

## ARTICLE 02

### ELECTRONIC EXTREMES: ORBITAL AND SPIN (INTRODUCTION)

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#### ABSTRACT

Electron that is born in a pivot position and swings from this position with two electronic extremes (EE) is introduced in article dedicated to Victoria Equation [1]. These two electronic extremes always provide equi-energetic sum and their energetic distribution is radius ( $r_i$ ) or division (d) function.

In this article, electron begins to show in three dimensions. First, by expanding its radial dimension to two dimensions with a circular orbit movement. Second, reaching three dimensions by raising and lowering these circular orbits with division variations (Swinging movement). In the previous sentence two electron movements have been included: orbital movement with circular movement in specific division and spin movement when moving between orbits changing division with swinging movement like a screw.

#### KEYWORDS

Electron, Atomic model, Victoria Equation, Electronic Extreme (EE), Orbital circumference ( $c_i$ ), Circular orbit height ( $H_i$ ), Orbital Planes Axis (OPA), Orbital and Spin movement in EE.

#### INTRODUCTION

This is second article of 24 dedicated to atomic model based on Victoria equation (Articles index is at end). Two electron fragments run simultaneously in circular orbits at a radial distance of nucleus. The next step is to know circular orbit radius for each of birth wavelength ( $\lambda_{\text{Birth}}$  or simply  $\lambda$ ) divisions. Radius orbit is defined as orbital circumference ( $c_i$ ), where  $c_A$  and  $c_B$  are the orbital circumference for the electronic extremes A y B respectively. It is preferred to indicate as orbital circumference ( $c_i$ ) to avoid confusing orbital radius with radial distance nucleus-electron ( $r_i$ ). Where suffix indicates electronic extreme considered and i suffix is used to both electronic extremes ( $EE_i$ ). All abbreviations are compiled, in conjunction with those included in [1], at article end.

#### P015 Orbital circumference ( $c_i$ ) from wavelength fold

Orbital circumference ( $c_i$ ) of two electronic extremes for any division (d) is proportional to electronic extreme wavelength ( $\lambda_i$ ) and inversely proportional to wavelength compaction factor ( $C_F$ ) (1).

$$(1) c_i = \frac{\lambda_i}{2\pi F_c}$$

By this expression is obtained that orbital circumference is derived from  $\lambda_i$  and, in the concrete case of  $C_F=1$ ,  $\lambda_i$  is equal to circumference perimeter. For that same  $\lambda_i$ , if  $C_F$  passes from 1 to 2, then  $c_i$  is divided by 2. As a consequence,  $\lambda_i$  is compacted by 2 to fit in new circumference perimeter. Before focusing on  $C_F$  value, this is followed by orbits geometric distribution.

**P16 Circular orbit height ( $H_i$ ) and relationship  $r_i \geq c_i$**

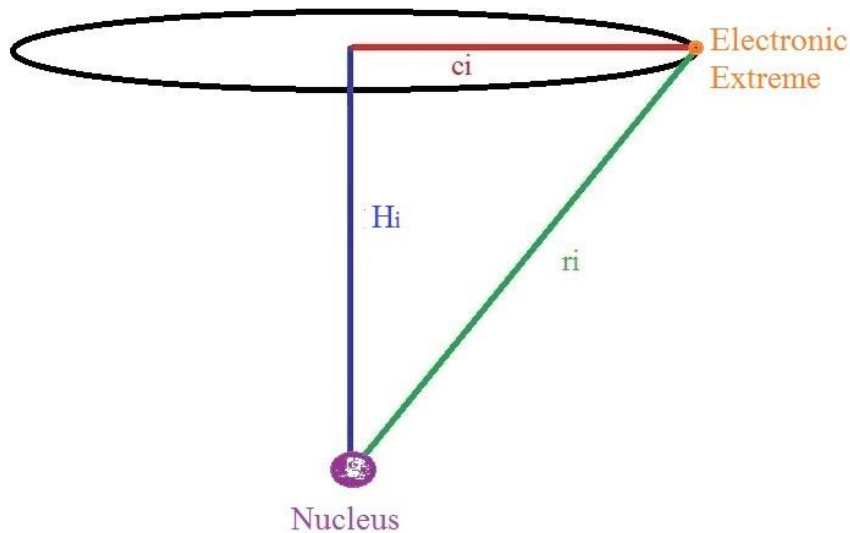
Circular orbital height ( $H_i$ ) is obtained by right-angled triangle relation (2):

$$(2) H_i = \sqrt{r_i^2 - c_i^2}$$

In any case, for division to exist and therefore do ES (Equi-energetic state), must be satisfied that  $r_i$  is higher to or equal to  $c_i$ .

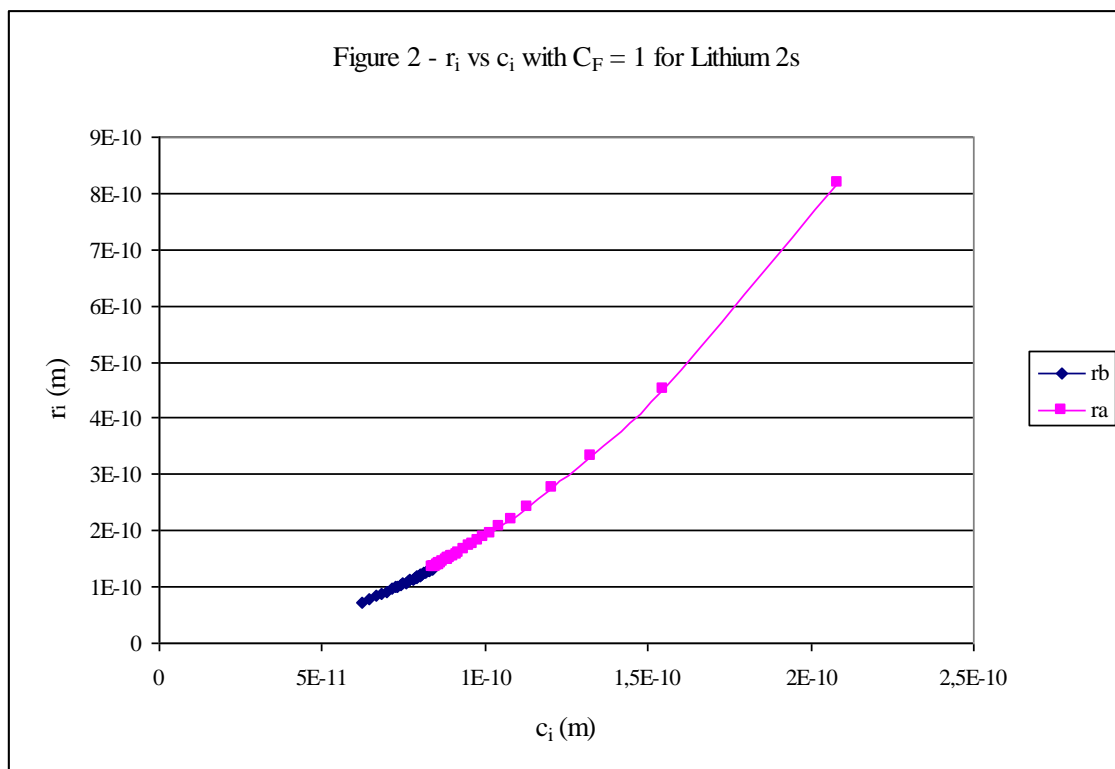
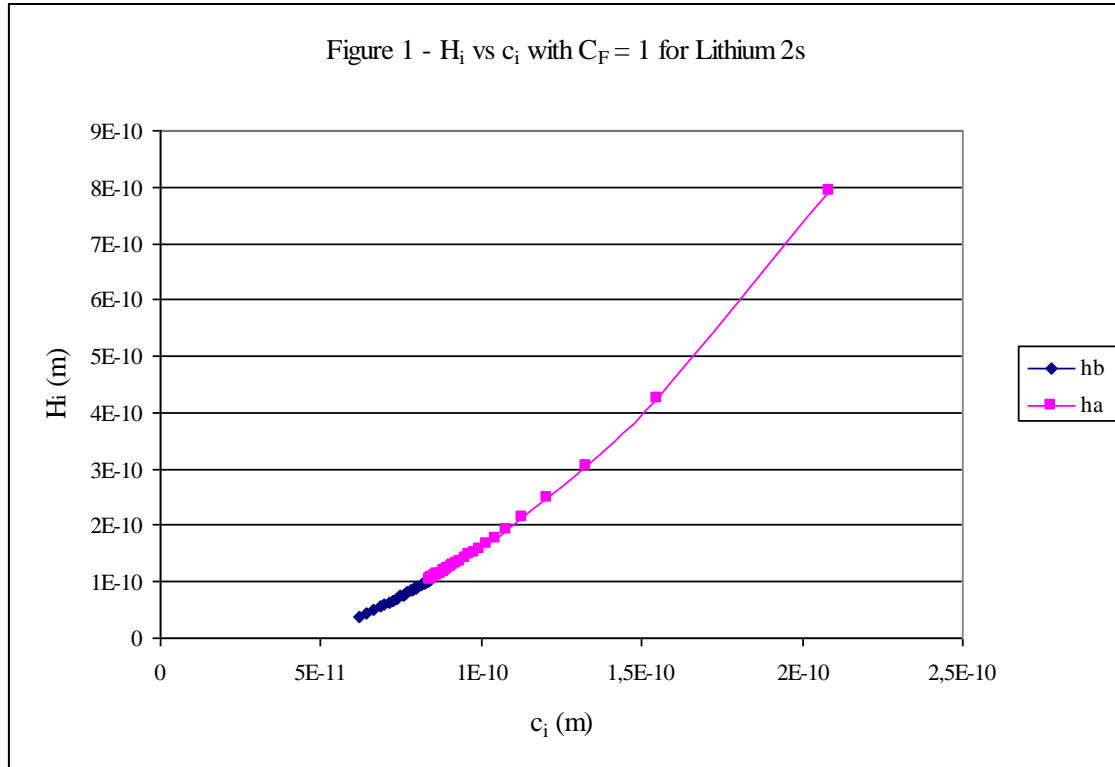
This article aims to be an introduction to geometry and implications of Victoria Equation and ES in the atom. Consequently, some licences are included and will be indicated and justified in later articles. For example, theory is going to work with  $C_F=1$ , to later explain  $C_F$  value reasons.  $H_i$ ,  $c_i$  and  $r_i$  representation for one of two electronic extremes is shown in **Image 1**.

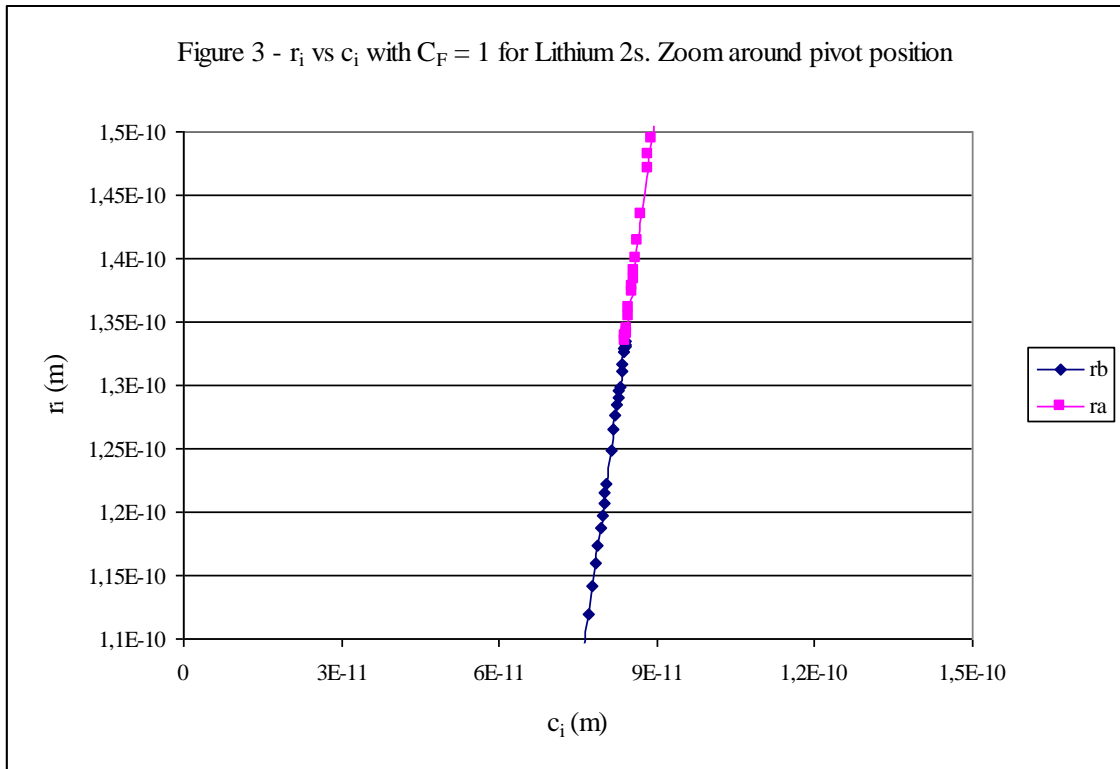
Image 1 -  $H_i$ ,  $c_i$  and  $r_i$  in circular orbital representation



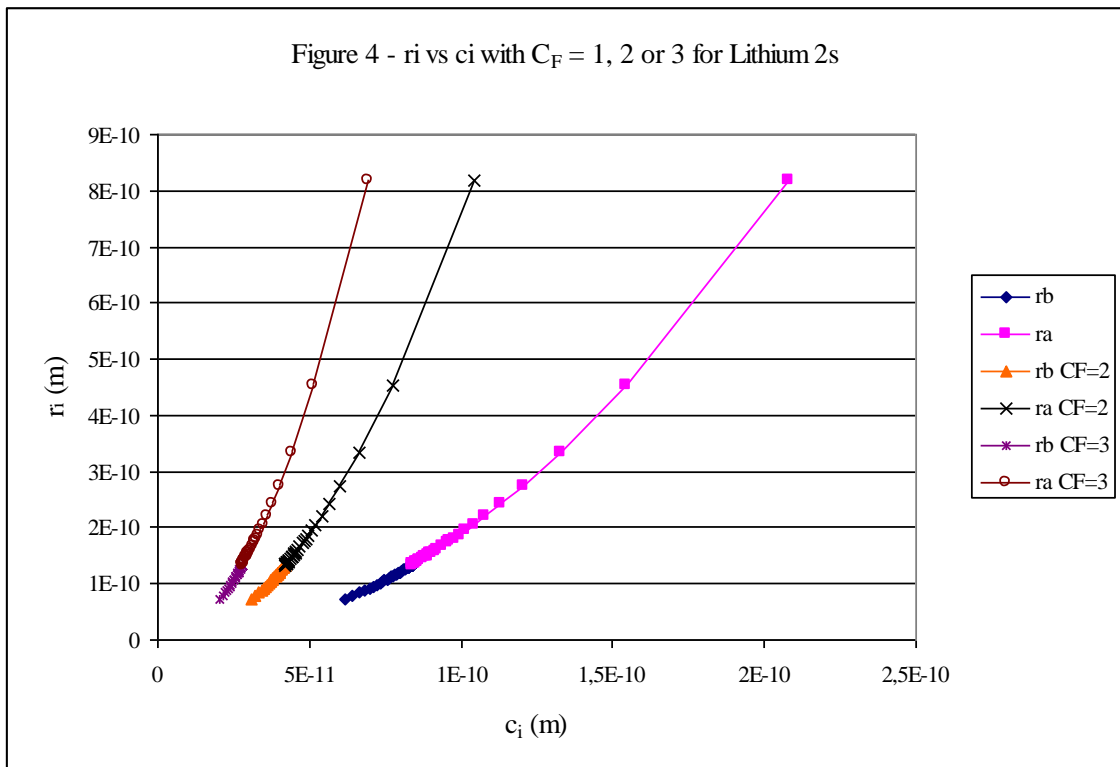
**Figure 1** shows electron with  $E_0$  corresponding to Lithium most external Ionization Energy (All IE are from [2]) according to the previous scheme of Image 1 (Axis Y is  $H_i$  and Axis X is  $c_i$ ). As in [1] and for the same reasons, divisions that are d range representative and show influence in curves have been selected. One division has been added to division 1 until reaching  $d=12$ . Subsequently, increase between divisions is greater.

$H_i$  and  $c_i$  continuous growth distribution is observed. This occurs whenever  $C_F = \text{constant}$ . Similar curve is obtained by plotting  $r_i$  vs.  $c_i$  (**Figure 2**). In the introductory mode of bond radius, an extension of birth zone is made (**Figure 3**) to observe that, in specific Lithium case, bond radius of its diatomic molecule ( $\text{Li}_2$ ) is 1.3365 Å [3] coincides with pivot radius or  $(r_i)_{d \rightarrow \infty}$  equals 1.3353 Å.

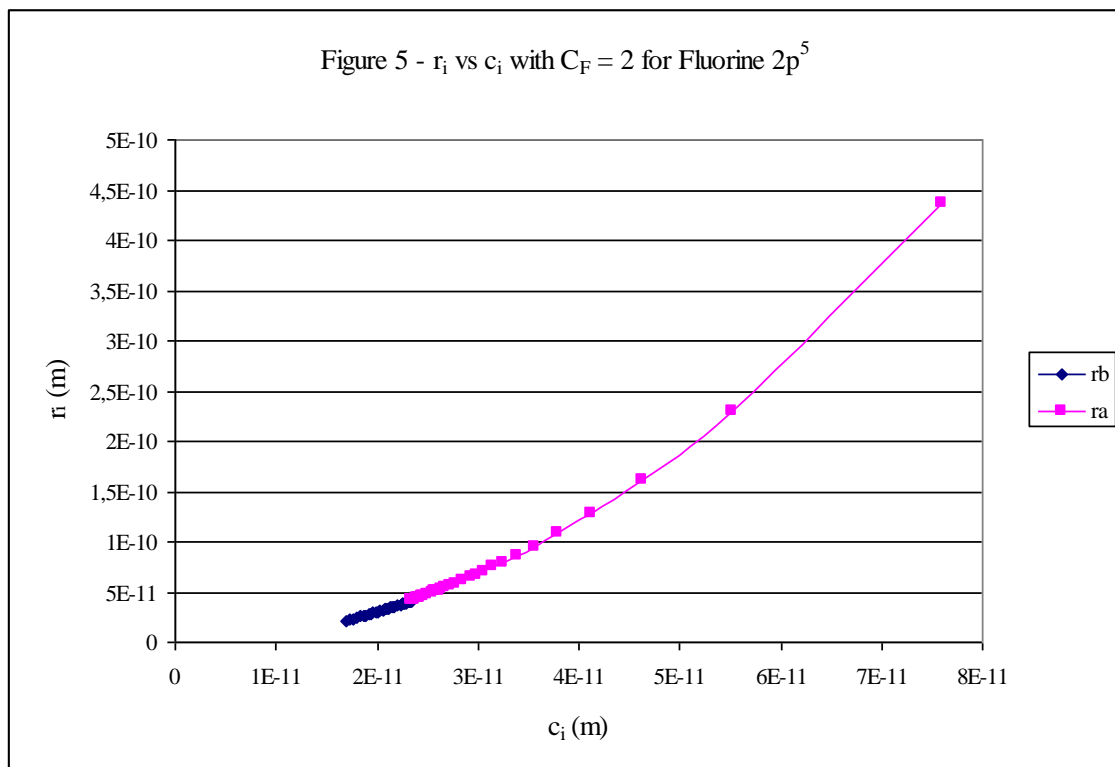




**Figure 4** shows Lithium 2s with different Compaction Factors of 1, 2 and 3.  $C_F$  increase causes  $c_i$  proportional compaction (1). In this way, starting from the same situation, multiplying  $C_F$  by a number implies division of  $c_i$  by the same factor.  $C_F$  affects  $c_i$  but no  $r_i$  which depends on energy and is obtained by Victoria Equation. Consequently, since  $C_F$  affects  $c_i$  while  $r_i$  remains constant,  $H_i$  must vary to balance  $c_i$  change and meet (2).



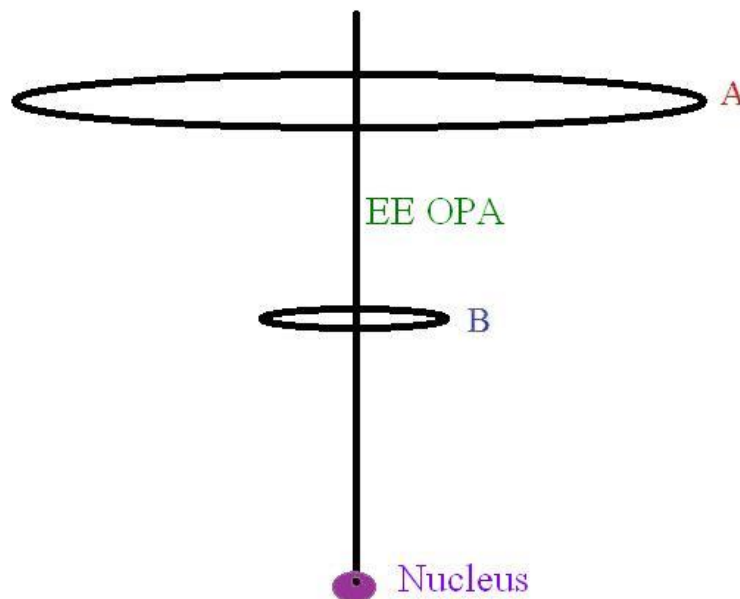
**Figure 5** is  $r_i$  vs.  $c_i$  representation for Fluorine outermost electron with their  $E_o=IE$  [2] and  $C_F=2$ .  $C_F=1$  is too low causing  $c_i>r_i$  and consequently  $H_i$  without real solutions (2). In [1] is used  $(r_i)_{d\rightarrow\infty}$  application: Radius approximate for outermost lobe in ns electrons. This application is only valid for outermost lobe in ns electrons because, at this time, z calculation is limited to these lobes as indicated in P14.  $z=1$  license for Fluorine outermost electron has been taken and is maintained to compare  $(r_i)_{d\rightarrow\infty}$  and theoretical atomic radius as maximum charge density in the outermost electron shell of the atom [1]. This comparison is only a rough approximation as explained in [1] and further considering that  $z=1$  for  $2p^5$  Fluorine is not its real z. Even being an approximation, comparison is optimal:  $(r_i)_{d\rightarrow\infty}$  for  $2p^5$  Fluorine is 41.3 pm, 38 pm [5] and 41 pm [4]. Results are not so positive in other atoms and subsequently, Probability concept will be introduced and  $C_F$  variable will be detailed.



**P17 Orbital planes of two Electronic extremes are parallel.**

Orbital planes corresponding to each of two EE are parallel and the same axis passes through them at its orbital centre (Image 2). This axis is called Orbital Planes Axis (OPA). EE are represented by A ( $EE_A$  or outermost) and B ( $EE_B$  or innermost).

Image 2 - Electronic Extremes Orbital Planes Axis: EE OPA



### P018 Rotation movement or fixation of OPA

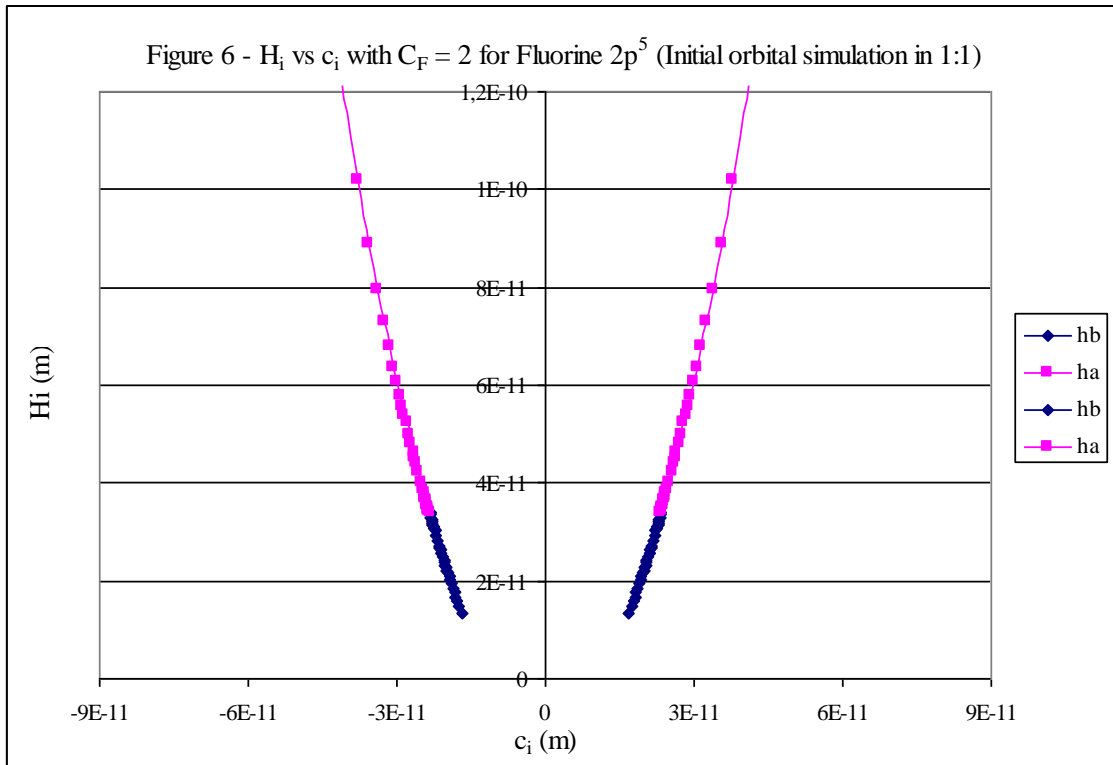
Rotation movement or fixation of OPA depends on the orbital type:

a) s electrons. In the case of spherical symmetry electrons that are first created in each energetic level, OPA does not present movement limitation and therefore can move through of three spatial dimensions. This fact allows it to have spherical symmetry.

b) No s electrons. The rest of orbitals have no OPA rotation possibility. Thus, in the case of electrons called p-type, each of the three p orbitals is oriented to one direction. The geometry must be deepened before studying reasons for these orientations.

Difference between s and non-s electrons is like seeing blades of moving fan (seen as a whole) or stopped (which looks its shape) respectively.

In the previous Figures, two axes do not have the same scale. Objective is to observe, even for lowest divisions of external electronic extreme, highest values of  $H_i$  and  $r_i$  respect to  $c_i$ . **Figure 6** shows two dimensions ( $c_i$  and  $H_i$ ) on the same scale. In addition, with this representation in two dimensions and considering that orbit is plane, for each  $H_i$  value can be plotted its corresponding value of  $+c_i$  and  $-c_i$ . Two dimensions can become three considering that in each  $H_i$  value there is one orbital plane that passes through the two points ( $+c_i$  and  $-c_i$ ) of the orbital circumference. In both two and three dimensions, Figure 7 already remembers orbitals with its dumbbell shape. It is true that there is a long way to go. For example, the  $H_i$  value has been limited (1.2 A) so that it can not be seen that as  $c_i$  always continue to increases with  $H_i$ . Constant  $F_C$  will be changed by variable  $F_C$  to resolve this problem in later article.



### P019 Orbital Angular Momentum (OAM)

Orbital angular momentum is defined as the sum of two electronic extremes OAM. As the movement is in orbit, the direction of the speed and the line connecting the centre of the orbit with the electron form an angle of 90 degrees. In consequence, sinus equals 1. Orbit radius considers how many times  $\lambda_i$  has been compacted (FC).

Orbital Angular Momentum for an electronic extreme gives (3) that simplifying gives (4):

$$(3) \text{OAM} = m_i c_i v_i C_F = \frac{m_e}{2} \frac{\frac{h}{2}}{\frac{m_e}{2} v_i 2\pi C_F} v_i C_F$$

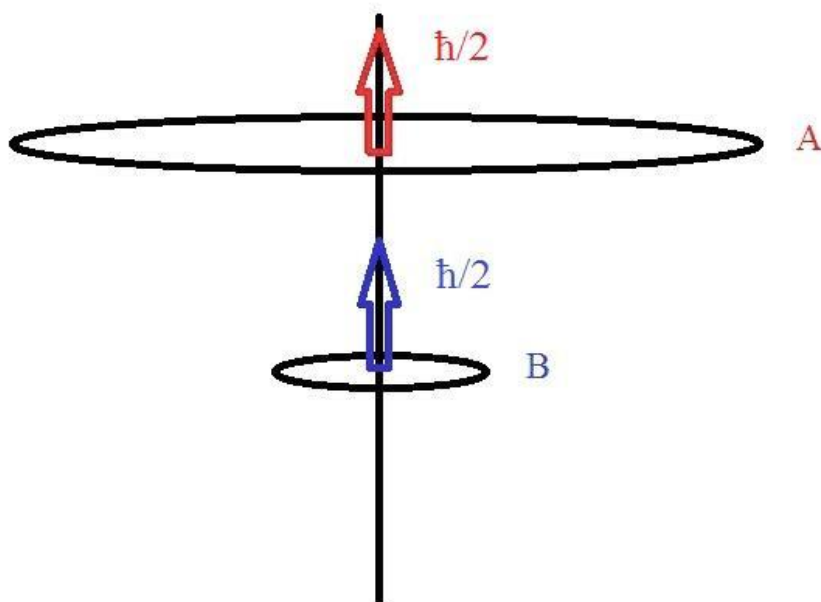
$$(4) \text{OAM}_i = \frac{h}{4\pi} = \frac{\hbar}{2}$$

OAM in Orbital Planes Axis or  $\text{OAM}_{\text{OPA}}$  (5) is sum of two identical contributions equals to (4) as consequence of **Image 3**.

- Two vectors are on the same axis.
- Two EE rotation directions are the same.

$$(5) \text{OAM}_{\text{OPA}} = \frac{\hbar}{2} + \frac{\hbar}{2} = \hbar$$

Image 3 - OAM in OPA: Two identical contributions



(5) result is valid for p-orbitals. The rest of orbitals without free axis movement (d, f, g...) need further studies. When OPA has free movement (s-orbital),  $OAM_{OPA}$  (5) cancel out and OAM gives zero.

### P20 Movement between orbits or spin movement

Spin movement is defined as electronic extreme rotation on its axis and, behaving like a screw, allows electronic extreme to approach and away from nucleus. This movement is done by raising and lowering orbits and is called: "electronic extremes swinging". Movement generated by screw spin implies that A and B electronic extremes first move away and then approach birth or pivot position.

### P21 Hypothesis of alternating spin movement

A and B electronic extremes make spin movement alternately:

- a) t1: First, one electronic extreme loses energy and moves away from nucleus ( $EE_A$  or  $EE_B$ ).
- b) t2: Second, the other electronic extreme wins energy and approach nucleus ( $EE_B$  or  $EE_A$ ).

Two electronic extremes do not make spin movement at the same time. This fact implies that electronic extremes do not vary their division in unison: they do it in turn. Thus, contribution to Spin Angular Momentum (SAM) of one electronic extreme (4) corresponds to the global one (6)

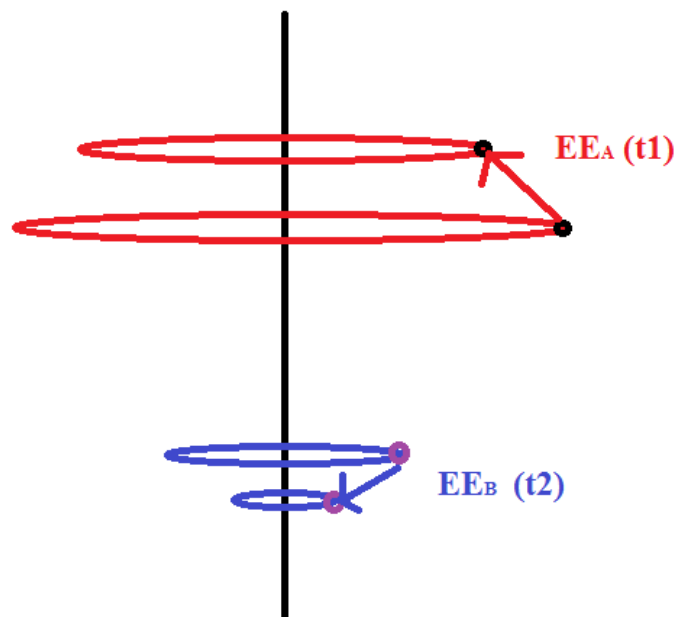
$$(6) SAM_{electron} = SAM_{one\ electronic\ extreme} = \frac{\hbar}{2}$$



Rotation occurs on its axis that is located in direction defined by orbit where electron extreme runs and towards where is going, that is, uniting both orbits. Analogy with screw movement is maintained because screw advances or recedes in same way: screw head is perpendicular to direction of its advance or retreat.

Two movements between orbits marked by arrows are shown in **Image 4**. A electronic extreme ( $EE_A$ ) loses energy in first instant ( $t_1$ ) and after that,  $EE_B$  gains that energy and is able to penetrate towards nucleus ( $t_2$ ). Screw rotation direction must be able to direct both SAM in proper vector sense. Orbital circumference ( $c_i$ ) decreases when moving away in  $EE_A$  case ( $c_A$ ) and is licence made since has not yet been justified (remember that  $c_i$  and  $H_i$  always grow at the same time in Figure 6)

**Image 4 - SAM with alternating spin movement (t1 and t2)**



## P22 Hypothesis of Spin Magnetic Momentum

In Spin Magnetic Momentum (SMM) only half of electron mass intervenes (P20 and P21). Classical SMM (7) differs from experimental SSM by g factor whose value is almost equal to 2 (2.0023193043622(15)) [6] (8). This difference is mainly due to (7) considering entire electronic mass when only half of electron mass is involved (9):

$$(7) \mu_{\text{CLASSIC}} = -\frac{e\hbar}{2m_e} \frac{s}{\hbar} = -\mu_B \frac{s}{\hbar}$$

$$(8) \mu_{\text{EXPERIMENTAL}} = -\frac{g e\hbar}{2m_e} \frac{s}{\hbar} = -g\mu_B \frac{s}{\hbar} \quad \text{with } g \approx 2$$

$$(9) \mu_{\text{EE}} = -\frac{e\hbar}{2 \frac{m_e}{2}} \frac{s}{\hbar} = -2\mu_B \frac{s}{\hbar}$$

Difference between  $g$  and  $2$  is 0.0023193043622. Two questions can be asked if reason is based on electron and electronic extreme mass:

- a) How much mass is not part of alternating spin movement? Said mass is called mass free of spin movement ( $m_{\text{free-sm}}$ ). RC in percentage between  $m_{\text{free-sm}}$  and  $10\hbar$  is  $\approx 0.05\%$

$$(10) m_{\text{free-sm}} = m_e - \frac{2m_e}{g} = 1.05515 \cdot 10^{-33} \approx 10\hbar$$

- b) Where is this mass that does not rotate on its axis like a screw? Proposed possibility is must be "external" to two electronic extremes and be part of  $\lambda$ .

## BIBLIOGRAPHY

- [1] Javier Silvestre. Victoria Equation - The dark side of the electron. (Document sent to vixra.org)
- [2] Kramida, A., Ralchenko, Yu., Reader, J., and NIST ASD Team (2014). NIST Atomic Spectra Database (ver. 5.2), [Online]. Available: <http://physics.nist.gov/asd> [2017, July 9]. National Institute of Standards and Technology, Gaithersburg, MD.
- [3] Huber, K.P.; Herzberg, G., Molecular Spectra and Molecular Structure. IV. Constants of Diatomic Molecules, Van Nostrand Reinhold Co., 1979
- [4] S. FRAGA, J. KARWOWSKI, K. M. S. SAXENA, Handbook of Atomic Data, Elsevier, Amsterdam, 1979.
- [5] Desclaux JP. Relativistic Dirac-Fock expectation values for atoms with  $Z = 1$  to  $Z = 120$ . Atom Data Nucl Data Tables 1973;12: 311-406.
- [6] David R. Lide, ed., *CRC Handbook of Chemistry and Physics, 89th Edition (Internet Version 2009)*, CRC Press/Taylor and Francis, Boca Raton, FL.

## Abbreviations List

Suffix indicates electronic extreme considered and  $i$  suffix is used to both electronic extremes ( $EE_i$ ). Following Table indicates abbreviations used in this theory and its use in article in question is marked with X. 2 is present article

Abbreviations Table						
Abbreviation	1	2	3	4	5	Meaning
$\alpha_{\text{NOA}}$					X	Nucleus-Orbit-Angle
$a_0$			X			Bohr radius
AL					X	Angular Limit
$c_i$		X	X	X	X	EE Orbital circumference
$C_F$		X	X	X	X	Wavelength compaction factor
$C_{\text{MON}}$					X	$C_F$ without $C_{\text{POTI}}$
$C_{\text{POTI}}$					X	Probabilistic Orbital Tide in Third Feliz Solution
$C_{\text{POTI-AL}}$					X	$C_{\text{POTI}}$ Angular Limit
$C_{\text{POTI-GAL}}$					X	$C_{\text{POTI}}$ Geometric Angular Limit

C <sub>POTI</sub> -LAG						C <sub>POTI</sub> Lobe Always growing
d	X	X	X	X	X	Birth wavelength division or simply, division
EE	X	X	X	X	X	Electronic extreme
E <sub>0</sub>	X	X	X	X	X	Initial, birth or output energy
E <sub>i</sub>	X		X	X		EE energy
E <sub>k<sub>i</sub></sub>	X		X	X		EE kinetic energy
E <sub>P<sub>i</sub></sub>	X			X		EE potential energy
ES	X	X				Equi-energetic state
f	X		X	X	X	Constant in Victoria Equation
F	X		X	X	X	Constant f multiplied by z
GAL					X	Geometric Angular Limit
h	X	X	X		X	Planck's constant
ħ		X		X	X	Reduced Planck's constant
h <sub>i</sub>	X		X			Planck's constant adapted to EE
H <sub>i</sub>		X	X	X	X	EE Circular orbit height
IE	X	X		X	X	Ionization Energy
m <sub>e</sub>	X	X	X	X	X	Electron mass
m <sub>i</sub>	X		X	X		EE mass
J				X	X	C <sub>F</sub> order in Second Feliz Solution (From x=1 to J)
K <sub>P</sub>			X			Probability constant in Variable C <sub>F</sub>
λ <sub>Birth</sub> λ	X	X		X	X	Birth wavelength
λ <sub>c</sub>	X					Electron classic wavelength
λ <sub>i</sub>	X	X	X	X		EE wavelength
λ <sub>i-Birth</sub>	X					EE wavelength when d→∞
LAG					X	Lobe always growing
M			X	X	X	MON (Modified Orbital Number)
MON			X	X	X	Modified Orbital Number
NIN	X		X	X		Negative in Negative (Electron in electron concept)
OAM		X				Orbital Angular Momentum
OPA		X				Orbital Planes Axis
P <sub>i</sub>			X	X	X	EE Probability
P			X	X	X	PEP (Principal Electronic Part)
PEP			X	X	X	Principal Electronic Part
q <sub>e</sub>	X					Electron charge
q <sub>i</sub>	X					EE charge
q <sub>ip</sub>	X					Proton charge
r <sub>AB</sub>	X					Difference in nucleus distance between EE <sub>A</sub> and EE <sub>B</sub>
r <sub>O</sub>	X					Nucleus distance when EE <sub>i</sub> is in pivot or initial position
r <sub>i</sub>	X	X	X	X	X	Distance between nucleus and EE

SAM		X				Spin Angular Momentum
SMM		X				Spin Magnetic Momentum
SSM	X		X			Secondary Swinging Movement
$v_i$	X	X	X	X	X	EE velocity
$z$	X	X	X	X	X	Effective nuclear charge
Z	X					Atomic number

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