1.0 Abstract

In “The Aether Found, Discrete Calculations of Charge and Gravity with Planck Spinning Spheres and Kaluza Spinning Spheres” (1), it was shown that spinning spheres can unite the gravitational and electromagnetic force with spinning spheres. The equation 4, developed in “The Aether Found, Discrete Calculations of Charge and Gravity with Planck Spinning Spheres and Kaluza Spinning Spheres” can be used to predict a value of the fine-structure constant constant. This constant is found to depend only on pi and the dimensionless relations of the rest masses of the electron, neutron, and proton. The following paper shows a predicted fine-structure constant using the Codata values for the fundamental physical constants at each publication since 1969. The fine-structure constant found is accurate to the measured fine-structure constant within less than one sigma. As the data for the fundamental physical constants has become more accurate, the prediction for the fine-structure constant has been trending for a precise number difference. Some, like John D. Barrow, Richard Feynman, and Sir Arthur Eddington knew that the fine-structures existence is embarrassingly elusive to grasp. Is its value to be found in string theory or quantum foam? Is pi a value incorporated in the fine-structure constant? John D. Barrow wrote;“If the deep logic of what determines the value of the fine-structure constant also played a significant role in our understanding of all the physical processes in which the fine-structure constant enters, then we would be stymied. Fortunately, we do not need to know everything before we can know something.” — John D. Barrow, New Theories of Everything(4) Why does, this Equation 2.2, below predict a value for the fine-structure constant within the limits of the Quantum Hall method of measuring the fine-structure constant? We do not know, but we also touch a forever that we do not yet understand, yet are allowed to exist in the “ moment an instant lasted forever and be destined for the leading edge of Eternity.

Background

> The fine-structure constant *α* is of dimension 1 (i.e., it is simply a number) and very nearly equal to 1/137. It is the "coupling constant" or measure of the strength of the electromagnetic force that governs how electrically charged elementary particles (e.g., electron, muon) and light (photons) interact. Currently, the value of *α* having the smallest uncertainty comes from the comparison of the theoretical expressiona_e(theor) and experimental value a_e(expt) of the anomalous magnetic moment of the electron a_e. Starting in the 1980's, a new and wholly different measurement approach using the quantum Hall effect (QHE) has caused excitement because the value of *α* obtained from it independently corroborates the value of *α* from the electron magnetic moment anomaly. The QHE value of *α* does not have as small an uncertainty as the electron magnetic moment value, but it does provide a significant independent confirmation of that value.(7)
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> The calculations, below, show a new method for calculating the fine-structure constant, that is calculated from a more basic group of dimensionless numbers. The ratios of the masses of the elementary particles are like the ratios of gears. These gears, and how they work together, can be shown, empirically to give the fine-structure constant. In fact, as one looks at the years of the Codata data for the ratios of masses and the fine-structure constant, the ratios of the masses lead ahead to a

more accurate calculation of the fine-structure constant. It also hints that the mass ratios of the elementary particles are related to the Lorentz factor.

2.0 The Equation for Charge

(1) $$q^2 = T\pi^3 hc\varepsilon \frac{Me}{2Mn} \qquad [1]$$

Where q=elementary charge, h=Planck's constant, Ɛ=dielectric permittivity, c=speed of light, q is elementary charge, Me=Mass of the Electron, Mp=Mass of Proton, and Mn=Mass of Neutron, and T is defined below.

$$T^2 = \frac{1}{\sqrt{1-(2^{0.5}\frac{\pi Me}{3*3Mn})^2}}[(\frac{Mp-Me}{Mn})^2+(\frac{Mn}{Mn})^2+(\frac{Mn}{Mn})^2] \text{ (1)} \qquad [2]$$

Equation 4.0 (1) $$\left[(e^2) * \frac{1}{h*c*2*\varepsilon}\right] / \left[T * (\pi^3) * \frac{Me}{4*M}\right] = 1 \qquad [3]$$

We will be using Equation 4 for approximating the fine-structure constant with the Codata constants since 1969.

Fine-structure constant= $$\sigma = T\pi^3 \frac{Me}{4Mn} \qquad [4]$$

The model that I am using for these equations is that of the universe(a sphere) is made of spheres, which again are made of spheres, made of spheres. Please see the colored sphere down a couple pages for an image. There is two main, competing phenomena. Perfect packing of spheres, and packing of spheres, layer after layer of a spherical shell. It is not likely that science will ever have the ability to see a sphere that is, on the order, of 10^-35 meters. It will probably be a combination of matching theoretical physics and empirical data to figure out the structure of the universe.

Equation 2.3, above, has two components, the first is very similar to a Lorentz transformation, the second is the sum of three perpendicular vectors. The Lorentz component, Equation 5 below,

$$\frac{1}{\sqrt{1-(2^{0.5}\frac{\pi Me}{3*3Mn})^2}} \qquad [5]$$

Seems to imply that the ratio of the electrons mass to the neutrons mass is proportional to a velocity.

3.0 Calculation of Fine-structure Constant

Using Equations, 2 and 4, the fine structure constant is calculated in the following table, and compared to the Codata value for that year. Then the values are compared to each other by calculating their separation in value by a quantity of sigma's different using the uncertainty from Codata for the respective year.

Codata year	Inverse Fine Structure Constant Equation 4	Inverse Fine Structure Constant Codata(2)
1969	1.3703280E+02	1.3703608(20) .E+02
1973	1.3703593.E+02	1.3703612(15)E+02
1986	1.370359971.E+02	1.370359895(61)E+02
1998	1.3703599866.E+02	1.3703599976(50)E+02
2002	1.3703599900.E+02	1.3703599911(46)E+02
2006	1.37035999077.E+02	1.37035999679(94)E+02
2010	1.37035999071.E+02	1.37035999074(44)E+02
2014	1.37035999146.E+02	1.37035999139(31)E+02

Table 3.0 Fine-structure constant table.

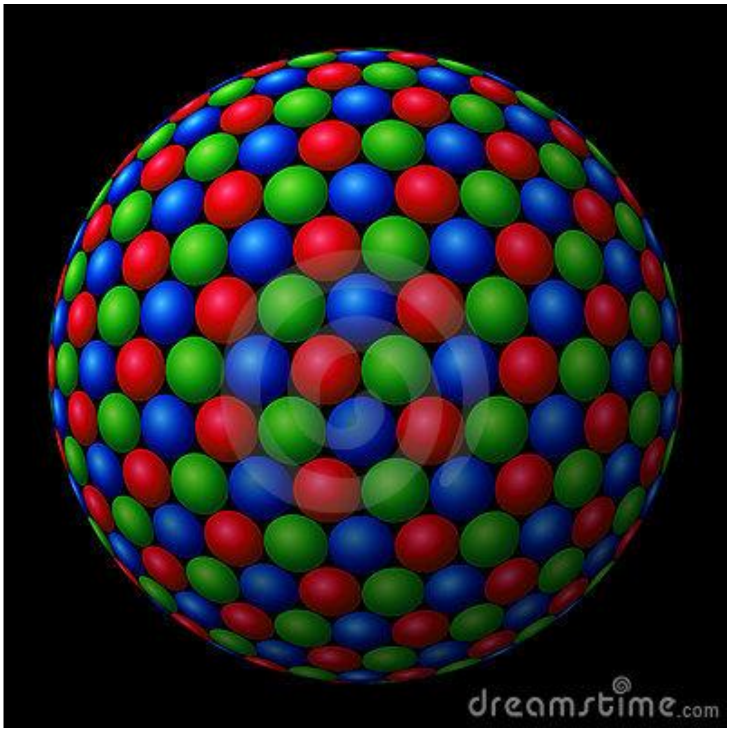
Note☺ All values calculated above for Fine-structure Constant Equation 4 are taken from (2) Codata.

It was Feynman who wrote,

“There is a most profound and beautiful question associated with the observed coupling constant, e - the amplitude for a real electron to emit or absorb a real photon. It is a simple number that has been experimentally determined to be close to 0.08542455. (My physicist friends won't recognize this number, because they like to remember it as the inverse of its square: about 137.03597 with about an uncertainty of about 2 in the last decimal place. It has been a mystery ever since it was discovered more than fifty years ago, and all good theoretical physicists put this number up on their wall and worry about it.) Immediately you would like to know where this number for a coupling comes from: is it related to pi or perhaps to the base of natural logarithms? Nobody knows. It's one of the greatest damn mysteries of physics: a magic number that comes to us with no understanding by man. You might say the "hand of God" wrote that number, and "we don't know how He pushed his pencil." We know what kind of a dance to do experimentally to measure this number very accurately, but we don't know what kind of dance to do on the computer to make this number come out, without putting it in secretly!”

— Richard Feynman, *QED: The Strange Theory of Light and Matter (5)*

We see that the fine-structure constant being related to pi, but also we see that it could be related to pi in wrapped up dimensions predicted in string theory, as the value, pi, is cubed. When we look at the “The Aether Found, Discrete Calculations of Charge and Gravity with Planck Spinning Spheres and Kaluza Spinning Spheres” (1), we find that there are hidden dimensions, but they are spheres within spheres at dimensions that are like Planck length and Planck time. It is like a quantum foam, but it is a uniform quantum foam, with irregularity within the hidden spheres, not on the surface of the hidden spheres. Please see image below for a polysphere nested within a sphere.



(6)

4.0 Background of Fine Structure constant from Codata

The fine-structure constant *α* is of dimension 1 (i.e., it is simply a number) and very nearly equal to 1/137. It is the "coupling constant" or measure of the strength of the electromagnetic force that governs how electrically charged elementary particles (e.g., electron, muon) and light (photons) interact. Currently, the value of *α* having the smallest uncertainty comes from the comparison of the theoretical expression a_e(theor) and experimental value a_e(expt) of the anomalous magnetic moment of the electron a_e. Starting in the 1980's, a new and wholly different measurement approach using the quantum Hall effect (QHE) has caused excitement because the value of *α* obtained from it independently corroborates the value of *α* from the electron magnetic moment anomaly. The QHE value of *α* does not have as small an uncertainty as the electron magnetic moment value, but it does provide a significant independent confirmation of that value.

The quantity *α* was introduced into physics by A. Sommerfeld in 1916 and in the past has often been referred to as the Sommerfeld fine-structure constant. In order to explain the observed splitting or fine structure of the energy levels of the hydrogen atom, Sommerfeld extended the Bohr theory to include elliptical orbits and the relativistic dependence of mass on velocity. The quantity *α,* which is equal to the ratio v_1/c where v_1 is the velocity of the electron in the first circular Bohr orbit and *c* is the speed of light in vacuum, appeared naturally in Sommerfeld's analysis and determined the size of the splitting or fine-structure of the hydrogenic spectral lines. Sommerfeld's theory had some early success in explaining experimental observations but could not accommodate the discovery of electron spin. Although the Dirac relativistic theory of the electron introduced in 1928 solves the main aspects of the problem of the hydrogen fine-structure, α still determines its size as in the Sommerfeld theory. Consequently, the name "fine-structure" constant for the group of constants below has remained:

$$\alpha = \frac{e^2/\hbar c}{4\pi\epsilon_o} = \frac{\mu_o c e^2}{2h},$$

where e is the elementary charge, $\hbar = h/2\pi$ where h is the Planck constant, $\varepsilon_0 = 1/\mu_0 c^2$ is the electric constant (permitivity of vacuum) and μ_0 is the magnetic constant (permeability of vacuum). In the International System of Units (SI), c, ε_0, and μ_0 are exactly known constants.

Our view of the fine-structure constant has changed markedly since Sommerfeld introduced it over 80 years ago. We now consider α the coupling constant for the electromagnetic force and similar to those for the other three known fundamental forces or interactions of nature: the gravitational force, the weak nuclear force, and the strong nuclear force. Further, since α is proportional to e^2, it is viewed as the square of an effective charge "screened by vacuum polarization and seen from an infinite distance."

According to quantum electrodynamics (QED), the relativistic quantum field theory of the interaction of charged particles and photons, an electron can emit virtual photons that can then emit virtual electron-positron pairs (e^+, e^-). The virtual positrons are attracted to the original or "bare" electron while the virtual electrons are repelled from it. The bare electron is therefore screened due to this polarization. The usual fine-structure constant α is defined as the square of the completely screened charge, that is, the value observed at infinite distance or in the limit of zero momentum transfer. At shorter distances corresponding to higher energy processes or probes (large momentum transfers), the screen is partially penetrated and the strength of the electromagnetic interaction increases since the effective charge increases. Thus α depends upon the energy at which it is measured, increasing with increasing energy, and is considered an effective or running coupling constant. Indeed, due to $e^+ e^-$ and other vacuum polarization processes, at an energy corresponding to the mass of the W boson (approximately 81 GeV, equivalent to a distance of approximately 2 x 10^{-17} m), $\alpha(m_W)$ is approximately 1/128 compared with its zero-energy value of approximately 1/137. Thus the famous number 1/137 is not unique or especially fundamental.

As indicated above, the value of alpha from the quantum Hall effect (QHE) has corroborated the value from the electron magnetic moment anomaly a_e. The QHE is characteristic of a completely quantized two-dimensional electron gas. Such a gas may be realized in a high-mobility semiconductor device such as a silicon metal-oxide-semiconductor field-effect transistor (MOSFET) or $GaAsAl_xGa_{1-x}As$ heterojunction of standard Hall bar geometry in an applied magnetic flux density B of the order of 10 T and cooled to about 1 K.

For a fixed current I (typically 10 µA to 50 µA) through the device, there are regions in the curve of Hall voltage U_H versus gate voltage for a MOSFET, or of U_H vs B for a heterojunction, where U_H remains constant as either the gate voltage or B is varied. These regions of constant U_H are termed quantum Hall plateaus. In the limit of zero dissipation (zero voltage drop) in the direction of current flow, the Hall voltage-to-current quotient $U_H(i)/I$ or Hall resistance $R_H(i)$ of the ith plateau, where i is an integer (we consider only the integral QHE), is quantized and given by $R_H(i) = U_H(i)/I = R_K/i$ where R_K is the von Klitzing constant (after the discoverer of the QHE).

The theory of the QHE predicts, and the experimentally observed universality of $R_H(i) = U_H(i)/I = R_K/i$ is consistent with the prediction, that $R_K = h/e^2 = \mu_0 c/2\alpha$. Since in the SI $\mu_0 = 4\pi \times 10^{-7}$ N/A^2 exactly, and c = 299 792 458 m/s exactly as a result of the 1983 redefinition of the meter in terms of the speed of light, a measurement of R_K in SI units (i.e., ohms) with a given uncertainty will yield a value of the fine structure constant α with the same uncertainty.

In practice, R_K is measured in terms of a laboratory standard of resistance. Thus, the resistance of the standard must be determined in the SI unit ohm in a separate experiment using an apparatus known as a calculable cross capacitor in which the unknown resistance of a reference resistor is compared with the known impedance of the capacitor. The change in capacitance of such a capacitor, and hence its change in impedance, can be readily calculated since the change depends only on the position of a movable screen electrode whose displacement can be measured with a laser interferometer. In the NIST version of the experiment, the known 0.5 pF change in capacitance of the NIST calculable cross capacitor is used to measure the capacitances of 10 pF reference capacitors. These and a 10:1 bridge are then used in two stages to measure the capacitance of two 1000 pF capacitors, which are in turn used as two arms of a special frequency dependent bridge to measure the impedances of two 100 kiloohm resistors. The latter are then compared using a 100:1 bridge with a 1000 ohm transportable resistor, which in turn is compared using dc techniques with the resistance standard in terms of which R_K has been measured. The ac-dc resistance difference of the 1000 ohm resistor is determined by means of a special 1000 ohm coaxial resistor of negligible ac-dc resistance difference. All ac measurements are carried out at a frequency of approximately 1592 Hz ($2\pi f = 10^4$ rad/s).

The QHE has already yielded a value of α with a relative standard uncertainty of 24×10^{-9}. When used to compare a_e(theor) with a_e(expt), it gives a fractional difference of $(29 \pm 24) \times 10^{-9}$. Since the 29×10^{-9} fractional difference is only 1.2 times the 24×10^{-9} relative standard uncertainty of the difference, it is within statistically acceptable limits. (9)

5.0 Discussion

The predicted values of Fine-structure are close to the limits of the Codata value. The close proximity of Equation 4 to the actual Codata value is remarkable in light of the combined variance of Equation 4 that is about 3 times higher than the variance of the Codata values. Although this does not prove that equation 4 is correct, the values predicted leave open the possibility that the equation could be correct.

Note that as time goes on the prediction of equation 4 becomes more precise.

The calculated values are within the values measured using the Quantum hall affect. This a new and different method of derived and empirical calculation for the fine-structure constant. It does not have the appearance of random number manipulation like numerology. The calculations are part of a new derivation to unite the forces of gravity and electromagnetic force through a polynested spinning sphere that has the appearance of both string theory and quantum foam theory. It is also not unexpected that pi should be part of the equation for the fine-structure constant, nor that it should have aspects that hint at wrapped up dimension of String Theory, nor is in unexpected that there should be undulations proposed by Quantum Foam theory. These undulations rather appear to be patterns of differences in rotation like Calabi Yau, rather than a physical differences in structure.

If one looks at the values of the fine-structure constant predicted with Equation 4, for year 1969, one sees that they are not within 3 sigma of the Codata value for 1969. It is now known the the electron/neutron mass ratio for 1969 was pretty far off, and this explains why Equation 4 gave a bad prediction.

The 2006 Fine-Structure constant is 1.37035999679(94)E+02, Equation 4 predicted 1.37035999077.E+02. It is now known that the 2006 Codata value was in error, whereas Equation 4 was more accurate.

“It is not the possession of truth, but the success which attends the seeking after it, that enriches the seeker and brings happiness to him.”

“Science advances one funeral at a time.”
― Max Planck

6.0 References

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