The Compton Effect in the Planck Vacuum Theory

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***Abstract*—This note reviews the Compton-effect photon scattering and relates it to the spinor nature of the electron and positron cores. The modified wavelength equation is seen to be proportional to the electron Compton radius from the Planck vacuum (PV) theory.**

***Index Terms*—Compton Effect, Compton (coupling) Radius, Planck Vacuum State.**

I. Introduction

THE theoretical foundation [1] [2] [3] [4] of the PV theory rests upon the unification of the Einstein, Newton, and Coulomb superforces:

$$\frac{c^4}{G}\left(=\frac{m_* c^2}{r_*}\right)=\frac{m_*^2 G}{r_*^2}=\frac{e_*^2}{r_*^2}\to r_* m_* c=\frac{e_*^2}{c}\quad(=\hbar)\qquad(1)$$

where the ratio c^4/G is the curvature superforce that appears in the Einstein field equations. G is Newton's gravitational constant, c is the speed of light, m_* and r_* are the Planck mass and length respectively [5, p.1234], and e_* is the massless bare (or coupling) charge. The Planck time is $t_*=r_*/c$ [5, p.1233]. The fine structure constant is given by the ratio $\alpha\equiv e^2/e_*^2$, where e is the observed electronic charge magnitude. The ratio e_*^2/c to the right of the arrow is the spin coefficient for the Planck particle (PP), the proton, and the electron cores, where $\hbar$ is the reduced Planck constant. The Newton constants can be obtained from the three superforces above and are [6]

$$G=\frac{r_* c^2}{m_*}=\frac{e_*^2}{m_*^2}\,.\qquad(2)$$

The proton and electron cores and their antiparticles are $(\pm e_*, m_p)$ and $(\pm e_*, m_e)$ respectively; and their spin coupling to the PV state is through the equalities

$$r_e\cdot m_e c=r_p\cdot m_p c=\frac{e_*^2}{c}=r_*\cdot m_* c\,.\qquad(3)$$

Furthermore, there are at least nineteen orders-of-magnitude between the electron and proton masses and the much heaver PP mass.

II. Electron Compton Radius

The following two spinor equations are the Dirac core equations for the electron and positron cores [7] [8]:

$$-ir_e\left(\frac{\partial u}{\partial x^0}-\sigma_j\frac{\partial u}{\partial x^j}\right)=u\qquad(4)$$

and

$$ir_e\left(\frac{\partial v}{\partial x^0}-\sigma_j\frac{\partial v}{\partial x^j}\right)=v\qquad(5)$$

where

$$r_e=\frac{e_*^2/c}{m_e c}.\qquad(6)$$

The u and v are the 2x1 wavefunction solutions to the equations, where $u+v=\widehat{0}$. The r_e in the equations is the Compton (coupling) radius that couples the equations to the PV state.

III. Conclusion and Comments

Assume that a quantum of energy $h\nu$ moves along the positive x-axis and strikes a free electron at rest; and then departs at an angle θ to the axis, with a longer wavelength. Then the equation for the increase in wavelength can be expressed as [5, p.118] [9, pp.432-433]

$$\Delta\lambda=\lambda'-\lambda=\frac{h}{m_e c}\left(1-\cos\theta\right).\qquad(7)$$

Using (1) and (6) then leads to

$$\frac{h}{m_e c}=2\pi\frac{\hbar}{m_e c}=2\pi\frac{e_*^2/c}{m_e c}=2\pi r_e\qquad(8)$$

so the wavelength equation becomes

$$\Delta\lambda=2\pi r_e\left(1-\cos\theta\right)\qquad(9)$$

which is proportional to the Compton radius r_e.

Finally, using the coupling radius

$$r_e=3.86\times10^{-11}[\mathrm{cm}]\qquad(10)$$

from the PV theory yields

$$2\pi r_e=2.42\times10^{-10}[\mathrm{cm}],\qquad(11)$$

the correct magnitude for the differential wavelength $\Delta\lambda$.

References

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