1.0 Abstract

When a charged particle travels faster than light it emits Cherenkov radiation. When a charged particle is accelerated it emits radiation called Bremsstrahlung radiation. Inside a proton are the many configurations of the nucleons. It is proposed here, and likely proposed by others that there may be some equivalent process that there is a constant acceleration of charged particles or superluminal movement of charged particles that causes the mass of the proton or other particles.

In the case of the mass ratio of the proton to the neutron, the possible form of the equation was found first. This paper is an attempt of an explanation and derivation for the equation that very closely, within the known Codata 2014 mass ratio of the proton to the neutron, gives the mass ratio of the proton to the neutron. An equation is developed below that uses the coupling dependence and Cherenkov radiation angles summing the radiation angles from $-\dfrac{pi}{2}$ to $\dfrac{pi}{2}$ angles and integrating through what may appear to be multiple levels of dimensions. This equation then uses a component of Bremsstrahlung radiation and proposes that there may be some relationship to both Bremsstrahlung radiation and Cherenkov type radiation within the nucleons that causes some type of resonance that stabilizes the masses of the fundamental particles. This resonance is demonstrated for a proton.

2.0 Equations

In an MIT course the Cherenkov radiation satisfied both a resonance and dispersion relation (1)

This is the following equation in their analysis.

$$Cos\theta = \frac{1}{v\beta} \qquad\qquad\qquad\qquad [1]$$

Where θ is the possible emission solution angles, v is relative permittivity, and β is velocity divided by the speed of light. If $v = 1$, which is a possibility inside the nucleons.

$$Cos\theta = \frac{1}{\beta} \qquad\qquad\qquad\qquad [2]$$

Note: In this case the velocity is greater than the speed of light. This is true of Cherenkov radiation.

If we look at the following google book (2) and equation 232 we find that θ must be divided by two to keep the sum of the angular momentums equal. Therefore we have

$$\frac{Cos\theta}{2} = \text{Possible emission solution angles.} \qquad\qquad [3]$$

If we integrate the possible emission solution angles $\dfrac{Cos\theta}{2}$ from $\dfrac{-\pi}{2}$ to $\dfrac{\pi}{2}$ but do this as the Cherenkov type radiation of the nucleons goes through 9 physical dimensions we than have the following equation.

$$\int_{-pi/2}^{pi/2}(\frac{Cos\theta}{2})^9 d\theta \qquad\qquad [4]$$

If we look at the most established relativistic formula for total radiated power for Bremmstralung radiation it is given by[11]

$$P = \frac{q^2\gamma^6}{6\pi\varepsilon_0 c}\left(\dot{\beta}^2\left(1-\beta^2\right)-(\vec{\beta}\times\dot{\vec{\beta}})^2\right). \qquad\qquad [4.1]$$

When we look at this equation 4.1, the $\beta^2(1-\beta^2)$ looks similar to the $p(1-p)$ that the author found in the relationship defined in equation 5 below. It should be noted that $\beta = \dfrac{v}{c}$ where v is the velocity of a particle and c is the speed of light. In the discussion section of this paper we will later explore the idea that

$$p = \beta^2 = \frac{v^2}{c^2} \qquad\qquad [4.2]$$

If we set equation 4 equal to $\dfrac{2p(1-p)}{\sqrt{3}}$ we obtain the following

$$\frac{2p(1-p)}{\sqrt{3}} = \int_{-pi/2}^{pi/2}(\frac{Cos\theta}{2})^9 d\theta \qquad\qquad [5]$$

We can substitute equation 4.2 into equation 5 and obtain the following.

$$\frac{2\beta^2(1-\beta^2)}{\sqrt{3}} = \int_{-pi/2}^{pi/2}(\frac{Cos\theta}{2})^9 d\theta \qquad\qquad [5.1]$$

Or

$$\frac{2\dfrac{v^2}{c^2}(1-\dfrac{v^2}{c^2})}{\sqrt{3}} = \int_{-pi/2}^{pi/2}(\frac{Cos\theta}{2})^9 d\theta . \qquad\qquad [5.2]$$

It is not known if the equation could be like this.

$$\frac{2\frac{v^{12}}{c^{12}}(1-\frac{v^{12}}{c^{12}})}{\sqrt{3}} = \int_{-pi/2}^{pi/2}(\frac{Cos\theta}{2})^9 d\theta \qquad [5.3]$$

One could make the substitution of

$$p = \beta^{12} = \frac{v^{12}}{c^{12}} \qquad [5.4]$$

This would be the equivalent of having 24 physical dimensions on the left and 9 physical dimensions on the right of Equation 5.3. This would be similar to the 24 physical dimensions of some string theories and 9 physical dimensions of other string theories.

It is not known why setting equation [4] should be set equal to $\frac{2p(1-p)}{\sqrt{3}}$. The value of

$\frac{2}{\sqrt{3}}$ could be due to the Cherenkov nucleon type radiation going through a

cuboctahedron angles of 60 degrees or the summing of 3 equal spins in the x, y, and z direction like the intrinsic angular momentum of the electron. Regardless the value of p yields two values which are called px and py as shown below.

px=0.998623461644, py=0.001376538356

The value of px=0.998623461644, is very close to the ratio of the mass of the proton over the mass of the neutron. Which is equation [6] below.
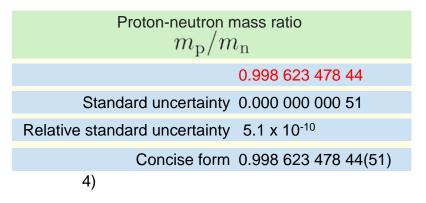
$$\frac{Mp}{Mn} = 0.998623478023 \qquad [6]$$

The following equations of 7 and 8 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 [7] appears to be a variation of the Lorentz factor.

$$\alpha = \frac{1}{\sqrt{1-(\frac{Me}{3Mn})^2}} = 1.00000001645 \qquad [7]$$

$$\frac{Mp}{Mn} = px*\alpha = 0.998623461644084 *1.00000001645 = 0.998623478023 \qquad [8]$$

$$\frac{Mp}{Mn} = 0.998623478023 \qquad [6]$$

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

Proton-neutron mass ratio $m_{\mathrm{p}}/m_{\mathrm{n}}$
0.998 623 478 44
Standard uncertainty 0.000 000 000 51
Relative standard uncertainty   5.1 x 10^{-10}
Concise form 0.998 623 478 44(51)

4)

3.)   Discussion

We see that Cherenkov type of radiation from the nucleons could offer some explanation for the mass of the proton. We also see that the equation use of integrating radiation angles to the ninth power, which may be an indication of the 9 physical dimension of string theory. More work needs to be done to determine why this particular equation for the proton neutron mass ratio and can this type of equation be applied to other particles of mass.

We also see from Equation 4.2, $p = \beta^2 = \dfrac{v^2}{c^2}$, and if we change equation 5 into equation 5.1 and 5.2

$$\frac{2\beta^2(1-\beta^2)}{\sqrt{3}} = \int_{-pi/2}^{pi/2} (\frac{Cos\theta}{2})^9 d\theta \qquad [5.1]$$

Or

$$\frac{2\frac{v^2}{c^2}(1-\frac{v^2}{c^2})}{\sqrt{3}} = \int_{-pi/2}^{pi/2} (\frac{Cos\theta}{2})^9 d\theta \qquad [5.2]$$

Equation 5.1 and 5.2 show that there could be some relationship between Cherenkov radiation to Bremsstrahlung radiation when calculating the mass ratio of the mass ratio of the proton to the neutron. It is also interesting to note that the ratio would be equivalent to some type of ratio of velocity of a particle squared to the speed of light squared.

This relationship isn't proven, but the relationship seems to be more than mere coincidence. It seems to be a start to finding the causes for the mass relationships of particles.

Brian Greene states in "The Elegant Universe". Page 203 (10), "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 "Evidence for Granulated Space" (8) Equation 2, 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." (9)

In the following quote it is indicated that vibrating strings at certain resonances could account for forces and masses.

The basic idea behind **String Theory** is that all of the different "fundamental particles" of the Standard Model are really just different versions of one basic object: - a vibrating oscillating string. Ordinarily an electron is pictured as a point with no internal structure. A point cannot do anything but move. But, if string theory is correct, then under an extremely "powerful microscope" (way beyond today's capabilities) we would realize that the electron is not really a point, but a tiny loop of vibrating string (sometimes called a filament). A string can do somethings besides move - it can oscillate in different ways. If it oscillates one way, then from a distance we see an electron and we are unable to tell it is really a string. But if it oscillates some other way, we call it a photon, or a quark, and so forth. If **String Theory** is correct, the entire universe is made of oscillating strings. See the illustration at the left showing some strings that might make up a quark.[12]

In Sarnowski's Sphere Theory it is not strings, but rotating spheres and imperfections that may be creating these stable resonances that give properties to our universe. This paper doesn't show the universe is granulated, but does show it is possible that Cherenkov type radiation and Bremsstrahlung radiation in the nucleon, could help account for the particular mass of particles.

References

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3) http://physics.nist.gov/cgi-bin/cuu/Value?alphinv

4) http://physics.nist.gov/cgi-bin/cuu/Value?mpsmn

5) http://physics.nist.gov/cgi-bin/cuu/Value?mesmn|search_for=electron-neutron

6) http://physics.nist.gov/cgi-bin/cuu/Value?mmusmn

7) http://physics.nist.gov/cgi-bin/cuu/Value?mtausmn|search_for=tau+neutron

8) http://vixra.org/pdf/1601.0234v1.pdf

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11) *A Plasma Formulary for Physics, Technology, and Astrophysics*, D. Diver, pp. 46–48.

12) http://www.particlecentral.com/strings_page.html