Measurement of Neutrino's Magnetic Monopole Charge

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Abstract

If there are magnetic monopoles in the universe, the magnetic charge will be a conserved quantity like the electric charge. And if the neutrino is magnetic monopole, the neutron must also have magnetic monopole charge due to the charge conservation law and the Earth will also show the sign of having magnetic monopole property as well. To test and measure the collective magnetic monopole charge of the neutrons from the Earth, we used the two different well-balanced rod magnets of high magnetic strength made of Neodymium. Upon test, consistent downward tilting on the south pole side of the rod magnet has been observed when the measurement was performed in Cuenca Ecuador where the vertical component of the geomagnetic dipole field of the Earth is minimum, indicating that the Earth has net magnetic monopole charge of north pole kind. From this observation, we conclude that at least the electron neutrino which is a byproduct of weak decay of the neutron must be magnetic monopole. Detailed measurement process is presented, and the physical consequences of the result are discussed in detail.

Introduction

In 1988, J.J. Steyaert published the conference paper titled "The Neutrino as a Tachyonic Non-charged Light Magnetic Monopole?" [1]. Alan Chodos et al discussed the subject in their paper "The neutrino as a tachyon" in 1985 [2] and E. Recami, on the same issues in 1978 [3] and more recently E J Jeong "Neutrinos must be Tachyons" in 1997 [4]. Much earlier, O.M.P. Bilaniuk, V.K. Deshpande and E.C.G. Sudarshan already discussed the possibility of tachyonic neutrinos in 1962 [5].

Dirac has theorized early that for electric charge to be quantized, magnetic monopole must exist [6]. Many years later in 1974 Polyakov [7] and 't Hooft [8] discovered that the existence of monopoles follows from quite general ideas about the unification of the fundamental interactions. Some GUTs [9], such as the Pati-Salam model [10] and superstring theory [11] predict the existence of magnetic monopoles as well.

Despite the ongoing measurements of the neutrinos mass, it seems like the mass of neutrinos has become more and more evasive, suggesting the possibility that neutrinos are tachyons. Recently in 2019, the joint experimental team of UK, South Africa, Spain, France and Brazil published the paper reporting that lightest neutrinos have upper bound mass 0.086eV with 95% confidence level [12].

Undoubtedly the questions if neutrinos are tachyons and if there are magnetic monopoles in the universe have been enduring mysteries in physics.

Now, we have two separate issues regarding neutrinos, one is if neutrinos are tachyons and the other is if neutrinos are magnetic monopoles as well while being tachyons. In this paper, we are trying to present new experimental evidence that neutrinos are light magnetic monopoles which may automatically prove the other issue that neutrinos are tachyons.

On the separate side of the note, the possibility of magnetic monopole tachyonic neutrinos comes from a rather simple gedanken experiment that provides us with a remarkably interesting picture of the vacuum in the universe.

Because of the symmetry in the theory of electricity and magnetism between electric and magnetic phenomenon, traveling magnetic monopole can create spiraling electric field along its path just like traveling electron creates spiraling magnetic field along its path. The electric fields created by the fast and randomly traveling magnetic monopole charges make it possible to visualize the space filled with tightly balanced electric field in the macroscopic scale but also profusely fluctuating in the microscopic scale [13].

It is not difficult to expect that electromagnetic wave can travel through this rigidly balanced electric field filled vacuum of the space. Local disturbance on the balanced electric field will propagate throughout the space like a ripple in the calm sea.

On the other hand, in the microscopic scale, the chaotic electric field will make the position and momentum of the free electron placed in zero gravity completely uncertain. In this case, the probability of the electron initially located in vacuum at $\vec{x} = 0$ and t=0 to be found later at the same location will decrease rapidly as time progresses.

What this means is that the hypothesis of tachyonic magnetic monopole neutrinos can account for both the mystery of the light propagation in vacuum as well as the mechanical origin of quantum mechanics. These results of gedanken experiment make it a demanding task to prove the conjecture that the neutrino could indeed be magnetic monopole tachyon.

Since a neutron decays into a proton, an electron and a neutrino, it is possible that individual neutrons carry magnetic monopole charges of small quantity as well because magnetic charges must be conserved in the process of beta decay just like the electric charge is conserved in the same process, unless magnetic charge can be created from the

nothingness in the beta decay process of individual neutron that had zero initial magnetic charge, the possibility of which is not supported by any known physics.

Experiment Principle

So, here the journey to measure the strength of the magnetic monopole charge of the neutrons has begun. If neutrons are magnetic monopoles, the earth which has about half of its mass consists of neutrons will also show the sign by pulling the perfectly balanced dipole magnetic rod and make it to tilt to one pole side. The only problem is that the Earth has dipole geomagnetic field that has a vertical component from the surface that can mimic the effect of magnetic monopole effect. In reality, it has been found that the Earth's geomagnetic field, as shown in the picture [14], has not only the magnetic field that runs horizontal to the surface of the Earth but also has the vertical component of the magnetic field in both the north and south hemispheres of the Earth that will obscure data intended to measure only the magnetic monopole effect..

So, the perfectly balanced magnetic compass tends to tilt toward one side in both northern and southern hemispheres without any monopole magnetic field effect. This is the reason it was decided that the equator is the best place to test the hypothesis of magnetic monopole neutron on the Earth.

After carefully weighing each of the both halves of the long dipole magnet made of neodymium and balancing the weight on the precision scale, the magnet is placed on the pivot made of a thin and tight string of negligible thickness at the center of the dipole magnet. If the earth does not have any magnetic monopole charge, the separately balanced neodymium magnetic rod should stay balanced by remaining in the horizontal position. However, it is observed that the strong neodymium magnet rod tilts consistently to one side no matter which direction the magnetic rod is placed in the equator.

By carefully measuring the force needed to separate the two half sections of the magnets to determine the magnetic strength and also by measuring the tilting weight, the strength of the collective magnetic monopole charge of the neutrons of the Earth could be measured.

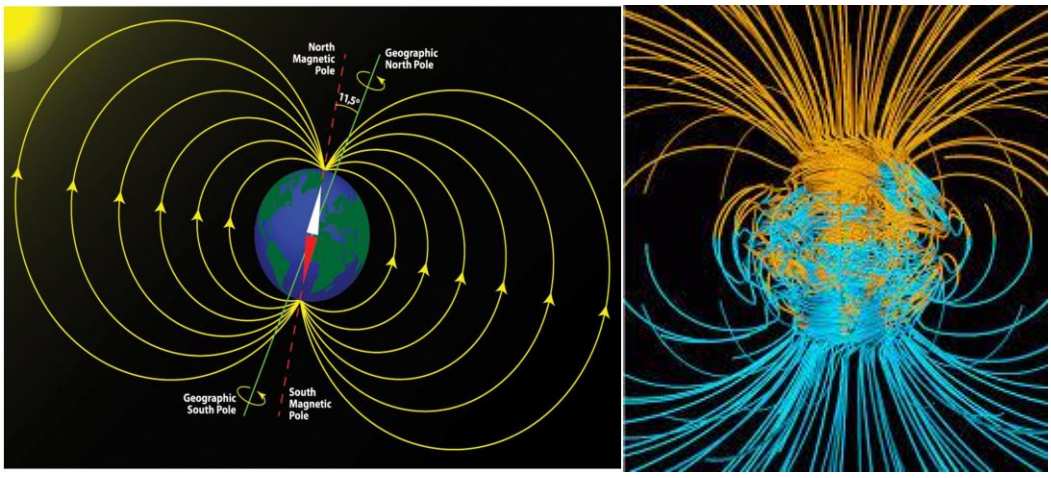
Analysis of Experimental Data

When a perfectly balanced cylindrical magnet of length 18.6 cm, diameter 10 mm, measured magnetic strength 454mT tilts to one side, the tilting force must come from the magnetic monopole charge of the earth only if the vertical dipole geomagnetic force can be eliminated. This is the fundamental assumption. When the tilting force is measured in the almost horizontal position using the precision scale, the force divided by two will be the result of the Earth magnetic monopole interacting with each poles of the dipole magnet. The essential problem is to find the location on Earth that the vertical dipole geomagnetic field is virtually negligible. Otherwise, the measurement will be tainted by

error caused by the vertical component of the dipole geomagnetic force. The computer simulated geomagnetic field reversal [14] shows the general profile of the chaotic dipole magnetic field on the Earth. It can be seen from the two pictures that there are limited regions in the equator that there is little to no vertical component of the geomagnetic field that is suitable place for the experiment.
The methodology of measuring the monopole magnetic charge of the earth depends on finding the right geographical location to make the critical measurement instead of taking large amount of data from random places and then take an average of it. Hence, we decided to choose a location in Ecuador and a city close from the equator. And it happens to be Cuenca Ecuador. In October 2018, we traveled to Cuenca equipped with two sets of long neodymium cylindrical magnets, precision magnetometer, precision scale and a well thought out balancer. In fact, it could have been Quito as well.

The coordinate location where measurement was made is (-2.899350, -78.989264) at Avenue Gonzalez Suarez and Calle Jacinto in Cuenca Ecuador.
The model used to measure the magnetic monopole charge of a neutron is taking the neodymium dipole magnet rod of length L where one side has N magnetic charge and the other end S magnetic charge of same magnitude like in the case of an electrostatic dipole. The earth as a monopole magnet exerts magnetic force onto this dipole magnet by pulling down on one side and pushing up the other when the dipole magnet is held up horizontally at the center by a tight string of negligible thickness. By measuring the weight tilting on the south pole side of the magnet at horizontal position, we estimate it will be a close value of monopole earth magnet pulling and pushing test magnet.

Since the magnetic rod is balanced on both the right and left sides by using the precision scale separately, we know that if there is no additional external force, the dipole magnetic rod must maintain the horizontal balance. And if the dipole magnetic rod does tilt and does it consistently, we know there is something in the Earth that is monopole magnetic in character.
In elementary particle physics, as we have discussed early the neutrino is still mysterious particle that has many surprises hidden in secret. If consistent tilting happens on the balanced test dipole magnet, it will be enough to prove that the earth is indeed a magnetic monopole coming from the accumulative magnetic monopole effect of the neutrons.



[14]

The above pictures of the geomagnetic field lines show that in the northern and southern hemispheres the vertical component of the magnetic field is present because the geomagnetic field line is not strictly horizontal to the surface of the earth in those regions. This is the reason it is necessary to perform the experiment close to the equator as much as possible.

The next step is to measure how much strength does the magnetic monopole of the earth have and then calculate the estimate number of the neutrons in the entire earth and we will be able to obtain the magnetic charge of the individual neutron and subsequently that of the individual neutrino.

Table (4) is the measurement table for the two test rod magnet 1 and 2. The pulling force F_1 is measured at the moment the two separate half of the test magnets are being separated and they are used to calculate the dipole magnet strength of the two test rod magnets. It turns out that using the magnetic flux density measurement data and converting it into the strength of the dipole magnets is not reliable compared to using the results from the direct measurement of the magnetic charge strength from the pulling force at the separated distance r_1. F_2 is the measured tilting weight on the precision scale when the test rod magnet is in horizontal position.

Using the relations for the force between the two long magnetic dipole rods placed face to face between north and south pole, which is identical to electrostatic force in form. [15]

$$F = \frac{\mu_0 q_{m1} q_{m2}}{4\pi r^2} \tag{1}$$

and by measuring the magnitude of the attractive force, for identical two 8.3/9.5 cm long dipole magnet which is half of the full length of the magnet, at the separation distance of 5.2/5.1mm, 1.2/0.65 Kg of weight equivalent of magnetic pulling force are observed (4).

$$F_1 = \frac{\mu_0 q_m q_m}{4\pi r_1^2} \tag{2}$$

If we write the magnetic monopole charge of the Earth Q_m, the force between the earth magnetic monopole charge and the dipole magnet becomes,

$$F_2 = \frac{2\mu_0 q_m Q_m}{4\pi R^2} \tag{3}$$

where the factor 2 comes from the two forces one from the attractive force between N-S and the other from repulsive force N-N on the opposite side of the test rod magnet.

The elevation at the test site of Cuenca Ecuador is 2.56 km above sea level.
So, $R = (6368 + 2.56)Km$, and the downward tilting weight measured at the horizontal position of the magnets is $0.78 gram$ and $0.52 gram$ respectively for the two test magnets on the micro scale.

Measurement Data from Two Cylindrical Rod Magnets (4)

Rod Magnet	length	diameter	F_1	r_1	F_2	B_0	Weight R/L
Rod Magnet 1	16.6 cm	12 mm	1.2 kg	5.2 mm	0.78 g	454 mT	71.55g/71.59g
Rod Magnet 2	19 cm	10 mm	0.65 kg	5.1 mm	0.52 g	413 mT	56.83g/56.75g

South pole side tilts downward for both the test Rod Magnet1 and Rod Magnet2, indicating that the earth is north magnetic monopole. "Weight R/L" is the weight of the half of each test magnet separately measured before assembling the two into the full length and r_1 is the distance measured between the two opposite poles when the attractive force F_1 between half of the same magnets is measured.

It must to be noted that the weight of the right and left side of the test magnets are measured separately in vertical position with S pole side down relative to the surface of the micro scale on top of three inch tall nonmagnetic foam to minimize the magnetic interference on the micro scale. In both cases, the difference in weight of right and left side of the rod magnet remained less than 0.08 gram and this weight difference is spread throughout the length of the magnets.

Hence, we have $Q_m = 2.7 \times 10^{16} Weber$ for the Earth's monopole magnetic charge of north kind measured by Rod Magnet1 and $Q_m = 2.6 \times 10^{16} Weber$ of same north kind measured by Rod Magnet2. We take the average of the two and $Q_m = 2.65 \times 10^{16} Weber$ for the magnetic monopole charge of the Earth of north kind.

To estimate the total number of neutrons on Earth to calculate the individual magnetic monopole charge of the neutron, we used the element table published by CRC handbook .
For 99.9 percent of the mass on Earth according to the element table [16],

%	Element	# Neutron/Proton	Weighted Average N/P
5.63	Iron	30/26	168.9/146.38
46.1	Oxygen	8/8	368.8/368.8
28.2	Silicon	14/14	394.8/394.8
2.33	Magnesium	12/12	27.96/27.96
8.23	Aluminum	14/13	115.22/106.99
4.15	Calcium	20/20	83/83

2.36	Sodium	12/11	28.32/25.96	
2.09	Potassium	20/19	41.8/39.71	
0.565	Titanium	26/22	14.69/12.43	
0.095	Manganese	30/25	2.85/2.375	
0.14	Hydrogen	0/1	0/0.14	(5)

Percentage of mass on earth: Neutron 50.7 %, Proton 49.3%
Mass of the earth: $5.972\times10^{24}\,Kg$, Mass of the neutron: $1.675\times10^{-27}\,Kg$.
Mass difference due to the isotopes is taken into account in each element's average atomic mass.

So, the best estimated number of neutrons on Earth is 1.81×10^{51}.

From this result, the single magnetic monopole charge of a neutron is calculated to be$1.46\times10^{-35}Weber$. The repulsive magnetic force between the matter objects is 1.2×10^{-13} times smaller than the attractive gravity force assuming the repulsive force between the equal weights of mass that has half of them consists of neutrons.

Assuming these tachyonic magnetic monopoles are responsible for quantum mechanical effect [13], the speed of tachyonic neutrino required to float the electron from the proton in hydrogen atom by its spiraling electric field created by the fast moving magnetic monopole charge m_ν can be written

$$\vec{E}=\frac{1}{4\pi\varepsilon_0}\frac{m_\nu\vec{\upsilon}\times\hat{r}}{r^2}=\frac{1}{4\pi\varepsilon_0}\frac{m_\nu\upsilon}{r^2}\quad\theta=90^\circ \tag{6}$$

which is expected from the formal equivalence of the known result

$$\vec{B}=\frac{\mu_0}{4\pi}\frac{q\vec{\upsilon}\times\hat{r}}{r^2} \tag{7}$$

for the magnetic field created by traveling electric charge q with velocity $\vec{\upsilon}$, assuming that Maxwell's equation permits faster than the speed of light travel for magnetic monopole particles without restriction. Since the electric field created by the traveling magnetic monopole neutrino must be strong enough to counteract the attractive electrostatic field from the proton

$$\vec{E}=\frac{1}{4\pi\varepsilon_0}\frac{e}{r^2} \tag{8}$$

By equating (6) and (8), the minimum speed of the magnetic monopole to stabilize hydrogen is given by

$$\upsilon = \frac{e}{m_\nu} \tag{9}$$

For electric charge of an electron $1.6\times10^{-19} Coulomb$ and the magnetic monopole charge $1.46\times10^{-35} Weber$, the speed of the magnetic monopole neutrino has to be at least $1.1\times10^{16} m/\sec$, which is 3.65×10^{7} times the speed of light to be able to float the electron and prevent it from collapsing into the proton in hydrogen and/or in all of the atoms because there is no dependency in r in the relation (9).

Since the speed of travel for the Fermi particle can not be a fixed value, and considering the general Gaussian distribution of statistical events, we can cautiously assume that the peak concentration of the tachyonic magnetic monopole particles distribution is at around 36 million times the speed of light while the minimum speed of tachyonic neutrinos will be the speed of light and there is no theoretical limit for the highest speed according to the mass energy relation in special relativity.

This repulsive force among magnetic monopole neutrons can be ignored in the macroscopic scale of secular mechanics and dynamical astronomy of the universe because the effect is 1.2×10^{-13} times smaller than that of Newtonian gravity. However, near the density of a blackhole singularity [17], the repulsive monopole magnetic force can not be ignored because it will prevent the size of the blackhole from going down to zero volume before reaching certain limit. This could provide a good theoretical starting point on the issue of what exactly caused the big bang.

Discussion

Conservation of Magnetic Monopole Charge from Neutron to Neutrino

We assumed here that the magnetic monopole charge of a neutron would be the same as that of a neutrino. In elementary particle physics, charge conservation law is known to be strictly observed, especially in the case of the electric charge. Therefore, there is no reason to suspect that the magnetic charge should not be conserved during the decay transition from the neutron to neutrino. Until any anomalous effect is observed, we will stick to the principle of magnetic charge conservation. In fact, electrons and neutrinos are treated as the same group of families in the electroweak theory of elementary particle physics. It is not out of ordinary in this respect that the neutrino can have its own magnetic monopole charge without disrupting the general flow of the electro-weak theory although it may need minor revision.

On the Issue of Different Flavors of Neutrinos

It is known that there are six types of neutrinos tau, muon, electron neutrinos and their antiparticles. However, we do not know how many tau and muon neutrinos are in the universe because tau and muon are not stable particles in isolation to be able to count how many of them were in existence. Super-Kamiokande experiment has reported that

the ν_μ / ν_e ratio has been calculated in detail with an uncertainty of less than 5% over a broad range of energies from 0.1 GeV to 10 GeV [18] for the evidence of oscillation of atmospheric neutrinos. We can expect there should be at least the same number of electron antineutrinos as the number of protons in the universe if each proton and electron came out of neutron beta decay. And since the neutrinos from tau and muon decay come out in pair with the antiparticles, the total net magnetic monopole charge in the universe still depends on the number of electron antineutrinos. The neutrino oscillation between flavors does not affect the total magnetic charge of the neutrinos.

As expected, the asymmetry in the number of electron neutrinos and antineutrinos in this universe has now become the major topic in elementary particle physics. When you thought you found the ultimate symmetry of the universe, there appears another glaring asymmetry staring at you asking for answers. Somehow this mystery may be solved if we assume that there is another universe entirely made of antimatters forming a completely normal universe having everything like in our universe including the neutrinos except that the neutrinos are the only particles that can commute and be shared between these two universes. This speculation is supported by the fact that CPT invariance of the universe is complete in elementary particle physics. The only difference is that in the antimatter universe, time must flow backward contrary to that of our universe.

Alternative Method to Detect Neutron's Magnetic Monopole Charge

In fact, one can imagine that this magnetic monopole charge could have been observed from neutron trajectory experiment. One may consider an experimental set up to detect the deviation of the motion of the neutron from straight trajectory coming out of double collimated exit affected by strong magnetic field or high electrostatic field set up 90 degree across its path. However, because of the extremely small magnitude of the magnetic monopole charge strength, the deviation of the path may be extremely small so that it may need extra strength magnetic field or electrostatic field to deflect the neutron beam and extreme precision measurement will be required to detect the passage deviation of the neutrons from the straight line. The magnetic monopole charge of the neutron is not the same as the magnetic moment of the neutron which represents the spin state.

The advantage of using the Earth for the measurement of magnetic monopole is in the fact that the Earth has such many neutrons to detect the minute effect caused by the huge number of small individual magnetic monopoles.

Permittivity of Free Space and Magnetic Monopole Charge Connection

Accurate determinations of Avogadro's number require the measurement of a single quantity on both the atomic and macroscopic scales using the same unit of measurement. This became possible for the first time when American physicist Robert Millikan measured the charge on an electron. The charge on a mole of electrons had been known for some time and is constant called the Faraday. The best estimate of the value of a Faraday, according to the National Institute of Standard and Technology is 96,485.3383 coulombs per mole of electrons. The best estimate of the charge on an electron based on

modern experiment is 1.60217653×10^{-19} coulombs per electron. If you divide the charge on a mole of electrons by the charge on a single electron you obtain a value of Avogadro's number of 6.02214154×10^{23} particles per mole [19].

The permittivity of Free Space is $\varepsilon_0 = 8.85\times10^{-12}$ Faraday/meter. And by coincidence, the magnetic monopole charge turns out to be the permittivity of Free Space divided by Avogadro's number.

$$8.85\times10^{-12}(Faraday/Meter)/6.02214154\times10^{23} = 1.47\times10^{-35}Weber. \quad (10)$$

It may be a pure coincidence, but it could also be a case to establish one more connection between the known macroscopic quantity and the new microscopic constant through Avogadro's number.

The fact that free empty space has any trait of electric field which is represented by the vacuum permittivity can not be understood without invoking some type of either uniform presence of electric charge or movements of undetectable monopole magnetic particles in space. Since there are no other indivisible electric charges other than electrons in the universe and since none have been detected in the empty space, the uninterruptable tachyonic magnetic monopole neutrinos make themselves as a perfect candidate for its cause.

Identity of Magnetic Flux

It has been a mystery in physics about what constitutes the magnetic flux in the permanent and electro-magnetic phenomenon. The magnetic fields in permanent magnets form a tightly closed loop with no obvious way of telling where it starts and where it ends. It looks like collimated stream of tachyonic magnetic monopole neutrinos traveling at the speed 36 million times the speed of light fit the bid perfectly.

The otherwise randomly traveling tachyonic magnetic monopole neutrinos are guided by the stream of the electrons moving inside the wire or in the atomic structure of the transition metals that allows the spin and orbital electrons to align themselves to accentuate the magnetic phenomenon. Wherever there are movements of electrons in coherent collective fashion, magnetic monopole tachyonic neutrinos flow perpendicular to their movement making a loop which constitutes magnetic flux. The reason magnetic flux loop does not get disconnected is because tachyonic magnetic monopole neutrinos are not, in the conventional sense, "material" particles.

Medium for Light Propagation

Assuming that these tiny magnetic monopole neutrinos zigzag the universe with incredible speed, and the number of them must be much larger than that of the electrons and/or the protons due to the muon and tau neutrinos, we can imagine that the space will no longer be free from massive entangled web of spiraling cylindrical electric field

produced by these massive number of magnetic monopoles. The reason for this expectation is due to the duality of Maxwell's equations between electric and magnetic phenomenon. In this picture, it is not difficult to imagine that the traveling magnetic monopole neutrinos random movements will create web of electric field in space, canceled macroscopically to be detectable, yet manifesting tremendous amount of chaotic and fluctuating electric field in the microscopic scale.

Because of the mutually repulsive magnetic force among themselves, neutrinos will be distributed evenly in space while moving incredibly fast and as such, macroscopic homogeneity of the directionally canceled electric field will be maintained in space. The seeming empty space becomes a tightly balanced rigid form of electric space ready to propagate ripple if the balance is disturbed at any local point in space. We have just identified a plausible medium for the propagation of light/electromagnetic waves in space.

After all, the widely known principle in physics that physical waves need a medium to propagate and the fact that electromagnetic wave is not an exception to this principle has been verified.

Mechanical Origin of Quantum Mechanics

Now, let's focus on the microscopic disturbance of the electric field caused by the tachyonic magnetic monopole neutrinos. Physicists have been baffled since the birth of quantum mechanics, why and how electrons do not collapse onto the nucleus considering the strong electrostatic force attracting each other. The unsatisfactory answer has been always "quantum mechanic forbids" electrons from falling into the nucleus. That is the end of the story because you cannot ask any further.

Suppose a single tachyonic monopole neutrino passes by the proton in consideration where the electron is about to collapse into it. The spiraling cylindrical electric field created by the tachyonic magnet monopole prevents the electron from falling into the proton by generating electric field perpendicular to the radial electrostatic field emanated from the proton. And consider that this process is unstopping because of the massive number of neutrino's incredibly fast motion by their nature. The tachyonic magnetic monopole neutrinos are the ones holding atoms in shape in the universe by creating quantum mechanical effect by their incessant motion.

Also, a single electron placed in empty space will not stay at the same location as time goes by because of the chaotic disturbance created by the motions of the tachyonic magnetic monopole neutrinos. The Planck's constant h must be related to the magnetic monopole charge of the neutrinos, their average speed and the number density in the space.

Philosophically, we have a unique and miraculous situation because the chaotic motion of tachyonic magnetic monopole neutrinos essentially creates the wonderful order of the atomic material world. What would be the chance that this kind of miracle can happen by accident?

The only discrepancy in this line of investigation is that the measured magnetic monopole charge of a neutron does not follow Dirac's prediction of $g = \frac{N}{2}\frac{\hbar c}{e}$ [20] where h is Planck's constant and N is an integer. The calculated Dirac's magnetic monopole charge is $N \times 0.99 \times 10^{-7}$ where N is an integer. However, if Dirac's magnetic monopole is taken for the magnetic monopole charge of the neutron, the repulsive magnetic force between material objects becomes too large to be ignored in the celestial mechanics. Newtonian mechanics will not work. There is a difference in the order of 10^{28} between Dirac's and the present report of the magnetic monopole charge $1.46 \times 10^{-35} Weber$. Dirac's magnetic monopole looks more like the value $g = N\frac{\mu_0}{4\pi}$ where $\mu_0 = 4\pi \times 10^{-7} H/m$ is vacuum permeability.

This result brings in the relation $h = \frac{\mu_0 e}{c}$ and by assuming $\mu_0 = n_0 m_v$ where m_v the magnetic monopole charge of the neutrino and n_0 is the vacuum magnetic monopole flux number density of the neutrinos in a given volume, we have recovered the form $m_v = \frac{1}{n_0}\frac{hc}{e}$ for the neutrino magnetic monopole where the constant $n_0 = 8.6 \times 10^{28}$.

Possible Cause of Gravity

In a flat universe where there is no interference for the passage of the tachyonic neutrinos, the density of the neutrinos will be uniform and homogeneous because of their extremely fast movement to compensate any local irregularity of the density to maintain the lowest energy state of the entire vacuum and as such the space will be free of gravity which is typically termed as isotropic asymptotically free space.

Just like in the case of atmospheric vacuum which is subjected to an enormous amount of atmospheric pressure, the vacuum of tachyonic neutrinos in the space becomes a center of gravity and the movement of the tachyonic neutrino gas tends to compress material objects together to reduce the overall volume that they occupy in the space. As such, spherical form becomes a standard structure of the stellar objects as well as the foundation of Newtonian mechanics. The reason for blockings of the passage of the neutrinos by nucleons is because neutrons have the same magnetic charge as neutrinos thereby they will repel against each other and protons have positive electric charge that can certainly generate interference with the electric field created by the fast moving tahcyonic neutrinos as well.

It is interesting to note that the reason for the interference of the passage of the tachyonic neutrinos by the nucleons is different for protons and neutrons, protons by the spiraling electric field of the neutrinos and neutrons by the direct repulsive magnetic force caused by the traveling magnetic monopole neutrinos. At least in both cases, they cause

interference for straight line passage of the neutrinos that can be the fundamental cause of the effect of gravity.
Gravity is caused by the magnetic monopole tachyonic neutrinos attempt to maintain the uniform density and the lowest energy state throughout the universe by their incredibly fast speed of travel.

This behavior of the tachyonic magnetic monopole neutrinos in the universe is somewhat similar to how air molecules are trying to avoid vacuum in the atmospheric space by moving the air and clouds along the density gradient of the atmospheric pressure to fill up the relative void on the surface of the Earth which sometimes results into violent storms. Considering the enormous speed of the tachyonic magnetic monopole particles, their ability to equalize the neutrino density in the homogeneous and isotropic universe would be considered instant in the vast region of the space. The issue on the cause of Hubble's expanding universe [21] and the dark energy has become rather mundane at this point because tachyonic magnetic monopole neutrinos repelling force will make the universe to go further apart from each other. The real issue is if this phase of expansion will go on forever or will it change into a phase of contraction by some other unknown physical principle.

Conclusion

Starting from the two assumptions that neutrinos are 1, tachyonic particles that carry 2, magnetic monopole charges and no other additional assumptions, we could reduce one assumption by physically measuring the magnetic monopole charge of the neutrinos indirectly by measuring the magnetic monopole charge of the neutrons of the Earth. We assume that magnetic charge conservation holds from neutron to neutrino.

At this point, the only left experimentally untested assumption is if the neutrino is indeed tachyon.

However, considering the simplicity of a physical theory based on the principle of Occam's razor that explains multiple mysteries with only one additional untested assumption and at the same time without violating the ones that have already been proven to be correct, we submit the result for scrutiny.

Following mysteries in physics are unraveled when tachyonic magnetic monopole neutrino hypothesis is implemented in accordance with the detection of magnetic monopole charges in neutrons.

1. Where about of the long sought magnetic monopole particle in elementary particle physics.
2. Identification of the physical nature of the magnetic flux in magnetic phenomenon,
3. Fulfillment of the symmetry in Maxwell's theory between electricity and magnetism
4. Identification of the physical nature of the medium that allows light propagation in vacuum

5. Provides plausible mechanical cause of quantum mechanics.
6. Identification of the density variation of tachyonic magnetic monopole neutrinos in space as a possible cause of gravity.
7. Lastly, it is revealed that there is a connection between the weak interaction and magnetic monopole that they always appear in conjunction with neutrinos.
As J.J. Steyaert hinted in his paper [1], tachyonic pair creation could be an electromagnetic phenomenon with light magnetic monopole charge having tachyonic properties.

It is difficult to measure the speed of a particle traveling near or over the speed of light due to the unpredictability of the detectors' electronic components and the corresponding device circuit's delayed response time. It is out of question to detect the speed of a particle traveling at 36 million times the speed of light with our current electronic equipments.

As such, although indirect regarding the reality of tachyonic property of neutrinos, it seems that the overall concept of tachyonic magnetic monopole neutrinos has enormous theoretical advantage of unraveling many mysteries of the physical universe.

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