

Hydrogen Atom Construction: Experimental Approach.

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In papers [1] and [2] vortical models of electron and proton were proposed. This article is devoted to investigation of standing waves originated in ether by proton. Just these waves define discrete spectra of optical electrons and bremsstrahlung. Standing waves in the vicinity of proton define nuclear forces.

In paper [1] equations of generalized electrodynamic and gravodynamic fields were traced out. Electric charge is initial condition for electrodynamic field and proton and electron mass is one of necessary two initial conditions for gravodynamic field induced by electron and proton. If we knew border conditions for these fields we would obtain complete physical picture created by these fields in the vicinity of proton and electron. In this case generalized formulas for electrodynamic and gravodynamic interaction proposed in paper [3] would describe their interaction.

But first we do not know these border conditions nowadays. And second there are many reasons to believe that the most important role in such interaction is played by the third field. Some manifestations of it are investigated today in the framework of thermodynamics and Shroedinger equations.

This field is called X-field here. We do not know its equations nowadays but we know its charge: it is spin. Apparently just it defines main features of the observed interaction picture between electron and proton. Electro- and gravodynamic fields add just some shades. The aim of this article is to propose rough description of the phenomena and leave some details for the future.

Let us remind some facts from paper [1]. Electron and proton are massive toruses. Particles drawing this torus perform two rotations: in equatorial and meridional planes.

Angular velocity of equatorial rotation for electron is

$$\omega_e = 8,1 \cdot 10^{20} \text{ rad/s}, \quad (1)$$

and radius of the greater circumference defining electron torus is

$$r_e = 3,8 \cdot 10^{-13} \text{ m}. \quad (2)$$

Electron's mass

$$m_e = 9,1 \cdot 10^{-31} \text{ kg} \quad (3)$$

Radius of the less circumference

$$\rho_e = 1,9 \cdot 10^{-13} \text{ m} \quad (4)$$

and angular velocity of the meridional rotation is

$$\Omega_e = 16,2 \cdot 10^{20} \text{ rad/s} \quad (5)$$

Electron's charge modulus is

$$|e| = m_p \omega_p = m_e \omega_e = 7,3 \cdot 10^{-10} \text{ kg/s} \quad (6)$$

Here m_p and ω_p are proton characteristics.

Let us note that

$$\omega_e r_e = \Omega_e \rho_e = c \quad (7)$$

were c is light velocity in free ether.

When we assert this we suppose that the space is filled with a certain media. We do not prescribe any qualities to these media except those which are corrolaries of some experimental facts and their interpretation in the framework of electro- and gravodynamic fields theory. One of these corrolaries is interpretation of electric constant \mathcal{E}_0 as free ether density

$$\mathcal{E}_0 = 1,87 \cdot 10^8 \text{ kg/m}^3 \quad (8)$$

and magnetic constant μ_0 as free ether compressibility

$$\mu_0 = 5,9 \cdot 10^{-26} \text{ ms}^2/\text{kg} \quad (9)$$

Light velocity in free either obtains natural interpretation as sound velocity in it.

$$c^2 = 1/\mu_0 \mathcal{E}_0 \quad (10)$$

Term "ether" is used instead of "physical vacuum" although it is a red flag for many physics nowadays.

Equality (7) means that either density and compressibility in the vicinity of electron corresponds its free state, i.e. electron do not enlarge and do not less product of ether and compressibility.

Proton characteristics are as follows. Angular velocity of its equatorial rotation is

$$\omega_p = \omega_e : 1836 = 4,41 \cdot 10^{17} \text{ rad/s} \quad (11)$$

its equatorial radius is

$$r_p = 2,1 \cdot 10^{-16} \text{ m} \quad (12)$$

Angular velocity of its meridional rotation is

$$\Omega_p = 6,1 \cdot 10^{24} \text{ rad/s} \quad (13)$$

and its meridional radius

$$\rho_p = 6,93 \cdot 10^{-17} \text{ m} \quad (14)$$

Charge sign is defined by the screw angular velocity of equatorial rotation constitutes with angular velocity of equatorial rotation or this is the same with spin which is impulse momentum of meridional rotation. It's direction coincides with direction of meridional rotation angular velocity.

Local light velocity in the vicinity of proton is

$$u_p = \Omega_p \rho_p = 4,2 \cdot 10^8 \text{ m/s} \quad (15)$$

This is greater then light velocity in free ether and this is an essential distinction of proton from electron: proton changes ether density and compressibility in its vicinity. It is clear that this deformation should decrease with distance increase from proton and converge to light velocity in free ether. Experiment shows that such convergence takes place discretely by steps, i.e.

$$u_n = \omega_n r_n \xrightarrow[n \rightarrow \infty]{} c \quad (16)$$

Here ω_n is angular velocity and r_n is radius of vortex proton originates in its vicinity on n step. u_n may be interpreted as local light velocity on n step.

Is this convergence monotonic?

Experiment answers: no.

There is at least one velocity between u_p and c . This velocity is

$$c_1 = c/137 = 2,19 \cdot 10^6 \text{ m/s} \quad (17)$$

To-day this velocity is interpreted as electron velocity on the lowest orbit in hydrogen atom. Another interpretation for it is proposed here as minimal local light velocity in the system of standing waves induced by proton in ether.

We come to a conclusion that there is a valley between two peaks u_p and c .

Electron needs additional energy in order to ascend as to c as to u_p , i.e. when it comes to proton and when it comes to free ether.

Let us investigate way from c_1 to free ether.

We adopt the following law of X-field charge conservation

$$m_e c_n r_n = \hbar \text{ for all } n=1,2,\dots,137. \quad (18)$$

Here C_n is local light velocity and r_n is radius of the vortex induced by proton on the n -th step. Such vortexes actually coincide with concept of Faraday force lines. We shall often use this term below.

One obtains for $n=1,2\dots 137$

$$r_n = \frac{\hbar}{m_e c_1 n} = \frac{5,27}{10^{11} n} m \quad (19)$$

In particular

$$r_{137} = 3,85 \cdot 10^{-13} m \quad (20)$$

$$\omega_1 = c_1 / r_1 = 4,2 \cdot 10^{16} \text{ rad/s} \quad (21)$$

$$\omega_n = 4,2 \cdot 10^{16} n \text{ rad/s} \quad (22)$$

$$\omega_{137} = 137^2 \omega_1 \approx 7,8 \cdot 10^{20} \text{ rad/s} \quad (23)$$

r_{137} and ω_{137} are very close to radius and equatorial angular velocity of electron.

We see that the first 137 force lines differ from the lines with greater numbers in that their radii are greater and their angular velocities are lesser than for electron.

Mathematically correlation (18) coincides with Bohr's quantum condition. But here it has understandable essence: it is conservation law for X-field charge. Just \hbar and not $\frac{1}{2}\hbar$ stands in the right hand part of (18). This means that force lines are bozons and not fermions. It becomes clear why frequencies of "rotation Bohr's orbits" do not coincide with radiation frequencies. Radiation frequencies are defined by force lines frequencies and are not connected with "electron movement" even when it really moves. Actually electron is in rest in nonstirred hydrogen atom. Therefore its orbital momentum is null.

Experiment shows that C_n increases as n . Taking (18) into account we can assert that r_n decreases as n and this means that ω_n increases as n^2 .

It was shown in [3] that electron can sustain constant velocity indefinitely long only if it is in rest or moves with double local lights velocity (this means that it moves under condition of superconductivity). When electron inside C_1 vortex is struck with photon or other electron it comes to another vortex with a velocity which differs from double local light velocity. Therefore it begins moving with friction. Friction energy concentrates. Electron loses its energy and returns to maternal vortex (force line).

Let us find formula for energy radiation in hydrogen atom when electron comes from force line n to force line m , $n > m$.

Force line \mathbf{n} posses the following kinetic energy

$$\frac{1}{2}m_e c_n^2 = \frac{1}{2}\hbar\omega_n \quad (24)$$

This energy is necessary to destroy this force line. Experiments show that energy necessary to tear out electron from this line is 137^2 times less. Therefore energy formula for electron coming from one force line to another one is

$$W_n - W_m = \frac{1}{2}\alpha^2 \hbar(\omega_n - \omega_m) \quad (25)$$

α^2 here is thin structure constant.

In particular

$$W_1 - W_{137} = \frac{1}{2}\hbar(\omega_1 - \omega_{137})/137^2 = 1,2 \cdot 10^{-22} j - 2,18 \cdot 10^{-18} j = 7,5 \cdot 10^{-4} ev - 13,6 ev. \quad (26)$$

Minus sign means that energy is spent for the process.

Now let us come to the slope from proton to domain with local light velocity C_1 . Accurate analysis here will be possible when neutron theory is constructed and some additional experimental facts which the author does not know nowadays are obtained. Therefore only just preliminary considerations are proposed below.

The following suppositions are assumed here.

1. Local light velocities decrease steadily and discreately from velocity $u_1 = u_p$ to velocity c_1 .
2. X-field charge conservation law is

$$m_p u_n r_n = \hbar, \mathbf{n}=1,2\dots 192. \quad (27)$$

where m_p is proton mass.

We assume that

$$u_1 = u_p = 4,2 \cdot 10^8 \text{ m/s} \quad (28)$$

Hence

$$\frac{u_1}{c_1} = 192 \quad (29)$$

$$u_n = r_n \omega_n, \mathbf{n}=1,2,\dots 192. \quad (30)$$

One obtains taking (27) into account

$$r_n = r_1 n, n=1,2\dots 192 \quad (31)$$

$$\omega_n = \omega_1 / n^2 \quad n=1,2\dots 192$$

r_1 and ω_1 may be found from (28), (29), (30)

$$r_1 = \hbar / m_p u_1 = 1,4 \cdot 10^{-16} \text{ m} \quad (32)$$

$$\omega_1 = u_1 / r_1 = 3 \cdot 10^{24} \text{ rad/s} \quad (33)$$

$$r_{192} = 2,7 \cdot 10^{-14} \text{ m}, \omega_{192} = 0,814 \cdot 10^{20} \text{ rad / s}, u_{192} = 2,2 \cdot 10^6 \text{ m / s} = c_1$$

Thus although 192-nd nucleare force line light velocity is equal to the first atomic force line light velocity their radii and angular velocities are not equal.

This means that there should be a domain between them with wave lengths from $2,7 \cdot 10^{-14} \text{ m}$ up to $5,27 \cdot 10^{-11} \text{ m}$. X-rays in multielectrons atoms supply us with some information concerning this domain. When electron moves to nucleous specific energy consumption sharply increase in the vicinity of these waves and radiation spectrum becomes continuous. But when electron overcomes this barrier it reaches nucleous comparatively easy. We can interpret this as a proof that interval between u_{192} and c_1 is filled with negatively charged force lines. They create Coulomb barrier for electron. But nuclear force lines are charged positively. And this helps electron to reach proton. These lines are too narrow for electron. Therefore electron moves not sticking in them. This corresponds to continuous radiation spectrum.

Proton moves symmetrically. It is braked on the external atomic lines C_n , accelerates in the interval between C_1 and u_{192} and again braked on nuclear force lines u_n . Proton size let it be inside all force lines. But u_n are charged positively. Therefore it can anchor only with the help of neutron. And this is a subject for special investigation.

Let us try to quantitatively evaluate energy picture when elementary particles cross force lines u_n . Electron moves similarly to the case of external C_n lines.

Let

$$\beta = 1/192 \quad (34)$$

Electron spends its energy when comes from u_{192} to u_n , $n < 192$. Electric field helps it but it must overcome X-field resistance.

We assume the following formula

$$W_{192} - W_n = \frac{1}{2} \beta^2 \hbar (\omega_{192} - \omega_n) \quad (35)$$

In particular

$$\frac{1}{2} \beta^2 \hbar (\omega_{192} - \omega_1) = 1,16 \cdot 10^{-19} j - 4,27 \cdot 10^{-14} j = 0,725 eV - 2,67 \cdot 10^5 eV \quad (36)$$

Minus sign means necessity to spend energy just as for crossing external atomic lines c_n . Coefficient β^2 appears because electric field helps electron to overcome X-field. But electric field hinders proton movement. Therefore we assume the following formula for proton:

$$W_{192} - W_n = \frac{1}{2} \hbar (\omega_{192} - \omega_n) \quad (37)$$

In particular proton needs energy

$$\frac{1}{2} \hbar (\omega_{192} - \omega_1) = 4,28 \cdot 10^{-15} j - 1,57 \cdot 10^{-9} j = 2,67 \cdot 10^4 eV - 9,83 \cdot 10^9 eV \quad (38)$$

to achieve other proton.

More detailed picture should appear when the neutron construction is understood, because just neutron does not let electric and X-field scatter protons about in complex nuclei.

In conclusion I would like to attract attention of my reader to similarity in behavior of ether and hyper fluidal liquid and invite for cooperation in all the problems mentioned here.

References.

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