The Higgs field and the Grid Dimensions

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Abstract

The Higgs boson (or Higgs particle), that was confirmed on 2012 in the ATLAS detector at CERN is supposed to be a quantum excitation of the condensate field which fills our universe and is responsible for the mass of elementary particles and is named the Higgs field. In this paper I will explain why this Higgs field is part of new dimensions which I refer to as the Grid extra dimensions (or grid dimensions). This paper will explain what are the expected measurements regarding the Higgs boson (particle) 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. This exciting evidence will enable us for the first time to probe new dimensions and open our perspectives to accept the option of extra dimensions and many worlds staggered within our known universe. This understanding might enable future communication through these dimensions between the staggered worlds themselves.

Modern Physics has two leading theories that contradict each other: (1) The Einstein's deterministic, local "smooth" General Relativity theory for the large scale with the relativistic behavior and the limitation on the speed of light in all the inertial reference frames. (2) Quantum theory with the quantized characteristics, non-local Schrodinger wave equations with its probabilistic behavior and the collapse of the wave function or the many worlds interpretation of Hugh Everett.

The Heisenberg uncertainty principle which is dependent on the Planck constant, the photonic energy which is dependent on Planck constant, the chaotic behavior of physics below the Planck length and Planck time, the non-local behavior of entanglement, the delayed choice quantum eraser, the Bekenstein – Hawking black hole entropy calculation and the Einstein special relativity limitation on the speed of light in all the inertial frames of reference, lead me to look for a new disruptive structure of the space-time fabric.

One option is to quantize space into three dimensional "space cells" in the size of Planck length l_P in each dimension and to quantize time into time pulses (Planck time).Our understanding of time is dependent on the number of Planck pulses that we count and for each Planck pulse, a physical step in the length of Planck length can occur with a probability between zero to one. A massless photon has a probability of one to pass one Planck length for each pulse of Planck time and that is the limitation of the velocity in each frame of reference and it is defined as the speed of light. An elementary particle which has mass has a probability lower than one to pass one Planck length for each pulse of Planck time.

The exciting question is what divides our fabric of space-time to these space cells and time pulses, and my assumption is that there are extra non local space time dimensions stretched like a four dimensional greed between the space cells and the time pulses. Another way to imagine the space feature of the grid dimensions is by imagining a three dimensional extra non local space in which

our known three dimensional space cells are floating ,vibrating, moving, turning, flipping or rotating like ice cubes(space cells) in water (grid extra dimensions) .

The probability to move from one space cell to the next for each Planck pulse of time is correlated to the mass of the elementary particle, where a photon with zero mass has a probability of one. Based on that I assume that the Higgs field is part of the extra grid dimensions. This paper will show a way to test this thesis.

Introduction – The grid dimensions as the path for the "many worlds theory"

In Figure 1 the three dimensional (3D) quantized space cells are illustrated as two dimensional blue rectangles in the size of plank's length in each dimension, and the three dimensional grid dimension is illustrated as the void between them, connecting them together and enabling non local quantum mechanics phenomena's like entanglement between two elementary particles.

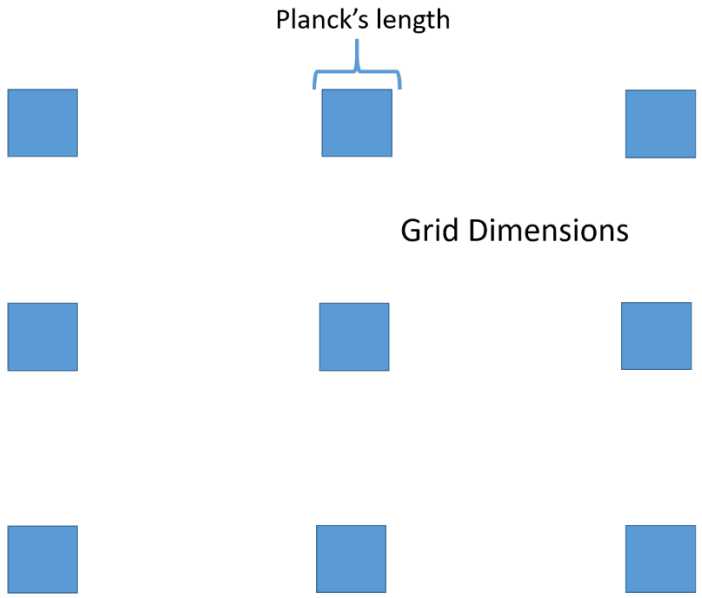

Figure 1: an illustration of a specific reference frame quantized in space, floating in the grid dimensions

To the observer in the specific reference frame illustrated in figure 1, the quantized space cells are clustered together since he cannot probe the grid dimensions and his perspective of space is similar to figure 2, where it seems as if there are no grid dimensions dividing space to quantized space cells.

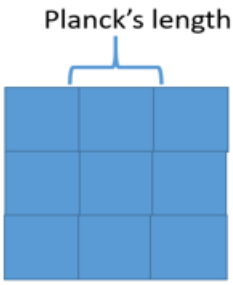

Figure 2: the perspective of an observer in its inertial reference frame described in figure 1.He is not aware of the extra grid dimensions.

Based on Einstein's special theory of relativity, for each inertial frame of reference, there is a different view of space time which means that we should approach our universe as infinite worlds of different reference frames which communicate with each other through physical observations.

In order to avoid the collapse phase of the Schrodinger's quantum mechanical wave function, Hugh Everett introduced the many worlds (multiverse) interpretation. In this interpretation the different worlds do not communicate with one another.

In both cases by introducing the quantized space and the extra grid dimensions, since there is no limit on the size of these grid dimensions, we can imagine staggered structures of different inertial reference frames and different worlds (Figure 3). The idea of quantized space-time enables to stagger quantized worlds (quantized multiverses) together in a similar way that radio different frequencies are staggered together while each channel (each reference frame or each world) is tuned to receive its own specific frequency (information) without being aware of the information transmitted to the other channels.

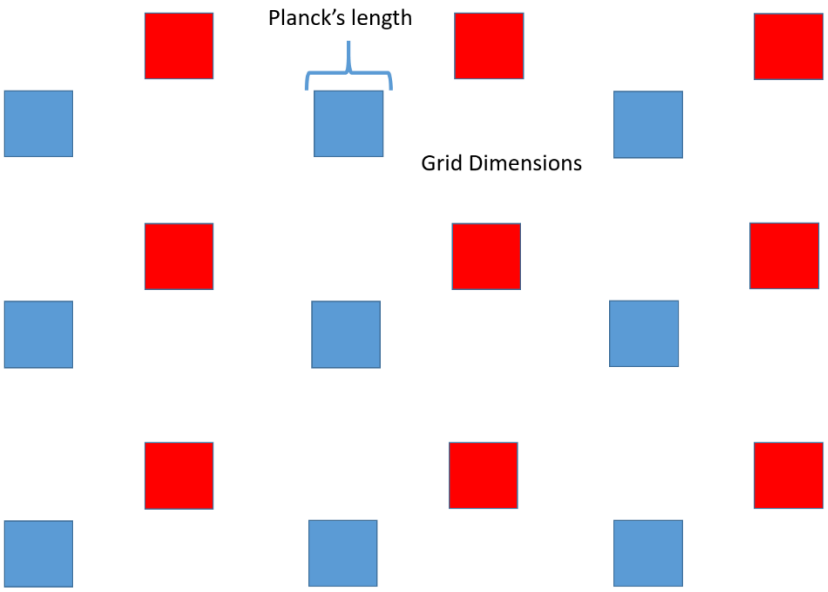

Figure 3: In figure 3 above, the 2D illustration of space is for simplicity and it represents 3D space showing only a small fraction of each world and only two staggered worlds (blue and red rectangles). There is no limit known to us regarding the size of the grid dimensions (illustrated as the void between the rectangles) and the number of staggered worlds that can float within it. These different worlds illustration can represent: different inertial reference frames, Everett's many worlds' (multiverse) interpretation, matter and anti-matter, matter and dark matter, particles and their associate super symmetric particles, etc. The Planck length is the size unit representing our known world. In the other worlds, if they exist, the size unit might change from our known Planck's length.

In figure 4 we see the perspectives of worlds A and B as they are not aware to each other and not aware to the grid dimension which they float in as a discrete staggered space cells. Each world can see only its own perspective. Since gravity is a curve in the fabric of space-time itself one world might influence the other without the ability to monitor one another (e.g. dark matter world and our known matter world which interact through gravity only which influences the curvature of the grid dimension).

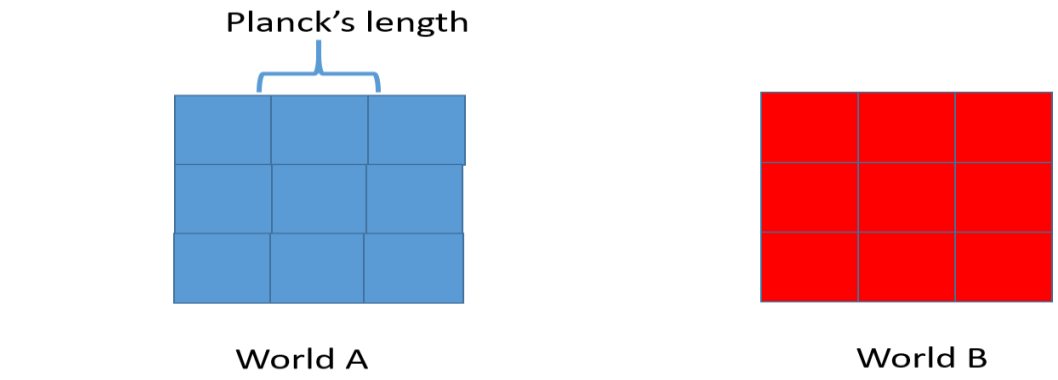

Figure 4: The perspectives of world A & B

Same analogue can be said about the time pulses. They can also be staggered without being aware of one another as illustrated for two worlds A and B in figure 5.

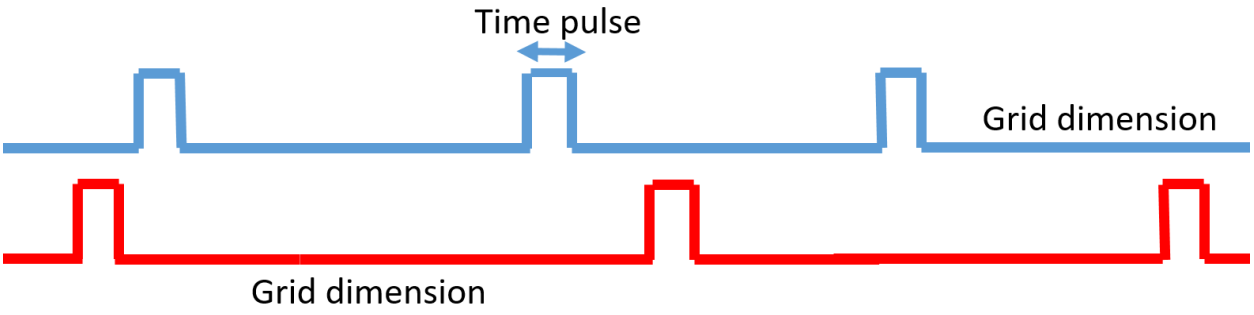

Figure 5: The time pulse represents in our known universe as the Planck time, which is the time that is needed to pass one Planck length at the speed of light .Assuming time is quantized and the grid dimension is the time interval between two adjacent time pulses , there is no limitation known to us regarding the length of the grid dimension time interval. Based on that assumption time pulses that trigger different worlds can be staggered as illustrated in figure 5 without being aware of one another, in the same analogue that internet digital information share the same optic fiber without mixing the information and without interfering one another. In the same way that space cells in other worlds (which are not our known universe) might not be in the size of Planck's length, their

time pulses might differ from Planck time and the interval between the pulses can defer from one world to the other. In the same way that infinite number of worlds can be visualized floating staggered in the grid dimension of space, infinite time pulses of different worlds can be staggered together in the grid dimension of time. Figure 3 and 5 illustrate just two examples of these infinite options.

The grid dimension and the Higgs field

Every time pulse of Planck's length, in our known world (universe), an elementary particle can move from one quantized space cell in the size of Planck's length to its nearest neighbor (this is in average and it is neglecting Heisenberg's un certainty principle) with a probability between 0 and 1 . The massless photon has a probability of 1 and it is defined as the speed of light. When the mass of the elementary particle increases with a constant force applied on it, the probability decreases towards 0 and vice versa. This probability is dictated by the grid dimension and is correlated directly to the mass of the elementary particle .This suggests that the grid dimension plays a critical role in the mass properties of elementary particles .The Higgs field plays also a critical role in our understanding of the condensate field that can apply mass to elementary particles. This paper suggests that the Higgs field is part of the grid dimension and based on this assumption predicts the measurements of Higgs particles in the future particle accelerators. In this article we suggest an experiment that might prove that the Higgs field is part of the grid dimensions. We claim that if it is true that space is quantized to small pieces in the size of Planck length then also the wave length of a photon must be an integer number of Planck's length, hence, based on the energy momentum relation:

$E^2 = (Pc)^2 + (m_0c^2)^2$

At the LHC in CERN the proton is accelerated closely to the speed of light

$E^2 \approx (mc^2)^2 + (m_0c^2)^2$

$$E = Energy\ , P = momentum\ , \lambda = wave\ length, m_0 = rest\ mass\ of\ the\ proton$$

Assuming that close to the speed of light, based on Einstein's special theory of relativity

$$m \gg m_0$$

$$E^2 \approx (mc^2)^2 = (Pc)^2$$

$$E \approx Pc$$

Based on De Broglie: $E \approx Pc = \frac{hc}{\lambda}$

$$P = \frac{h}{\lambda}$$

Assuming that space is quantized into three dimensional (3D) space cells in the size of Planck length (l_P) in each dimension $\lambda = N * l_p$, where N is an integer number (1, 2, 3…).

$$l_p = Planck's length$$

$$P_N = \frac{h}{\lambda} = \frac{h}{N * l_P} = \frac{A}{N} = discrete\ momentum$$

$$E_N = \frac{hc}{\lambda} = \frac{hc}{N * l_P} = \frac{Ac}{N} = discrete\ energy$$

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

$$c = speed\ of\ light\ , h = Plank's constant\ , G = gravitational\ constant$$

At the next generation LHC, $E_N = \frac{Ac}{N} = 100TeV = 100 * 1.6 * 10^{-7} Joule$

$$N = \frac{41 * 3 * 10^8}{100 * 1.6 * 10^{-7}} = 7.6 * 10^{13}$$

The difference between two adjacent discrete momentums is:

$$\Delta p_N = P_{N-1} - P_N = \frac{A}{N-1} - \frac{A}{N} \approx \frac{A}{N^2}$$

Assuming that $E = Pc$, the difference between two adjacent discrete kinetic energy levels is (:

$$\Delta E_N = E_{N-1} - E_N = c * \Delta p_N \approx \frac{Ac}{N^2} = \frac{41 * 3 * 10^8}{58 * 10^{26}} = 2 * 10^{-18} J \approx 10^{-11} TeV = 10eV$$

Let's assume a simple model in which a proton receives an increase in its kinetic energy ΔE every time it finishes a round loop at the LHC (figure 6). When $\Delta E \neq N * \Delta E_N$ ($E_N = the\ discrete\ kinetic\ energy\ of\ the\ accelerated\ proton\ at\ LHC$), the residual energy, ($0 < Residual\ Energy\ (RE) < \Delta E_N$) will not contribute to the protons acceleration, since $\Delta P < \Delta P_N$. I suggest that in this case $the\ Residual\ Energy\ (RE)$ will be fully absorbed

in the grid dimension and will not be transferred to the proton. In another words, while $RE < \Delta E_N$ this extra energy RE will be fully absorbed in the Higgs field.

A Higgs particle (boson) has 125 GeV (0.125 TeV) mass. At the future LHC as calculated above, $RE \leq \Delta E_N \approx 10^{-11}\, TeV$.

There are two assumptions:

1. The measured collision energy will not include the Residual Energy (RE) of the acceleration phase. This will prove that space is quantized (figure 6)

2. Since each second, billions of collisions are being generated at the LHC, this small Residual Energy portion, absorbed in the Higgs field can generate a vibration in the Higgs field and generate a Higgs boson. In that case, when the Residual Energy (RE) is nearly equal to ΔE_N , during the acceleration phase, the Residual Energy will generate the Higgs boson and during the collision it will be detected that the collision energy doesn't include the residual energy and that it is lower in 125 GeV than the expected energy (figure 7). This will prove that space is quantized and that the Higgs field is part of the grid dimensions.

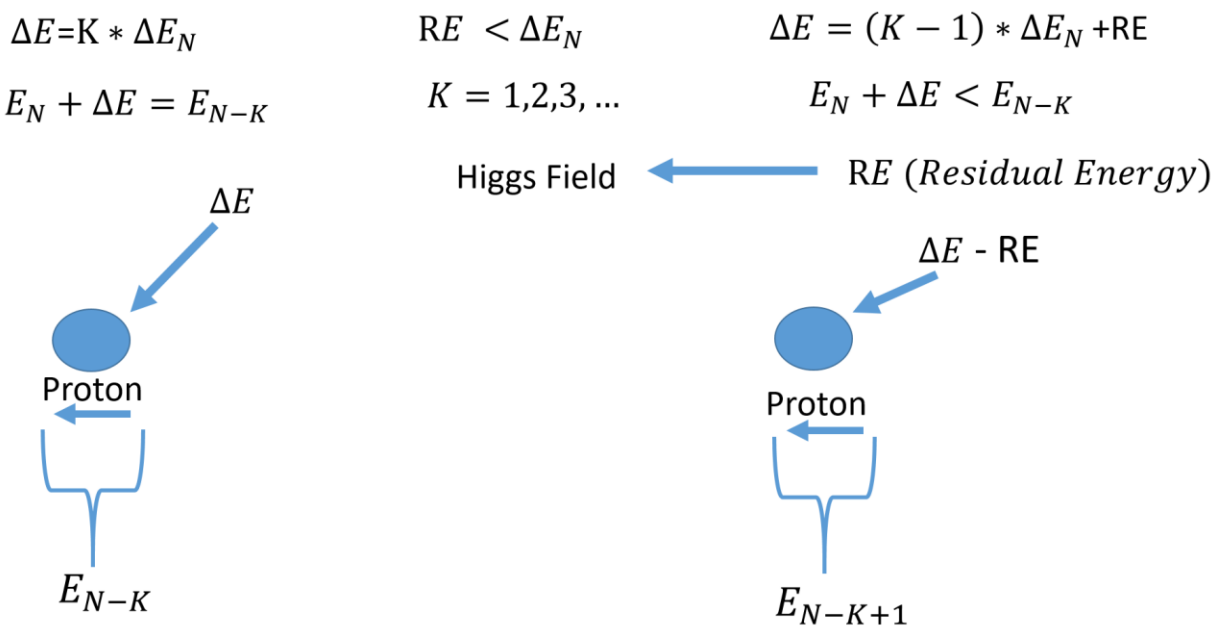

Figure 6: On the left, the increase in the energy at every loop of the future accelerator discrete, meaning it is equal to an integer number K times the gap between two adjacent discrete energy

levels with no extra Residual Energy ($RE = 0$) $\Delta E = K * \Delta E_N = K * (E_{N-1} - E_N)$. This energy increases the proton energy from E_N to E_{N-K} and will be measured during the collision. On the right, the increase in the energy at every loop of the future accelerator in not an integer number times the gap between two adjacent discrete energy levels and it has an extra Residual Energy which is not zero ($RE \neq 0$). Based on the assumption that space is quantized and that only discrete energy levels can be absorbed by the proton, this residual energy is absorbed directly in the Higgs field which is part of the grid dimension. During the collision the measured energy will be lower than the expected since it will not include the Residual Energy of each acceleration phase. To summarize, the Residual Energy (RE) will not be measured in the collision since it was not transferred to the proton and was fully absorbed in the Higgs field which is part of the grid dimensions.

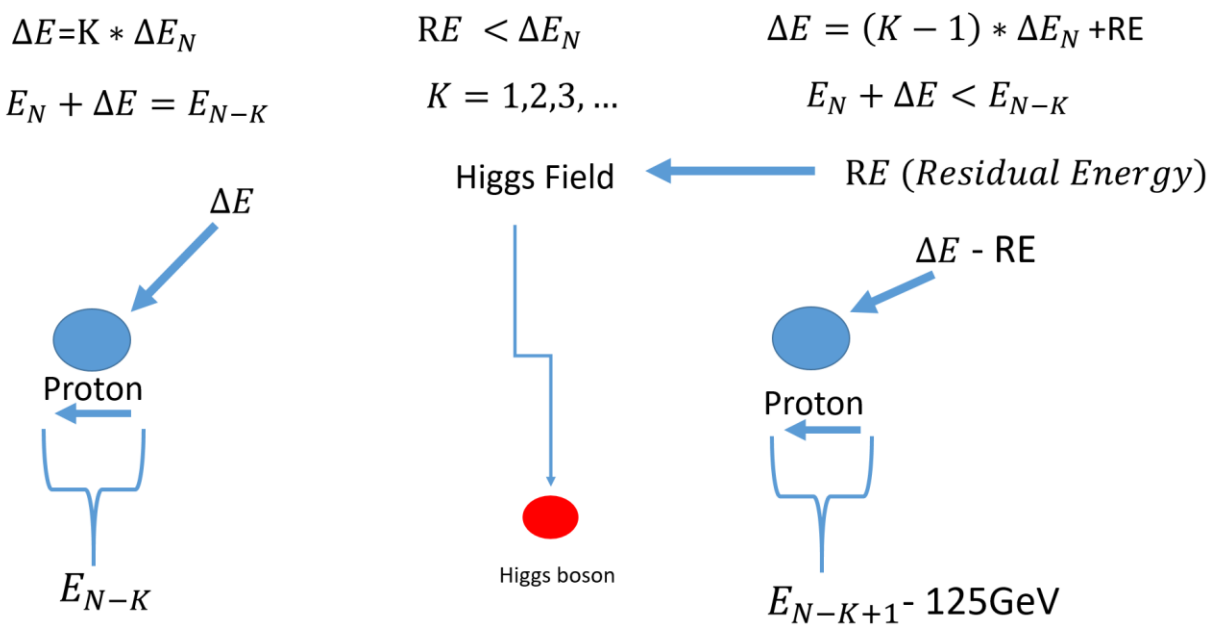

Figure 7: If this energy procedure of proton acceleration accurse billion times each second and the Residual Energy (RE), which can reach up to 10eV in the future LHC, is fully absorbed in the Higgs field, it can contribute to the generation of Higgs boson. If during this acceleration phase a Higgs boson was generated, an extra well defined loss of 125GeV will be measured during the collision. This will strongly indicate that space time is quantized and that the Higgs field is part of the grid dimension .If that is the case than the Higgs boson is the radiation from these extra grid dimensions.

Conclusion

The need to unite General Relativity and quantum mechanics, leads me to introduce a new structure of space time, in which space and time are quantized to the size of Planck's length and Planck's time (space time cells) with a grid like dimension between them, which connects all these space and time cells enabling non local space phenomena's like entanglement and time phenomena's like the delayed choice quantum eraser. These extra grid dimensions enable to construct theoretically staggered many worlds configuration and approach some of the leading mysteries of physics like the Schrodinger's wave collapse, dark matter, anti-matter, super symmetry ,the micro wave background temperature uniformity and the delayed choice quantum eraser of the double slit experiment. The unique characteristics of the Higgs field which is everywhere in the vacuum with a zero spin boson, combined with the role of the grid dimensions in passing on energy from one space-time cell to the next, suggests that the Higgs field is part of the grid dimensions. This paper suggests a way to prove the quantized universe theory through collision energy measurements in the future LHC at CERN.