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HYPOTHESIS

The Neutron Hypothesis: Derivation of the Mass of the Proton From the Frequency Equivalents of a Neutron, Electron, Bohr Radius, and Ionization Energy of Hydrogen

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Abstract: The mass of a proton is an important fundamental constant, but a logical rational for its mass is unknown. This paper demonstrates a method to accurately and logically derive the frequency equivalent of the mass of a proton, v_p, from frequency equivalents of the masses of a neutron and electron, the Bohr radius, and the ionization energy of hydrogen. The hypothesis is that the fundamental constants are all related to annihilation frequency of the neutron (v_n) which is the fundamental frequency. The hypothesis states that the fundamental constants must be related to simple linear relationships on the ln ln planes based solely on the slopes and intercepts of two lines related to hydrogen, the weak kinetic line (electron, and Bohr radius), and the electromagnetic line (Planck constant, and ionization energy of hydrogen). The mass of the proton can be derived by subtracting the components lost in the beta decay process from v_n. Each n is a principal quantum number and associated with at least one fundamental constant including the primes: 7, electron, 5, Bohr radius, 3, ionization energy, and 2, neutrino. The total kinetic energy lost in the beta decay process is related to the other principal quantum numbers which are not primes including 4, 6, and 8. There is a 2nd factor related to the principal quantum number 5 utilizing all of the slopes and intercepts of the two hydrogen lines. v_n minus the sum of these lost frequency equivalents is $2.26873187 \times 10^{23}$ Hz. v_p is $2.26873183 \times 10^{23}$ Hz. The relative error is 2×10^{-8}. The derived mass equivalent of a proton is $1.67262166 \times 10^{-27}$ kg. The relative error is 2×10^{-8}. The known proton mass is $1.6726216 \times 10^{-27}$ kg. The known relative error is 5×10^{-8} kg.

Keywords: neutron, proton, quantum physics, fundamental constant, unified physics model

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Introduction

The mass of a proton, p, is an important fundamental constant. A logical quantum rationale for the origin of its mass is unknown. Understanding the origin of the mass of a proton is therefore very important in a unified physics model. It is question that has not been asked since there seems to be no possible answer. Some of the neutron beta decay components that are known include: the mass of the electron, e, and the ionization energy of hydrogen or the Rydberg constant, R. The Bohr radius, a_0, can be derived. The kinetic energy lost in the neutron beta decay process cannot be completely directly measured or indirectly derived. This includes the kinetic and radiation energy of the electron, proton, and the anti neutrino. These factors cannot be measured during the decay process, but the final mass of the proton is known. There is a very specific total amount of matter/energy lost. Predicting the total lost component including the energy is a significant advance in physics.

This paper demonstrates a method to accurately and logically derive the frequency equivalent of the mass of a proton, v_p, from frequency equivalents of the masses of a neutron, v_n, and electron, v_e, the Bohr radius, v_{a0}, and the ionization energy of hydrogen or the Rydberg constant, v_R. All of the calculations are done in ratios or normalized frequency equivalent units of Hz. The neutron hypothesis has been successful in demonstrating the relationship of principal quantum numbers to many particles, and bosons.[1] The hypothesis is that the fundamental constants are all related to v_n which represents the fundamental frequency. The degenerate values of many physical constants as frequency equivalents including properties of hydrogen are related to degenerate exponent values of v_ns Hz related to 1 ± 1/n (quantum fractions, qf) where n is a consecutive integer series from 1 to ∞, equation (1). Each n is a principal quantum number and associated with at least one fundamental constant including: 1, a proton or neutron, 7, an electron, 5, the Bohr radius, 3, the ionization energy, 2, the neutrino. The known exponent value, exp_k, is calculated from equation (2), the exponent domain. Equation (3) is the inverse function, the frequency domain. Each entity is plotted on a ln ln plane where the x component is related to the qf-1 and the y component is δ, the difference of the known exponent (exp_k) and the qf equation (4).

$$v_k \approx v_n s^{1\pm 1/n} Hz \tag{1}$$

$$\exp_k = \frac{\log v_k}{\log v_n s} \tag{2}$$

$$v_k = v_n s^{\exp_k} \tag{3}$$

$$\delta = \exp_k - qf \tag{4}$$

The hypothesis states that the fundamental constants must be related to simple linear relationships on the ln ln plane based solely on the slopes and intercepts of two lines related to hydrogen, the weak kinetic, wk, line (electron, and Bohr radius), equation (5), and the electromagnetic, em, line (Planck constant, and ionization energy of hydrogen), equation (6), Figure (1), Table (1).

$$y_{wk} = \delta_{wk} = 3.000365472*10^{-3}(\text{qf}-1) + 3.516383487*10^{-3} \tag{5}$$

$$y_{em} = \delta_{em} = -3.451683629*10^{-3}(\text{qf}-1) - 3.451683629*10^{-3} \tag{6}$$

The mass of the proton can be derived by subtracting the lost components of the beta decay process from v_n. The known components principal quantum numbers are related to the electron, 7, Bohr radius, 5, and the ionization energy, 3. It is logically theorized that the neutrino is related to 2 based on its mass derived from the wk line. These are all primes and logically related to unique specific physical entities.

The total kinetic energy lost in the beta decay process is logically theorized to be related to the other principal quantum numbers which are not primes including 4, 6, and 8 on the weak kinetic line as well. Finally it is known that in quantum mechanics a rotation of 720° is essential for complete translation so a 2nd factor related to the principal quantum number 5 utilizing all of the slopes and intercepts of the two hydrogen lines is used to derive this 2nd value. The principal quantum number 5 is related to the Bohr radius and therefore related rotation and configuration in space. The sum of these known and derived frequency equivalents will be shown to equal

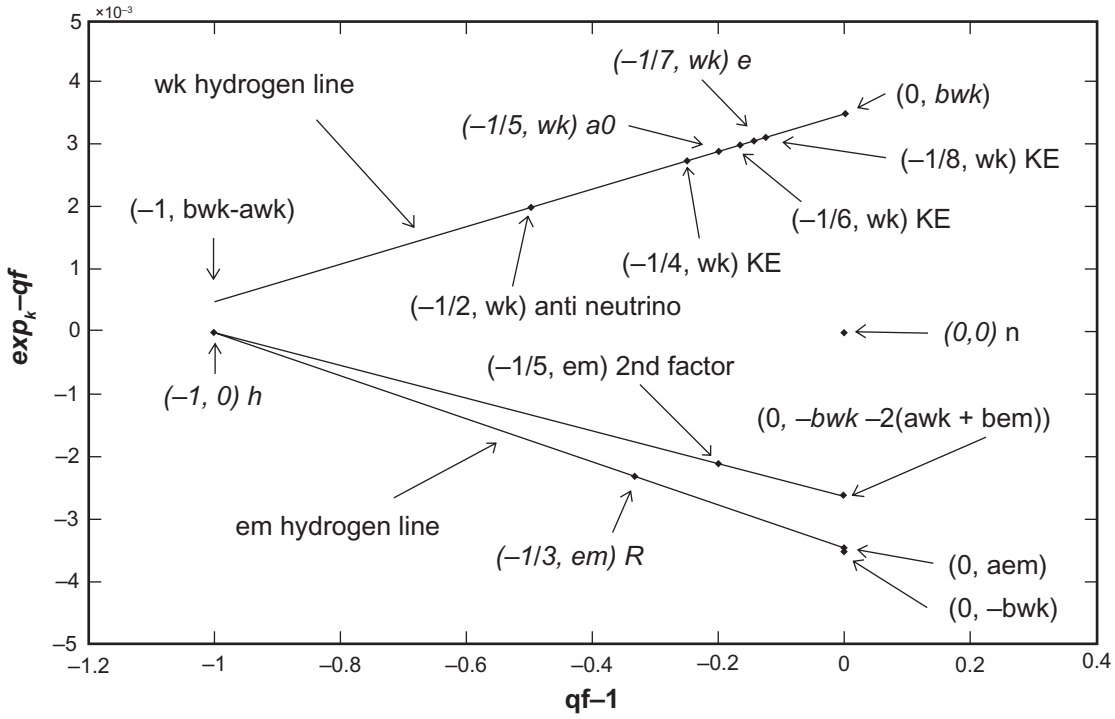

Figure 1. Plots the z points related to the derivation of v_p. The known values are italic. The 1/n value and the associated hydrogen line for the z points are shown. The other points related to the slopes and intercepts are also shown. The neutron (0, 0) and Planck's constants (–1, 0) z points are defined by their definition. The z points for hydrogen are labeled. These include the wk line and the em line. z points used in the derivation include, (0, –bwk), and (0, –bwk –2(awk + bem)). The z point for the last known 2nd factor related to principal quantum number 5 is also labeled. Note that the line connecting z point (–1, 0), and (0, –bwk –2(awk + bem)) intersects with the known 2nd factor related to principal quantum number 5 z point.

to the difference between v_n and v_p supporting the hypothesis (Table 1).

Materials and Methods

All of the fundamental constants are converted to frequency equivalents. The masses are converted by multiplying by c^2 (speed of light squared) then dividing by h (Planck constant). The distances are converted by dividing the wavelength into c. Energies are converted by dividing by h. The sum of all of the lost components of beta decay will be subtracted from v_n to derive v_p.

All of the data for the fundamental constants is from website: http://physics.nist.gov/cuu/Constants/.

A previous work has demonstrated the transformation of the properties of hydrogen to the ln ln plane as specific z points.[1] Since the exponent base $v_n s$ ratio of the v_k and v_n are utilized as dimensionless coupling constants the neutron is plotted at the (0, 0) z point, equation (7). Planck's constant by definition

Table 1. List of the known and derived values used in the derivation of v_p.

Constant	#	qf	v_k* or v calculated Hz	exp_k* or exp calculated	δ* or calculated
Neutron	∞	1	2.2718590×10^{23}*	1*	0*
Proton	39043	39043/39044	2.2687317×10^{23}*	0.9999743869*	$-2.561304433 \times 10^{-5}$*
Kinetic energy	8	7/8	$1.618728475 \times 10^{20}$	0.8781413378	$3.141337803 \times 10^{-3}$
Electron	7	6/7	1.2355899×10^{20}*	0.8602306177*	$3.087759848 \times 10^{-3}$*
Kinetic energy	6	5/6	$1.71029704 \times 10^{19}$	0.8363496559	$3.016322575 \times 10^{-3}$
2nd factor	5	4/5	4.3322666×10^{18}	0.7979281920	$-2.071807952 \times 10^{-3}$
Bohr radius	5	4/5	5.6652564×10^{18}*	0.8029163111*	$2.916311156 \times 10^{-3}$*
Kinetic energy	4	3/4	$1.909266808 \times 10^{17}$	0.7527662921	$2.766292119 \times 10^{-3}$
Rydberg	3	2/3	$3.28984196 \times 10^{15}$*	0.6643655448*	$-2.301122419 \times 10^{-3}$*
Neutrino	2	1/2	$2.656145456 \times 10^{11}$	0.502016200	$2.01620075 \times 10^{-3}$

is at the −1, 0 point. The neutron is plotted at the (0, 0) z point. The x axis values are plotted at the only possible ±1/n values. These are associated with the gf values of 1 ± 1/n. The exp_k −qf difference is the y axis value δ, equation (4).

$$v_n s^{\exp_k - 1} = \frac{v_k}{v_n} \tag{7}$$

There are two hydrogen lines used in previous derivations are the same values are utilized in this method as well (Fig. 1). One line is related to the z points for the Bohr radius and the mass of a electron, the weak kinetic, *wk*, line. This term is used since it is related to weak entities such Z, and tau. It is assumed that the kinetic components of beta decay are also related to this line. The other line is related to Planck's constant and the ionization of hydrogen. This is referred to the electromagnetic line, *em*, since it is related to electromagnetic properties such as charge, pions, and quarks. These slopes and intercepts are logically assumed to be fundamental and related to other constants.

The known components lost in the neutron beta decay process are the mass of an electron, the Bohr radius, and ionization energy of hydrogen. These frequency equivalent values are listed in Table 1.

The electron anti neutrino (v_e) is assumed to be related to the principal quantum number 2. It is assumed to be on the wk line at the qf value of ½. The frequency equivalent is $2.656145456 \times 10^{11}$ Hz. Its mass is calculated to be $1.9582421 \times 10^{-39}$ kg. This is within the range of the known neutrino mass, and is another prime principal quantum number.[2] The estimated mass/energy equivalent is not well established. It is estimated to be approximately 1.5 eV or 3.6×10^{14} Hz. This value is not really relevant to the proton mass calculation since it is so small, but is of interest related to completing the principal quantum number series of the model.

The kinetic frequency equivalents lost are assumed to be related to ½ of the values of principal quantum numbers 4, 6, and 8 on the wk line. The factor ½ is because they are kinetic energies. These values are shown in Table 1 and Figure 1.

The sum of the kinetic values, 4, 6, 8 and the known lost frequency values is equal to $3.083942887 \times 10^{20}$ Hz. The known difference between the proton and neutron is $3.12726555 \times 10^{20}$ Hz. The difference between these two values is $4.33226662 \times 10^{18}$ Hz. This last lost component is referred to as the 2nd factor related to principal quantum number 5. It is nearly equal to the Bohr radius frequency equivalent. The exp_k is 0.7979281920. The calculated δ equals $-2.071807952 \times 10^{-3}$. This z point is plotted on the ln ln plane in Figure 1. The δ z point for the 2nd factor component is seen at x axis −1/5. The δ is negative since the frequency equivalent is less than $v_n s$ raised to the qf, 4/5.

This z point value can be derived utilizing the assumption that there are two needed rotations in a quantum transformation. This is speculation though. Since the Bohr radius is related to rotation the quantum number 5 is logical. Also since there are two rotations the square or two times the slopes and intercepts of the hydrogen line values should be utilized. Figure 1 shows the two hydrogen lines and other pertinent points used in the derivation. The line connecting z point for Planck's constant at (−1, 0) and the z point (0, $-bwk - 2(awk + bem)$) intersects the vertical −1/5 line at $-2.090997738 \times 10^{-3}$ equation (8). The frequency equivalent is 4.3277979×10^{18} Hz.

$$y = (-2.6137471 \times 10^{-3}) * (qf - 1) - 2.6137471 \times 10^{-3} \tag{8}$$

The sum of the known and derived frequency equivalents of neutron beta decay equals $3.127220866 \times 10^{20}$ Hz. v_n minus this total value is the derived frequency of the proton, 2.2687318×10^{23}. The known v_p is 2.2687317×10^{23}. The relative error is 2×10^{-8}. The known relative error is 5×10^{-8}. The derived exponent for the proton is 0.9999743873. The exp_k for the proton is 0.9999743869. The relative error is 3.7×10^{-10}. The derived mass equivalent is $1.67262166 \times 10^{-27}$ kg. The relative error is 2×10^{-8}. The known proton mass is $1.6726216 \times 10^{-27}$ kg, known relative error, 5×10^{-8}.

Discussion

There is no model or hypothesis to predict the mass of a proton. It is related to a very complicated beta decay process where there are many transformations

including: matter to kinetic energy, radiation energy, bosons, matter, and quarks. The neutron hypothesis logically and accurately does answer this mystery. Each lost component is related to a specific consecutive integer 2–8. All of the components lost in the beta decay process are logical. The constant entities include the neutrino, ionization energy, Bohr radius, and an electron. These are all related to prime principal numbers. This is logical since the primes are unique numbers and should have unique physical manifestations as well in a model based on their inherent significance as numbers. The non primes 4, 6, and 8 should not be related to a unique physical entity, and logically are related to a non specific process of lost kinetic energy. This is equally logical.

The neutron hypothesis states that simple combinations of the slopes and intercepts of the hydrogen lines should be related to other relevant physical constants. This derivation supports that hypothesis. It is also logical that all of the slopes and intercepts combined are utilized in this specific derivation. It is logical that it should be related to two times these values. This may be due to the unique quantum mechanics fact that a rotation of 360° does not return a transformed quantum entity to its original state, but 720°. There are many transformation of matter in the beta decay process and this added value is probably related to the intricacies of this complex process.

This derivation supports the neutron hypothesis by adding multiple logical theoretical z points that are also physically relevant and accurate predictors. These principal quantum numbers are 2, 4, 6, and 8. This extends the total number from the previous work.[1] Since the mass of the proton is known its derivation is not "needed" for many calculations. The derivation of this important fundamental constant does add great insight into the numerical structure that defines the fundamental constants similar to the derivation of the electron g- spin factor.

Disclosures

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