The Neutron Magnetic Moment
# Derived from a Speculative Model

Eric Louis Beaubien
X @el_beaubien
Oct. 17, 2025

Abstract

This article quantifies the known measured magnetic moment of the neutron corrected from a previous article. My original neutron viXra article (2507.0122) gave the exact numbers for the neutron mass and its Compton wavelength derived from NIST constants (codata 2022), but the magnetic moment it generated was incorrect. Herein that measure is corrected through a re-imagining of the electron's magnetic field. This solution yields the correct magnetic moment while retaining the previous neutron mass and Compton wavelength calculations.

———

$$\frac{M_p}{\sqrt{1-v_p^2}} + \frac{m_e}{\sqrt{1-v_e^2}} = \text{Neutron rest mass}$$

$$\frac{M_p}{\sqrt{1-v_p^2}} \Big/ \frac{m_e}{\sqrt{1-v_e^2}} = \frac{v_e}{v_p} = \frac{r_e}{r_p}$$
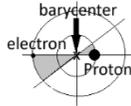
In my previous article (2507.0122), the known mass of the neutron was generated from the theory that the neutron is an orbital construct of an electron and proton moving at large fractions of the speed of light. For purpose of calculating that neutron magnetic moment the following constraints must be kept … $r_e/r_p = V_e/V_p = \gamma m_p/\gamma m_e$ … as a strict basic requirement for any such calculation. From that article, we obtained the electron velocity V_e relative to V_p. The neutron's Compton wavelength (1.31959090382e-15) was shown to be the only value found through iterative estimates consistent with the standard constants and the requirement that $\gamma m_p + \gamma m_e$ be the neutron mass … accompanying that Compton wavelength.

Equation #1 $v_e = \sqrt{1/(\beta^2/v_r^2 - \beta^2 + 1)}$

Equation #2

$$r_e = \frac{2.817940320459489e\text{-}15}{(v_e+v_p)^2\ \gamma_e} \qquad r_p = \frac{1.5346982640656338e\text{-}18}{(v_e+v_p)^2\ \gamma_p}$$

We then made a second equation **#2** for generating the values of r_e, r_p and R_Q (the electrostatic distance that equals $r_e + r_p$) from the values of v_p and v_e that we got from Equation **#1** … utilizing the fact that the electrostatic force equation and the centrifugal force equation **MUST** be equal. The optimal values found are given below … (see other article if values not readable).

$\frac{V_e}{V_p} = \frac{R_e}{R_p} = \frac{\gamma m_p}{\gamma m_e}$	$\frac{\gamma m_p (v_p c)^2}{r_p} =$	$\frac{\gamma m_e (v_e c)^2}{r_e} =$	$e^2/4\pi\varepsilon_0 R_Q^2$
726.30230750	132.490142387	132.490142407	132.490142424

$$\mu = I \times A = \left(\frac{qv}{2\pi r}\right) \times \pi r^2 = \frac{qvr}{2}$$
A = area↑

$q = 1.602176634e\text{-}19$
codata neutron magnetic moment
= -9.662 3653 x 10-27 J T-1

$\gamma_e = 1/\sqrt{1-v_e^2}$	$\frac{\gamma_e m_e}{\text{x e-30}}$	$\gamma_p = 1/\sqrt{1-v_p^2}$	$\frac{\gamma m_p}{\text{x e-27}}$		V_e x c	x	r_e x e-15	$\dot{=} -qvr/2$	V_p x c	x	r_p x e-18	$\dot{=} \circleddash +qvr/2$	$-\mu e +\mu P$
								x e--26				x e-32	x e-26
2.5280852373	2.3029298486	1.0000007995	1.6726232632		.9184417384132	1.3177765401225		2.90666167797	.0012645447067	1.8143636974778		5.510101979	-2.906656169

$\frac{\gamma m_e + \gamma m_p}{\text{x e-27}}$	$\frac{r_p}{\text{x e-18}}$	+	$\frac{r_e}{\text{x e-15}}$	=	R_Q x e-15
1.6749261930	1.8143636975		1.31777653995		1.31959090365

The calculated magnetic moment is too large by a factor of 3

$$\frac{2.906656169}{.96623653} = 3.008224$$

magnetic moment ➞

Because the original calculated magnetic moment has a three-fold variance (3.00822) from the experimentally measured neutron magnetic moment (-9.662e-27), we are forced to suppose an alteration of **Q** (1.602e-19 = e) … and the velocity of the particles (v_e, V_p) … such that the true results of equations #1 and #2 are retained. This requires an alteration of the rest masses of the proton and electron within the bound state of the proposed neutron … with a weakened force binding the two charges at the same distance (neutron Compton wavelength).

We propose that the structure of a charge has a *'cap'* instead of an infinite limit as in the following illustration. This cap is meant to calibrate the electric field gradient. ***The radius of the cap is the initial distance at which the field gradient is ½ when that distance is doubled.***

1

In the Standard Model (as well as herein) the field gradient diminishes as *1/r* where *r* is the distance from the charge center. So that we get the familiar **q/r x q/r = q² /r²** (which is equivalent to adding couplings). However, in the Standard Model the *1/r* function continues to infinity as 'r' approaches zero which does not properly objectify the field gradient with respect to finite density considerations. The illustration below provides a better understanding of what is meant by a cap and its relation to a field gradient.
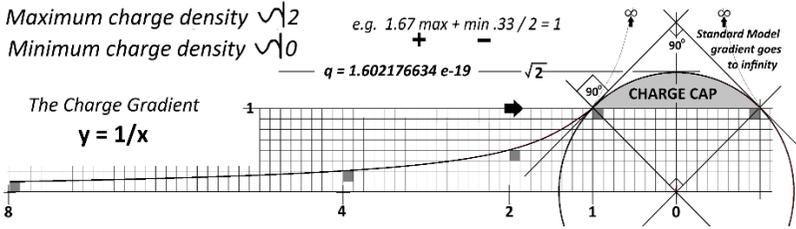
The upshot is that as two unlike charges approach each other, they cancel out tending to a uniform density of '1', i.e. they become lesser charges … and the energy required to produce them is returned to the masses that accompanied them. The hypothesis *is 'a charge represents the finite energy required to produce it'* … without inertial evidence of mass from the charge.

A mass accompanies a charge, but it is not the charge. By reverse logic, mass/energy would apparently disappear when being used to create a charge. Charge is seen as an alteration of the density of an **'alpha field'** (a Euclidean 3/D manifold) that requires absolute conservation of density. For any field increment that exceeds unit density, there must be a corresponding increment of lesser density such that the two densities when added restore **'unit density'**.
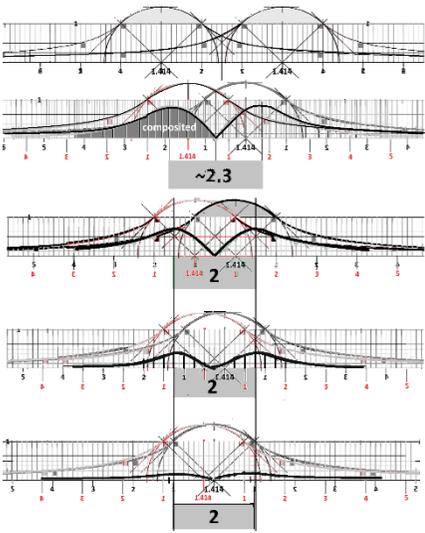
At left is an illustration of the effect of charge cancellation as two charges approach very close to the cap radius. This may be unobservable at atomic distances but should have noticeable effects at the femtometer range.

There is an unexpected stop at the cap diameter such that the highest point on the diminishing charge 'hump' remains at a distance (~2). This is for charge opposites only. Opposites subtract one from the other on a vertical graph line diminishing the original charges, while like charges are simply additive along the vertical line in the expected fashion.

In this way, the charges attract each other by ever lesser amounts and the energy that went into their production is deposited into the rest masses that accompanied them. In addition to this charge-mass reciprocity, there may be other kinetic factors that muddy the waters such as diminishing potential energy converted to kinetic, relativistic mass increases and the *neutrino* that may require energy modifications.

First, we 'correct' the neutron magnetic moment by multiplying both Q (e) and the velocities of the electron and proton (from the former model) in their femtometer hypothetical orbits by the square root of 1/3.008224 (**.57656**). This automatically yields the correct magnetic moment as given by experiment.

$e = 1.602176634\,e\text{-}19$
$V_e = .91844173$
$V_p = .0012645447.$

$$\sqrt{\frac{1}{3.008224}} = .57656$$

$$\mu_n = \frac{1}{3.008224}\left(\frac{Q v_e C r_e}{2} - \frac{Q v_p C r_p}{2}\right)$$

$$\mu_n = \left(\frac{Q.57656\; V_e C.57656\; r_e}{2} - \frac{Q.57656\; V_p C.57656\; r_p}{2}\right)$$

Then we recalculate the other factors involved in constructing the previous model wherein the total mass of the electron and proton (with new relativistic corrections) is the neutron mass. The distances of the electron and proton from their barycenter are retained from the original article … adding up to the Compton wavelength of the neutron mass. Below are the new calculations that then give the proper magnetic moment to the former neutron model.

New Force Calculations
(with new velocities for electron and proton)

Electrostatic Force

$$R = (r_e + r_p) \quad 1.31959090382e\text{-}15 \qquad \frac{\text{electrostatic}}{\text{force}} = e^2/4\pi e_0 R^2$$

e (new revised) = 1.602176634e-19 x .57656 = 9.2375096e-20

$$e^2/(r_e+r_p)^2 4\pi e_0 = \frac{2.30707755e\text{-}28}{1.7413201e\text{-}30} = \begin{array}{c} \text{old estimate} \\ \textbf{132.49014239} \end{array}$$

$$e^2/(r_e+r_p)^2 4\pi e_0 = \frac{7.669220268e\text{-}29}{1.7413201e\text{-}30} = \begin{array}{c} \text{new estimate} \\ \textbf{44.0425644} \end{array}$$

Centripetal Force (electron & proton)

electron
$$\frac{m_e(v_e c)^2}{\sqrt{1-v_e^2}\ r_e} = 44.0425644 \implies \frac{m_e}{\sqrt{1-v_e^2}} = \frac{r_e}{(v_e c)^2} \times 44.04256 = 2.302929688e\text{-}30$$

(old ratio retained as required) ⟹ ratio = 726.302315

proton
$$\frac{m_p(v_p c)^2}{\sqrt{1-v_p^2}\ r_p} = 44.0425644 \implies \frac{m_p}{\sqrt{1-v_p^2}} = \frac{r_p}{(v_p c)^2} \times 44.04256 = 1.6726231e\text{-}27$$

$$2.302929688e\text{-}30 + 1.6726231e\text{-}27 = 1.674926029688e\text{-}27 \text{ (neutron mass)}$$

$$\frac{m_e}{\sqrt{1-v_e^2}} = 2.302929688e\text{-}30 \qquad \frac{m_p}{\sqrt{1-v_p^2}} = 1.6726231e\text{-}27$$

$$m_e = 2.302929688e\text{-}30\ \sqrt{1-v_e^2} \qquad m_p = 1.6726231e\text{-}27\ \sqrt{1-v_p^2}$$

$$m_e = 1.967826e\text{-}30 \text{(new rest mass)} \qquad m_p = 1.67262265e\text{-}27 \text{(new rest mass)}$$

Trying other combinations that multiply together to equal the required 1/3.008224 modifier (= .332422) … we see that only when the **Q**(charge) and **V**(velocity) components receive the square root of .332422 modifier **(.57656)** do we get the required result. All other dual factors of .332422 result in higher or lower masses for the neutron.

Alternate possible calculations
using variants of xy = 1/3.008224

	factors of 1/3.008224 = .332422	New Force electrostatic	$\frac{m_e}{\sqrt{1-v_e^2}}$	ratio	$\frac{m_p}{\sqrt{1-v_p^2}}$	
1	.8 x .41552	84.793689	8.53644e-30	726	6.20003e-27	electron + proton Mass too large
2	.7 x .47488	64.920169	5.0039e-30	726	3.6343e-27	
3	.57656 .57656	44.042563	2.30293e-30	726	1.67262e-27	< e + P = Neutron mass
4	.47488 x .7	29.87798	1.05987e-30	726	7.69785e-28	
5	.41552 x .8	22.87533	6.21276e-31	726	4.51234e-28	Mass too small
	.332422 x 1	14.64074	2.544838e-31	726	1.84832e-28	
	1 x .332422	132.49	2.084014e-29	726	1.51362e-26	< Original electrostatic force cannot be corrected

Summing up …

We have the mass of the neutron as a unique result obtained by assuming that the electron and proton are bound in a classical 'dumbbell' orbit whose total diameter is the Compton wavelength of the neutron … with their combined masses and relativistic gamma functions equaling the neutron mass. However, this calculation yields a neutron magnetic moment that is 3.008224 times greater than the experimentally measured moment. So, we arbitrarily decremented the strength of the charge (suspecting that a new factor was missing) … from …
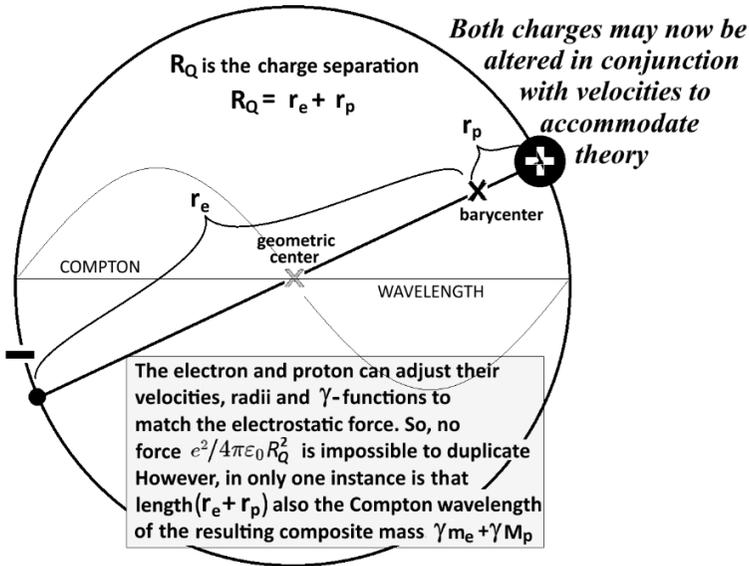
e = 1.602176634e-19 … to e = .57656 x 1.602176634e-19

(or 'Q' since we are dealing with a single electron) … while arbitrarily retaining the total diameter of $r_e + r_p$ = R = 1.31959090382e-15. And simultaneously decreasing both the velocity of the electron and proton by .57656 from their former velocities of .9184417c and .0012645447c. This reduces the magnetic moment and the electrostatic force … as well as the centripetal force on the electron and proton … while slightly increasing the rest mass of the electron and proton.

This gambit yields the unique answer required in that changing **Q** and the **V's** by the square root of 1/3.008224 gives us the lengths, masses and charges characteristic of the neutron. *We simply must postulate that opposed charges have a self-negating property by which, at proximity, they obliterate their opposites and deposit that energy required to produce them into the rest mass that accompanies each* … resulting in an altered rest mass for the proton and electron when occupying the neutron form.

At base, we are asserting that classical/relativistic mechanics continues to be valid in the quantum domain being objectified as the '*locus of action*', i.e. an abstract classical linear path taken through space by any quantum object around which quantum probabilistic behavior takes place as the dominant feature at those smallest levels of existence.

Below is the overall result from my first article … now adding that the charges themselves can also change to accommodate theory. Only one result satisfies all requirements for any orbital-type explanation of the experimentally measured properties of the neutron.

R_Q is the charge separation

$R_Q = r_e + r_p$

Both charges may now be altered in conjunction with velocities to accommodate theory

r_p

barycenter

r_e

geometric center

COMPTON

WAVELENGTH

The electron and proton can adjust their velocities, radii and γ-functions to match the electrostatic force. So, no force $e^2/4\pi\varepsilon_0 R_Q^2$ is impossible to duplicate However, in only one instance is that length $(r_e + r_p)$ also the Compton wavelength of the resulting composite mass $\gamma m_e + \gamma M_p$

References

Neutron Compton Wavelength as a Composite Electron-Proton Close Orbital
viXra:2507.0122 Author: Eric Louis Beaubien Category: Nuclear and Atomic Physics
Alexander Unzicker: "The Neutron Coincidence" viXra:2411.0178 Nuclear and Atomic Physics
The NIST Reference: https://physics.nist.gov/cuu/Constants