1.0 Abstract

When is empirical evidence good enough to prove a hypothesis that cannot be observed directly? String Theory has the problem that strings will probably never ever be observed. The equations below, with the Fine structure constant, the mass ratio of the proton, electron, muon, and tau to the neutron all use the same patterns for developing an empirical equation for their values. The equations are remarkably similar.

2.0 Equations

**Inverse Fine Structure Constant**

Inverse Fine Structure Constant\(= \sigma = T \pi^3 \frac{M_e}{4M_n} \)  \[1\]

Inverse Fine Structure Constant=137.035999146

Which is within less than one sigma of the Codata Inverse fine structure constant shown below.

Where Me is Mass of Electron, Mn is Mass of Neutron, Mp is mass of Proton and T is as follows.

\[
T^2 = \frac{1}{\sqrt{1 - \left(2^{0.5} \frac{\pi M_e}{3*3M_n}\right)^2}} \left[\left(\frac{M_p - M_e}{M_n}\right)^2 + \left(\frac{M_n}{M_p}\right)^2 + \left(\frac{M_n}{M_p}\right)^2\right] \]

\[2\]

**Inverse fine-structure constant**

\(\alpha^{-1}\)

<table>
<thead>
<tr>
<th>Value</th>
<th>137.035 999 139</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard uncertainty</td>
<td>0.000 000 031</td>
</tr>
<tr>
<td>Relative standard uncertainty</td>
<td>2.3 (\times) 10^{-10}</td>
</tr>
</tbody>
</table>

Concise form 137.035 999 139 (31)

(1)

**Proton to Neutron Mass Ratio**

\[P(1 - P) = \frac{3^{0.5}}{(2)} \int_0^{\pi} ((\sin(t))/2)^9 dt \] \[3\]

Where two values for P are found

\[P_x=0.998623461644, \quad P_y=0.001376538356 \]
\[ \alpha = \frac{1}{\sqrt{1 - \left(\frac{Me}{3Mn}\right)^2}} = 1.0000001645 \] \hfill [4]

\[ \frac{M_p}{Mn} = P_x \alpha = 0.998623461644084 \times 1.0000001645 = 0.998623478023 \] \hfill [5]

\[ \frac{M_p}{Mn} = 0.998623478023 \] \hfill [6]

Which is with less than one sigma of the proton-neutron mass ratio from Codata shown below.

### Proton-neutron mass ratio

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>0.998 623 478 44</td>
</tr>
<tr>
<td>Standard uncertainty</td>
<td>0.000 000 000 51</td>
</tr>
<tr>
<td>Relative standard uncertainty</td>
<td>5.1 \times 10^{-10}</td>
</tr>
<tr>
<td>Concise form</td>
<td>0.998 623 478 44 (51)</td>
</tr>
</tbody>
</table>

(2)

**Electron to Neutron Mass Ratio**

\[ P_x N (1 - N) = 8 / 3^{9/2} \int_0^{\pi} (\sin(t)) / 2^3 dt \] \hfill [7]

\[ N_x = 0.0000906445574284686867 \text{ and } N_y = 0.999909355442571531 \]

\[ \frac{1}{(1 - \left(\frac{\pi \times P_y}{12^{0.5}}\right)^2)^{0.5}} = \alpha = 1.00000077922996619330 \] \hfill [8]

Where \( P_x \) and \( P_y \) are the results of the calculation from Equation 3

\[ \frac{Me}{Mn} = N_x \times 6 \times \alpha = 0.00054386734446 \] \hfill [9]

\[ \frac{Me}{Mn} = N_x \times 6 \times \alpha = 0.0000906445574284686867 \times 6 \times 1.000000779229 = 0.00054386734446 \]

Which is within one sigma of the codata electron-neutron mass ratio.
**electron-neutron mass ratio**

\[ \frac{m_e}{m_n} \]

<table>
<thead>
<tr>
<th>Value</th>
<th>5.438 673 4428 \times 10^{-4}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard uncertainty</td>
<td>0.000 000 0027 \times 10^{-4}</td>
</tr>
<tr>
<td>Relative standard uncertainty</td>
<td>4.9 \times 10^{-10}</td>
</tr>
</tbody>
</table>

Concise form: 

\[ 5.438 \, 673 \, 4428(27) \times 10^{-4} \]

(3)

**Muon and Tau to Proton Mass Ratio**

\[ P_x \cdot m(l - m) = 3 / 16 \int_0^\pi (\sin(t)) / 2^9 \, dt \].

Where \( P_x \) is the calculation result of Equation [3]

\[ 0.998623461664 \cdot m(l - m) = 3 / 16 \int_0^\pi (\sin(t)) / 2^9 \, dt \]

\[ M_x = 0.99970188182917 \text{ and } M_y = 0.0002981181708363 \]

\[ L_m = \frac{1}{\sqrt{1 - \left(\frac{\pi M_y}{9}\right)^2}} = 1.0000000054 \]

(11)

**Muon**

\[ \frac{M_u}{M_n} = 1 - L_m \cdot P_x + \frac{M_x}{9} \]

\[ \frac{M_u}{M_n} = 1 - 1.0000000054 \cdot 0.998623461644084 + \frac{0.99970188182917}{9} = 0.1124545198 \]

Which is almost within one sigma of the Codata muon-neutron mass ratio shown below.

**Muon-neutron mass ratio**

\[ \frac{m_{\mu}}{m_n} \]

<table>
<thead>
<tr>
<th>Value</th>
<th>0.112 454 5167</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard uncertainty</td>
<td>0.000 000 0025</td>
</tr>
<tr>
<td>Relative standard uncertainty</td>
<td>2.2 \times 10^{-8}</td>
</tr>
</tbody>
</table>

Concise form: 

\[ 0.112 \, 454 \, 5167(25) \]

(4)
Fine Structure Constant and Mass Ratio of Elementary Particles.

\[\frac{M_t}{M_n} = (2*(1 - Lm*Px) + \frac{17*Tx}{9}\]  

\[\frac{M_t}{M_n} = 2*(1-1.0000000054*0.998623461644084) + \frac{17*0.99970188182917}{9}\]

\[\frac{M_t}{M_n} = 1.8910789\]

Which is within two sigma of the Codata tau-neutron mass ratio shown below.

<table>
<thead>
<tr>
<th>Tau-neutron mass ratio</th>
<th>(m_\tau/m_\Pi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>1.891 11</td>
</tr>
<tr>
<td>Standard uncertainty</td>
<td>0.000 17</td>
</tr>
<tr>
<td>Relative standard uncertainty</td>
<td>9.0 \times 10^{-5}</td>
</tr>
<tr>
<td>Concise form</td>
<td>1.891 11 (17)</td>
</tr>
</tbody>
</table>

(5)

**Discussion**

We see various similarities in the equations for these, well known, fundamental physics values.

1) All of these use a Lorentz like factor that indicates a relationship of mass to the speed of light. The proton uses one third of the electron mass. The electron uses \(\pi\) the mass of the proton divided by the square root of 12. The muon and tau both use a sine probability value that is \(\pi\) divided by 9 times the probability value. The fine structure constant is similar to the muon and tau in that it uses \(\pi\) divided by 9, but it uses the mass of the electron.

2) All of the masses use a sine probability value with the following base equation.

\[P(1-P) = \int_0^{\pi} ((\sin(t))/2)^9 dt\]

It is surmised that this is a probability value of a particle going in variations of \(x, y,\) and \(z\) direction, but through 3 dimensionally, mostly isolated areas. Thus the 9 dimensions of string theory. Brian Greene states in “The Elegant Universe”. Page 203 (8)”Why does string theory require the particular number of nine space dimensions to avoid nonsensical probability values?” If one looks at how the fine structure, alternative derivation shown in “The Aether Found, Discrete Calculations of Charge and Gravity with Planck Spinning Spheres and Kaluza Spinning Spheres” (6) Equation 4, which is equation 1, above, the derivation shows that the aether is made of spheres made of spheres. The discontinuities inherent in a sphere made of spheres, being responsible for all properties we can
measure, as evidenced by the calculations in “How can the Particles and Universe be Modeled as a Hollow Sphere” (7)

3) Please note, that the equations for the mass ratios of the muon and tau to the neutron are complimentary and almost identical.

4) The equations for the electron, muon, and tau all include a component that is the mass ratio of the proton to the neutron which is the Px value from Equation 3, above, and a separate component that is one minus the ratio of the proton to the neutron, which is the Py from Equation 3, above.

These observation alone, might be considered to be mere coincidence, together they show a compelling reason that the universe is packed with spheres in a cuboctahedron structure and thus the reason for pi, the square root of 2, the square root of 3, 2 and 3 being numbers that continually herald the cuboctahedron/spherical shell packing competition that give the universe observable properties and shows that defects are a necessary part of the construction of an observable universe.
References

1) http://physics.nist.gov/cgi-bin/cuu/Value?alphinv
2) http://physics.nist.gov/cgi-bin/cuu/Value?mpsmn
3) http://physics.nist.gov/cgi-bin/cuu/Value?mesmn|search_for=electron-neutron
4) http://physics.nist.gov/cgi-bin/cuu/Value?mmusmn
5) http://physics.nist.gov/cgi-bin/cuu/Value?mtausmn|search_for=tau+neutron