Calculation of the wavelengths of the lyman series in the hydrogen atom based on the quantized space and time theory of elementary particles

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Abstract: In the current article, utilizing the theory of quantization of time and space and the internal structure of elementary particles, the radiation spectrum of the excited hydrogen atom is calculated theoretically. By doing this, the electron movement parameters in the hydrogen atom have been stated in a novel way, and via generalizing these calculations, the excited states of other atoms can be calculated. It can be shown that during the transfer of the electron from a higher level to a lower one, what is the state of the electron in terms of momentum, energy, time, and place.

Keywords: Hydrogen– space and time quanta, Elementary particles

Introduction: The electron model, the time and lengthof which are shown schematically in the following figures1,2,3 explains the Lorentz relations[1], and by using it, it is possible to calculate the radiated energy spectrum in the excited hydrogen atom when it comes from a higher level to a lower level. The reason for the presence of the electron in the S1 level has been explained by the wavelength. In the present article, it is stated that since the components of the electron velocity vector (Y, Z) in a hypothetical Cartesian system does not become zero; it causes the electron not to fall into the nucleus.
In the fig.1, it is shown that the time for an electron is created in the form of consecutive sequences, and the length of the electron is created in the same way. We call this moving element a moton in the quanta of the past time and the quanta of the present time [1]. The medium for the creation of this sequence is the Super Dimension Axiom [1], and the super-light spin originates from the existence of this super dimension.

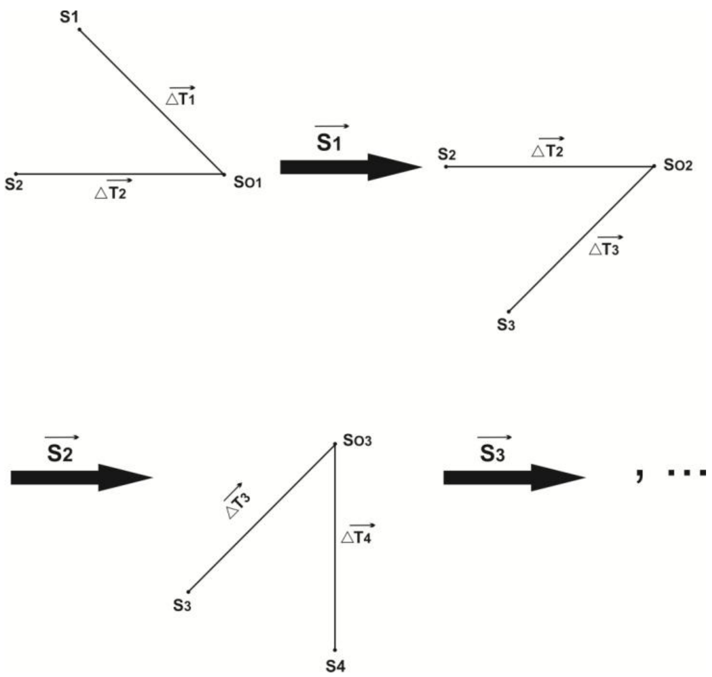

Fig. 1. The sequence of time quanta of the electron

In the Fig.1, the spatial diagram of a moton in length belonging to the quanta of the past time and the quanta of the present time is shown. The speed of an electron for an observer is determined by this sequence of quanta of space and time and it is the motons that determine the base speed in the quantum of time and space of the past independently of the external observer, and the quantum of time and space of the present depends on the environment.

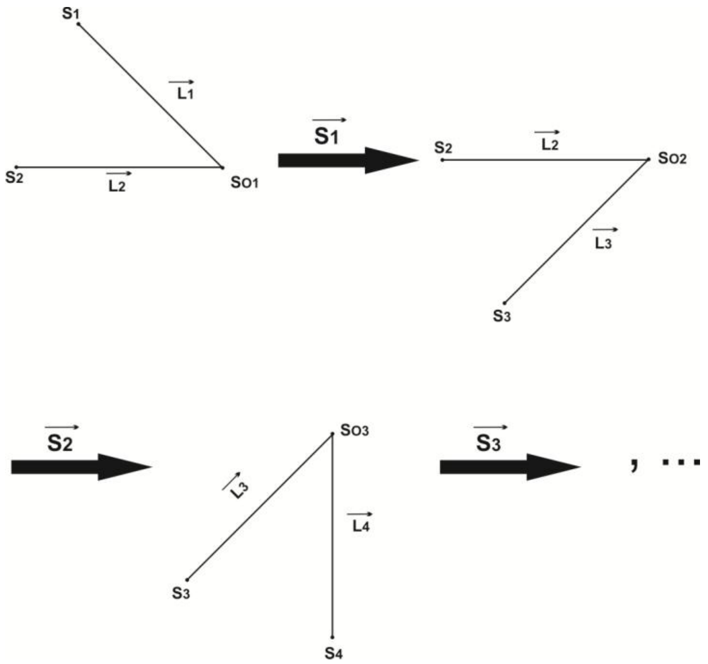

Fig. 2. The sequence of length quanta of the electron with positive spin

Itis again this super dimension that performs the task of converting. For example, the time and length quanta of the present to the past time and length in the next sequence. Regarding the nature and structure of this super dimension, in my other article, some excerpts are stated about the nature of the super dimension and some information has been provided [2].

Figure3 shows that sequences of time and space are created and passed successively by the function of moton and super-dimension. From the point of view of the experimenter, an electron is the embodiment of two sequences of both time and space.

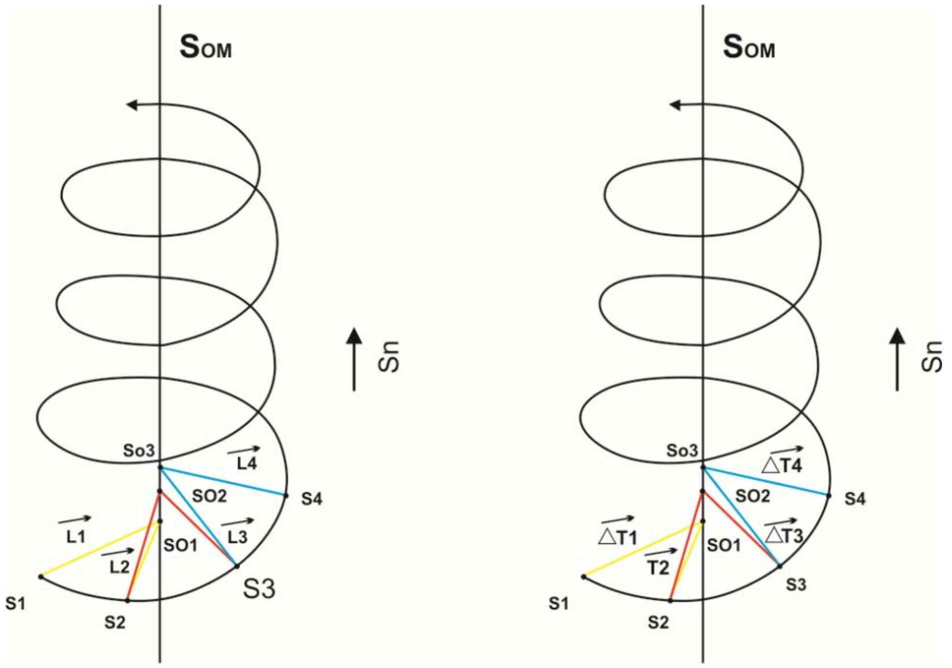

Fig. 3. The sequence of time and length quanta of an electron in super dimension $\overrightarrow{S_n}$. The electron has positive spin angular momentum with a relative velocity with respect to a local frame

At the temperature of zero Kelvin, these sequences of time and space almost coincide on a plane and can be used as inertial system. In this inertial system, the quanta of the motons have the highest value. In fig.3, the illustrated super dimension performance is obtained basis on the Planck constant. The equations of action of motons are expressed based on Einstein's equation of equivalence of energy and mass. The set of these equations determines the equations of mass, energy, momentum, and angular momentum of an electron.

1: We can find the relative velocity of a particle concerning a reference frame using Figures 1, 2, and 3: [1]

$$\vec{V}^2 = \left(\frac{\vec{l}_{1(so1)}}{\Delta\vec{T}_{1(so1)}} \times \frac{\vec{l}_{2(so1)}}{\Delta\vec{T}_{2(so1)}}\right) - \left(\frac{\vec{l}_{2(so2)}}{\Delta\vec{T}_{2(so2)}} \times \frac{\vec{l}_{3(so3)}}{\Delta\vec{T}_{3(so3)}}\right) ,(1)$$

$$\vec{V}^2 = (\vec{V}_Y \times V_X) - (\vec{V}_X \times \vec{V}_Z) \quad (2)$$

$$\vec{l}_0 = \vec{l}_1 = \vec{l}_2 \ (s_{o1}) = 1.409 \times 10^{-15} m,(3)$$

$$\Delta\vec{T}_0 = \Delta\vec{T}_1 = \Delta T_2 \ (s_{o1}) = 0.47 \times 10^{-23} s,(4)$$

$$\vec{l}_3 \ (s_{o2}) = \frac{\vec{l}_0}{\gamma} ,(5)$$

$$\Delta\vec{T}_3 \ (s_{o2}) = \Delta\vec{T}_0 \gamma \ ,(6)$$

$$V^2 = C^2 - \frac{C^2}{\gamma^2} ,(7)$$

$$\gamma \equiv \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} : \ \textit{Lorentz factor} \ (8)$$

$$\vec{l} = \frac{\vec{l}_0}{\gamma}, \qquad \Delta T = \Delta\vec{T}_0\gamma \quad (9)$$

$$|V| = \sqrt{c^2 - \frac{c^2}{\gamma^2}}$$ *: Relative velocity of the particle.(10)*

determination of the the Lorentz factor coefficient has been explained in my other article[2].The maximum Lorentz factor for charged particles should be 1722.9.

This is a very great achievement because the minimum wavelength for charged particles is equal to the length quanta and it is obtained by using the deBroglie formula here it is obtained based on the assumption of moton existence and this equivalence shows a great attainment between the Einstein's mass-energy formula and Planck's constant [2].

By using the desired number in Equation 10, the maximum speed of the sequence of space and time in the present time of a moton is calculated.

$$|V| = \sqrt{c^2 - \frac{c^2}{\gamma^2}} = 299792407.5 m/s \qquad (11)$$

2: The energy of the 2nd layers up to the infinite number of the excited hydrogen atom is obtained from the sum of the electric potential energy between the proton and the electron with the kinetic energy of the electron between the atom levels, and the electron kinetic energy at each level of the atom's energy level. The sign of kinetic energy is negative.
the electric potential energy between the proton and the electron is the work required for the electron to fall in the proton's electric field. If we assume that the electron and proton are fixed relative to each other in the X axis and the electron moves only in the Y, and Z plane, then:

$$\vec{V}^2 = (\vec{V}^2{}_Y \times \vec{\delta}_X) - (\vec{\delta}_X \times \vec{V}_Z)$$

(12)

Equation (12) causes the Lorentz factor to become one in the charging formula.[1]

$$q = \frac{\sqrt{(8\pi\varepsilon_0 m_0 c^2 l_0)}}{\sqrt[4]{(1-\frac{v^2}{c^2}}} = \sqrt{8\pi\varepsilon_0 m c^2 l_0} = 1.602\times10^{-19}c$$

(13)

Consequently, by assuming the Bohr radius for the distance of the electron of the first layer with the proton and the electric potential energy of the first layer of the hydrogen atom, it is obtained from equation 14 [1]

$$U_1 = \frac{8\pi\varepsilon_0 m_0 c^2 l_0}{4\times 2\pi\times\varepsilon_0\times 37556\times l_0\times 1} = 13.6ev$$

(14)

And if there is a movement in the X (proton-electron)axis, the relative value of this equation for potential energy is equal to Equation 15.

$$U_1 = \frac{8\pi\varepsilon_0 m_0 c^2 l_0}{4\times 2\pi\times\varepsilon_0\times 37556\times l_0\times\sqrt{1-\frac{v^2}{c^2}}} = \frac{13.6ev}{\sqrt{1-\frac{v^2}{c^2}}}$$

(15)

We define A_0 as a basic spherical network:

$A_0 = 4*2\pi*37556 l_0$

(16)

By using the fact of quantized time and length, we can prove that the angular momentum of an electron is also quantized. Therefore electrons can only be located on surfaces that are integral multiples of A_0:

A= n A_0

(17)

n= (1, 2, 3, 4…)

$$U_n = \frac{13.6ev}{n \times \sqrt{1 - \frac{v^2}{c^2}}} \text{ [1]} \qquad (18)$$

n= layer number

3: The kinetic energy of the electron moving to the first layer in the excited hydrogen atom consists of two parts, one is the energy resulting from the movement along the X-axis, and the other is the energy resulting from the sum of each layer above the second layer that the electron passes through and this energy is in Y and Z graph plane. In the two states of the proton, in this calculation, these two energies are assumed to be constant.

Equation 19 is used to calculate the kinetic energy of the surface of the layers, Ka, and the energy of the path of the electron to the proton would be Kn.

$$K = p \times v = \frac{h \times v \times \sqrt{1 - \frac{v^2{}_{\max}}{c^2}}}{n \times l_0 \times \sqrt{1 - \frac{v^2}{c^2}}} \quad (19)$$

$n = 37556$

$$v \approx \delta \Rightarrow \sqrt{(1 - \frac{v^2{}_{\max}}{c^2})} = 5.8 \times 10^{-5}$$

$$v = v_{\max} \Rightarrow \sqrt{(1 - \frac{v^2{}_{\max}}{c^2})} \approx 1 \qquad (20)$$

This relation is a floor component relation that explains the paradoxical states in the movement of elementary particles. The fraction numerator shows that there is an uncertainty in the calculation of the elementary particle energy at zero speed. A particle can take energy or emit radiation on the condition of observing, the quanta of time and space of the elementary particle and the surrounding space-time. If the velocity is zero in one of the X, Y, or Z axes, $\sqrt{(1-(\frac{v^2}{c^2})} = 1$, and if there is a significant amount of speed in all X, Y, and Z axes, $\sqrt{(1-(\frac{v_{\max}{}^2}{c^2})} = 1$. This creates a paradox, the paradox is that there is velocity, but it is not, and this paradox is solved for the ionic particle by the radiation of a photon.

By numbering the relation for the kinetic energy caused by the movement of the electron from the S1 to S2 layer, which is equal to the path length

$$L_{S2-S1} = n \times 37556 l_0 \quad (21)$$

$$K_1 = \frac{h \times 299792407.5}{37556 \times 1.409 \times 10^{-15} \times 1722.9} = 13.59 ev$$

(22)

Incredibly, the kinetic energy of the electron in the state of transition from S2 to S1 is calculated. Formula 19 is a new equation for elementary particle mechanics.

By summing the kinetic energy and the electric potential of the electron from formulas 22 and 19, the electron transfer from a level to the S1 level is obtained.

$$E_{PHOTON} = h\nu = E1 - E2 = U_1 - K_2 - U_2 - Ka_2 \quad (23)$$

$$U_N = \frac{13.6 ev}{n}$$

(24)

$$K_n = \frac{h \times 299792407.5}{(n-1) \times 37556 \times 1722.9 \times 1.409 \times 10^{-15}} \quad n \succ 1$$

(25)

$$Kan = \frac{h \times 299792407.5}{N \times 37556 \times 1722.9 \times 1.409 \times 10^{-15}}$$

(26)

Kan is the kinetic energy of each electron in the squares of the quanta of the Z and Y axes.

$$N = \frac{4\pi \times (nr)^2}{4\pi \times r^2} = n^2$$

(27)

Therefore, for the electron to fall from level S2 to S1, we will have

$$E_{photon} = h\nu = Es_1 - Es_2 = 13.6ev - 13.59ev - 6.8ev - 3.4ev = -10.2ev$$
$$\Rightarrow \lambda = 121.5nm$$

(28)

The kinetic energy of the path of electron fall from higher to lower layers destroys the electric potential energy, so the energy of 10.2 electron volts is repeated for all layers up to the sixth layer.

$$Un = -Kn + 1$$

(29)

And only the kinetic energy in the quantized squares of the Y and Z axes is added periodically.

$$E_{photon} = h\nu = Es_1 - Es_n = -10.2ev - \sum_{i=3}^{n} \frac{1}{n^2} \times \frac{h \times 299792407.5}{37556 \times 1722.9 \times 1.409 \times 10^{-15}}$$

(30)

n=2

$\lambda = 121.5nm$

n=3

$\lambda = 105nm$

n=4

$\lambda = 98nm$

n=5

$\lambda = 94.6nm$

n=6

$\lambda = 92nm$

With exact values, the linear radiation spectrum of the Lyman series for excited hydrogen is obtained by using the theory of quantization of time and space and the internal structure of elementary particles.

Conclusion: so far, for obtaining the wavelength of the radiation spectrum of the hydrogen atom, a function has been extracted from the experimental data set. But since electron is an elementary particle, this radiation should be obtained with the formulas of the elementary particles, which has been done in this article.

REFERENCES

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[1]Hadronic journal volume 33, Number3, June 2010 Quantized space a- Time and internal structure of elementary particles: A new model 249 Hamid Reza Karimi Electrical engineering Department Azadof south of Tehran 17776-13651, Iran hr.karimy@gmail.com.

[2]Calculation of the exact range of the mass of higgs boson in the large Hadron collider (LHC) of the basis of the quantized space and time theory

that published on Hadronic journal 44,Number 1,

[3]Anomalous magnetic moment um of mouns in FNAL on the basis of quantize space and time theory .it published in Hadronic journal vol 44 no2

[4].Ernest M Henley,AlejandroGarcia.SubatomicPhysics,Thirdedition.world

scientific publishing Co.pte.ltd**.**2007

[5].Griffiths, David J.(davidjeffry).Introduction to elementary particle. john Wiley &sons,Inc.1987

[6]. Robert Resnick, Introduction to Special Relativity, *Wiley Fastern Private Limited*, 1972.

[7].James William Rohlf.Modern Physics from α to z.Wiley.1994