The Composite Electron with Compton Radius

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Abstract We argue that an electron e^- with rest mass m_e is composed of three sub-electrons charged with $\frac{2}{3}e^-$, $\frac{2}{3}e^-$, $\frac{1}{3}e^+$, encircling it at Compton radius $r_e = \frac{\hbar}{m_e c}$, at speed $v_e = \frac{\sqrt{3}}{2}c$, and at frequency $f_e = \frac{\sqrt{3}}{2}\frac{m_e c^2}{h}$. The Rotational Energy of the electron is $\frac{1}{2}I_e\omega_e^2 = \frac{3}{4}m_e c^2$

The sub-electrons harmonic motion explains electron's diffraction.

Keywords: Sub-electron, Compton Radius, Composite Particles, Quark, electron, Proton, Rotation Energy, Electric Energy, Magnetic Energy, Lorentz Force, Relativistic Mass,

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1.

The Composite Electron with Compton Radius

We have shown that for an electron with rest mass m_e, and a Compton radius $r_e = \dfrac{\hbar}{m_e c}$, the Rotation Velocity is $v_e = \dfrac{\sqrt{3}}{2}c$, and the Rotation Frequency is $f_e = \dfrac{\sqrt{3}}{2}\dfrac{m_e c^2}{h}$.

A rotating electron experiences centrifugal force that resists the circular motion.

The electron cannot be one particle charged with e^- revolving about a center at distance r_e, because the centrifugal force on the encircling particle due to its resistance to move in circular motion has to be balanced by an attraction to the center.

Fractional charges of $\dfrac{1}{3}e^-$ have been observed. But three particles each with charge $\dfrac{1}{3}e^-$ will be electrically repulsed from each other, and experience centrifugal forces that will push them away from the center.

To supply the centripetal forces that will keep three particles rotating about the center, they have to carry opposite charges, such as

$$\frac{2}{3}e^{-}, \frac{2}{3}e^{-}, \frac{1}{3}e^{+}.$$

Similarly, For a proton with a Compton radius, the Rotation Velocity is $v_p = \frac{\sqrt{3}}{2}c$, and the rotation frequency is $f_p = \frac{\sqrt{3}}{2}\frac{m_p c^2}{h}$

Two **u** quarks have charge $\frac{2}{3}e^{+}$, and one **d** quark has charge $\frac{1}{3}e^{-}$.

2.

Sub-electrons

In 1928, J. J. Thomson presented in [Thomson,p.33], experimental evidence that the electron is a composite particle.

> "…*the properties of the electron recently discovered lead to the view that the electron…has itself a structure, being made up of smaller parts which carry charges of electricity*."

Later, Millikan presented in [Millikan, p. 161] evidence from his experiments for the existence of Subelectrons.

> "…*Ehrenhaft and Zerner even analyze our report on oil droplets and find that these also show in certain instances indications of* ***sub-electrons****, for they yield in these observers' hands too low values of* e*, whether computed from the Brownian movement or from the law of fall*."

These statements were made long before it was suggested that the proton, and the neutron are composed of quarks.

The evidence for subelectrons had to lead to a planetary model for the electron. Just to balance the electric forces on them, the Subelectrons must be moving, and since they are not going anywhere, the motion is in a closed orbit.

The existence of fractional charges, and sub-electrons, is now well-established. For instance, [Wagoner, pp. 541-5].

3.

Sub-electrons' Orbits

The electron rotation produces the centrifugal forces of repulsion that balance the centripetal forces of attraction.

3.1 Closed Orbit

To stay within the electron boundaries,

the subelectrons should have a closed orbit.

3.2 Central Force

By [Routh, p. 274], a closed orbit results from a central force that is proportional to the inverse square of the distance,(such as the Coulomb electric force) or directly to the distance(such as the centripetal force).

Subelectrons charges supply

the electromagnetic attractive force that close the orbit.

3.3 Orbit Stability

By [Routh, p.280] Central Force orbits are stable. That is, they are bounded in a ring between two circles. The stability of the electron indicates such orbits.

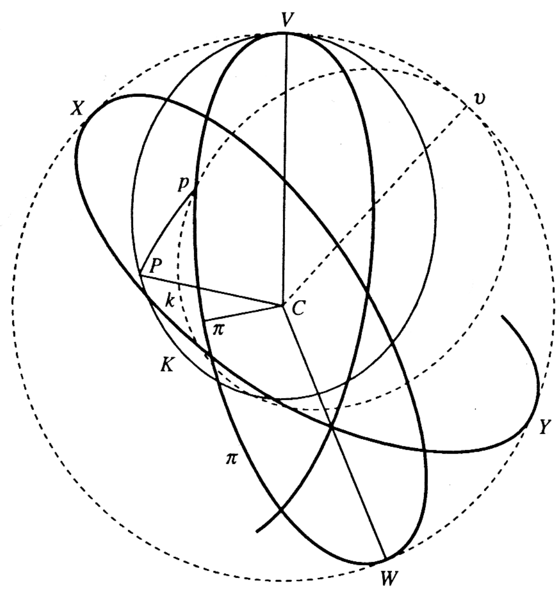
3.4 Planar Motion

Since the electric force is an inverse-squared-law force,

Subelectrons' orbits will be in the same plane,

and not on a sphere

The plane of motion of the particle turns around on a sphere <u>only under a non-inverse squared law force.</u>



[Chandrasekhar, p. 195].

3.5 Electron Diffraction

The harmonic motion of subelectrons within the electron supports Electron diffraction.

Else, the diffraction of electrons is unexplained, and the electron remains misunderstood as to whether it is a wave or a particle.

4.

The Electron's Structure

4.1 The Charges of the Subelectrons

The simplest choice of

Three particles with charge $\frac{1}{3}e$, and mass ε,

will repel each other, and be repelled from the center by the centrifugal forces on them.

Similarly to the proton structure, we assume,

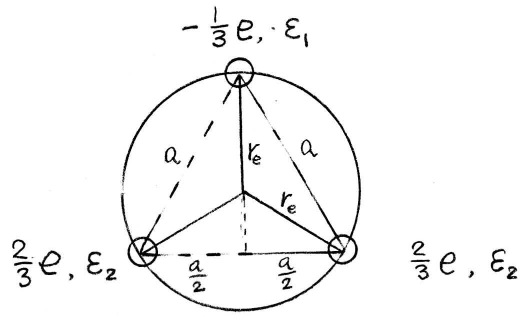
Two $\mathbf{u}_{\mathrm{e}}$ with charge $\frac{2}{3}e^{-}$, and mass ε_u,

and

One $\mathbf{d}_{\mathrm{e}}$ with charge $\frac{1}{3}e^{+}$, and mass ε_d.

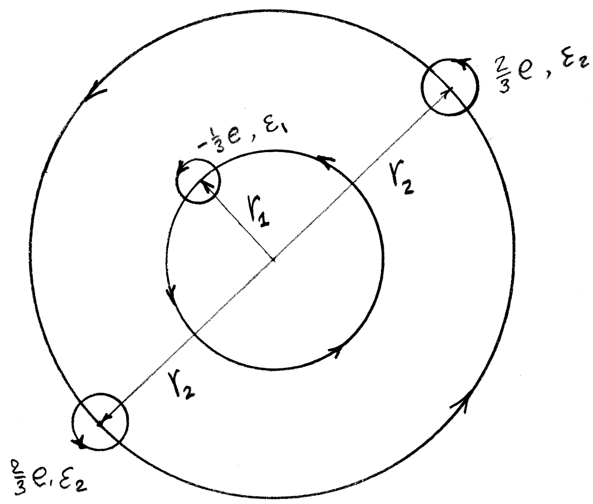
4.2 The Location of the Sub-electrons

If the subelectrons were at vertices of an equilateral triangle, the repulsion will break up the electron.



Perhaps, the $\frac{2}{3}e^{-}$ are at distance $2r_u$, with orbit radius r_u.

And the $\frac{1}{3}e^{+}$ orbits at smaller radius r_d,



The electron Compton radius, r_{e}, is between the two rings,

$$r_1 < r_{\mathrm{e}} < r_2,$$

5.

The Mass and the Rotational Energy of the Spinning Electron

5.1 The Relativistic Mass of the Spinning Electron is $\boxed{2m_{\mathrm{e}}}$

Proof: The rotation speed of the electron is the relativistic, $v_e = \frac{\sqrt{3}}{2}c$ and the mass is the relativistic,

$$\frac{m_{\mathrm{e}}}{\sqrt{1-\frac{v_e^2}{c^2}}} = \frac{m_{\mathrm{e}}}{\sqrt{1-\frac{1}{c^2}\frac{3}{4}c^2}} = 2m_{\mathrm{e}}.$$

5.2 The Rotational Energy of the Electron is $\boxed{\frac{3}{4}m_e c^2}$

Proof: The spin angular moment of the rotating electron is $I_{\mathrm{e}}\omega_{\mathrm{e}} = 2m_{\mathrm{e}}v_{\mathrm{e}}r_{\mathrm{e}}$. Therefore, the rotational energy is

$$\frac{1}{2}(I_e\omega_{\mathrm{e}})\omega_{\mathrm{e}} = \frac{1}{2}(2m_{\mathrm{e}}v_{\mathrm{e}}r_{\mathrm{e}})\omega_{\mathrm{e}} = m_{\mathrm{e}}v_e^2 = m_{\mathrm{e}}\frac{3}{4}c^2 = \frac{3}{4}m_{\mathrm{e}}c^2$$

5.3 The Non-Rotational, Electric, Magnetic, Energies of the Electron are $\boxed{\frac{1}{4}m_e c^2}$

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