The Compton Radius of Quanta

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Abstract

The Classical Radius of the proton, and the electron are based on flawed assumptions.

We have seen[1] that the Classical Electron Radius and the Classical Proton Radius lead to non-credible conclusions.

The Compton Radius is better approximation to the radius of quanta.

	mass	Compton Radius
Electron	$9.10938356 \times 10^{-31}$ kg	$3.38615926 \times 10^{-13}$ m
Proton	$1.6672629 \times 10^{-27}$ kg	$1.834322459 \times 10^{-16}$ m
U Quark	2.2MeV	10^{-30} m
D Quark	4.7MeV	0.468×10^{-30} m
ν_e Neutrino	0.12eV	1.667×10^{-23} m

[1] H. Vic DannonThe Electric Forces within the Compton Radii of the Proton, and the Electron are Very Strong

Contents

1.

The Electron Classical Radius versus its Compton Radius

The potential electric energy contained in an electron with radius r_e is

$$\frac{1}{4\pi\varepsilon_0}\frac{e^2}{r_e}.$$

The electromagnetic energy contained in an electron with mass m_e is

$$m_e c^2.$$

Assuming equality

$$\frac{1}{4\pi\varepsilon_0}\frac{e^2}{r_e} = m_e c^2,$$

$$r_e = \frac{1}{4\pi\varepsilon_0}\frac{e^2}{m_e c^2},$$

Using PDG values,

$$= \frac{1}{4\pi}\frac{1}{8.854187817\times 10^{-12}}\frac{(1.6021766208\times 10^{-19})^2}{(9.10938356\times 10^{-31})(2.99792458\cdot 10^{8})^2}$$

$$= 2.920970413\times 10^{-15}$$

The assumption that the electric potential energy contained in an electron with radius r_e equals the electromagnetic energy contained in its mass m_e is not self evident.

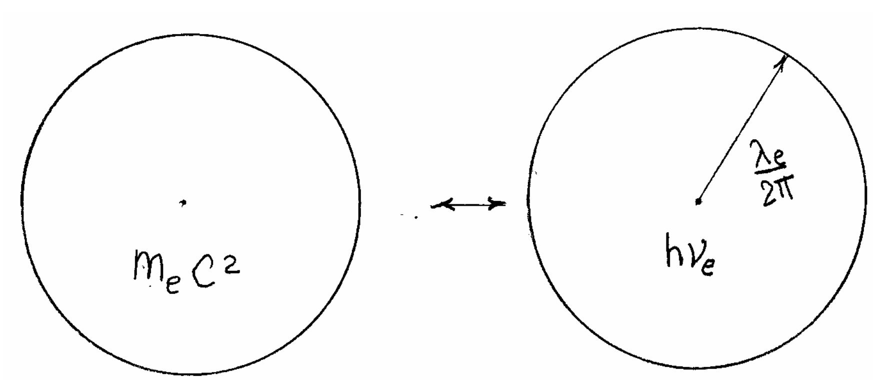
It ignores other possible energies such as rotational, kinetic, and magnetic.

And it is inconsistent with the nature of radiation as photons with energy

$$h\nu_e = h\frac{c}{\lambda_e}.$$

Thus, we replace the electron with a photon with Compton wavelength

$$\lambda_e = 2\pi r_e.$$



Then,

$$m_e c^2 = h\frac{c}{2\pi r_e},$$

And **Compton Radius of the electron** is

$$r_e = \frac{h}{2\pi m_e c}$$

$$= \frac{6.626070040 \times 10^{-34}}{(2\pi)9.10938356 \times 10^{-31} 2.99792458 \times 10^{8}}$$

$$= 3.38615926 \times 10^{-13}$$

More than 100 times larger than the Classical Electron Radius.

We have seen[2] that the Classical Electron Radius and the Classical Proton Radius lead to non-credible conclusions.

[2] H. Vic Dannon: The Electric Forces within the Compton Radii of the Proton, and the Electron are Very Strong

2.

The Proton Classical Radius versus its Compton Radius

The potential electric energy contained in a proton with radius r_p is

$$\frac{1}{4\pi\varepsilon_0}\frac{e^2}{r_p}.$$

The electromagnetic energy contained in a proton with mass m_p is

$$m_p c^2 .$$

Assuming equality

$$\frac{1}{4\pi\varepsilon_0}\frac{e^2}{r_p} = m_p c^2 ,$$

$$r_p = \frac{1}{4\pi\varepsilon_0}\frac{e^2}{m_p c^2},$$

$$= \frac{1}{4\pi\varepsilon_0}\frac{e^2}{(1846 m_e)c^2}$$

$$= \frac{1}{1846} 2.920970413 \times 10^{-15}$$

$$= 1.582324167 \times 10^{-18}$$

The assumption that the electric potential energy contained in a proton with radius r_p equals the electromagnetic energy contained in its mass m_p is not self-evident.

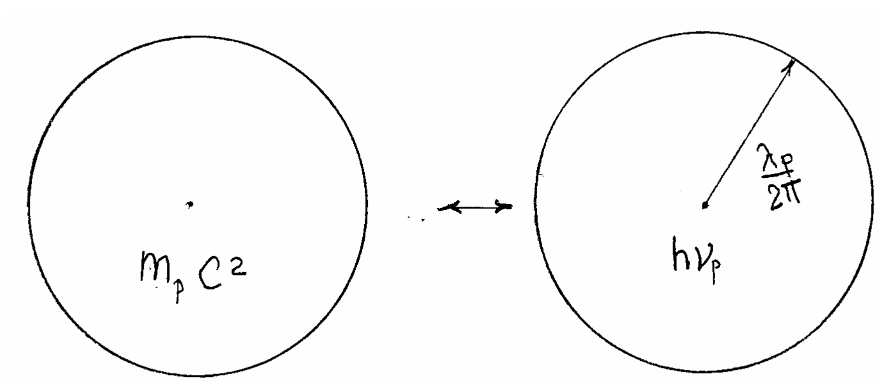
It ignores other possible energies such as rotational, kinetic, and magnetic.

And it is inconsistent with the nature of radiation as photons with energy

$$h\nu_p = h\frac{c}{\lambda_p}.$$

Thus, we replace the proton with a photon with Compton wavelength

$$\lambda_p = 2\pi r_p.$$



Then,

$$m_p c^2 = h \frac{c}{2\pi r_p},$$

And **Compton Radius of the proton** is

$$r_p = \frac{h}{2\pi m_p c}$$

$$r_p = \frac{h}{2\pi(1846 m_e)c}$$

$$= \frac{r_e}{1846}$$

$$= \frac{1}{1846} 3.38615926 \times 10^{-13}$$

$$= 1.834322459 \times 10^{-16}$$

More than 100 times larger than the Classical Proton Radius.

We have seen[3] that the Classical Electron Radius and the Classical Proton Radius lead to non-credible conclusions.

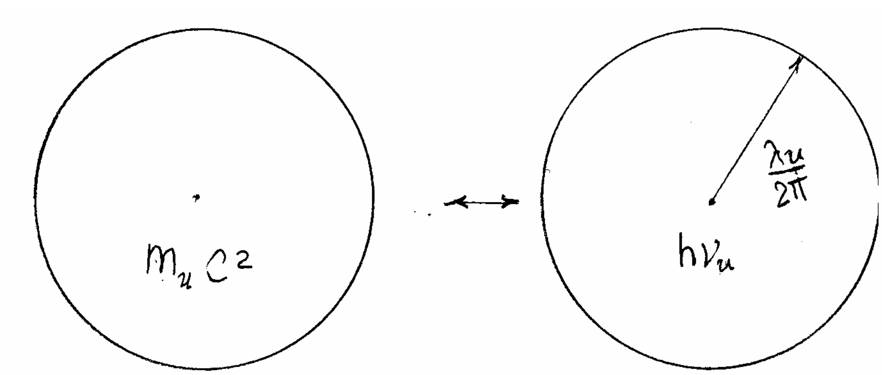
[3] H. Vic Dannon: The Electric Forces within the Compton Radii of the Proton, and the Electron are Very Strong

3.

The u quark Compton Radius

we replace the u quark with charge $\frac{2}{3}e^{+}$ with a photon with Compton wavelength

$$\lambda_u = 2\pi r_u .$$



Then,

$$m_u c^2 = h\frac{c}{2\pi r_u},$$

And **Compton Radius of the u quark** is

$$r_u = \frac{h}{2\pi m_u c}$$

$$r_u = \frac{\frac{h}{2\pi} MeV}{(m_u MeV)c}$$

$$= \frac{6.582119514 \times 10^{-22} MeV}{(2.2MeV)(2.99792458) \cdot 10^{8}}$$

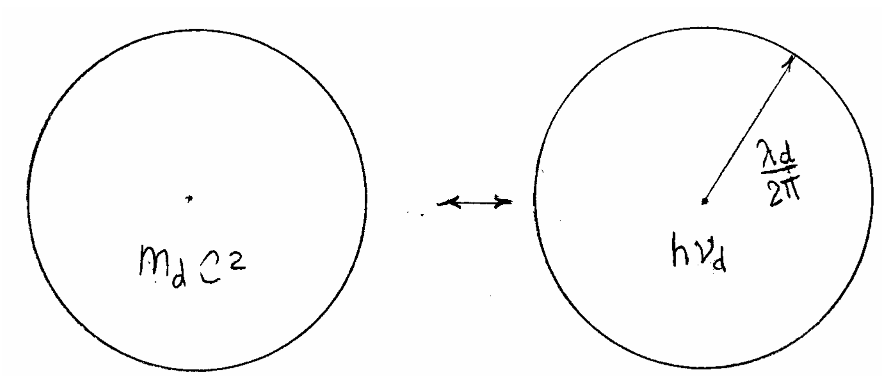
$$\approx 10^{-30}\text{m}$$

4.

The d quark Compton Radius

we replace the d quark with charge $\frac{1}{3}e^-$ with a photon with Compton wavelength

$$\lambda_d = 2\pi r_d .$$



Then,

$$m_d c^2 = h \frac{c}{2\pi r_d},$$

And **Compton Radius of the d quark** is

$$r_d = \frac{h}{2\pi m_d c}$$

$$r_d = \frac{\frac{h}{2\pi} MeV}{(m_d MeV)c}$$

$$= \frac{6.582119514 \times 10^{-22} MeV}{(4.7MeV)(2.99792458) \cdot 10^{8}}$$

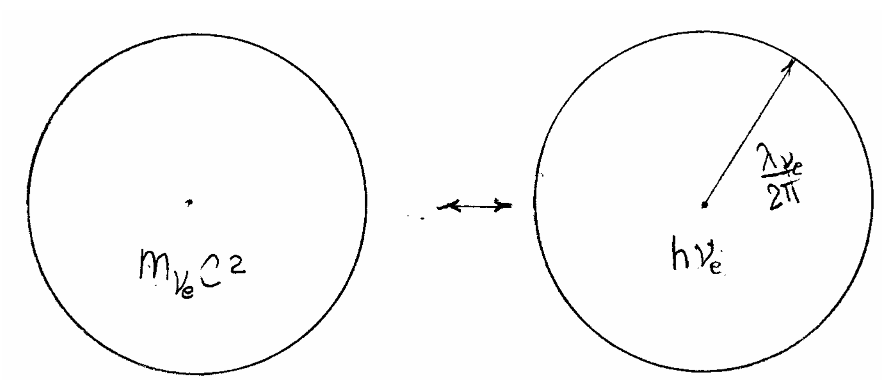
$$\approx (0.468)10^{-30}\text{m}$$

5.

The ν_e neutrino Compton Radius

we replace the ν_e neutrino with a photon with Compton wavelength

$$\lambda_{\nu_e} = 2\pi r_{\nu_e}.$$



Then,

$$m_{\nu_e}c^2 = h\frac{c}{2\pi r_{\nu_e}},$$

And **Compton Radius of the ν_e neutrino** is

$$r_{\nu_e} = \frac{h}{2\pi m_{\nu_e}c}$$

$$r_{\nu_e} = \frac{\frac{h}{2\pi} MeV}{(m_{\nu_e} MeV)c}$$

$$= \frac{6.582119514 \times 10^{-22} 10^6 eV}{(0.12 eV)(2.99792458) \cdot 10^8}$$

$$\approx 1.667 \times 10^{-23} \mathrm{m}$$

References

[Dannon] H. Vic Dannon: "The Electric Forces within the Compton Radii of the Proton, and the Electron are Very Strong"

[PDG] Particle Data Group, 2016 Particle Physics Booklet.

https://en.wikipedia.org/wiki/Proton

https://en.wikipedia.org/wiki/Classical_electron_radius

https://en.wikipedia.org/wiki/Electron

https://en.wikipedia.org/wiki/Planck_constant

https://en.wikipedia.org/wiki/Compton_wavelength#Relationship_to_other_constants

https://en.wikipedia.org/wiki/Quark

https://en.wikipedia.org/wiki/Neutrino#Properties_and_reactions