

THE DAON THEORY  
The Atom

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## Abstract

The **Daon theory** is a new general theory of physics, it is a completely new way to approach physics and includes, in principle, all phenomena of nature.

The theory is presented in a series of closely related papers treating Electromagnetism, Atomic physics, Relativity, Particle physics, Gravitation and Cosmology.

The numerical value of the main natural constants and parameters are calculated, while the explanations for the various natural phenomena are simple and logical. All the results from this theory agree, as far as we know, with experimental data.

In this part, we present some unknown forces acting within the atoms, giving the explanation to the strange behaviour of the electrons. We present a simulation program (ATOMOL) able to follow all charged particles within an atom, including their velocity, position and energy at any given moment. We explain the electron's associated wave, the fine structure constant, the constant of Planck and we explain and calculate the magnetic moment of the electron and the nucleus.

## Introduction

The daon theory is constructed on the basis of one unique fundamental object **the Daon**, which is the ultimate constituent of all matter. It is a very small rotating sphere; its size (if its medium interaction is zero) is  $r_{d_{fd}} = 4.5 \cdot 10^{-19}m$ , its effective velocity of rotation is  $c$ , while its associated "mass" is  $m_d = 2.3 \cdot 10^{-41}kg$  these three parameters are all fixed by experimental evidence or geometrical necessity[1].

We strongly recommend to read the first part[1], as preparation for the following, since there you have the theoretical basis for the Daon Theory. All fundamental electromagnetic phenomena are their explained.

It's necessary to introduce some unknown forces to understand the behaviour of the electrons within an atom. These forces are quite logical and straight forward. The position, velocity and energy of each electron can be calculated exactly, at any moment!

We will, for simplicity reasons, use classical definitions as far as possible.

# Chapter 1

## The forces, acting on the electron, within the atom

We have an electron in orbit around a nucleon, with a charge  $q$  and infinite mass, i.e. an electron having a circular trajectory with radius  $R$ . Let us suppose that, in the case of our atom, there is no relative velocity between the nucleus and the surrounding free daons. The electron has constant velocity and radial position, we will call this the classical orbit. The electron is then in equilibrium between the EM-force and centrifugal force i.e,

$$F = \frac{qe}{4\pi\epsilon_0 R^2} = m_e \frac{v^2}{R} \quad (1.1)$$

It is necessary to use the *Daon theory*, to get a better understanding of the electron's behaviour. To understand the following section, you should read [1].

### 1.1 The centrifugal force

An electron, at constant velocity  $v$  (relative to the surrounding free daons), is rotating around an axis parallel with its velocity vector and associated with an intrinsic force[1]. This force can be written

$$\vec{F}_i = \frac{e^2}{4\pi\epsilon_0 r_e^2} \frac{\vec{v}}{c} \quad (1.2)$$

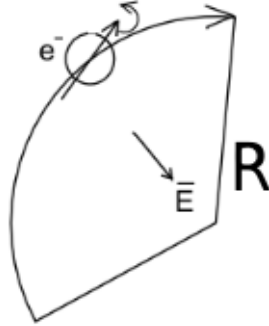


Figure 1.1: Schematics showing the centrifugal force

$r_e = 1.23$  fm is the electrons reference radius[1].

The time of reaction, of the daons associated with an electron, is limited, the electron's rotational axis therefore gets an angle relative to its trajectory, as presented in figure 1.1. The intrinsic force (eq. 1.2) produce then a radial (centrifugal) force in the direction of the radius vector. We obtain an equilibrium when

$$F_c = F_i \sin \theta = m \frac{v^2}{R} \Rightarrow \sin \theta = O_n \frac{c}{v} \quad (1.3)$$

$$O_n = \frac{r_e^2}{R^2}$$

where  $\theta$  is the angle between the velocity vector of the electron and its rotational axis.  $O_n$  is an interaction parameter indicating the *order* of the daons (electric field), associated with the nucleus, at the position of the electron[1].

## 1.2 The action deviating the electron from the classical trajectory

The medium direction of the rotational axis, of the daons associated with an electron, are parallel to the electrical field lines. An isolated electron, with no velocity relative to its surrounding free daons, have therefore the main direction, of its associated daons rotational axis, directed radially outwards[1]. If we now apply the electrical field, from the nucleus, around the electron,

we must obtain a bend of the electrical field lines, as well as the associated daons rotational axis, towards the nucleus.

This creates a relative difference in velocities of the daons rotation, at the points of contact between the daons in neighbouring shells, leading to a rotation of the electron, around an axis parallel to the nucleon's electrical field (see magnetic fields in [1]). The velocity of this rotation, corresponds to the electric field of the nucleus, at the position of the electron, as presented in equation (1.3).

$$v_\phi = c \frac{q}{e} O_n \quad R \gg r_e \quad (1.4)$$

$$O_n = \frac{r_e^2}{R^2}$$

$q$  is the charge of the nucleus while  $v_\phi$  is the velocity of rotation of the electron, relative to the surrounding free daons. The order  $O_n$  is the order of the daons associated with the nucleus, at the position of the electron.

The rotation of the electron, due to the electrical field of the nucleus, deviates the direction of the electron's velocity vector. The result is a force produced perpendicular to the electron's velocity vector and to the electric field from the nucleon. This force can be expressed in the following way[1], using eq. (1.3),

$$\vec{F} = \frac{e^2}{4\pi\epsilon_0 r_e^2} \frac{v_\phi}{c} \frac{\vec{R} \times \vec{v}}{Rc} \quad (1.5)$$

$$= \frac{qe}{4\pi\epsilon_0 R^3 c} \vec{v} \times \vec{R} \quad (1.6)$$

which deviates the electron from the classical trajectory.

### 1.3 Another force of deviation

If we take a closer look on this scenario, we find another important phenomenon! The electron has a stronger attraction on the side closest to the nucleon, compared to the side further away, this produce a rotation, of the electron, such as to maintain the electron aligned with the direction of the

nucleon's electrical field. You can compare the situation with the moon orbiting around the earth, it has always the same side directed versus the earth (a phenomenon due to the *much weaker* gravitational force acting on the moon).

The result is that the direction, of the electron's axis of rotation, will be fixed, relative to the nucleus electric field, keeping the equilibrium between centrifugal and *electric* force. But, the supplementary angular velocity, produced by the force in equation (1.6), will give a centripetal force which also must be matched with the centrifugal force. But, there is here no electric force, i.e., the supplementary angular velocity produce a deviation, with no change of energy, in a similar way as the magnetic force[1]. The corresponding direction of the electron's rotational axis, will be directed parallel to its velocity vector.

The corresponding force of deviation, perpendicular to the electric field and parallel to the force (1.6), can be written

$$\vec{F}_D = \frac{qe}{4\pi\epsilon_0 R^3} \tan \eta \frac{\vec{v} \times \vec{R}}{v} \quad (1.7)$$

The angle  $\eta$ , is the angle between the vector, normal to the equatorial plane and the electrical field acting on the electron. This assure that the electron stays in a plane having its vector normal parallel with the mean action of the electrical field, during one turn.

But, equation (1.7) gives no limit to the value of  $\tan \eta$ , i.e. **the electron can place itself in any orbit, as long as its mean path stays on an equipotential surface**, and still be in equilibrium.

The difference between the trajectory due to gravitation and the trajectory due to electromagnetism is due to the phenomenon of induction, i.e. a charged particle resist any changes. That is why a charged particle can stay in any trajectory, as long as it stays on an equipotential surface.

## 1.4 An electron's associated wave

We are looking after stable orbits for the electrons, but, to obtain this, it's necessary to get a better understanding of the behaviour of the electron.



It is known that the electron has some, not well defined, oscillation producing the so called associated wave. Such an oscillation must, within the daon theory, be produced by its transverse characteristics.

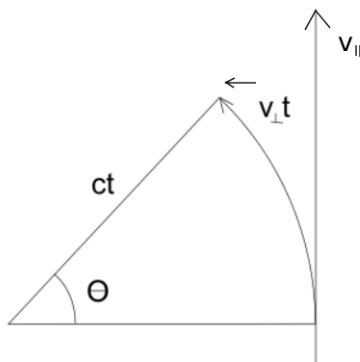


Figure 1.2: The difference in the radial equilibrium, due to the curvature of the trajectory.

We will examine an electron, having a velocity  $\mathbf{v}$ , following a trajectory with a radius of curvature  $r$ , due to an external force. The electric field of such an electron is deformed, corresponding to the response from the surrounding daons. This is due to the shorter way the "action-signal" has to go on the side of the bend, relative to the opposite side, as demonstrated in figure 1.2. The electron therefore feels a supplementary action in the direction of the bend, due to the shorter time the surrounding daons need to react to the "action signal", coming from the electron[1]. This transverse force can become permanent if it exists an equilibrium of force and energy, in the transverse sense.

The electron's transverse velocity must be smooth since the interaction with the surrounding daons also must be smooth. The only possible such motion is therefore a spiralling trajectory. The electron's trajectory can then be imagined placed on a cylinder, having a radius  $\rho$ , where the wavelength ( $\lambda$ ) corresponds to a piece of a cylinder of one complete turn, as indicated in figure 1.3.

We can then write

$$\frac{2\pi\rho}{\lambda} = \frac{v_{\perp}}{v_{\parallel}} \quad (1.8)$$

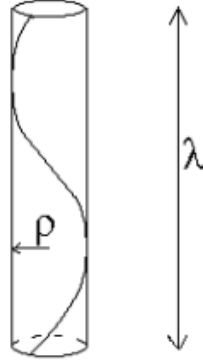


Figure 1.3: Schematic presentation of the spiralling movement of the electron.

## 1.5 The fine structure constant

It was already shown[1], that the constant velocity of an electron is associated with an intrinsic force, directly proportional to its velocity (eq. 1.2). The *transverse* force of the electron, can therefore be express as

$$F_{\perp} = \frac{e^2}{4\pi\epsilon_0\rho^2} \frac{v_{\perp}}{c} = m_e \frac{v_{\perp}^2}{\rho} \quad (1.9)$$

$$\Rightarrow m_e v_{\perp} \rho = \frac{e^2}{4\pi\epsilon_0 c} \quad (1.10)$$

This perpendicular angular momentum gives a constant value, it follows that *the transverse action must be the real source for the law of Louis de Broglie*.

The time necessary for a complete oscillation, in the transverse and the longitudinal sense, must be identical, we have therefore (using the law of Louis de Broglie  $mv\lambda = h$ ),

$$m_e v_{\perp} \rho = m_e v_{\parallel} \frac{\lambda}{2\pi} \frac{v_{\perp}^2}{v_{\parallel}^2} \quad (1.11)$$

If we now apply equations (1.9) and (1.11), on the ground state of the Hydrogen atom, we obtain

$$\hbar = \frac{e^2}{4\pi\epsilon_0 v_0} \quad (1.12)$$

$$m_e v_{\perp} \rho = \hbar \frac{v_0}{c} \quad (1.13)$$

which means that the fine structure constant  $\alpha$  can be written

$$\alpha = \frac{v_0}{c} = \frac{v_{\perp}^2}{v_{\parallel}^2} \quad (1.14)$$

**i.e., the fine structure constant is the square of the ratio between the transverse and the longitudinal velocities.**

It should be noted that the electron's spiralling trajectory (associated wave) can be left or right handed. This is due to the transverse force-energy equilibrium, which is independent from the direction of the spiral. The electron itself is always "spinning" in the left-handed direction, giving the correct magnetic field[1].

## 1.6 Possible stable orbits of the electron

If we now introduce the associated wave, on the electron's trajectory, it is evident that a closed orbit is possible only if the electron is in resonance, i.e. the electron's spiralling trajectory must make an integer or half integer number of spirals during one complete orbit of the electron. The electron must find a trajectory where it is in resonance on its orbit.

The force of deviation, expressed in equation (1.6), deviates the electron from its classical orbit, but why doesn't the electron find an equivalent orbit, slightly displaced relative to the classical one? The answer is that the electron must obtain a closed orbit, i.e., an orbit with an integer number of spirals, which at the same time must be in agreement with the law of Lois de Broglie and symmetric relative to the equipotential surface.

The force of deviation (eq. 1.6) and (eq. 1.7), is modifying the direction of the electron so that it moves, on the potential surface, towards smaller radii, where the first resonance is at a radius reducing the number of spirals one half relative to the corresponding resonance for the classical orbit, i.e.

the electron can place itself in an orbit where its angular momentum must be smaller than the classical one and having an integer or half integer number of oscillation in one turn of its orbit!

We obtain therefore the resonance condition, for an electron within an atom as,

$$\sin \eta = \frac{j}{n} \quad (1.15)$$

$j$  is the number of spirals (of the associated wave) on the electrons orbit, while  $n$  is the number of spirals if the trajectory would have been in a plane perpendicular to the equipotential surface.

This means that **the electron's angular momentum corresponds to the electron's real orbit.**

## 1.7 Rules

We can write the *ideal* electromagnetic equations, for an electron within an atom, as follows:

$$m_e v R = j \hbar \quad (1.16)$$

$$v = v_0 \frac{Z}{n} \quad (1.17)$$

$$R = R_0 \frac{n j}{Z} \quad (1.18)$$

Index  $l$  indicates the values for the lowest energy state of the Hydrogen atom, while  $Z$  is the *effective* charge seen by the electron.

The above equations are only approximately valid since the center of the electromagnetic field, felt by an electron, is displaced relative to the position of the nucleus.

This gives us a limited number of possibility to obtain a stable orbit:

- The number of spirals the electron does, relative to its equipotential surface, must be symmetric and therefore integer;  $n=1,2,3,..$  This gives then the number corresponding to the main energy level.

- An integer number of spirals would result in an unstable resonance since then the minima and maxima would stay in the same position, resulting in a feedback loop of oscillation. Half integer number of spirals gives an exchange between minima and maxima leading to a stable orbit.

The number of spirals the electron does in one turn of its orbit must be lower than  $n$  and half integer, i.e.,  $j = \frac{1}{2}, \frac{3}{2}, \frac{5}{2} \dots n - \frac{1}{2}$ , this means that **the electron always has to make two turns to obtain a closed orbit.**

- The orbit of an electron can be left handed or right handed, relative to the radius of the atom. But, the electron has a slight preference for a right handed orbit due to (eq. 1.6).
- An electron can jump from one energy level to another but, it must always find a closed trajectory at a specific  $\eta$  and equipotential (eq. 1.15). This is rather easy, from a principle ( $n$ ) level to another, since any of the principle energy levels ( $j$ ) are possible.

An important phenomenon is that the associated wave deforms the electric field lines around the electron, in such a way that the field lines seem to come from the mean path of the electron (in the radial sense) as if there were no associated wave.

This seems rather simple so a computer code (ATOMOL) was developed, able to make a detailed calculation of the electron trajectories around a nucleus, using the classical EM-phenomena + force of deviation+associated wave.

What is important here is that the above described theory can be applied, to calculate the trajectory of any charged particle within an atom as well as molecule.

# Chapter 2

## The first 10 Atoms

The usual terminology of atomic physics leads to some confusion, we have therefore chosen to use more general expressions.

The electrons trajectory for some of the lighter atoms are presented in the following. The modifications due to magnetic field and high speeds are included, but, they are so small that they can be neglected for the presented atoms.

### 2.1 Hydrogen

The ground state for the Hydrogen atom is obtained when the only electron is in resonance at its lowest level, i.e., when the electron's associated wave can make one half oscillation ( $j = \frac{1}{2}$ ), in one turn of the electron's orbit. The electron has to make two turns to obtain a closed orbit, which corresponds to the classical orbit ( $n=1$ ). The trajectory is **not** on the equator but displaced so that the radius of curvature is reduced by a factor two, relative to the equator radius, as presented in figure 2.1. The program ATOMOL gives an energy 13.58 eV for the ground state and 3.395 eV for  $n = 2; j = \frac{1}{2}$  (we tried also  $j = \frac{3}{2}$  which gave the same energy). There is no difference in energy due to different directions of orbit or spiral.

The equilibrium of the atom, in the sense of position, is assured through the movement of the nucleus, which necessarily will obtain an added "force of deviation" to compensate for the movement of the electron. The results from ATOMOL is always presented in an associated table; the experimental values are in parenthesis. Notice that almost all the binding energy is in the

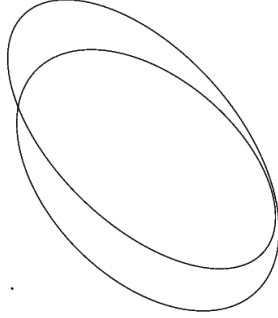


Figure 2.1: Trajectory of the **1H** electron

potential energy of the nucleus.  $E_{nucl}$  is the energy lost by the nucleus.

$$E_{1H} = -13.58 \text{ (-13.598) eV} \quad E_{nucl} = -13.57 \text{ eV}$$

n	l	j	v $10^6 \frac{m}{s}$	$\rho$ pm	E eV	$\eta$ (deg)	$E_{ioniz}$ eV
1	0	0.5	2.19	26.5	-0.008	30.0	13.58 (13.598)

$n$  is the principle level number ( $n = \frac{j}{\sin \eta}$ ).

$l$  is the sub-level number of the principle level.

$j$  is the number of oscillations during one turn.

$v$  is the velocity of the electron.

$\rho$  is the radius of curvature of the electron.

$E$  is the total energy (potential + kinetic) of the electron.

$\eta$  is the angle between the electric field vector, acting on the electron, and the vector, normal to the plane of the electron's trajectory.

$E_{ioniz}$  is the ionization energy of the atom.

The orbit of the electron is perfectly closed, while the path of the nucleus is a perfect circle (the nucleus has no associated wave, it only reacts relative to the electron, the spiralling trajectory of the electron in *not* felt by the nucleus).

## 2.2 Helium

We get the ground state for the Helium atom, when its two electrons both make two turns to obtain a closed orbit (the K-shell). The two electrons have both perfectly closed orbits, while the nucleus just move linearly in response to the electrons action.

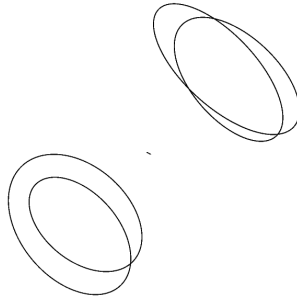


Figure 2.2: Trajectories for the two electrons of the **4He** atom.

$$E_{4He} = -78.9 \text{ } (-79.005) \text{ eV} \quad E_{nucl} = -85.4 \text{ eV}$$

n	l	j	v $10^6 \frac{m}{s}$	$\rho$ pm	E eV	$\eta$ (deg)	$E_{ioniz}$ eV
1	0	0.5	3.48	16.6	3.25	32.04	24.5 (24.587)

Notice that the electron has positive energy.

The para-helium have its electrons both orbiting in the same handedness, relative to the radius of the nucleus, while the ortho-helium has its electrons orbiting with opposite handedness, which leads to an instability in the radial sense. This instability is due to the interaction between the electrons which, when they have a slight difference in velocity or radius, leads to a slip in position. This situation is then reinforced by the effective charge from the nucleus, which becomes stronger for the closest electron and weaker for the other one, increasing the slip . . . .

The lowest energy state for ortho-helium is therefore two electrons in two different n-levels (1 and 2), moving with the opposite handedness relative to the nucleus radius (ATOMOL gives an energy increase of 20.3 eV). The same phenomenon must exist in all Helium-like atoms.



## 2.3 Lithium

There is no room for a third electron at the same level as the K-shell electrons, probably due to the potential, which is perfectly centred on the nucleus (a test was made giving as result strong instability). This electron can therefore not have the same  $\eta$  (eq. 1.15). Another equipotential surface must be found where the electron can make a closed orbit. There is no other possibility at this n-level, it is therefore necessary to move outwards to the next n-level, i.e., where the electron can make two complete spirals on the closed orbit corresponding to the equipotential surface.

The ground state of the Lithium atom is obtained, adding a third electron having a closed orbit after two turns ( $j = \frac{1}{2}$ ), but now placed at  $\sin \eta = \frac{1}{4}$ , as presented in figure 2.3. In the position of this equipotential surface, it is also possible to choose  $\sin \eta = \frac{3}{4}$ , which leads to a closed orbit after 2 turns having 3 spirals.

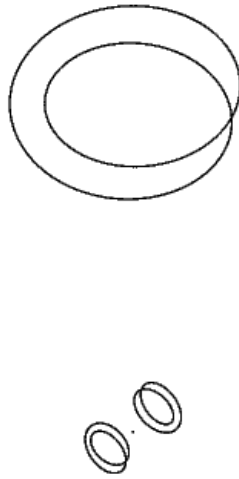


Figure 2.3: Trajectories for the three electrons of the **7Li** atom.

$$E_{7Li} = -203.4 \text{ } (-203.486) \text{ eV} \quad E_{nucl} = -220 \text{ eV}$$

n	l	j	v $10^6 \frac{m}{s}$	$\rho$ pm	E eV	$\eta$ (deg)	$E_{ioniz}$ eV
1	0	0.5	5.3	10.5	8.3	31.29	
2	0	-0.5	1.1	56	-0.03	14.54	3.5 (5.392)

The two K-electrons are slightly displaced, for reasons of electrostatic symmetry, the vectors, normal to their respective orbital plane, have an angle of 178.8 degrees.

The indicated values are mean values, since the electrons are not in phase with each other, although the atom itself is a closed system with constant energy and angular momentum. An individual electron's modification of energy is compensated by the surrounding ordered daons (order and size) to match the necessary equilibrium.

For bigger atoms the orbits are not any more perfectly closed, since the frequencies are different for the different (sub-)levels. Only the mean values of the orbits are "closed" (you can take the earth as example; its orbit is not "closed", although the mean orbit is stable).

## 2.4 Beryllium

We get the ground state of the Beryllium (**Be**) atom when the two external electrons both have  $j = \frac{1}{2}$  per turn with  $\sin \eta = \frac{1}{4}$ .

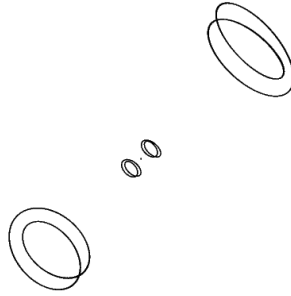


Figure 2.4: Trajectories for the four electrons of the **9Be** atom.

$$E_{9Be} = -398.9(-399.15) \text{ eV} \quad E_{nucl} = -440.5 \text{ eV}$$

n	l	j	v $10^6 \frac{m}{s}$	$\rho$ pm	E eV	$\eta$ (deg)	$E_{ioniz}$ eV
1	0	0.5	7.9	7.3	20	30.8	
2	0	-0.5	1.9	33	0.72	15.45	10 (9.323)

Notice that the K-electrons vector normals are positioned linearly with the corresponding L-electrons, due to a much lower energy in this structure, relative to a possible perpendicular structure (see Li).

The minus sign, for the  $j$  values in  $n = 2$ , for the Li and Be, means that the handedness for these electrons are inverted, i.e. they turn in the opposite direction, compared with the K-electrons. This gives more stability and lower energy.

In fact, we find also here excited levels, corresponding to different handedness, in the same way as for ortho and para-helium.

## 2.5 Boron

We add another electron to obtain the ground state of the Boron (**11B**) atom. The added electron has the same value of angular momentum  $j = \frac{1}{2}$  as before. The added electron place itself symmetrically (for electrostatic reasons) but further away where the effective charge is reduced, increasing the radius of the corresponding equipotential surface. A test was made, making the added electron having the same handedness as but this was highly unstable, i.e., the three electrons in n-level 2, can not have the same handedness!

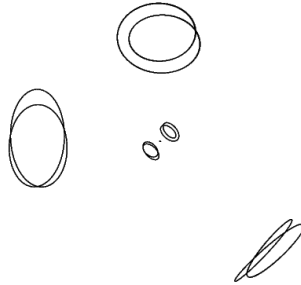


Figure 2.5: Trajectories for the electrons of the **11B** atom.

$$E_{11B} = -670(-670.95) \text{ eV} \quad E_{nucl} = -751 \text{ eV}$$

n	l	j	v $10^6 \frac{m}{s}$	$\rho$ pm	E eV	$\eta$ (deg)	$E_{ioniz}$ eV
1	0	0.5	9.95	5.75	32	30.8	
2	0	-0.5	2.57	24.5	2.5	16.3	
2	1	0.5	2.08	25.5	2.3	16.35	10 (8.298)

The two K-electrons take a position parallel with the two  $s$  electrons in the L-level. The two  $s$  electrons in the L-level, have an angle of 170 degrees between their vector normals, while the  $p$  electron has its vector normal symmetrically placed relative to the other electrons. Notice the difference in handedness between the s-electrons and the p-electron, in the L-level. Is this the real reason for the difference between these two sub-levels?

The program ATOMOL reach here its limits; different disturbances (numerical excitation, resonances...) do not allow further use: We therefore developed a simplified version, using medium fields and circular orbits for the electrons. These modifications gave a stable and faster program, but, which has bigger errorbars, especially for the interaction between the electrons. This leads to big errors in the excitation energies of the atoms, but, at this stage we believe that the structure of the atoms is of mayor interest. Further developments (introducing perturbation theory on the circular orbit, dynamic time step and improving the contribution from the spiralling trajectories) can certainly improve the performance of the program.

## 2.6 Carbon

We can now add another electron into the L-shell, giving the carbon.

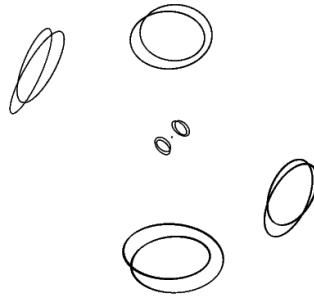


Figure 2.6: Trajectories of the electrons of the **12C** atom.

$$E_{12C} = -1014 \text{ (-1030.2) eV} \quad E_{nucl} = -1130 \text{ eV}$$

n	l	j	v $10^6 \frac{m}{s}$	$\rho$ pm	E eV	$\eta$ (deg)	$E_{ioniz}$ eV
1	0	0.5	11.9	4.65	45	30.65	
2	0	-0.5	2.75	22.3	3.3	18.1	
2	1	0.5	2.75	22.3	3.3	18.1	14 (11.26)

In the L-level, the s-electrons have an angle of around 160 degrees between vector normals, while the p-electrons have an angle of around 70 degrees between their vector normals. The electrons lay in planes perpendicular to each other. The k-electrons vector normals have an angle of 177 degrees between them.

The sum of the kinetic and potential energy of an individual electron is not zero, although rather small. This is due to the effective charge, seen by an electron, which is variable and not centred on the nucleus. It is in fact the potential of the **nucleus** (its missing mass) which has almost all the missing energy since the nucleus has a very small kinetic energy, due to its relatively heavy mass.

## 2.7 Nitrogen

The Nitrogen gives a new geometry since the s-electrons in the L-level are parallel with the k-electrons, while the mean position of the p-electrons, in the L-level, produce a perfect triangle, necessary for the electrostatic equilibrium. Here the central potential is smeared out which allows more electrons in the same energy level.

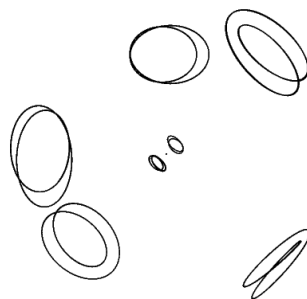


Figure 2.7: Trajectories of the electrons of the  $^{14}\text{N}$  atom.

$$E_{14N} = -1465 \text{ (} -1486.0 \text{) eV} \quad E_{nucl} = -1622 \text{ eV}$$

n	l	j	v $10^6 \frac{m}{s}$	$\rho$ pm	E eV	$\eta$ (deg)	$E_{ioniz}$ eV
1	0	0.5	13.0	4.12	65	30.61	
2	0	-0.5	3.2	18.2	5.7	18.75	
2	1	0.5	3.3	17.8	5.0	18.0	11 (14.53)

## 2.8 Oxygen

Oxygen again change the geometry, since here the lowest level is obtained when the mean position of the p-electrons in the L-level produce a perfect square, as shown in figure 2.8.

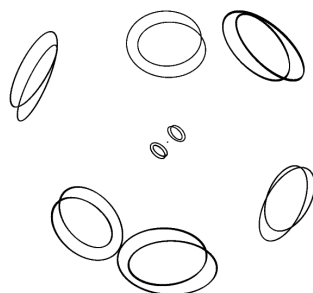


Figure 2.8: Trajectories of the electrons of the **16O** atom.

$$E_{16O} = -1988 (2043.8) \text{ eV} \quad E_{nucl} = -2214 \text{ eV}$$

n	l	j	v $10^6 \frac{m}{s}$	$\rho$ pm	E eV	$\eta$ (deg)	$E_{ioniz}$ eV
1	0	0.5	16.5	3.45	86	30.4	
2	0	-0.5	3.65	15.5	8.5	18.9	
2	1	0.5	3.7	15.7	9.0	18.9	15 (13.62)

## 2.9 Fluorine

It is not possible to add another electron into the  $L; j = \frac{1}{2}$  shell (strong instability), but it's here possible to add an electron with an angular momentum  $j = \frac{3}{2}$ , i.e., an electron making 3 complete spirals in 2 turns at an angle  $\sin \eta \simeq \frac{3}{4}$ , such an electron will have a 3 times bigger radius. But, we found that this gave an asymmetric and unstable structure. We therefore found it necessary, to obtain a stable structure, to add *two* electrons with  $j = \frac{3}{2}$ , reducing the number of electrons with  $j = \frac{1}{2}$ . This gave a stable structure presented in figure 2.9, where the vectors, normal to the orbital plane of the two K-electrons, the two s-electrons in the L-shell and the two electrons in the  $L; j = \frac{3}{2}$  are all aligned parallel with each other. The mean position of the three remaining p-electrons form a perfect triangle (like for the Nitrogen atom).

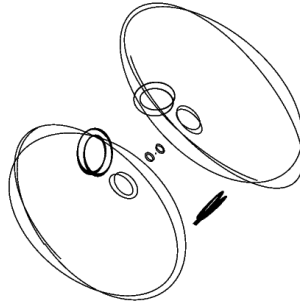


Figure 2.9: Trajectories of the electrons of the **19F** atom.

$$E_{19F} = -2603 \text{ } (-2715.9) \text{ eV} \quad E_{nucl} = -2961 \text{ eV}$$

n	l	j	v $10^6 \frac{m}{s}$	$\rho$ pm	E eV	$\eta$ (deg)	$E_{ioniz}$ eV
1	0	0.5	19.0	3.07	116	30.4	12 (17.4)
2	0	-0.5	2.9	24.0	3.35	17.15	
2	1	0.5	4.2	14.0	11.1	18.0	
2	1	1.5	6.4	26.8	42.5	54.9	

The p-electrons, in the L-level, have very closely the same energy, this is possible only if they stay on the same medium equipotential surface. But,

in this case, they must be in resonance with each other! In fact, if you examine figure 2.9, you realise that, this is most certainly the case, since the electrons of respective  $j$ -values are passing close to each other forcing a specific interaction.

We have some doubts if the ionization will reduce the structure to the Oxygen structure or if the remaining  $j = \frac{3}{2}$  electron structure will be sufficiently stable for the de-excitation.

## 2.10 Neon

We now add an electron into the L-level ( $j = \frac{1}{2}$ ), where the mean position of the electrons produce a perfect square (like for the Oxygen atom), as for Fluorine we have two  $j = \frac{3}{2}$  electrons in L-level, as demonstrated in figure 2.10.

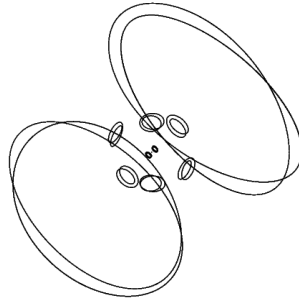


Figure 2.10: Trajectories of the electrons of the **20Ne** atom, including associated waves.

$$E_{20NE} = -3340 \text{ } (-3511.7) \text{ eV} \quad E_{nucl} = -3850 \text{ eV}$$

n	l	j	v $10^6 \frac{m}{s}$	$\rho$ pm	E eV	$\eta$ (deg)	$E_{ioniz}$ eV
1	0	0.5	21.2	2.75	155	30.4	20 (21.565)
2	0	-0.5	3.25	17.7	7.5	18.45	
2	1	0.5	4.2	13.8	13	18.2	
2	1	1.5	7.8	22.3	65	52.7	



In the same way as for the Fluorine, also the corresponding Neon electrons must be in resonance, to explain the identical energy for the p-electrons.

We have some doubts if the ionization will reduce the structure to the Fluorine structure or if the remaining  $j = \frac{3}{2}$  electron structure will be sufficiently stable for the de-excitation.

We have now found the reason for  $\Delta j \neq 0$ ; this is due to the handedness of the electrons! Each sub-level has all its electrons having the same handedness i.e., they turn in the same sense relative to their vector normals, this comes from the fact that an electron having the opposite handedness, relative to the other electrons in its sub-level, produce an excitation and therefore instability within the sub-level (see for example the ortho- and para-Helium).

The probability of right or left handedness of an electron must be close to the same (with a slight propensity for right handedness), this leads to sub-levels having alternating handedness, if the s-level is right handed then the p-level will have left handedness,... If you take a look at the above figures, you will notice that the electrons which are *geometrically* one above the other, have opposite handedness. This is due to the stability and lower energy for such geometries. Parallel orbits and velocities gave instabilities in all examined cases!

An "allowed" electron transition is therefore between two levels having the same handedness. "Forbidden" transitions can happen, if the electron is strongly disturbed or if the electron, moving down to lower levels, pass through the atom, coming to the opposite side of the atom, where its handedness change sign!

# Chapter 3

## Angular momenta

We will use the Hydrogen atom as example, since this is the simplest scenario, where an analytical approach can be made. The result can be generalized to all atoms.

We write the force acting on the electron respective the nucleus as,

$$\vec{F}_{e_{dev}} + \vec{F}_{e_E} = \frac{eq}{2\pi\epsilon_0 r^2} = m \frac{v_e^2}{\rho_e} \quad (3.1)$$

$$\vec{F}_{n_{dev}} + \vec{F}_{n_E} = \frac{eq}{2\pi\epsilon_0 r^2} = M \frac{v_n^2}{\rho_n} \quad (3.2)$$

$$F_{e_{dev}} = \frac{F_{e_E}}{\tan \eta} \quad \eta = 30 \text{ degrees}$$

$m$  is the mass of the electron and  $M$  is the mass of the nucleus.  $\rho$  is the radius of curvature and  $r$  is the distance from the nucleus to the electron. The indexes are respectively for the electron and the nucleus.

The angular momenta is

$$L_e = mv_e \rho_e = \frac{\hbar}{2} \quad (3.3)$$

$$L_n = Mv_n \rho_n = L_e \frac{m}{M} \quad (3.4)$$

The angular momentum of the nucleus have both  $v_n$  and  $\rho_n$  smaller, relative to the electron, with the ratio of the masses ( $\frac{m}{M}$ ). This means that

it's not the associated wave of the nucleus which is giving it its angular momentum! But, the nucleus must react to the action from the electrons, so that the atom's internal equilibrium is maintained. The hyper fine structure must therefore be due to the interaction between the electron and the nucleus.

The nucleus own angular and magnetic momenta are somewhat more difficult to calculate since the geometry of the proton, with its distribution of charge and mass, is rather complex [2].

The force of deviation do *not* contribute to the energy, we have therefore the total energy

$$E_e = \frac{eq}{8\pi\epsilon_0 r} + m_e \frac{v_e^2}{2} \quad (3.5)$$

$$E_n = \frac{eq}{8\pi\epsilon_0 r} + M_n \frac{v_n^2}{2} \quad (3.6)$$

the potential field is divided into two equal parts.

### 3.1 The magnetic angular momenta

We apply an external magnetic field  $B$  over the Hydrogen atom, this defines a north and a south pole, according to the direction of the magnetic field.

Such an external magnetic field produce a force perpendicular to the magnetic flux and to the velocity of all the charged particles in the atom. This force will modify the energy of these particles, creating a precession of the charged particles orbit, around their mean position (Zeeman effect). At stronger fields the *mean* position of the particles azimuthal position start a precession, always on their mean equipotential surface, but now detached from their initial position. The force maintaining the electrons in their mean azimuthal position is rather weak, which is the reason for the Paschen-Back's effect.

The force equilibrium becomes

$$\frac{eq}{2\pi\epsilon_0 r^2} + ev_e B \simeq m_e \frac{v_e^2}{\rho_e} \quad (3.7)$$

$$\frac{eq}{2\pi\epsilon_0 r^2} + qv_n B \simeq M_n \frac{v_n^2}{\rho_n} \quad (3.8)$$

The force of deviation adapt itself to maintain the resonance, and do not influence the energy levels, we have therefore the energies as,

$$E_e = \frac{eq}{8\pi\epsilon_0 r} + \frac{ev_e B}{2} r + m_e \frac{v_e^2}{2} \quad (3.9)$$

$$E_n = \frac{eq}{8\pi\epsilon_0 r} + \frac{qv_n B}{2} r + M_n \frac{v_n^2}{2} \quad (3.10)$$

In case of the Hydrogen atom, all changes to the energy, induced by the magnetic field, can be found in the potential energy. We can therefore write

$$\frac{eq}{8\pi\epsilon_0 r^2} + qv_e B + qv_n B = \frac{eq}{8\pi\epsilon_0 (r + \Delta r)^2}$$

and the *magnetic* angular momenta becomes

$$L_e = \frac{eB}{2m} m v_e r = \frac{eB}{2m} \hbar \quad (3.11)$$

$$L_n = \frac{qB}{2M} M v_n r = \frac{qB}{2M} \hbar \quad (3.12)$$

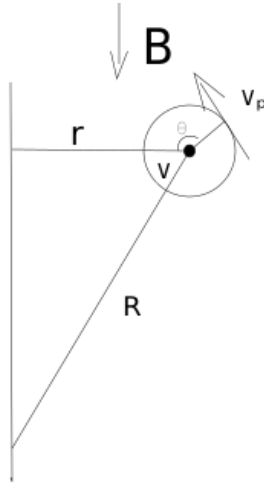


Figure 3.1: Schematics for calculation of the magnetic momentum.

## 3.2 Higher order

There is also a small contribution from the spiralling trajectory of the electron. The correct velocity is, in fact  $v = \sqrt{v_e^2 + v_\perp^2}$ , the transverse velocity ( $v_\perp$ ) of the electron, has a component perpendicular to  $\vec{B}$ , which increase the effect of the magnetic field. Equation (3.10) becomes

$$L_e = \frac{eB}{2m} mr \sqrt{v_e^2 + v_\perp^2} \cos^2 \theta \quad (3.13)$$

The resonance is possible only if the electron makes 2 turns (to obtain a closed orbit), this means that this added action, from the electron's spiralling trajectory, will be at the *same* azimuthal position in its orbit! This should further reduce the added precession with a factor  $\sin \phi$ . We obtain therefore the electron's magnetic angular momentum as

$$L_e = \frac{1}{\pi} \int_0^\pi \frac{1}{\pi} \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sqrt{1 + \alpha \cos^2 \theta} d\theta \sin \phi d\phi \simeq \frac{eB}{2m} 1.0011598 \hbar \quad (3.14)$$

$\theta$  is the angle between the magnetic field and the transverse velocity of the electron, while  $\phi$  is the azimuthal angle along the electron path.

The nucleus do not feel the oscillation of the electron, which means that the nucleus do not have this correction!

The Hydrogen atom will adapt the velocities and the potential field to maintain the resonance of the electron, this will give a feedback to the influence from the magnetic field, which we neglected. Measurements on a single electron could give problem due to change of resonance condition.

# Chapter 4

## Other phenomena

The smallest possible radius of an electron's orbit gives normally the lowest energy; this is so since the potential surface isn't spherical, which gives potential "wells" with stronger field in their bottom where an electron with a smaller orbit can go deeper.

An important question is, why is the atom not radiating? In the case of an electron within an atom, the electrons are moving under a varying EM-field, which leads to a variation of their mass-energy, but the atom itself has constant energy-mass. This means that any modification of an individual particles energy-mass is absorbed by the surrounding ordered daons.

All the particles within an atom have small variation of the size of its associated daons. This variation is felt all around the atom as a variation of the free daon size. This variation corresponds to a multitude of standing waves of the free daon size all around the atom. Such variations should produce a weak attraction between all masses. This seems to be a likely candidate for the Casimir force. A dedicated study can be made, to verify this suggestion.

### 4.1 Synchrotron radiation

Once the electron's associated wave is understood, the explanation for the synchrotron radiation becomes evident.

The electron's spiralling motion (see figure 4.1), has as consequence that a magnetic or electric field, perpendicular to the medium path of the electron, corresponds to adding a supplementary transverse acceleration. This means

that the transverse movement of the electron's spiralling trajectory, corresponds to a periodic acceleration and deceleration, which must be a source of radiation.

A magnetic field is proportional to the velocity of the free daon flux around the target charge[1], i.e.

$$B = \frac{e}{4\pi\epsilon_0 r_e^2} \frac{v_B}{c^2} \quad (4.1)$$

$v_B$  is always very small (1 Tesla  $\simeq 10^{-4} \frac{m}{s}$ ).

The electric field has an effect corresponding to a velocity, which can be calculated from

$$\frac{v_E}{c} = O = \frac{r_e^2}{r^2} \quad (4.2)$$

$v_E$  is also always very small ( $1 \frac{MV}{m} \simeq 10^{-15}$  ;  $v_E \simeq 10^{-6} \frac{m}{s}$ ).

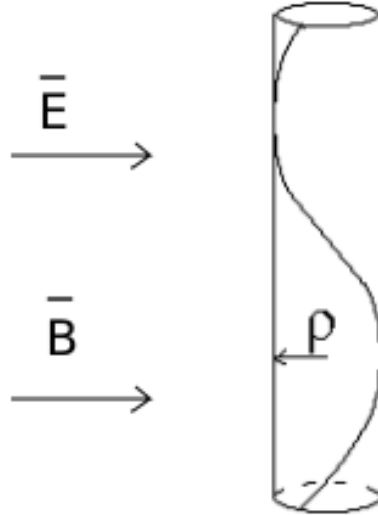


Figure 4.1: Schematic showing the synchrotron radiation principal.

The frequency of the radiation (non relativistic) must correspond to the spiralling trajectory (associated wave), i.e.

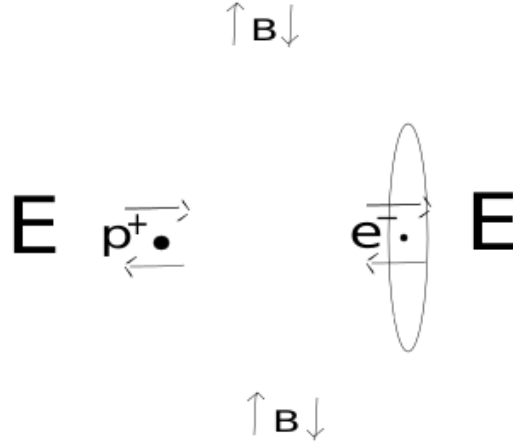


Figure 4.2: Scenario of the Lamb shift on an Hydrogen atom.

$$\nu = \frac{v_{\perp}}{2\pi\rho}N = \frac{v_{\parallel}}{\lambda}N \quad N = 1,2,3,\dots \quad (4.3)$$

## 4.2 The Lamb shift

The Lamb shift is of symbolic importance, since it's connected with the development of quantum electrodynamics, we will therefore spend some words on this specific phenomenon.

Experimentally [3], you measure a difference in the energy levels caused by an EM-radiation. This is believed to be a demonstration of the influence from virtual photons within the EM-fields in action.

Virtual photons do not exist, within the Daon theory, we have therefore a different interpretation.

We will use the Hydrogen atom as example, since this is the simplest scenario, as presented in figure 4.2.

We apply an EM-field on an Hydrogen atom and examine what would happen: First we realize that the hydrogen atom will follow the E-field, since this action is much stronger than the action due to the B-field, i.e. the atom will align itself with the direction of the E-field, as shown in figure 4.2.



The oscillating E-field will then make the atom oscillate, where the electron and the nucleon will oscillate in opposite phases, since they have opposite charges. This will add an energy to the atom, which should explain the energy shift, seen in the experiment.

It is difficult to extract an exact calculation of its energy or frequency, so at the moment we give only a qualitative explanation.

## Conclusions

We calculate the fine structure constant and the Planck's constant while examining the associated wave of the electron.

We thereafter present some hitherto unknown phenomena which explains the behaviour of the electrons within an atom. A computer code (ATOMOL) is presented, which can give any characteristic of each individual electron, including velocity and position at any given moment, within the cohort of electrons of an atom. The lighter atoms (H-Ne) are presented as examples.

The "anomalous" magnetic moment of the electron, is shown to be due to the reduced radius of the electron's orbit.

ATOMOL can simulate the behaviour of any atom, but, it should be further developed to improve stability, reduce errorbars and included molecules. It could then become a valuable instrument for applied physics in general. We would like to continue this development using an open source project. If somebody is interested, having some experience on how to start an open source project, please contact me!

# Bibliography

- [1] J.E.S. Gustafsson "Fundamental Electro-magnetics", ViXra
- [2] J.E.S. Gustafsson "Particles", ViXra
- [3] W. E. Lamb; R. C. Retherford (1947). "Fine Structure of the Hydrogen Atom by a Microwave Method". *Physical Review*. 72 (3): 241–243. Bibcode:1947PhRv...72..241L. doi:10.1103/PhysRev.72.241.