

A new approach to the Higgs field

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Abstract

The Higgs boson (or Higgs particle) produced by the quantum excitation of the Higgs field, that was confirmed on 2012 in the ATLAS detector at CERN is supposed to be the explanation for the mass of elementary particles. In this paper I will explain why this Higgs field is a new dimension which I refer to as the Grid dimensions (or Grid extra dimensions). This paper will explain what are the expected measurements regarding the Higgs particles based on this assumption. In this paper I will show what will be the future measured evidence that the Higgs particle measured at the particle accelerators is a quantum excitation of the Grid dimensions themselves.

1. Introduction – the GRID dimensions theory

Modern physics has two leading theories that contradict each other: (1) The Einstein's deterministic, local, "smooth" General Relativity theory for large scales. (2) Quantum theory with the quantized characteristics, non-local Schrodinger wave equations with its probabilistic behavior, the measurement problem, Heisenberg uncertainty principle and the entanglement "spooky action at a distance" for the elementary particles scale.

Let's take a basic principle from both theories. The first is from Einstein's special relativity, that energy and matter cannot travel faster than the speed of light. The second is from quantum mechanics that at the Planck length and Planck time physics is chaotic. When combining these two principles together we arrive to the suggested model that the fabric of space is quantized, the size of each quanta of space is in the size of Planck length in each of the three dimensions, that time is quantized to the time sequences of Planck time and that for each pulse of Planck time, energy and matter can travel only from one quanta of space to its nearest neighbor, meaning a distance of one Planck length. This explains why we are limited to the speed of light and to the Planck scale. This idea of quantized space time is also known as Loop Quantum Gravity (LQG).

When we model a fabric of space is made from separate individual pieces in the size of Planck Length, It is reasonable to ask what is between those pieces. Or in other words, what is the new "space" that border and divide the quantized space fabric into small, Planck's length pieces in each of the three dimensions. We suggest a new revolutionary theory. We claim that between these quantum cells of space there are non-local grid like dimensions (GRID dimensions) connecting all the cells together (Figure 1)

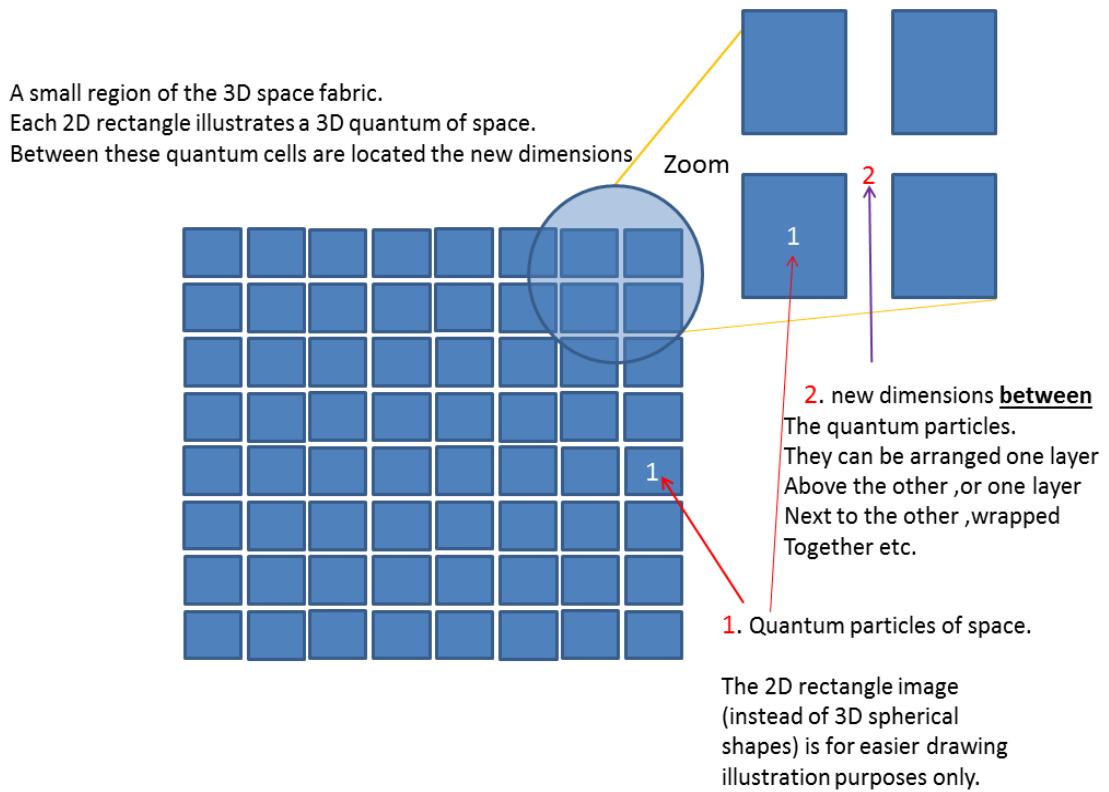


Figure 1. Space-time 2D illustration of the non-local 3D GRID dimensions (white grid lines) and the 3D Planck length sized cells of the quantized universe, (blue rectangles).

Although the 2D illustration in Fig. 1. Is of a line GRID and quantum rectangle cells, the expected quantized cells are probably a 3D symmetric spherical shape moving or rotating within the 3D GRID dimensions.

These non-local GRID dimensions (or can also be written as Grid dimensions in this paper) enable the non-local quantum mechanics phenomena's like quantum entanglements, quantum tunneling, the wave like behavior of the elementary particles and the Pauli's exclusion principle (Figure 2)

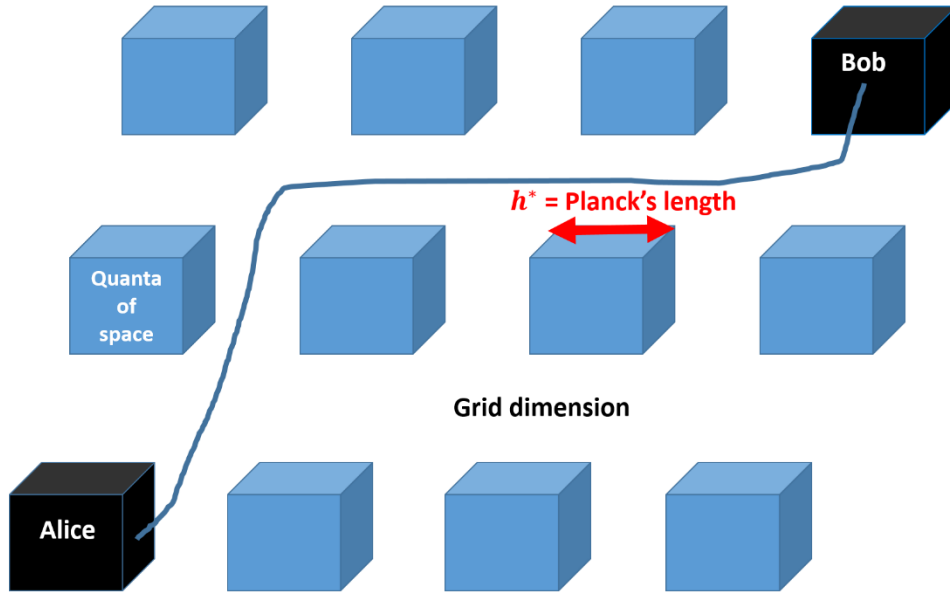


Figure 2. Space 3D illustration of the quantized space. The local space quanta is illustrated by a local blue cube in the size of Planck's length in each of its three dimensions. The illustrated white non-local bordering space between the space cubes is the grid dimension. It is a new non local dimension which enables the non-local ("spooky action at a distance") behavior of elementary particles. In this figure the non-local entanglement between two elementary particles, Bob and Alice is illustrated by a blue line connecting between them through the Grid dimensions. The quanta of space is illustrated as a three dimensional cube but by symmetrical considerations it is probably a three dimensional symmetrical round shape.

2. Transport of elementary particles

The energy of a massless photonic particle, transports from one quanta of space to its nearest neighbor quanta of space (a distance of one Planck's length) every quantized pulse of Planck's time, and this is by definition the speed of light. An elementary particle which has mass, has a probability of p_r to transport its energy from one quanta of space to the next nearer neighbor every quantized pulse of Planck's time. Since p_r is smaller than one, an elementary particle with mass will always travel slower than the speed of light. The inherent mass (m_0) of an elementary particle (e.g. electron) is dependent on it's p_r .

$$m_0 \propto \frac{(1-p_r)}{p_r}, \text{ where it is zero when } p_r = 1 \text{ and infinity when } p_r = 0.$$

The velocity (v) of the elementary particle is $v = c * p_r$ where c is the speed of light.

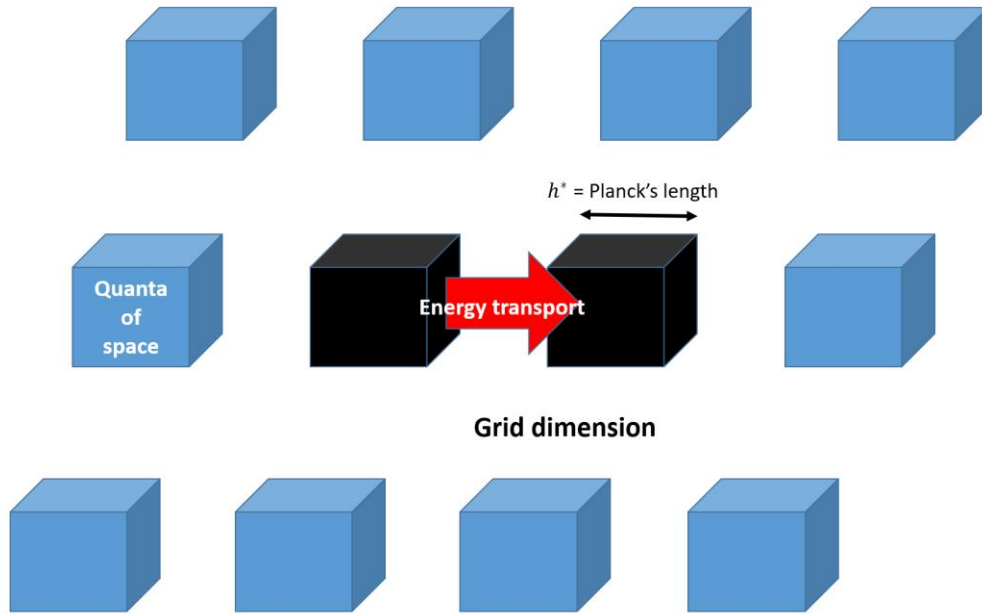


Figure 3. Energy transport from one quanta of space to its nearest neighbor during one pulse of Planck's time. The energy transports (as illustrated by the red arrow) from the black cube on the left to the black cube on the right, in the figure.

This interpretation of the Grid dimension regarding its role in applying mass to elementary particles is similar to the Higgs field. This paper suggests that Higgs field is the Grid dimension and by measuring the Higgs boson we are practically measuring bosons generated due to vibrations in the Grid dimension. There is no way for us to measure the distance of the Grid dimension that is between one quanta of space to its nearest neighbor quanta of space since it is not part of our three dimensional quantized space-time.

3. Quantized universe, the Grid dimension and the Higgs particle

In this article we suggest an experiment that might prove that the Higgs field is the Grid non-local dimension, dividing our known space to space quanta's in the size of Planck's length in each dimension. We claim that if it is true that space is quantized to small pieces of a Planck Length then also the wave length of a photon must be an integer number of Planck lengths. Hence:

$$\lambda = N * h^* \tag{1}$$

Where

N = 1, 2, 3, . . . — Positive integer number

h^* – Planck's length in each of space's 3 dimensions.

$$h^* = 1.62 * 10^{-35} \text{ m (meter).}$$

From Einstein's photoelectric equation and Eq. (1), the discrete energy E_N of a Photon is

$$E_N = \frac{h c}{\lambda} = \frac{c h}{N h^*} = \frac{A c}{N} \quad (2)$$

Where

h – Is Planck Constant = $6.63 * 10^{-34} \text{ m}^2 \text{ kg sec}^{-1}$

c – Is the velocity of light, kg – kilogram, sec – second, m - meter

$$A = \frac{c h}{h^*} = \sqrt{\frac{2\pi c^3 h}{G}} \approx 41 \text{ m kg sec}^{-1}$$

G – Is gravitational constant = $6.674 * 10^{-11} \text{ m}^3 \text{ Kg}^{-1} \text{ sec}^{-2}$.

$\pi \approx 3.14$

The meaning of Eq. (2) is that the quantized energy (discrete energy) of Photons E_N is a combination of the universal constants (c, G, h, π), divided by an integer N . the smaller the N , the higher the energy.

The energy difference between two successive Photons ($N, N+1$) is

$$\Delta E_N = E_N - E_{N+1} = \frac{A * c}{N * (N+1)} \quad (3)$$

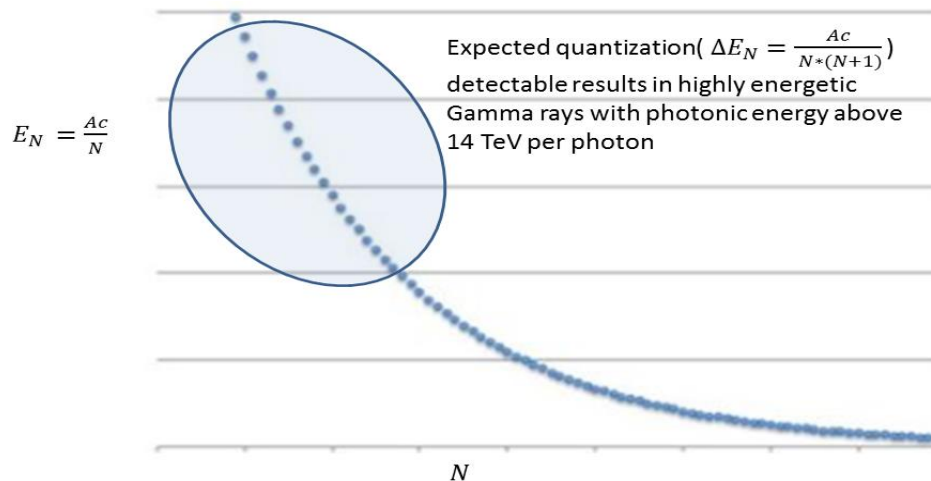


Figure 4. Photonic energy as a discrete function of N will be referred as discrete energy. The Photonic energy gap ΔE_N increases as a function of the increase of E_N

Since $E = mc^2$, photons can become matter and vice versa and so equation 3 represents the discrete energy for the creation of photons and/or elementary particles

due to collisions in the accelerators (e.g. the LHC at CERN) or due to cosmic gamma ray bursts.

Let's assume a collision at the LHC in CERN with an energy E_K . If the collision in the accelerator has a non-discrete energy level (non-discrete energy), meaning K is not an integer number of Planck's length ($N - 1 < K < N$) then there is a residual energy (E_r) in the form $E_r = E_K - E_N = \frac{Ac}{K} - \frac{Ac}{N} = \frac{Ac(N-K)}{NK} \approx \frac{Ac(N-K)}{K^2}$ which cannot generate photons or elementary particles based on the quantized space-time theory. Since $0 \leq (N - K) \leq 1$ the maximum value of E_r is when K is nearly equal to $N-1$ and its maximum value is $E_r \text{ maximum} \approx \frac{Ac}{K^2}$. When K equals $N-1$, the collision energy is an integer number of Planck's length and the residual energy drops to zero meaning $E_r = 0$. This paper predicts that since the fabric of space is quantized, and each quanta of space is in the size of Planck's length in each dimension, and between them there is the Grid dimension, and the residual energy cannot generate photons or elementary particles, it will vibrate the Grid dimension itself and generate Bosons similar to the Higgs Boson (I will refer to it from now on as the Higgs Boson or Higgs particles). As K decreases, the residual energy increases and the Higgs Boson measured energy, due to the vibration of the Grid dimension, increases. When K equals exactly a discrete number of Planck's length N , the residual energy $E_K - E_N$ is zero, and the Higgs Boson measured energy drops down dramatically to zero since there is no residual energy and the entire energetic collision can generate photons and/or elementary particles and there is no extra energy to vibrate the Grid dimension and generate the Higgs Boson. This drop down prediction in the detected energy of the measured Higgs particles will be measured in future high energetic collisions.

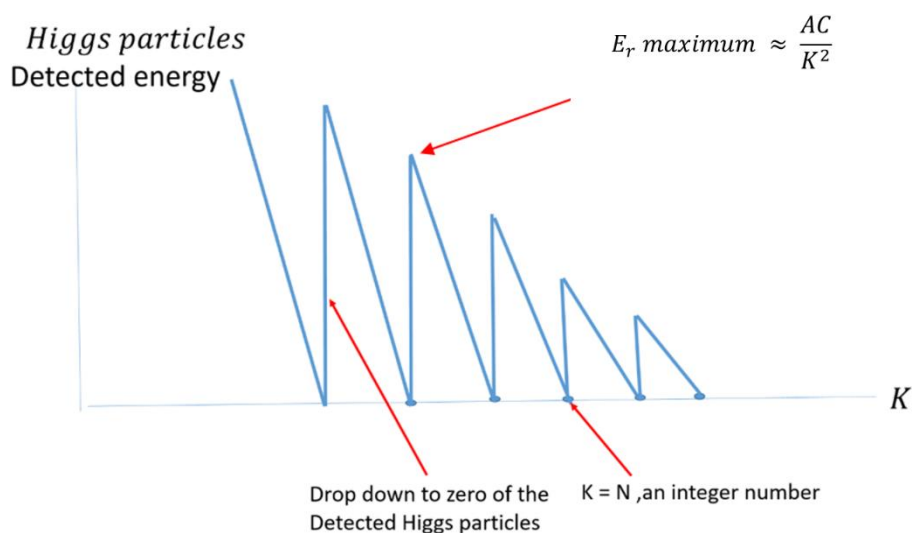


Figure 5.

K represents the collision energy divided by the number of Planck's length

$$E_K = \frac{c h}{K h^*} = \frac{Ac}{K} . \text{ As the collision energy } E_K \text{ increases K decreases and as long}$$

as $K \neq N$ the residual energy $E_K - E_N$ increases, resulting in an increase of the vibration of the Grid dimension and an increase of the Higgs particles total measured energy. At the discrete points where K equals N , all the collision energy transforms to photons and elementary particles, the residual energy drops to zero ,and the Higgs particles detected energy drops to zero. The Higgs particles energy is equal to the residual energy. This generates a saw tooth wave of the measured Higgs particles energy Vs. K (which is proportional to the collision energy).

$$E_{Higgs\ particles} = E_r = E_K - E_N \approx \frac{Ac(N-K)}{K^2} , \text{ when K is not an integer.}$$

$$E_{Higgs\ particles} = 0 , \text{ when K is an integer}$$

Conclusion:

The Heisenberg uncertainty principle dictates that if a particle will be confined to a region of space in the size of Planck's length in each dimension its velocity will be so high that the energy, based on Einstein's theory will generate a local Planck scaled black hole. This means that space is limited in confining information and the limitations are in the size of Planck's length. This leads to the idea that space is quantized into voxels of space quanta's (or space cells) in the size of Planck's length in each of the three dimensions. Even though it is referred here as a cube and it is illustrated as a cube, from symmetrical reasons it is more likely to be shaped as a round sphere and it might be spinning moving or rotating in the Grid dimension (or dimensions) that surrounds it. The idea that space is quantized is nor new but this article focuses on the new space which surrounds the quantized space voxels, referred in this paper as the Grid space. This new Grid space is a new dimension that can enable non-local phenomena's like entanglement, the non-local collapse of Schrodinger's wave function (the measurement problem), quantum tunneling and Pauli's exclusion principle. The Einstein special relativity theory dictates that nothing can move faster than light. This leads to the assumption that for every quantized pulse of time in the length of Planck time, energy can move one step of Planck length from one space quanta to its nearest neighbor (figure 3). The probability to move from one space quanta to the next is proportional to its mass. For light the probability is 1 and the mass is zero. Since the transfer of energy from one quanta of space to the next is done through the surrounding Grid dimension, it is logical to assume that this new dimension is what today we refer to as the Higgs field and is responsible to the given mass of elementary particles. Vibrating this field will generate Higgs particles. The Grid dimension absorbs the residual energy between the generated energy and the nearest lower discrete energy. Discrete energy is the energy that if transformed to a photon will have a wave length which is a discrete number of Planck's length (equation 2). The residual energy absorbed in the Grid dimension generates the Higgs particle, measured at CERN. An increase in the residual energy will result in an increase in the generated Higgs particles due to the vibration of the Grid dimension.

This increasing saw tooth wave like behavior is expected to be measure in the future energetic accelerators.

The idea of special relativity that each moving particle in the universe has its own inertial frame of reference is a puzzling idea. If we quantize the space of the inertial frame of reference ,than in the “ocean” of Grid space surrounding it ,endless inertial frames of space for different particles moving at different velocities ,can be staggered together (Figure 6) without any interaction between them. This can be also a visual symmetrical way to approach Hugh Everett’s many worlds interpretation.

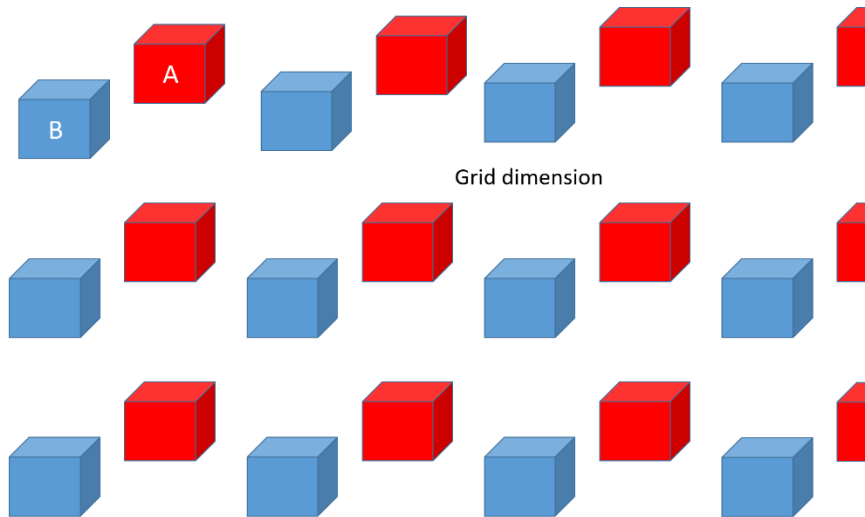
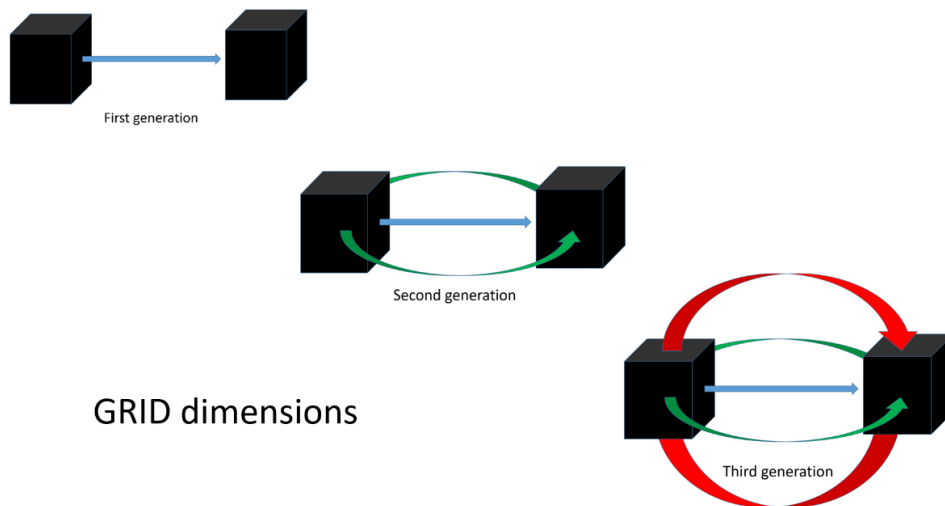


Figure 6: in this figure two different quantized inertial frames of reference (red and blue) are illustrated floating staggered to one another in the Grid dimension. A is one quanta of space in the red inertial frame of reference , while B is one quanta of space in the blue inertial frame of reference and both frames are floating in the three dimensional non local Grid dimension illustrated as a white void of space. There is no limit on the size of the Grid dimension and there is no limit to the number of quantized inertial frames of reference that can float within it. This is a very symmetrical and intuitive way of approaching Einstein’s special relativity principle in which for each inertial frame of reference there is a different space-time interpretation. This approach can also visualize a symmetric model for the Hugh Everett’s many worlds interpretation to explain the measurement problem in quantum mechanics. We can also suggest a symmetric solution in which the red quantized space is matter and the blue quantized space is anti- matter.

Another idea that can be visualized through this approach is the three generations in the standard model of elementary particles. Assuming that energy /mass of an elementary particle is transported (figure 2) through the Grid dimension from one space cell to its nearest neighbor ,for every pulse of quantized Planck time in a probability dictated by the Grid dimension, than there are up to three possible routes of energy transportation through the Grid dimension (figure 7).



GRID dimensions

Figure 7: in this figure we can see the three generations of the elementary particle as represented in the standard model. These are the three optional routes in which energy can transport through the Grid dimension from one quanta of space(illustrated as a black cube on the left) to the next one (illustrated as a black cube on the right). The first generation is the simplest transport model and that is why it is the most stable configuration. The quanta of space is illustrated as black cube, the energy transport by colored arrows travelling from different directions in the Grid dimensions which are represented by a white void. The number of directions vary from one to three and represent the three generations in the elementary standard model.

There are still so many un resolved mysteries in the foundation of quantum mechanics and in the new frontiers of astronomy that need to be revealed like dark matter, dark energy, anti- matter , hidden variables , entanglement ,the double slit experiment ,quantum tunneling, the uncertainty principle, the measurement problem, the probabilistic nature of quantum mechanics, the Pauli exclusion principle , virtual particles popping in and out of existence ,the inflation period of the big bang, the uniformity of the cosmic microwave background radiation ,the unification of quantum mechanics and general relativity and the unseen extra dimension needed for string theory. The Grid dimension model opens a new non local dimension (or even dimensions) that might lead to the answer of these fundamental questions. Since we can only experience our quantized space-time and not the “ocean” of Grid dimension (or dimensions) surrounding us, we might not be able to reveal fully its deep secrets but we can realize its existence and improve our models and the understanding of our surroundings. One day we might be able to communicate with parallel quantized universes floating in the Grid dimensions surrounding us through vibrations in the Grid dimension.