ATOMIC MODEL – AN ATOMIC MODEL AND SOME FEW POSSIBLE APPLICATIONS

Ion* PETRESCU

This paper presents, shortly, a new and original relation (18), who determines the radius with that, the electron is running around the nucleus of an atom. One utilizes, two times the Lorentz relation (5), the Niels Bohr generalisate equation (7), and a mass relation (4) which it has been deduced from the kinematics energy relation written in two modes: classical (1) and coulombian (2). Equalizing the mass relation (4) with Lorentz relation (5) one obtains the equation (6), which give us a relation between the electron velocity at power two (v^2) and the radius (r). The second relation (8), between v^2 and r, it has been obtained by equalizing the mass of Bohr equation (7) and the mass of Lorentz relation (5). In the system (8) – (6) eliminating the electron velocity (v^2), one determines the radius r, with that, the electron is moving around the nucleus; see the relation (18). ***For a Bohr energetically level*** *(n=a=constant value),* ***one determines now two energetically below levels****, which form an electronic layer (a cloud). The author realizes by this paper a new atomic model.*

Keywords: Atom, Atomic, Electron, Nucleus, Proton, Neutron, Quantum, The Quantum Number, The Atomic Number, Layer, Bohr Energetically Level, Two Below Levels, Cloud, Radius, The Electron Velocity.

Introduction

In this paper the author determines a new relation for calculating the radius with that the electron is running around the nucleus of an atom. In this mode the author realizes a new atomic theory (a new atomic model). One can foresee some few possible applications: "Predict New Elements", "Electromagnetic

* Prof. Assist., TMR Department, University POLYTECHNIC of Bucharest, ROMANIA

Amplification by the Stimulated Emission of Radiation” – MASER, IRASER, LASER, “Obtaining More Nuclear Energy”, etc…

1. The new relations

Writhing the kinematics-energy relation in two mode, classical (1) and coulombian (2) one determines the relation (3):

$$E_C = \frac{1}{2} m.v^2 \tag{1}$$

$$E_C = \frac{1}{8} \frac{Z.e^2}{\pi.\varepsilon_0.r} \tag{2}$$

$$m.v^2 = \frac{1}{4} \frac{Z.e^2}{\pi.\varepsilon_0.r} \tag{3}$$

From equation (3), determining explicit the mass of the electron, one obtains the relation (4):

$$m = \frac{Z.e^2}{4.\pi.\varepsilon_0.v^2.r} \tag{4}$$

Now, we write the Lorentz’s relation (5), for the mass of a corpuscle, in function of the corpuscle velocity, at power two:

$$m = \frac{m_0.c}{\sqrt{c^2 - v^2}} \tag{5}$$

With the relations (4) and (5) one obtains the first essential expression (relation 6):

$$\frac{m_0.c}{\sqrt{c^2 - v^2}} = \frac{Z.e^2}{4.\pi.\varepsilon_0.v^2.r} \tag{6}$$

One utilizes now, the Niels Bohr generalisate relation (7):

$$m = \frac{n^2.\varepsilon_0.h^2}{\pi.r.e^2.Z} \tag{7}$$

One utilizes for the second time the Lorentz relation (5), together with the Bohr relation (7) and in this mode one obtains the second essential expression (relation 8):

$$\frac{m_0.c}{\sqrt{c^2 - v^2}} = \frac{n^2.\varepsilon_0.h^2}{\pi.r.e^2.Z} \tag{8}$$

Now, one keeps just the two essential expressions (the relations 6 and 8).

One writes (8) in the form (8’):

$$\sqrt{c^2 - v^2}.n^2.\varepsilon_0.h^2 = \pi.r.m_0.c.e^2.Z \tag{8'}$$

One puts the form (8') at the power two, for explicit the velocity of electron at power two (v^2), (see the formula 9):

$$v^2 = \frac{(n^4.\varepsilon_0^2.h^4 - \pi^2.r^2.m_0^2.e^4.Z^2).c^2}{n^4.\varepsilon_0^2.h^4} \tag{9}$$

The formula (9) can be written in the form (10):

$$v^2 = c^2 - k.c^2.r^2 \tag{10}$$

where the constant k take the form (10'):

$$k = \frac{\pi^2.m_0^2.e^4.Z^2}{n^4.\varepsilon_0^2.h^4} \tag{10'}$$

Now one writes the essential relation (6) in the form (6'):

$$4.m_0.c.\pi.\varepsilon_0.r.v^2 = Z.e^2.\sqrt{c^2 - v^2} \tag{6'}$$

Then, putting the relation (6') at power two, one obtains the relation (6''):

$$16.m_0^2.c^2.\pi^2.\varepsilon_0^2.r^2.v^4 = Z^2.e^4.(c^2 - v^2) \tag{6''}$$

In the relation (6'') one introduces the velocity of electron at power two, taken from the expression (10) and one obtains the formula number (11):

$$16.m_0^2.\pi^2.\varepsilon_0^2.(c^2 - k.c^2.r^2)^2 = Z^2.e^4.k \tag{11}$$

The relation (11) can be written in the form (12):

$$(c^2 - k.c^2.r^2)^2 = \frac{Z^2.e^4.k}{16.m_0^2.\pi^2.\varepsilon_0^2} \tag{12}$$

One put the relation (12) at the power $\frac{1}{2}$ and one obtains the expression (13):

$$(c^2 - k.c^2.r^2) = \pm\frac{Z.e^2.\sqrt{k}}{4.m_0.\pi.\varepsilon_0} \tag{13}$$

The relation (13) can be written in the form (14):

$$k.c^2.r^2 = c^2 \mp \frac{Z.e^2.\sqrt{k}}{4.m_0.\pi.\varepsilon_0} \tag{14}$$

The form (15) is the explicit radius at the power two (r^2), taken from relation (14):

$$r^2 = \frac{1}{k} \mp \frac{Z.e^2}{4.m_0.\pi.\varepsilon_0.\sqrt{k}.c^2} \tag{15}$$

Now, one exchange, in the relation (15), the constant k with the expression (10') and one obtains the relation (16):

$$r^2 = \frac{n^4.\varepsilon_0^2.h^4}{\pi^2.m_0^2.e^4.Z^2} \mp \frac{n^2.h^2}{4.\pi^2.m_0^2.c^2} \quad (16)$$

The expression (16) can be written in the form (17):

$$r^2 = \frac{n^4.\varepsilon_0^2.h^4}{\pi^2.m_0^2.e^4.Z^2}.(1 \mp \frac{e^4.Z^2}{4.c^2.\varepsilon_0^2.h^2.n^2}) \quad (17)$$

Putting the expression (17) at the power $\frac{1}{2}$, one obtains for the radius (r), the final expression (18); (Positive, because physically exist just the positive solution!, r can't be negative):

$$r = \frac{n^2.\varepsilon_0.h^2}{\pi.m_0.e^2.Z}.\sqrt{1 \mp \frac{e^4.Z^2}{4.c^2.\varepsilon_0^2.h^2.n^2}} \quad (18)$$

The expression (18) it's not just a new theory for calculating the radius with that the electron is running around the nucleus of an atom; it's really a new theory of an atomic model. For a value of the quantum number n (for a constant atomic number Z), we haven't just one energetically level (like in the Bohr model). Now one can find two energetically below levels, which form an electronic layer, an electronic cloud. For example, for n=1, we have two sublevels (two below levels).

1.1. Notes utilized

The permissive (permitivity) constant:

ε_0=8.85418*10^{-12} [$\frac{C^2}{N.m^2}$];

The Planck constant: h=6.626*10^{-34} [J.s];

The rest mass of electron: m_0=9.1091*10^{-31} [kg];

The Pitagora number: π=3.141592654 [ ];

The electrical elementary load: e=-1.6021*10^{-19} [C];

The light speed in vacuum: c=2.997925*10^8 [m/s];

n=the principal quantum number (the Bohr quantum number);

Z=the number of protons from the atomic nucleus (the atomic number).

1.2. Deducing radius, r, more precisely

The relation (18) can be deduced more exactly, if one begins to calculate from the relation (6''). This relation, (6''), shall be written in the form (6'''):

$$16m_0^2c^2\pi^2\varepsilon_0^2r^2v^4 + Z^2e^4v^2 - Z^2e^4c^2 = 0 \quad (6''')$$

One can see easily, that the relation (6''') represents an equation of two degree in v^2.

One calculates v^2 with the formula (6^{IVa}):

$$v_{1,2}^2 = \frac{-Z^2e^4 \pm \sqrt{Z^4e^8 + 8^2 m_0^2 \pi^2 \varepsilon_0^2 c^4 Z^2 e^4 r^2}}{2.16.m_0^2.c^2.\pi^2.\varepsilon_0^2.r^2} \qquad (6^{IVa})$$

Physically exist just the positive solution, and one keeps it for the relation (6^{IV}) (only the positive sign):

$$v^2 = \frac{-Z^2e^4 + \sqrt{Z^4e^8 + 8^2 m_0^2 \pi^2 \varepsilon_0^2 c^4 Z^2 e^4 r^2}}{2.16.m_0^2.c^2.\pi^2.\varepsilon_0^2.r^2} \qquad (6^{IV})$$

Now we can think that the relation (6^{IV}) give us only one solution for the electron speed at power two (v^2), but really, exist two solutions for this parameter, v^2, because the value of the radius at power two (r^2) give us two physically solutions. One puts the relation (6^{IV}) in the form (6^{V}):

$$v_{1,2}^2 = \frac{-1 + \sqrt{1 + \frac{8^2 m_0^2 \pi^2 \varepsilon_0^2 c^2}{Z^2 e^4} c^2 r^2}}{\frac{1}{2} \frac{8^2 m_0^2 c^2 \pi^2 \varepsilon_0^2}{Z^2 e^4} r^2} \qquad (6^{V})$$

The formula (6^{V}) can be written in form (6^{VI}), where the constant k_1 take the form (6^{VII}):

$$v_{1,2}^2 = \frac{\sqrt{1 + k_1 c^2 r^2} - 1}{\frac{k_1}{2} r^2} \qquad (6^{VI})$$

$$k_1 = \frac{8^2.m_0^2.\pi^2.\varepsilon_0^2.c^2}{Z^2.e^4} \qquad (6^{VII})$$

Now, the form (6^{VI}) may be introduced in the relation (10) and one obtains the form (19):

$$\frac{k_1}{2} r^2 (c^2 - k.c^2.r^2) = \sqrt{1 + k_1.c^2.r^2} - 1 \qquad (19)$$

The relation (19) can be written it in the form (19'):

$$\frac{k_1}{2} c^2 r^2 - \frac{k_1}{2} k c^2 r^4 + 1 = \sqrt{1 + k_1.c^2.r^2} \qquad (19')$$

With the relation (19') at the power two one obtains the equation (19'') in r:

$$1 + k_1 c^2 r^2 = \frac{1}{4} k_1^2 c^4 r^4 + \frac{1}{4} k_1^2 k^2 c^4 r^8 + 1 - \frac{1}{2} k_1^2 k c^4 r^6 + k_1 c^2 r^2 - k_1 k c^2 r^4 \qquad (19'')$$

The equation (19'') is boil down to the form (19'''):

$$\frac{1}{4}k_1^2k^2c^2c^2r^8 - \frac{1}{2}k_1^2kc^2c^2r^6 + (\frac{1}{4}k_1^2c^2c^2 - k_1kc^2)r^4 = 0 \qquad (19''')$$

One simplifies the equation (19’’’) to the form (19^{IV}):

$$\frac{1}{4}k_1k^2c^2r^4 - \frac{1}{2}k_1kc^2r^2 + (\frac{1}{4}k_1c^2 - k) = 0 \qquad (19^{IV})$$

One multiplies the equation (19^{IV}) with four and one obtains the equation (19^{V}):

$$k_1k^2c^2r^4 - 2k_1kc^2r^2 + (k_1c^2 - 4k) = 0 \qquad (19^{V})$$

The relation (19^{V}) is a two degree equation in r^2, which give us two solutions for r^2 (see the form 20):

$$r_{1,2}^2 = \frac{k_1kc^2 \mp \sqrt{k_1^2k^2c^4 - k_1^2k^2c^4 + 4k_1k^3c^2}}{k_1k^2c^2} \qquad (20)$$

The relation (20) may be reduced to the forms (20’) and (20’’):

$$r_{1,2}^2 = \frac{k_1kc^2 \mp 2kc\sqrt{k_1k}}{k_1k^2c^2} \qquad (20') \qquad\qquad r_{1,2}^2 = \frac{k_1c \mp 2\sqrt{k_1k}}{k_1kc} \qquad (20'')$$

The formula (20’’) can be written in the forms (20’’’) and (20^{IV}):

$$r_{1,2}^2 = \frac{1}{k} \mp \frac{2}{c\sqrt{k_1k}} \qquad (20''') \qquad\qquad r_{1,2}^2 = \frac{1}{k}(1 \mp \frac{2\sqrt{k}}{c\sqrt{k_1}}) \qquad (20^{IV})$$

Now, in the relation (20^{IV}) one exchanges the two constants, (k with the expression 10’) and (k_1 with the expression 6^{VII}), and one obtains the relation (20^{V}):

$$r_{1,2}^2 = \frac{n^4\varepsilon_0^2h^4}{\pi^2m_0^2e^4Z^2}(1 \mp \frac{\frac{2\pi.m_0e^2Z}{n^2\varepsilon_0h^2}}{\frac{c8m_0\pi\varepsilon_0c}{Z.e^2}}) \qquad (20^{V})$$

One simplifies the relation (20^{V}) and one obtains the form (20^{VI}):

$$r_{1,2}^2 = \frac{n^4\varepsilon_0^2h^4}{\pi^2m_0^2e^4Z^2}(1 \mp \frac{e^4.Z^2}{4.c^2.\varepsilon_0^2.h^2.n^2}) \qquad (20^{VI})$$

One can see that the relation (20^{VI}) is identically with expression (17).

From relation (20^{VI}) one calculates the radius, r, with the formula (20^{VII}):

$$r_{1,2} = \frac{n^2\varepsilon_0h^2}{\pi.m_0e^2Z}(1 \mp \frac{e^4.Z^2}{4.c^2.\varepsilon_0^2.h^2.n^2})^{\frac{1}{2}} \qquad (20^{VII})$$

The expression (20^{VII}) is identically with expression (18), but the relation (20^{VII}) it has been obtained more precisely. One has utilized for the electron velocity the relation (6^{VI}), which can give us for the two values of radius r, (or r^2), two different values for electron velocities v, (or v^2). The expression (10) is an incomplete relation for the electron velocity, which can't be utilized to determine the two different values of v^2. Now one determines these two different values for v, or v^2, which are more important for us.

1.3. Determining the two different values of electron velocities, v, or v^2

Now one start with relation (6^{VI}), which can be written in the form (21):

$$v^2 = \frac{2.c^2}{\sqrt{1+k_1.c^2.r^2}+1} \tag{21}$$

One notes the radical with R (see the relation 22):

$$R = \sqrt{1+k_1.c^2.r^2} \tag{22}$$

In the relation (22) one introduces for r^2 the expression (20^{IV}), and one obtains for (22) the form (22'):

$$R = \sqrt{1+\frac{k_1.c^2}{k}(1\mp\frac{2.\sqrt{k}}{c.\sqrt{k_1}})} \tag{22'}$$

In relation (22') one exchanges the two constant k_1 and k with the two values from expression (6^{VII}), respective (10') and one obtains for (22') the form (22''):

$$R = \sqrt{1+\frac{8^2 m_0^2\pi^2\varepsilon_0^2 c^4 n^4 \varepsilon_0^2 h^4}{Z^2 e^4\pi^2 m_0^2 e^4 Z^2}(1\mp\frac{2\pi.m_0 e^4 Z^2}{8n^2\varepsilon_0^2 h^2 c^2})} \tag{22''}$$

One put the expression (22'') in the form (22'''):

$$R = \sqrt{1+\frac{8^2\varepsilon_0^4 c^4 h^4 n^4}{e^8 Z^4}(1\mp\frac{e^4 Z^2}{4\varepsilon_0^2 c^2 h^2 n^2})} \tag{22'''}$$

The expression (22''') shall be written in the form (22^{IV}):

$$R = \sqrt{1+\frac{8^2\varepsilon_0^4 c^4 h^4 n^4}{e^8 Z^4}\mp\frac{2.8\varepsilon_0^2 c^2 h^2 n^2}{e^4 Z^2}} \tag{22^{IV}}$$

The expression (22^{IV}) will be restricted to the forms (22^{V}) and (22^{VI}):

$$R = \sqrt{(1\mp\frac{8\varepsilon_0^2 c^2 h^2 n^2}{e^4 Z^2})^2} \quad (22^{V}) \qquad R = \left|1\mp\frac{8.\varepsilon_0^2.c^2.h^2.n^2}{e^4.Z^2}\right| \quad (22^{VI})$$

One notes with E the expression (23):

$$E = \frac{8.\varepsilon_0^2.c^2.h^2}{e^4}\frac{n^2}{Z^2} \tag{23}$$

This expression must be evaluated:

$$E = \frac{8 * 8.85418^2 * 10^{-24} * 2.997925^2 * 10^{16}}{1.6021^4 * 10^{-76}} *$$
$$* \frac{6.626^2 * 10^{-68} * n^2}{Z^2} = \frac{37564.06551 * n^2}{Z^2} \quad (23')$$

For Z_{max}=92, we have a minimum of expression E (23''):

$$E_{\min} = 4.438098477 * n^2 \quad (23'')$$

One can see easily, that E_{min}> 1: $E_{\min} \succ 1$ (24)

Now one can write the expression (22^{VI}) in the forms (22^{VII}) a, and b:

$$R_1 = E - 1 \quad (22^{VIIa}) \qquad R_2 = E + 1 \quad (22^{VIIb})$$

Now one can evaluate the expression (21), which takes two forms (21^{Ia}) and respective (21^{Ib}):

$$v_1^2 = \frac{2.c^2}{E - 1 + 1} \quad (21^{Ia}) \qquad v_2^2 = \frac{2.c^2}{E + 1 + 1} \quad (21^{Ib})$$

Then, the two relations take the forms (21^{II})a and b:

$$v_1^2 = \frac{c^2}{\frac{E}{2}} \quad (21^{IIa}) \qquad v_2^2 = \frac{c^2}{\frac{E}{2} + 1} \quad (21^{IIb})$$

If one replaces E with the expression (23) one obtains for the electron velocities the distinct relations (21^{III})a and b:

$$v_1^2 = \frac{e^4 Z^2}{4.\varepsilon_0^2.h^2.n^2} \quad (21^{IIIa}) \qquad v_2^2 = \frac{c^2}{\frac{4.\varepsilon_0^2.c^2.h^2.n^2}{e^4.Z^2} + 1} \quad (21^{IIIb})$$

1.4. Determining the masses and the energy of the atomic electron in movement

The exact velocities can be written in the forms (25, 26):

$$r_- = r_1 \Rightarrow v_1^2 = \frac{e^4.Z^2.c^2}{4.\varepsilon_0^2.c^2.h^2.n^2} \quad (25)$$

$$r_+ = r_2 \Rightarrow v_2^2 = \frac{e^4.Z^2.c^2}{4.\varepsilon_0^2.c^2.h^2.n^2 + e^4.Z^2} \quad (26)$$

With these velocities one can write the two adequate masses:

$$r_- = r_1 \Rightarrow m_1 = \frac{m_0}{\sqrt{1 - \frac{e^4.Z^2}{4.\varepsilon_0^2.c^2.h^2.n^2}}} \quad (27)$$

$$r_+ = r_2 \Rightarrow m_2 = \frac{m_0}{\sqrt{1 - \frac{e^4.Z^2}{4.\varepsilon_0^2.c^2.h^2.n^2 + e^4.Z^2}}} \quad (28)$$

The total electron energy can be written in the forms (29) and respectively (30):

$$r_- = r_1 \Rightarrow W_1 = \frac{m_0.c^2}{\sqrt{1 - \frac{e^4.Z^2}{4.\varepsilon_0^2.c^2.h^2.n^2}}} \quad (29)$$

$$r_+ = r_2 \Rightarrow W_2 = \frac{m_0.c^2}{\sqrt{1 - \frac{e^4.Z^2}{4.\varepsilon_0^2.c^2.h^2.n^2 + e^4.Z^2}}} \quad (30)$$

The frequency of pumping, between the two near energetically below levels can be written in the form (31):

$$\nu = \frac{W_1 - W_2}{h} = \frac{m_0.c^2}{h}\left(\frac{1}{\sqrt{1 - \frac{e^4.Z^2}{4.\varepsilon_0^2.c^2.h^2.n^2}}} - \frac{1}{\sqrt{1 - \frac{e^4.Z^2}{4.\varepsilon_0^2.c^2.h^2.n^2 + e^4.Z^2}}}\right) \quad (31)$$

2. Determining the pumping frequencies between nearer sublevels, and some few possible applications

With the relations deduced at paragraph 1.4. one determines the frequencies who can stimulate the transition between the first sublevels (first couple of electrons, n=1), see the table one:

Table 1

The pumping frequencies, between first two nearer sublevel, n=1								
Z	ν	Element	Z	ν	Element	Z	ν	Element
1	1.75131E+11	H	2	2.80231E+12	He	3	1.41886E+13	Li
4	4.48513E+13	Be	5	1.09527E+14	B	6	2.27181E+14	C
7	4.21028E+14	N	8	7.18543E+14	O	9	1.15149E+15	F
10	1.75595E+15	Ne	11	2.57234E+15	Na	12	3.64547E+15	Mg
13	5.02453E+15	Al	14	6.7632E+15	Si	15	8.91965E+15	P
16	1.15566E+16	S	17	1.47414E+16	Cl	18	1.8546E+16	Ar

19	2.30473E+16	K	20	2.83266E+16	Ca	21	3.44704E+16	Sc
22	4.15702E+16	Ti	23	4.97224E+16	V	24	5.90284E+16	Cr
25	6.95952E+16	Mn	26	8.1535E+16	Fe	27	9.49654E+16	Co
28	1.1001E+17	Ni	29	1.26797E+17	Cu	30	1.45461E+17	Zn
31	1.66145E+17	Ga	32	1.88994E+17	Ge	33	2.14162E+17	As
34	2.41809E+17	Se	35	2.72101E+17	Br	36	3.05214E+17	Kr
37	3.41326E+17	Rb	38	3.80627E+17	Sr	39	4.23312E+17	Y
40	4.69585E+17	Zr	41	5.19659E+17	Nb	42	5.73753E+17	Mo
43	6.32098E+17	Tc	44	6.94931E+17	Ru	45	7.62502E+17	Rh
46	8.35067E+17	Pd	47	9.12897E+17	Ag	48	9.9627E+17	Cd
49	1.08548E+18	In	50	1.18082E+18	Sn	51	1.28262E+18	Sb
52	1.39119E+18	Te	53	1.50689E+18	I	54	1.63006E+18	Xe
55	1.76108E+18	Cs	56	1.90034E+18	Ba	57	2.04823E+18	La
58	2.20518E+18	Ce	59	2.37163E+18	Pr	60	2.54804E+18	Nd
61	2.73489E+18	Pm	62	2.93267E+18	Sm	63	3.14191E+18	Eu
64	3.36316E+18	Gd	65	3.597E+18	Tb	66	3.84402E+18	Dy
67	4.10486E+18	Ho	68	4.38017E+18	Er	69	4.67067E+18	Tm
70	4.97706E+18	Yb	71	5.30013E+18	Lu	72	5.64068E+18	Hf
73	5.99956E+18	Ta	74	6.37768E+18	W	75	6.77596E+18	Re
76	7.19542E+18	Os	77	7.63712E+18	Ir	78	8.10216E+18	Pt
79	8.59173E+18	Au	80	9.10709E+18	Hg	81	9.64956E+18	Tl
82	1.02206E+19	Pb	83	1.08216E+19	Bi	84	1.14543E+19	Po
85	1.21203E+19	At	86	1.28215E+19	Rn	87	1.35598E+19	Fr
88	1.43372E+19	Ra	89	1.51562E+19	Ac	90	1.60189E+19	Th
91	1.6928E+19	Pa	92	1.78864E+19	U	93	1.88968E+19	Np
94	1.99627E+19	Pu	95	2.10875E+19	Am	96	2.2275E+19	Cm
97	2.35293E+19	Bk	98	2.4855E+19	Cf	99	2.62568E+19	Es
100	2.77402E+19	Fm	101	2.93111E+19	Md	102	3.09758E+19	No
103	3.27416E+19	Lw	104	3.46162E+19		105	3.66084E+19	

2.1. Discussion

The substance is structured in this mode, that, we can obtain more energy, if one can penetrate it deeply. In this mode, one may check and extract, more energy in small portions. The atomic electrons are coupled. The transition between two coupled electrons can give us more energy, in small portions.

First, one can make a stronger “Electromagnetic Amplification by the Stimulated Emission of Radiation” (MASER, IRASER, etc…).

To make a L A S E R, can be more difficult (impossible at first seen), because all frequencies, calculated in the table one, are outside of the visible domain ($4.34*10^{14} \div 6.97*10^{14}$ [Hz]).

2.2. The L A S E R frequencies

In the table two, one can see the possible LASER pumping frequencies, calculated for different principal quantum number n:

Table 2

The L A S E R pumping frequencies							
n	Z	ν[Hz]	Element	n	Z	ν[Hz]	Element
2	15	=5.54942E14	P		78	=4.43344E+14	Pt
	22	=5.072E14	Ti		79	=4.66537E+14	Au
3	23	=6.0598E14	V		80	=4.90629E+14	Hg
	29	=4.8452E+14	Cu		81	=5.15642E+14	Tl
	30	=5.54942E+14	Zn		82	=5.41601E+14	Pb
4	31	=6.32782E+14	Ga		83	=5.68529E+14	Bi
	36	=4.71283E+14	Kr		84	=5.96449E+14	Po
	37	=5.25911E+14	Rb		85	=6.25386E+14	At
	38	=5.8516E+14	Sr		86	=6.55364E+14	Rn
5	39	=6.49284E+14	Y	11	87	=6.86408E+14	Fr
	43	=4.6261E+14	Tc		85	=4.41451E+14	At
	44	=5.072E+14	Ru		86	=4.6261E+14	Rn
	45	=5.54942E+14	Rh		87	=4.8452E+14	Fr
	46	=6.0598E+14	Pd		88	=5.072E+14	Ra
6	47	=6.60463E+14	Ag		89	=5.30668E+14	Ac
	50	=4.56488E+14	Sn		90	=5.54942E+14	Th
	51	=4.94145E+14	Sb		91	=5.8004E+14	Pa
	52	=5.34086E+14	Te		92	=6.0598E+14	U
	53	=5.76403E+14	I		93	=6.32782E+14	Np
	54	=6.21189E+14	Xe		94	=6.60463E+14	Pu
7	55	=6.68536E+14	Cs	12	95	=6.89044E+14	Am
8	57	=4.51937E+14	La	13	92	=4.39854E+14	U
	58	=4.8452E+14	Ce		93	=4.59306E+14	Np

	59	=5.18835E+14	Pr		94	=4.79396E+14	Pu
	60	=5.54942E+14	Nd		95	=5.00139E+14	Am
	61	=5.92904E+14	Pm		96	=5.21548E+14	Cm
	62	=6.32782E+14	Sm		97	=5.43638E+14	Bk
	63	=6.7464E+14	Eu		98	=5.66422E+14	Cf
	64	=4.48422E+14	Gd		99	=5.89916E+14	Es
	65	=4.77132E+14	Tb		100	=6.14134E+14	Fm
	66	=5.072E+14	Dy		101	=6.39091E+14	Md
	67	=5.38669E+14	Ho		102	=6.64801E+14	No
	68	=5.71581E14	Er		103	=6.9128E+14	Lw
	69	=6.0598E+14	Tm		99	=4.38489E+14	Es
	70	=6.4191E+14	Yb		100	=4.56488E+14	Fm
9	71	=6.79416E+14	Lu		101	=4.75037E+14	Md
	71	=4.45624E+14	Lu		102	=4.94145E+14	No
	72	=4.71283E+14	Hf		103	=5.13824E+14	Lw
	73	=4.98035E+14	Ta		104	=5.34086E+14	
	74	=5.25911E+14	W	14	105	=5.54942E+14	
	75	=5.54942E+14	Re				
	76	=5.8516E+14	Os				
	77	=6.16596E+14	Ir				
	78	=6.49284E+14	Pt				
10	79	=6.83255E+14	Au				

Conclusions

If one can make a super-LASER, then one can try to master the fusion process, with this LASER and with hot plasma.

R E F E R E N C E S

1. *M. Petrescu-Prahova, I. Petrescu-Prahova,* ş.a., “Fizica-Manual pentru anul IV liceu, secția reală.” Editura Didactică şi Pedagogică, Bucureşti, 1976.

2. *D. Ciobotaru, ş.a*., “FIZICA - Manual pentru clasa a XII-a.” EDP, Bucureşti, 1994.