ARTICLE 01
VICTORIA EQUATION - THE DARK SIDE OF THE ELECTRON

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ABSTRACT

Following postulates focus application on atomic electrons which, by balancing and swinging of electronic extremes around pivot or initial position, achieve electron cloud with specific positions and momentums and always maintaining initial energy with electronic extremes energy sum (equi-energetic state or ES).

First Victoria Equation applications serve to make an initial approximation to atomic radius, to show 2 electronics extremes radial distribution from which velocities and momentums are derived, as well as to know nuclear radius distance and energy of both electronic extremes as function of parameter called birth wavelength division.

KEYWORDS

Electron, Atomic model, Victoria Equation, Electronic Extreme (EE), Equi-energetic state (ES), electron pivot position, EE swinging, birth wavelength and birth wavelength division.

INTRODUCTION

This is first article of 24 dedicated to atomic model based on Victoria equation (Articles index is at end). Two electronic extremes with its swinging move away and approach alternately with respect to atomic nucleus and this provide electron delocalization (electron cloud). This swinging movement is performed in energetic equilibrium between both electronic extremes. Energetic equilibrium prevents orbit movement from being accompanied by energetic loss due to irradiation to outside. Following postulates are provided prior to Victoria Equation.

1) Initial Postulates for Victoria Equation

P01 Swinging movement of two electronic extremes around pivot or initial position.

Electron distributes its energy in two electronic extremes (EE) that are placed on both pivot position sides: one oscillates nearer and with more energy (B intern electronic extreme or EE_B) and another more remote and with less energy (A extern electronic extreme or EE_A).

Where suffix indicates electronic extreme considered and i suffix is used to both electronic extremes (EE_i). All abbreviations are compiled at article end.

P02 Equi-energetic State (ES)

Electronic extremes energy sum is always equal to initial energy. This fact causes that there are ES infinite number in which, if one EE varies its energy, the other EE must compensate it with same modulus and opposite sign. If E represents energy, then (1) where E_A is A electronic extreme energy, E_B is EE_B energy and E_o is initial or output energy.

$$(1)\ E_o = E_A + E_B$$

At the output time, EE_i have same energy ($E_A = E_B$) and nucleus distance is pivot or initial position (r_O). Therefore, and considering P01, EE relative position is given by (2) where r is nucleus distance.

$$(2)\ r_B \leq r_O \leq r_A$$

P03 ES Energy

E_o is initial energy and is Ionization Energy (IE) measured experimentally whenever electron is in ground state. E_A and E_B are not currently measurable.

P04 Inter-electron repulsion absence by negative charge saturation (NIN I)

Negative charge saturation always occurs for:

$$\text{electron number} \leq Z \text{ (with Z = Atomic number)}$$

Among electrons in charge saturation there are no repulsion forces between them and in Victoria Equation there is no repulsion terms. NIN stands for "Negative in Negative" as electron in electron placed orderly and its meaning is expanded as this theory progresses.

P05 Energy Balance

Energy balance applies Bohr Model to EE. If Ek_i and Ep_i are kinetic and potential energy respectively for each EE, Energy balance is (5):

$$(3)\ E_A = Ek_A + Ep_A$$

$$(4)\ E_B = Ek_B + Ep_B$$

$$(5)\ E_o = Ek_A + Ep_A + Ek_B + Ep_B$$

P06 Initial Energy wavelength divisions

If r_{AB} is considered to be difference in nucleus distance between EE_A and EE_B (6), then ES satisfy that λ_{Birth} (λ_{Birth} (or simply, λ) is birth wavelength and is defined in P08) divided by a number called division (d) is equal to r_{AB} (7).

$$(6)\ r_{AB} = r_A - r_B$$

$$(7)\ \frac{\lambda}{d} = r_{AB}$$

(8) is obtained from (6) and substituting r_{AB} with (7):

$$(8)\ r_B = r_A - \frac{\lambda}{d}$$

Initial position ($r_A = r_B$) occurs when $d \to \infty$ and electronic extremes drift away as d decreases.

P07 Electronic Extremes charge

First step for EE creation is supposed to be electron charge division into two semi charges.

P08 De Broglie Hypothesis in particle with more than one wave I - Birth moment

λ_{Birth} or λ (Birth wavelength) used in (7) and (8) is obtained by applying De Broglie hypothesis and considering Bohr orbits energetic balance. De Broglie relation must be adapted to P07, i.e. to the waves that are born from same particle and energy.

Kinetic energy (9) and relation between electron energy and kinetic energy in Bohr orbits for one electron without EE is given in (10):

$$(9)\ Ek = \frac{1}{2} m_e v^2$$

$$(10)\ Ek = - E_o$$

First step in birth moment is P07 which implies that EE energy is E_o half and thus affecting birth wavelength (λ_{Birth} or hereinafter λ) multiplying it by $2^{1/2}$ (12) with respect to classic wavelength (λ_c) (11).

$$(11)\ \lambda c = \frac{h}{m_e v} = \frac{h}{m_e \sqrt{\frac{-2E_O}{m_e}}} = \frac{h}{\sqrt{-2E_O m_e}}$$

$$(12)\ \lambda_{BIRTH} = \lambda = \frac{h}{m_e v} = \frac{h}{m_e \sqrt{\frac{-E_O}{m_e}}} = \frac{h}{\sqrt{-E_O m_e}}$$

P09 Electron mass distribution in EE

After birth moment wavelength (λ) in P08, electron is divided into two equal mass fragments (13) where m_i is EE mass and m_e is electron mass.

$$(13)\ m_i = \frac{m_e}{2}$$

P10 Planck´s constant adapted to EE (h_i)

Planck´s constant adapted to EE (h_i) is quotient between Planck´s constant (h) and waves number that are born from same energetic particle (14). Energetic particle is a particle subdivided into several particles that are in energetic equilibrium (fulfilling P02).

$$(14)\ h_i = \frac{h}{waves_{ENERGETIC\,PARTICLE}}$$

h_i in electron with two electronic extremes is (15) and therefore, h is equal to h_i sum (16).

$$(15)\ h_i = \frac{h}{2}$$

$$(16)\ h = \sum_{i=1} h_i$$

P11 De Broglie Hypothesis in particle with more than one wave II - λ_i and relation with λ_{Birth} (λ) and λ_C.

After charge division with λ_{Birth} (λ), electron is subdivided into two equal mass fragments (m_i) (13) with its associated wavelength λ_i (λ_A or λ_B) (17) whose Planck´s (h_i) considers electronic extremes (15).

$$(17)\ \lambda_i = \frac{h_i}{m_i v_i}$$

Electronic extreme velocity (v_i) (18) takes into account (9), (10) and (13):

$$(18)\ v_i = \sqrt{\frac{2Ek_i}{m_i}} = \sqrt{\frac{-4E_i}{m_e}}$$

λ_i (17) can rewrite (19) by changing m_i, h_i and v_i with (13), (15) and (18) respectively, where λ_i is EE wavelength at any time with energy = E_i.

$$(19)\ \lambda_i = \frac{h}{2\sqrt{-E_i m_e}}$$

λ_i equation (19) is like classic wavelength (λ_C) (11), but divided by $2^{1/2}$. In fact, when $d \to \infty$, then $(E_i)_{d\to\infty}$ = IE /2 (P08) and consequently is obtained Birth λ_i ($\lambda_{i\text{-}Birth}$) (20)

$$(20)\ \lambda_{i\,-\,\text{Birth}} = \frac{h}{2\sqrt{\frac{-IE}{2}m_e}} = \frac{h}{\sqrt{-2\,IE\,m_e}}$$

At birth moment, both electronic extremes have same λ (21) since $(E_A)_{d\to\infty} = (E_B)_{d\to\infty} = IE/2$.

$$(21)\ (\lambda_A)_{d\,\to\,\infty} = (\lambda_B)_{d\,\to\,\infty} = \lambda_{i\,-\,\text{Birth}}$$

At the same time, $\lambda_{i\text{-Birth}}$ is also equal to λ_C (22) since h divided by 2 (15) in numerator is compensated because IE (P08) and me (13) are also divided by 2 in denominator with an 1/2 exponent.

$$(22)\ \lambda_C = \lambda_{i\text{-Birth}}$$

Finally, at birth moment, λ_{Birth} (λ) (12) is correlated with $(\lambda_A)_{d\to\infty}$ and $(\lambda_B)_{d\to\infty}$ by right-angled triangle relation (23):

$$(23)\ \lambda_{BIRTH} = \lambda = \sqrt{(\lambda_A)^2_{d\to\infty} + (\lambda_B)^2_{d\to\infty}}$$

Table 1 summarizes expressions and relations of three states involved in EE birth. P indicates Postulate where is entered and No. recalls equation number.

Table 1. Wavelength of three states involved in Electronic extremes birth				
State	Symbol	P	No.	Expression
Classic or standard λ	λ_C	8	11	$\frac{h}{\sqrt{-2E_O m_e}}$
Birth λ	λ_{Birth} or λ	8	12	$\frac{h}{\sqrt{-E_O m_e}}$
Birth λ_i	$\lambda_{i\text{-Birth}}$	11	20	$\frac{h}{\sqrt{-2E_O m_e}}$
Relations	$(22)\ \lambda_C = \lambda_{i\text{-Birth}}$ $(23)\ \lambda_{BIRTH} = \lambda = \sqrt{(\lambda_A)^2_{d\to\infty} + (\lambda_B)^2_{d\to\infty}}$			

Equal relations between $(v_i)_{d\to\infty}$ and $(p_i)_{d\to\infty}$ with electron

Considering (1), (9), (10) and (13) and consequently at birth moment, both electronic extremes have same energy (24.A), $(v_i)_{d\to\infty}$ is equal to v_e where v_e is electron velocity with previous electron to its division in electronic extremes.

$$(23.B)\ (E_A)_{d\to\infty} = (E_B)_{d\to\infty} = IE/2$$

$$(23.C)(v_i)_{d\,\to\,\infty} = \left(\frac{2(Ek_i)_{d\,\to\,\infty}}{m_i}\right)^{1/2} = \left(\frac{-IE}{m_i}\right)^{1/2} = \left(\frac{-2IE}{m_e}\right)^{1/2} = v_e$$

This fact in turn causes equality at birth moment between electron momentum and sum of electronic extremes momentums since velocity is the same (23.C) and electronic extreme mass is half of electron mass (13). Therefore, particle momentum or electron momentum (p_e) does not change with its fragmentation in two electronic extremes (23.D):

$$(23.D)\ p_e = m_e v_e = \sum m_i (v_i)_{d \to \infty} = m_A (v_A)_{d \to \infty} + m_B (v_B)_{d \to \infty} = 2m_i (v_i)_{d \to \infty} = m_e v_e$$

In contrast, velocity must be considered joint ($v_{i\text{-joint}}$) for any other division ($d \neq \infty$) if equality with v_e and p_e must be achieved:

$$(23.E) v_{i\ -\ joint} = \left(\frac{2(E_{kA}` + E_{kB})}{m_A + m_B} \right)^{1/2} = \left( \frac{2(E_{kA}` + E_{kB})}{m_e} \right)^{1/2} = v_e$$

$$(23.F)\ p_{i\ -\ joint} = (m_A + m_B) v_{i\ -\ joint} = p_e = m_e v_e$$

Alternate mechanisms for transit electron to electronic extreme might be possible and cause differences in geometry and probability that can be compensated with modifications in compaction factor that is developed in later articles.

P12 Possible division (d) values

d must be positive (24) since its quotient with λ (λ_{Birth}) equals to r_{AB} (7) and both are positive magnitudes.

$$(24)\ d > 0$$

Further probability studies imply that $0 < d \leq 1$ have Probability = 0 and if those studies are accepted d interval could be (24.B.):

$$(24.B.)\ d > 1$$

P013 ES and d relation

Equi-energetic states (ES) (P02) number is theoretically infinite because each division creates a new ES (7).

P14 Effective nuclear charge in ns electron external lobe

If electron charge (q_e) is -q and EE charge (q_i) is -0.5q (25) (P08), effective nuclear charge (z) in electrons remains to be determined.

$$(25)\ q_i = \frac{q_e}{2}$$

In the simplest model, first electron (1s) interacts with all protons and z is equal to Atomic Number (Z). Nucleus loses one charge with this first electron. Therefore, second electron interacts with Z-1 nuclear charge and so on, third electron with Z-2, fourth electron with Z-3... Until the outermost electron interacts with only Z=1.

However, the simplest model only occurs with external lobe of ns electron. Consequently, 2s electron in is outermost lobe has z_{2s} = Z-2 and, for example, z_{2s} for Li(I) and B(III) is 1 and 3 respectively. 3s electron Argon has z_{3s} (Ar) = Z-10=18-10=8.

Subsequently, z is formulated for other electrons and internal lobe of ns electron as z coupling between them. This idea is part of NIN continuation introduced in P04.

2) Victoria Equation

Victoria Equation is obtained after initial postulates. (5) development with kinetic and potential energies of Bohr orbits is (26) and only difference is electron substitution for electronic extreme (EE):

$$(26)\ E_o = -\frac{Kzq_p/q_{eA}/}{r_A} + \frac{m_A Kzq_p/q_{eA}/}{2m_A r_A} - \frac{Kzq_p/q_{eB}/}{r_B} + \frac{m_A Kzq_p/q_{eB}/}{2m_A r_B}$$

m_i is simplified and considering relation between q (where q_i, q_e and q_p are EE, electron and proton charge respectively):

$$/q_i/ = \frac{/q_e/}{2} = \frac{q_p}{2} = \frac{q}{2}$$

F common factor (27) is extracted (28). F is a constant multiplied by z.

$$(27)\ F = \frac{Kq^2}{2} z = fz = 1{,}153538564 \bullet 10^{-28} z$$

$$(28)\ E_o = F\left(-\frac{1}{r_A} + \frac{1}{2r_A} - \frac{1}{r_B} + \frac{1}{2r_B} \right)$$

Development leads to equation (29):

$$E_o = F\frac{-4r_A r_B^{\,2} + 2r_A r_B^{\,2} - 4r_A^{\,2} r_B + 2r_A^{\,2} r_B}{4r_A^{\,2} r_B^{\,2}}$$

$$E_o = F\frac{-2r_A r_B^{\,2} - 2r_A^{\,2} r_B}{4r_A^{\,2} r_B^{\,2}} = -F\frac{2r_A r_B\left(r_A + r_B\right)}{4r_A^{\,2} r_B^{\,2}}$$

$$(29)\ E_o = -F\frac{r_A + r_B}{2r_A r_B}$$

(29) has 2 unknowns (r_A and r_B) that are reduced to one (30) by (8) corresponding to P06 Initial Energy wavelength divisions.

$$(30)\ E_o = -F\frac{r_A + \left(r_A - \frac{\lambda}{d}\right)}{2r_A\left(r_A - \frac{\lambda}{d}\right)}$$

Developing parentheses and taking denominator to left side of (30) is obtained:

$$2E_o r_A^{\,2} - \frac{2E_o r_A \lambda}{d} = -2Fr_A + \frac{F\lambda}{d}$$

Victoria Equation equals zero is given by (31).

$$(31)\ 2E_o r_A^{\,2} + \left(2F - \frac{2E_o\lambda}{d}\right)r_A - \frac{F\lambda}{d} = 0$$

(31) is second degree equation with r_A as unknown for each division assigned and λ is related to E_o (12). Therefore, r_A solutions for each division correspond to second degree equation resolution (32).

$$(32)\ r_A = \frac{-F + \frac{E_o\lambda}{d} \pm \sqrt{F^2 + \frac{E_o^{\,2}\lambda^2}{d^2}}}{2E_o}$$

Negative sign preceding square root is selected (33) because positive sign implies r_B is negative and other consequences without physical sense (Expanded in **Annexe 1**).

$$(33)\ r_A = \frac{-F + \frac{E_o\lambda}{d} - \sqrt{F^2 + \frac{E_o^{\,2}\lambda^2}{d^2}}}{2E_o}$$

λ_{Birth} (λ) is related to E_o by (12). r_A Victoria equation with great symmetry is deduced by λ substitution and E_o terms grouping (34).

$$(34)\ r_A = \frac{-F - \frac{h\sqrt{-E_o}}{dm_e^{\,1/2}} - \sqrt{F^2 + \frac{h^2(-E_o)}{d^2 m_e}}}{2E_o}$$

Symmetry can be best observed if substitution (35) is made in (34) in order to obtain (36).

$$(35)\ n = \frac{h\sqrt{-E_o}}{dm_e^{\,1/2}}$$

$$(36)\ r_A = \frac{-F - n - \sqrt{F^2 + n^2}}{2E_o}$$

Energy A Electronic Extreme (Energy A EE or simply E_A) (37) is derived from (26) and (27).

$$(37)\ E_A = F\left(-\frac{1}{r_A}+\frac{1}{2r_A}\right)=\frac{-F}{2r_A}=\frac{-fz}{2r_A}$$

E_B is obtained as E_A (37) so can be expressed with i suffix that is used to both electronic extremes (38)

$$(38)\ E_i = \frac{-F}{2r_i}=\frac{-fz}{2r_i}$$

r_B can be formulated (39) considering relation between r_A, r_B, d and λ_{Birth} (8) and r_A Victoria Equation (34)

$$(39)\ r_B = \frac{-F-\frac{h\sqrt{-E_o}}{dm_e^{1/2}}-\sqrt{F^2+\frac{h^2(-E_o)}{d^2m_e}}}{2E_o}-\frac{\lambda}{d}$$

E_B can be calculated with (38) and, if known E_A, more easily from P02 equi-energetic states (ES). E_B is obtained (39.B. from (1):

$$(39.B.)\ E_B = E_o - E_A$$

3) r_i and E_i when division $\rightarrow \infty$

r_B expression (39) is identical to r_A (34) when $d\rightarrow\infty$ since $-\lambda/d\rightarrow 0$. In addition, terms having d in denominator are also annulled (40):

$$(40)\ (r_A)_{d\rightarrow\infty}=(r_B)_{d\rightarrow\infty}=(r_i)_{d\rightarrow\infty}=\frac{-fz}{2(E_i)_{d\rightarrow\infty}}=\frac{-fz}{E_o}=\frac{-F}{E_o}$$

If $(r_A)_{d\rightarrow\infty}=(r_B)_{d\rightarrow\infty}$, Energy of both EE is the same (41) because z is equal.

$$(41)\ (E_A)_{d\rightarrow\infty}=(E_B)_{d\rightarrow\infty}=(E_i)_{d\rightarrow\infty}=\frac{-fz}{2(r_i)_{d\rightarrow\infty}}$$

According to P02, EE energy sum is always equal to initial Energy (E_o), EE energy when $d\rightarrow\infty$ is equal to E_o half (42) and (43).

$$(42)\ E_o=(E_A)_{d\rightarrow\infty}+(E_B)_{d\rightarrow\infty}=2(E_i)_{d\rightarrow\infty}=\frac{-fz}{(r_i)_{d\rightarrow\infty}}$$

$$(43)\ (E_i)_{d\rightarrow\infty}=\frac{E_o}{2}$$

$(r_i)_{d\to\infty}$ application: Radius approximate for outermost lobe in ns electrons to n=3

(40) provides EE radius when d→∞ as quotient between –F and initial energy (Eo). F is proportional to f constant and to effective nuclear charge (z).

$(r_i)_{d\to\infty}$ for outermost lobe in ns electrons is the only one that can be calculated by (40) at this time because z calculation is limited to these lobes as indicated in P14.

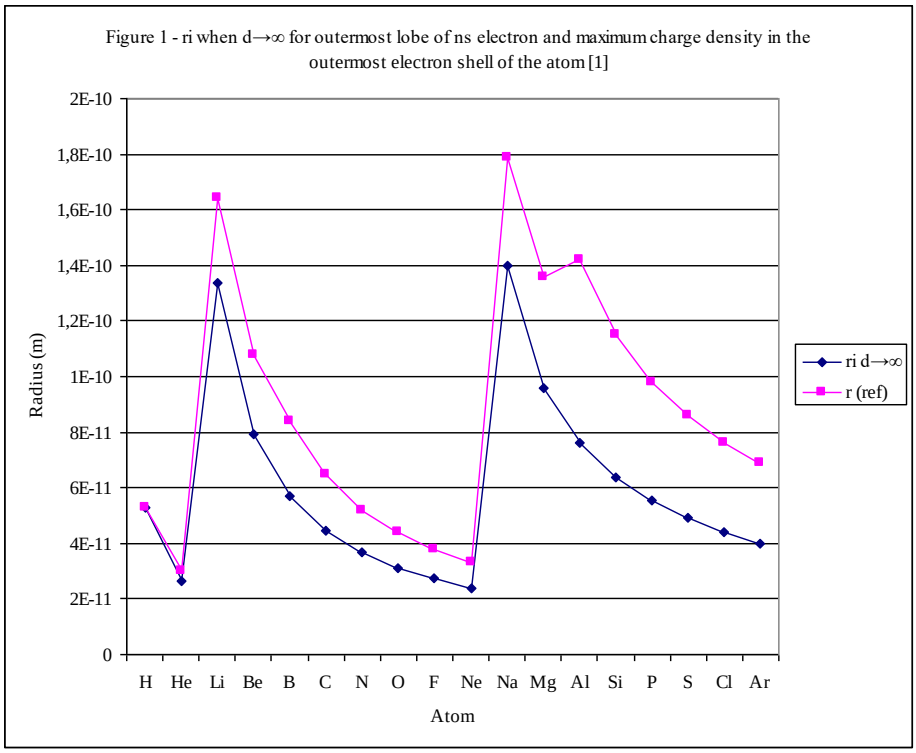
Comparison between $(r_i)_{d\to\infty}$ for outermost lobe in ns electron and theoretical atomic radius as maximum charge density in the outermost electron shell of the atom [1] should only serve as a rough approximation (**Table 2**) since following points are highlighted:

Table 2. Radius for outermost lobe of ns electrons when d→∞

Z	n	z	Symbol	$(ri)_{d\to\infty}$
1	1	1	H	5,29177E-11
2		2	He	2,64613E-11
3	2	1	Li	1,33535E-10
4		2	Be	7,90704E-11
5		3	B	5,69446E-11
6		4	C	4,46543E-11
7		5	N	3,67750E-11
8		6	O	3,12764E-11
9		7	F	2,72152E-11
10		8	Ne	2,40899E-11
11	3	1	Na	1,40099E-10
12		2	Mg	9,57724E-11
13		3	Al	7,59271E-11
14		4	Si	6,37974E-11
15		5	P	5,53619E-11
16		6	S	4,90601E-11
17		7	Cl	4,41336E-11
18		8	Ar	4,01496E-11

a) $(r_i)_{d\to\infty}$ is maximum probability density only in Hydrogen case. For all other cases, $(r_i)_{d\to\infty}$ < maximum probability density and this situation is aggravated as outermost electron shell n increases.
b) $(r_i)_{d\to\infty}$ for outermost lobe in ns electrons is therefore only applicable to compare H, Li or Na atoms with [1] because [1] is referred to atoms. For example in Table 2, O is referred to O (VI) which is 2s electron with E_o=IE=-138,1189 eV [2] (All Ionization Energies are from [2])
c) Following articles explain how remaining electrons are located by geometric and probabilistic coupling with ns electron which in terms of geometric and probabilistic coupling is called origin electron.

Table 2 representation is in **Figure 1**. Application of these points justifies that, although values are not those indicated in [1], both curves have same morphology. Comparison between [1] and EE Probability is made again when geometry, probability and coupling of Electronic Extremes are defined in later articles.



4) r_i and E_i when division → 0

This case is opposite to the previous one when d→∞ and λ/d→0. Now, d→0 and then correlation term between r_A and r_B is ∞ (λ/d→∞).

For r_A, starting from (33) and making d→0, F terms are annulled by those that include d in denominator (44). Low probabilities in minor divisions and even zero probability when d=[0-1] are treated in later articles.

$$(44)\ (r_A)_{d\to 0} = \frac{\frac{E_o\lambda}{d} - \sqrt{\frac{E_o^2\lambda^2}{d^2}}}{2E_o} = \frac{\frac{-2/E_o/\lambda}{d}}{2E_o} = \frac{\lambda}{d} = \infty$$

This simplification of eliminating F terms can not be done with r_B since r_B calculation (8) and (39) has an additional term (-λ/d) that annuls simplification made when $(r_A)_{d\to 0}$ (44). This fact might suggest that $(r_B)_{d\to 0}\to 0$, but actually causes important term to return to F, but now with a critical difference: F in square root is accompanied by term that tends to infinite and is negligible compared to F that is not in square root. Consequently, $(r_B)_{d\to 0}$ is given by (45):

$$(45)\ (r_B)_{d\to 0} = \frac{-F}{2E_o}$$

(46) includes F value (27) in (45):

$$(46)\ (r_B)_{d\to 0} = \frac{-Kzq^2}{4E_o} = -5{,}76769 \bullet 10^{-29}\ \frac{z}{E_o}$$

(45) and (46) mark EE_B maximum penetration or minimum distance between nucleus and electron. This development implies that electron, or more properly EE_B, approaches nucleus but does not touch and maximum that penetrates is $(r_i)_{d\to\infty}$ half (40). Greater penetration must be studied separately with Secondary Swinging Movement (SSM) (Expanded in **Annexe 1**).

5) Victoria Equation Application to H, Li and Ar: Energy, radius and division.

Data included in **Table 3** are used hereinafter.

Table 3. Data for ns electrons			
Symbol	n	z	E_o (Ionization Energies) (eV) [2]
H	1	1	-13,598434005136
Li	1	3	-122,4543538
	2	1	-5,391714761
Ar	1	18	-4426,2227
	2	16	-918,374
	3	8	-143,457

Ei vs. r_i

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 (**Table 4** for Hydrogen in **Annexe 2**). The smallest spacing in low divisions is performed because their energy variations are larger. This fact also causes important changes in r_A. Victoria equation is solved to obtain r_A (33) or (34). From there, r_B (8), E_A and E_B (38) are obtained. **Figure 2** is E_i vs. r_i representation for Hydrogen and **Figure 3** is Figure 2 zoom made in $d\to\infty$ vicinity.

Figure 2 - Electronic Extremes Energy (Ei) vs Electronic Extremes radius (ri) for Hydrogen

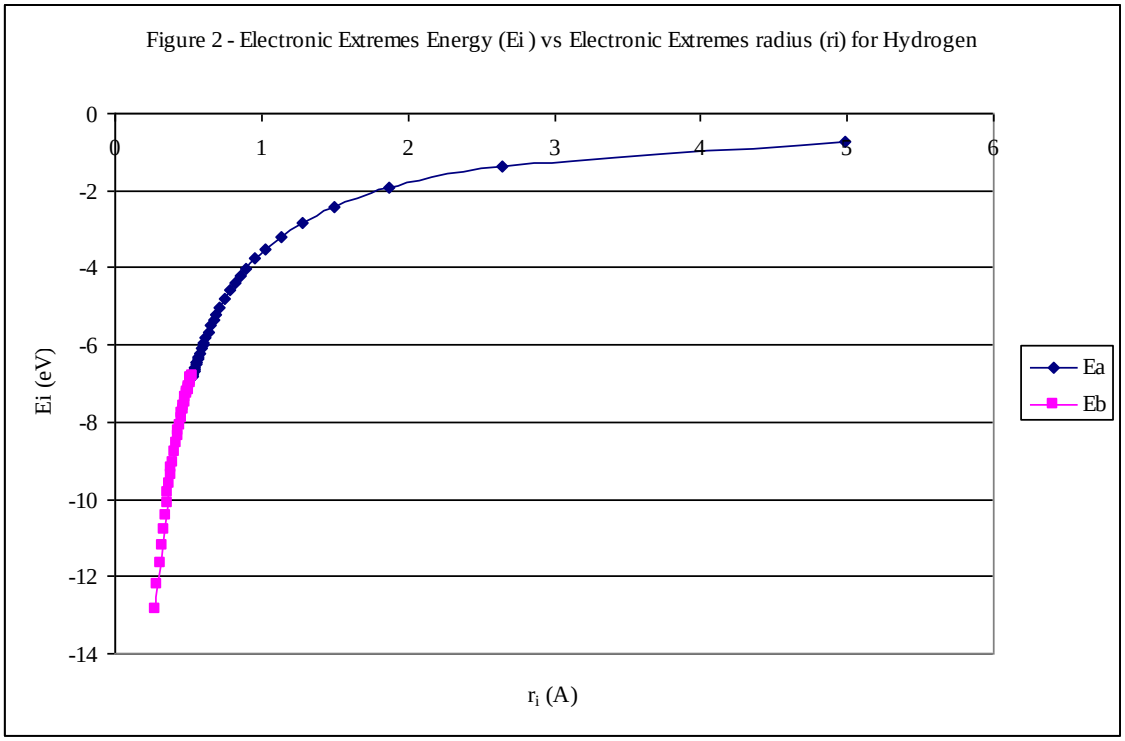
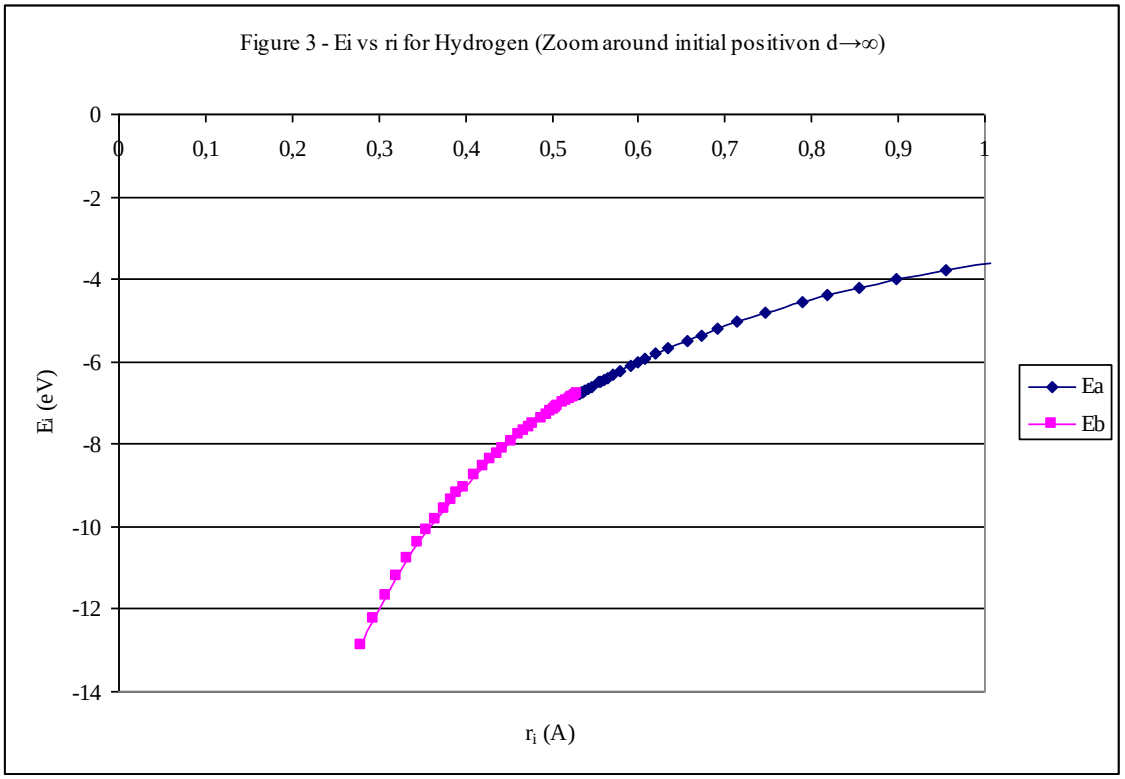


Figure 3 - Ei vs ri for Hydrogen (Zoom around initial positivon d→∞)



Following observations of Table 3 and their two associated figures (Figure 2 and 3) are highlighted:

a) P01 Swinging movement of two EE around pivot or initial position (d→∞). From pivot position, EE_B penetrates towards nucleus while EE_A moves away from nucleus with opposite energy differentials and with greater r_i variations.
b) P02 Equi-energetic states (ES). E_A and E_B is equal E_o can be checked for all divisions.

c) Minimum distance between nucleus and electron or EE_B maximum penetration according to (45) is (47) for Hydrogen and can be corroborated in Table 3 and Figures 2 and 3. This EE_B maximum penetration belongs to so-called Main Swinging Movement and continues hypothetically in Annexe 1.

Log(d) vs. r_i

Log(division) vs. r_i may appear that axes are inverted if is considered that division is the one that implies r_i (33). The reason is that, with axes reversed, representation provides reminiscences to radial charge density (radial probability) (**Figure 4**). In order that these reminiscences do not lead to error, is important to note:

a) Division plays a prominent role in electron Probability, but is not Probability.
b) Maximum probability occurs when $d \rightarrow \infty$, but only for Hydrogen (and in general for 1s electron). All other electrons have their maximum probability for r_A greater that $(r_i)_{d\rightarrow\infty}$

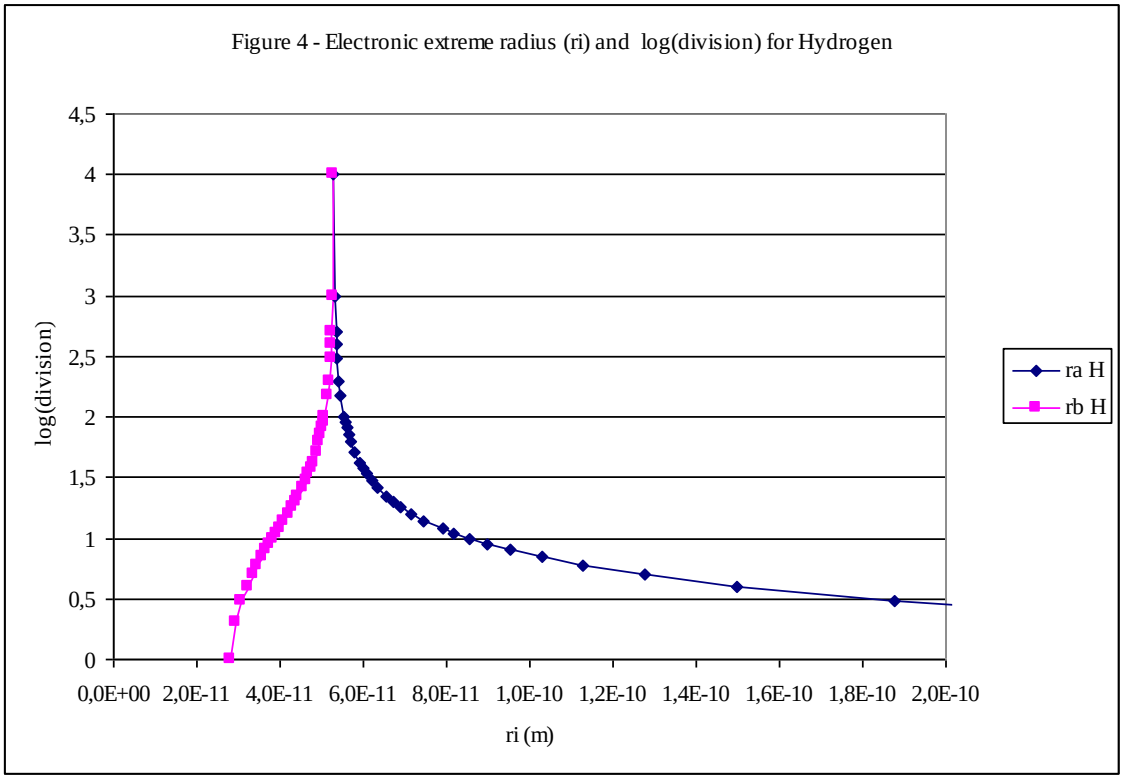


Figure 5 shows Lithium 1s and 2s. 2s is only in n=2 without internal lobe in n=1 because P14 does not indicate its z for n=1. Argon 1s, 2s and 3s are in **Figure 6**. As in 2s Li, outermost lobe is the only one represented. Initial Energy (E_o) is Ionization Energy (IE) and are given in Table 3. In **Table 5**, Radius when $d \rightarrow \infty$ is compared with radii equated to the outermost maximum of the 1-electron charge densities of electrons in the various shells in neutral atoms [3]

Figure 5 - EE radius (ri) and log(division) for Lithium

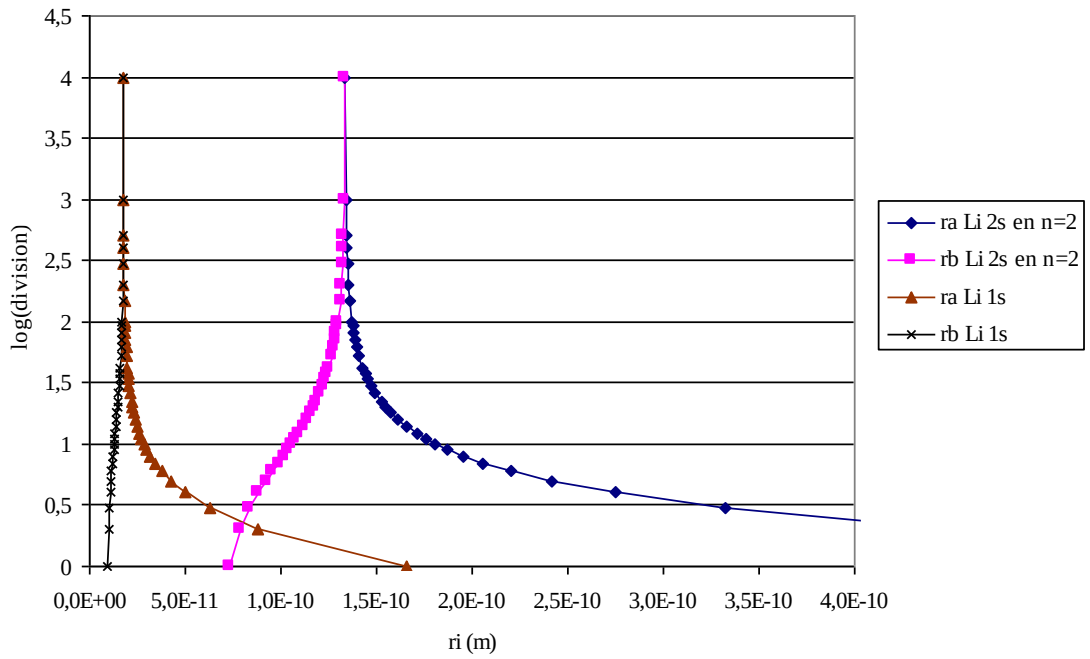


Figure 6 - EE radius (ri) and log(division) for Argon

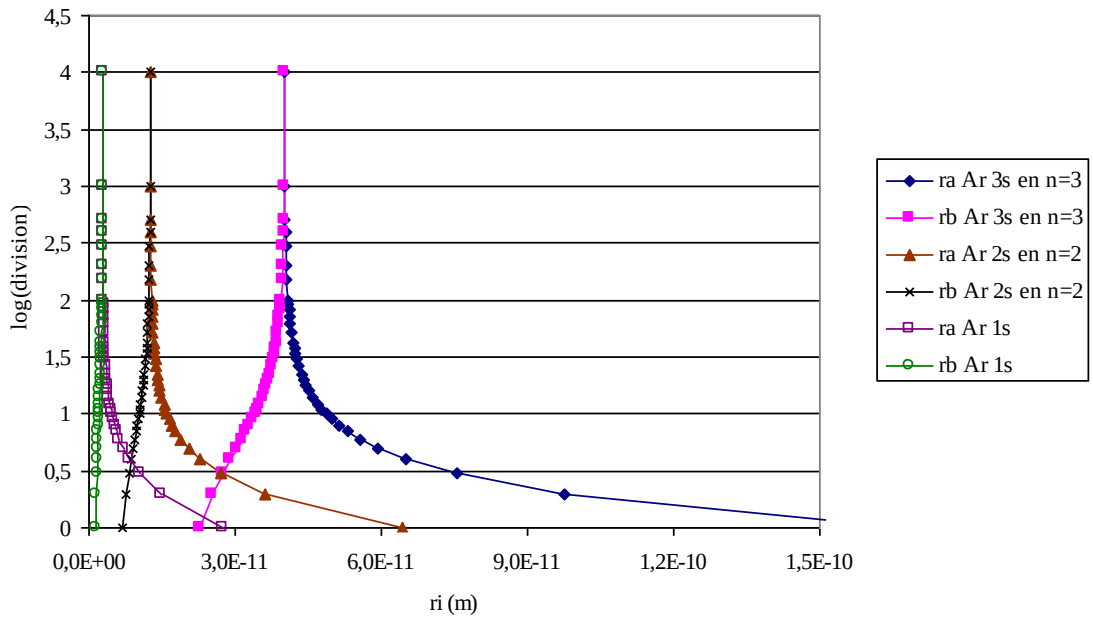
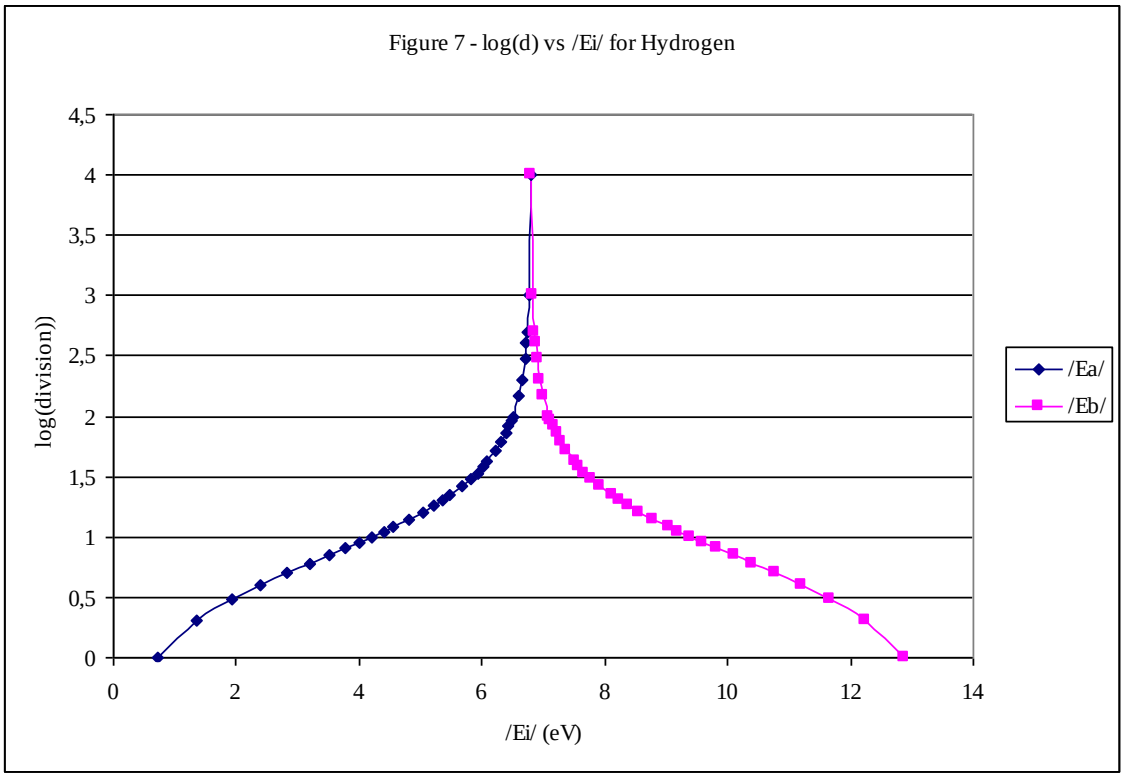


Table 5. Comparison between $(r_i)_{d\to\infty}$ and [3]

Atom	Lithium		Argon		
Electron	1s	2s	1s	2s	3s
$(r_i)_{d\to\infty}$ (A)	0,176	1,335	0,029	0,125	0,401
r maximum charge densities (A) [3]	0,186	1,586	0,030	0,18	0,607

Log(d) vs.E_i

Figure 7 keeps axes inverted to compare with Figures 4 to 6. Although morphology is similar, main difference is that Log(d) vs.E_i curve is symmetrical on both $E_{d\to\infty}$ sides. Symmetry is provided by P02. In contrast, Log(d) vs.r_i is not symmetrical on both $r_{d\to\infty}$ sides.



Victoria Equation as r_i function

Instead of arriving at Victoria Equation expression where unknown is r_i as d function (34) or (39), inverse situation can be the one sought, that is, unknown is d as r_i function. This equation (47) that allows calculation method with r_i defined has its application in Probability where, for example, is required to know probability around its maximum or to add probabilities of different electrons and to draw joint Probability vs. r_i curve. These studies are seen in later articles. Therefore (47) permits to know division associated with r_i and therefore r_i specific region can be studied.

$$(47)\ d_A = \frac{E_o\lambda + \frac{F\lambda}{2r_A}}{F + E_o r_A}$$

Similarly, (48) is used for r_B:

$$(48)\ d_B = -\frac{E_o\lambda + \frac{F\lambda}{2r_B}}{F + E_o r_B}$$

Annexe 1: Approach possibility to nucleus (r→0)

EE_B maximum penetration or minimum distance between nucleus and electron has been dealt in item "4) r_i and E_i when division → 0" and maximum that penetrates is $(r_i)_{d\to\infty}$ half (45). If innermost ns electron lobe has r→0 possibility there must be an additional explanation that allows to penetrate more. First explanation is discarded and second is studied.

1) Positive sign preceding square root in r_A solutions from Victoria Equation

Positive sign selection (32) allows to have EE with r=]0,-F/(2E_o)[but lacks physical sense for this theory:

a) EE_A would occupy the innermost interval when it should be intern EE that is EE_B.
b) E_A and E_B would increase to $E_A\to-\infty$ and $E_B\to\infty$
c) EE_B would compensate $-E_A>>-E_o$ when $(r_A)_{d\to0}$ via $E_B>0$. This sign change in E_B would imply that $E_P>0$ and $E_k<0$.
d) For this sign change, r_B should be negative and therefore distance between nucleus and EE_B would be negative.

All these facts have no physical sense and consequently, positive sign preceding square root selection is discarded.

2) Feliz Mechanism: Subdivision continued in EE as r→0 (first attempt developed to justify theoretical probability until arrival to nucleus even thought probability has not yet been dealt with in this theory)

Up to this point, electron with a single subdivision into two electronic extremes (EE_A and EE_B) providing Main Swinging Movement (MSM) has been considered. According to Feliz Mechanism, innermost lobe EE_B in ns electron can be subdivided into two new EE forming a Secondary Swinging Movement (SSM) that meets what is seen for MSM. Subdivision is made from EE_B and therefore, $EE_{B\text{-}1i}$ mass and charge is one quart of electron mass and charge. Suffix "B-1i" indicates:

B	SSM born from EE_B MSM
1	First SSM
i	A or B EE

$EE_{B\text{-}2A}$ and $EE_{B\text{-}2B}$ have one eight of electron mass and charge and successively with $EE_{B\text{-}3i}$ $EE_{B\text{-}4i}$ … Suffix "B-2i" indicates:

B-2	SSM born from $EE_{B\text{-}1B}$ (EE_B of first SSM)
2	Second SSM
i	A or B EE

$EE_{B\text{-}1i}$ Initial Energy or $(E_o)_{B\text{-}1}$ is not exactly E_o (where E_o is IE generally (P02 and P03)) and correspond to E_B when its Probability is quite small which is for low divisions. As previously indicated, Probability has not been developed and division only plays a prominent role in Probability, but is not Probability. Therefore and to be able to illustrate how electron has possibility through this mechanism to penetrate in direction

to nucleus, SSM energies and division (Axis Y) reducing factor by way of example have been included in **Table 6** for **Figure 8**.

In order not to complicate only EE_B of SSM has been represented (obviating EE_A of SSM) and in the range of divisions indicated in Table 6. Likewise, in all cases, EE_B d=10 of immediately higher charge has been selected as energetic source of the next SSM. It is important to note that, considering (40) and (42), $(r_i)_{d\to\infty}$ of born SSM is equal to $(r_B)_{d=\text{selected as energetic source}}$ of immediately higher charge. Importance is that, in the case of hypothetical SSM existence, implies that SSM born is created ($d\to\infty$) where EE_B division selected and consequently, there are no areas without probability.

As division is not probability, there are inconsistencies such as pivot or initial position can not be represented in Figures 4-8 because Log(initial position division)=∞.

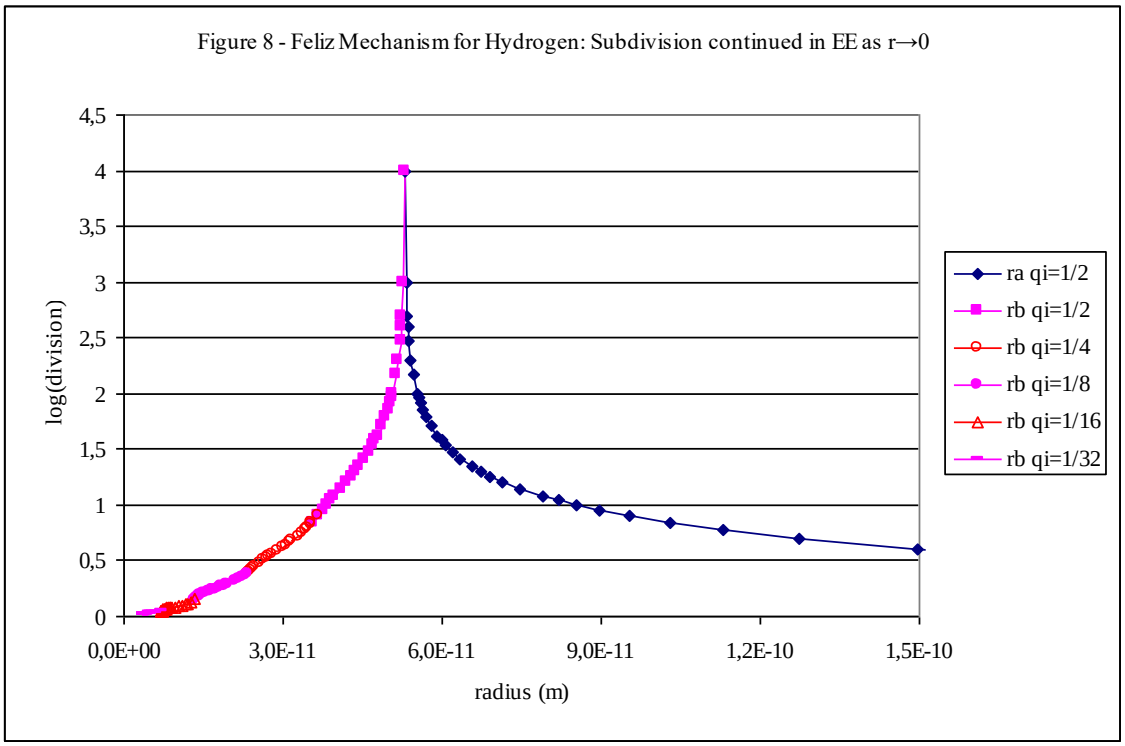


Table 6 - Values devised for Hydrogen to simulate division as Probability for SSM born from EE_B (Feliz Mechanism: Subdivision continued in EE as r→0)

Swinging Movement	qi	Origin	Eo	Divisions represented
MSM	1/2	Electron	-13,598434005136 (IE)	EE_A= [1,10^4] EE_B=[7, 10^4]
$SSM_{B\text{-}1B}$	1/4	MSM d_B=10	-9,2018523	$EE_{B\text{-}1B}$ =[8, 150]
$SSM_{B\text{-}2B}$	1/8	$SSM_{B\text{-}1B}$ d_B=10	-7,3642426	$EE_{B\text{-}2B}$ =[10, 500]
$SSM_{B\text{-}3B}$	1/16	$SSM_{B\text{-}2B}$ d_B=10	-6,6703428	$EE_{B\text{-}3B}$ =[10, 10^4]
$SSM_{B\text{-}4B}$	1/32	$SSM_{B\text{-}3B}$ d_B=10	-6,4199125	$EE_{B\text{-}4B}$ =[10, 10^4]

Annexe 2

Table 2. r_i and E_i for Hydrogen divisions				
d	**r_A (A)**	**r_B (A)**	**E_A (eV)**	**E_B (eV)**
1	4,982982903	0,279583172	-0,72244097	-12,87599304
2	2,645861853	0,294161987	-1,36058161	-12,23785239
3	1,876023887	0,308223977	-1,91890466	-11,67952934
4	1,497431990	0,321582058	-2,40405641	-11,19437759
5	1,274793396	0,33411345	-2,82391719	-10,77451682
6	1,129656184	0,345756229	-3,18673153	-10,41170247
7	1,028412400	0,356498153	-3,50045466	-10,09797934
8	0,954287827	0,366362861	-3,77235345	-9,826080550
9	0,897996953	0,375396983	-4,00882316	-9,589610847
10	0,853999792	0,383659819	-4,21535346	-9,383080541
11	0,818797699	0,391215905	-4,39658170	-9,201852304
12	0,790080086	0,398130109	-4,55638744	-9,042046565
14	0,746234576	0,410277452	-4,82410102	-8,774332982
16	0,714506971	0,420544487	-5,03831471	-8,560119294
18	0,690593799	0,429293814	-5,21277629	-8,385657714
20	0,671983776	0,436813789	-5,35713973	-8,241294277
22	0,657122228	0,443331331	-5,47829738	-8,120136625
26	0,634935206	0,454035216	-5,66972968	-7,928704324
30	0,619211953	0,462431962	-5,81369749	-7,784736511
34	0,607514056	0,46917877	-5,92564229	-7,672791718
38	0,598484012	0,474710335	-6,01504954	-7,583384467
42	0,591309216	0,479323508	-6,08803462	-7,510399382
52	0,578519852	0,488069857	-6,22262308	-7,375810924
62	0,570093839	0,494232554	-6,31459372	-7,283840280
72	0,564129485	0,498804488	-6,38135584	-7,217078165
82	0,559687846	0,502329312	-6,43199778	-7,166436225
92	0,556252845	0,505128935	-6,47171698	-7,126717027
100	0,554019139	0,506985142	-6,49780978	-7,100624226
150	0,545601478	0,51424548	-6,59805944	-7,000374570
200	0,541479148	0,51796215	-6,64829106	-6,950142945
300	0,537414675	0,521736676	-6,69857216	-6,899861842
400	0,535404165	0,523645666	-6,72372614	-6,874707868
500	0,534204818	0,524798018	-6,73882163	-6,859612375
1000	0,531821784	0,527118385	-6,76901753	-6,829416476
10000	0,529694914	0,529224574	-6,79619700	-6,802237009

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[3] J.C. Slater in Quantum Theory of Matter, 2nd ed. (1968), pp. 145 and 150, McGraw-Hill.

Abbreviations List

Suffix indicates electronic extreme considered and i suffix is used to both electronic extremes (EE_i).

d	Birth wavelength division or simply, division
EE	Electonic extreme
E_o	Initial or output energy.
E_i	EE energy
Ek_i	EE kinetic energy
EP_i	EE potential energy
ES	Equi-energetic state
h	Planck´s constant
h_i	Planck´s constant adapted to EE
IE	Ionization Energy
me	Electron mass
m_i	EE mass
MSM	Main Swinging Movement
λ_{Birth} λ	Birth wavelength
λ_c	Electron classic wavelength
λ_i	EE wavelength
$\lambda_{i\text{-}Birth}$	EE wavelength when $d \rightarrow \infty$
NIN	Negative in Negative (Electron in electron concept)
p_e	Electron momentum
p_i	EE momentum
q_e	Electron charge
q_i	EE charge
q_{ip}	Proton charge
r_{AB}	Difference in nucleus distance between EE_A and EE_B
r_O	Nucleus distance when EE_i is in pivot or initial position
r_i	Distance between nucleus and EE
SSM	Secondary Swinging Movement
v_e	Electron velocity
v_i	EE velocity
z	Effective nuclear charge
Z	Atomic number

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