PHOTONS DO NOT EXIST, LIGHT DOES NOT MOVE, IT IS TRANSMITTED BY ELECTROMAGNETIC RESONANCE.

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SUMMARY:
A new theory about light is presented, according to which it does not move in space, like particles or self-sustaining waves. It is transmitted as a resonance phenomenon between two tuned electromagnetic oscillators. This is demonstrated by using the helical model of the electron to calculate the frequency of the first quantum transition of the Lymann series of the emission spectrum of the hydrogen atom.

INTRODUCTION:

Historically, light has been considered as a material flow of particles or waves that propagate through space carrying energy. The contradictions between both models led to the adoption of a hybrid approach called "wave-particle" that currently prevails, and which postulates the existence of "photons", luminous particles with wave characteristics, and that travel in space at a constant speed, independent of the chosen reference system. However, this model cannot explain certain phenomena such as the Doppler-Fizeau effect , the displacement of the frequency of light according to the speed of distance from its source with respect to the receiver, nor the "double slit" phenomenon.

In this article, a model of light transmission is proposed as a phenomenon of electromagnetic resonance, between two coupled or tuned oscillators, in the same way that occurs in the lower part of the electromagnetic spectrum, used for the transmission of information. For this, the helical model of the electron is used, postulated since the third decade of the 20th century by various authors (Consa , O., 2018) and the frequency of the first quantum transition of the Lymann series of the emission spectrum of the atom is calculated. of hydrogen, with an accuracy greater than 90%.

DEDUCTION OF THE HELICAL MODEL OF THE ELECTRON:

The simplest electromagnetic oscillator consists of two elementary electric charges, of opposite sign, between which there must be equality of electric and magnetic forces.

The electric force F_e between two particles is expressed

$$F_e = \frac{q\,q'}{4\,\pi\,\varepsilon_0\,D^2}$$

Where

q , $q2$ are the charges, D is the distance that separates them, and ε_0 is the coefficient of electrical permittivity in a vacuum.

The magnetic force F_m, caused by the relative motion of the two charges, is expressed:

$$F_m = \frac{\mu_0 q \ q' \ V^2}{4 \pi D^2}$$

Here, q, q' are the charges, μ_0 the coefficient of magnetic permeability in a vacuum, V is the relative velocity of the charges, and D the distance that separates them.

If we equate the two equations:

$$\frac{q \, q'}{4 \pi \varepsilon_0 \ D^2} = \frac{\mu_0 q \ q' \ V^2}{4 \pi D^2}$$

and

$$V = \frac{1}{\sqrt{\mu_0 \varepsilon_0}} = C \quad (velocidad\ de\ la\ luz\ en\ el\ vacío)$$

This result indicates that in the electromagnetic oscillator composed of the two elementary charges, they must move with a relative speed equal to that of light, to remain in equilibrium.

The most basic electromagnetic oscillator, composed of two elementary charges, is the hydrogen-1 atom, in which an electron, with an electric charge of – 1.6 x 10 $^{-19}$ C, moves around a proton, whose charge is + 1.6 x 10 $^{-19}$ C.

If we accept that the electron moves around the proton in a circular orbit with a constant tangential speed C, of approximately 3 x 10 ^{8} m/s, what will be its radius of gyration $\boldsymbol{R_e}$ and its frequency of rotation $\boldsymbol{f_e}$?

According to Bohr's theory, the centripetal force that keeps the electron rotating in a stable circular orbit is equal to the electrical force of attraction between said electron and the proton that constitutes the nucleus.

Consequently

$$\frac{q^2}{4 \pi R_e^2 \varepsilon_0} = \frac{m_e \ C^2}{R_e}$$

Here, $\boldsymbol{m}_e$ is the mass of the electron (9.11 x 10^{-31} kg).

Solving for $\boldsymbol{R}_e$:

$$R_e = \frac{q^2}{4\,\pi\, m_e\, \varepsilon_0\, C^2}$$

R_e = 2.8 x $10^{-.15}$ m

This is a value very close to the "classical electron radius", which has been calculated and interpreted in various ways.

Now, Bohr's theory establishes that the radius of gyration (α_0) of the electron around the nucleus, in the hydrogen atom , in its basal state, is equal to 5.31 x 10 -11 ^{m}.

This inconsistency can be solved by postulating the following:

The electron moves around the nucleus following a helical path, defined by its motion in a principal circular orbit, with a radius of gyration α_0, at a tangential velocity V_t, and by a circular motion perpendicular to the principal orbit, with a radius of gyration R_e and a tangential speed V_e. The total speed of the electron is equal to C (speed of light in a vacuum).

Since the two trajectories are perpendicular to each other, we can define this equation:

$$(V_t)^2 + (V_e)^2 = c^2$$

From Bohr's theory it is possible to calculate the tangential velocity of the electron in its main orbit around the nucleus (V_t) , which has a value of 2.18 x 10^{6} m/s.

Substituting this value into the previous equation, we can calculate the value of V_e : 2,999 x 10^{8} m/s-

Consequently, $V_e \approx c$.

The spin frequency of the electron (f_e), in its smaller orbit, is

$$f_e = \frac{V_e}{2\,\pi\, R_e}$$

Since $V_e \approx c$:

$$f_e \approx \frac{c}{2\,\pi\, R_e}$$

f_e is approximately 1.72 x 10 ^{22} Hz.

On the other hand, if we divide V_t for C, we obtain

$$\frac{2.18 \; x \; 10^6 \; m/s}{3 \; x \; 10^8 \; m/s} = 7.27 \; x \; 10^{-3}$$

This is the approximate value of the " *fine structure constant* ", which has been interpreted in various ways, but originally had the meaning that we have expressed: the numerical relationship between the tangential velocity in its first circular orbit, and the speed of light. .

With the data obtained, we can define the parameters of the electromagnetic resonator made up of the proton and the electron of the hydrogen atom , which is the simplest that we can conceive.

For every electromagnetic resonator, its resonance frequency (fr) *is defined* by the equationEscriba aquí la ecuación.

$$f_r = \frac{1}{2 \, \pi \, \sqrt{L \, C}}$$

where L is the inductance and C is the capacitance, measures of the capacity to store energy in the form of a magnetic and electric field, respectively, in a physical system. The inductance L, at a macroscopic level, is a function of the magnetic permeability constant (μ) of the system, and a geometric factor. The same is valid for the capacitance C, *dependent on the electrical* permittivity constant of the system (ε) and their respective geometry.

In macroscopic terms, the electrostatic energy (E_c) stored in a capacitance C, is expressed by this equation:

$$E_c = -\frac{(q)^2}{2 \, C}$$

where q is the accumulated net charge.

In the hydrogen atom, the total energy of the electron (E_e) , rotating in its primary orbit of radius $\alpha_0 =$ 5.31 x 10 $^{-11}$ m, is defined

$$E_e = -\frac{e^2}{8\,\pi\,\varepsilon_0\,\alpha_0}$$

where *and* is the elemental charge of the proton and electron ($\pm$ 1.6 x 10 $^{-19}$ C), and ε_0 is the electrical permittivity constant in vacuum (8.85 x 10 $^{-12}$ C ^{2} / N m ^{2}).

Substituting q for e in the first equation, and equating it with the second , we get

$$\frac{1}{2\,C} = \frac{1}{8\,\pi\,\varepsilon_0\,\alpha_0}$$

then

$$C = 4\,\pi\,\varepsilon_0\,\alpha_0$$

This is the " self-capacitance " of the hydrogen atom , if it is considered as a hollow sphere of radius α_0. The calculated value of this self-capacitance is 5.9 x l0 $^{-21}$ F.

To calculate the inductance L of the hydrogen atom, we assimilate the helical path of the electron around the nucleus, constituted by the proton, to a circular solenoid (or toroidal coil) of average radius α_0, with N turns, and a length equal to 2 π α_0.

To calculate the inductance L of this "circular coil", we use the formula

$$L = \frac{\mu_0\,(N^2)\,A}{2\,\pi\,\alpha_0}$$

Here,

A is the area of each loop traveled by the electron in its helical path, equal to

$\pi\,(R_e)^2$. Let us remember that R_e is the radius of gyration of the electron in its smaller orbit, perpendicular to the larger orbit.

α_0 is the average radius of the toroid, which multiplied by $2\,\pi$ gives the length of the circular solenoid.

μ_0 is the magnetic permeability of the vacuum ..

To calculate the number of turns N traveled by the electron in a complete revolution around the nucleus, we divide the rotation frequency f_{and} of the electron in its secondary orbit by its spin frequency f_0 in the primary orbit, since every time the electron completes a spin in this orbit, it will have rotated N times in its secondary orbit. Consequently the equation of inductance L takes this form:

$$L = \frac{\mu_0 \left(\frac{f_e}{f_0}\right)^2 \pi \, (R_e)^2}{2 \, \pi \, \alpha_0}$$

Here

Re = 2.8 x 10 $^{-11}$ m

f_e = 1.72 x 10 ^{22} Hz

α_0 = 5.31 x 10 $^{-11}$ m

f_0 = 6.57 x 10 ^{15} Hz

μ_0 = 4 π x 10 $^{-7}$ T m / A

By performing the indicated operations we obtain an inductance value L = 6.27 x 10 $^{-13}$ H.

We can now calculate the resonant frequency of the system, f_r**,** by means of the equation

$$f_r = \frac{1}{2 \, \pi \sqrt{L \, C}}$$

f_r = 2.62 x 10 ^{15} Hz

Experimentally, it is known that the first frequency of light emitted by the excited hydrogen atom, in the so-called " Lymann series ", is **2.4677 Hz** , which coincides exactly with the value calculated by means of the Rydberg formula , in the transition from the first to the second quantum state:

$$f = 3.2903 \; x \; 10^{15} \; Hz \left[\frac{1}{(n_2)^2} - \frac{1}{(n_1)^2}\right]$$

$$(n_{1\,>} \; n_2)$$

The result obtained by calculation, using the helical model of the electron, differs from the experimental one by approximately 6%.

This difference can be attributed to two factors:

1) The "toroidal solenoid" model is not totally valid to describe the helical path of the electron around the atomic nucleus, since it cannot be assimilated to an electric current distributed uniformly along that solenoid.

2) The system formed by the electron and the proton in the hydrogen atom behaves like a parametric oscillator, since when it oscillates, the radius of gyration (the most important parameter) increases and decreases cyclically, taking the circular orbit to a trajectory elliptical.

Conclusions

The helical model of the electron allows us to predict the frequency of the first quantum transition of the electron in the hydrogen atom, demonstrating that it is like any electromagnetic resonator.

The quantum transitions of an electron have a duration determined by the distance they are from the source of electromagnetic energy, since this varies linearly as a function of the former. The quantum transition occurs when the electron energy reaches a value determined by the resonance frequency, multiplied by Planck's constant (*E = hf).*

The so-called "speed of light", whose value is 3 x 10 ^{8} m/s, is actually the constant ratio of the distance between the emitter and the receiver of electromagnetic energy in resonance, and the time necessary for the energy to in the receiver allows the electronic quantum transition.

References:

References

Consa , O., *Helical Solenoid Model of the Electron.* Progress in Physics, vol 14 (2018). Retrieved from WWW Research Gate.Net, 2024.