ECE APPLIED TO ENERGY FROM SPACE-TIME: AMPLIFICATION OF THE RADIATIVE CORRECTION BY SPIN CONNECTION RESONANCE.

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ABSTRACT

The well known radiative correction is amplified by spin connection resonance, whereby the initially Coulombic potential in an easily ionized material is amplified to the point where electrons are released for use in circuits, energy production and energy savings. It is assumed that the radiative correction can be represented by an oscillating part of the fine structure constant. The methods of Einstein Cartan Evans (ECE) field theory are used to amplify the induced jitterbugging of the electron in each orbital that is the primary characteristic of the radiative correction. The latter is observed in well known phenomena such as the electron g factor, the Lamb shift and the Casimir effect. It is shown that the initially small radiative correction can be amplified for practical implementation.

Keywords: Einstein Cartan Evans (ECE) field theory, radiative correction, spin connection resonance amplification, new sources of energy.

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1 INTRODUCTION

Recently the Einstein Cartan Evans (ECE) field theory has offered a generally covariant unified field theory based on the principles of relativity - that physics is objective and causal {1-11}. Relativity is the most precise theory of physics. Electrodynamics and quantum mechanics have been forged together with gravitation and the other fundamental force fields in one theoretical framework based on Cartan geometry {12}. With these developments came the realization that the spin connection of space-time plays a central role in electrodynamics, which in ECE is considered to be a theory of general relativity, not of special relativity. It has been shown {11} that the spin connection can produce amplification of gravitational effects, an amplification which may be used in counter-gravitational devices. In the field of electrodynamics it has been shown {1-11} that the spin connection may be used to amplify the repulsion between electrons in an atom or molecule to the point at which the electrons are freed from the nucleus and may be used in circuits to produce power or save power. Recently, it has been shown {1-11} that the Lamb shift may be explained within experimental precision by using an average effect of the ubiquitous zero'th eigenstate of the quantized electromagnetic field ("zero point energy") to describe the well known {13,14} radiative correction. The Lamb shift has been described in ECE theory in a manner that is consistent with the description of the g factor of the electron in earlier work {1-11}.

In Section 2 the radiative correction in the hydrogen atom is considered to arise from an oscillating component of the averaged radiative correction used in previous work {1-11}. The Lamb shift is illustrated in atomic hydrogen for this type of radiative correction. The charge density in each orbital is calculated for each orbital. In Section 3 these charge densities are used in the generally covariant Coulomb law of ECE theory and it is shown that the radiative correction in each orbital of atomic hydrogen can be amplified by spin connection resonance to the point at which the electron breaks free form the proton and may be used in a circuit to produce power. This process is known as "energy from space-time". This paper therefore identifies the driving term of the spin connection resonance mechanism as the radiative correction. The latter causes zwitterbewegung, the well known {15} jitterbugging of the electron in each orbital due to the ubiquitous, background, radiative correction. The latter is due to the fact that in the quantized electromagnetic field surrounding the atom, there are ever present and ever oscillating electric and magnetic fields. In the zero'th eigenstate of the quantized, background, electromagnetic field these electric and magnetic fluctuations exist when there are no photons {15} present, the photon being defined as the quantum of energy. The electromagnetic potential due to these fluctuating electric and magnetic fields produces well known phenomena such as the g factor of the electron and other particles, the Lamb shift, and the Casimir effect. These are examples of the ways in which the radiative correction is observed experimentally. No energy is required to manufacture the potential of the radiative correction, which is therefore like an enormous natural reservoir of energy, one which is ever present. The natural effect of the radiative correction is very small (about four parts in ten million of atomic hydrogen), but in ECE theory (generally covariant unified field theory) it may be amplified by spin connection resonance {1-11}. In Section 4 the results of Sections 2 and 3 are developed numerically, and in Section 5 a discussion is given of the type of material most likely to release electrons through the theory of this paper. The hydrogen atom is used as a model for future work based on density functional code in solids.

2. RADIATIVE CORRECTION IN THE HYDROGEN ATOM.

In previous work on the electron g factor and Lamb shift {1-11} the mean value of the radiative correction was implemented as follows:

$$g \rightarrow g\left(1 + \frac{\langle \alpha \rangle}{4\pi}\right)^2 \quad -(1)$$

$$\nabla^2 \rightarrow \nabla^2 \left(1 + \frac{\langle \alpha \rangle}{4\pi} \right)^2 \quad -(2)$$

where g is the electron g factor, and where α is the fine structure constant. Eq. (1) was used with the Dirac equation derived from the ECE wave equation, and Eq. (2) was used with the Schrödinger equation. In order to model the jitterbugging of the electron it is assumed that:

$$\alpha = \langle \alpha \rangle \left(1 + \cos(\kappa r) \right) \quad -(3)$$

where κ is a characteristic wave-number of the jitterbugging and where r is the radial coordinate {1-11}. The jitterbugging is therefore the initially small driving term of the spin connection resonance (SCR) mechanism of previous work {1-11}. The hydrogen atom is used to model the effect of Eq. (3) on each orbital.

To first order in α :

$$\left(1 + \frac{\alpha}{4\pi} \right)^2 \sim 1 + \frac{\alpha}{2\pi} = 1 + \frac{\langle \alpha \rangle}{2\pi} \left(1 + \cos(\kappa r) \right) \quad -(4)$$

and the Schrödinger equation of atomic hydrogen becomes:

$$-\frac{\hbar^2}{2m} \left(1 + \frac{\langle \alpha \rangle}{2\pi} \left(1 + \cos(\kappa r) \right) \right) \nabla^2 \phi + V^{(0)} \phi = E \phi \quad -(5)$$

where

$$V^{(0)} = -\frac{e^2}{4\pi\epsilon_0 r} \quad -(6)$$

is the initially Coulombic attraction between the proton and electron. The effect of SCR is to amplify this attraction into a strong repulsion which allows the electron to break free from the proton. In Eq. (5), ϕ is the wave-function and E is the total energy {15}. In Eq. (6), e is the charge on the proton (minus the charge on the electron), and ϵ_0 is the vacuum permittivity in S.I. units {15}.

It is well known {15} that Eq. (5) can be developed into:

$$-\frac{\hbar^2}{2m}\left(1+\frac{\alpha}{2\pi}\right)\frac{d^2 P}{dr^2}+V_{eff}^{(0)}P = EP \quad -(7)$$

where:

$$P(r) = rR(r). \quad -(8)$$

Here R is the radial wave-function of the hydrogen atom. The potential energy in Eq. (7) is

$$V_{eff}^{(0)} = -\frac{e^2}{4\pi\epsilon_0 r}+\frac{l(l+1)\hbar^2}{2mr^2} \quad -(9)$$

where l is the angular momentum quantum number, m is the mass of the electron and $\hbar$ is the reduced Planck constant. The positive term in Eq. (9) is the well known centrifugal repulsion term in atomic hydrogen {15}. Using previous work {1-11} on the Lamb shift in atomic hydrogen and helium, Eq. (7) is re-written as:

$$-\frac{\hbar^2}{2m}\frac{d^2 P}{dr^2}+V_{eff}P = EP \quad -(10)$$

where:

$$V_{eff} = -\frac{e^2}{4\pi\epsilon_0(r+r(vac))}+\frac{l(l+1)\hbar^2}{2m(r+r(vac))^2}. \quad -(11)$$

Here r(vac) is a radial adjustment due to the radiative correction. It is different for each orbital and can be calculated by subtracting Eq. (10) from Eq. (7), giving:

$$-\frac{\hbar^2}{4\pi m}\alpha\frac{d^2P}{dr^2}+\left(V_{eff}^{(0)}-V_{eff}\right)P=0. \quad -(12)$$

The known hydrogenic P may be used in Eq. (12) to compute r(vac) using computer algebra. This assumption is based on the experimental fact that the Lamb shift for atomic H splits the 2s and 2p levels by about four parts in ten million, so the hydrogenic wave-functions are only slightly affected. In previous work the experimentally measured Lamb shift was explained in terms of an average r(vac) for the hydrogen and helium atoms. More accurately, as in this paper, r(vac) oscillates from Eq. (3), i.e. the electron jitterbugs in each orbital. The jitterbugging is the phenomenon used to build up the driving term of the SCR mechanism.

To construct the driving term, the charge density ρ in each orbital must be calculated, the driving term is then $-\rho/\epsilon_0$. In order to calculate ρ, it is necessary to calculate the probability of finding the electron in a volume element $d\tau$ at some point (r, θ, ϕ) in spherical polar coordinates {15}. This probability is:

$$dP_e=|\psi(r,\theta,\phi)|^2d\tau. \quad -(13)$$

The volume element is:

$$d\tau=r^2dr\sin\theta\, d\theta\, d\phi. \quad -(14)$$

The probability of finding the electron in a spherical shell of thickness dr and radius r is the sum over these probabilities {15} as θ and ϕ move over the range:

$$0\leqslant\theta\leqslant\pi,\quad 0\leqslant\phi\leqslant 2\pi. \quad -(15)$$

This sum is:

$$\rho_e = \int_0^{\pi} \sin\theta \, d\theta \int_0^{2\pi} |\psi(r, \theta, \phi)|^2 \, d\phi \, dr. \qquad -(16)$$

However, the P function of Eq. (7) depends only on r, so the summed probability is:

$$\rho_e = 4\pi r^2 P. \qquad -(17)$$

If we consider the probability to be determined by R itself, rather than P, then the summed probability is:

$$\rho_e = 4\pi r^2 R. \qquad -(18)$$

The use of Eq. (17) or (18) is a matter of choice. If we choose Eq. (18) and normalize the summed probability to be unit-less by use of the Bohr radius a_0 {15} we obtain:

$$\rho_{e,norm} = 4\pi \left(\frac{r + r(vac)}{a_0} \right)^2 R^2. \qquad -(19)$$

This expression has assumed that R is hydrogenic, and unaffected by r(vac), so the latter appears only in the pre-multiplying factor. This is an approximation, but in the hydrogen atom an excellent approximation. In other materials it may not be as good an approximation, and Eq. (5) would have to be solved directly with density functional code or another suitable numerical method. Finally the charge density of each orbital is defined to be:

$$\rho = e \rho_{e,norm} / V_e \qquad -(20)$$

where V_e is an effective volume for each orbital. If a spherical volume is assumed:

$$V_e = \frac{4}{3} \pi r_e^3 \qquad -(21)$$

where r_e is the mean radius of each orbital.

3. SCR AMPLIFICATION MECHANISM.

This mechanism {1-11} is based on a simplified definition of the electric field in ECE theory:

$$\underline{E} = -\left(\underline{\nabla} + \underline{\omega}\right)\phi \qquad (22)$$

where $\underline{\omega}$ is the spin connection vector and ϕ is the scalar potential. A simplified form of the Coulomb law of ECE theory is used. This happens to have the same mathematical form as the Coulomb law of Maxwell Heaviside theory:

$$\underline{\nabla} \cdot \underline{E} = \frac{\rho}{\epsilon_0} . \qquad (23)$$

The spin connection is assumed to be {1-11}:

$$\omega_r = -\frac{1}{r} . \qquad (24)$$

These equations give:

$$\frac{d^2\phi}{dr^2} + \frac{1}{r}\frac{d\phi}{dr} - \frac{1}{r^2}\phi = -\frac{\rho}{\epsilon_0} . \qquad (25)$$

This equation was transformed into an undamped oscillator equation:

$$\frac{d^2\phi}{dR^2} + \kappa_0^2\phi = \exp\left(2i\kappa_0 R\right)\frac{\rho}{\epsilon_0} \qquad (26)$$

using the Euler transform {16}:

$$\kappa_0 r = \exp\left(i\kappa_0 R\right) . \qquad (27)$$

Eq. (26) was used to produce a Fourier analysis {1-11} for an assumed cosinal driving term (right hand side of Eq. (26)), and an equivalent circuit was designed. Resonant amplification of ϕ was shown to occur, and this phenomenon was studied in atomic hydrogen {1-11}. It was shown that the SCR mechanism can ionize the hydrogen atom and that the electron thus released could be used to produce electric power. In this section the driving term of Eq. (20) is used in Eq. (25) so that the overall process is shown to be the SCR amplification of the radiative correction.

If the Euler transform method is used, the mathematical problem to be solved is therefore as follows:

$$\frac{d^2\phi}{dR^2} + \kappa_0^2 \phi = \frac{\rho}{\epsilon_0} \cos(2\kappa_0 R), \quad -(28)$$

$$\rho = \frac{4\pi e}{\epsilon_0 \bar{V}_e} \cdot \left(\frac{\cos^2(\kappa_0 (R + R(vac)))}{a_0^2 \kappa_0^2} \right) R^2(r), \quad -(29)$$

$$r + r(vac) = \frac{1}{\kappa_0^2} \cos(\kappa_0 (R + R(vac))), \quad -(30)$$

$$\alpha = \langle \alpha \rangle (1 + \cos(\kappa r)). \quad -(31)$$

However, Eq. (25) can be solved directly by computer and this method is also considered in Section 4.

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