

Protium 1H Structure and the Fine Structure Constant

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Abstract

Atomic Hydrogen 1H or Protium has been redescribed using fundamental physics techniques outlined in this paper. A new geometric approach is introduced that results in a useful explanation for the inverse Fine Structure Constant $1/\alpha$ and the Rydberg Energy of Ionization of the ground state electron from the hydrogen 1H atom. Along with a new physical mechanism to describe the 1H ground state orbit ($n = 1$, $a_e = a_0$) and higher energy levels orbitals ($n > 1$).

Keywords: Hydrogen, 1H, Protium, Atomic Structure, Fine Structure Constant, Rydberg, Bohr Orbit, Orbitals, Wave Form Pathways (WFP),

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1. Introduction

At this current time Fundamental Physics typically uses Quantum Mechanics (QM) to describe the structure of Atoms using the Schrodinger Equation for wave mechanics or Heisenberg Matrix Mechanics which was originally used to describe the Bohr orbit but now used to create orbitals. Orbitals trace the electron in the form of a probability field around the 1H Protium, with the conjugate square of the Wave Function $\phi(x)$ at any location describes the probability density of finding the electron at that location. The Mathematics includes 3 space coordinates, 1 time coordinate, imaginary numbers and sometimes by resolution through configuration K-space (aka reciprocal space or Fourier space or momentum space or frequency space).

This paper proposes a different approach using a mix of established fundamental physics and newly hypothesized geometry of atomic structures to derive some fundamental constants and to further elucidate atomic internal structure.

When physicist's used to approach Paul Dirac with a new fundamental physics theory, he used to apparently ask them if they've worked out the reason for the Fine Structure Constant, and reply if not go back to the blackboard.

The great physicist Wolfgang Pauli stated that when he dies his first question to the deity will be '*What is the meaning of the fine structure constant?*'

A quote from Arthur Eddington '*I believe that the number 137 is the most important number in physics*' and similarly from Richard Feynman '*All good theoretical physicists put this number up on their wall and worry about it*'.

Quote from Max Born '*The fact that alpha has just the value of 1/137 is certainly no chance but itself a law of nature. It is clear that the explanation of this number must be the central problem of natural philosophy.*'

And a quote from who I see as one of the greatest physicists, the German Arnold Sommerfield '*In the fine structure constant, e is the representation of electron theory, h the appropriate representative of the quantum theory, c comes from relativity...*'.

So to answer Sommerfield see the contents of this paper, but briefly, α is the link between EM energy and matter, or better the link (beauty) between spirit (goodness) and hard reality (truth).

2. Protium structure and inverse Fine Structure Constant $1/\alpha$

The equations used in this paper are well established in the Fundamental Physics textbooks up to University Physics and Applied Physics to Undergraduate and Postgraduate levels. Relativistic effects will be ignored in this paper as it aims to present an alternative basis to Fundamental Physics based on Classical Mechanics and Electro-Magnetism (EM).

2.1. New Method for the Calculation of $1/\alpha$ based on Protium structure

The Fine Structure Constant (unitless) is commonly defined as approximately:

$$\alpha \approx \frac{1}{137} \quad (1)$$

My Geometrical Hypothesis 1 assumes the circumference of 1H Protium's electron path is as per Figure 1. From this the inverse of the Fine Structure constant $1/\alpha$ can be calculated:

$$2 \cdot \pi \cdot a_e = \frac{1}{\alpha} \cdot \lambda_e \quad (2a)$$

$$2 \cdot \pi \cdot a_p = \frac{1}{\alpha} \cdot \lambda_p \quad (2b)$$

Similarly for the proton path radius at the center of the 1H atom.

Substitute for the wavelength using constants found through the Compton Wavelength formula:

$$2 \cdot \pi \cdot a_e = \frac{1}{\alpha} \cdot \frac{h}{m_e \cdot c} \quad (3)$$

Considering Ref. [1] the Bohr radius of the 1H electron

$$2 \cdot a_e = \frac{n^2 \cdot h^2}{2 \cdot \pi^2 \cdot m_e \cdot e \cdot E} \quad (4)$$

Note, in 1913 the physical constants values were factored differently as shown in Ref. [1] so use a modern version of the Bohr Radius from Ref. [2] Quantum Mechanics by D. H. McIntyre.

$$a_e = \frac{4 \cdot \pi \cdot \epsilon_0 \cdot \hbar^2}{m_e \cdot e \cdot E} \quad (5)$$

Note the magnitude of the proton charge $E = e$ the electron charge.

Substituting (5) into (3)

$\frac{8 \cdot \pi^2 \cdot \epsilon_0 \cdot \hbar^2}{m_e \cdot e^2} = \frac{1}{\alpha} \cdot \frac{h}{m_e \cdot c}$	(6a)
---	------

83 Resolving for $\hbar = h/2\pi$ in Eqn. (6a)

$\frac{8 \cdot \pi^2 \cdot \epsilon_0 \cdot h^2}{m_e \cdot e^2 \cdot 4 \cdot \pi^2} = \frac{1}{\alpha} \cdot \frac{h}{m_e \cdot c}$	(6b)
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84 Cross cancelling in Eqn. (6b)

$\frac{2 \cdot c \cdot \epsilon_0 \cdot h}{e^2} = \frac{1}{\alpha}$	(6c)
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85

86 Substituting in the values of the constants into (6c) from the Definitions/ Terms Section:

$\frac{1}{\alpha} = \frac{2 \cdot 2.9979 \times 10^8 \cdot 8.8542 \times 10^{-12} \cdot 6.6261 \times 10^{-34}}{(1.6022 \times 10^{-19})^2}$	(7)
--	-----

87 Computing (7) for the Fine Structure Constant:

$\frac{1}{\alpha} = 137.0316845$	(7) calc
----------------------------------	-------------

88 The current measured 137.035 999 177 from Ref. [3] Nist so variation of only $\approx 0.003 \%$.

89 Let $n = 1$ for the electron being in the ground state orbit of 1H and fill in the remaining constants

$a_e = \frac{1}{2 \cdot \pi \cdot \alpha} \cdot \lambda_e$	(2a)
$Radius\ 1H = a_e = \frac{1}{2 \cdot \pi \cdot \alpha} \cdot \lambda_e = \frac{137.03}{2 \cdot \pi} \cdot 2.4263 \times 10^{-12} = 52.92 \times 10^{-12} m$	(2a) calc

90 Electron Wavelength (11a)calc below giving the expected 1H Bohr most probable radius.

91 Likewise calculate proton orbit radius in the 1H atom, given (11b)calc $\lambda_p = 1.32144 \times 10^{-15} m$

$a_p = \frac{1}{2 \cdot \pi \cdot \alpha} \cdot \lambda_p = 2.88193 \times 10^{-14} m$	(2b) calc
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92 As expected orbit radius electron/ proton = $a_e/a_p = 1836.1 = m_p/m_e$

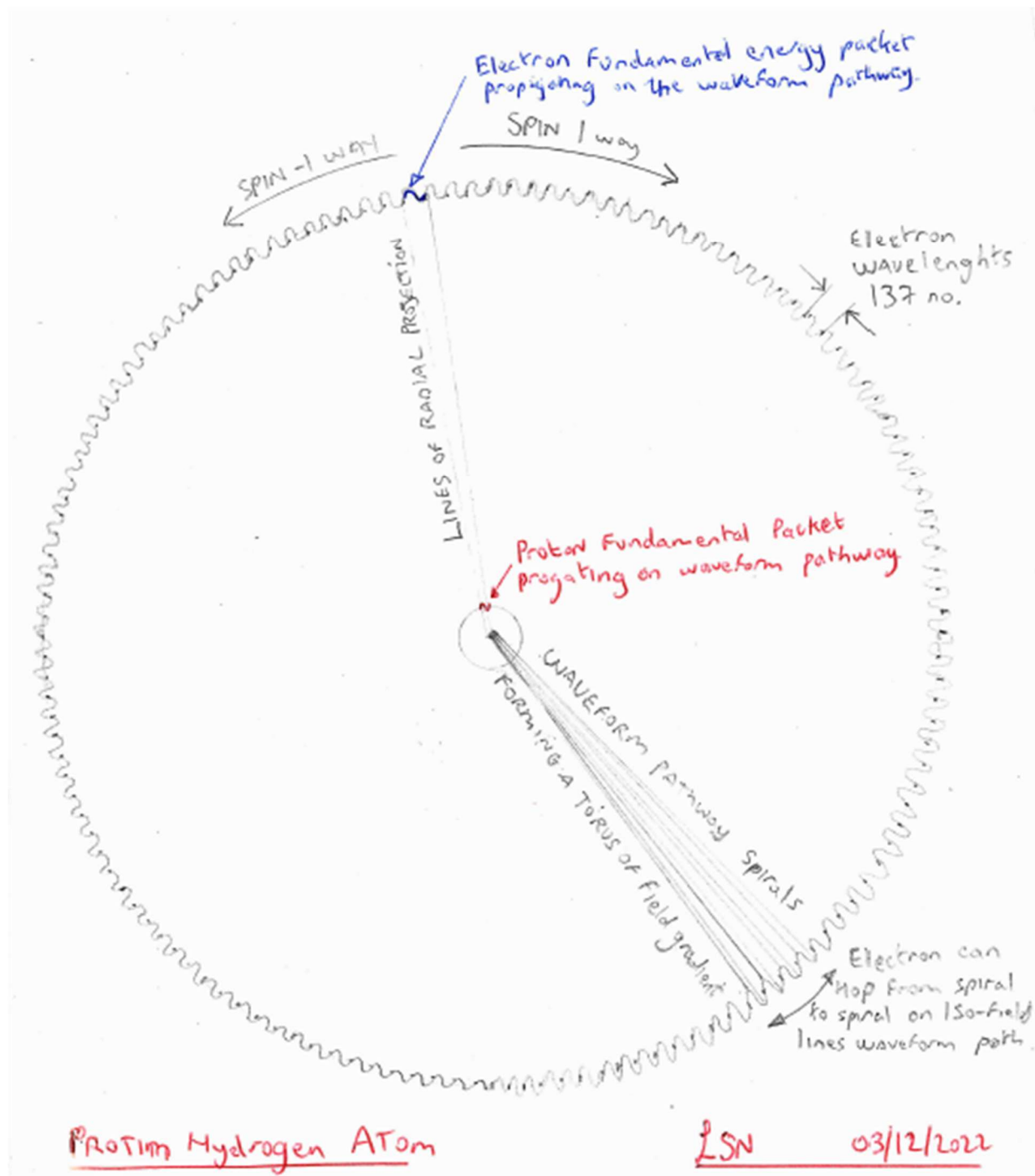


Figure 1: WFP's of Electron & Proton motion around the center of a 1H Protium atom (not to scale).

In Figure 1 given that the proton and electron are both following a helix 3D Wave Form Pathway (WFP) to create the orbit of the electron at the outer circumference of the 1H atom, with the proton doing something similar at the center.

They're both intrinsically spinning that creates Spin Magnetic moment. And also Orbiting along there WFP's to create Orbital Magnetic Moments. Hence this combination results in precession spirals of both around the common atomic center. Thus, Figure 1 2D sketch can only show a sinusoidal plane wave, which is a section of the 3D Helical WFP's of the electron.

Note, the Figure marks that indicate spin 1 way in both directions can be considered to be looking at this plane from both faces. Currently I imagine the 1H atom as a toroidal donut shaped disc – but I have not yet found a good enough magnifying glass for a clear sight of it.

3. Explaining the electron Ionization Energy of 1H Protium

The ionization Energy of the 1H protium ground state electron has been determined both theoretically and experimentally = 13.6 eV = 2.18×10^{-18} Joules

Hypothesis 2 for 1H Protium states the proton magnetic field interaction product by the magnetic moment of the electron (Bohr Magnetron) determines the ionization energy $E = \mu_B \cdot B$.

3.1. New Method to calculate 1H electron Ionization Energy

Assuming the reader has knowledge of the following well proven physics equations:

$$E = m \cdot c^2 \quad \text{Energy and Mass equivalence Equation} \quad (8a)$$

$$E = h \cdot \nu \quad \text{Einstein's 1905 paper on Photoelectric effect} \quad (8b)$$

$$c = \nu \cdot \lambda \quad \text{Wave velocity = frequency * wavelength} \quad (8c)$$

Therefore using these equations at the start of Section 2.2 to define the frequency

$\nu_e = \frac{m_e \cdot c^2}{h}$	(9a)
$\nu_p = \frac{m_p \cdot c^2}{h}$	(9b)

Note equations (9) are ignoring relativistic effects (so another day for 7th Duc Louis de Broglie).

The electron and proton intrinsic spin currents can be defined using these spin frequencies:

$I_e = \nu_e \cdot e$	(10a)
$I_p = \nu_p \cdot E$	(10b)

Note the magnitude of the proton charge $E = e$ the electron charge.

From equations (8), the electron and proton Compton Wavelengths can be defined:

$\lambda_e = \frac{h \cdot c}{E} = \frac{h}{m_e \cdot c}$	(11a)
$\lambda_p = \frac{h}{m_p \cdot c}$	11b)

For an EM (Electro-Magnetic) wave propagating through space in a spiral WFP then I assume electron & proton wave amplitude in plane is approx.. equal to the spiral radius where: $r = \lambda/4$

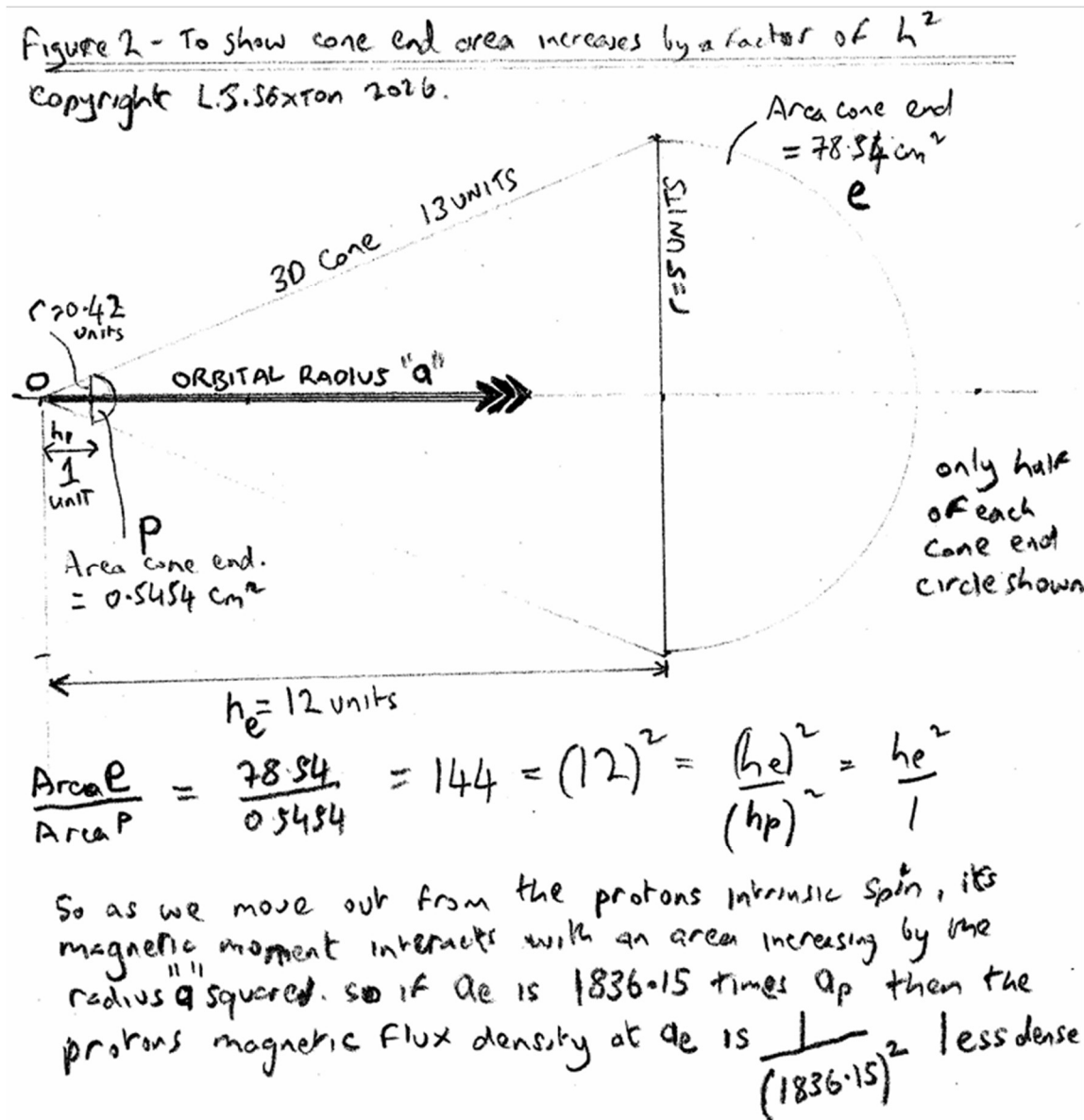
$r_e = \frac{\lambda_e}{4}$	(12a)
$r_p = \frac{\lambda_p}{4}$	(12b)

123

124 From Ref. [2] treating the protons and electrons 1H WFP orbits as current loops then the
 125 Magnetic Flux density B due to the proton current, but at the Bohr radius of the electron is:

$B_p^{ae} = \frac{\mu_o \cdot I_p}{2 \cdot a_p \cdot 1836.15^2}$	(13)
--	------

126 Note $m_p/m_e = a_e/a_p = 1836.15$ is included as a division factor squared as B is dependent on Cone
 127 end Area's which increases by a squared factor as $a = h$ cone height, like a Sphere $SA = 4\pi r^2$.



128

129 **Figure 2:** Diagram showing B (Tesla) decreasing by a factor of the orbital radius's ratio squared.

130 Knowing from Ref. [2] Zeeman Effect that the Energy of interaction between the applied 1H
131 proton magnetic field and the magnetic moment of the electron is $E = -\mu_B \cdot B$.

132 So I assume that the electron is ionized from the 1H Protium atom once this energy is reached,
133 Therefore:

$1H \text{ electron ionization energy} = -\mu_B \cdot B_p^{ae}$	(14)
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134 Where B_p^{ae} is Proton Magnetic Flux Density experienced by the electron at the Bohr radius a_e .

135

136 3.2. Calculation of 1H electron Ionization Energy

137 Calculate the Compton frequency of the Proton at the center of the 1H atom

$\nu_p = \frac{m_p \cdot c^2}{h}$	(9b)
$\nu_p = \frac{1.6726 \times 10^{-27} \cdot (2.9979 \times 10^8)^2}{6.6261 \times 10^{-34}} = 2.26865 \times 10^{23} \text{ Hz}$	calc

138

139 Calculate the proton intrinsic spin current (based on its local Compton spin frequency):

$I_p = \nu_p \cdot E$	(10b)
$I_p = 2.26865 \times 10^{23} \cdot 1.6022 \times 10^{-19} = 36348.385 \text{ Amps}$	calc

140 Note the magnitude of the proton charge $E = e$ the electron charge.

141 Comparing the Proton Compton wavelengths with that of the Electron at the periphery:

$\lambda_e = \frac{h}{m_e \cdot c} = \frac{6.6261 \times 10^{-34}}{9.1094 \times 10^{-31} \cdot 2.9979 \times 10^8} = 2.4263 \times 10^{-12} \text{ m}$	(11a) calc
$\lambda_p = \frac{h}{m_p \cdot c} = \frac{6.6261 \times 10^{-34}}{1.6726 \times 10^{-27} \cdot 2.9979 \times 10^8} = 1.32144 \times 10^{-15} \text{ m}$	(11b) calc

142 From (11a)calc and (11b)calc, by dividing one into the other:

$\frac{\lambda_e}{\lambda_p} = \frac{r_e}{r_p} = 1836.1030 = \frac{m_p}{m_e} = \frac{a_e}{a_p}$	(12) calc
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143 Which is very close to the Literature mass ratio of the proton to the electron of 1836.15.

144 Given Magnetic permeability of free space is $\mu_0 = 4\pi \times 10^{-7} \text{ H/m}$

145 Now calculate the Magnetic Flux Density produced by the 1H proton at the 1H electron:

$B_p^{ae} = \frac{\mu_o \cdot I_p}{2 \cdot a_e} = \frac{4\pi \times 10^{-7} \cdot 36348.385}{2 \cdot 2.88193 \times 10^{-14} \cdot 1836.15^2} = \frac{7.9247 \times 10^{11}}{1836.15^2} = 235052.7 \text{ Tesla}$	(13) calc
---	--------------

146

147 Given Bohr Magnetron = $e \cdot \hbar / 2 \cdot m_e = \mu_B \approx 9.274 \times 10^{-24} \text{ J/T}$ from Ref [2]

148 I assume the electron is ionized from 1H Protium atom once the energy reaches $\mu_B \cdot B_p^{ae}$

$1H \text{ electron ionization} = \mu_B \cdot B_p^{ae} = 9.274 \times 10^{-24} \cdot 235052.7 = 2.17988 \times 10^{-18} \text{ J}$	(14) calc
$1H \text{ electron ionization} = \mu_B \cdot B_p^{ae} = \frac{2.17988 \times 10^{-18}}{1.6022 \times 10^{-19}} = 13.60 \text{ eV} = \text{Ryd}$	(14) calc

149 Exact ionization energy of ground-state protium 1H atom is 13.598434599702 eV Ref [4]

150 Thus, Rydberg energy has been correctly calculated by using known methods of the product of
151 the ground state electron magnetic moment with the Magnetic Flux density of the 1H proton.

152 The application of the Geometrical Hypothesis 1 of the 1H atom shown in Figure 1 with the
153 Hypothesis 2 that the 1H electron ionization energy is $E = -\mu_B \cdot B$, once the correct B generated
154 by the proton is applied at the Bohr radius, has proven to be a new approach to correctly
155 predicting various constants, i.e. the inverse Fine Structure constant and the Rydberg energy.

156

157 4. Explain electron orbitals given this new geometrical hypothesis

158 So we have proven that the Bohr radius a_o called a_e in this paper for the electron's ground state
159 orbit in the 1H atom, has been reaffirmed by the geometric hypothesis of Figure 1 and the
160 orbital radius result of $a_e = 52.9 \times 10^{-12} \text{ m}$ in equation (2a) calc shown in Section 2.

161 But equation (4) from Bohr's 1913 paper Ref. [1] is questioned as the electrons orbital radius
162 is proposed to increase its radius with a factor of n^2 , given the increasing energy levels of the
163 electron are indexed by n, with Bohr's original 1913 equation (4) reminded here:

$2 \cdot a_e = \frac{n^2 \cdot h^2}{2 \cdot \pi^2 \cdot m_e \cdot e \cdot E}$	(4)
---	-----

164

165 Given the geometric proposal to the 1H atom structure shown in Figure 1, and successful use
166 of this hypothesis in Sections 2 and 3, then I question the validity of Bohr's equation (4) of the
167 increase in the orbital radius of bound electrons to atoms? Hence any model, Bohr,
168 Schrodinger, Heisenberg, QM, etc. that gives such increase in the radius of bound electron(s)
169 orbits or orbitals or probability cloud dimensions for $n > 1$ are to be questioned.

We know that transitions between electron energy levels are often occurring with the absorption and/ or emission of light of specific wavelengths and frequencies (quantized) given the transition, e.g. H₂O molecules everywhere in nature and life processes. But we do not visually see such rapid expanding or contracting of matter that one may expect if the models mentioned in the previous paragraph had validity for $n > 1$.

4.1. Method to explain electron orbitals by Wave Form Pathways (WFP)

In Figure 1 we can see the plane section of the electron Wave Form Pathway (WFP) around the proton in the 1H Hydrogen Protium atom, with its center axis being the $a_e = a_0$ Bohr radius.

My hypothesis 3 is that as the 1H electrons Energy levels increase ($n > 1$), there is no corresponding increase in the radius of the electrons $a_e = a_0$ orbit. Rather please see Figure 3:

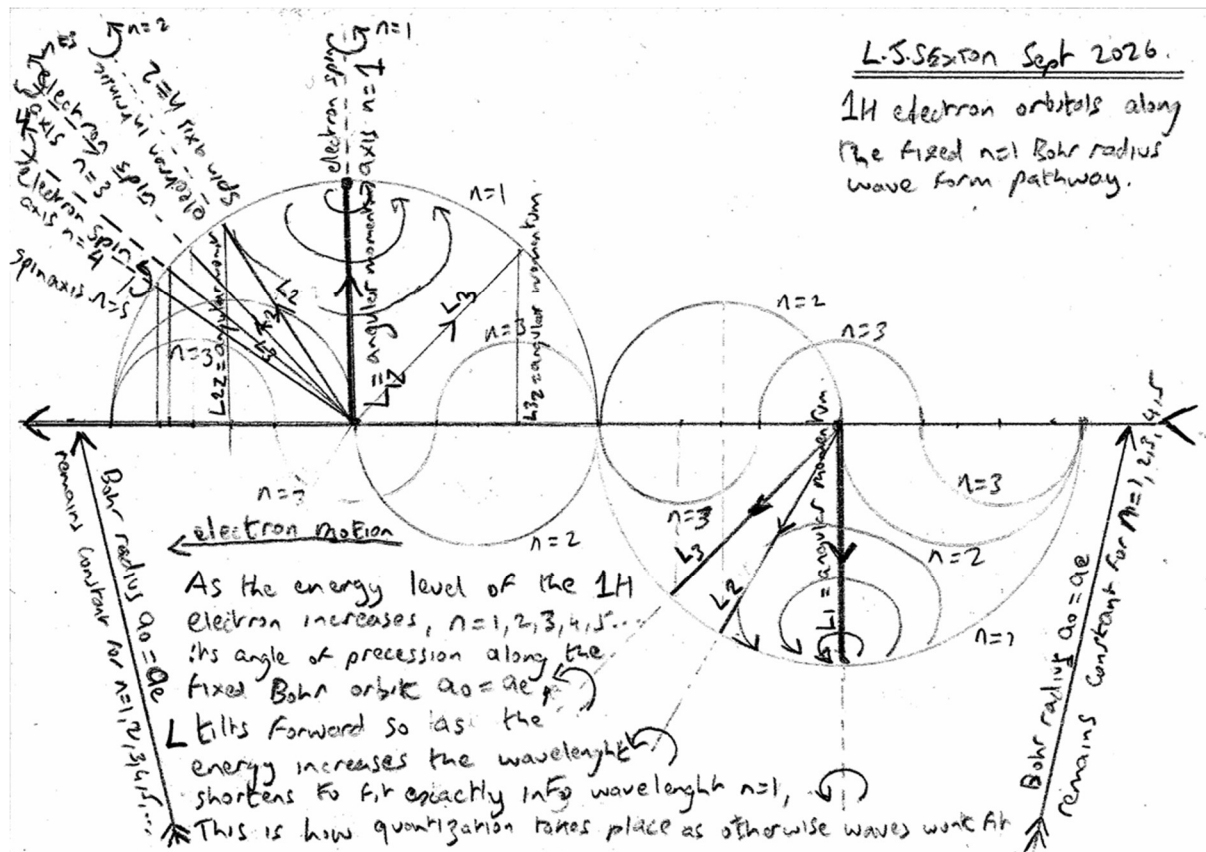


Figure 3: Diagram showing 1H electron orbits for $n = 1, 2, 3$ all along the same Bohr Radius.

The intrinsic spin of the electron does not change, instead the pitch angle of its Angular momentum L vector gets tilted forward as its energy levels increase. The reason its quantized is that the angular momentum axis L precesses around the Bohr ground state orbit radius ($a_e = a_0$ for $n = 1$) which is a circumference line. As L pitches forward for any increase in energy level its advancement traces a sinusoidal plane wave, and its wavelength must be varied by a whole number so that matches the nodes of the ground state wave. This is the reason that bound electron energy levels are quantized, so light photons emitted/ absorbed produce spectral lines.

So as expected, the increase in energy level of the electron shortens its wavelength, and not lengthens it as predicted by the Bohr radius formula in equation (2). Also as wavelength is shorter then frequency is faster with a corresponding increase in energy levels as per $E = h \cdot f$.

From Ref. [2] chapter on the Hydrogen Atom, the Rydberg energy (see Section 3) equation with quantized energy levels is defined as follows for the first two energy levels:

$E_{2-1} = Ryd \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$	(15)
--	------

Well if energy can be factored by angular momentum L precession spin area, like it was done for equations (13) and (14), then we can work out from Figure 3 the relationship based on the product of an energy constant C_E by a Function of Area $F(A)$. Then we can work out the difference in energy levels by the difference in areas swept by the angular momentum L axis as it precesses forward along the Bohr radius $a_0 = a_e$ circumference its travelling along, by either axis-L precessing perpendicularly around it for $n = 1$. Or the axis-L is pitched forward at angles matching $n = 2, 3, 4, 5$, etc. so it sweeps a smaller area as it rotates around the Bohr radius $a_0 = a_e$ circumference as it precesses forward. But a smaller area equals a shorter precession wavelength so results in a higher frequency to energy increases in a quantized manner as expected by the formula $E = h \cdot f$. This extra energy is due to light photons (otherwise called light quanta) being absorbed.

So following this, Energy Level is a product of an energy constant and the Function of the area traced in plane by the precession of the angular momentum vector L as it spins around the Bohr ground state orbit radius ($a_e = a_0$ for $n = 1$) circumference line.

$E_{2-1} = C_E \cdot F(A)$	(16a)
$E_{2-1} = C_E \cdot (\pi \cdot r_1^2 - \pi \cdot r_2^2)$	(16b)
$r_2 = \frac{r_1}{2}$	(16c)
$r_2^2 = \frac{r_1^2}{4} = \frac{r_1^2}{n_2^2}$	(16d)
$E_{2-1} = C_E \cdot (\pi \cdot r_1^2) \cdot \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$	(16e)

Thus, by comparison equations (15) and (16e) are equivalent and Hypothesis 3 shown in Figure 3 is theoretically proven to be a possible solution to quantized electron energy levels and corresponding orbitals of the 1H proton. This also means Ryd is proportional to $F(A)$.

215 For comparison from Ref. [2] Spin Precession the Larmor frequency is defined:

$\omega_L = \frac{e \cdot B_p^{ae}}{2 \cdot m_e}$	(17a)
$\omega_L = \frac{e \cdot B_p^{ae}}{2 \cdot m_e} = \frac{1.6022 \times 10^{-19} \cdot 235052.7}{2 \cdot 9.1094 \times 10^{-31}} = 2.0671 \times 10^{16} Hz$	(17a) calc
$E_L = \frac{h \cdot \omega_L}{2 \cdot \pi} = \frac{6.6261 \times 10^{-34} \cdot 2.0671 \times 10^{16}}{2 \cdot \pi} = 2.18 \times 10^{-18} J = 13.6 eV$	(17b) calc
$v_{\parallel} = \omega_C \cdot r_e = v_{\perp}$	(17c)
$v_{\perp} = \omega_C \cdot r_e = 4.1342 \times 10^{16} \cdot 0.606575 \times 10^{-12} = 25077 m/sec$	(17d) calc

216 The Energy due to the Larmor Frequency of the electron at energy level $n = 1$ is the same as
 217 the Rydberg energy evaluated in Section 3 equation (14)calc is probably coincidental as the
 218 equations are equivalent if there various constants and variables are worked out.

219 Assuming in the ground state the electron orbit in Figure 1, the sinusoidal wave is due to
 220 precession helix pitch angle of 45° . Hence, axial velocity will equal the perpendicular velocity.

221 But the predicted precession velocity of the electron around the proton in the 1H atom is 87.3
 222 times lower than the $c/137 = 2188978 m/sec$ predicted in the current theory – see Ref. [2]
 223 Hydrogen Energy Levels. So currently I feign no hypotheses related to the electron's velocity.

224

225 **5. Definitions, Terms and Constants**

226 α = Fine Structure Constant (unitless)
227 a_e = radius of the electron orbit for $n = 1$ on 1H atom (m), also called the Bohr radius.
228 a_p = radius of the proton orbit for $n = 1$ on 1H atom (m)
229 B = Magnetic Field Strength (Tesla) also know as Magnetic Flux Density (T)
230 C_E = energy constant
231 c = speed of light in a Vacuum (2.9979×10^8 m/s)
232 e = electron charge (1.6022×10^{-19} C) = magnitude of E proton charge
233 I = current (Amps = Columbs per second)
234 EM = Electro-Magnetic
235 E = Energy
236 $F(A)$ = Function of Area
237 h = Planck's constant (6.6261×10^{-34} J·s)
238 $\hbar = h / 2\pi$
239 μ_0 = Magnetic permeability of free space ($4\pi \times 10^{-7}$ H/m)
240 m_e = rest mass electron (9.1094×10^{-31} kg)
241 m_p = rest mass of proton (1.6726×10^{-27} kg)
242 n = integer Index number
243 ϵ_0 = Permittivity of Free Space (8.8542×10^{-12} F/m)
244 Ryd = Rydberg Energy
245 λ = wavelength (m)
246 ν = frequency (hz)
247 v = velocity
248 WFP = Wave Form Pathway
249 ω_L = Larmor Frequency (Hz)
250

6. Conclusions

The Geometrical Hypothesis 1 assumes the 1H Protium's electron WFP follows a circumference length of α^{-1} multiplied by the electrons Compton Wavelength, see Figure 1. From this Hypothesis 1 the inverse of the Fine Structure constant α^{-1} was accurately calculated = 137.0316845 (see equation (7) calc). Plus the Bohr radius in the $n=1$ ground state $a_0 = a_e$ is reconfirmed by Geometrical Hypothesis 1 in Section 2 as 52.9×10^{-12} m (equation (2a) calc).

Hypothesis 2 for 1H Protium states the proton magnetic flux density product with the magnetic moment of the electron (Bohr Magneton) determines the ionization energy $E = \mu_B \cdot B$. In Section 3 this was calculated to be correct as the Ground State Energy = 13.6 eV = Rydberg (see equation (14) calc). This is a remarkable result that indicates that it's the magnetic attraction of the proton intrinsic spin to the electron intrinsic spin is that provides the energy barrier to ionization. Investigations about the 3D to 4D definition of the EM coupling of the proton to the electron in 1H atoms and for higher Z atoms and molecules in order to define their internal structure, perhaps using the EM Wave Form Pathways (WFP) introduced in this paper, could be investigated.

This also lead to questions about the applicability of the Bohr atomic model and various guises of quantum mechanics being used currently to produce electron cloud probability fields around the 1H proton, and onwards to higher Z atoms. Albeit somewhat successful but perhaps an overly complicated modelling approach that does not allowing the elucidation of the currently hidden inner structures of the periodic table of atoms, as it infers by statistics atomic structures.

My hypothesis 3 is that as the 1H electrons Energy levels increase ($n > 1$), there is no corresponding increase in the radius of the electrons orbit. Rather please see Figure 1 & 3. Given that the difference in Energy levels that define photon absorption and emission spectra can be similarly predicted by the difference in areas swept by the angular momentum L axis as it precesses forward along the Bohr radius $a_0 = a_e$ circumference that its travelling along, with its pitch angle depending on its quantized energy level was shown to be successful in Section 4. This result seems to show that the absorbed energy changes the electrons angular momentum axis L tilt angle which actually decreases a little the electron outer orbit radius, and intuitively increases the precession frequency and energy levels that eventually leads to atom ionization.

Perhaps allow a Hypothesis 4 related to Figure 3 and the precession of the angular momentum vector L as it spins around the Bohr ground state orbit radius ($a_e = a_0$ for $n = 1$) circumference line. If in the 1H Protium atom it is an up-spin electron that advances along the circumference line by the precession spin turning anticlockwise as you sit in it like a car, and assuming the electrons intrinsic is also turning anticlockwise as you look out along the L angular momentum vector. Then could it be that the down-spin electron does exactly the opposite in both cases, so we know $-1 \times -1 = +1$, and we call the up-spin electron +1. Then if we take the case of 2He, overall the down-spin electron can orbit in harmony with the up-spin electron that results in Helium being so inert. Maybe both 2He electrons orbit in a complementary stationary state.

In the future I plan...

290 **Conflict of Interest**

291 The author declares no conflict of interest.

292 **Author Contributions**

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294 **Funding**

295 This research was supported by my Business www.MegalithicPower.com and perhaps the
296 consciousness connection and intellectual power that the Power Pendants possibly bring.

297 **Acknowledgments**

298 Thanks to my friends, family and tutors for my Applied Physics MSc.

299 **Ethical Statements**

300 N/A.

301 **Data and Code Availability**

302 N/A.

303 **Declaration of Generative AI Usage**

304 I used a Casio fx-82MS for which I've lost the handbook so limited functionality.
305 The study is as rigorous as what could be produced in a day, although it was stirring for years.
306 No generative Ai was used in the writing of this paper.
307 (Hopefully the psychotic silicone won't be able to read my Figures either ;)

308 **Supplementary Materials**

309 N/A.

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