FESAC White Paper

STRINGSYNTHESIS FUSION

William B. Webb
Energy Control Engineering, Lake City Mn 55041
wbwebb@rconnect.com

Stringsynthesis demonstrates its superior accuracy by allowing precise calculation of the electron emission beta decay for the 30 least massive black neutronium nuclei and the step-by-step calculation of their transmutations thru 203 intermediate nuclei on their way to becoming the calculated nuclei centering the 30 least massive light emitting atoms. This is a perfect 233 for 233 match between calculations of stringsynthesis and factual nuclear data. This superior match provides affirmation that Nobel Laureate Murray Gell-Mann's nuclear string theory is correct and that this outgrowth of his string theory, stringsynthesis, is also correct.

Nuclei are threesomes of Gell-Mann's string-like loops. Stringsynthesis accurately describes their structures and how they fuse. Loops from two nuclei synthesize (fuse) to build a more massive nucleus. The resulting fused nucleus is still a threesome of loops. It's the strings that have done the synthesizing not whole nucleons: stringsynthesis not nucleosynthesis. Fusion is a stringsynthesis process not a nucleosynthesis process. The attached *Stringsynthesis Electron Emissions* introduces the superior accuracy of this new correct science.

{Orbital electrons are also Gell-Mann string-like loops. Loop electrons have no need for a quantum mechanical cloud-like explanation with a wave function to describe their probable location. The attached *String Theory's Electrons* presents the all inclusive correct properties of Gell-Mann's loop electrons}.

This paper proposes renewed experiments using the proven Proton > Fluorine19 fusion. This fusion has been studied for 60 years as a collision (see page 231 of Halliday and Resnick, *Physics,* Parts I & II, John Wiley and Sons). A beam of protons impinges on a Fluorine19 target causing a small number of fusion collisions. Fusion of a proton, having kinetic energy 1.85 Mev, and a Fluorine19 target produces Neon20 which immediately has a structured fission to high kinetic energy helium, with a perpendicular exit, and oxygen. There is a net relativistic mass-energy yield of 8.13 Mev.

Stringsynthesis shows the need to orient and align the spin axis of two colliding nuclei to enhance their fusion probability. Renewed experiments will work to optimize fundamental physical methods of enhancement using lasers, electric fields and magnetic fields. Excess unfused hydrogen from the proton beam will be burned-off (oxidized) to water. The process exhaust will be helium, water vapor and excess air. These experiments are, in essence, a fusion-aided-combustion. The equipment and materials are simple, safe and inexpensive. UW-Madison and several other fusion labs already have the basic necessary equipments and operating personnel. This is an excellent test bed for learning the science and art of the stringsynthesis fusion process.

During the 35 years as president of my companies I employed correct science. To revitalize our faltering fusion processes we should now employ the more correct stringsynthesis science. Stringsynthesis is our country's new world leading science.

Stringsynthesis Electron Emissions

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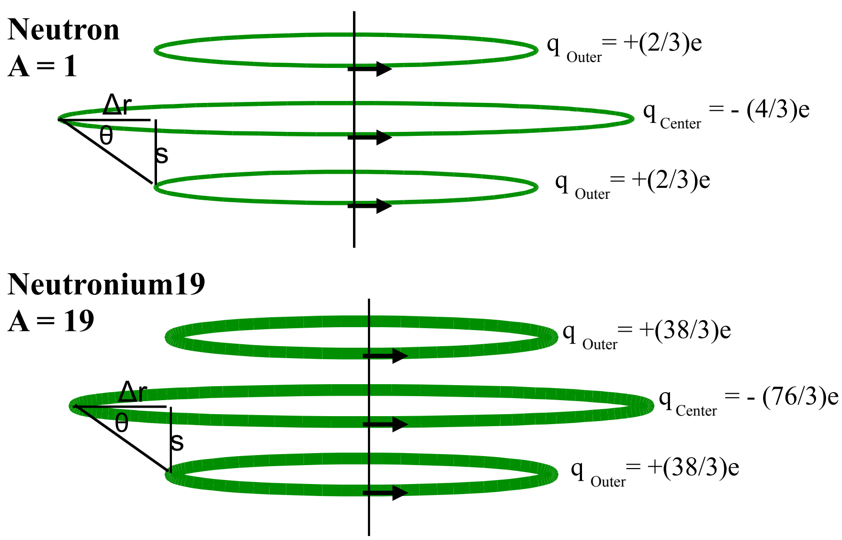
Stringsynthesis demonstrates its superior accuracy by allowing precise calculations of the electron emission beta decay for the 30 least massive black neutronium**A** nuclei and the step-by-step calculation of their transmutations thru 203 intermediate nuclei on their way to becoming the calculated nuclei centering the 30 least massive light emitting atoms. This is a perfect 233 for 233 match between calculations of stringsynthesis and factual nuclear data. This superior match provides affirmation that Nobel Laureate Murray Gell-Mann's nuclear string theory is correct and that this outgrowth of his theory, stringsynthesis, is also correct. In a black region, string-like loops synthesize with other string-like loops to make rope-like loops. String-like and rope-like loops structure into threesomes bound by electrostatic and gravitational forces. Bound threesomes become nuclei. Loops not structuring into threesomes remain dark matter. Balanced threesomes of string-like loops become neutrons. Balanced threesomes of more massive rope-like loops become more massive neutronium**A** nuclei. After formation, neutrons and neutronium**A**s quickly begin emitting electrons. This paper develops the threesome loop structures of nuclei and derives the simple equation for calculation of nuclear electron emission. This paper shows it's the string-like loops that do the synthesizing not whole nucleons: stringsynthesis not nucleosynthesis.

I. Introduction

Every nucleus in the universe has two "outer loops" and one "center loop". Figure 1 illustrates the Stringsynthesis' neutron and neutronium**19** nuclei. The neutron, as prescribed by ***Nobel Laureate Murray Gell-Mann***[1] consists of three single strand, fractionally charged, vibrating, string-like loops. Stringsynthesis' Neutronium**19** has that same threesome dimensional structure but has 19 synthesized strands in each of its three rope-like loops. It has exactly 19 times more total mass-energy. All loops, both string-like and rope-like, rotate like a lariat so they take a circular shape. Rotation speeds are relativistic. The neutron's single strand string-like loops are denoted in the figure by their mass number **A =1.** The neutronium**19**'s multiple strand rope-like loops are denoted by their mass number **A =19.** With the charges shown, both the neutron and neutronium**19** are electrically neutral and both are an electrostatically balanced structure.



Each of the Neutron's three string-like loops is single strand, rotating, circular-shaped and fractionally charged.

The neutron's charge ratio is: $|q_{Outer}/q_{Center}| = 0.5$

Each of Neutronium**19**'s three rope-like loops has 19 strands, is rotating, circular-shaped and fractionally charged.

The Neutronium**19**'s charge ratio is: $|q_{Outer}/q_{Center}| = 0.5$

Figure 1 The Neutron and Neutronium**19** Nuclei.

As can be seen from the figure, the charge on a general neutronium**A** rope-like loop with mass number **A**, is just **A** times larger than the corresponding charge on the neutron's string-like loop. The charges on the two outer rope-like loops of a neutronium**A** nucleus will then be:

$$q_{Outer} = +\mathbf{A}(2/3)e \tag{1}$$

The Neutronium**19** in the figure above thus has charge $q_{Outer} = +(38/3)e$ on each of its two outer loops.

The charge on the center loop of a neutronium**A** is q_{Center} = **-A**(4/3)e. In the Neutronium**19** figure above the center loop thus has charge q_{Center} = - (76/3)e. For all nuclei the negatively charged center loop is the supplier of electrons for electron emission beta decay. After having emitted atomic number **Z** electrons, each electron with charge - (3/3)e, the center loop will then have the lesser negative charge:

$$q_{Center} = -\,[(\mathbf{A})(4/3)e - \mathbf{Z}(3/3)e] \qquad (2)$$

The absolute value of the loop charge ratio $|q_{Outer} / q_{Center}|$ is singularly important to nuclear stability. In the following paragraphs we'll demonstrate the law that all nuclear loop threesomes with a charge ratio $|q_{Outer} / q_{Center}| < 0.77$ are electron emitters. Note that the neutron and all neutronium**A**s start with an initial charge ratio $|q_{Outer} / q_{Center}| = 0.5$.

II. Nuclear Electron Emission

A. Electron Emission The neutron's electron emission beta decay is typical for all neutronium**A** and other electron emitting nuclei. Figure 2 shows the neutron in decaying green. String vibrations loosen a loop-shaped electron from the rotating negatively charged center loop. (Gell-Mann's electrons are also string-like loops). Once loosened the electron's emission is electrostatically forced. The radially expanding circular-shaped electron is shown in black. The resulting stable proton is shown in red. The proton recoils radially in place without need for a recoil antineutrino particle. The proton has gained stability with its larger loop charge ratio $|q_{Outer} / q_{Center}| = 2.00$.

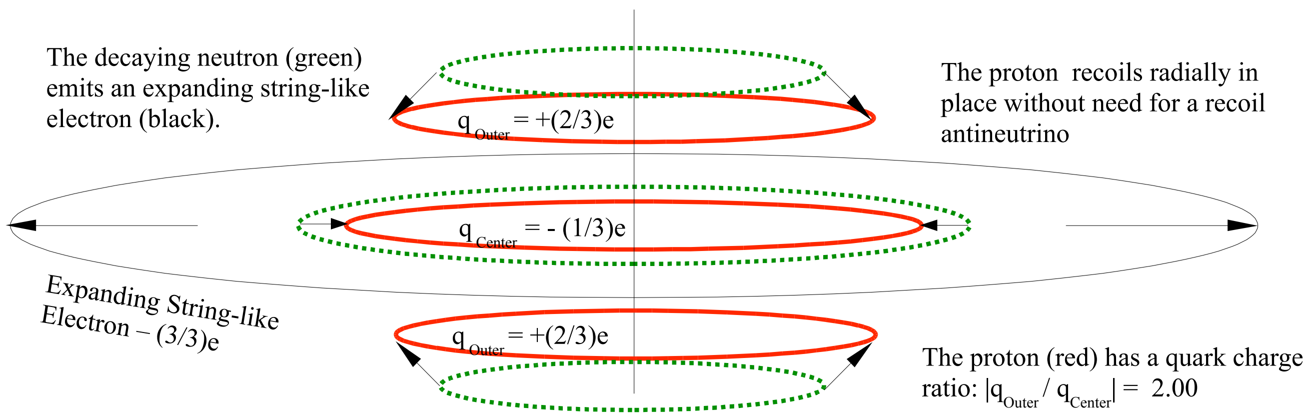


Figure 2 The Neutron's Electron Emission is Typical of Electron Emission from all Nuclei

B. Forces Binding Nuclear Loops The loops of stringsynthesis nuclei are closely spaced resulting in huge electrostatic binding forces. The reference textbook[2] uses electric fields (on page 673) to analyze forces binding a threesome consisting of a negative charged circular-shaped central loop and two positive charged outer points. The axial-directed attractive force between their negative central loop and either positive outer point is given by:

$$F_{Attract} = (1/4\pi\varepsilon_o)(q_{Outer}\, q_{Center} \sin\theta \cos^2\theta) /(\Delta r)^2 \qquad (3)$$

The axial-directed repulsive force between their two outer positive point charges is given by:

$$F_{Repel} = (1/4\pi\varepsilon_o)\,(q_{Outer})^2/(2s)^2 = (1/4\pi\varepsilon_o)\,(q_{Outer})^2\,(\cos^2\theta / \sin^2\theta) /(2\Delta r)^2 \qquad (4)$$

These textbook equations (3) and (4) involve "points charges" so these force equations are theoretically exact. But these same equations are found to suffice with good accuracy to describe attractive and repulsive forces binding the loop threesomes of stringsynthesis.

B. Requirement for Balance A loop threesome is at balance when its axial-directed attractive and repulsive forces are equal. Equating equations (3) and (4) provides the requirement for balance. That requirement is called the charge ratio equation and is given by:

$$| q_{Outer} / q_{Center} | = 4 \sin^3 \theta \qquad (5)$$

Equation (5) imposes limits on the charge ratio. Figure 1 shows that the angle θ can have values more than 0^o but less than 90^o so the term $\sin^3 \theta$ will be larger than zero but less than one. The charges on loops can therefore have any value, large or small, as long as the absolute value of their charge ratio is more than zero but less than four:

$$0 < | q_{Outer} / q_{Center} | < 4 \qquad (6)$$

In practice, the smallest possible charge ratio is the value $|q_{Outer} / q_{Center}| = 0.5$ for neutrons and all other neutronium**A**s. The stable proton has a larger charge ratio $|q_{Outer} / q_{Center}| = 2.0$. One of the largest charge ratios is $|q_{Outer} / q_{Center}| = 3.5$ for the very stable oxygen**16** nucleus. The obvious implication is that balanced nuclear loop threesomes use electron emission to increase their charge ratio and thereby improve their stability.

C. Stringsynthesis' Charge Ratio 0.77 The axial-directed attractive force of equation (3) has value zero at both 0^o and 90^o and a maximum at some intermediate angle. Location of that intermediate angle is found by equating the differential $\delta F_{Attract} / \delta\theta$ to zero. That maximum occurs at the spatial angle: $\theta_{Max\ Att} = \tan^{-1}(1/\sqrt{2}) = 35.26^o$. (The reference text[2] confirms this angle on page 683). The charge ratio corresponding to this spatial angle of maximum attraction 35.26^o can be calculated from the charge ratio equation (5) and has value:

$$| q_{Outer} / q_{Center} |_{Max\ Attract} = 0.77 \qquad (7)$$

The charge ratio 0.77 is found to be the single determinant that segregates, with perfect accuracy, the 233 least massive electron emitting nuclei. Recall the general loop charge equations (1) and (2). The ratio of these general charges gives:

$$| q_{Outer} / q_{Center} | = 2\mathbf{A} / (4\mathbf{A} - 3\mathbf{Z}) \qquad (8)$$

Equation (8) is graphed in figure 3 as a function of different mass numbers **A** and different atomic numbers **Z** for the 30 least massive neutronium**A** nuclei and the 203 intermediate nuclei resulting therefrom because of electron emission. The horizontal straight graph line **Z = 0** at the base of the figure intersects the vertical mass number lines 1 thru 30. These base line intersections are the locus of 30 electron emitting neutronium**A** nuclei having those mass numbers. The graph lines that are concave up each have an integer atomic number **Z w**ith values 1 thru 14. These curved lines have 203 intersections with the vertical mass number lines. All (30 + 203) 233 intersections are a correct calculated representation of a specific electron emitting nucleus with correct calculated mass numbers, atomic numbers, charge, charge ratio and electron emission decay instability. All the 233 nuclei in the graph have a calculable charge ratio equal to or more than 0.50 but less than 0.77 and all are only electron emitters. All these 233 nuclei then transmute to non electron emitting nuclei with a quark charge ratio larger than 0.77. **Nuclei with a charge ratio $| q_{Outer} / q_{Center} | < 0.77$ are electron emitters.**

Figure 3 highlights the nine steps of electron emission decay for neutronium**19**. It transmutes to the stable Fluorine**19** nucleus by emitting nine loop-shaped electrons on its way to finally achieving a charge ratio larger than 0.77. Here are neutronium**19**'s calculated steps of electron emission using equation (8):

Z	$\lvert q_{Outer} / q_{Center} \rvert$	Isotope	Electron Emit?	Resulting Z	Resulting Isotope
0	.5000	Neutronium19	Yes	1	H^{19}
1	.5205	H^{19}	Yes	2	He^{19}
2	.5429	He^{19}	Yes	3	Li^{19}
3	.5672	Li^{19}	Yes	4	Be^{19}
4	.5938	Be^{19}	Yes	5	B^{19}
5	.6230	B^{19}	Yes	6	C^{19}
6	.6552	C^{19}	Yes	7	N^{19}
7	.6909	N^{19}	Yes	8	O^{19}
8	.7308	O^{19}	Yes	9	F^{19}
9	.7755	F^{19}	No! Now electron emission stable because $\lvert q_{Outer} / q_{Center} \rvert > .77$		

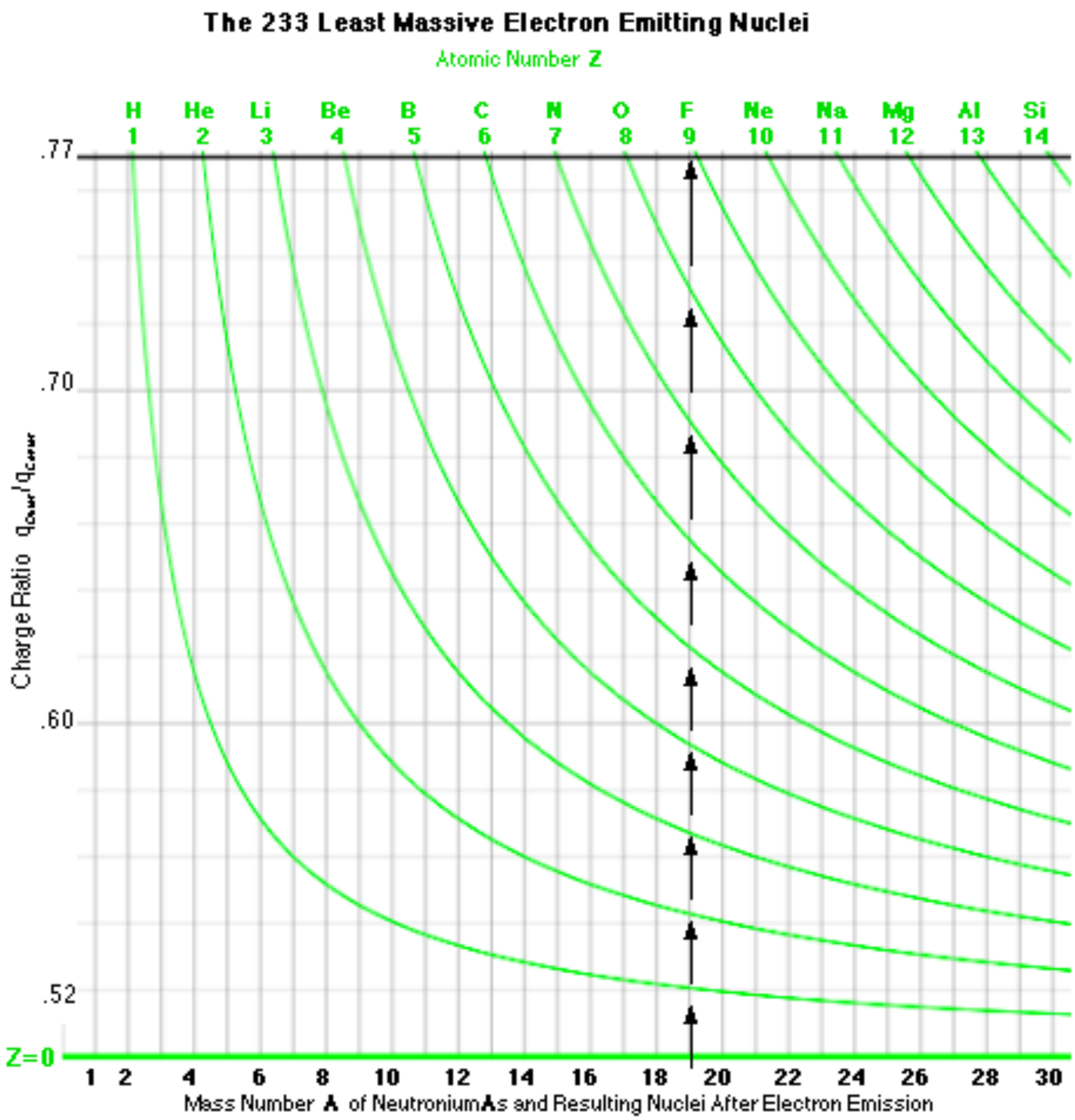


Figure 3. Graphs of the Charge Ratio Equation $| q_{\text{Outer}} / q_{\text{Center}} | = 2\mathbf{A} / (4\mathbf{A} - 3\mathbf{Z})$ for values from 0.5 to 0.77.

{The truth of this paper will be lost if it is not understood that all nuclei with a charge ratio larger than 0.77 will, when possible, undergo additional calculable charge rearrangements that further increases their charge ratio to values well above 0.77 but still less than 4.0. This further improves their stability. Most nuclei use "internal charge rearrangements" to increase their ratio without changing their atomic number. Some nuclei use neutron emission or alpha particle emission to achieve a larger charge ratio with different atomic numbers. Many nuclei, as a final act, positron emit or electron capture which further increases their ratio and peaks their stability. This final act decreases their atomic number by one integer and, most importantly, makes these nuclei appear out-of-place when presented on the nucleosynthesis style *standard nuclear wall chart*. Calculations that demonstrate these further charge rearrangements have not been included in this introductory paper but are available from the author.}

III. Conclusions

Stringsynthesis demonstrates its superior accuracy by allowing precise calculations of the electron emission beta decay for the 30 least massive black neutroniumA nuclei and the step-by-step calculation of their transmutations thru 203 intermediate nuclei on their way to becoming the calculated nuclei centering the 30 least massive light emitting atoms. This is a perfect 233 for 233 match between calculations of stringsynthesis and factual nuclear data. This superior match provides affirmation that Nobel Laureate Murray Gell-Mann's nuclear string theory is correct and that this outgrowth of his theory, stringsynthesis, is also correct.

IV. References

[1] *Nobel Laureate Murray Gell-Mann* - Wikipedia
[2]HALLIDAY AND RESNICK *Physics Parts I &II*, John Wiley and Sons, New York(1966).

String Theory's Electrons

William B. Webb

A half century ago, Nobel Laureate Murray Gell-Mann established that electrons are string-like loops. For fifty years we've needed a string theory that correctly explains the loop-shaped electron. This paper shows that the electron of hydrogen and that of ionized helium are rotating circular loops of string-like material with a length equal to the circumference of the orbit they occupy. They rotate like a lariat around their centered nuclei. Their 34 calculated photon emission wave lengths are all in excellent agreement with measured data. Their quantized orbit sizes and rotational speeds are determined by "atomic number" whole integer multiples of the *fine structure constant.* Each electron maintains a circular orbit that is always nearly the same size: their photon emissions come from braking radiation when orbit speeds decelerate. These electrons have ring tensions that accommodate a wide range of tangential speeds of rotation. Their circular shape and ring tensions negate all electrostatic and gravitational potential energies: there are no negative energies to decrease the electron's rest mass-energy. Any wave induced on these electrons propagate their energy at a speed having the same value as the tangential speed of rotation. With matching wave speed and a constant rest mass-energy, these electrons are uniquely suited to be governed by the Einstein law of total mass-energy. These electrons have no need for a quantum-mechanical cloud-like explanation with a wave function to described their probable location. They simply occupy all of their orbit. These electrons correctly demonstrate relativistic circumferential length contraction. A self tensioning analysis suggests these electrons are made of tiny segments, each segment having a minute neutrino-like mass.

INTRODUCTION

A century ago, ***Nobel Laureate Neils Bohr***[1] taught how his quantized "point electron" could orbit a proton. A half century later, ***Nobel Laureate Murray Gell-Mann***[2] established that the Bohr electron is not a point but a loop of string-like material. This paper presents a competent string theory for the loop-shaped (circular-shaped) electrons of hydrogen and of ionized helium. The theory shows excellent agreement with empirical data.

DESCRIPTION OF THE ELECTRON

Like a Lariat

Orbital string-like electrons rotate like a lariat with a taut circular shape. Their tiny nucleus is at the center of their rotation. Here's an illustration of a circular-shaped electron rotating like a lariat around its centered nucleus.

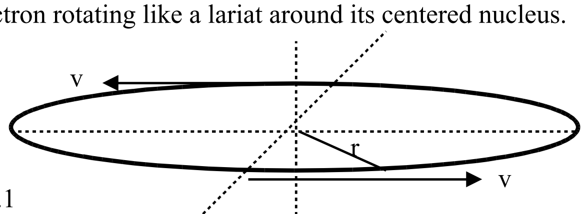


Fig.1
A Circular-Shaped Electron Rotates Around its Nucleus

To formulate the properties of these electrons, we start by making the standard assumption that the wave length of any disturbance induced on the taut string has ***de Broglie's Wave Length***[3] h/mv. We then deviate from the norm by assuming that those waves have a length that is an integer multiple n of the full circumferential length, i.e., waves have lengths $n2\pi r$. Equating wave lengths provides the unique quantum condition for the angular momentum of these circular-shaped string-like electrons:

$$mvr = h/ n2\pi. \quad (1)$$

Constant Radial Sizes with Variable Rotation Speeds

From equation (1) we can determine electron radial sizes. Using the Einstein expression for the electron's ***relativistic mass***[4] $m = m_o (1- \beta_n^2)^{-1/2}$ and its tangential rotation speed $v_n = \beta_n c$ gives the quantized radii as:

$$r_n= h /2\pi\ m\ n\ v = (h/2\pi\ m_o c)[(1/n\beta_n)^2 - (1/n)^2]^{1/2} \quad (2)$$

Appendix A develops the mathematics of how the rotational speed term $n\beta_n$ in equation (2) relates to the ***fine structure constant***[5] $\alpha = 1/137.035999$. It's found that the quantized speeds of these string-like circular-shaped electrons, rotating like a lariat around their nuclei, are directly dependent on "atomic number **Z**" whole integer multiples of the fine structure constant. The speed terms $n\beta_n$ for this paper's hydrogen electron (with Z=1) and for the ionized helium electron (with Z=2) are:

$$n\beta_{n\ Hydrogen} = Z\alpha = \alpha$$
$$n\beta_{n\ Helium} = Z\alpha = 2\alpha \quad (3)$$

Calculations using equation (2) with constant speed terms $n\beta_n$ from equation (3) show these electrons always maintain nearly constant quantized radial sizes. Sizes are all within the wide of the line in the illustration of Fig. 1. For the hydrogen electron, for instance, with n = 1, $r_{n=1} = 5.291631 \times 10^{-11}$ meters while with n = 10, $r_{n=10} = 5.291771 \times 10^{-11}$ meters. This electron's radial sizes are also nearly the same as the so-called ***Bohr Radius***[6] $r_{Bohr} = 5.291772 \times 10^{-11}$ meters. Equation (2), in fact, reduces to the exact definition of the Bohr Radius when the quantum term $(1/n)^2$ is small enough to be ignored. The Bohr Radius, as taken from equation (2), is:

$$r_{Bohr} = (h/2\pi\, m_o c)(1/n\beta_n) = h/2\pi\, m_o c\, \alpha \quad (4)$$

Photon Emissions

These circular-shaped electrons emit a photon when decelerating from a faster to a slower rotation speed, i.e., from a larger to a smaller rotational kinetic energy. Photons emitted are braking ***Bremsstrahlung Radiation***[7]. The photon seems to simply delaminate from the rotating electron and move tangentially away with speed c.

The values of $\beta_n = Z\alpha/n$ from equations (3) can be used in the ***Einstein relativistic kinetic energy equation***[8], to determine the electron's kinetic energy at each orbit speed. The relativistic kinetic energy equation is:

$$E_n = m_o c^2[(1- \beta^2_n)^{-1/2} - 1] \quad (5)$$

Photons carry away all the energy lost by the braking electron. The electron's energy loss ΔE is the difference between its initial orbit kinetic energy and final orbit kinetic energy. Appendix B presents calculated orbit energies using equation (5) with progressively larger quantum numbers n for both the hydrogen and ionized helium atoms. Energy differences are then used to calculate this electron's Bremsstrahlung photon emission wave lengths using the ***Einstein photon energy***[9] relation $\lambda = c\ h / \Delta E$. The 34 calculated wavelengths are in excellent agreement with measured data. These string theory electrons demonstrate their accuracy by allowing correct calculation of photon emission wavelengths.

These circular-shaped rotating electrons and their delaminating photons have the frequency relation: $\boldsymbol{\nu}_{Electron} = 2\ \boldsymbol{\nu}_{Photon}$. The electrons, with their unwavering circular shape, must rotate twice to delaminate a full-wave-length photon. This frequency relation provides an alternative, perhaps easier, way to calculate wave lengths of photons. Recall that these string theory electrons have wave lengths $\lambda = n2\pi r$. Then, using the wave relation $\boldsymbol{\nu} = v/\lambda$ and the ratio of orbit speed to photon speed $v/c = \beta = Z\alpha/n$, we can write the wave length of the maximum energy photon that can be delaminated in a transition from quantum number n = i as $\lambda_{n=i} = (i)^2(2\pi r_i)\ 2/Z\alpha$ and from quantum number n = j as $\lambda_{n=j} = (j)^2(2\pi r_j)\ 2/Z\alpha$. Since these electrons have nearly constant radial size, we can write for hydrogen's electron $\lambda_{n=i} = (i)^2$ (91.126) nm and $\lambda_{n=j} = (j)^2$ (91.126) nm. For the ionized helium electron we can write $\lambda_{n=i} = (i)^2$ (22.782) nm and $\lambda_{n=j} = (j)^2$ (22.782) nm. Lesser energy photons resulting from a transition i > j will then have wave lengths that are accurate to four significant figures given by:

$$1/\lambda_{i>j} = (1/\lambda_{n=i}) - (1/\lambda_{n=j}) \quad (6)$$

Not all electron models can be governed by the Einstein relativistic kinetic energy equation. Most cannot because of their negative potential energies. The following paragraphs discuss the unique features a successful model must have. It's believed this circular-shaped string theory electron is the only model having these necessary features.

Balanced Forces

A string-like circular-shaped electron is born by delamination from a rotating string-like circular-shaped nucleus. The electron grows in circular size. If and when it achieves orbit, it will have balance between two sets of forces.

Set One: Electrostatic Balanced Forces

The first set of forces has an inward acting distributed ***Coulomb Electrostatic Attraction***[10] from the centered nucleus that is balanced by an equal outward acting electrostatic self tensioning force. Self tensioning is an electrostatic repulsive force between small segments of the string-like loop. Appendix C shows that subdividing these circular-shaped strings into 421 small segments mathematically produces the correct self tensioning. These 421 small segments are believed to relate in some way to the minute ***neutrino particle***[11]. Self tensioning can maintain the electron's circular-shape even when not rotating. Since these electrons always maintains nearly the same radial size, this set of forces remain very nearly constant while remaining balanced.

Set Two: Gravitational Balanced Forces

The second set of balanced forces have a wide range of variability. Large changes in the tangential speeds of rotation cause large changes in the outward acting distributed centrifugal force. Those outward acting force changes are accommodated by a corresponding change of an inward acting ring tension. The accommodating ring tension allows these electrons to rotate like a lariat. Both of this paper's electrons and a lariat can rotate with a wide range of tangential speeds and associated centrifugal forces without significantly changing radial size.

Constant Rest Mass and Rest Mass-Energy

This electron has zero net electrostatic potential energy: the centered nucleus experiences no net force from the circular-shaped electron. There are no net electrostatic potential energies whose negative values would cause a decreased rest mass and rest mass-energy.

This electron has zero net gravitational potential energies: the potential energy U_F of the outward acting centrifugal force F is exactly balanced by the potential energy U_T of the inward acting ring tension T. The relation between these two forces is $T = - F/ 2\pi$. Energy equations give: $\delta U_T = - T\delta(2\pi r) = -(-F/2\pi)(2\pi)\delta r = F\delta r = - \delta U_F$. These gravitational potential energies sum to zero. This electron has no net gravitational potential energies whose negative values would cause a decreased rest mass and rest mass-energy.

These string theory circular-shaped electrons have no net potential energies of any kind to alter their rest mass and rest mass-energy.

Wave Speeds Have the Same Value as Rotation Speeds

Reference[12] (page 493) shows that when a disturbance (like a size change) effects a rotating string-like loop held taut only by centrifugal forces, that disturbance will move at a tangential speed matching that of the loop's rotation. These endless circular-shaped string theory electrons are tensioned only by their centrifugal forces, (recall that attraction from the centered nucleus is balanced by electrostatic self tensioning). These electrons will thus propagate their energy from any disturbance circumferentially without restraint and with speed exactly matching the rotation: $\beta_{Wave} = \beta_n$. These string theory electrons have all their motions with the single speed β_n . Any disturbance will then have a back wave that has zero speed and is standing. These string-like loop-shaped electrons are thus waveless and have the simple unwavering appearance of the circular orbit they occupy.

Governed by the Relativistic Kinetic Energy Equation

These string theory electrons have all their motions with the same single speed β_n and have no negative potential energies that decrease their rest mass-energy. The electron's total energy, in each orbit, is thus composed entirely of its constant rest mass-energy and its single speed relativistic kinetic energy. These unique speed and energy features allow these electrons to be governed by the Einstein relativistic kinetic energy equation (5).

Other Important Features

These circular-shaped electrons correctly experience circumferential contractions as relativistic rotation speeds increase. Equation (2) can be rewritten as:

$$2\pi r_n = h[1 - \beta_n{}^2]^{1/2} / m_o c\,(n\beta_n) = 2\pi r_{Bohr} [1 - \beta_n{}^2]^{1/2} \qquad (7)$$

Equation (7) is identically the definition for this electron's circumferential length ***Lorentz Contraction***[13]. This string theory circular-shaped electron is the first particle model to correctly demonstrate relativistic length contraction.

The ***Wave Mechanics***[14] probable location of these string theory electrons has little uncertainty. These electrons occupy every portion of their orbit and all orbits are within 0.0027% of the same size.

These electrons satisfy the C***orrespondence Principal***[15]. Hydrogen calculations using equation (3) with the quantum number n = 1 gives a relativistic rotation speed of slightly less than one percent of the speed of light. At the larger quantum n = 1,000,000 the rotation speed has a much slower classical value like that of a rotating lariat, 2.2 meters/sec.

Summary

String Theory's Electrons have no need for a quantum-mechanical cloud-like explanation requiring a wave function to described their probable location. String Theory Electrons simply occupy all of their orbit. They are the first and only orbital electron's to: 1) have the required string theory loop-shape, 2) agree with all the experimental data, 3) have nearly constant radial size, 4) have rotational speeds determined by atomic number multiples of the fine structure constant, 5) be free of negative potential energies of all kinds, 6) be free of orbital wave motions, 7) be correctly governed by the relativistic law of total mass-energy, 8) correctly display relativistic length contraction, 9) require only whole integer quantum numbers [never half integer quantum numbers as required by other models for ionized helium], 10) and mathematically suggest features of its electron neutrino.

REFERENCES

[1] *Nobel Laureate Neils Bohr* - Wikipedia Encyclopedia
[2] *Nobel Laureate Murray Gell-Mann* - Wikipedia
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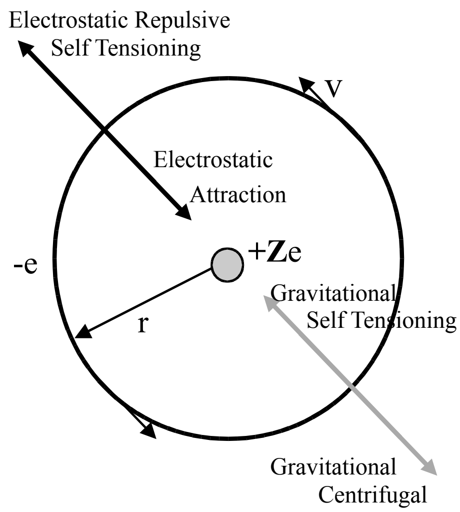
[5] *Fine Structure Constant* - Wikipedia Encyclopedia
[6] *Bohr Radius* - Wikipedia Encyclopedia
[7] *Bremsstrahlung Radiation* - Wikipedia Encyclopedia
[8] *Einstein Relativistic Kinetic Energy - Wikipedia*
[9] *Einstein Photon Energy* – Wikipedia Encyclopedia
[10] *Coulomb Electrostatic Attraction* - Wikipedia
[11] *Neutrino particle* - Wikipedia Encyclopedia
[12] HALLIDAY AND RESNICK, *Physics Parts I &II,* John Wiley and Sons, New York(1966).
[13] *Lorentz Contraction*- Wikipedia Encyclopedia
[14] *Wave Mechanics* - Wikipedia Encyclopedia
[15] *Correspondence Principal* - Wikipedia Encyclopedia
[16] http://hyperphysics.phy-astr.gsu.edu/hbase/tables/hydspec.html#c1
[17] http://laserstars.org/spectra/ProtoHydrogen.html

APPENDIX A

Rotation Speeds are Determined by the Atomic Number

The figure below illustrates a single circular-shaped electron with distributed charge -e rotating like a lariat around a nucleus with charge +**Z**e. **Z** is this atom's atomic number. (**Z** is, of course, a whole integer.)



The figure shows two sets of balanced forces. These forces are, in actuality, evenly distributed forces around the circumferential length of the electron but, for simplicity, are shown in this figure by a single force vector.

The electrostatic attractive and repulsive self tensioning forces oppose each other with value $F = (Ze)(e)/(4\pi\varepsilon_o r^2)$. Since the radius of this electron is always nearly constant, this set of forces always stay in balance with very little change in magnitude.

The gravitational centrifugal force and its balancing self tensioning force oppose with value $F = mv^2/r$. The speed of rotation can have a wide range of values so these balanced forces have a wide range of magnitudes.

When the electron is rotating at its maximum speed, the electrostatic and gravitational forces are equal. At that speed: $(Ze)(e)/(4\pi\varepsilon_o r^2) = mv^2/r$. Using the angular momentum relation of equation (1) $mvr = h/n2\pi$ with quantum number n=1 and the relation $v = \beta c$ allows simplification of this force equality to: $\beta_{n=1} = \mathbf{Z}\, e^2/2hc\varepsilon_o$. It's recognized that the value $e^2/2hc\varepsilon_o$ is equal to the *fine structure constant α* . We thus have for the maximum rotation speed $\beta_{n=1} = \mathbf{Z}\,\alpha$. Slower speeds then obey the quantum relation:

$$\beta_n = \mathbf{Z}\,\alpha/n$$

It's seen that rotation speeds are directly determined by the nucleus' atomic number.

APPENDIX B

String Theory Calculated Emission Spectrum vs. Measured

Orbit Relativistic Kinetic Energy: $E_n = m_o c^2[(1-\beta_{2n})^{-1/2} - 1]$ Joules

$m_o c^2 = 8.18710438 \times 10^{-14}$ Joules $\beta_n = Z\alpha/n$ $\alpha = 1/137.035999$

Hydrogen's Electron Z = 1

$hc = 19.864455 \times 10^{-26}$ Joules-meters

Calculated Orbit K.E. ~ Joules

$E_{n=1} = 2.179959 \times 10^{-18}$
$E_{n=2} = 0.544973$
$E_{n=3} = 0.242209$
$E_{n=4} = 0.136242$
$E_{n=5} = 0.087195$
$E_{n=6} = 0.060552$
$E_{n=7} = 0.044487$
$E_{n=8} = 0.034061$
$E_{n=9} = 0.026912$

Transition	Wavelength (nm) Calculated	Measured (Ref. # 16)
1 > 2	121.496	121.566
1 > 3	102.529	102.583
1 > 4	97.197	97.254
1 > 5	94.920	94.976
1 > 6	93.726	93.782
2 > 3	656.102	656.272
2 > 4	486.003	486.133
2 > 5	433.931	434.047
2 > 6	410.065	410.174
2 > 7	396.903	397.007
2 > 8	388.803	388.905
2 > 9	383.438	383.538
3 > 4	1874.59	1875.01
3 > 5	1281.46	1281.81
3 > 6	1093.50	1093.80
3 > 7	1004.67	1004.98
3 > 8	954.34	954.62
4 > 5	4050	4050
4 > 6	2624	2630
5 > 6	7456	7400

Ionized Helium's Electron Z = 2

Calculated Orbit K.E. ~ Joules

$E_{n=1} = 8.72088 \times 10^{-18}$
$E_{n=2} = 2.17996$
$E_{n=3} = 0.96885$
$E_{n=4} = 0.54497$
$E_{n=5} = 0.34878$
$E_{n=6} = 0.24221$
$E_{n=7} = 0.17795$
$E_{n=8} = 0.13624$
$E_{n=9} = 0.10765$

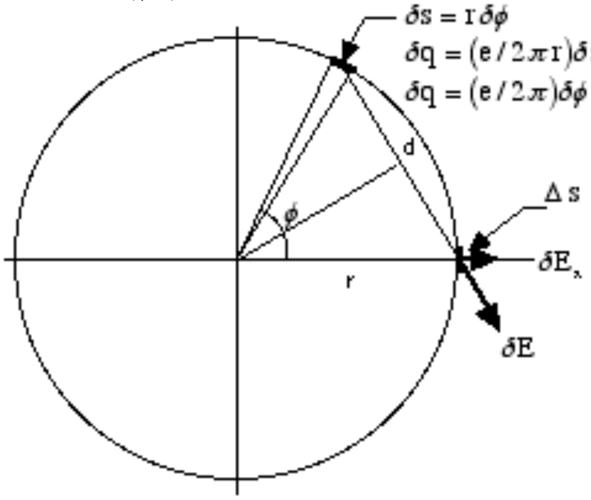
Transition	Wavelength (nm) Calculated	Measured (Ref. # 17)
1 > 2	30.370	Not Available
1 > 3	25.625	"
1 > 4	24.296	"
1 > 5	23.727	"
2 > 3	164.019	164.0
2 > 4	121.496	121.5
2 > 5	108.479	108.4
2 > 6	102.513	102.5
3 > 4	468.639	468.6
3 > 5	320.359	320.3
4 > 5	1012.50	1012.3
4 > 6	656.101	656.0
4 > 7	541.229	541.1
4 > 8	486.002	485.9
4 > 9	454.225	454.1
5 > 7	1162.80	1162.6
5 > 8	934.622	934.4
5 > 9	823.793	823.6

APPENDIX C

Electrostatic Self Tensioning

A string-like loop with a distributed charge will naturally self tension to a circular shape. String theory's circular-shaped hydrogen electron has its total charge -e evenly distributed around its circumferential length $2\pi r$. Every small segment of the electron is repelled by all the other small segments. There is a segment size and number that produces an outward pointing electric field and outward acting electrostatic force that exactly balances the inward pointing field and acting force resulting from hydrogen's centered proton.

Consider the two small segments Δs and δs high-lighted in the figure. From the figure $d = 2r \sin(\varphi/2)$ and $\delta E_x = \delta E \sin(\varphi/2)$.



Segments of the Circular-Shaped Electron

From Coulombs Law $\delta E = (\delta q / 4\pi\varepsilon_o)(1/d^2)$. Making substituting gives:

$$\delta E_x = (e / 4\pi\varepsilon_o r^2)(1/8\pi)[1/\sin(\varphi/2)]\delta\varphi$$

A calculus integration of this equation determines the sum of the radial outward pointing electric fields $\Sigma\delta E_x$ acting on the segment Δs caused by repulsion from all the small segments similar to δs. This same value of electric field points radially outward on all segments.

The correct total outward pointing electric field results when integrating over the upper half circle through the range $\varphi = 0.0074696$ radians to π radians and then doubling that result to account for the bottom half range. The outward pointing electric field acting on the segment Δs, as well as on all the other similar sized segments, then has value $E_x = (e / 4\pi\varepsilon_o)(1/r^2)$. This field produces an outward acting evenly distributed force on the electron that exactly balances the inward acting evenly distributed force from a centered proton.

Each segment Δs, in its circular-shaped electron of radius $r = 5.291772 \times 10^{-11}$ meters then has a length $\Delta s = 7.906 \times 10^{-13}$ meters. This analysis suggests that the electron is made of 421 segments. Each segment has a small neutrino-like mass of $m_{\Delta s} = (1/421)m_e$ and a very slight charge of $q_{\Delta s} = -(1/421)e$.

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