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Quanta transfer in quantized space

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Physical phenomena emerge from the basic quantum fields everywhere in space. However, not only the phenomena emerge from the basic quantum fields, the law of Conservation of energy and the universal constants must have its origin from the same spatial structure. This paper describes the relations between the main law of physics, some universal constants and the structure of quantized space.

Introduction

The law of Conservation of energy is the main law in physics. Its existence originates upon the phenomenological view of reality: local additions and subtractions of energy in relation to the mutual changes of observable phenomena. This point of view presupposes a fundamental difference between the phenomena and the surroundings of the phenomena in the universe.

Modern physics has abandoned this concept of reality. Quantum field theory has replaced the phenomenological point of view and all the phenomena are thought to emerge from the creation by the underlying basic quantum fields[1]. Distinct fields that are existent always and everywhere in the universe. Albeit not all the known fields have a theoretical description in quantum field theory. Quantum gravity is not incorporated in the conceptual frame work of quantum field theory.

Notwithstanding the fact that the law of Conservation of energy originates from the phenomenological point of view, the conservation of energy must be consistent in quantum field theory too. However, the concept of quantum field theory is not restricted to the observable phenomena within the quantum fields.

The observable phenomena represent only partly all the existing energy in the universe because everywhere in space there is a transfer of energy. Phenomena like particles are just concentrations of energy that have only distinct properties during a period of time.

I cannot postulate the conservation of energy between equal volumes of space, in fact volumes of enclosed quantum fields with the same size and shape. It is clear that there is an energy difference between 1m^3 of the volume inside our sun and 1 m^3 somewhere in a void between the galaxies.

So the question is: “*What about the mechanism behind the conservation of energy, caused by the structure of the basic quantum fields*?”

The Planck-Einstein relation

The only phenomenon that’s observable everywhere in the universe is the electromagnetic wave. Therefore, if I want to discover a *gleam* of the structure of the basic quantum fields within the frame of reference of modern physics I have to examine electromagnetic waves, travelling in space.

The properties of electromagnetic waves, as a stream of single quanta, are described by the Planck-Einstein relation:

$$E = hf = \frac{hc}{\lambda} \tag{1}$$

[h = Planck's constant; f = frequency; λ = wave length; c = speed of light]

The equation is really remarkable because nearly every quantity is a constant. The only exception is the wave length. Unfortunately, an equation with all constants and only 1 exception, a property that is an undetermined variable, is logically inconceivable. Why should the universe make a difference between the nature of properties that are 100% related to each other? All are constants and one is a variable?

All these quantities emerge from the interactions between the underlying structure of the basic quantum fields, so why are some properties constants and other variables?

Why isn't the wave length a constant? Probably because it was not customary to imagine that the curvature of space, Einstein's theory of general relativity, can have a constant that determines length. However, the wave length of electromagnetic waves is enormous in relation to the smallest elementary particles so there is no empirical based argument to reject an invariant basic wave length. Especially because the concept of a minimal length scale is well known in theoretical physics[2].

Of course, the mutual interactions between local macroscopic phenomena show all the characteristics of curved space-time as described by Einstein's theory of general relativity. That's why in the past the physics text books have taught that Einstein's space-time is the underlying fabric of the universe, perfect in line with the observations. This in contrast to the axioms of Isaac Newton about absolute space and absolute time.

But that's just a believe. There is any proof to support the opinion that space-time is the fabric of our universe. Because without phenomena there is still the structure of the creating basic quantum fields. Some kind of an “aether”[3].

The Planck-Einstein relation shows the determination of the energy by the wave length. Therefore, I can express the wave length with the help of a new constant:

$$\lambda = n\underline{\lambda} \quad (2)$$

[n = integer (variable); $\underline{\lambda}$ = standard length]

In other words, $\underline{\lambda}$ is a constant and named *standard length* in this paper (the underline is used to show the difference).

Now I can rewrite the Planck-Einstein relation:

$$E = hf = \frac{hc}{n\underline{\lambda}} \quad (3)$$

The revised equation shows that energy is inversely proportional to the number of standard lengths by which a single quantum is transferred. The outcome is equal to the unmodified equation (1).

The spatial structure of quantum fields

Suppose I increase the energy of the electromagnetic wave. The result is a decrease of the number of standard lengths between the beginning and the end of 1 electromagnetic waveform. The limit is n = 1 $\underline{\lambda}$, but because of the nature of electromagnetic waves the minimum length scale must be half the size of the minimum electromagnetic wave length. See the schematic cross section of a wave form in figure 1 with the help of an easy to draw metric.

However, what is represented by the size of the standard length? When I think it over I have to conclude that the standard length is a property of the structure of the creating basic quantum fields. Moreover, the Planck-Einstein equation makes no difference in relation to the direction of the transfer of electromagnetic waves in space.

In other words, the standard length $\underline{\lambda}$ must be the representation of the size of a spatial unit that forms the aggregated structure of the basic quantum fields, like the bubbles in a foam.

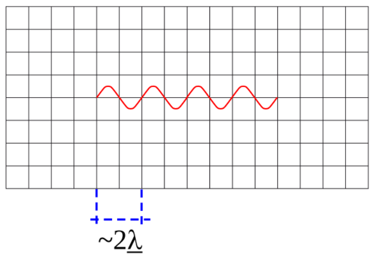

figure 1

The schematic image cannot be a surprise, because quantum fields have a spatial structure. The only difficulty is the relation between the structure of quantized space and Einstein’s curved space-time.

The cause of the difference is the scale of the observed phenomena. General relativity describes the mutual relations between macroscopic phenomena and quantum field theory describes the structure that is responsible for the creation of the observable phenomena in the microcosm.

Because electromagnetic waves are everywhere in our universe I have to accept that the bubbles of the foam *tessellate* space, like the schematic image in figure 2 shows. The use of cubes in the image has no direct relation with the geometrical properties of the structure. I have used cubes because it is easy to draw.

Now I have to conclude that every volume in space consists of one or a multiple of the spatial unit that forms the basic structure of the quantum fields. Mathematically spoken, the unit is the element of a mathematical set. Moreover the mathematical set envelopes everything in the universe, so it is the all-inclusive set that represents our universe.

It is only a small step to conclude that all the spatial units together form the main structure of the basic quantum fields in our universe and the structure is what we call *quantized space*[4]. The consequence of this concept is the

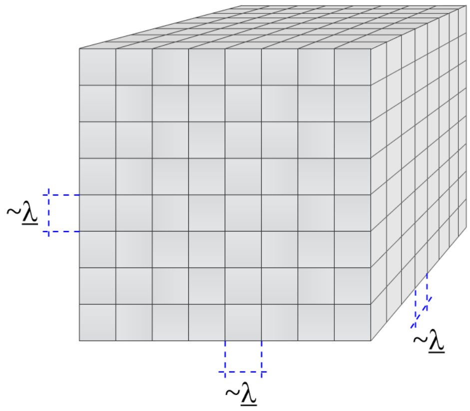

figure 2

existence of topological properties because the volume of every spatial unit is invariant. Therefore every element is a topological object that represents a homeomorphism.

The element of the mathematical set, the spatial unit of quantized space, gets the character "*e*". Now every volume (*V*) in the universe represents:

$$V = nV_e \quad (4)$$

[*n* = integer (variable); V_e = volume element]

Topological transformations

The topological transformation of an invariant volume that tessellates space is restricted to the transformation of its shape by the transfer of a flux of infinite small amounts of volume within its boundary. But because every volume is one or a multiplied of the volume of a unit all the units of quantized space have to change their shape synchronously (see figure 3, the cross section of 2 square bodies).

The image (3) shows that the mutual deformation (ΔV) of 2 rectangle bodies with an invariant volume is only possible if both bodies transfer volume synchronously within their boundary to or from the joint faces. Therefore:

$$\Delta V_A = \Delta V_B \quad (5)$$

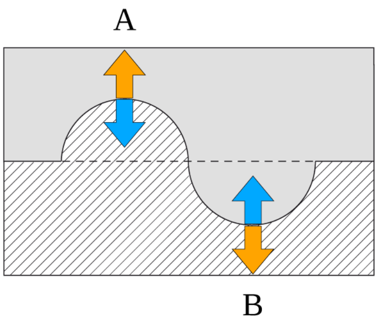

figure 3

The consequence is that spatial units with an invariant volume cannot change their shape independently from all the other units around because all the units tessellate space. In other words, all the spatial units of quantized space change their shape synchronously. Nevertheless, a flux of infinite small amounts of volume doesn't correspond with the existence of Planck's constant. So how is it possible that a continuous fluently topological deformation can result in fixed amounts of change/energy?

Planck's constant

Figure 4 shows in a schematic way one unit and the arrows reflect the direction of the deformation of every face of the cube in relation to the adjacent units around *at a certain moment*. So I can write:

$$\Delta V_A + \Delta V_B = \Delta V_C + \Delta V_D + \Delta V_E + \Delta V_F \quad (6)$$

The equation (6) shows that one quantum isn't a distinct amount of topological deformation with an imaginary boundary and shape. Because both parts of the equation represents the energy (local change) of one quantum.

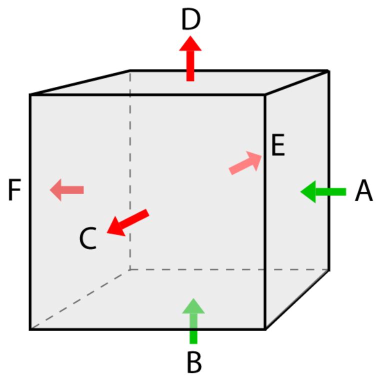

figure 4

Max Planck derived the constant of energy with the help of the emission of black body radiation[5]. An electromagnetic wave is a linear recurrent change of local properties in vacuum space. Therefore there was no reason to propose there are fluently transferred amounts of energy that are a multiple of the minimal observable topological deformation of one unit.

Figure 4 shows that more than one unit can be responsible for the transfer of 1 distinct quantum. That is the logical consequence of figure 4 and the corresponding equation 6.

The shapes of the units of quantized space change continuously and one result is the repeated change of the direction of deformation of one or more faces of a unit. For example, the red arrow of face C changes into a green arrow in opposite direction. In other words, all the units of quantized space have to change the direction of the mutual deformations at exactly the same moment. This synchronisation of the change of the direction of the topological deformation is the well known fixed amount of energy.

To distinguish between the energy of Planck's constant (*h*) and the energy of the constant of topological deformation, the quantum, the latter gets the notation $\underline{h}$.

$$h = n\underline{h} \quad (7)$$

Quantum time

The pass on of the fixed amount of topological deformation between the units of the structure of the basic quantum fields is impossible without a constant velocity.

In other words, the velocity of the transfer of a single quantum is independent from the velocity of an energy concentration from which the single quantum originates. This constant velocity is of course the speed of light (*c*).

Figure 5 shows the linear pass on of a quantum of topological deformation from a unit to an adjacent unit (from unit A to B). It is the smallest amount of an observable change of position of a fixed amount of energy transfer from one element to an adjacent element. In between there is no observable change measurable because every phenomenon, inclusive the used probe, changes at the same rate.

In other words, the limitation to detect the exact position of a phenomenon is directly related to the minimal length scale ($\underline{\lambda}$).

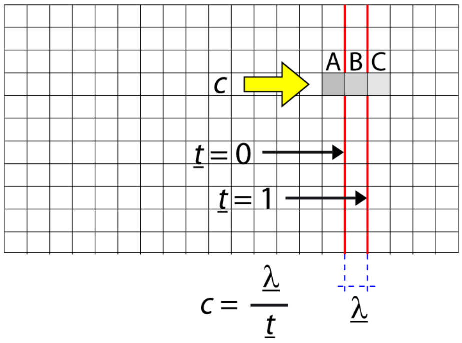

figure 5

The transfer in one direction of a fixed amount of energy, the quantum, between adjacent elements have a certain duration: length divided by velocity. Length ($\underline{\lambda}$) and velocity (*c*) are constants, therefore time, in relation to the topological deformation of the units of quantized space, is a constant too. So T (duration) becomes a multiple of $\underline{t}$ (underlined to express the status as a universal constant in this paper):

$$T = n\underline{t} \quad (8)$$

Velocity

Suppose unit A in figure 5 has a topological deformation that is equal to a surplus of 10^6 quanta in relation to the units around. This surplus of energy will distinguish unit A from the units around so the observer will think that unit A seems to be a phenomenon.

However, every unit of quantized space transfers only 1 quantum ($\underline{h}$) during the constant of time ($\underline{t}$). In other words, it costs 10^6 $\underline{t}$ before all the topological deformation of unit A is transferred to unit B.

The velocity of every quantum is the speed of light thus the velocity (S) of the energy concentration (number of quanta) that is transferred from unit A to unit B is:

$$S = \frac{c}{n} \quad (9)$$

Unfortunately the concentration of energy is always distributed over more than one unit and the concentration has a spin too. But the principle is clear, the velocities of phenomena are the result of the surplus of energy in relation to the average energy of the units around.

That is why fast moving clocks, or particles, are forced to slow down the internal transfer of quanta because every unit can only transfer 1 quantum during 1 $\underline{t}$. The observable effect of the mechanism is called relative time.

Conservation of quanta transfer

Figure 5 seems to show a violation of the speed of light. Because if unit B is deformed by the transfer of 1 quantum by unit A during 1 $\underline{t}$ ($0 \rightarrow 1$), unit B has to deform unit C synchronously. That means at exactly the same moment that unit A transfers 1 quantum to unit B.

The cause that is responsible for the pass on of topological deformation between the units is a property of every spatial unit. It is the universal mechanism of every unit of quantized space to change its shape in a topological way. This property must be a constant too because topological objects that tessellate space cannot change continuously without the existence of a universal property responsible for the topological deformation.

In other words, unit A cannot force the deformation of unit B + C + etc. because every unit has an identical amount of internal mechanism to change its shape.

Moreover, figure 5 doesn't show the transfer of the quanta of all the other units around. All the units of quantized space tessellates the volume of the universe and every unit transfers 1 quantum during 1 *t*. The consequence is that all the transfer of quanta in the universe is conserved. This is the foundation of the law of Conservation of energy.

That means that identical volumes, unregarded their position in the universe, have an identical amount of quanta transfer during the same period of time.

Therefore, the total amount of quanta transfer in space is conserved and is correlated. Besides that, the topological transformations are non-local because all the units tessellate space.

Finally, it shows that the law of Conservation of energy is not a law of nature. It is the mathematical consequence of the properties of the elements of the all-inclusive set; the units of the structure of the basic quantum fields

References

1. Art Hobson (2013). There are no particles, there are only fields. doi: 10.1119/1.4789885
   American journal of physics **81**, 211 (2013)
   https://arxiv.org/ftp/arxiv/papers/1204/1204.4616.pdf
2. Sabine Hossenfelder (2013). Minimal length scale scenarios for quantum gravity.
   Living Reviews in Relativity, January 2013
   doi: 10.12942/Irr-2013-2
   https://arxiv.org/pdf/1203.6191.pdf
3. Albert Einstein; transcription of a lecture at Leiden University in 1920. https://www-history.mcs.st-andrews.ac.uk/Extras/Einstein_ether.html
4. Gerard 't Hooft (2001). Obstacles on the way towards the quantization of space, time and matter.
   Studies in History and Philosophy of Modern Physics, Volume 32, Issue 2, June 2001, Pages 157 – 180.
   doi: 10.1016/S1355-2198(01)00008-9
   http://www.staff.science.uu.nl/~hooft101/gthpub/foundations.pdf
5. Max Planck (1901). Ueber das Gesetz der Energieverteilung im Normalspectrum.
   Ann. Phys., **309** (3): 553–63,
   doi:10.1002/andp.19013090310