) Diffraction Grating as shown.



Interference pattern created by a single slit (upper with monochromatic light and lower with white light)

Before we go into explaining DSX, I would like to propose one experiment to demonstrate the existence of ether like substance surrounding the diffraction causing straight-edge. The experiment is proposed as follows:

1. The hypothesis:
    a. Since the EDG/EFG is dependent on the mass (more importantly the density of the material of the slit) of the atom (particularly its nucleus) there should be a correlation between the density of the material of a slit and the degree of diffraction. Therefore, greater the density of the metal slit (ρ_s) greater will be the diffraction (θ_d) (if $\sin\theta_d = \frac{m\lambda}{a}$ where, m is an integer (1), λ is the wavelength of

the light, *a* is the slit width). Similar to the dependence of angle of refraction on the density of the medium refracting the light.

2. Prepare slits of following metals (decreasing order of density (g cm^{-3})), of exactly the *same dimensions*:

	Metal	Density (g cm^{-3})
1.	Pt	21.45
2.	Au	19.30
3.	Pb	11.34
4.	Cu	8.96
5.	Fe	7.874
6.	Tn	7.365- white
7.	Zn	7.14
8.	Tn	5.769- gray
9.	Ti	4.506
10.	Al	2.70

3. In this diffraction experiment, using the same light source (a laser), place each slit in the same exact position with great precision one after other.
4. Determine angle of diffraction for each metal (θ_d).
5. There should be a correlation between θ_d and some form of ρ_s.

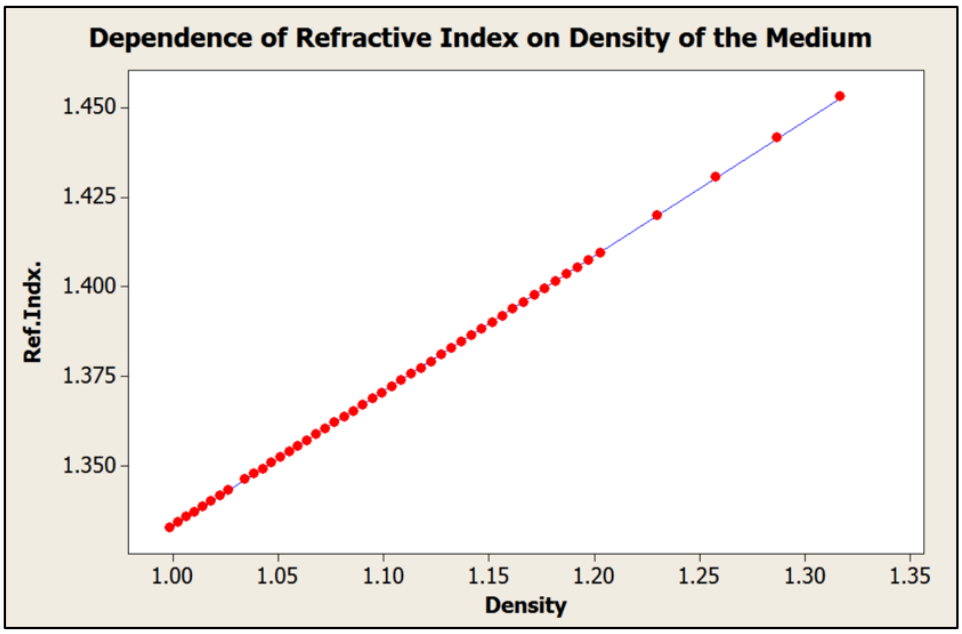
$$\theta_d = k\rho_s + C \quad \ldots \text{Eq. (25)}$$

Where *k and C* are constants.

Note: Another possible experiment can be of the geometry of the diffracting edge as well (straight, round and beveled end).

One, indirect, supportive fact for such possible correlation is that Refractive Index (*n*) is related with the Density (ρ) of the medium as shown in Fig. 11(a).

Figure 11:
(a) Dependence of Refractive Index (n) on Density (ρ) of the Medium (0 to 65% Sucrose Solution)



As you can see the correlation between the densities of sucrose solutions (of different concentrations (% w/v)) with their experimentally determined refractive indices. The data [33] are shown in Table II and results are shown below.

Linear regression of Refractive Index of Sucrose Solution with Density

Regression Analysis: Ref.Indx. versus Density

The regression equation is
Ref.Indx. = 0.957 + 0.376 Density

49 cases used, 1 cases contain missing values

Predictor	Coef	SE Coef	T	P
Constant	0.956966	0.000409	2337.69	0.000
Density	0.376463	0.000368	1023.93	0.000

S = 0.000194697 R-Sq = 100.0% R-Sq(adj) = 100.0%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.039743	0.039743	1048435.84	0.000
Residual Error	47	0.000002	0.000000		
Total	48	0.039745			

Observed values, calculated values and Residuals for Refractive Index

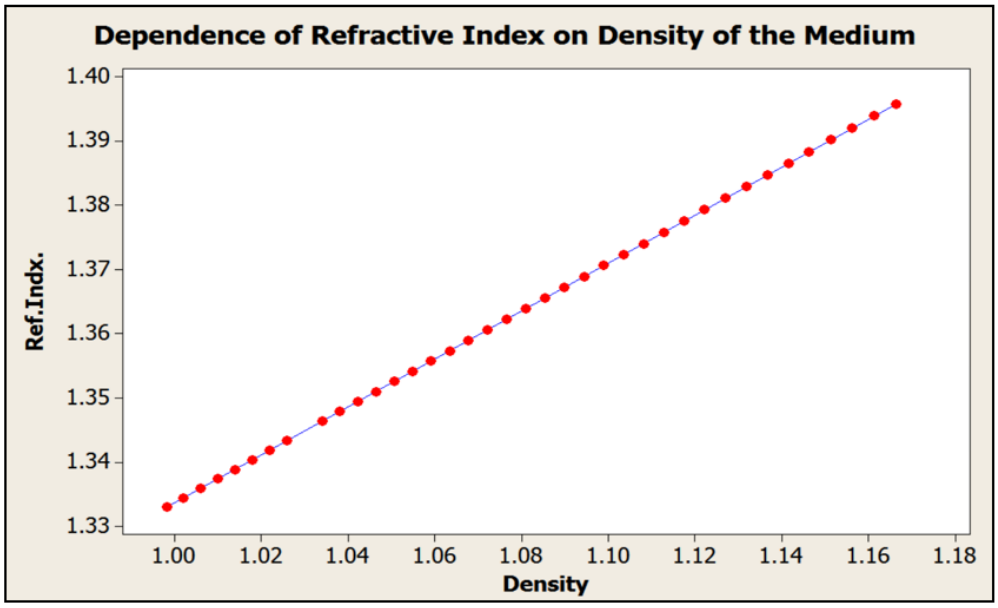
(Where: Fit= Calculated value, SE Fit= Standard Error of fit, Residual = Observed – Calculated value, St Resid = Studentized Residual)

Obs	Density	Ref.Indx.	Fit	SE Fit	Residual	St Resid
1	1.00	1.33300	1.33275	0.00005	0.00025	1.32
2	1.00	1.33440	1.33422	0.00005	0.00018	0.96
3	1.01	1.33590	1.33569	0.00005	0.00021	1.12
4	1.01	1.33740	1.33716	0.00005	0.00024	1.29
5	1.01	1.33880	1.33866	0.00005	0.00014	0.73
6	1.02	1.34030	1.34017	0.00004	0.00013	0.70
7	1.02	1.34180	1.34167	0.00004	0.00013	0.67
8	1.03	1.34330	1.34318	0.00004	0.00012	0.63
9	*	*	*	*	*	*
10	1.03	1.34640	1.34623	0.00004	0.00017	0.90
11	1.04	1.34790	1.34777	0.00004	0.00013	0.67
12	1.04	1.34940	1.34935	0.00004	0.00005	0.24
13	1.05	1.35100	1.35093	0.00004	0.00007	0.34
14	1.05	1.35260	1.35252	0.00004	0.00008	0.44
15	1.05	1.35410	1.35410	0.00003	0.00000	0.02
16	1.06	1.35570	1.35572	0.00003	-0.00002	-0.08
17	1.06	1.35730	1.35733	0.00003	-0.00003	-0.18
18	1.07	1.35900	1.35895	0.00003	0.00005	0.24
19	1.07	1.36060	1.36057	0.00003	0.00003	0.15
20	1.08	1.36220	1.36223	0.00003	-0.00003	-0.15
21	1.08	1.36390	1.36392	0.00003	-0.00002	-0.12
22	1.09	1.36550	1.36558	0.00003	-0.00008	-0.41
23	1.09	1.36720	1.36727	0.00003	-0.00007	-0.38
24	1.09	1.36890	1.36897	0.00003	-0.00007	-0.35
25	1.10	1.37060	1.37070	0.00003	-0.00010	-0.51
26	1.10	1.37230	1.37243	0.00003	-0.00013	-0.68
27	1.11	1.37400	1.37416	0.00003	-0.00016	-0.84
28	1.11	1.37580	1.37589	0.00003	-0.00009	-0.49
29	1.12	1.37750	1.37766	0.00003	-0.00016	-0.85
30	1.12	1.37930	1.37943	0.00003	-0.00013	-0.69
31	1.13	1.38110	1.38124	0.00003	-0.00014	-0.73
32	1.13	1.38290	1.38305	0.00003	-0.00015	-0.76
33	1.14	1.38470	1.38485	0.00003	-0.00015	-0.80
34	1.14	1.38650	1.38670	0.00003	-0.00020	-1.03
35	1.15	1.38830	1.38851	0.00003	-0.00021	-1.07
36	1.15	1.39020	1.39039	0.00003	-0.00019	-0.98
37	1.16	1.39200	1.39223	0.00003	-0.00023	-1.21
38	1.16	1.39390	1.39411	0.00003	-0.00021	-1.12
39	1.17	1.39580	1.39603	0.00003	-0.00023	-1.22
40	1.17	1.39780	1.39792	0.00004	-0.00012	-0.61
41	1.18	1.39970	1.39984	0.00004	-0.00014	-0.72
42	1.18	1.40160	1.40179	0.00004	-0.00019	-1.02
43	1.19	1.40360	1.40375	0.00004	-0.00015	-0.80
44	1.19	1.40560	1.40571	0.00004	-0.00011	-0.58
45	1.20	1.40760	1.40767	0.00004	-0.00007	-0.35
46	1.20	1.40960	1.40966	0.00004	-0.00006	-0.33
47	1.23	1.42000	1.41986	0.00005	0.00014	0.72
48	1.26	1.43070	1.43037	0.00006	0.00033	1.79
49	1.29	1.44180	1.44129	0.00007	0.00051	2.83RX
50	1.32	1.45320	1.45250	0.00008	0.00070	3.93RX

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

As you can see observation #9 was removed from analysis as it was determined to be an outlier. Also on further examination of the results it was realized that observations #40 to #50 were biased with some error (perhaps due to more sticky nature of the sucrose syrup at high concentrations). Therefore a reanalysis was done of the data excluding #9, #40 to #50 and the results are shown below and the graph is shown in Fig. 11(b).

Figure 11(b): Graph of Refractive Index vs. Density of the medium (Reduced Data Set)



One can see a huge improvement in t-statistics, F-value and Fit values. The maximum error in calculated refractive index is only $7x10^{-5}$.

Linear regression of reduced data set for Refractive Index and Density of sucrose solution

Regression Analysis: Ref.Indx. versus Density

The regression equation is
Ref.Indx. = 0.960 + 0.374 Density

38 cases used, 1 cases contain missing values

Predictor	Coef	SE Coef	T	P
Constant	0.959954	0.000119	8054.10	0.000
Density	0.373675	0.000110	3389.04	0.000

S = 0.0000338096 R-Sq = 100.0% R-Sq(adj) = 100.0%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.013129	0.013129	11485617.76	0.000
Residual Error	36	0.000000	0.000000		
Total	37	0.013129			

Reduced Data Set (with Fit values)

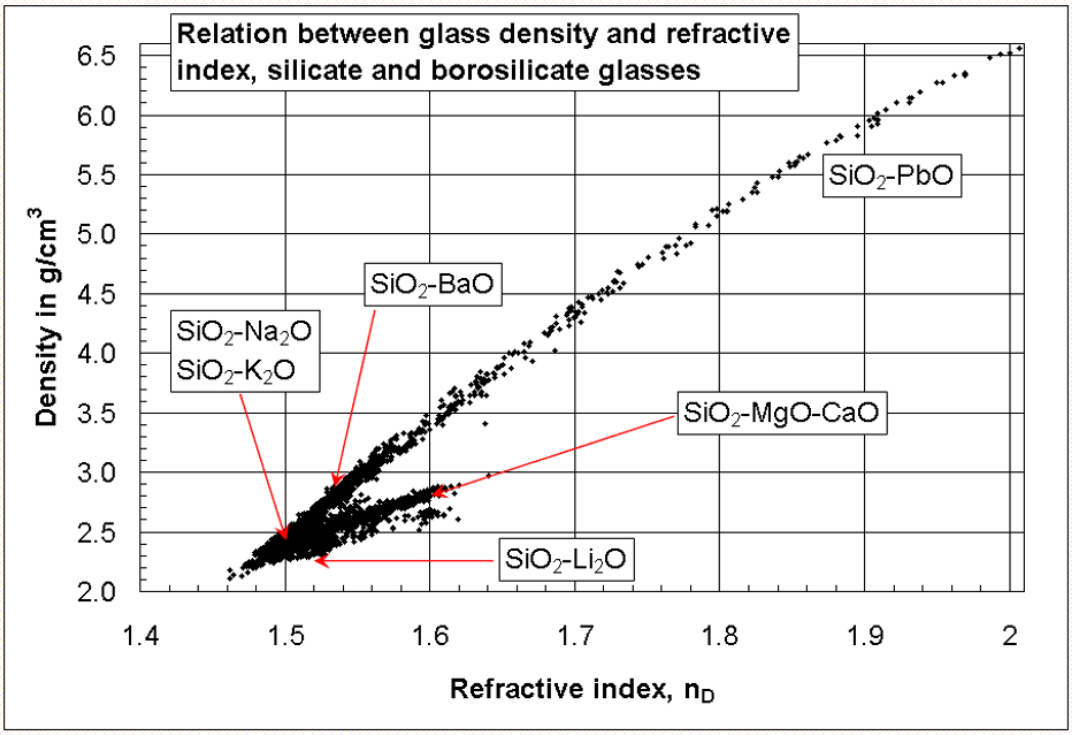
Obs	Density	Ref.Indx.	Fit	SE Fit	Residual	St Resid
1	1.00	1.33300	1.33296	0.00001	0.00004	1.34
2	1.00	1.33440	1.33441	0.00001	-0.00001	-0.44
3	1.01	1.33590	1.33587	0.00001	0.00003	0.88
4	1.01	1.33740	1.33733	0.00001	0.00007	2.19R
5	1.01	1.33880	1.33882	0.00001	-0.00002	-0.72
6	1.02	1.34030	1.34032	0.00001	-0.00002	-0.56
7	1.02	1.34180	1.34181	0.00001	-0.00001	-0.40
8	1.03	1.34330	1.34331	0.00001	-0.00001	-0.23
9	*	*	*	*	*	*
10	1.03	1.34640	1.34633	0.00001	0.00007	1.99
11	1.04	1.34790	1.34787	0.00001	0.00003	1.01
12	1.04	1.34940	1.34944	0.00001	-0.00004	-1.08
13	1.05	1.35100	1.35101	0.00001	-0.00001	-0.16
14	1.05	1.35260	1.35257	0.00001	0.00003	0.76
15	1.05	1.35410	1.35414	0.00001	-0.00004	-1.33
16	1.06	1.35570	1.35575	0.00001	-0.00005	-1.53
17	1.06	1.35730	1.35736	0.00001	-0.00006	-1.74
18	1.07	1.35900	1.35896	0.00001	0.00004	1.06
19	1.07	1.36060	1.36057	0.00001	0.00003	0.86
20	1.08	1.36220	1.36222	0.00001	-0.00002	-0.47
21	1.08	1.36390	1.36390	0.00001	0.00000	0.09
22	1.09	1.36550	1.36554	0.00001	-0.00004	-1.24
23	1.09	1.36720	1.36722	0.00001	-0.00002	-0.69
24	1.09	1.36890	1.36890	0.00001	-0.00000	-0.13
25	1.10	1.37060	1.37062	0.00001	-0.00002	-0.70
26	1.10	1.37230	1.37234	0.00001	-0.00004	-1.27
27	1.11	1.37400	1.37406	0.00001	-0.00006	-1.84
28	1.11	1.37580	1.37578	0.00001	0.00002	0.60
29	1.12	1.37750	1.37754	0.00001	-0.00004	-1.10
30	1.12	1.37930	1.37929	0.00001	0.00001	0.23
31	1.13	1.38110	1.38109	0.00001	0.00001	0.42
32	1.13	1.38290	1.38288	0.00001	0.00002	0.61
33	1.14	1.38470	1.38467	0.00001	0.00003	0.81
34	1.14	1.38650	1.38650	0.00001	-0.00000	-0.14
35	1.15	1.38830	1.38830	0.00001	0.00000	0.06
36	1.15	1.39020	1.39017	0.00001	0.00003	1.03
37	1.16	1.39200	1.39200	0.00001	0.00000	0.08
38	1.16	1.39390	1.39387	0.00001	0.00003	1.06
39	1.17	1.39580	1.39577	0.00001	0.00003	0.89

R denotes an observation with a large standardized residual.

The reason for the discussion about the sucrose solution data is to emphasize that refractive index and therefore angle of refraction is related with the density of the medium, as we very well know and the ordinary matter (eumatter) density is directly proportional to the ether density based on EDG/EFG hypothesis. This angle of refraction is similar to angle of diffraction in space (in which there is an apparent absence of a medium) filled with a gradient of ether density. By using density of ponderable material, such as sucrose solution, we are essentially implying density of ether and these two entities are directly related as per EFT. Thus in the experiment about sucrose solution we should imagine a volume containing ether of some density (ignoring the presence of ponderable matters sucrose and water) in the container with sucrose solution. It is this density of ether which is changing the light path and causing refraction. It should be pointed out that this medium (sucrose solution) is very homogenous at molecular level compared to silicate and borosilicate glasses where similar relationship (see Fig. 11(c)) between n and ρ exists but not as accurate as sucrose solutions.

Figure 11:

(c) Relationship between Refractive Index and Density of Silicate and Borosilicate Glasses



(Reprinted from Wikipedia)

Further evidence for the linear relation between refractive index and density of the transparent medium (such as glass) comes from this second example. In this example data from a paper published in 1929 (by F. A. Bannister) are taken [33]. The data used from that paper are given in Table III. Here, different glass compositions are presented containing some of these oxides, viz. SiO2, Na_2O, K_2O, CaO, BaO and PbO. At first the plot of refractive index (n) against density (ρ) is shown and the regression results are shown below.

Linear regression of glass Refractive Index with Density [33]

Regression Analysis: RefIndex versus Density

The regression equation is
RefIndex = 1.27 + 0.0989 Density

Predictor	Coef	SE Coef	T	P
Constant	1.26539	0.00817	154.81	0.000
Density	0.098913	0.002852	34.69	0.000

S = 0.0102238 R-Sq = 93.7% R-Sq(adj) = 93.6%

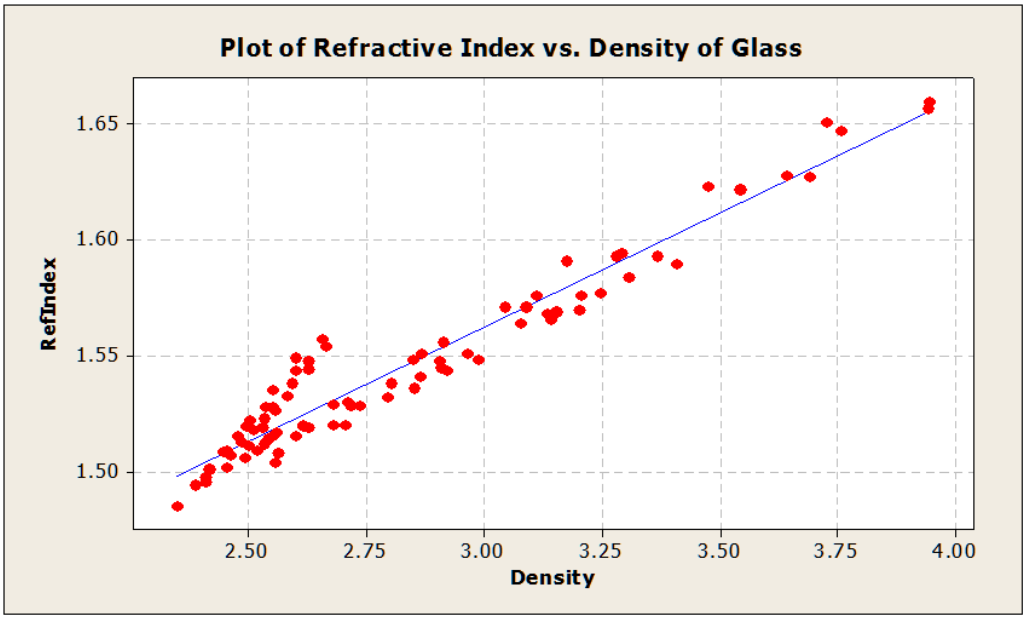
Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.12577	0.12577	1203.26	0.000
Residual Error	81	0.00847	0.00010		
Total	82	0.13424			

It is apparent that the relationship is poor and shows a significant scatter in the plot in Fig. 11(d).

Figure 11:

(d) Relationship between refractive index and density of silicate glasses



In order to improve this relationship a further analysis was done using the glass composition data. Here weight percent (wt%) of each metal oxide was calculated and a multiple regression of refractive index against wt% of Na_2O, K_2O, CaO, BaO and PbO was performed. The statistical analysis results are shown below and the plot of observed refractive index and calculated refractive index is shown in Fig. 11(e) and analysis of the residuals is shown in Fig. 11(f). Fig. 11(g) shows a plot of observed refractive index against the calculated value derived from the multiple regression model.

Figure 11(e): Multiple regression of Refractive Index vs Wt% of Metal Oxide

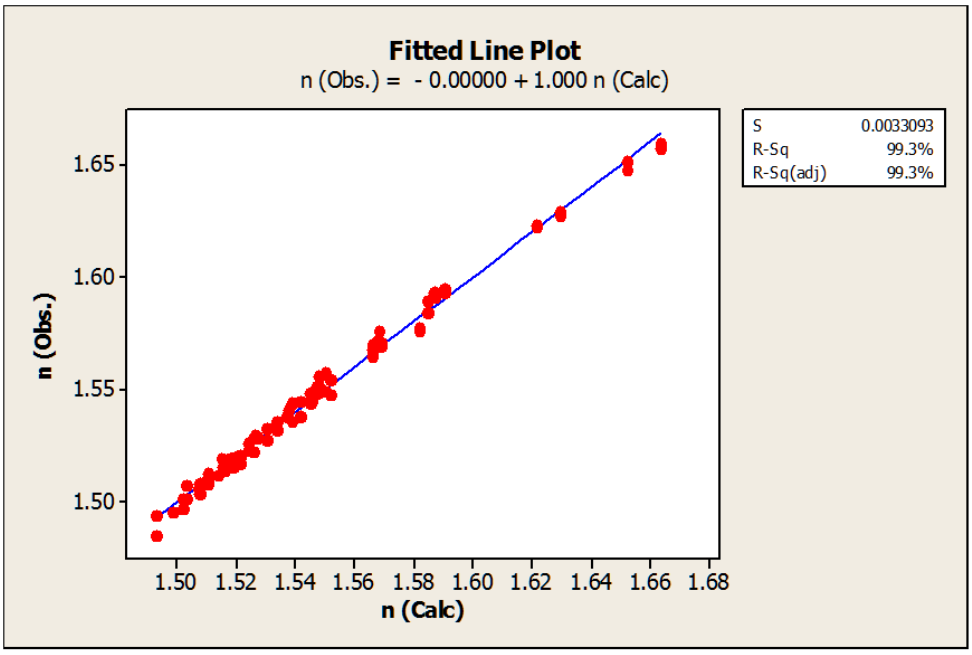


Figure 11(f): Residual analysis of the multiple regression results

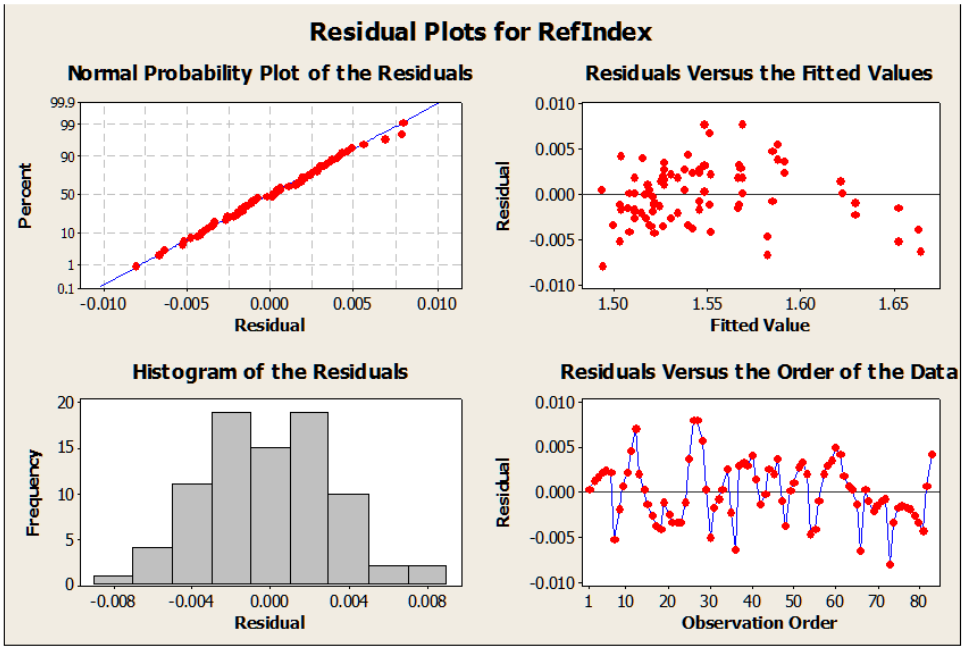
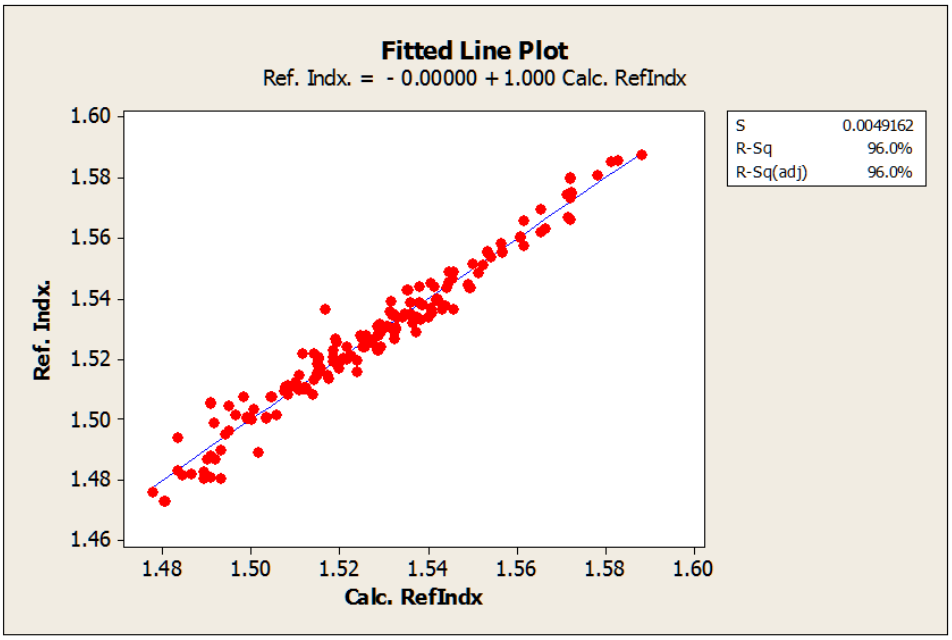


Figure 11(g): Plot of Observed Refractive Index vs. Calculated Refractive Index as per Multiple Regression Model



Multiple regression of glass Refractive Index with Weight % of each Metal Oxide

Regression Analysis: RefIndex versus w%Na2O, w%K2O, w%CaO, w%PbO, w%BaO

The regression equation is
RefIndex = 1.48 + 0.000841 w%Na2O + 0.000837 w%K2O + 0.00243 w%CaO
+ 0.00695 w%PbO + 0.00380 w%BaO

Predictor	Coef	SE Coef	T	P
Constant	1.47913	0.00167	887.00	0.000
w%Na2O	0.00084149	0.00005430	15.50	0.000
w%K2O	0.00083677	0.00006434	13.01	0.000
w%CaO	0.00242837	0.00006898	35.20	0.000
w%PbO	0.00695433	0.00006898	100.81	0.000
w%BaO	0.00379954	0.00006898	55.08	0.000

S = 0.00339421 R-Sq = 99.3% R-Sq(adj) = 99.3%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	5	0.133352	0.026670	2315.01	0.000
Residual Error	77	0.000887	0.000012		
Total	82	0.134239			

Source	DF	Seq SS
w%Na2O	1	0.004432
w%K2O	1	0.005689
w%CaO	1	0.006056
w%PbO	1	0.082224
w%BaO	1	0.034952

As you can see the correlation has improved significantly (R-sq = 99.3%) and the plot is very linear with some scatter. Also note that the constant in regression equation has similar value as the refractive index of the base material (SiO_2 with n = 1.4585(experimental) vs. 1.4791 (calculated)).

Similar results are also obtained for another data set [34]. These data are presented in Table IV and a plot of glass density against refractive index is shown in Fig. 12(c). As you can see there is general dependence of refractive index on the density, however, there is no straight line correlation. These data, from Table IV, were examined statistically and a preliminary screen was done to identify statistically non-significant factors. The factors which were excluded due to p-value greater than 0.05 were LiO_2, ZnO, MnO, Sb_2O3, CeO_2, As_2O3, SO_3, SeO_2, Cr_2O_3 and

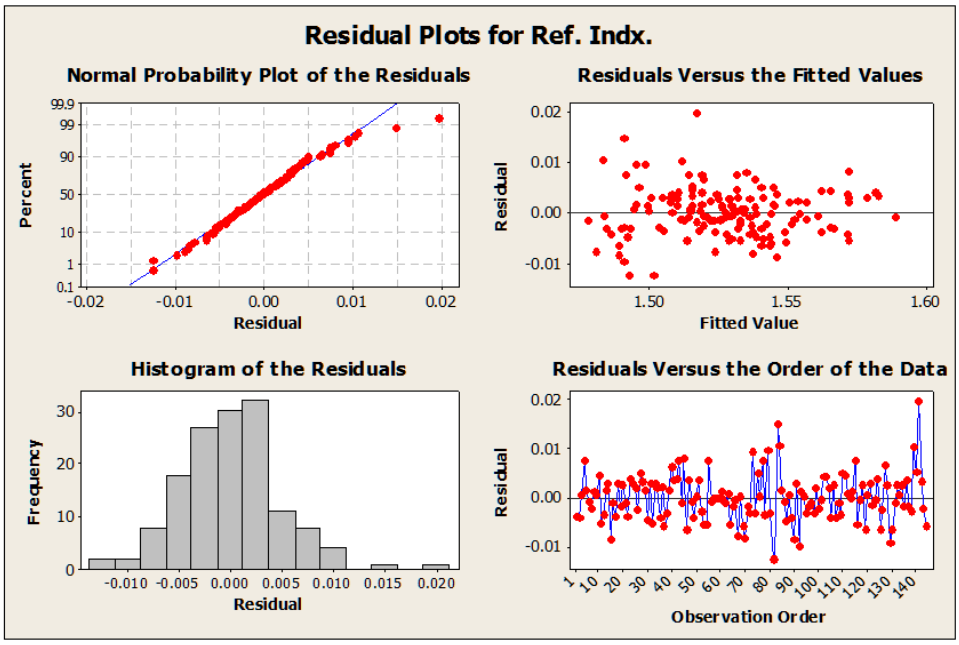
CoO. Then a multiple analysis was done on the significant factors versus the refractive index. The results are shown below:

Multiple regression of glass Refractive Index with Weight % of each of glass constituent

```
The regression equation is
Ref. Indx. = 1.46 + 0.00134 Na2O + 0.00295 PbO + 0.00381 CaO + 0.00258 BaO
+ 0.00130 K2O + 0.000808 B2O3 + 0.000503 Al2O3 + 0.00200 MgO
+ 0.00257 SrO + 0.00520 TiO2 + 0.00413 ZrO2 + 0.00190 Fe2O3
- 0.00547 F


Predictor       Coef    SE Coef       T      P
Constant     1.46379    0.00242  604.16  0.000
Na2O       0.0013359  0.0001359    9.83  0.000
PbO        0.0029477  0.0006755    4.36  0.000
CaO        0.0038144  0.0001256   30.36  0.000
BaO        0.0025825  0.0001772   14.57  0.000
K2O        0.0013027  0.0003086    4.22  0.000
B2O3       0.0008078  0.0001227    6.58  0.000
Al2O3      0.0005027  0.0001837    2.74  0.007
MgO        0.0020002  0.0002900    6.90  0.000
SrO        0.0025737  0.0002175   11.83  0.000
TiO2        0.005198   0.001344    3.87  0.000
ZrO2       0.0041292  0.0006884    6.00  0.000
Fe2O3      0.0018986  0.0009439    2.01  0.046
F          -0.005467   0.001813   -3.02  0.003


S = 0.00513811   R-Sq = 96.0%   R-Sq(adj) = 95.6%


Analysis of Variance

Source           DF         SS         MS       F      P
Regression       13  0.0833076  0.0064083  242.74  0.000
Residual Error  130  0.0034320  0.0000264
Total           143  0.0867396
```

As you can see that the correlation is excellent with R-sq (adj) value of 95.6% with all coefficient significant and an F value of 243. Using this equation the refractive index of each glass composition was calculated and a plot showing the calculated *n* vs. observed *n* is shown in Fig. 11(g). As compared to plot in Fig. 11(c) this graph shown a much better fit. Furthermore the residual analysis is shown in Fig. 11(h).

Figure 11(h): Analysis of the residuals from the multiple regression analysis



Again as seen in previous example, the intercept value is very close to the known value (*n= 1.4638*) of SiO_2 glass which is the base material of all glasses listed in Table IV. This base value of refractive index is increased by the *linear* addition form each component of the glass. Thus for each given chemical the refractive index increases linearly and only by added weight percentage of that chemical.

The important point to emphasize here is that *density is the governing factor that alters the refractive index* and thus controls the velocity of light through the medium. Therefore it is the *generic property* ***density*** of the constituent molecules of metal oxides that determines the degree of refractive index and thus controls the speed of light. Therefore it is postulated, as per EFT, that the *density of the ordinary matter (eumatter) which in turn controls the ether density which is the controlling factor for the light propagation and phenomena of refraction as well as diffraction.*

This effect of density in curving the light beam is similar to the 1919 solar eclipse experiment that showed that the star light is bent by the mass of sun as sun creates curvature in the spacetime. As we know in Einstein's Field Equations the Riemann curvature is proportional to the mass (more accurately density) as shown below:

$R^{\mu\nu} \propto T^{\mu\nu}$ …Eq. 25a

This is similar to the following equation:

$R^{\mu\nu} \propto \rho$ …Eq. 25b

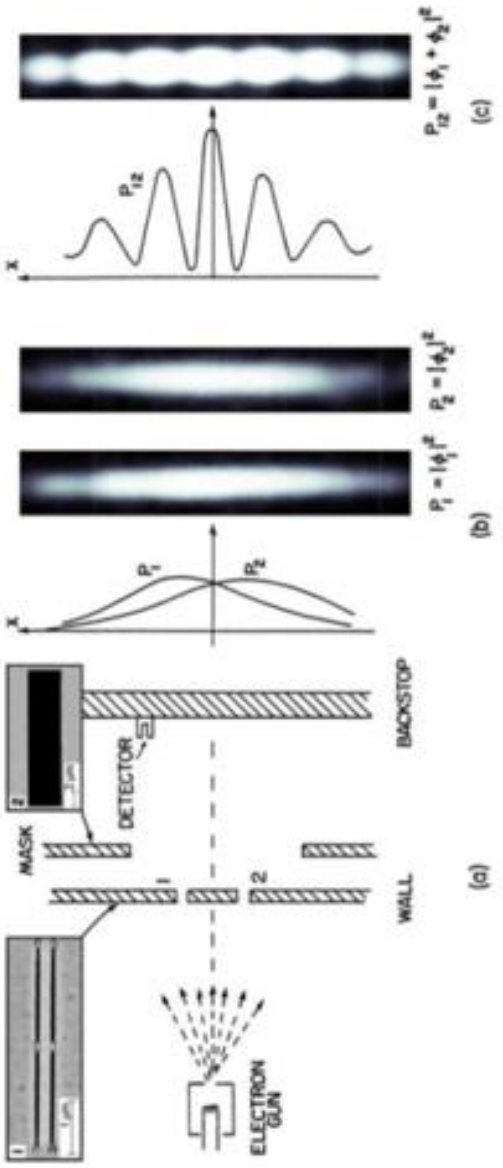
Where, ρ is the density of the mass.

By analogy, the EDG/EDF in the *very close vicinity of an edge* (made of any material) (see Fig. 10(a) and Fig. 10(b)) is controlled by the density of that substance used for the construction of the edge. This is the reason why a definite relationship, as shown in Eq. (25), is predicted between the angle of diffraction and the density of the substance/metal used for the construction of the edge, keeping all other variables constant.

Double Slit Experiment (DSX):

Now let's explain DSX. Using afore mentioned hypotheses, postulates and concepts of EFT one *can* explain DSX *in a classical way*, as deemed necessary by Richard Feynman, to truly understand quantum mechanics (QM). In order to do so, an actual experiment performed by Bach *et.al* [35], is used here. It is abbreviated as BDSX (Bach Double Slit Experiment). Bach et al. designed and performed this experiment just exactly as the thought experiment proposed by Richard Feynman (see Fig. 12).

Figure 12: Controlled double slit electron diffraction experiment of Bach et al. (Reprinted from Bach et al.)



In this study Bach *et al.* used controlled beam of electrons (of 50 pm de Broglie wavelength (λ)) such that one electron is emitted at a time and then it is allowed to enter either Slit #1 or #2 (each of 62 nm width and 4μm height and separated by 272 nm distance) or both at a time and observe the buildup of electrons on a detector placed beyond the double slit.

Note: It is important to note that for most of the double slit experiments carried out with light, the slit width is of the order of the light wavelength. However in the BDSX the ratio of slit width to λ is 62 nm/50 pm or 62/0.05 = 1,240. This is a much larger ratio than what is required (0.5 to 1) and surprisingly *diffraction still occurs*! As per EFT this can be explained by stating that the slit width is sufficiently narrow, at 62 nm, for the EDG/EFG to occupy completely the slit void and hence cause diffraction of the electrons.

First of all observe the diffraction occurring from Slit#1 and Slit#2 individually as seen in Fig.12 (middle section, window (b)). The smear is not uniform. Rather there is a dot pattern seen in this image from Slit#1 (P1). Since Slit#2 is identical to #1 P2 should be identical to P1 as well. However due to some experimental setup difference we see that P2 is not exactly matching P1. In P1 one can see round islands of white clouds connected or overlapping one another and showing a somewhat smeared image. Based on these images (especially P1 in Fig. 12(middle section (b)) one can say that the single electrons do diffract while passing through Slit#1and show interference pattern. This is similar to any single slit experiment (see Fig. 10(b)) except that the beam shines on the slit at an angle instead of centered on the slit.

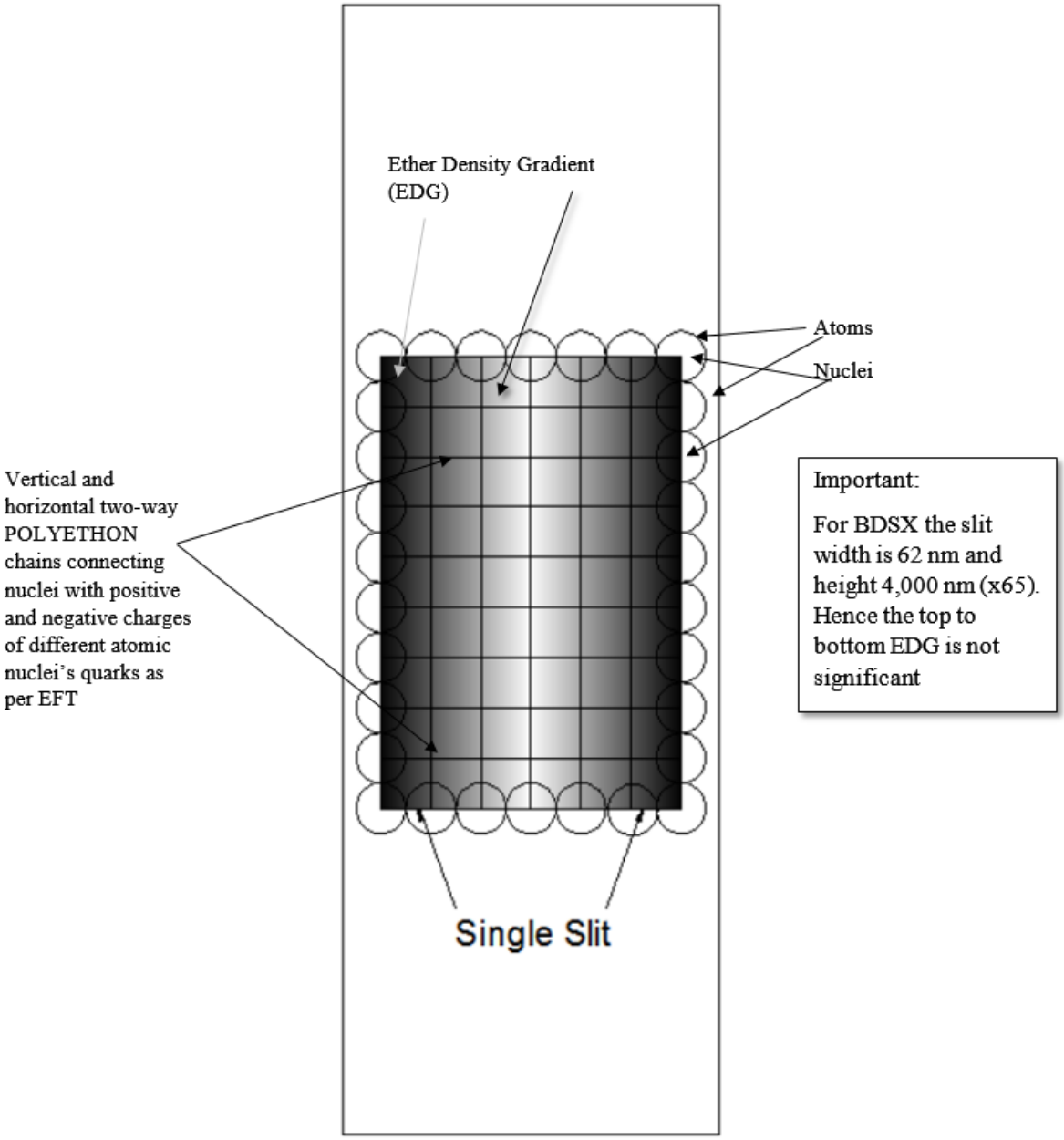
First of all, according to Huygens-Fresnel principle *only a wave* can show diffraction pattern while passing through a slit. A single photon or electron in this case, as a particle rather than a wave, cannot show diffraction pattern based on conventional thinking. However, as per de Broglie, electron should also have wave property. In case of BDSX the wavelength of these electrons is 50 pm. This observation, however, can be easily explained by EFT whether electron is a particle or a wave. As shown in Fig. 10(b) a single electron can diffract while passing through the EDG/EFG or an *imaginary reversed prism* at the corner of the edge as discussed earlier under Single-Edge Diffraction section. Therefore the only question remains which is *"How does a single electron interfere with itself and show dark and light fringe pattern*?*"* Generally it requires two photons or electrons to create interference by superposition. The argument used is that the peak of one wave merges with that of the other wave and the resultant

wave is of having maximum amplitude or is meats the trough then the amplitude is zero. Thus one photon or electron cannot interfere with itself. Hence there are few theories explaining the *bi-presence* (dual presence) of a single electron.

Now as per EFT there are lines of polyethons connecting the + and – constituents of atoms (see Fig. 7(f)) from one side of the slit wall to the opposite side wall, left to right, top to bottom as well as shown in Fig. 13.

Figure 13:

'Wire Mesh' formation by Two-way Polyethons and Ether Density Gradient (EDG) inside a Slit



Thus the slit void is really a 'sieve' or 'mesh' of polyethon wires created by connections between $+\frac{2}{3}$ up quark with $-\frac{1}{3}$ down quark of different nuclei. The connections between electrons and positive quarks are ignored since the motion of electron causes the links to be very

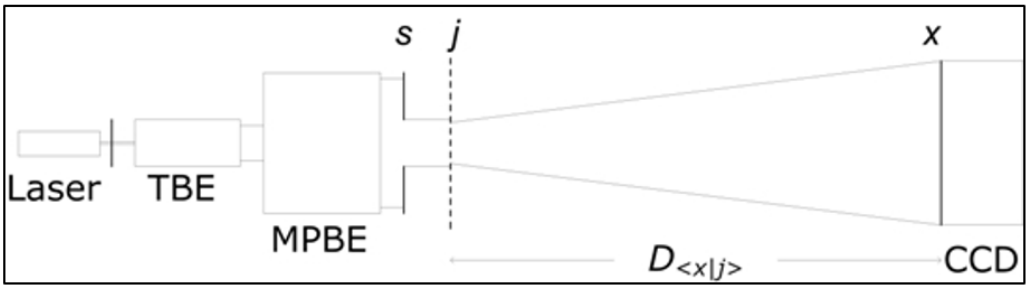
temporary and weak. The slit is also superimposed by the EDG/EFG due to ether flux from lower density of matter to higher density. However the axiom is: *only the **shortest (therefore the strongest)** polyethon chains are formed to be at the 'ground state' which are the most stable.*

Some thoughts on dimensions of the slit, atoms and the 'mesh'. The slit width in case of BDSX is of 62 nm size whereas the height is 4 μm (4,000 nm). This is much bigger than the size of a metal atom (Fe: atom radius of 126 pm and nucleus of 5.4 x 10^{-15} m or 5.4 fm). The atom is 46,667 times bigger than the nucleus. The mesh structure has a gap width (sieve size) of 2x126 = 252 pm. This is much wider than the 50 pm de Broglie wavelength of the electrons of 600 eV energy used in BDSX.

Now imagine a photon or electron as a particle (or *wavelet*) when it goes through this mesh goes only through the open 'holes' and cannot go through the 'wires'. Thus a combination of the wire mesh and EDG/EFG restricts the movement through the slit and its exit from slit. This is in accordance with the proposal by Huygens in 1678 [36] that every point which a luminous disturbance reaches become a source of spherical wave. Due to the VERTICAL nature of the slit, i.e. two sides being extremely close, there is a vertical bias and this bias is reflected in property similar to a prism arrangement shown in Fig. 10(b). Thus the ether gradient (EDG) arrangement causes *diffraction* and widening (magnification) of the beam whereas the wire mesh of polyethons acts like a Diffraction Grating (as shown in Fig. 10(d)). Due to the obstruction caused by the wires/grating the particle/wave passing through the slit structure falls on the detector with *a pattern only resembling* that of *interference of waves with light and dark bands.* Please also note that the wire mesh may act like a grating, however its presence is not essential for the interference/probability pattern. We have seen this type of pattern caused by a single straight-edge in Fig. 9 (b). In reality there is no such interference but only single particl*es*

passing through the mesh and the EDG can produce diffraction pattern with interference. It seems that the complex structure of the space within the slit does three things. One, it creates diffraction by refracting the electrons through the use of EDG. Second, it magnifies the dark and light band pattern coming out of the 'vertical grille' onto a projection screen behind the slit similar to a concave lens would magnify the image. Thirdly, it causes the formation of light and dark pattern which we interpret as interference pattern. In reality there is no interference. The *dark and light bands are the probability patterns* as shown by N-Slit Interferometric (NSI) equation. NSI equation was first applied in the generation and measurement of complex 'interference' (we will see later that these are probability patterns) patterns by Duarte and Paine [37]. The probability equation is shown in Eq. (26(a)) and the experimental design is shown in Fig. 14(a).

Figure 14(a): Schematics of the N-Slit Interferometer (NSI)



Top view diagram of the N-slit Interferometer indicating the position of the planes s, j, and x. The N-slit array, or grating, is positioned at j. The intra interferometric distance can be several hundred meters long. TBE is a telescopic beam expander, MPBE is a multiple-prism beam expander.

$$\left|\langle x \mid s \rangle\right|^2 = \sum_{j=1}^{N} \Psi(r_j) \left(\sum_{m=j+1}^{N} \Psi(r_m) \cos(\Omega_m - \Omega_j) \right) \quad \ldots \text{Eq. (26(a))}$$

Where,

N = total number of slits in the array or transmission grating and x, s and j terms are described in Fig. 14(a).

The phase term is related to the geometry using Eq. (26(b)):

$$\cos(\Omega_m - \Omega_j) = \cos k\left|L_m - L_{m-1}\right| \quad \ldots \text{Eq. (26(b))}$$

Where,

k = wave number, and this value relates to the wave nature of the photon or electron.

L_m, L_{m-1} = exact path differences

Here it should be noted that the Dirac-Duarte (DD) Interferometric Equation (DDIE) (i.e. Eq. (26(a))) describes a probability distribution that is related to the intensity distribution measured experimentally [38]. DDIE *applies to the propagation of a single photon (and also to, most likely, a single electron* of BDSX as well), or the propagation of an ensemble of indistinguishable photons. Interferograms generated with this equation have been shown to compare well with measured interferograms for both even (N = 2, 4, 6...) and odd (N = 3, 5, 7...) values of N from 2 to 1600.

Another example that supports the formation of *light and dark pattern as a function of probability and not interference* is given by diffraction pattern of "atoms" by a standing light wave acting as a diffraction grating (Kapista-Dirac Effect as originally demonstrated by Gould et al. and Bernet et al.[39, 40]. The arrangement of atom diffraction experiment is shown in Fig. 14(b) and the interference/diffraction pattern is shown in Fig. 14(c).

Figure 14(b): Diffraction of atoms through a standing light wave (used as a diffraction grating).

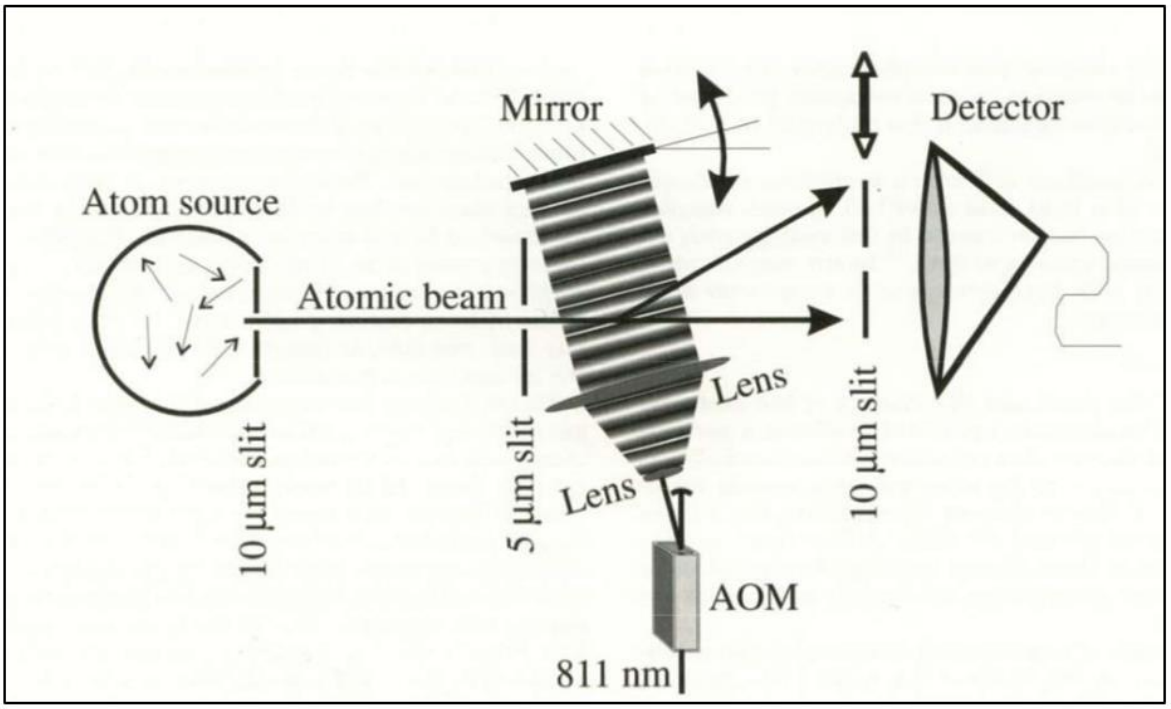
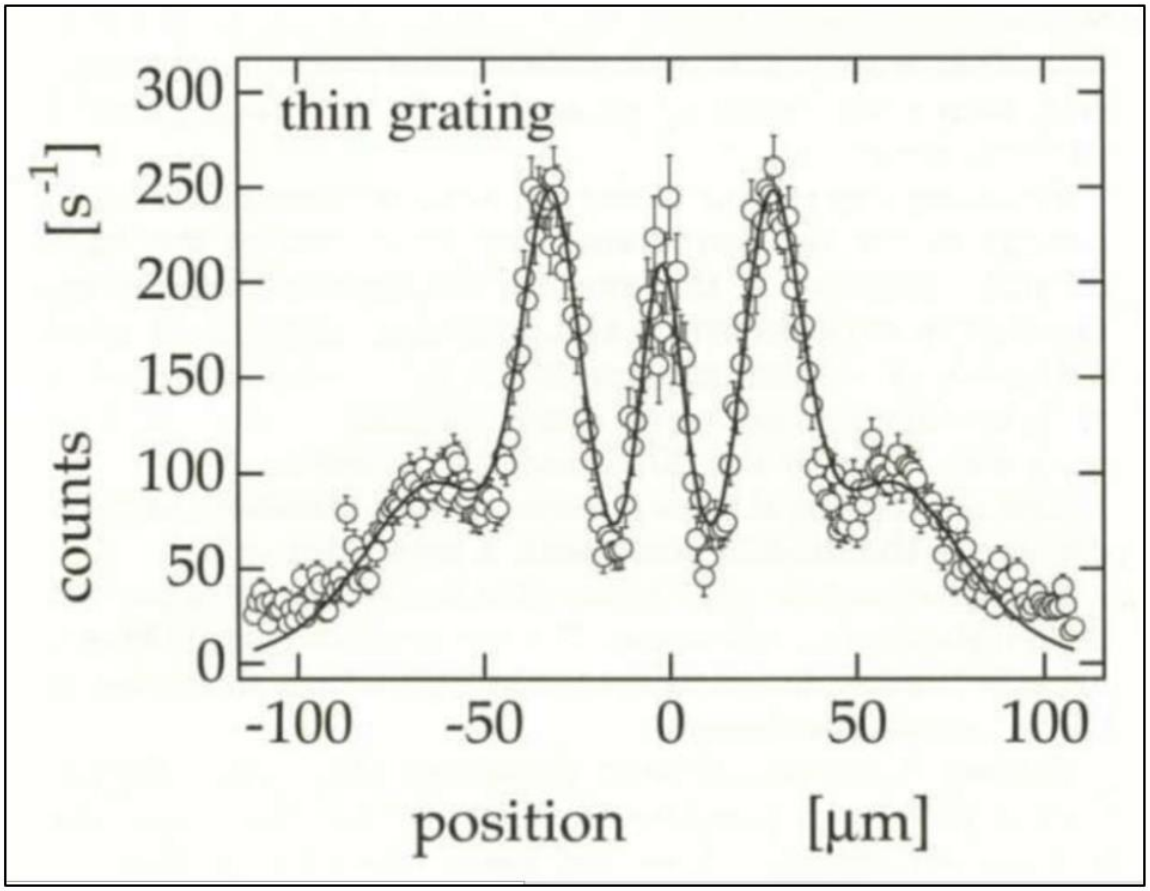


Figure 14(c): Diffraction pattern of atoms by standing light wave



It is apparent that there are light and dark bands in the diffraction pattern. Now consider the dark band. Is this dark band due to the interference or two waves of atoms? If so do these atom annihilate each other and create a dark band? If there is interference we will see a release of tremendous amount of energy due to annihilation of these atoms. In fact we will have devised a method of 'cold fusion'! But, we do not see any energy released and *hence this experiment proves that the interference pattern is due to natural distribution and hence the probability of the atoms hitting the detector and not that of any interference.* Generalizing this finding one can say that a diffraction grating produces a probability pattern on the screen when a *particle with wavy nature* passes through it. The particle can be a photon, electron or an atom and the grating can be

an actual grating, a slit or a standing light wave. This example supports the probability pattern similar to the one calculated by Eq. (26(a)). Hence forth we will consider interference pattern equivalent to a probability pattern.

Now let us get back to the slit. The apparent void of the slit contains a complex structure of EDG/EFG as well as polyethons crisscrossing and connecting nuclei of the atoms lining the slit's inner walls. Hence a slit acts as a diffraction grating and produces a probability pattern when wavy particles (as per de Broglie all particles are wavy due to wave-particle duality) pass through it.

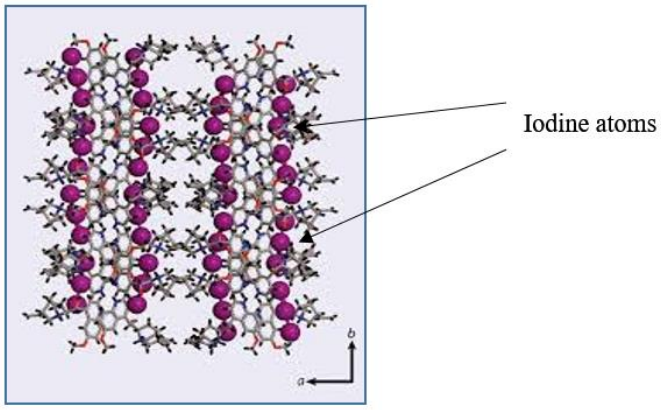
Perhaps, the vertical geometry of EDG/EFG in a slit gap also has an effect on the plane of polarization of the light diffracted, it is believed that the diffracted light will be horizontally (perpendicular to the slit) polarized. This is because horizontal polyethon bridges between atoms across the slit make a grille which allows only horizontally oriented (perpendicular E-field to the slit) light rays to pass through. This is a prediction of EFT and should be verified. To post-slit polarization idea is substantiated further by the following example.

We know that Polaroid film does the same thing (it allows only polarized light to come through) by the principle of polarization where the vertical crystal alignment of iodoquinone sulfate act as polarizing element. The generally accepted explanation is the induction of electric current by the E-field of the light wave in the wires or crystals of iodoquinone sulfate. This seems less likely as these crystals are not completing a circuit, only static electric induction is possible. As per EFT there is no induction required. Simply the ether density gradient is sufficient to cause polarization too. In case of the Polaroid® film (see Fig. 11(i) [41]) it is the mass of iodine atom which increases ether density to create EDG/EFG in its proximity leading to

a stronger ether gradient as compared to the other constituents of the polymer matrix holding iodoquinone sulfate crystals. Iodine has a density of 4.933 g/cm^3. As discussed previously EDG/EFG is directly proportional to the density of the ponderable matter.

Figure 11(i): Image showing iodine atoms in Herapathite in Polaroid® film.

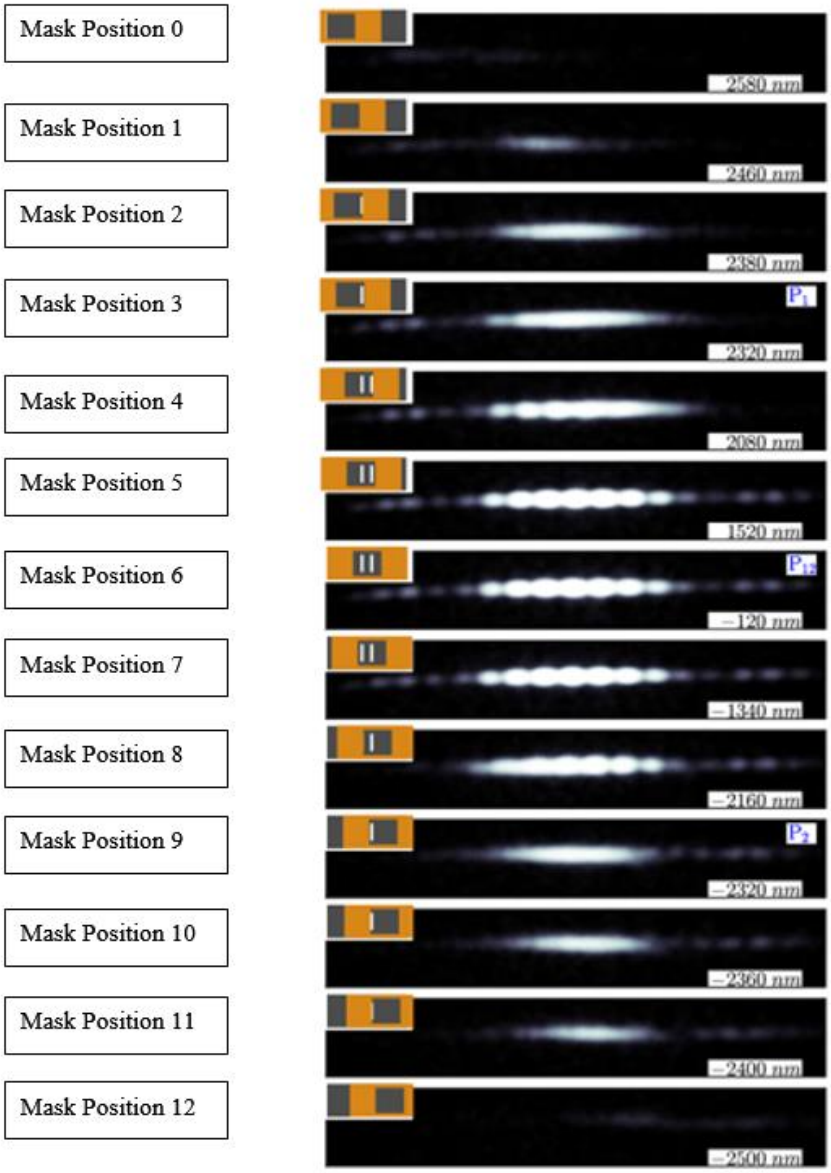
These heavy atoms of Iodine create an EDG which causes polarization of transmitted light. Only light with perpendicular (horizontal) plane of polarization (E-field) passes through the film.



In the light of above discussion, let's examine the diffraction and interference pattern of BDSX.

Figure 15:

Mask movement over Slit#1, Slit#2 or both. (Reprinted from Bach et al.)



Top left corner inset shows the movement of Mask over Slit#1, Slit#2 or both.

As shown in Fig. 15, the diffraction and interference pattern progresses from open Slit#1 to both open #1 & open #2 slits corresponding to Mask Position 1 through 12. Here the image for OPEN slit #1 shows a *not* completely smooth pattern (Mask Position 3 in Fig. 15). There are 'blobs' of electron densities even emerging from Slit#1. This is showing that electrons coming

from Slit#1 show *diffraction as well as interference pattern*. This is similar to a diffraction and interference pattern produced by a single slit as shown in Fig. 10(b) (similar to straight-edge diffraction). The important point to note here is that we can see interference pattern even when only single slit is open (see Mask Positions 2 & 3 in Fig. 15). The only difference is that here the beam is incident on the slit at an angle and not straight on the slit head-on as shown in Fig. 10(b). The same situation with the electrons coming from Slit#2 alone. This is shown in Fig. 15 with Mask Position 8, 9, 10, 11. As one would expect, when you combine two diffracted pattern you get one pattern with sum of intensities of the two individual patterns. This is shown in Fig 15 with both slits open in Mask Positions 4, 5, 6 & 7.

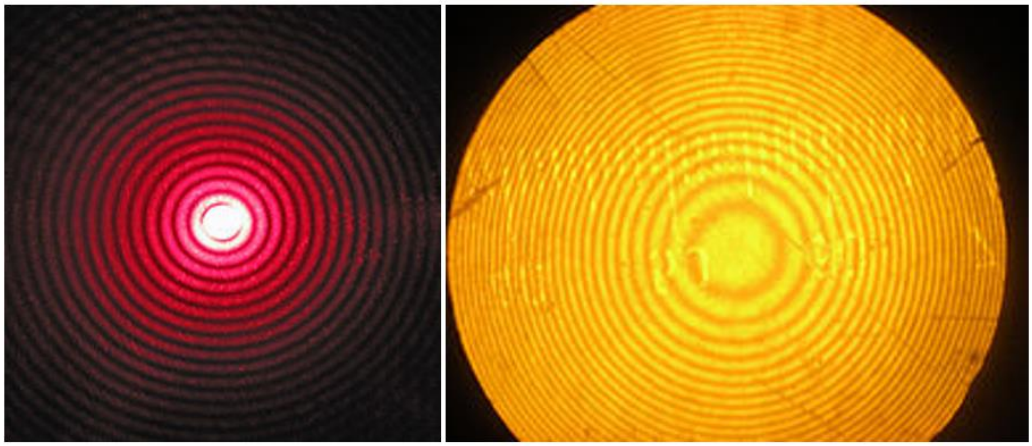
Based on afore going discussion, one can conclude that the diffraction pattern with interference produced by a double slit experiment in *not unique*. It simply is a sum of two individual diffraction patterns which also exhibits an 'interference'. The most important point to make here is that there is *no interference per se* and hence no interference pattern. The dark and light bands are due to the passage of a single wavy particle (of electron or photon) passing through a slit which has a 'mesh' like grid of polyethons and having an EDG/EFG. This pattern is predictable by DDIE (Eq. (26)). One has to realize that in predicting the behavior of the electron (or photon) as a particle classical mechanics cannot be applied since we are dealing with particles which travel in a 'straight line' using a sinusoidal path. Thus when these particles encounter an obstruction like a diffraction grating (polyethon wire mesh) their trajectory of dispersion is not easily predictable unlike the trajectory of billiard balls, rather one has to combine wave behavior with classical mechanics to come up with an equation like DDIE to predict the dispersion behavior of such wavy-particles. Hence probability distribution pattern is the appropriate way to describe the light and dark pattern rather than calling it an interference

pattern caused by the action of TWO particles colliding to create a positive or negative constructive or destructive interference.

Therefore, one can also apply this analogy/concept of polyethon mesh and EDG/EFG to a *circular aperture*. Here, instead of *vertical* geometry as in case of a slit, it has *circular* geometry and therefore shows diffraction pattern resembling that of Newton's Rings (see Fig. 16).

Figure 16:

Comparison between diffraction pattern produced by a circular aperture and a laser and Newton's Rings



Diffraction pattern produced by a circular aperture using a laser

(These rings may be reproduced by a Plano-*Conical* lens)

Source (Wikipedia)

Newton's Rings produced using a Plano-*Convex* lens and transmitted light

Based on the above given explanation of DSX in a classical way one can say that description of diffraction and interference behavior of a wavy-particle like photon, electron or even atom is possible in a simple, mechanical and intuitive way. Thus we meet the requirement laid down by Richard Feynman for understanding the phenomenon of double-slit diffraction which is at the heart of Quantum Mechanics.

Furthermore, there is a question which is raised when one uses the interference based explanation for DSX. If one examines the idea of interference of the diffracted electrons one has to account for the annihilation of the electrons in the dark band (destructive interference) as this band represents the absence of electrons. If this was the case there should be a significant amount of energy released (600 eV for each electron) because of the interaction of two of the interfering electrons as both have positive energies. Also there is the question of bringing two same charges close enough for annihilation. This seems practically an impossible task. Furthermore, if two electrons do interfere they have to come close to each other at a distance less than the wavelength (50 pm on case of BDSX). In this case the electrostatic repulsion between two electrons will be too great to have any interaction, either constructive or destructive, to cause any interference pattern.

Now the only question remains in fully understanding DSX is *"What about the observer effect that we talk about in relation to DSX?"*

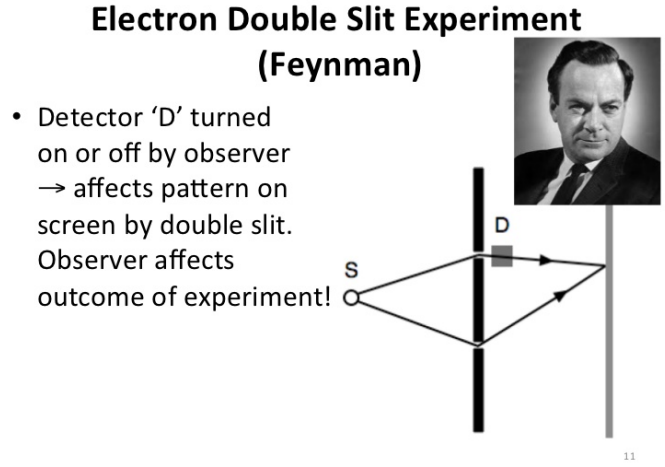
DSX and the Observer Effect:

In the double slit experiment what is the role of the 'observer' that apparently alters the way the particles behave? Is it the simple act of observation or a disruption by the observation equipment?

Remember that when we did thought experiment with laser and an aperture producing Airy's disc we explained that the physical property of the space in the aperture must be altered to cause diffraction. Later, in DSX we showed that the slit void is filled with complex and invisible structures introduced by the EDG/EFG and the polyethon links causing mesh like structure (Fig.

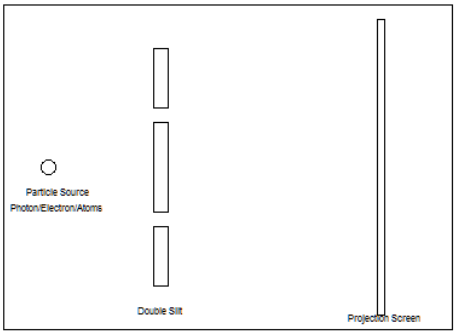
13). This is the state of the entire universe in which all matter particles are connected with each other *via* polyethons and that there are EDGs/EFGs everywhere. As soon as there is matter in an empty space, the matter causes EDG/EFG and projects its 'tentacles' of polyethons. This is similar to the idea of GR that a mass 'tells the surrounding space what to do'. If there are other objects nearby these tentacles and ether densities they also create connections with the surrounding objects. So it is not just the slit having a complex structure as shown in Fig. 13 it is the entire room in which DSX experiment is conducted. This is the reason why (as we will see later) the 'structure' (caused by EDG and polyethon links) of the space influences the outcome of the DSX experiment when an observer is present. An 'observer' effect is shown in Fig. 17.

Figure 17: The 'observer' effect in DSX



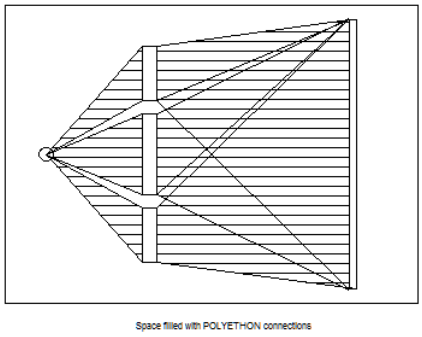
Now imagine a DSX carried out *without* an 'observer' (an equipment of some kind) as shown in Fig. 18 (a).

Figure 18(a): Empty space surrounding a Double Slit Experiment (DSX)



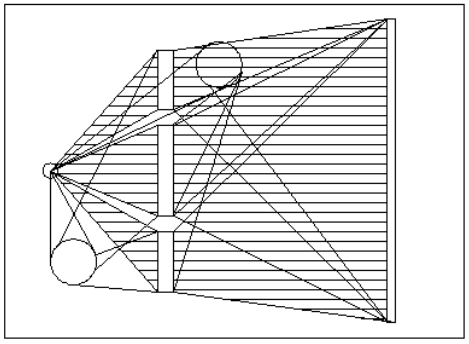
As you can see and as we generally expect the space is empty surrounding the DSX experimental setup. Now see the space with polyethon connections added in Fig. 18(b).

Figure 18(b): Structure of space, filled with polyethon connections, surrounding a Double Slit Experiment (DSX) in absence of an Observer



Please remember that we have not yet added ether density gradients (EDGs) for clarity. As you can see the space is now 'filled' with 'wire' like connections between all objects (the light source, double slit and the screen). These connections are one-to-many, as seen in Fig. 8(b), between all objects. This is a very complex scene without the observers. When we add two observers (large circles in Fig. 18(c) the picture become extremely complex.

Figure 18(c): Structure of space, filled with polyethon connections, surrounding a Double Slit Experiment (DSX) in presence of Observers



There are now new connections between the objects of DSX and the observers. This scenario is further complicated when the observers (equipment) are passive (still interfering with space structure) or active with electricity (even more interfering due to the flow of electricity in the apparatus and static electricity in the detector). Thus it does not matter whether the instrument is plugged-in or not it will create an interference and alter DSX outcome. Of course, the picture becomes unimaginably complex when, on top of this complexity, we add the EDG/EFG existing between all the objects and the observers. And… don't forget to add all the connections with surrounding walls and corresponding EDGs/EFGs! Now one can imagine how the diffraction of the particles and the generated fringe pattern can get affected by an observer.

EFT and Radioactive Decay (RAD):

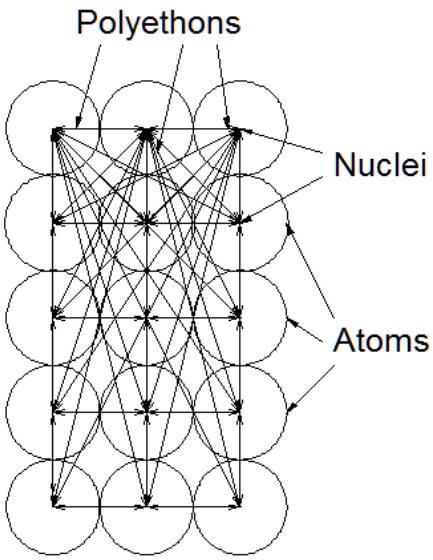
The discussion about radioactive decay may sound out of place in the context of prior discussions but there is a good reason to ponder over it here. The reason is that we just discussed the observer effect in DSX and the cause of this effect is the connections that polyethons make

with each other of every particle under consideration around the DSX setup. We will come to this after we address the nature of radioactive decay first.

A paper published by Javorsek et al. [42] showed dependence of RAD on annual periodicity, thus relating to the rotation around the Sun. As we know and as per this paper RAD was not dependent on temperature, pressure, humidity and Earth-Sun distance. Furthermore, they observed this periodicity for radioactive element of very different types such as ^{32}Si, ^{36}Cl, ^{56}Mn, and ^{226}Ra. This study shows that it is possible for RAD to be affected by a non-familiar factor(s). It is, therefore, true that nuclear process like RAD does *vary* and it is not 'a real constant' for a given element.

As per EFT it is possible for RAD to change. However this change is predicted to be related to changes in EDG/EDF and polyethon connections. The reason being, ether is the only submatter (below eumatter or ordinary matter) which is small enough and hence can 'access' the interior of the nucleus and thus partake in or influence nuclear processes. Furthermore as we discussed earlier regarding the polyethon connections and observer effect in DSX the same type of connections exists between each nucleus with rest of nuclei of the radioactive mass (as shown in Fig. 18(d)).

Figure 18(d): Polyethon connections between nuclei of a radioactive mass



Radioactive Mass

Only top three nuclei are fully connected with rest for clarity

Thus changes in the inter-nuclei (between the quarks of protons and neutrons) connections created by polyethons can influence the nuclear process and that this influence extends to the entire radioactive mass under consideration. One more factor to consider is the 'pressure' created by tremendous 'suction' of polyethons by the nuclei of the radioactive mass. Please remember that the proton/neutron density is of the order of 10^{18} kg m^{-3}. Under such black hole like 'gravitational' pressures changes in the nature of the nuclear particles are quite possible whereby a small instability of nucleus becomes quite significant.

Considering the effect of disruption of pattern of polyethon connections in DSX observer effect one can also see how the nuclei of a radioactive mass are interconnected. As a nucleus (in the radioactive mass) decays and mutates to another type of nucleus the total number of connections per each nuclei changes. Thus the rate of decay is directly proportional to the number of total connections. As the total number of connections lowers so does the rate of decay.

This is the reason why the RAD exhibits a negative exponential rate (first order kinetics) because the rate is directly proportional to the number of links of the radioactive nuclei. One way of proving the role of this connections is to ask a question "*In a given mass of radioactive material, if one nucleus decays how does the rest of the nuclei 'know' this and* ***adjust*** *the decay rate accordingly*?" The only possible answer is the connectivity of these nuclei with each other *via* polyethons so that when one nucleus 'dies' everyone 'mourns' and decides to 'die' relatively slowly thereafter. Hence the amount of material decaying reduces as time progresses. In other words, the whole radioactive mass acts as a 'solid solution' or a homogenous mass (albeit interconnected one) of an element which reduces in concentration over a period of time exponentially and as the concentration decreases so does the amount decaying subsequently also decreases. This is why the rate equation is setup as shown in Eq. 26(a):

$$-\frac{dN}{dt} = \lambda N \quad \ldots \text{ Eq. 26(a)}$$

Where N is initial number of radioactive nuclei at given time t and λ is the decay rate constant. Thus rate of decay ($-dN/dt$) is dependent on/proportional to the number of 'live' particles (N).

Remember that interconnections of particles via polyethons is the same principle that we have used in explaining DSX and Gravity as well. It seems like a common underlying principle for many phenomena.

EFT and Nature of the Photon:

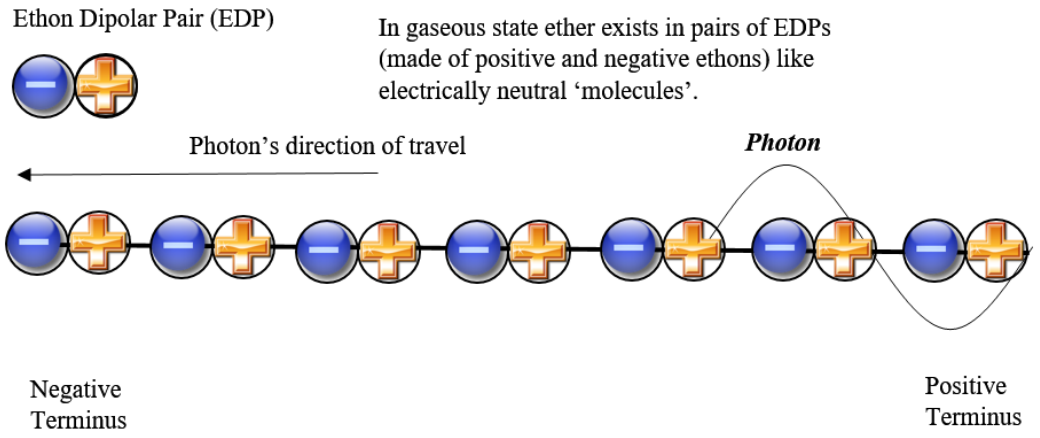
"The biggest ail of physics is not knowing the nature of photon"

--- E. Schrödinger

Thus, what is a photon is a big question in physics. It was considered as a particle (corpuscle) by Newton and as a wave by Huygens and many others. Einstein considered it as a

particle (quantum). As per EFT the nature of photon is simple to describe. It is a quantum of energy (just as Einstein described $E = h\nu$). However it does not have independent existence in space i.e. this 'snippet' or 'wavelet' of energy does not travel as a wave or particle through the space by itself as an entity. Rather, this energy quantum travels on the chain of ethons (polyethon made of EDPs) as shown in Fig. 19 (a).

Figure 19(a): Formation of a polyethon (full track) by joining EDPs the pairs made of ε^+ and ε^-.



Positive end of EDP is always associated with the negative charge of electron (photon generator). Thus the other end of the chain is always negative. This is the case for light originating from electronic shell. However if the light originated from the nucleus (γ ray) then one does not know which terminus is associated with the origin of the photon).

Just like a pulse of electrical current is running through a copper wire. These chains do not exist in space but are formed as required (*pro re nata*) when an electrical disturbance is passing through the gaseous ether. It is like a plucked string by a charged entity (like electron) where the string (polyethon) is formed as the energy propagates through the space. Just like laying tracks (polyethon) just before the train moves forward (please note that this laying process is much faster than the speed of light and we will discuss that ethons *do move* much faster than *c* (as in case of cosmic inflation and near a black hole). Before the movement of the train there were no tracks just the fragments of tracks randomly floating around in space (EDPs). This is

similar to the iron filings when exposed to magnet lineup in the "Lines of force". Thus the photon moves as an electrical disturbance along the polyethon chain. *This, the formation of polyethon chains, is the reason why light is ALWAYS A TRANSVERSE WAVE and never a longitudinal wave*. When it encounters obstacles it reflects, diffracts or refracts just like a ray travelling straight in space encountering different events (this also supports the *RAY NATURE OF LIGHT*). Now we can also explain how the photoelectric effect works. In case of ejecting an electron the terminal ethon (with its negative terminus as the positive terminus is connected to the photon originating electron) interacts with the escaping electron and transfers energy from polyethon to the electron and causes the electron to eject. This is just like breaking the wine glass with high frequency of the sound, however sound is never thought of as a particle although it is the air molecules that carry the energy. Similarly the terminal ethon (with all energy of the energy wavelet) is the one which ejects the electron. A photon is more like wavelet or snippet (quantum) of energy travelling along a whip and then transferring the electromechanical energy to the object near the end of the whip, an electron or an object. This is what is akin to 'wave function collapse' in Quantum Field Theory (QFT). Here, the ejection of the electron is only possible if the electrical quantum is of sufficient energy to overcome the ionization potential of that electron.

Furthermore, one of the point to note here is that the propagation of photon is *always forward* as noted by Huygens when explaining the diffraction through a slit. As per Huygens [36] very point that light reaches becomes a source of a spherical wave; the sum of these secondary waves determine the form of the wave at any subsequent time. He assumed that the secondary *waves travelled only in the "forward" direction* and it is not explained in any theory. Why? Thus the light behaves as a point source moving forward from the every small part of the

slit. The reason for only forward movement was never explained. As per EFT the electrical current (EM disturbance of photon) will always move forward from positive to negative polarity as shown in Fig. 19(a). *It can never travel backwards.*

The conceptual model of photon presented here in EFT can support several observations:

(1) Photon's wave like nature,

(2) It's particle like nature (when the wave collapses) at the end of polyethon like a 'whip' or 'string',

(3) Only its wave nature can explain Maxwell's assumption of a wave travelling in the medium ether,

(4) Only the wave nature of photon in conjunction with the existence of ether can make possible SR's most important axiom i.e. i*nvariance of c*. And as we know GR is an extension of SR for accelerated frames of reference. Thus both these theories depend on the wave nature of the photon and the existence of ether.

(5) Why photons always travel forward and do not travel 'backwards' when passing through a slit (as assumed by Huygens)

(6) This model can also explain quantum entanglement as we will see next.

(7) This model explains why photons are created by EM disturbance and no other mechanical undulation can replace the EM disturbance by assuming the propagation of photon on polarizable polyethon chains.

(8) Why light has a 'ray' like nature and always travel in a straight line

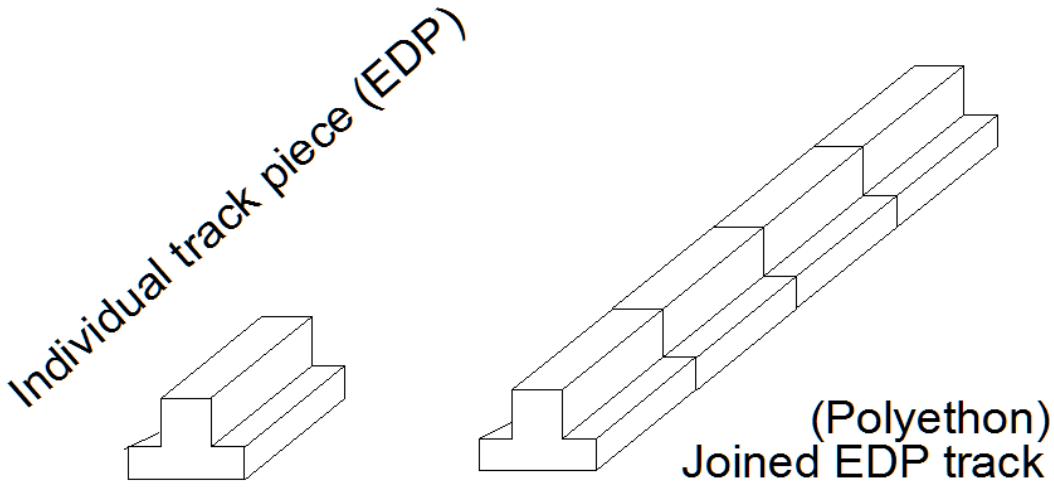
(9) The important requirement for static ether was that it should be 'stiff/rigid enough' for the vibrations of very high frequencies to travel. Therefore sometime ether was thought of as a tar like material by Stokes. In EFT the formation of POLYETHON provides such

mechanism as polyethons are (a) linear, (b) incompressible and (c) very stiff. These properties provides all necessary requirements for a photon to travel at a very high frequencies.

EFT and EPR Paradox or Quantum Entanglement:

One of the thing that bothered Einstein was the quantum mechanics and to test it he, along with his colleagues Boris Podolsky and Nathan Rosen (thus EPR), designed a thought experiment levelled against the Copenhagen Interpretation of QM. In EPR paper (1935) two entangled particles (photons) are considered. According to EPR there were two possible explanations. One, there was some interaction between the particles, even though they were separated by a large distance (as per Bell theorem). Two, the outcome of all possible measurements was already present in both particles (the Copenhagen Interpretation). EFT supports the first explanation, just like Bell. The reason for this agreement is as follows. Two photons can be linked by a single polyethon i.e. two vibrating undulations are occurring on the same string separated by time. Now the nature of the string is such that it can form, from ethon dipole pairs (EDPs) (see Fig. 2), such that they have a fixed orientation. For example a rail track is cut into equal pieces and 'joined' back to gether. Here the joining has to be in certain orientation of each piece so that the final track can form back just like the original track as shown in Fig. 19 (b).

Figure 19(b): Rail track pieces (EDPs) and formation of a full track by joining EDPs (Polyethon)



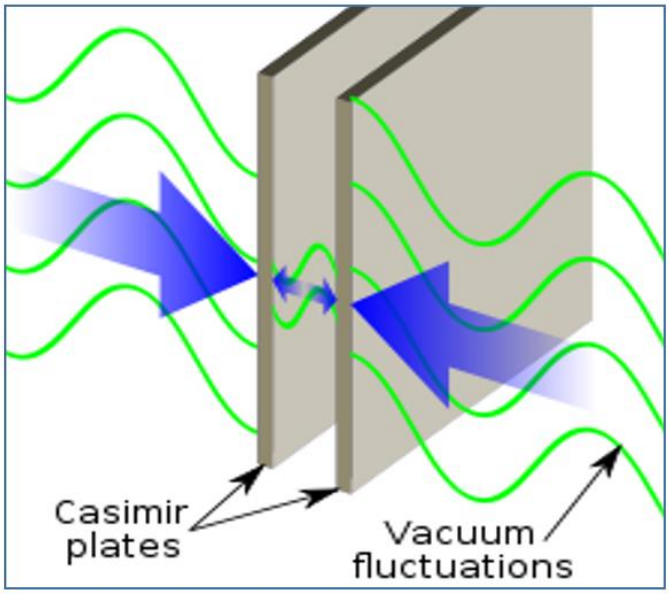
Now imagine that two monorail cars (two photons) are travelling on the same track, some distance apart (it can be any distance as the track can be as long as the length of the universe). In a way these cars are 'entangled'. Now try to topple one car by turning the track by, say, 90º. Obviously both cars will topple no matter how far apart they are. *More importantly*, this action of toppling will occur *instantaneously* for both cars regardless of the distance between them as turning action of the track takes exactly the same time for both toppling events. Thus the time difference between these two toppling events is zero, hence one can say that two events occurred, distant apart, *instantaneously at a speed faster than that of light* (although speed of light is considered the cosmic speed limit). Thus affecting one photon of the tangled pair will affect the other one instantaneously. It is also true that if you give a 'tug' to one particle the other particle will also be affected instantaneously. This description, in retrospect, also points to the fact that Ethon Dipole Pairs (EDPs) have 'certain orientation' like a railway track has like 'top side' or 'bottom side'. All joining EDPs to make a polyethon (similar to rail track) must have the

same orientation of all EDPs. Of course this is a conceptual presentation of EDP chain (polyethon), its connection with 'action at distance' and photon entanglement. The real EDP chain may have altogether different arrangement in how it is organized and how it entangles photons.

EFT and Casimir Effect:

The Casimir Effect is seen between two uncharged metallic plates, separated by few nanometers, in vacuum. The plates meet each other without any external force applied (see Fig. 19(c).

Figure 19(c): Casimir effect is believed due to the vacuum fluctuations as shown below

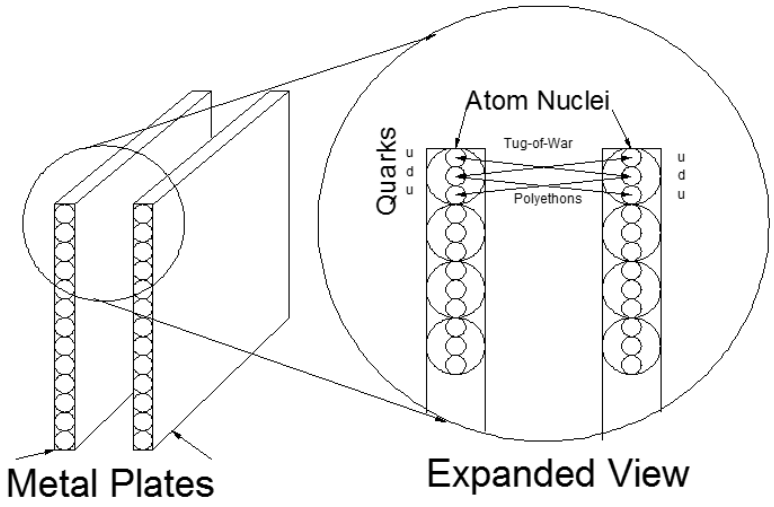


Currently it is believed that this is due to *vacuum fluctuations*. The force acting between plates gets stronger as the distance between the plates is reduced. In one example for the plates

separated by 10 nm the external force acting on these plates was equivalent to 1 atmosphere. According to Quantum Field Theory (QFT) these forces are arising from a quantized field. Furthermore, what 'nothingness of vacuum' harbor?

As per EFT these vacuum fluctuations are actually ether molecules. Hence, according to EFT the quantized field is representing ether molecules such as EDPs. These EDPs make a chain (polyethon) connecting two oppositely charged entities of the opposite atomic nuclei (see Fig. 19(d)).

Figure 19(d): As per EFT the attraction between two plates is due to electrostatic/dielectric property of the metal plates and the ether due to which the POLYETHONS are tugged by both plates



Thus the up quark of one plate is connected to the down quark of the second plate nucleus. These polyethon link exists between the plates throughout the entire inner surfaces of two plates. As we know (as per EFT) these polyethon chains are 'sucked-in' or 'eaten' by the charged particles of the each plate. Thus there is a 'pull' created between these plates which results in what we call Casimir Effect. Again, this pull gets stronger as the plates gets closer as the ether density grows near the plate surface. Perhaps this phenomenon is similar to what was

observed on International Space Station in microgravity when an inflated plastic bag containing sugar or salt particles shows spontaneous clumping [19]. Perhaps one can assign this attractive force to van der Waals force as originally thought by Hendrik Casimir. However a general approach as adopted by EFT is that two objects attract each other by the way of polyethon chains created in between them and that the chain length is reduced over time, by a process of ether absorption, causing a force of attraction.

EFT and Gravitational Lensing:

The first gravitational lensing was shown by Eddington in 1919 to prove Einstein's prediction (from GR) that Sun can bend starlight. We also know gravitational lensing occurs when light from a distant source passes around a galaxy and forms an image in the telescope as if the light has passed through a (the periphery of a) convex lens. As per EFT this effect is due to the ether density gradient that is established around the massive object like a galaxy. The density gradient is in the plane of the galaxy. This gradient bends the passing light toward higher ether density from lower ether density, just as we have seen this in a straight edge diffraction. It also can be compared to the bright spot observed behind an opaque disk by Dominique-Francois-Jean Arago (1868), hence known as Arago Spot. Thus gravitational lensing is another form of *diffracted* light caused by the ether density gradient (EDG).

EFT and the Age of the Universe:

In determining the age of the universe the speed of light is used. Thus we say it has taken light about 13.8 billion years to reach us. *One thing we assume, for this calculation, is that the speed of light never changed during the course of the evolution of our universe*. However, this is the point that needs to be reconsidered about the speed of light during the course of the expansion of the universe. Therefore if ether had existed since the birth of the universe its density would have changed as well as the universe expanded, by volume ($v = k \times r^3$ where r = radius of the universe), while the ether density decreased (density = $m/V = k \times m/r^3$) significantly over time as, perhaps, the mass of ether remained constant and volume of the universe increased cubically. As we know from our previous discussions that speed of light (*c*) is dependent on the ether density as refractive index (in other words the speed of light) decreases with increased ether density. Thus when we see distant stars from 13.8 (actually from ~13.45 plus the 350 million years of darkness) billion light years away the light actually took much longer to reach us than 13.8 billion years as the speed of light increased steadily over this time period perhaps from a few mm/s to 299,792,458 m/s as of today. Thus if the age of universe is calculated as per the increasing speed of light the actual age of the universe will be much bigger than what we estimate today at 13.8 billion years! There is a needs to develop an equation for accurate calculation of the age of the universe based on increasing speed of light during the evolution of the universe. This varying speed of light idea perhaps resonates with some of the physicists as notable as Einstein (1911), by Robert Dicke (1957), and by several researchers in last decades.

EFT and Super Luminal Speed:

We know that speed of light is considered a cosmic limit. However, as will be discussed further, there is no speed limit set by any physical law of nature. One of the reason that speed of light is considered a limit because it helps us understand the phenomena happening in other accelerated frames of reference. Without the use of this limit we may not be able to account for those observations. Please note that such effect as length contraction (due to the limit of speed) are just perceptions and not realities. That is how we will 'see' a fast moving object but in reality the object remains the same physically without any deformation. Thus the transformation equations are just a means for us to observe (perception) and understand phenomena occurring in different frames of references. Furthermore, the reason provided by 19th century physicists that since matter interacts with ether it would require infinite amount of energy to increase any object to *c*. Hence *c* has been considered the cosmic limit.

Does that mean that there are no phenomena occurring the universe that are faster than *c*? Let's examine the case of an object travelling from beyond the Event Horizon into a Black Hole.

Let's suppose that a flash light (FL) is thrown into a Black Hole (BH), from beyond the Event Horizon (EH), where the light beam is facing outward towards the observer. Due to the gravitational attraction of the BH the FL is moving towards the BH at an accelerated speed (*v*). Until now the observer sees a beam of light coming towards him/her. However, when the FL reaches the EH the beam of light becomes invisible. At this point the speed of FL *v* is exactly equal to the speed of light *c* and therefore makes it invisible to the observer. We do not know the fate of the FL beyond the EH but we assume that it falls in the BH eventually. The reason for this assumption is that when matter falls into a BH it eventually creates beams of energy emanating from the polar regions of the BH as seen in quasars. Thus there is an evidence that whatever falls

in BH beyond the EH ultimately reaches the BH. Therefore, we can assume that the FL in our thought experiment also fell in the BH.

We know from the Equivalence Principle of General Relativity that the gravitational "force" as experienced locally by an object (FL) near massive body (BH) is actually the same as the force experienced by an observer in a non-inertial (accelerated) frame of reference. Thus the acceleration of FL is in proportion to the gravitational force exerted by BH. For this reason the speed of FL beyond EH is further accelerated such that *v* (which is equal to c at the EH) is now greater than *c* inside the EH. As per EFT the rate of flow of ether into the BH is proportional to the mass (actually density) of the BH and distance from the center of the BH. As the FL reaches near the BH its velocity is as fast as that of the flowing ether. Thus the object is not going faster than c in the ether. Rather both ether and FL (like boat and flowing water in a river) are commoving to gether towards the BH and achieves an overall speed greater than *c*. Thus:

$v < c$ before the EH,

$v = c$ at the EH, and

$v > c$ beyond the EH.

As per the Special Relativity (SR) we can say that at the EH (see Eq. (27(a))) and any calculation beyond this point is meaningless.

$$t' = \gamma\left(t - \frac{vx}{c^2}\right) \quad \text{... Eq. (27(a))}$$

Where *t'* is the relativistic time of the moving frame of the reference (FL) relative to BH.

$$\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$$ …Eq. (27(b))

As we know that *v* equals *c* at the EH and hence the value of γ factor becomes infinite. Substituting value of γ from Eq. (27(b)) into Eq. (27(a)) we can say that *t'* is also infinite. Hence we can say time essentially stops and any interpretation of an event beyond this stage is meaningless. However, we have shown above that the FL does indeed fall into BH and hence does travel beyond EH taking certain time (*t'*) to do so. Does this mean FL travelled at speed beyond the cosmic limit *c*? The intuitive answer, as per EFT, is that the FL did travel at a speed greater than *c* and fell into the BH. Therefore one can say that *c* is not the cosmic speed limit!

There is one more argument for the cosmic speed limit. This is based on some classical experiments and famous energy-mass equivalence equation of Einstein from 1905 paper.

First of all let's take a simple example of kinetic energy (E_k) of a body with mass *m*. We know that classically its value is as shown in Eq. (27(c)).

$$E_k = \frac{1}{2}mv^2$$ …Eq. (27(c))

Here the 'extra' energy associated with the moving body *m* is related with its velocity *v*. This relationship was first experimentally determined by Willem 's Gravesande (1722) as mv^2 [43]. Which was later corrected by adding ½. However it was Émilie du Châtelet who repeated and publicized the work of 's Gravesande and expressed E_k as $\frac{1}{2}mv^2$. The origin of this equation lies in the way the measurements were done. The velocity of a ball dropped into a tray of soft clay was studied in relation to the radius of the circle created in the clay and thus the Eq. 27(c)

was developed. Hence kinetic energy is related with the radius/area of the circle which in turn is related with the falling ball's velocity *v*. However we know that the energy content of the same mass *m* is also related with the speed of light by Einstein's equation $E=mc^2$.

At this point it is important to remind us that in deriving this ($E=mc^2$) equation *Einstein did use the similarity between the known equation for energy of a moving body with velocity v as given in Eq. 27(c)* and the equation derived for the loss of kinetic energy Eq. (27(d)) as shown below [44]:

$$K_0 - K_1 = \frac{1}{2} \cdot \frac{L}{c^2} v^2 \quad \text{...Eq. (27(d))}$$

Where,

v = velocity of the reference frame with respect to which the light emitting body is travelling

L = total energy of two light beams emitted

c = the speed of light

K_0 = energy of the body before emitting the light

K_1 = energy of the body after emitting the light

Based on this equation Einstein equated $\frac{L}{c^2}$ with *m*, from known *classical relationship* Eq. (27(c)) at that time as the loss of kinetic energy of the light emitting system. This is the reason why a proportionality constant between energy and mass *has some physical meaning* (as *speed of light c*) as compared to most other constants which are just some numbers like Planck's constant (h) and Boltzmann's constant (k_B).

Now suppose that the mass *m* is dropped on the clay with zero velocity (*v*=0) however dissipates all its energy content ($E=mc^2$) when it touches the clay. Thus it will create a circle in clay in proportion to its energy content. Therefore if its energy content was mc^2 then its velocity should have been $\sqrt{2}c$ or $v=\sqrt{2}c$ so that when Eq. 27(c) is applied, the kinetic energy (E_k) will be mc^2. Thus the imaginary body with mass *m* must be travelling with a speed of $\sqrt{2}c$. This speed is higher than *c* and violates the cosmic speed limit although this speed ($\sqrt{2}c$=1.4142*c*) is essential in explaining the energy content of a body. Thus if a ball of mass *m* is dropped with velocity $v=\sqrt{2}$ m/s then its total energy content, when it hits the clay tray and vaporizes completely in the process just like the additional mass, due to its velocity, disappears when it hits the clay, is given by the equation below:

E_{total} = E_k from the mass of the ball + E_k from the velocity of the ball

$$E_{total}=\frac{1}{2}(m)(\sqrt{2}c)^2+\frac{1}{2}(m)(\sqrt{2})^2 \quad \text{…Eq. (27(e))}$$

Or

$$E_{total}=mc^2+m$$

Since *m* is very small as compared to mc^2 one can approximate Eq. (27(e)) to mc^2.

EFT and Quantum Field Theory (QFT):

QFT is a theoretical framework for constructing quantum mechanical models of subatomic particles. QFT treats *particles as an exited state* of an underlying physical field. Thus

these particles are field quanta. First of all we can ask the question what is a field? In the view of EFT a field is ether itself. When an EDP pair is excited it turns into a photon, when it (γ-ray) splits it turns into electron and positron. Thus ether provides a tangible physical entity instead of a *phantom* quantity of nature which is considered irreducible further in its meaning and interpretation. In QFT there is a field for each particle e.g. photon, electron and in Quantum Chromo Dynamics (QCD) one for each type of quarks (six). Thus we need at least eight types of fields coexisting with each other and without interfering with each other. To that we have to add gravitation field and now Higgs' field. Totally 10 fields. And there is one more called atomic displacement field. Can they coexists providing each an independent behavior? It is questionable at the least. Now consider, a single electron in otherwise empty universe. It has an electromagnetic field. Its field lines are stretching across the whole universe. From where does that energy comes to create such a field from a tiny mass of electron? On the other hand if the space is filled with ether it can give rise to different types of 'fields' depending up on how a particle interacts with ether. In one way QFT interaction terms are similar to those of charges with electric and magnetic fields in Maxwell's equation. *However Maxwell envisaged, based on Faraday's description, the existence of ether to provide 'action at a distance' and used the term field to describe the behavior of ether and not to replace it.* Also, Maxwell promised to only interpret Faraday's concepts of EM phenomena and *not to introduce any new concept* or theory as he 'never conducted a single experiment'.

EFT and Flat Earth (a hypothetical scenario) and a Different 'Gravity':

Suppose the Earth were a flat disc of enormous proportion so that it cannot be imagined as a point mass for the purpose of gravity calculations. Now consider the inverse square law. Since we do not consider Earth as a point object the rate of change of surface area is not in

proportion to $4\pi r^2$ but linear. Thus the gravitational force will change linearly (r) and not by $1/r^2$. With this scenario the equivalence principle of GR is violated since gravity is now equivalent to velocity and not acceleration because the objects will fall on Earth without any acceleration. In case of EFT this is consistent with the ether flux or flow. This flat earth scenario does not violate any principle of the EFT. Here one can also imagine an elevator moving upwards with *uniform motion*. The gravity felt by the person standing in the elevator will be of uniform velocity and not any acceleration (and Newton's law would be $F=mv$ and not $F=ma$). Similarly a ball dropped in the uniformly moving elevator will fall with uniform velocity and not is accelerated fashion. Thus, again, *gravity does not mean acceleration*. Perhaps we need to define gravity as (a) accelerated gravity (as on Spherical Earth), and (b) uniform gravity (as on a Flat Earth). In fact one can say that *type of the gravity* is dependent on the *type of geometry* of the object.

EFT and Occam's razor:

EFT seems to meet requirements of Occam's razor principle as quoted here: the principle states that "A*mong competing hypotheses, the one with the fewest assumptions should be selected. Other, more complicated solutions may ultimately prove correct, but—in the absence of certainty—the fewer assumptions that are made, the better*" [45]. As you have seen in this paper a multitude of physical phenomena are explained by EFT making a *single assumption* of existence of ether. This ether is also described, at quantum level, with a single set of common properties and still it explains very wide variety of natural phenomena such as diffraction, DSX (quantum mechanics), gravity, radioactivity and perhaps many others. Not only EFT explains many phenomena but it also agrees with, but very important, theories such Maxwell's EM theory and Einstein's SR and GR theories. Hence as per Ockham's razor principle EFT should be

selected as a physical theory over others which has fewest assumptions considering how many phenomena it explains and perhaps will explain in the future.

Tables

Table I:

Elements of Periodic Table and Calculated Properties (Charge Related).

Where,

n = neutron,

p = proton,

prot pos = positive charge due to u quarks in proton,

prot neg = negative charge due to d quarks in proton

neut pos = positive charge due to u quarks in neutron

neut neg = negative charge due to d quarks in neutron

Total Charge = prot pos + prot neg + neut pos + neut neg + atomic number (electrons)

Total Charge –Electrons = Nuclear charge only

Element Name	Symbol	Atomic Num	Atomic Mass	n	p+n	prot pos	prot neg	neut pos	neut neg	Total Charge - electrons	Total Charge
Hydrogen	H	1	1	0	1	1.33	0.33	0.00	0.00	1.67	2.67
Helium	He	2	4	2	6	2.67	0.67	1.33	1.33	6.00	8.00
Lithium	Li	3	7	4	11	4.00	1.00	2.67	2.67	10.33	13.33
Beryllium	Be	4	9	5	14	5.33	1.33	3.33	3.33	13.33	17.33
Boron	B	5	11	6	17	6.67	1.67	4.00	4.00	16.33	21.33
Carbon	C	6	12	6	18	8.00	2.00	4.00	4.00	18.00	24.00
Nitrogen	N	7	14	7	21	9.33	2.33	4.67	4.67	21.00	28.00
Oxygen	O	8	16	8	24	10.67	2.67	5.33	5.33	24.00	32.00
Fluorine	F	9	19	10	29	12.00	3.00	6.67	6.67	28.33	37.33
Neon	Ne	10	20	10	30	13.33	3.33	6.67	6.67	30.00	40.00
Sodium	Na	11	23	12	35	14.67	3.67	8.00	8.00	34.33	45.33
Magnesium	Mg	12	24	12	36	16.00	4.00	8.00	8.00	36.00	48.00
Aluminum	Al	13	27	14	41	17.33	4.33	9.33	9.33	40.33	53.33
Silicon	Si	14	28	14	42	18.67	4.67	9.33	9.33	42.00	56.00
Phosphorus	P	15	31	16	47	20.00	5.00	10.67	10.67	46.33	61.33
Sulfur	S	16	32	16	48	21.33	5.33	10.67	10.67	48.00	64.00
Chlorine	Cl	17	35	18	53	22.67	5.67	12.00	12.00	52.33	69.33
Argon	Ar	18	40	22	62	24.00	6.00	14.67	14.67	59.33	77.33
Potassium	K	19	39	20	59	25.33	6.33	13.33	13.33	58.33	77.33
Calcium	Ca	20	40	20	60	26.67	6.67	13.33	13.33	60.00	80.00
Scandium	Sc	21	45	24	69	28.00	7.00	16.00	16.00	67.00	88.00
Titanium	Ti	22	48	26	74	29.33	7.33	17.33	17.33	71.33	93.33
Vanadium	V	23	51	28	79	30.67	7.67	18.67	18.67	75.67	98.67
Chromium	Cr	24	52	28	80	32.00	8.00	18.67	18.67	77.33	101.33
Manganese	Mn	25	55	30	85	33.33	8.33	20.00	20.00	81.67	106.67
Iron	Fe	26	56	30	86	34.67	8.67	20.00	20.00	83.33	109.33
Cobalt	Co	27	59	32	91	36.00	9.00	21.33	21.33	87.67	114.67
Nickel	Ni	28	59	31	90	37.33	9.33	20.67	20.67	88.00	116.00

Element Name	Symbol	Atomic Num	Atomic Mass	n	p+n	prot pos	prot neg	neut pos	neut neg	Total Charge - electrons	Total Charge
Copper	Cu	29	64	35	99	38.67	9.67	23.33	23.33	95.00	124.00
Zinc	Zn	30	65	35	100	40.00	10.00	23.33	23.33	96.67	126.67
Gallium	Ga	31	70	39	109	41.33	10.33	26.00	26.00	103.67	134.67
Germanium	Ge	32	73	41	114	42.67	10.67	27.33	27.33	108.00	140.00
Arsenic	As	33	75	42	117	44.00	11.00	28.00	28.00	111.00	144.00
Selenium	Se	34	79	45	124	45.33	11.33	30.00	30.00	116.67	150.67
Bromine	Br	35	80	45	125	46.67	11.67	30.00	30.00	118.33	153.33
Krypton	Kr	36	84	48	132	48.00	12.00	32.00	32.00	124.00	160.00
Rubidium	Rb	37	85	48	133	49.33	12.33	32.00	32.00	125.67	162.67
Strontium	Sr	38	88	50	138	50.67	12.67	33.33	33.33	130.00	168.00
Yttrium	Y	39	89	50	139	52.00	13.00	33.33	33.33	131.67	170.67
Zirconium	Zr	40	91	51	142	53.33	13.33	34.00	34.00	134.67	174.67
Niobium	Nb	41	93	52	145	54.67	13.67	34.67	34.67	137.67	178.67
Molybdenum	Mo	42	96	54	150	56.00	14.00	36.00	36.00	142.00	184.00
Technetium	Tc	43	98	55	153	57.33	14.33	36.67	36.67	145.00	188.00
Ruuthenium	Ru	44	101	57	158	58.67	14.67	38.00	38.00	149.33	193.33
Rhodium	Rh	45	103	58	161	60.00	15.00	38.67	38.67	152.33	197.33
Palladium	Pd	46	106	60	166	61.33	15.33	40.00	40.00	156.67	202.67
Silver	Ag	47	108	61	169	62.67	15.67	40.67	40.67	159.67	206.67
Cadmium	Vd	48	112	64	176	64.00	16.00	42.67	42.67	165.33	213.33
Indium	In	49	115	66	181	65.33	16.33	44.00	44.00	169.67	218.67
Tin	Sn	50	119	69	188	66.67	16.67	46.00	46.00	175.33	225.33
Antimony	Sb	51	122	71	193	68.00	17.00	47.33	47.33	179.67	230.67
Tellurium	Te	52	128	76	204	69.33	17.33	50.67	50.67	188.00	240.00
Iodine	I	53	127	74	201	70.67	17.67	49.33	49.33	187.00	240.00
Xenon	Xe	54	131	77	208	72.00	18.00	51.33	51.33	192.67	246.67
Cesium	Cs	55	133	78	211	73.33	18.33	52.00	52.00	195.67	250.67
Barium	Ba	56	137	81	218	74.67	18.67	54.00	54.00	201.33	257.33
Lanthanum	La	57	139	82	221	76.00	19.00	54.67	54.67	204.33	261.33
Cerium	Ce	58	140	82	222	77.33	19.33	54.67	54.67	206.00	264.00
Praseodymium	Pr	59	141	82	223	78.67	19.67	54.67	54.67	207.67	266.67
Neodumium	Nd	60	144	84	228	80.00	20.00	56.00	56.00	212.00	272.00
Promethium	Pm	61	145	84	229	81.33	20.33	56.00	56.00	213.67	274.67
Samarium	Sm	62	150	88	238	82.67	20.67	58.67	58.67	220.67	282.67
Europium	Eu	63	152	89	241	84.00	21.00	59.33	59.33	223.67	286.67
Gadolinium	Gd	64	157	93	250	85.33	21.33	62.00	62.00	230.67	294.67
Terbium	Tb	65	159	94	253	86.67	21.67	62.67	62.67	233.67	298.67
Dysprosium	Dy	66	163	97	260	88.00	22.00	64.67	64.67	239.33	305.33
Holmium	Ho	67	165	98	263	89.33	22.33	65.33	65.33	242.33	309.33
Erbium	Er	68	167	99	266	90.67	22.67	66.00	66.00	245.33	313.33
Thulium	Tm	69	169	100	269	92.00	23.00	66.67	66.67	248.33	317.33
Ytterbium	Yb	70	173	103	276	93.33	23.33	68.67	68.67	254.00	324.00
Lutetium	Lu	71	175	104	279	94.67	23.67	69.33	69.33	257.00	328.00
Hafnium	Hf	72	178	106	284	96.00	24.00	70.67	70.67	261.33	333.33

Element Name	Symbol	Atomic Num	Atomic Mass	n	p+n	prot pos	prot neg	neut pos	neut neg	Total Charge - electrons	Total Charge
Tantalum	Ta	73	181	108	289	97.33	24.33	72.00	72.00	265.67	338.67
Tungsten	W	74	184	110	294	98.67	24.67	73.33	73.33	270.00	344.00
Rhenium	Re	75	186	111	297	100.00	25.00	74.00	74.00	273.00	348.00
Osmium	Os	76	190	114	304	101.33	25.33	76.00	76.00	278.67	354.67
Iridium	Ir	77	192	115	307	102.67	25.67	76.67	76.67	281.67	358.67
Platinum	Pt	78	195	117	312	104.00	26.00	78.00	78.00	286.00	364.00
Gold	Au	79	197	118	315	105.33	26.33	78.67	78.67	289.00	368.00
Mercury	Hg	80	201	121	322	106.67	26.67	80.67	80.67	294.67	374.67
Thallium	Tl	81	204	123	327	108.00	27.00	82.00	82.00	299.00	380.00
Lead	Pb	82	207	125	332	109.33	27.33	83.33	83.33	303.33	385.33
Bismuth	Bi	83	209	126	335	110.67	27.67	84.00	84.00	306.33	389.33
Polonium	Po	84	209	125	334	112.00	28.00	83.33	83.33	306.67	390.67
Astatine	At	85	210	125	335	113.33	28.33	83.33	83.33	308.33	393.33
Radon	Rn	86	222	136	358	114.67	28.67	90.67	90.67	324.67	410.67
Francium	Fr	87	223	136	359	116.00	29.00	90.67	90.67	326.33	413.33
Radium	Ra	88	226	138	364	117.33	29.33	92.00	92.00	330.67	418.67
Actinium	Ac	89	227	138	365	118.67	29.67	92.00	92.00	332.33	421.33
Thorium	Th	90	232	142	374	120.00	30.00	94.67	94.67	339.33	429.33
Protactnium	Pa	91	231	140	371	121.33	30.33	93.33	93.33	338.33	429.33
Uranium	U	92	238	146	384	122.67	30.67	97.33	97.33	348.00	440.00
Neptunium	Np	93	237	144	381	124.00	31.00	96.00	96.00	347.00	440.00
Plutonium	Pu	94	244	150	394	125.33	31.33	100.00	100.00	356.67	450.67
Americium	Am	95	243	148	391	126.67	31.67	98.67	98.67	355.67	450.67
Curium	Cm	96	247	151	398	128.00	32.00	100.67	100.67	361.33	457.33
Berkelium	Bk	97	247	150	397	129.33	32.33	100.00	100.00	361.67	458.67
Californium	Cf	98	251	153	404	130.67	32.67	102.00	102.00	367.33	465.33
Einsteinium	Es	99	252	153	405	132.00	33.00	102.00	102.00	369.00	468.00
Fermium	Fm	100	257	157	414	133.33	33.33	104.67	104.67	376.00	476.00
Mendelevium	Md	101	258	157	415	134.67	33.67	104.67	104.67	377.67	478.67
Nobelium	No	102	259	157	416	136.00	34.00	104.67	104.67	379.33	481.33
Lawrencium	Lr	103	262	159	421	137.33	34.33	106.00	106.00	383.67	486.67
Rutherfordium	Rf	104	261	157	418	138.67	34.67	104.67	104.67	382.67	486.67
Dubnium	Db	105	262	157	419	140.00	35.00	104.67	104.67	384.33	489.33
Seaborgium	Sg	106	266	160	426	141.33	35.33	106.67	106.67	390.00	496.00
Bohrium	Bh	107	264	157	421	142.67	35.67	104.67	104.67	387.67	494.67
Hassium	Hs	108	277	169	446	144.00	36.00	112.67	112.67	405.33	513.33
Meitnerium	Mt	109	268	159	427	145.33	36.33	106.00	106.00	393.67	502.67

Table II:

Sucrose solution Refractive Index and Density Data

Observation #	Density (g/cm^3)	Refractive index	Sucrose in Water (% w/v)	Molarity
1	0.9982	1.3330	0	0.000
2	1.0021	1.3344	1	0.029
3	1.0060	1.3359	2	0.059
4	1.0099	1.3374	3	0.089
5	1.0139	1.3388	4	0.119
6	1.0179	1.3403	5	0.149
7	1.0219	1.3418	6	0.179
8	1.0259	1.3433	7	0.210
9	1.0299*	1.3488	8	0.211
10	1.0340	1.3464	9	0.272
11	1.0381	1.3479	10	0.303
12	1.0423	1.3494	11	0.335
13	1.0465	1.3510	12	0.367
14	1.0507	1.3526	13	0.399
15	1.0549	1.3541	14	0.431
16	1.0592	1.3557	15	0.464
17	1.0635	1.3573	16	0.497
18	1.0678	1.3590	17	0.530
19	1.0721	1.3606	18	0.564
20	1.0765	1.3622	19	0.597
21	1.0810	1.3639	20	0.632
22	1.0854	1.3655	21	0.666
23	1.0899	1.3672	22	0.701
24	1.0944	1.3689	23	0.735
25	1.0990	1.3706	24	0.771
26	1.1036	1.3723	25	0.806
27	1.1082	1.3740	26	0.842
28	1.1128	1.3758	27	0.878
29	1.1175	1.3775	28	0.914
30	1.1222	1.3793	29	0.951
31	1.1270	1.3811	30	0.988
32	1.1318	1.3829	31	1.025
33	1.1366	1.3847	32	1.063

Table II (Continued):

Observation #	Density (g/cm^3)	Refractive index	Sucrose in Water (% w/v)	Molarity
34	1.1415	1.3865	33	1.100
35	1.1463	1.3883	34	1.138
36	1.1513	1.3902	35	1.177
37	1.1562	1.3920	36	1.216
38	1.1612	1.3939	37	1.255
39	1.1663	1.3958	38	1.295
40	1.1713	1.3978	39	1.334
41	1.1764	1.3997	40	1.375
42	1.1816	1.4016	41	1.415
43	1.1868	1.4036	42	1.456
44	1.1920	1.4056	43	1.498
45	1.1972	1.4076	44	1.539
46	1.2025	1.4096	45	1.581
47	1.2296	1.4200	50	1.796
48	1.2575	1.4307	55	2.020
49	1.2865	1.4418	60	2.255
50	1.3163	1.4532	65	2.500

Table III: Data for Composition of Glass, its Refractive Index and Density from paper by F. A. Bannister (1929)

		Proportion of Silicon Dioxide and Metal Oxides								
Obs.	**Glass Type**	**SiO2**	**Na2O**	**K2O**	**CaO**	**PbO**	**BaO**	**Total**	**RefIndex**	**Density**
1	Calcium Glass	100	40	0	5	0	0	145	1.5110	2.503
2		100	40	0	10	0	0	150	1.5189	2.533
3		100	40	0	15	0	0	155	1.5259	2.559
4		100	40	0	20	0	0	160	1.5327	2.584
5		100	40	0	30	0	0	170	1.5442	2.629
6		100	40	0	40	0	0	180	1.5540	2.667
7		100	20	0	5	0	0	125	1.4970	2.412
8		100	20	0	10	0	0	130	1.5088	2.458
9		100	20	0	15	0	0	135	1.5192	2.499
10		100	20	0	20	0	0	140	1.5279	2.537
11		100	20	0	30	0	0	150	1.5435	2.603
12		100	20	0	40	0	0	160	1.5573	2.659
13		100	0	40	5	0	0	145	1.5125	2.488
14		100	0	40	10	0	0	150	1.5179	2.513
15		100	0	40	15	0	0	155	1.5229	2.535
16		100	0	40	20	0	0	160	1.5277	2.555
17		100	0	40	30	0	0	170	1.5379	2.594
18		100	0	40	40	0	0	180	1.5475	2.630
19		100	0	20	5	0	0	125	1.5011	2.420
20		100	0	20	10	0	0	130	1.5081	2.450
21		100	0	20	15	0	0	135	1.5151	2.478
22		100	0	20	20	0	0	140	1.5223	2.505
23		100	0	20	30	0	0	150	1.5355	2.555
24		100	0	20	40	0	0	160	1.5491	2.601
25	Lead Glass	100	40	0	0	5	0	145	1.5299	2.710
26		100	40	0	0	10	0	150	1.5558	2.912
27		100	40	0	0	15	0	155	1.5761	3.112
28		100	40	0	0	20	0	160	1.5927	3.282
29		100	40	0	0	30	0	170	1.6219	3.543
30		100	40	0	0	40	0	180	1.6472	3.756
31		100	20	0	0	5	0	125	1.5186	2.628
32		100	20	0	0	10	0	130	1.5448	2.911
33		100	20	0	0	15	0	135	1.5691	3.152
34		100	20	0	0	20	0	140	1.5930	3.368
35		100	20	0	0	30	0	150	1.6272	3.690
36		100	20	0	0	40	0	160	1.6571	3.940
37		100	0	40	0	5	0	145	1.5290	2.681

Table III: Continued…

		Proportion of Silicon Dioxide and Metal Oxides								
Obs.	**Glass Type**	**SiO2**	**Na2O**	**K2O**	**CaO**	**PbO**	**BaO**	**Total**	**RefIndex**	**Density**
38		100	0	40	0	10	0	150	1.5510	2.868
39		100	0	40	0	15	0	155	1.5710	3.043
40		100	0	40	0	20	0	160	1.5910	3.175
41		100	0	40	0	30	0	170	1.6230	3.474
42		100	0	40	0	40	0	180	1.6508	3.728
43		100	0	20	0	5	0	125	1.5201	2.616
44		100	0	20	0	10	0	130	1.5480	2.849
45		100	0	20	0	15	0	135	1.5707	3.089
46		100	0	20	0	20	0	140	1.5941	3.290
47		100	0	20	0	30	0	150	1.6284	3.640
48		100	0	20	0	40	0	160	1.6596	3.942
49	Barium Glass	100	40	0	0	0	5	145	1.5155	2.604
50		100	40	0	0	0	10	150	1.5280	2.738
51		100	40	0	0	0	15	155	1.5404	2.864
52		100	40	0	0	0	20	160	1.5510	2.966
53		100	40	0	0	0	30	170	1.5679	3.134
54		100	40	0	0	0	40	180	1.5775	3.248
55		100	20	0	0	0	5	125	1.5037	2.557
56		100	20	0	0	0	10	130	1.5202	2.708
57		100	20	0	0	0	15	135	1.5357	2.853
58		100	20	0	0	0	20	140	1.5483	2.987
59		100	20	0	0	0	30	150	1.5698	3.203
60		100	20	0	0	0	40	160	1.5895	3.407
61		100	0	40	0	0	5	145	1.5195	2.619
62		100	0	40	0	0	10	150	1.5285	2.718
63		100	0	40	0	0	15	155	1.5381	2.803
64		100	0	40	0	0	20	160	1.5479	2.904
65		100	0	40	0	0	30	170	1.5644	3.079
66		100	0	40	0	0	40	180	1.5755	3.205
67		100	0	20	0	0	5	125	1.5080	2.565
68		100	0	20	0	0	10	130	1.5203	2.681
69		100	0	20	0	0	15	135	1.5317	2.798
70		100	0	20	0	0	20	140	1.5437	2.922
71		100	0	20	0	0	30	150	1.5652	3.143
72		100	0	20	0	0	40	160	1.5838	3.308
73	Base Glass	100	20	0	0	0	0	120	1.4851	2.353
74		100	30	0	0	0	0	130	1.4952	2.413
75		100	40	0	0	0	0	140	1.5015	2.457

Table III: Continued…

		Proportion of Silicon Dioxide and Metal Oxides								
Obs.	**Glass Type**	**SiO2**	**Na2O**	**K2O**	**CaO**	**PbO**	**BaO**	**Total**	**RefIndex**	**Density**
76		100	50	0	0	0	0	150	1.5056	2.495
77		100	60	0	0	0	0	160	1.5090	2.521
78		100	70	0	0	0	0	170	1.5118	2.535
79		100	80	0	0	0	0	180	1.5139	2.544
80		100	90	0	0	0	0	190	1.5155	2.555
81		100	100	0	0	0	0	200	1.5168	2.560
82		100	0	20	0	0	0	120	1.4937	2.388
83		100	0	40	0	0	0	140	1.5073	2.465

Table IV: Glass composition and Refractive Index Data. The table contains Weight Percent (wt%) of each Chemical Component of the Glass.

Obs#	*Ref. Indx.*	SiO2	Na2O	PbO	CaO	BaO	K2O	B2O3	Al2O3	MgO	Li2O	ZnO	SrO	TiO2	ZrO2	Fe2O3	F	MnO	Sb2O3	CeO2	As2O3	SO3	SeO2	Cr2O3	CoO
1	*1.5019*	80.96	10.61	0.00	6.93	0.00	0.25	0.00	1.14	0.06	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
2	*1.5239*	73.96	10.06	0.00	11.78	0.00	2.08	0.00	1.01	0.10	0.00	0.00	0.00	0.47	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.26	0.00
3	*1.5336*	69.06	15.32	0.00	12.35	0.00	0.02	0.00	1.16	0.10	0.93	0.00	0.00	0.01	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.31	0.00
4	*1.5266*	73.31	14.60	0.00	6.80	0.00	0.02	0.00	1.09	2.95	0.00	0.00	0.00	0.50	0.00	0.43	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.29	0.00
5	*1.5205*	71.06	14.73	0.00	6.78	0.00	1.97	0.00	1.12	3.08	0.91	0.00	0.00	0.01	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00
6	*1.5351*	69.22	10.75	0.00	11.67	0.00	2.10	0.00	1.13	3.25	0.89	0.00	0.00	0.51	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
7	*1.5150*	72.09	14.67	0.00	6.77	0.00	2.04	0.00	3.12	0.06	0.00	0.00	0.00	0.51	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.00
8	*1.5111*	75.21	10.87	0.00	6.81	0.00	2.08	0.00	3.25	0.06	0.92	0.00	0.00	0.01	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.30	0.00
9	*1.5350*	68.31	14.74	0.00	12.16	0.00	0.01	0.00	3.19	0.11	0.91	0.00	0.00	0.52	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
10	*1.5201*	74.09	10.70	0.00	6.97	0.00	0.03	0.00	3.19	3.15	0.91	0.00	0.00	0.51	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.30	0.00
11	*1.5334*	64.93	14.73	0.00	11.58	0.00	2.12	0.00	3.12	3.15	0.00	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.29	0.00
12	*1.5287*	70.85	10.38	0.00	12.18	0.00	0.02	0.00	3.06	2.85	0.00	0.00	0.00	0.01	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00
13	*1.5170*	74.49	13.66	0.00	7.16	0.00	2.13	0.00	1.14	0.01	0.56	0.00	0.00	0.54	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.28	0.00
14	*1.5109*	79.51	10.51	0.00	6.79	0.00	0.06	0.00	1.09	0.06	0.92	0.00	0.00	0.50	0.00	0.43	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00
15	*1.5287*	67.60	13.96	0.00	11.61	0.00	2.02	0.00	1.01	0.10	0.00	0.00	0.00	0.01	0.00	3.66	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00
16	*1.5130*	75.51	11.02	0.00	6.99	0.00	2.07	0.00	1.03	2.81	0.00	0.00	0.00	0.01	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.30	0.00
17	*1.5336*	68.17	15.13	0.00	11.40	0.00	0.02	0.00	1.10	3.42	0.00	0.00	0.00	0.50	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00
18	*1.5347*	71.18	10.93	0.00	12.07	0.00	0.03	0.00	1.15	3.36	0.92	0.00	0.00	0.01	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.28	0.00
19	*1.5106*	74.17	14.88	0.00	7.03	0.00	0.02	0.00	3.22	0.06	0.00	0.00	0.00	0.01	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.32	0.00
20	*1.5318*	73.16	10.17	0.00	12.22	0.00	0.03	0.00	3.12	0.10	0.00	0.00	0.00	0.50	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.28	0.00
21	*1.5261*	71.31	10.01	0.00	11.90	0.00	2.12	0.00	3.26	0.08	0.99	0.00	0.00	0.01	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00
22	*1.5138*	73.69	10.95	0.00	6.94	0.00	2.09	0.00	2.93	2.81	0.00	0.00	0.00	0.52	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00
23	*1.5228*	71.22	13.79	0.00	7.45	0.00	0.01	0.00	3.21	2.79	1.07	0.00	0.00	0.01	0.00	0.44	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
24	*1.5439*	63.04	14.76	0.00	11.42	0.00	2.02	0.00	3.14	3.16	0.96	0.00	0.00	0.50	0.00	0.44	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.30	0.00
25	*1.5582*	54.85	0.61	0.00	17.64	0.00	0.00	6.82	14.34	4.20	0.00	0.00	0.00	0.56	0.00	0.77	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Obs#	*Ref. Indx.*	SiO2	Na2O	PbO	CaO	BaO	K2O	B2O3	Al2O3	MgO	Li2O	ZnO	SrO	TiO2	ZrO2	Fe2O3	F	MnO	Sb2O3	CeO2	As2O3	SO3	SeO2	Cr2O3	CoO
26	*1.5302*	70.87	0.00	0.00	16.08	0.00	0.00	0.00	12.50	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	*1.5454*	65.50	0.00	0.00	15.75	0.00	0.52	0.00	14.95	1.53	0.00	0.00	0.00	1.00	0.00	0.59	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	*1.5859*	55.43	2.04	0.00	24.58	0.00	0.00	0.00	11.15	5.01	0.00	0.00	0.00	1.00	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	*1.5459*	62.85	2.06	0.00	17.09	0.00	0.00	0.00	15.08	0.56	0.00	0.00	0.00	1.02	0.00	0.81	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	*1.5671*	56.76	2.01	0.00	25.03	0.00	0.55	0.00	15.08	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	*1.5812*	52.55	0.00	0.00	25.13	0.00	0.53	0.00	14.60	5.84	0.00	0.00	0.00	0.00	0.00	0.83	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	*1.5381*	59.19	2.03	0.00	16.68	0.00	0.54	8.62	11.12	0.53	0.00	0.00	0.00	0.00	0.00	0.79	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	*1.5752*	50.10	2.06	0.00	22.74	0.00	0.00	8.68	12.07	3.95	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	*1.5736*	50.11	0.00	0.00	23.17	0.00	0.00	8.97	15.97	0.48	0.00	0.00	0.00	0.98	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	*1.5575*	50.49	2.05	0.00	16.96	0.00	0.54	9.07	15.15	4.73	0.00	0.00	0.00	1.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	*1.5558*	53.92	0.00	0.00	16.84	0.00	0.00	8.85	14.93	4.65	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	*1.5662*	59.07	2.02	0.00	25.07	0.00	0.54	0.00	11.23	0.55	0.00	0.00	0.00	0.99	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38	*1.5620*	61.75	0.00	0.00	25.12	0.00	0.00	0.00	11.11	0.67	0.00	0.00	0.00	0.00	0.00	0.81	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	*1.5466*	63.81	2.15	0.00	16.15	0.00	0.52	0.00	12.32	4.24	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	*1.5441*	65.92	0.00	0.00	14.95	0.00	0.51	0.00	14.85	2.00	0.00	0.00	0.00	1.00	0.00	0.50	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	*1.5491*	60.87	2.11	0.00	17.03	0.00	0.00	0.00	14.92	4.59	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42	*1.5852*	54.30	0.00	0.00	24.78	0.00	0.00	0.00	14.71	5.22	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43	*1.5429*	64.96	1.96	0.00	13.57	0.00	0.00	8.88	9.38	0.44	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44	*1.5554*	55.36	0.00	0.00	17.32	0.00	0.00	8.82	11.41	4.75	0.00	0.00	0.00	1.05	0.00	0.82	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	*1.5801*	52.90	0.00	0.00	22.74	0.00	0.49	8.57	11.12	4.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46	*1.5366*	57.11	0.00	0.00	17.10	0.00	0.53	8.91	15.30	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
47	*1.5746*	48.83	2.19	0.00	22.66	0.00	0.00	9.16	15.86	0.51	0.00	0.00	0.00	0.00	0.00	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48	*1.5874*	41.07	2.12	0.00	24.46	0.00	0.46	9.21	15.91	4.36	0.00	0.00	0.00	1.00	0.00	0.83	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	*1.5198*	73.27	13.81	0.00	8.78	0.00	0.03	0.00	0.13	3.86	0.00	0.00	0.00	0.02	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50	*1.5150*	74.99	12.05	0.00	7.03	0.00	0.50	0.00	2.01	3.01	0.00	0.00	0.00	0.05	0.00	0.10	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.04	0.00
51	*1.5280*	72.59	14.31	0.00	7.13	0.00	0.55	0.00	0.22	2.62	0.00	0.00	0.00	1.07	0.00	1.47	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.00

Obs#	*Ref. Indx.*	SiO2	Na2O	PbO	CaO	BaO	K2O	B2O3	Al2O3	MgO	Li2O	ZnO	SrO	TiO2	ZrO2	Fe2O3	F	MnO	Sb2O3	CeO2	As2O3	SO3	SeO2	Cr2O3	CoO
52	*1.5170*	72.48	15.03	0.00	7.01	0.00	2.00	0.00	0.10	3.01	0.00	0.00	0.00	0.05	0.00	0.10	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.01
53	*1.5270*	69.65	15.05	0.00	9.03	0.00	2.01	0.00	0.10	3.01	0.00	0.00	0.00	1.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
54	*1.5240*	69.68	15.02	0.00	9.01	0.00	2.00	0.00	0.10	4.01	0.00	0.00	0.00	0.05	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
55	*1.5390*	66.97	15.10	0.00	9.39	0.00	2.18	0.00	2.10	3.67	0.00	0.00	0.00	0.06	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.39	0.00
56	*1.5280*	69.63	12.00	0.00	9.12	0.00	2.09	0.00	1.98	3.65	0.00	0.00	0.00	0.06	0.00	1.42	0.00	0.00	0.00	0.00	0.00	0.04	0.01	0.00	0.00
57	*1.5310*	67.73	15.01	0.00	9.00	0.00	0.50	0.00	2.00	4.00	0.00	0.00	0.00	0.05	0.00	1.50	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
58	*1.5270*	70.30	11.84	0.00	7.35	0.00	2.11	0.00	1.99	3.70	0.00	0.00	0.00	1.05	0.00	1.43	0.00	0.21	0.00	0.00	0.00	0.03	0.00	0.00	0.00
59	*1.5340*	67.72	15.03	0.00	9.02	0.00	0.50	0.00	2.00	3.01	0.00	0.00	0.00	1.00	0.00	1.50	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.01
60	*1.5310*	68.97	15.08	0.00	7.04	0.00	2.01	0.00	0.10	4.02	0.00	0.00	0.00	1.01	0.00	1.51	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.04	0.01
61	*1.5290*	70.47	12.07	0.00	9.05	0.00	2.01	0.00	2.01	3.02	0.00	0.00	0.00	1.01	0.00	0.10	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.04	0.01
62	*1.5200*	70.92	15.09	0.00	7.04	0.00	0.50	0.00	2.01	4.02	0.00	0.00	0.00	0.05	0.00	0.10	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.04	0.01
63	*1.5270*	72.07	12.03	0.00	9.02	0.00	2.00	0.00	0.10	3.01	0.00	0.00	0.00	0.05	0.00	1.50	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.01
64	*1.5230*	72.95	12.05	0.00	9.04	0.00	0.50	0.00	0.10	4.02	0.00	0.00	0.00	1.00	0.00	0.10	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.04	0.00
65	*1.5240*	70.33	15.02	0.00	7.01	0.00	0.50	0.00	2.00	4.01	0.00	0.00	0.00	1.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
66	*1.5190*	72.26	12.06	0.00	7.04	0.00	2.01	0.00	2.01	3.02	0.00	0.00	0.00	0.05	0.00	1.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.01
67	*1.5160*	73.08	12.08	0.00	7.24	0.00	2.14	0.00	0.22	3.77	0.00	0.00	0.00	1.07	0.00	0.13	0.00	0.22	0.00	0.00	0.00	0.03	0.03	0.00	0.00
68	*1.5190*	74.67	12.06	0.00	7.04	0.00	0.50	0.00	0.10	4.02	0.00	0.00	0.00	0.05	0.00	1.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.01
69	*1.5080*	77.25	12.00	0.00	7.00	0.00	0.50	0.00	0.10	3.00	0.00	0.00	0.00	0.05	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70	*1.4727*	81.03	4.09	0.00	0.02	0.00	0.06	12.61	2.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
71	*1.4762*	84.11	3.75	0.00	0.00	0.00	0.00	9.93	2.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72	*1.4880*	79.60	3.89	0.00	1.93	1.97	0.00	10.41	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
73	*1.5044*	74.83	8.02	0.00	1.95	0.00	2.91	10.03	2.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74	*1.4815*	75.90	3.88	0.00	0.00	0.00	2.99	10.37	6.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75	*1.5015*	68.96	8.59	0.00	0.00	2.04	3.19	10.14	7.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76	*1.5003*	70.08	8.60	0.00	1.99	2.05	0.00	10.21	7.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
77	*1.4991*	73.77	4.11	0.00	0.00	2.05	2.96	14.92	2.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Obs#	*Ref. Indx.*	SiO2	Na2O	PbO	CaO	BaO	K2O	B2O3	Al2O3	MgO	Li2O	ZnO	SrO	TiO2	ZrO2	Fe2O3	F	MnO	Sb2O3	CeO2	As2O3	SO3	SeO2	Cr2O3	CoO
78	*1.4897*	72.79	8.15	0.00	0.00	2.07	0.00	14.80	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
79	*1.5079*	70.35	7.84	0.00	1.91	0.00	2.87	14.80	2.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80	*1.4868*	69.92	7.71	0.00	0.00	0.00	0.00	15.25	7.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81	*1.4892*	66.81	4.06	0.00	2.01	2.01	2.99	14.87	7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
82	*1.4804*	71.49	4.34	0.00	2.00	0.00	0.00	15.03	7.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
83	*1.5056*	76.72	7.62	0.00	0.00	1.93	2.70	8.91	2.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84	*1.4941*	79.98	7.80	0.00	0.00	0.00	0.00	10.15	2.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
85	*1.4965*	76.48	4.09	0.00	1.89	1.95	2.99	10.47	2.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
86	*1.4830*	78.55	3.00	0.00	0.00	1.69	0.00	9.87	6.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
87	*1.4870*	74.04	3.89	0.00	1.96	0.00	2.90	9.97	7.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
88	*1.4951*	72.46	8.31	0.00	2.05	0.00	0.00	9.97	7.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
89	*1.4821*	75.67	3.95	0.00	0.00	0.00	3.02	15.13	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90	*1.4807*	76.81	4.07	0.00	1.76	0.00	0.00	15.06	2.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
91	*1.5034*	70.68	7.95	0.00	1.95	1.98	0.00	15.26	2.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
92	*1.4812*	71.10	4.55	0.00	0.00	2.08	0.00	15.11	7.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
93	*1.5004*	64.97	8.24	0.00	0.00	1.97	2.88	14.85	7.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
94	*1.5085*	61.76	8.31	0.00	2.10	2.11	3.04	15.37	7.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95	*1.5372*	61.40	7.62	0.00	0.05	9.21	7.53	0.00	2.06	0.00	0.01	0.51	9.17	0.43	1.39	0.04	0.00	0.00	0.30	0.28	0.00	0.00	0.00	0.00	0.00
96	*1.5308*	64.91	9.13	0.01	0.04	12.73	6.08	0.00	1.38	0.01	0.00	0.00	0.93	0.10	2.98	0.00	0.06	0.00	0.71	0.68	0.25	0.00	0.00	0.00	0.00
97	*1.5097*	70.69	6.12	2.88	0.00	2.04	9.05	0.00	3.50	0.00	0.51	0.00	1.01	0.08	2.90	0.04	0.63	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00
98	*1.5005*	71.35	8.28	2.96	0.00	1.92	6.09	0.00	3.36	1.46	0.00	2.09	1.06	0.57	0.00	0.04	0.61	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00
99	*1.5094*	71.02	5.60	0.00	3.11	1.93	8.81	0.00	3.60	1.51	0.00	1.97	1.03	0.08	0.00	0.04	0.00	0.00	0.18	0.81	0.31	0.00	0.00	0.00	0.00
100	*1.5396*	63.70	5.86	0.03	3.36	2.02	5.94	0.00	3.58	1.43	0.00	0.00	9.68	0.50	2.94	0.00	0.00	0.00	0.67	0.01	0.27	0.00	0.00	0.00	0.00
101	*1.5602*	52.14	6.54	2.87	3.18	12.90	5.67	0.00	3.55	1.50	0.00	0.00	9.81	0.08	0.00	0.02	0.65	0.00	0.53	0.56	0.00	0.00	0.00	0.00	0.00
102	*1.5658*	53.53	6.00	0.02	3.17	12.73	6.03	0.00	1.35	1.39	0.50	1.46	9.68	0.10	2.93	0.00	0.75	0.00	0.25	0.08	0.04	0.00	0.00	0.00	0.00
103	*1.5695*	51.55	9.27	2.85	3.26	13.04	5.69	0.00	3.61	0.00	0.53	0.00	9.73	0.08	0.00	0.02	0.00	0.00	0.19	0.00	0.20	0.00	0.00	0.00	0.00

Obs#	*Ref. Indx.*	SiO2	Na2O	PbO	CaO	BaO	K2O	B2O3	Al2O3	MgO	Li2O	ZnO	SrO	TiO2	ZrO2	Fe2O3	F	MnO	Sb2O3	CeO2	As2O3	SO3	SeO2	Cr2O3	CoO
104	*1.5520*	53.83	8.86	0.02	0.06	12.90	8.82	0.00	1.37	1.36	0.50	1.49	9.89	0.10	0.02	0.00	0.00	0.00	0.69	0.07	0.03	0.00	0.00	0.00	0.00
105	*1.5322*	58.90	9.12	0.00	3.31	12.90	8.98	0.00	3.49	0.00	0.51	0.00	0.95	0.52	0.00	0.00	0.75	0.00	0.26	0.05	0.27	0.00	0.00	0.00	0.00
106	*1.5274*	62.95	8.87	0.01	0.07	2.05	8.82	0.00	3.65	1.36	0.50	0.00	9.83	0.51	0.00	0.00	0.07	0.00	0.70	0.62	0.00	0.00	0.00	0.00	0.00
107	*1.5448*	57.09	9.04	0.00	3.16	12.83	8.96	0.00	1.35	1.35	0.00	0.01	0.94	0.52	2.98	0.00	0.84	0.00	0.26	0.68	0.00	0.00	0.00	0.00	0.00
108	*1.5512*	59.94	6.06	3.09	3.40	2.06	8.97	0.00	1.31	0.07	0.50	0.00	10.09	0.51	3.02	0.00	0.07	0.00	0.25	0.64	0.03	0.00	0.00	0.00	0.00
109	*1.5629*	50.61	9.33	2.79	0.00	12.84	5.87	0.00	3.55	0.00	0.00	1.20	9.68	0.46	2.89	0.02	0.00	0.00	0.19	0.59	0.00	0.00	0.00	0.00	0.00
110	*1.5493*	57.21	6.09	2.82	0.05	12.74	8.95	0.00	3.51	1.41	0.50	1.46	0.93	0.10	2.96	0.00	0.05	0.00	0.25	0.70	0.28	0.00	0.00	0.00	0.00
111	*1.5359*	66.26	9.27	2.96	3.22	2.02	6.03	0.00	1.35	1.43	0.50	1.47	1.00	0.51	2.99	0.00	0.00	0.00	0.69	0.02	0.28	0.00	0.00	0.00	0.00
112	*1.5388*	58.04	9.05	3.09	3.44	2.06	8.89	0.00	1.33	0.04	0.00	1.46	10.04	0.10	0.02	0.00	0.78	0.00	0.70	0.66	0.30	0.00	0.00	0.00	0.00
113	*1.5540*	52.99	6.51	0.00	0.00	12.82	8.77	0.00	3.43	0.00	0.00	1.20	9.59	0.48	2.82	0.02	0.63	0.00	0.53	0.00	0.21	0.00	0.00	0.00	0.00
114	*1.5276*	64.75	6.12	2.92	0.08	12.85	6.06	0.00	1.34	1.43	0.50	0.01	0.95	0.51	0.00	0.00	0.80	0.00	0.71	0.70	0.28	0.00	0.00	0.00	0.00
115	*1.5219*	67.87	9.27	0.01	3.34	1.99	6.06	0.00	3.46	0.00	0.50	1.44	0.99	0.09	2.89	0.00	0.79	0.00	0.68	0.60	0.00	0.00	0.00	0.00	0.00
116	*1.5356*	59.50	8.99	3.17	0.05	2.06	8.89	0.00	1.33	1.40	0.00	0.01	10.16	0.10	3.04	0.00	0.73	0.00	0.25	0.03	0.31	0.00	0.00	0.00	0.00
117	*1.5436*	60.64	6.18	2.92	3.38	12.78	8.96	0.00	1.36	0.04	0.00	1.48	0.95	0.52	0.00	0.00	0.00	0.00	0.71	0.08	0.01	0.00	0.00	0.00	0.00
118	*1.5126*	69.91	5.65	0.00	0.00	1.95	5.89	0.00	1.39	0.00	0.51	2.03	10.10	0.55	0.00	0.04	0.68	0.00	0.20	0.76	0.35	0.00	0.00	0.00	0.00
119	*1.4827*	82.85	6.06	0.00	0.00	1.94	6.54	0.00	1.23	0.00	0.00	0.00	1.05	0.09	0.00	0.04	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00
120	*1.5310*	62.75	16.00	0.00	8.27	0.00	0.83	3.31	4.90	3.46	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00
121	*1.5076*	78.00	13.00	0.00	5.00	0.00	0.00	3.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
122	*1.5105*	71.20	13.00	0.00	5.00	0.00	2.00	3.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00
123	*1.5383*	62.80	17.00	0.00	11.00	0.00	0.00	3.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.60	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
124	*1.5148*	66.60	17.00	0.00	5.00	0.00	0.00	3.00	6.00	1.00	0.00	0.00	0.00	0.00	0.00	0.60	0.60	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00
125	*1.5338*	59.14	17.50	0.00	11.26	0.00	2.06	3.05	6.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
126	*1.5487*	55.17	14.34	0.00	12.65	0.00	2.20	3.39	6.41	4.94	0.00	0.00	0.00	0.00	0.00	0.69	0.01	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00
127	*1.5259*	64.43	17.75	0.00	4.92	0.00	2.06	9.08	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00
128	*1.5386*	61.70	13.46	0.00	11.52	0.00	2.05	9.06	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.66	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
129	*1.5367*	57.80	17.00	0.00	11.00	0.00	0.00	9.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00

Obs#	*Ref. Indx.*	SiO2	Na2O	PbO	CaO	BaO	K2O	B2O3	Al2O3	MgO	Li2O	ZnO	SrO	TiO2	ZrO2	Fe2O3	F	MnO	Sb2O3	CeO2	As2O3	SO3	SeO2	Cr2O3	CoO
130	*1.5376*	54.10	14.01	0.00	13.81	0.00	0.00	9.52	6.35	1.14	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00
131	*1.5240*	55.40	17.00	0.00	5.00	0.00	2.00	9.00	6.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
132	*1.5241*	61.40	13.00	0.00	5.00	0.00	0.00	9.00	6.00	5.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
133	*1.5155*	68.40	18.91	0.00	5.54	0.00	2.18	3.23	0.00	1.02	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00
134	*1.5312*	71.20	13.00	0.00	11.00	0.00	0.00	3.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00
135	*1.5200*	67.40	17.00	0.00	5.00	0.00	2.00	3.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
136	*1.5116*	68.80	13.00	0.00	5.00	0.00	2.00	3.00	6.00	1.00	0.00	0.00	0.00	0.00	0.00	0.60	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
137	*1.5212*	62.51	17.95	0.00	5.32	0.00	0.00	3.03	6.40	4.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00
138	*1.5343*	61.03	13.38	0.00	11.59	0.00	0.00	3.06	5.88	4.43	0.00	0.00	0.00	0.00	0.00	0.04	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
139	*1.5218*	67.40	17.00	0.00	5.00	0.00	0.00	9.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
140	*1.5205*	66.60	13.00	0.00	5.00	0.00	0.00	9.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.60	0.60	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00
141	*1.5366*	67.05	14.55	0.00	5.47	0.00	2.16	9.72	0.00	1.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
142	*1.5185*	63.80	13.00	0.00	5.00	0.00	2.00	9.00	6.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00
143	*1.5397*	55.40	17.00	0.00	11.00	0.00	0.00	9.00	6.00	1.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
144	*1.5434*	48.60	17.00	0.00	11.00	0.00	2.00	9.00	6.00	5.00	0.00	0.00	0.00	0.00	0.00	0.60	0.60	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00

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