Equation of Motion for the Electron or Proton Cores in Free Space According to the Planck Vacuum Theory

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***Abstract*—This paper argues that the equation of motion (EOM) for the electron or proton cores is the relativistic energy-momentum equation from the Compton scattering calculations. It is noted that the Compton radii are constants of the motion.**

***Index Terms*—Energy-Momentum Equations, Electron or Proton Equation of Motion, Planck Vacuum Theory.**

I. Introduction

THE theoretical foundation [1]—[5] of the PV theory rests upon the unification of the Einstein, Newton, and Coulomb superforces:

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

where the ratio c^4/G_d 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 [6, p.1234], and e_* is the massless bare (or coupling) charge. The Planck time is $t_* = r_*/c$ [6, 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. One of the e_*s in e_*^2 belongs to the PP under consideration and the other to any one of the remaining PPs making up the PV state.

II. Particle Spin

The electron, proton, and PP Dirac cores associated with the PV theory defined above are

$$(\pm e_*, m_e)\quad(\pm e_*, m_p)\quad\text{and}\quad(\pm e_*, m_*)\tag{2}$$

respectively. The $\pm$ signs in the equations include the antiparticles. Their coupling to the highly energetic PV state is through the spin equations

$$r_em_ec=r_pm_pc=\frac{e_*^2}{c}=r_*m_*c\tag{3}$$

where it appears that *particle spin and (3) exist to separate (in magnitude) the masses on the left from the mass m_* on the right*. The spin is generated in the zero-point PV oscillations [7].

All of the preceding equations are fixed in the sense that their structure is determined at the high PV energy level. This level is roughly nineteen (proton cores) to twenty-two (electron cores) orders-of-magnitude more energetic than the processes taking place at the electron or proton levels. The masses m_e and m_p are assumed to be created along with their Compton radii r_e and r_p within the PV state.

III. Conclusions and Comments

The present author has been searching for an EOM for the electron and proton cores in (2) for some time, while the answer is already available from the equations below.

The relativistic energy-momentum equation is [8]

$$W^2=c^2P^2+m_e^2c^4=c^2P^2+c^2(m_ec)^2\tag{4}$$

where W is the total energy, cP is the total kinetic energy and P is the relativistic momentum. W and P include particle spin, which has its source to the right of the arrow in (1).

For the first elementary particle in (2) the solution to (4) can be expressed as

$$W/m_ec^2=W/c\cdot m_ec=\pm\left[1+(P/m_ec)^2\right]^{1/2}\tag{5}$$

which includes the positron (+ sign). This is the EOM for the electron core $(\pm e_*, m_e)$. In the rest frame P has only spin momentum (m_ec) so the normalized energy equation becomes

$$W/m_ec^2=\pm 2^{1/2}.\tag{6}$$

These results also apply to the proton core by replacing m_e with m_p and using the ($-$ sign) for the antiproton.

In closing, equation (3) leads to the corresponding PV potentials

$$\frac{e_*^2}{r_e}=m_ec^2\qquad\frac{e_*^2}{r_p}=m_pc^2\qquad\text{and}\qquad\frac{e_*^2}{r_*}=m_*c^2\tag{7}$$

where the Compton radii are constants of the motion [8]; or

$$\frac{e_*^2/c}{r_e}=m_ec\quad\frac{e_*^2/c}{r_p}=m_pc\quad\text{and}\quad\frac{e_*^2/c}{r_*}=m_*c\tag{8}$$

in terms of the spin coefficient $e_*^2/c=\hbar$.

References

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