## 1.0 Abstract

It was found in other papers by Michael John Sarnowski that there appears to be a relationship between a process similar to Bremsstrahlung and Cherenkov radiation and the mass ratios of the Proton, Electron, Muon, and Tau to the Neutron. This correlation also is used to make predictions for these ratios and the Sommerfeld Fine-Structure Constant and the von Klitzing constant. Relating this to a possible granular crystalline cuboctahedron structure of space-time. The predictions for these ratios and constants will be listed in section 2.0. A summary of the calculations will be shown in section 3.0. Section 4.0 will detail the consistency of the empirical equations that give the equations credence. Section 5.0 will explain the parts of the equations for the mass ratios of the particles. This paper is the combination of various other papers by Michael John Sarnowski, which are listed in the reference section.

## 2.0 Predictions of Mass Ratios of particles, the Sommerfeld Fine-Structure constant, and the von Klitzing constant. The Codata Values are listed to the side.

Proton Neutron Mass Ratio

$$\frac{Mp}{Mn} = 0.99862347871$$

Codata 0.99862347844(51)

Electron Neutron Mass Ratio

$$\frac{Me}{Mn} = 5.4386734442 * 10^{-4}$$

Codata 5.4386734428(27) x 10-4

Proton Electron Mass Ratio

$$\frac{Mp}{Me} = 1836.15267393$$

Codata 1836.15267389(17)

Muon Neutron Mass Ratio

$$\frac{Mu}{Mn} = 0.1124545198$$

Codata 0.1124545167(25)

Tau Neutron Mass Ratio

$$\frac{Mt}{Mn} = 1.8910789$$

Codata 1.89111(17)

Inverse Sommerfeld Fine-Structure Constant

$$\sigma^{-1} = 137.035999098$$

Codata 137.035999139(31)

von Klitzing Constant

$$\frac{h}{q^2} = 25812.80744794 ohms$$

Codata 25812.8074555(59) Ω

The predictions for the mass ratios and constants above are predictions made to test the hypothesis that the equations used to derive them are more than empirical, that there are underlying resonances in the structure of the universe, that make the universe, more than perfection, that makes the universe interesting because it has defects. It is expected that it might take 4 -16 years or more to achieve better measurements to either partially confirm or partially falsify the Bremsstrahlung Cherenkov Radiation Resonance Hypothesis of Mass Relations of Particles and Sphere Theory of the Universe.

## 3.0 Summary of Calculations

### 3.1Proton neutron Mass ratio

$$\frac{(\beta^2)(1-\beta^2)}{3^{0.5}} = \int_0^{pi/2} (\frac{Cos\theta}{2})^9 d\theta \qquad [10]$$

$$p_x = \beta_x^2 = 0.998623461644 \, , \quad p_y = \beta_y^2 = 0.0013765383559158466 \qquad [10.1]$$

The following equations of 10 propose that the mass of the electron has a small relativistic affect on the mass of the proton. This is not the actual electron, but because it would be an action inside of the proton nucleon, but is a hint that electron type of interactions are inside the proton as well. It also shows that there may be some relativistic affects within the nucleons and that masses are related to a dimensionless relationship to the speed of light as equation [11] appears to be a variation of the Lorentz factor.

$$\alpha = \frac{1}{\sqrt{1-(\frac{3^{0.5}\pi Me}{16Mn})^2}} = 1.000000017097 \qquad [11]$$

$$\frac{Mp}{Mn} = px * \alpha = 0.998623461644084 * 1.000000017097 = 0.99862347871 \qquad [11.1]$$

$$\frac{Mp}{Mn} = 0.99862347871 \qquad [11.2]$$

### 3.2 Electron Neutron Mass Ratio

$$\frac{Mp}{Mn}\frac{(\beta^2)(1-\beta^2)}{3^{0.5}} = \frac{\lambda_\infty}{\lambda_e}\int_0^{pi/2} (\frac{Cos\theta}{2})^9 d\theta \qquad [9.7]$$

Where $\frac{\lambda_\infty}{\lambda_e}$ is defined below.

The Energy levels for the Bohr hydrogen atom is as follows.

$\frac{1}{\lambda_x} = R_\infty(\frac{1}{n_1^2} - \frac{1}{n_2^2})$ where $R_\infty = \frac{m_e q^4}{8\epsilon_0^2 h^3 c}$ and where $n_1$ and $n_2$ are any two different positive integers (1, 2, 3, ...), and $\lambda$ is the wavelength (in vacuum) of the emitted or absorbed light.

We will called $\lambda_\infty$ for the infinity orbital and $\lambda_e$ for the electron. It is not possible to measure these levels, but we can see if these wavelengths follow a pattern for the masses of particles.

It is proposed that the ratio of the mass of the proton to the neutron, and of course other particles is related to the ratio the energy levels of a similar process to the Bohr hydrogen, but at a deeper level. It is not expected that $R_\infty$ is not the same number for this deeper level, but this number does not need to be known since we will be taking ratios of the wavelengths and the $R_\infty$ ratio will become one. For the proton to neutron orbital energy ratio the following equation is proposed.

$$\frac{\lambda_\infty}{\lambda_e} = \frac{R_\infty(\frac{1}{n_{1e}^2} - \frac{1}{n_{2e}^2})}{R_\infty(\frac{1}{n_{1\infty}^2} - \frac{1}{n_{2\infty}^2})} \qquad [9.8]$$

The following values are substituted in. $n_{1e} = 3$, $n_e = 9$, $n_{1\infty} = 1$, $n_{2\infty} = \infty$ which yields

$$\frac{\lambda_\infty}{\lambda_e} = \frac{R_\infty(\frac{1}{3^2} - \frac{1}{9^2})}{R_\infty(\frac{1}{1^2} - \frac{1}{\infty^2})} = \frac{8}{81} \qquad [9.9]$$

Whatever the value of, $R_\infty$, at the next level of dimensions, it cancels with the ratio in equations 9.8 and 9.9

Equation 9.7 becomes Equation 9.10 with the equation 9.9 substitution

$$\frac{Mp}{Mn}(\beta^2)(1-\beta^2)\frac{3^{0.5}}{2} = \frac{8}{81}\int_0^{pi/2}(\frac{Cos\theta}{2})^9 d\theta \qquad [9.10]$$

This equation yields the following possible values for $\beta^2$

$\beta^2 = 0.000090644486771358 \, and \, 0.999909355132288474$

Additionally there may be a relativistic affect from the proton as follows.

$$\frac{1}{(1-(\frac{\pi * Py}{12^{0.5}})^2)^{0.5}} = \alpha = 1.00000077922996619330 \qquad [9.10.1]$$

If we take the first value of $\beta^2 = 0.000090644486771358$ and and multiply by 6 and $\alpha$

$$\frac{Me}{Mn} = 6 * \beta^2 * \alpha = 6 * 0.000090644486771 * 1.0000007792299 = 0.00054386734442 \qquad [9.11]$$

3.3 Proton Electron Mass Ratio

The Proton Electron Mass Ratio is calculated from

$$\frac{Mp}{Mn} = px*\alpha = 0.998623461644084*1.000000017097 = 0.99862347871 \quad [11.1]$$

And

$$\frac{Me}{Mn} = 6*\beta^2*\alpha = 6*0.000090644486771*1.0000007792299 = 0.00054386734442 \quad [9.11]$$

Defined in sections 3.1 and 3.2 above respectively.

$$\frac{Mp}{Me} = 1836.15267393$$

3.4 Muon Neutron Mass Ratio and Tau Neutron Mass Ratio

Let's propose that the value p is a ratio. Here we show that $p$ may be the ratio of the mass of the electron to the neutron. Let's propose that this ratio may come about by calculating the ratio of the Bremsstrahlung type radiation of the Electron to the Neutron. It is called Bremsstrahlung type radiation since it would be a radiation of photons that are absorbed back into the nucleons which would actually not get emitted outside of the constituent particles. If we look at the most established for Bremsstrahlung Radiation, we have the following.

$$P = \frac{q^2\gamma^6}{6\pi\epsilon c}(\dot{\beta}^2*(1-\beta^2)-(\vec{\beta}\times\dot{\vec{\beta}})^2) \quad [9]$$

If we look at the case where the acceleration is parallel with the velocity, then

$$P_{parallel} = \frac{q^2\gamma^6}{6\pi\epsilon c}\dot{\beta}^2_{parallel} \quad [9.1]$$

When we divide Equation 9 by Equation 9.1 we obtain

$$\frac{P}{P_{parallel}} = \frac{\dot{\beta}^2*(1-\beta^2)-(\vec{\beta}\times\dot{\vec{\beta}})^2}{\dot{\beta}^2_{parallel}} \quad [9.2]$$

Lets propose that this equation contains some special situations.

1) For $\dot{\beta}^2$ is equal to $\frac{\frac{Mp}{Mn}\beta^2}{2}$ for exponential deceleration.

2) $\dot{\beta}^2_{parallel} = 1$ [9.3]

3) $(\vec{\beta}\times\dot{\vec{\beta}}) = 0$ [9.4]

4)

Then equation 9.2 becomes the following

$$\frac{P}{P_{parallel}} = \frac{Mp}{Mn}\frac{(\beta^2)(1-\beta^2)}{2} \qquad [9.5]$$

We can then set this equal to the something similar to Cherenkov Radiation through 9 dimensions as proposed below.

We can then change the following equation

$$p(1-p) = \int_0^{pi/2} (\frac{Cos\theta}{2})^9 d\theta \qquad [5]$$

to

$$\frac{Mp}{Mn}\frac{(\beta^2)(1-\beta^2)}{2} = \int_0^{pi/2} (\frac{Cos\theta}{2})^9 d\theta \qquad [9.6]$$

It is possible that there are other factors. We could multiply the left hand side of the equation to an orbital energy level as shown in equation 11

$$\frac{Mp}{Mn}\frac{(\beta^2)(1-\beta^2)}{2} = \frac{\lambda_\infty}{\lambda_{muontau}}\int_0^{pi/2} (\frac{Cos\theta}{2})^9 d\theta \qquad [9.7]$$

Where $\frac{\lambda_\infty}{\lambda_{muontau}}$ is defined below.

The Energy levels for the Bohr hydrogen atom is as follows.

$\frac{1}{\lambda_x} = R_\infty(\frac{1}{n_1^2} - \frac{1}{n_2^2})$ where $R_\infty = \frac{m_e q^4}{8\epsilon_0^2 h^3 c}$ and where $n_1$ and $n_2$ are any two different positive integers (1, 2, 3, ...), and $\lambda$ is the wavelength (in vacuum) of the emitted or absorbed light.

We will called $\lambda_\infty$ for the infinity orbital and $\lambda_{muontau}$ for the muontau. It is not possible to measure these levels, but we can see if these wavelengths follow a pattern for the masses of particles.

It is proposed that the ratio of the mass of the muon and tau particle to the neutron, and of course other particles is related to the ratio the energy levels of a similar process to the Bohr hydrogen, but at a deeper level. It is not expected that $R_\infty$ is not the same number for this deeper level, but this number does not need to be known since we will be taking ratios of the wavelengths and the $R_\infty$ ratio will become one. For the muon and tau to neutron orbital energy ratio the following equation is proposed.

$$\frac{\lambda_\infty}{\lambda_{muontau}} = \frac{R_\infty(\frac{1}{n_{1muontau}^2} - \frac{1}{n_{2muontau}^2})}{R_\infty(\frac{1}{n_{1\infty}^2} - \frac{1}{n_{2\infty}^2})} \quad [9.8]$$

The following values are substituted in. $n_{1muontau} = 2$, $n_{2muontau} = 4$, $n_{1\infty} = 1$, $n_{2\infty} = \infty$ which yields

$$\frac{\lambda_\infty}{\lambda_{muontau}} = \frac{R_\infty(\frac{1}{2^2} - \frac{1}{4^2})}{R_\infty(\frac{1}{1^2} - \frac{1}{\infty^2})} = \frac{3}{16} \quad [9.9]$$

Whatever the value of, $R_\infty$, at the next level of dimensions, it cancels with the ratio in equations 9.8 and 9.9

Equation 9.7 becomes Equation 9.10 with the equation 9.9 substitution

$$\frac{Mp}{Mn}\frac{(\beta^2)(1-\beta^2)}{2} = \frac{3}{16}\int_0^{pi/2}(\frac{Cos\theta}{2})^9 d\theta \quad [9.10]$$

This equation yields the following possible values for $\beta^2$

$\beta^2 = MTy = 0.000298118170815717 and MTx = 0.99970188182918$ If we take the first value

It appears from the following equations that the mass of the muon and tau is due to a combination of resonance from the proton resonance solution and from the muon tau resonance solution.

The relativistic correction

$$Lm = \frac{1}{\sqrt{1-(\frac{\pi MTy}{9})^2}} = 1.0000000054. \quad [9.11]$$

Equation for Muon-Neutron Mass ratio

Equation 9.12

Muon Neutron Mass Ratio

$$\frac{Mu}{Mn} = 1 - Lm * Px + \frac{MTx}{9} = 1 - 1.0000000054 * 0.998623461644084 + \frac{0.99970188182917}{9} = .1124545198$$

Tau Neutron Mass Ratio

Equation for Tauon-Neutron Mass ratio

$$\frac{Mt}{Mn} = (2*(1 - Lm * Px) + \frac{17 * MTx}{9} = 2*(1 - 1.0000000054 * 0.998623461644084) + \frac{17 * 0.99970188182917}{9}$$

$\frac{Mt}{Mn} = 1.8910789$ Within one sigma of Codata 1.89111 and within0.99998

3.5 Inverse Sommerfeld Fine-Structure Constant

In Evidence for Granulated, Granular Topological Spacetime the following equation is developed for the fine structure constant (3)

$$\sigma = \frac{1}{\sqrt{1-(\frac{\pi Me}{3*3Mn})^2}} T\pi^3 \frac{Me}{4Mn} \qquad [4.1]$$

Where $\frac{1}{\sqrt{1-(\frac{\pi Me}{3*3Mn})^2}}$ is a Lorentz correction factor where the mass and velocity over the speed of light are related.

Where

$$T^2 = (\frac{Mp-Me}{Mn})^2 + (\frac{Mn}{Mn})^2 + (\frac{Mn}{Mn})^2]. \qquad [2.1]$$

$$T^2 = 2.99616291064$$

$$T = 1.73094278087$$

$$\sigma = \frac{1}{\sqrt{1-(\frac{\pi Me}{3*3Mn})^2}} T\pi^3 \frac{Me}{4Mn} \qquad [4.1]$$

If we use the values for the mass ratio of the proton to the neutron in section 3.1 above, 0.99862347871 and the mass ratio of the electron to the neutron in section 3.2 above, of 0.00054386734442 and plug it into equations 2.1 and 4.1 above, we obtain the following value for the dimensionless Sommerfeld Fine-Structure constant

$$\sigma^{-1} = 1.00000001802066067/(1.73094278087 * pi^3 * 0.00054386734442/4)$$
$$\sigma^{-1} = 137.035999098$$

3.6 von Klitzing Constant

The following equation was developed in “Evidence for Granulated, Granular Topological Spacetime”(1),

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

Where

$$T^2 = (\frac{Mp - Me}{Mn})^2 + (\frac{Mn}{Mn})^2 + (\frac{Mn}{Mn})^2 \qquad [2.1]$$

and

$$\beta = \frac{1}{\sqrt{1-(\frac{\pi Me}{3*3Mn})^2}} = 1.00000001802066067 \qquad [2.2]$$

If we rearrange this equation for $\frac{h}{q^2}$ the von Klitzing constant we obtain the following.

$$\frac{h}{q^2} = \frac{2Mn}{\beta Me*T\pi^3 c\grave{o}} \qquad [3]$$

If we use the values for “T” and “ $\frac{Me}{Mn}$ determined in “Prediction for the Sommerfeld Fine-Structure"(2) and the CODATA values for c, the speed of light, and $\grave{o}$, the vacuum dielectric permittivity.

These values are shown below.

$$T^2 = (\frac{Mp - Me}{Mn})^2 + (\frac{Mn}{Mn})^2 + (\frac{Mn}{Mn})^2 \qquad [2.1]$$

$$T^2 = 2.99616291064$$

$$T = 1.73094278087$$

$$\frac{M_p}{M_n} = 0.99862347871$$

$$\frac{Me}{Mn} = 5.4386734442*10^{-4}$$

$$c = 299792458\frac{m}{s}$$

$$\grave{o} = 8.85418781762*10^{-12}\frac{F}{m}$$

Which yields a value for equation 3, the von Klitzing constant of

$$\frac{h}{q^2} = 25812.80744794 ohms$$

## 4.0 Discussion of Results

Section 4 discusses the common elements of the results.

### 4.1 Lorentz Factor commonality

The calculations for the Proton Neutron mass ratio, Electron Neutron mass ratio, Muon Neutron mass ratio, Tau Neutron mass ratio, and the Fine Structure constant all use a Lorentz Factor calculation. The Proton Electron mass ratio and the Von Klitzing constant are just combinations of other values determined in this paper. The Lorentz factors used are shown below.

Proton Neutron mass ratio Lorentz factor

$$\alpha = \frac{1}{\sqrt{1-(\frac{3^{0.5}\pi Me}{16Mn})^2}} = 1.000000017097$$

Electron Neutron mass ratio Lorentz factor

$$\alpha = \frac{1}{(1-(\frac{\pi * Py}{12^{0.5}})^2)^{0.5}} = 1.00000077922996619330$$

Muon Neutron and Tau Neutron mass ratio Lorentz factor

$$Lm = \frac{1}{\sqrt{1-(\frac{\pi MTy}{9})^2}} = 1.0000000054$$

Where

$$\frac{Mp}{Mn}\frac{(\beta^2)(1-\beta^2)}{2} = \frac{3}{16}\int_0^{pi/2}(\frac{Cos\theta}{2})^9 d\theta$$

and

$$\beta^2 = MTy = 0.000298118170815717 and MTx = 0.99970188182918$$

Fine Structure Constant Lorentz Factor

$$\alpha = \frac{1}{\sqrt{1-(\frac{\pi Me}{3*3Mn})^2}}$$

There a number of factors that are interesting about these Lorentz factors.

1) The Lorentz factors all have the value pi in the numerator. This would likely indicate something about the speed of light being related to pi. It also may indicate something about the structure of space-time. That travel may be in arcs in a granular universe.
2) The Lorentz factors are all like a mass ratio that takes the place of velocity over the speed of light in the Lorentz calculation. This may indicate that mass is related to a fraction of the speed of light.
3) For the fine structure constant and the mass ratio of the muon and tau the masses are all multiplied by pi/9. Seems unlikely to be a coincidence.
4) All of the Lorentz factors use numbers that could easily come from dimensional factors in crystalline like structures $2^{0.5}$, 2, 3, and pi. This seems unlikely to be mere coincidence.
5) Please note that the mass of the tau is not known accurately enough to verify the Lorentz factor for the tau particle.

There are a number of interesting relations of the mass ratios.

1) The mass of the electron, muon, and tau, and the fine structure constant are all related to the mass ratio of the proton to the neutron. Unlikely to be a coincidence. This would indicate that there are seen or unseen measureable and unmeasureable parts to the masses. Specifically, the electron and proton properties are in the protons, electron, muon, tau and many other particles and part of the fine structure constant.
2) All of the mass ratios have two parts to them, the resonance part and then the Lorentz factor. Further parts may be found in the future.

The Muon and Tau mass ratios to the Neutron.

There is a very interesting relationship of the masses of the muon and tau leptons. Both use the same equation. The only difference is that the muon has a component that is 1/9 and the tau has a component of 17/9. The author always noted the observation that the muon appeared to be about 1/9 of the mass of the neutron, while the tau appeared to be about 17/9. The difference was found to be that the muon has about one part difference between the proton and neutron and the tau has two parts difference between the proton and neutron mass. Very unlikely to be mere coincidence. This relationship was found as a total surprise by the author.

5.0 Partial explanation how particles mass ratios can be related to a Bremsstrahlung like radiation.

Let's propose that this ratio may come about by calculating the ratio of the Bremsstrahlung type radiation of the Proton to the Neutron. It is called Bremsstrahlung type radiation since it would be a radiation of photons that are absorbed back into the nucleons which would actually not get emitted outside of the nucleons. If we look at the most established for Bremsstrahlung Radiation, we have the following.

$$P = \frac{q^2\gamma^6}{6\pi\epsilon_0 c}(\dot{\beta}^2 * (1-\beta^2) - (\vec{\beta}\times\dot{\vec{\beta}})^2) \qquad [9]$$

If we look at the case where the acceleration is parallel with the velocity, then

$$P_{parallel} = \frac{q^2\gamma^6}{6\pi\epsilon_0 c}\dot{\beta}^2_{parallel} \qquad [9.1]$$

When we divide Equation 9 by Equation 9.1 we obtain

$$\frac{P}{P_{parallel}} = \frac{\dot{\beta}^2 * (1-\beta^2) - (\vec{\beta}\times\dot{\vec{\beta}})^2}{\dot{\beta}^2_{parallel}} \qquad [9.2]$$

Lets propose that this equation contains some special situations.

1) $\dot{\beta}^2$ is constant and is equal to $\frac{1}{\sqrt{3}}$
2) $\dot{\beta}^2_{parallel} = 1$
3) $(\vec{\beta}\times\dot{\vec{\beta}})^2 = 0$

So each particle mass ratio can be a relation of a Bremsstrahlung type of radiation to a parallel Bremsstrahlung radiation.

## 6.0 Conclusion

It appears the mass ratios of particles and the fine structure constant are related to a Cherenkov and Bremsstrahlung radiation. Likely these particles are a multitude of stable resonances. The empirical numbers seem to indicate a crystalline type of granular structure to space-time. Most probably cuboctahedron structure. They also indicate many resonances as the particles seem to be related to each other. The mass ratio of particles seem to be related to fractions of the speed of light. At least some of the particles seem to be related to orbitals like the electrons relationship to the proton. These equations are empirically derived, but it defies belief that these arrangements are or could be mere coincidence. It is the start of the derivation of a dimensionless granular universe.

The predictions of mass ratios, Sommerfeld fine-structure constant, and the von Klitzing Constant are given so that it is a verification of Michael John Sarnowski's Sphere Theory, Cuboctahedron Structure of the Universe Theory, and Bremsstrahlung Cherenkov Radiation type Resonances theory.

## 7.0 References

1) Prediction of the von Klitzing Constant http://vixra.org/pdf/1612.0355v3.pdf
2) Prediction of the Mass Ratio of the Proton to the Electron http://vixra.org/pdf/1612.0326v1.pdf
3) An Electro Magnetic Resonance in 9 Dimensions that gives Mass Ratio of Proton to Neutron http://vixra.org/pdf/1612.0302v2.pdf
4) Muon-Neutron and Tauon-Neutron Mass ratio Prediction http://vixra.org/pdf/1612.0122v1.pdf

5) An Electro Magnetic Resonance in 9 Dimensions that gives Mass Ratio of Electron to Neutron http://vixra.org/pdf/1612.0068v3.pdf
6) Prediction for the Dimensionless Sommerfeld Fine-Structure http://vixra.org/pdf/1611.0364v4.pdf
7) Evidence for Granulated, Granular Topological Spacetime http://vixra.org/pdf/1601.0234v3.pdf
8) http://physics.nist.gov/cuu/Constants/