Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 February 2021 doi:10.20944/preprints202102.0392.v1

Origins of the time, mass, energy, wave function, electric charges, and magnetic monopoles

Jae-Kwang Hwang
JJJ Physics Laboratory, Brentwood, TN 37027 USA

Abstract;
Origins of the time, mass, electric charges and magnetic monopoles are explained. The energies, electric charges and magnetic charges of the particles are defined as $E = c\Delta t\Delta V$ and $|q| = c\Delta t = E/\Delta V$, and $|q_m| = c^2\Delta t$, respectively, for the 3-D quantized spaces warped along the time axis direction of ct in the 4-D Euclidean space. The energy (or mass) and charges (or electric charges and magnetic charges) are the vectors along the time axis of ct in the 4-D Euclidean space. This new concept is closely connected to the wave function of the quantum mechanics. The electric charges, magnetic charges and energies have the property of the space direction independence. Magnetic monopoles (charges) are the force carrying bosons with the inside electric field time loop. Electric monopoles are the elementary fermions. Photon space fluctuations are explained with the quantized magnetic charges.

Key words; Quantized magnetic monopoles, origins of the physical constants, Photon space fluctuations, 3-D quantized space model, 4-D Euclidean space.

1. Introduction

In modern physics, there are several physical constants like mass (gravitational charge), energy, electric charge and magnetic charge. Here $E = mc^2$. The origins of these physical constants are not clearly explained in the standard model. It will be interesting to search for the origins of these

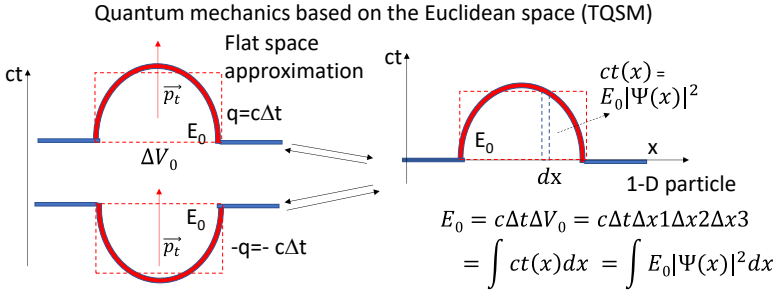

Fig. 1. Wave function of the particle is explained in TQSM. Note that the absolute time of ct is used in the wave function.

physical constants that could require the revolutionary ideas beyond the standard model. In the present work, the energies and electric charges of the particles are defined as $E = c\Delta t\Delta V$ and $|q| = c\Delta t = E/\Delta V$, respectively, for the 3-D quantized spaces warped along the time direction of ct in terms of the new 3-dimensional quantized space model (TQSM) in Fig. 1. The TQSM model is

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 February 2021 doi:10.20944/preprints202102.0392.v1

based on the 4-D (dimensional) Euclidean space. The x1x2x3 space is the 3-D quantized space with the quantized time length of $c\Delta t_q$. The 3-D quantized x1x2x3 space is the flat photon space with $c = \Delta x4/\Delta t$ moving along the time axis of ct of the unquantized 4-D Euclidean space in Fig. 2. This is called as the 3-D quantized space model (TQSM) in the present work. The basic ideas are explained in Refs. [1,2] and the following papers.

In the standard model and general relativity, the matters and space are separated. The matters are moving on the 4-D Minkowski space-time. The origin of the matters is one of the unsolved problems. How the matters have the masses and how the matters are separated from the space are the interesting questions. In the present work, it is suggested that the matters are the part of the space-time based on the 4-D Euclidean space as follows. The fourth dimensional (x4) axis is taken as the time axis of ct in Fig. 2. The matters are originated from the warping of the flat space along the time axis. The flat space is defined as the 3-D Euclidean space with the quantum time width of $\Delta x4_q = c\Delta t_q$. The energy is defined as the 4-D space volume of $E = c\Delta t\Delta V$. The matters get the masses from the warping of the flat space. Therefore, the mass of the matter or particle is defined

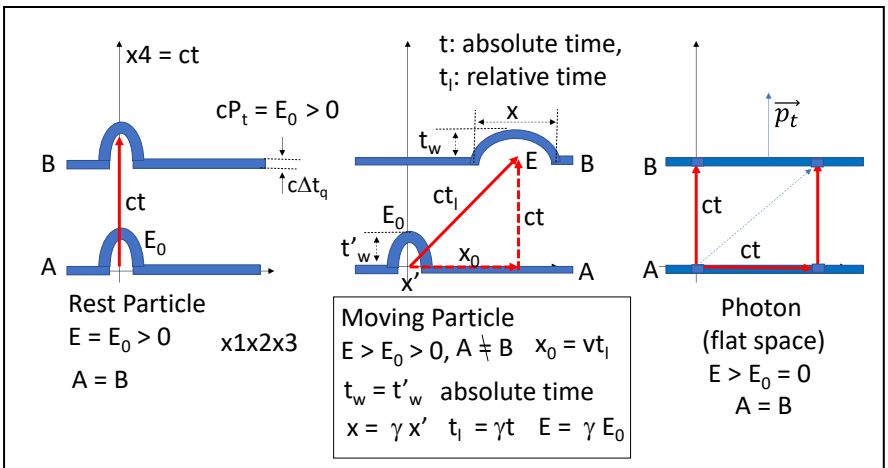

Fig. 2. Rest particle, moving particle and photon are compared. The relative time used in the Lorentz transformations is ct_l and the absolute time is ct in the TQSM.

as the 4-D volume of the warped space. The warped space has the non-zero mass and non-zero energy with the relation of $E=mc^2$. The flat space has the zero-rest mass and non-zero energy. Under this assumption, the flat space corresponds to the photon. The warped spaces correspond to the particles and matters. This is the origin of the mass in terms of the present 3-D quantized space model [1,2].

The rest mass of the photon is zero. We observe the massive particles with the 3-D space volumes. The massive particles and massless photons occupy the 3-D volume on the 3-D Euclidean space. Then, what is the difference between the massless photon and massive particles? The answer to this question comes from the 4-D Euclidean space. It is thought that the massive particles take the 4-D warped space that is the warped version of the flat photon space along the time axis of ct. The 4-D volume of the 4-D warped space is the rest mass energy of the massive particle. Under this new idea, the flat photon space has the zero-rest mass energy. The flat photon space has the 3-D quantized space of the physical x1x2x3 space with the very small-time (quantum time) width of

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 February 2021 doi:10.20944/preprints202102.0392.v1

$c\Delta t_q$. The physical 4-D Euclidean space is the 4-D quantized space-time. The 4-D quantized space-time is the 3-D quantized space of the physical x1x2x3 space with the very small-time (quantum time) width of $c\Delta t_q$ [1].

In the 4-D Euclidean space, all axes have the positive and negative directions. However, only the space momenta along the 3-D space axes have been studied for both positive and negative directions in the physical world. For the time axis, only the positive axis in the 4-D Minkowski space has been taken into consideration because we observe only the positive time direction since the big bang [1]. From the viewpoint of the 4-D momenta on the 4-D Euclidean space, the time axis should have the positive and negative time directions [1]. If the negative time direction is allowed in the physical point of view, the well-known big bang theory should be changed to include the negative time direction. In this case, the partner universe with the negative time momentum is allowed. Note that the negative energy and negative mass are allowed from the negative time momentum. This means that the big bang is the pair creation of our matter universe and partner anti-matter universe which are the 3-D quantized spaces. This new interpretation completes the big bang theory in terms of the conserved CPT symmetry. It explains why our universe is the matter universe [1,2].

And in general relativity, the particle and space-time are separated [3,4]. And the massive particle changes and warps the shape of the space-time and the massive particle moves on the warped space-time by creating the space-time fluctuations called as the gravitational waves. This is the gravitation interaction in terms of the general relativity. And the associated time (t_l in the present work) is defined on the Minkowski space. The time (t_l) is changing and transformed following the Lorentz transformations in the special relativity. Therefore, the space-time is very dynamic because the relative time and space is changing all together.

The time (defined as t_l in the present work) in the special relativity takes one axis of the 4-D Minkowski space. This time is the relative time changing as a function of the moving velocity of the particle. This time is sometimes dealt as the increasing entropy of the universe. The Lorentz transformations (LT) in the special relativity theory describe the velocity dependence of the time (t_l) and space (x). For example, $c^2\Delta\tau^2 = c^2\Delta t_l^2 - \Delta x^2$. Here, τ is called as the proper time based on the Minkowski space. The concept of the time should be different in the 4-D Euclidean space in the present work. The time (defined as t in the present work) takes one axis of the 4-D Euclidean space. In this case, the time (defined as t in the present work) is the absolute time that is not dependent on the velocity of the particle in Fig. 2. Here, $\Delta d^2 = c^2\Delta t^2+\Delta x^2$. If $\Delta d^2 = c^2\Delta t_l^2$ and $c^2\Delta t^2 = c^2\Delta\tau^2$, the 4-D Minkowski space can be connected to the 4-D Euclidean space. Then, the time (defined as t_l in the present work) used in the special relativity is the relative time corresponding to the distance (Δd) in the 4-D Euclidean space. And the proper time used in the special relativity is the absolute time in the 4-D Euclidean space. Therefore, based on the 4-D Euclidean space, the 4-D space distance of $\Delta d = c\Delta t_l$ should be dependent on the particle velocity. But the absolute time of ct is not dependent on the particle velocity as shown in the time width of $t_w = t'_w$ in Fig. 2. The absolute time of our universe is constantly flowing with the constant light velocity of $c = \Delta x4/\Delta t$ along the x4 axis in the 4-D Euclidean space as shown in Figs. 1 and 2. It is because our universe is the photon space. The absolute time is just the constant flowing of the photon space with the

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 February 2021 doi:10.20944/preprints202102.0392.v1

light speed of c along the x4 axis. The particle cannot be accelerated or decelerated along the absolute time axis of ct because our universe is the photon space with the constant light velocity of $c = \Delta x4/\Delta t$ along the absolute time axis of ct. If the particle moves along the ct_l axis in the Euclidean space, the associated relative time (ct_l) and 3-D space distance (x) are related with the particle velocity of $v = \Delta x/\Delta t_l$ following the Lorentz transformations that are expressed based on the 4-D Euclidean space. In Fig. 2, the absolute time of ct corresponding to the relative time of ct_l can be expressed as the function ($t_l = \gamma t$) of v, too.

As a matter of fact, in Fig. 1 the particle wave functions in the quantum mechanics use the time which does not follow the special relativity. It is strange because the relative time following the special relativity should be used. But this question can be solved in the present work based on the 4-D Euclidean space if the particle wave functions are the warped photon space as shown in Fig. 1. The particle wave functions use the absolute time of ct and the particle movement can be described by the Lorentz transformations (LT) in the 4-D Euclidean space in Fig. 2. The flat photon space does not follow the Lorentz transformations. And the particle defined as the warped space moves following the Lorentz transformations. If we live on the 3-D photon space in the x1x2x3 space, x4 = ct and $\Delta x^2 = \Delta x1^2 + \Delta x2^2 + \Delta x3^2$. And $c^2\Delta t_l^2 = c^2\Delta t^2 + \Delta x^2$.

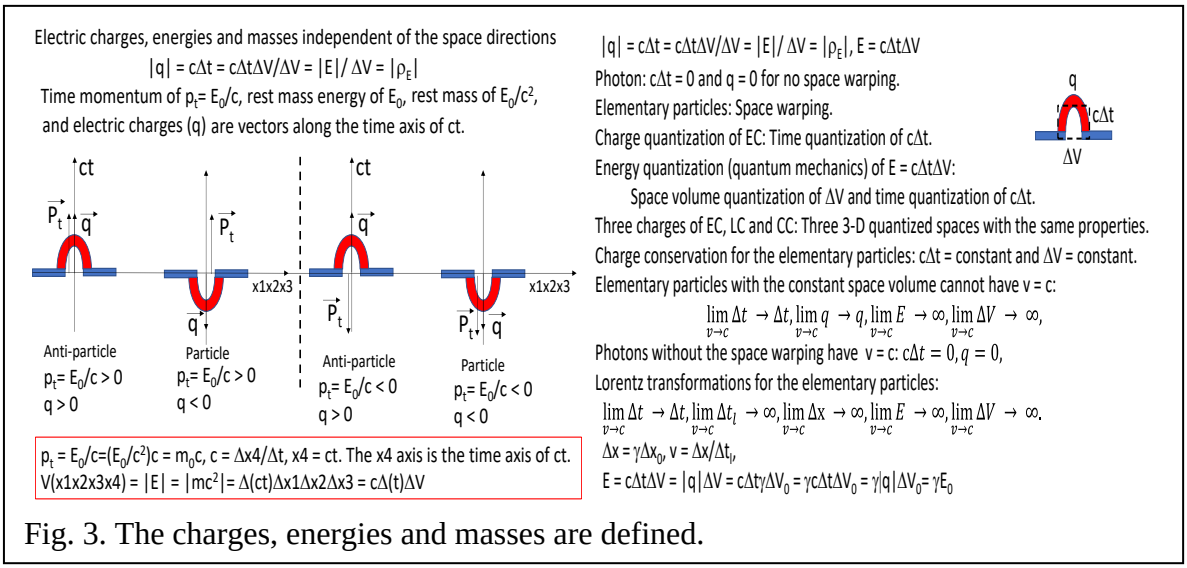

Fig. 3. The charges, energies and masses are defined.

The elementary particles at rest have cΔt = constant and ΔV_0 = constant that makes the elementary particles to have the constant rest masses. The rest mass energy of the elementary particle is defined as $E_0 = c\Delta t\Delta V_0$.The energies ($E=\gamma m_0c^2$) and space volumes of these particles are changed following the Lorentz transformations in Figs. 1 and 2. The charges of these particles are conserved if the charges are defined as |q| = cΔt = E/ΔV = constant. In quantum mechanics, the energy and charge of the elementary particle are quantized. The energy (or mass) and charges (or electric charges and magnetic charges) are the vectors along the time axis of ct in the 4-D Euclidean space. Therefore, $\vec{E} = E\hat{t}, \vec{q} = q\hat{t}$, and $\overrightarrow{q_m} = q_m\hat{t}$. Because these quantities are independent of the 3-D space directions, these are called as the physical constants in the 3-D x1x2x3 space. This is called as the property of the space direction independence in the present work. The time momentum of E_0/c is the constant that can be described as a vector of $\overrightarrow{P_t} = P_t\hat{t} = \frac{E_0}{c}\hat{t}$. Note that all physical constants along the time axis have the negative value along the negative time direction. Therefore, the masses, energies, and charges have the negative values in Fig. 3. These are closely

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 February 2021 doi:10.20944/preprints202102.0392.v1

related to the time conversion (T) symmetry and charge conversion (C) symmetry along the time (ct) axis. It is well known that the parity (P) is the space conversion symmetry along the 3-D space axes. Therefore, the CPT symmetry is the space conversion symmetry along the 4-D Euclidean space axes. In this case, because our quantized 3-D space (x1x2x3 space) is the matter universe flowing along the positive time direction of ct, from the T symmetry the partner quantized space (x1x2x3 space) is required as the partner anti-matter universe along the negative time direction of ct. Our matter universe and partner anti-matter universe should be created from the big bang. The

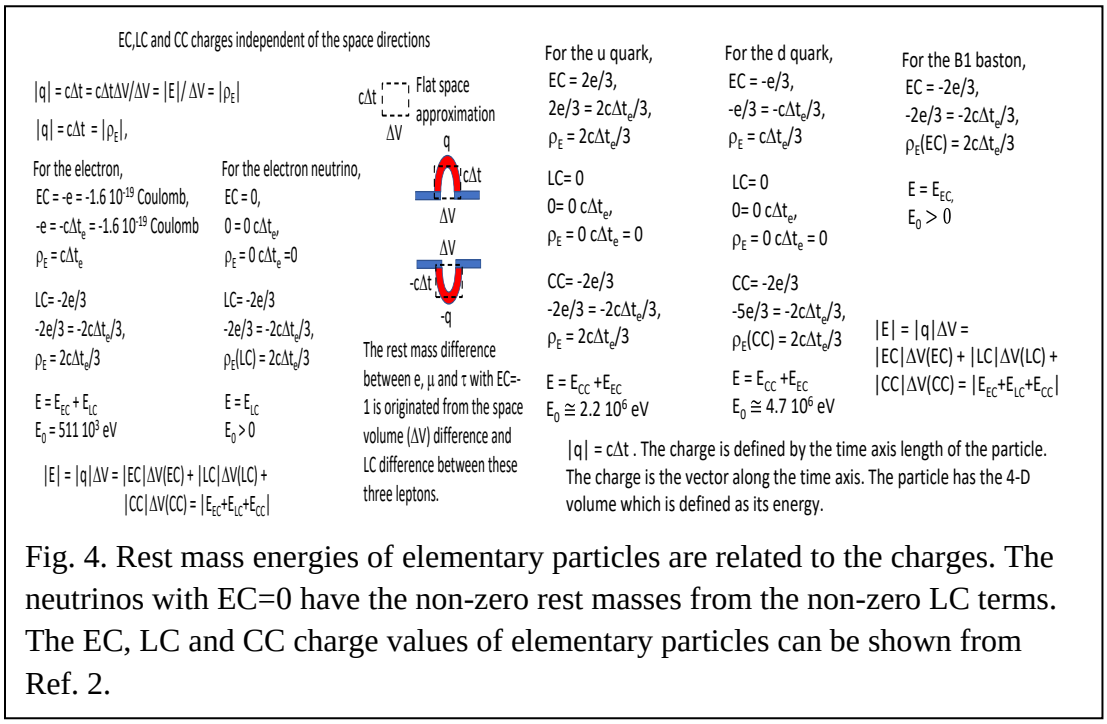

Fig. 4. Rest mass energies of elementary particles are related to the charges. The neutrinos with EC=0 have the non-zero rest masses from the non-zero LC terms. The EC, LC and CC charge values of elementary particles can be shown from Ref. 2.

time conversion (T) symmetry connects the particle with the positive energy in our matter universe and the anti-particle with the negative energy in the partner anti-matter universe. The x1x2x3 space is the 3-D quantized space with the quantized time length of $c\Delta t_q$. The 3-D quantized x1x2x3 space is the flat photon space with $c = \Delta x4/\Delta t$ moving along the time axis of ct of the unquantized 4-D Euclidean space. This is called as 3-D quantized space model (TQSM) in the present work.

Of course, the time conversion symmetry (T) in the special relativity and standard model is the time conversion symmetry along the time axis of ct_l in the 4-D Minkowski space. This T symmetry connects the past time direction and future time direction of the particles. In this case, the time of ct_l is always flowing toward the positive time direction. There is no negative time direction. It is because the 4-D Minkowski space was created at big bang and the time of ct_l started from the big bang. Therefore, in the special relativity and standard model, only the positive time of ct_l exists. The time axis of ct_l is the relative time axis defined following the moving particle. The time axis of ct_l is always changing with the velocity ($v = \Delta x/\Delta t_l$) of the particle. The time of ct_l is called as the relative time in the present work because the time of ct_l is closely dependent on the particle velocity. The time of ct is called as the absolute time in the present work because the time of ct is not dependent on the particle velocity. The Lorentz transformations in the Minkowski space describe the relation between the relative time of $c\Delta t_l$ and the moving space distance of Δx.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 February 2021 doi:10.20944/preprints202102.0392.v1

In the 4-D Euclidean space, the time of ct is called as the absolute time because the time of ct is not dependent on the particle velocity. In the Euclidean space, the $c\Delta t_l$ and Δx are changing following the Lorentz transformations. And $c\Delta t$ corresponding to $c\Delta t_l$ and Δx is given. In other words, the particle moves along the ct axis with the fixed photon velocity of $c= \Delta x4/\Delta t$. This does not change with the particle velocity. It is the reason why the time of ct is defined as the absolute time. Again, I will indicate that only the $c\Delta t$ value corresponding to $c\Delta t_l$ and Δx can be given in the Lorentz transformations of the present work.

The electric charges and magnetic charges are the vectors along the time axis of ct like the energy. The electric charges and magnetic charges are independent of the 3-D space directions in the 4-D Euclidean space. This indicates that the electric and magnetic charges are closely related to the warped spaces along the time axis. Already, electric charges have been observed as the electric monopoles. However, the magnetic charges have never been discovered as the magnetic monopoles. Electric monopoles do not have the dependence of the space directions. This independence from the space directions allows the electric charges of elementary particles to remain constant on the x1x2x3 space. The magnetic monopoles should be independent of the 3-D

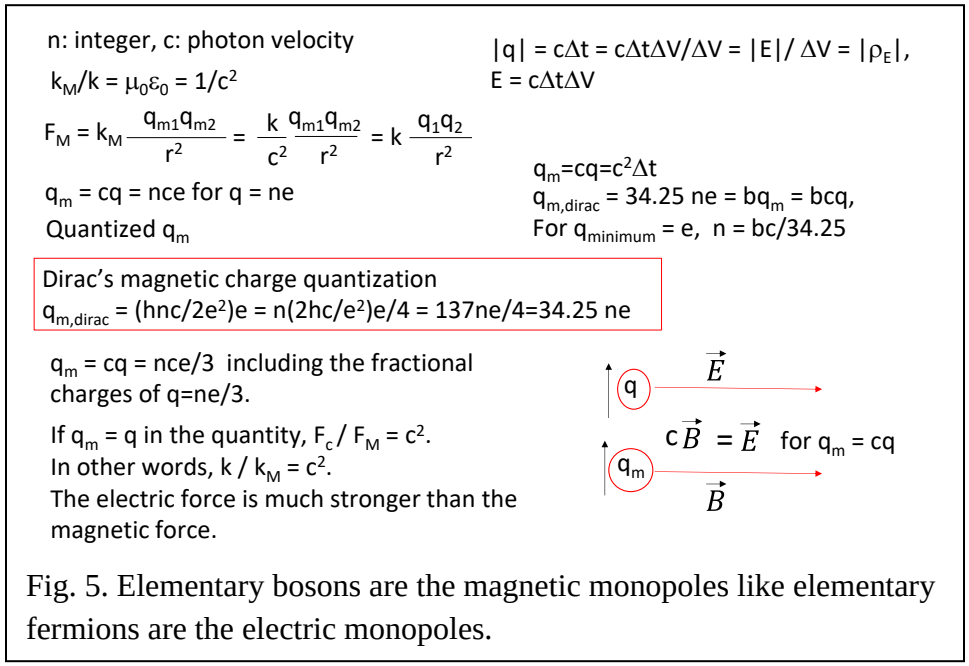

Fig. 5. Elementary bosons are the magnetic monopoles like elementary fermions are the electric monopoles.

space directions. It indicates that the electric and magnetic charges are the vectors along the time axis of ct. This tells that the electric and magnetic charges are related to the warping of the 3-D quantized x1x2x3 space along the time axis of ct. The physical constants of energy (mass), electric charges and magnetic charges should be related to the warping of the 3-D quantized x1x2x3 space along the time axis of ct. The warping of the 3-D quantized x1x2x3 space along the time axis of ct can be expressed by the 4-D space volume. The heavier particle will have the bigger 4-D space volume. It is suggested that the particle mass is proportional to the 4-D space volume that the particle occupy. Therefore, this warped x1x2x3 space is called as the particle with the constant rest mass. And the physical constant corresponding to the time length of $c\Delta t$ should exist because this time length follows the time axis but not the 3-D space axes. Then, the electric charges are defined as the time length of $c\Delta t$. The magnetic charges will be defined and explained in the text. In the present work, the energies and electric charges of the particles are defined as $E = c\Delta t\Delta V$ and $|q| =$

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 February 2021 doi:10.20944/preprints202102.0392.v1

$c\Delta t = E/\Delta V$, respectively, for the 3-D spaces warped along the time direction of ct in terms of the new 3-dimensional quantized space model (TQSM).

1. Mass and electric charges

As explained in the introduction, the mass is defined as the 4-D space volume of the warped space in Figs. 1 - 3. The 3-D quantized space model consists of the 3 3-D quantized spaces of the x1x2x3, x4x5x6 and x7x8x9 spaces. The charges of the x1x2x3, x4x5x6 and x7x8x9 spaces are called as the electric charges (EC), lepton charges (LC) and color charges (CC), respectively. The mass consists of three masses of the x1x2x3, x4x5x6 and x7x8x9 spaces. For simplicity, mass and charges are explained based on the x1x2x3 space in Figs. 1 - 3. This explanation can be easily extended to the x4x5x6 and x7x8x9 spaces. In Fig. 6, the fermions, bosons, graviton, and photon are compared. The massive particles are described as the warped shape of the flat photon space. The energy of the massive particle has the rest mass energy (4-D space volume) of $E = c\Delta t\Delta x1\Delta x2\Delta x3$. And the electric charge (q) and magnetic charge (q_m) are defined as $|q| = c\Delta t$ and $|q_m| = c^2\Delta t$ in Figs. 5 and 6. All the energy, electric charge and magnetic charge are the vectors along the time axis of ct. Therefore, the rest masses, electric charges and magnetic charges of the

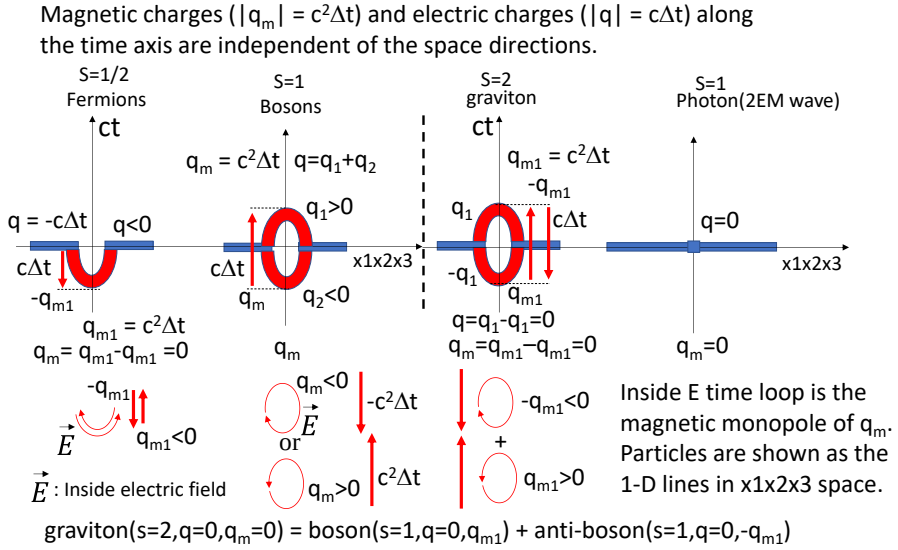

Fig. 6. Elementary bosons are the magnetic monopoles like elementary fermions are the electric monopoles.

elementary particles are the physical constants when seen from the 3-D space. This indicates that these physical constants have the space direction independence. The elementary fermions have the opened 4-D shape of the half circle and the elementary bosons have the closed 4-D shape of the full circle.

Our universe has the positive energy and positive mass. In other words, the time momentum has the positive value of $p_t = E_0/c > 0$. The more details about the space-time evolution can be seen in Ref. 1. The charges, energies and masses are defined as shown in Figs. 1 - 3. These physical constants are independent of the space directions because these constants are defined along the time axis of ct. The charges (q) of EC, LC and CC are newly defined as $q = c\Delta t = \rho_E$ in the present

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 February 2021 doi:10.20944/preprints202102.0392.v1

work. The elementary particles have the conserved charges and conserved rest mass ($m_0=E_0/c^2$). This indicates that the elementary particles have the conserved space volumes. The rest mass energies of the particles can be calculated if we know the charges and volumes in Fig. 4. The neutrinos have the nonzero rest masses because the neutrinos have the non-zero lepton charges (LC). Three neutrinos of electron neutrino, muon neutrino and tau neutrino will have the different rest masses because these three neutrinos have the different lepton charges (LC) [2]. This means that the rest masses of the elementary particles could be expressed as the function of the charges of EC, LC and CC if the space volumes of the elementary particles are varied with the charges. The EC, LC and CC charge values of elementary particles can be shown from Ref. 2. Also, the rest mass energies of the elementary particles are dependent on their space volumes. In Fig. 4, the charges of (EC,LC) for e and ν_e are e(-1,-2/3) and ν_e (0,-2/3), respectively. Because the neutrinos have the very small rest masses, the lepton charge effect on the neutrino rest mass is very small. But the lepton charge effect on the rest masses of the electron, muon and tau is very large. The charges of (EC,LC,CC) for u and d are u(2/3,0,-2/3) and d(-1/3,0,-2/3), respectively. And the charge of (EC) for B1 dark matter is B1(-2/3). In Fig. 4, the relation between the charges and energy is summarized.

2. Magnetic monopoles (charges)

Magnetic monopoles have never been observed [5-8]. Only the magnetic monopoles have been theoretically proposed. The quantized magnetic charges were proposed to be related to the quantized electric charges by Dirac [5]. And the electroweak-scale magnetic monopoles were recently reported by Hung [8]. However, there is no experimental evidence for the existence of the magnetic monopoles. Whether the magnetic monopoles exist or not is one of the big physical questions.

In the present work, it is thought that the magnetic charge is the vector along the time axis in Figs. 5-7. The electric monopoles and gravitational monopoles (rest mass) are the vectors along the time axis. It is because that these monopoles do not have the space direction dependence. For example, the electric current space loop has the space direction dependence in Fig. 7. The front view and back view of this electric current loop have the opposite magnetic field direction which means that this loop is the magnetic dipole in Fig. 7. This current space loop has the space direction dependence. The electric current loop is the same as the electric field loop. Therefore, if the magnetic monopole exists in the nature, it is a vector along the time axis because the magnetic monopole should not have the space direction dependence in Figs. 5-7. Also, it is known that the electric field loop can induce the magnetic field. It means that if there is a magnetic monopole, two conditions should be met. One is that the magnetic monopole should be a vector along the time axis. Second option is that the magnetic monopole exists as the electric field loop. This magnetic monopole is called as the electric field time loop in the present work. Note that the electric field time loop is the loop along the time axis of ct in the Euclidean 4-D space. This electric field time loop has the 1-D line shape when projected on the space axis. This electric field time loop looks like the line with the inside electric fields on the x2 and x3 space axes. The electric charge ($|q| = c\Delta t$) along the time axis is the same when the electric charge is seen from any space direction. The magnetic charge ($|q_m| = c^2\Delta t$) along the time axis is the same when the magnetic charge is seen from any space direction. It does not change the rotational direction of the electric field time loop. This means that the electric field time loop does not have the space direction

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 February 2021 doi:10.20944/preprints202102.0392.v1

dependence. The same argument is applied for the electric monopole explanation. The electric charge is the vector along the time axis. In Fig. 6, the electric monopoles (charges) are found in elementary fermions. These fermions have the zero magnetic charges. And the magnetic

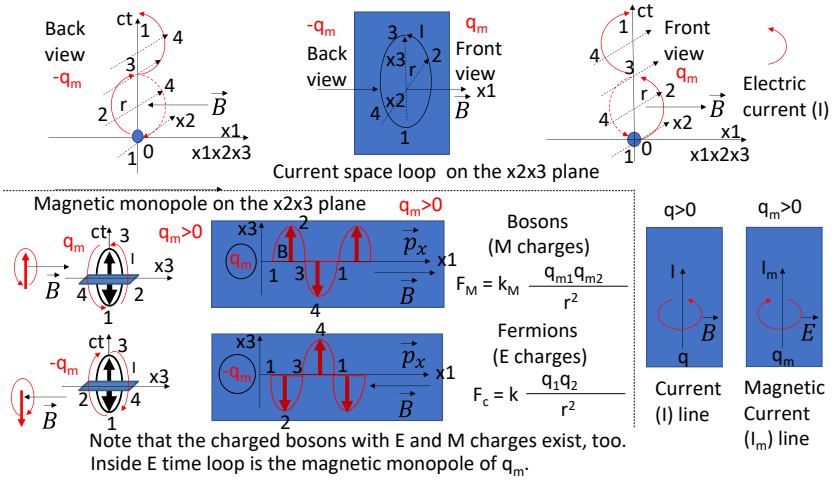

Fig. 7. Magnetic monopoles and magnetic dipoles are compared.

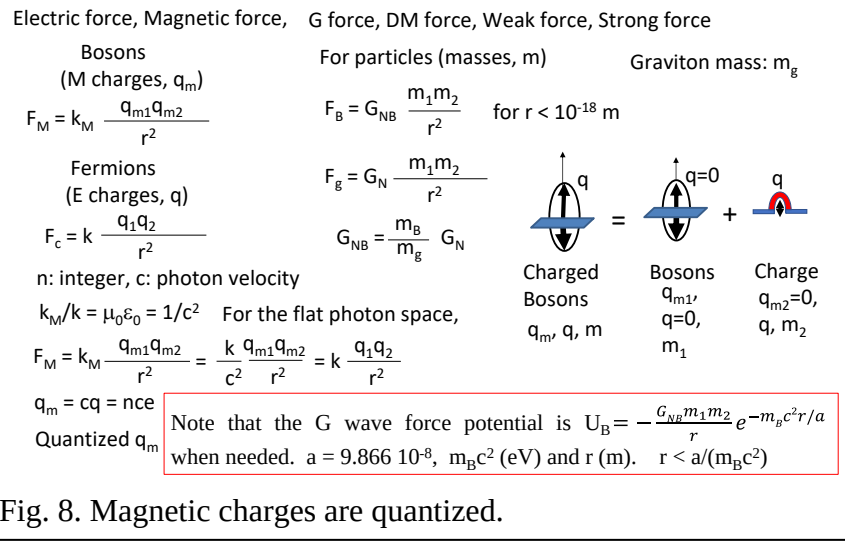

Fig. 8. Magnetic charges are quantized.

monopoles have been found in elementary bosons with the spin of 1. The graviton and photon have the zero magnetic charges. The internal electric fields within the bosons form the electric time loop. It is proposed that the bosons have the counterclockwise E field direction with the positive magnetic charge. Then, the anti-bosons have the clockwise E field direction with the negative magnetic charge. The magnetic field is emitted from the positive magnetic charge and absorbed to the negative magnetic charge. In Fig. 7, the front view and back view of the electric current loop have the opposite magnetic field direction. This electric current loop is the loop in x2x3 space which has the space direction dependence because the rotational axis of the current is changed. Therefore, if the front view of the loop is the positive magnetic charge and back view of the loop is the negative magnetic charge. This means that the electric current loop is the magnetic dipole. The electric field time loop of the bosons without the space direction dependence are compared in

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 February 2021 doi:10.20944/preprints202102.0392.v1

Fig. 7. The elementary fermions, gravitons and photons have the zero magnetic charges. Only the elementary bosons have the magnetic charges.

3. Flat photon space and charge quantization

The electromagnetic wave equations can be obtained for the flat photon space. Flat photon space does not have the electric charges and magnetic charges. In this case, the electromagnetic wave equations can be obtained. From the electromagnetic wave equations, $k_M/k = \mu_0\varepsilon_0 = 1/c^2$ for the plat photon space is obtained as shown in Figs. 5 and 8. Then the quantized magnetic charge is given as $q_m = cq = cne$. Here n is the integer. This quantization is compared with the Dirac's magnetic charge quantization of $q_m = 34.25ne$ in Figs. 5 and 8. The magnetic field (B) and electric field (E) are balanced within the 2EM waves with the same potential energy for the flat photon space [1]. With the condition of $q_m = cq = cne$, $c\vec{B} = \vec{E}$ for the photon of 2EM waves on the flat photon space. When the electric charge is defined as $|q| = c\Delta t$, the magnetic charge can be defined as $|q_m| = c^2\Delta t$. Both the electric charges and magnetic charges are the vectors along the time axis. Because the electric charge is quantized, the magnetic charge is quantized, too.

It has been well known that the photon space has the local space fluctuation by the pair production and pair annihilation of the particle (F: fermion) and anti-particle ($\bar{F}$: anti-fermion) like the electron and positron. In Fig. 9, The new process with the pair of the particle and antiparticle connected with the pair of the boson (Z) and anti-bosons ($\bar{Z}$) is added. The fermion and anti-fermion form the 2E wave and the boson and anti-boson form the 2M wave when these particles and anti-

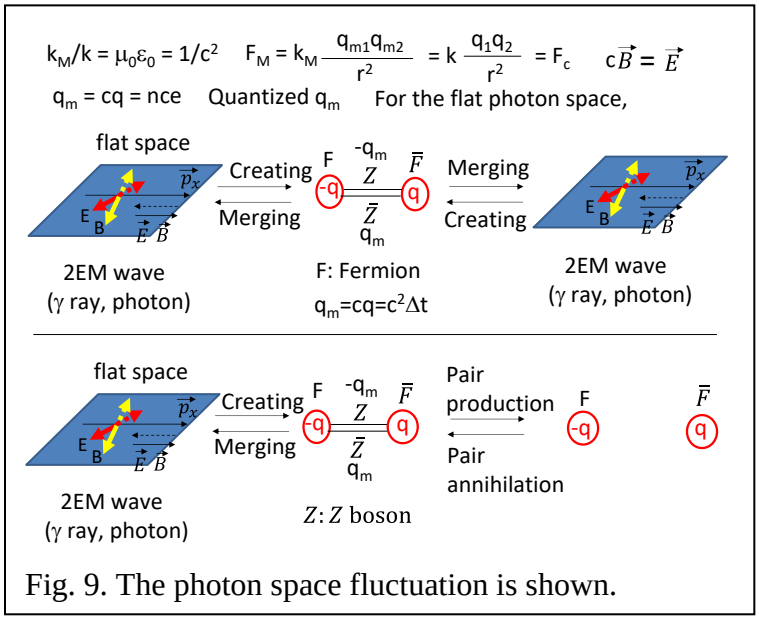

Fig. 9. The photon space fluctuation is shown.

particles are merged and annihilated. This coupling makes the photon of the 2EM waves for the flat photon space [1]. These merging and creating processes in Fig. 9 are called as the photon fluctuation in the present work. If the extra energy enough to cut these merging and creating processes is added, the pair production of the fermion and anti-fermion takes place as shown in Fig. 9. As the reverse process, the photon (gamma ray) with the energy higher than the background photon can be created by the pair annihilation of the fermion and anti-fermion.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 February 2021 doi:10.20944/preprints202102.0392.v1

Also, the G force equations in Fig. 8 give the relation of $G_{NB} = G_N m_B/m_g$ [1]. The q charged boson is equal to the q uncharged boson with the q charged warped space added. This means that the

Quantized magnetic charges (q_m) of bosons based on $q_{MEC}(Z(0,0)) = -1$

	Dark matter force				Weak force (EC,LC)				Strong force (EC,LC,CC)			
	MEC				MEC				MEC			
X1	-5/3	Z(0)			-1	Z(0,0)	Z(0,−1)	Z(0,−2)	-1/3	Z(0,0)	Z(0,−1)	Z(0,−2)
X2	-8/3	W(-1)			-2	W(-1,0)	W(-1,-1)	W(-1,-2)	-4/3	W(-1,0)	W(-1,-1)	W(-1,-2)
X3	-11/3	Y(-2)			-3	Y(-2,0)	Y(-2,-1)	Y(-2,-2)	-7/3	Y(-2,0)	Y(-2,-1)	Y(-2,-2)
Total	-8				-6				-4			
	-4 = -1/3 -4/3 -7/3				MLC				MLC			
X4	-6 = -1 -2 -3				-5/3	Z(0,0)	W(−1,0)	Y(−2,0)	-1	Z(0,0)	W(−1,0)	Y(−2,0)
X5	-8 = -5/3 -8/3 -11/3				-8/3	Z(0,-1)	W(-1,-1)	Y(-1,-1)	-2	Z(0,-1)	W(-1,-1)	Y(-1,-1)
X6	For fermion (q) – boson (q_m) pair, $q_m = q - 1$				-11/3	Z(0,-2)	W(-1,-2)	Y(-2,-2)	-3	Z(0,-2)	W(-1,-2)	Y(-2,-2)
Total					-8				-6			
									MCC	CC		
X7									-5/3	0		
X8									-8/3	-1		
X9									-11/3	-2		
Total									-8	-3		

Note that the magnetic charges (MEC, MLC, MCC) are conserved by the virtual two boson process (VTBP) within Planck time scale for all bosons.
All elementary fermions, Photons and gravitons have the zero magnetic charges.

Fig. 10. The bosons are tabulated with the magnetic charges. See Ref. 2 for the fermions and bosons with the charges of (EC,LC,CC).

bosons with the same q charges have the same magnetic charges. The force carrying bosons are tabulated by using the magnetic charges (q_m) of (MEC, MLC and MCC) and charges (q) of (EC, LC and CC) in Fig. 10. All magnetic charges are normalized based on the magnetic charges of Z(0,0) boson. Also, the elementary fermion table and elementary boson table are reported in Ref. 2.

The elementary bosons are the force carrying bosons in Figs. 8-10. These force carrying bosons are tabulated in Fig. 10. These force carrying bosons exists for a very short time and is called as the virtual particles. Therefore, it will be very difficult to observe the magnetic charges directly. The photons in the flat photon space are the electromagnetic waves (2EM waves). The origins of these electromagnetic waves are explained in Fig. 9. In Fig. 9, the photon space fluctuations are explained. The photon space fluctuation are the repeating processes of the creating and merging of fermion- and anti-fermion pair and boson and anti-boson pair. The electromagnetic waves (2EM waves) are continuously created through these processes. The fermion and anti-fermion are merged to form the 2E waves and the boson and anti-boson are merged to form the 2M waves. Therefore, the magnetic waves (2M waves) of the electromagnetic waves (2EM waves) are originated from the magnetic charges of the boson and anti-boson. This is the indirect evidence for the presence of the magnetic charges and magnetic monopoles. Of course, the electric waves (2E waves) of the electromagnetic waves (2EM waves) are originated from the electric charges of the fermion and anti-fermion. This is the indirect evidence for the presence of the electric charges and electric monopoles.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 February 2021 doi:10.20944/preprints202102.0392.v1

4. Summary

In the present report, only the origins of the time, mass, electric charge and magnetic monopole (charge) are discussed. These physical constants are closely related to the local warped spaces of the 3-D quantized spaces. Additionally, the warped spaces are the particles which can be described by the wave functions of the quantum mechanics. In other words, the present physical concepts are very new and can be considered as the revolutionary or unconventional ideas. Because the origins of these physical constants have never been clearly explained, the present theoretical ideas beyond the standard model need to be investigated.

I will summarize the present ideas as follows. The particles get the mass or energy through the warping of the flat photon space. The local warped space is the massive particle. This particle should be separated to the elementary fermions and elementary bosons. Therefore, the elementary fermions are proposed as the open warped space with the half circle shape. And elementary bosons are proposed as the closed warped space with the full circle shape. The warped shapes are the same when seen from any space directions. This is called as the property of the space direction independence. We can only see the projected shape on the x1x2x3 space of the 4-D space-time from the warped space. The projected shape of the elementary particle on the x1x2x3 space is the 1-D line shape with the very small cross section of the quantum size. The elementary particle is the warped space which correspond to the wave function of the quantum mechanics. This is the origin of the wave function.

With these basic concepts, the physical constants viewed on the x1x2x3 space have the space direction independence. It indicates that the physical constants are the vectors along the time axis. The energy is the vector along the time axis as shown in the definition of the time momentum. Based on the same reasons, other physical constants without the space direction dependence should be the vectors along the time axis. Therefore, the electric charges, magnetic monopoles and mass are the vectors along the time axis. The mass is defined as $m = E/c^2$. Electric charges and magnetic charges are newly defined in the present work. The electric charge of q is $q = c\Delta t$ of the particle with the warped space. Then, the energy and electric charge have the relation of $E = c\Delta t\Delta V$ and $|q| = c\Delta t = E/\Delta V$. These are the important equations that can explain the charge conservation and energy conservation. There are two kinds of the electric charges. The positive electric charge is assigned to the elementary fermions warped along the positive time axis. And the negative electric charge is assigned to the elementary fermions warped along the negative time axis.

The magnetic monopoles have never been found. In the present work, the elementary bosons are the magnetic monopoles. When the electric charge is defined as $|q| = c\Delta t$, the magnetic charge can be defined as $|q_m| = c^2\Delta t$. Both the electric charges and magnetic charges are the vectors along the time axis. Because the electric charge is quantized, the magnetic charge is quantized, too. Then the magnetic charges are defined as the positive magnetic charge for the counter-clockwise E time loop and the negative magnetic charge for the clockwise E time loop. The elementary bosons with the closed circle shape have the internal E field flowing along the warped space with the closed circle shape. This is called as the internal E time loop. There are two kinds of the internal E field. Therefore, the counterclockwise direction is assigned to the positive magnetic charge and clockwise direction is assigned to the negative magnetic charge. The magnetic monopoles are the

 doi:10.20944/preprints202102.0392.v1

elementary bosons. When the fermion and anti-fermion are annihilated to the photons. The photon space fluctuations build the electromagnetic waves (2EM waves). It is thought that the electric waves (2E waves) of the electromagnetic waves (2EM waves) are originated to the electric charges of the electric monopoles. And it is proposed that the magnetic waves (2M waves) of the electromagnetic waves (2EM waves) are originated to the magnetic charges of the magnetic monopoles. The presence of the elementary waves on the flat photon space can be the indirect evidence of the magnetic monopoles and electric monopoles. These magnetic monopoles are the elementary bosons, and the electro monopoles are the elementary fermions.

The possible origins of the energy, electric charge, and magnetic charge for the particles of the elementary fermions and elementary bosons are discussed in the prework work. It means that these physical constants should be conserved during the physical processes. The more details about the physical processes based on the conservation of the energy, electric charges and magnetic charges will be discussed in the following papers.

Contact E-mail: jkhwang.koh@gmail.com

References

[1] Jae-Kwang Hwang, Preprints 2020, 2020080726 (doi: 10.20944/preprints202008.0726.v1).
[2] Jae-Kwang Hwang, Mod. Phys. Lett. **A32**, 1730023 (2017).
[3] Albert Einstein, **Relativity: The Special and General Theory** (Henry holt and company, New york 1921).
[4] Max Born, **Einstein's Theory of Relativity** (Courier Dover Pub,. 2012) pp. 236-237.
[5] P.A.M. Dirac, Proc. Roy. Soc. **A133**, 60 (1931).
[6] Arttu Rajantie, Physics Today **69**, 10, 40 (2016).
[7] L. Patrizii1 and M. Spurio, Annual Review of Nuclear and Particle Science, **65**, 279 (2015).
[8] P.Q. Hung, Nucl Phys. **B962**, 115278 (2021).