ECE2 JITTERBUGGING THEORY

by

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ABSTRACT

Interaction with the vacuum in ECE2 theory is developed with the zitterbewegung (jitterbugging) theory used to calculate the Lamb shift in atomic H. The jitterbugging vector spin connection is calculated and is a simple quantity on the one electron level. This theory is expected to be as accurate as the calculation of the Lamb shift, first carried out by Bethe as is well known.

Keywords: ECE2, jitterbugging theory of vacuum interaction.

UFT 392

1. INTRODUCTION

In recent papers and books of this series {1 - 30}, interaction with the vacuum has been developed with the new law of conservation of antisymmetry. There are laws of conservation of trace, scalar and vector antisymmetry which must be obeyed throughout physics: notably in dynamics, gravitation, electrodynamics and fluid dynamics, but also in nuclear physics for example. The notes accompanying this paper (UFT392 on www.aias.us) provide examples in which antisymmetry is applied, and provide a background to the new theory of Sections 2 and 3: the use of zitterbewegung in ECE2. The notes contain detailed calculations and are intended to be read with this paper.

Note 392(1) develops the laws of conservation of antisymmetry in two dimensions. Note 392(2) defines a calculational methodology for two dimensional orbits. Note 392(3) develops tests of the Einstein theory in two and three dimensions. Note 392(4) proves violation of antisymmetry conservation in the Newton and Einstein theories of the standard model. Note 392(5) is a detailed review of the complete equations of ECE2 theory: the wave, field and antisymmetry equations. Note 392(6) finalizes the methodology of Note 392(5), giving a suggested order of calculation. Note 392(7) develops Note 392(6) in the electrostatic limit, and defines the electro vector potentials. Finally Note 392(8) introduces the zitterbewegung theory developed in Section 2 of this paper.

Section 3 is a computational and graphical development of section 2, notably illustrating the jitterbugging spin connection.

2. JITTERBUGGING IN ECE2 THEORY

This theory is a development of the scalar and vector potentials used in recent papers and notes to include the well known zitterbewegung (or "shivering") of the electron first introduced by Schroedinger in 1930 from the Dirac equation and used by Bethe in 1947 to calculate the Lamb shift very accurately. Therefore it follows that the Bethe theory extended to ECE2 physics will produce equally accurate results.

Consider the scalar potential of the Coulomb law in the zitterbewegung theory:

$$\phi_t = \frac{1}{4\pi\epsilon_0}\int\frac{\rho(\mathbf{x}')}{|\mathbf{x}-\mathbf{x}'-\delta(\mathbf{x}-\mathbf{x}')|}\,d^3x' \quad -(1)$$

Here $\rho(\mathbf{x}')$ is the charge density, ϵ_0 the vacuum permittivity, and in which the denominator defines the fluctuating position of the charge. This is the vacuum fluctuation used to calculate the Lamb shift. Note carefully that ϕ_t describes the interaction with the vacuum, which is responsible for the electron fluctuations - zitterbewegung or shivering. Therefore ϕ_t is the total scalar potential of a material in contact with the vacuum. In the simplest case this is one electron in contact with the vacuum. The total vector potential of magnetostatics is, similarly: .

$$\mathbf{A}_t = \frac{\mu_0}{4\pi}\int\frac{\mathbf{J}(\mathbf{x}')}{|\mathbf{x}-\mathbf{x}'-\delta(\mathbf{x}-\mathbf{x}')|}\,d^3x' \quad -(2)$$

where $\mathbf{J}(\mathbf{x}')$ is the current density and μ_0 is the vacuum permeability.

It follows that the ECE2 electric field strength in volts per metre of electrostatics is:

$$\mathbf{E}_t(\mathbf{x}) = -\frac{1}{4\pi\epsilon_0}\boldsymbol{\nabla}\int\frac{\rho(\mathbf{x}')}{|\mathbf{x}-\mathbf{x}'-\delta(\mathbf{x}-\mathbf{x}')|}\,d^3x' \quad -(3)$$

$$= -\boldsymbol{\nabla}\phi + \boldsymbol{\omega}\phi = -\frac{\partial \mathbf{A}_E}{\partial t} - \omega_0\mathbf{A}_E$$

where $\mathbf{A}_E$ is the electrostatic vector potential of Note 392(7), a concept that does not exist in the standard model, and where $\boldsymbol{\omega}$ is the vector spin connection. In Eq. (3), ϕ is the scalar potential in the hypothetical absence of vacuum interaction, which is described by the spin connection terms. Therefore:

$$\phi = \frac{1}{4\pi\epsilon_0}\int \frac{\rho(\underline{x}')}{|\underline{x}-\underline{x}'|}\, d^3x' \quad -(4)$$

The spin connection four vector is:

$$\omega^\mu = \left(\frac{\omega_0}{c}, \underline{\omega}\right). \quad -(5)$$

The magnetic flux density of magnetostatics is :

$$\underline{B}_t = \frac{\mu_0}{4\pi}\,\underline{\nabla}\times\int \frac{\underline{J}(\underline{x}')}{|\underline{x}-\underline{x}'-\delta(\underline{x}-\underline{x}')|}\, d^3x' = \underline{\nabla}\times\underline{A} - \underline{\omega}\times\underline{A} \quad -(6)$$

where $\underline{A}$ is the vector potential in the hypothetical absence of the vacuum:

$$\underline{A} = \frac{\mu_0}{4\pi}\int \frac{\underline{J}(\underline{x}')}{|\underline{x}-\underline{x}'|}\, d^3x' \quad -(7)$$

The existence of the well known radiative corrections {1 - 30} such as the Lamb shift and anomalous g factors of elementary particles means that the vacuum is ubiquitous. Every material quantity is influenced by the vacuum. It is therefore clear that a circuit can take energy from the vacuum as in UFT311, UFT321, UFT364, UFT382 and UFT383 on www.aias.us.

The fields in the hypothetical absence of the vacuum are:

$$\underline{E} = -\underline{\nabla}\phi \quad -(8)$$

and

$$\underline{B} = \underline{\nabla}\times\underline{A}. \quad -(9)$$

It follows that:

$$\underline{E}_* - \underline{E} = \underline{\omega}\,\phi \quad -(10)$$

$$\underline{B}_* - \underline{B} = -\underline{\omega} \times \underline{A} \quad -(11)$$

where:

$$\underline{E} = -\frac{1}{4\pi\epsilon_0}\underline{\nabla}\int \frac{\rho(\underline{x}')}{|\underline{x}-\underline{x}'|}\, d^3x' \quad -(12)$$

and

$$\underline{B} = \frac{\mu_0}{4\pi}\underline{\nabla} \times \int \frac{\underline{J}(\underline{x}')}{|\underline{x}-\underline{x}'|}\, d^3x' \quad -(13)$$

It follows that:

$$\underline{\nabla}\int \rho(\underline{x}')\left(\frac{1}{|\underline{x}-\underline{x}'-\delta(\underline{x}-\underline{x}')|} - \frac{1}{|\underline{x}-\underline{x}'|}\right) d^3x' = \underline{\omega}\int \frac{\rho(\underline{x}')}{|\underline{x}-\underline{x}'|}\, d^3x' . \quad -(14)$$

Similarly:

$$\underline{\nabla} \times \int \underline{J}(\underline{x}')\left(\frac{1}{|\underline{x}-\underline{x}'-\delta(\underline{x}-\underline{x}')|} - \frac{1}{|\underline{x}-\underline{x}'|}\right) d^3x' = -\underline{\omega} \times \int \frac{\underline{J}(\underline{x}')}{|\underline{x}-\underline{x}'|}\, d^3x \quad -(15)$$

On the one electron level:

$$\underline{E}_* = -\frac{e}{4\pi\epsilon_0 (r-\delta r)^2}\underline{e}_r \quad -(16)$$

and

$$\underline{E} = -\frac{e}{4\pi\epsilon_0 r^2}\underline{e}_r \quad -(17)$$

so the vector spin connection of this zitterbewegung theory is:

$$\underline{\omega} = \left(\frac{r}{(r-\delta r)^2} - \frac{1}{r}\right)\underline{e}_r = \left(\frac{1}{(r-\delta r)^2} - \frac{1}{r^2}\right)\underline{r} \quad -(18)$$

Therefore $\underline{\omega}$ can be worked out with for the Lamb shift for example using quantum mechanical methods. The fluctuations can also be calculated with Brownian motion theory, or used as an input parameter with which to model the spin connection as in UFT311, which describes the result of a circuit with great accuracy by modelling the spin connection. This circuit is reproduced experimentally in UFT364, and the method further developed in UFT321, UFT382 and UFT383. The spin connection can now be modelled by modelling the zitterbewegung or shivering of one electron, a macroscopic charge, or charge density.

The vacuum electric field strength in volts per metre is defined by the ECE2 scalar antisymmetry law. So:

$$\underline{E}(\text{vac}) = \underline{\omega}\phi = -\frac{e}{4\pi\epsilon_0}\left(\frac{1}{(r-\delta r)^2} - \frac{1}{r^2}\right)\frac{\underline{r}}{r} \quad -(19)$$

is the shivering electric field strength of the vacuum. The ECE2 theory shows that the origin of this field is the shivering spin connection (18).

The vacuum magnetic flux density is not considered in the Bethe theory but in ECE2 is defined by:

$$\underline{B}(\text{vac}) = -\underline{\omega}\times\underline{A} \quad -(20)$$

where:

$$\underline{\omega} = \left(\frac{1}{(r - \delta r)^2} - \frac{1}{r^2} \right) \underline{r} \quad -(21)$$

and

$$\underline{A} = \frac{\mu_0}{4\pi} \int \frac{\underline{J}(\underline{x}')}{|\underline{x} - \underline{x}'|} \, d^3 x' \quad -(22)$$

The potential $\underline{A}$ in the hypothetical absence of the vacuum must be calculated from the vector antisymmetry law:

$$\frac{\partial A_Z}{\partial Y} + \frac{\partial A_Y}{\partial Z} = \omega_Y A_Z + \omega_Z A_Y \quad -(23)$$

$$\frac{\partial A_X}{\partial Z} + \frac{\partial A_Z}{\partial X} = \omega_Z A_X + \omega_X A_Z \quad -(24)$$

$$\frac{\partial A_Y}{\partial X} + \frac{\partial A_X}{\partial Y} = \omega_X A_Y + \omega_Y A_X \quad -(25)$$

and the shivering spin connection (21). The total vector potential (2) must be used in the design of circuits. The relation between $\underline{A}_t$ and $\underline{A}$ is:

$$\underline{B} = \underline{\nabla} \times \underline{A}_t = \underline{\nabla} \times \underline{A} - \underline{\omega} \times \underline{A} \quad -(26)$$

The trace antisymmetry law of Lindstrom is:

$$\frac{1}{c^2} \left(\frac{\partial \phi}{\partial t} + \omega_0 \phi \right) - \underline{\nabla} \cdot \underline{A} + \underline{\omega} \cdot \underline{A} = 0 \quad -(27)$$

for electromagnetism in general. Note 392(8) shows that it can be analysed into two parts, a trace antisymmetry law for electrostatics:

$$\frac{\partial \phi}{\partial t} + \omega_0 \phi = 0 \quad -(28)$$

and its equivalent for magnetostatics:

$$\underline{\nabla} \cdot \underline{A} = \underline{\omega} \cdot \underline{A} \quad -(29)$$

The potential ϕ is not time dependent, so it follows that:

$$\omega_0 = 0 \quad -(30)$$

The law (29) gives the divergence of $\underline{A}$. In the standard model the divergence is gauge dependent and not well defined.

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REFERENCES

{1} M. W. Evans, H. Eckardt, D. W. Lindstrom, D. J. Crothers and U. E. Bruchholtz, "Principles of ECE Theory, Volume Two" (ePubli, Berlin 2017).

{2} M. W. Evans, H. Eckardt, D. W. Lindstrom and S. J. Crothers, "Principles of ECE Theory, Volume One" (New Generation, London 2016, ePubli Berlin 2017).

{3} M. W. Evans, S. J. Crothers, H. Eckardt and K. Pendergast, "Criticisms of the Einstein Field Equation" (UFT301 on www.aias.us and Cambridge International 2010).

{4} M. W. Evans, H. Eckardt and D. W. Lindstrom "Generally Covariant Unified Field Theory" (Abramis 2005 - 2011, in seven volumes softback, open access in various UFT papers, combined sites www.aias.us and www.upitec.org).

{5} L. Felker, "The Evans Equations of Unified Field Theory" (Abramis 2007, open access as UFT302, Spanish translation by Alex Hill).

{6} H. Eckardt, "The ECE Engineering Model" (Open access as UFT203, collected equations).

{7} M. W. Evans, "Collected Scientometrics" (open access as UFT307, New Generation, London, 2015).

{8} M .W. Evans and L. B. Crowell, "Classical and Quantum Electrodynamics and the B(3) Field" (World Scientific 2001, open access in the Omnia Opera section of www.aias.us).

{9} M . W. Evans and S. Kielich, Eds., "Modern Nonlinear Optics" (Wiley Interscience, New York, 1992, 1993, 1997 and 2001) in two editions and six volumes, hardback, softback and e book.

{10} M. W. Evans and J. - P. Vigier, "The Enigmatic Photon" (Kluwer, Dordrecht, 1994 to 1999) in five volumes hardback and five volumes softback, open source in the Omnia Opera Section of www.aias.us).

{11} M. W. Evans, Ed. "Definitive Refutations of the Einsteinian General Relativity" (Cambridge International Science Publishing, 2012, open access on combined sites).

{12} M. W. Evans, Ed., J. Foundations of Physics and Chemistry (Cambridge International Science Publishing).

{13} M. W. Evans and A. A. Hasanein, "The Photomagneton in Quantum Field Theory (World Scientific 1974).

{14} G. W. Robinson, S. Singh, S. B. Zhu and M. W. Evans, "Water in Biology, Chemistry and Physics" (World Scientific 1996).

{15} W. T. Coffey, M. W. Evans, and P. Grigolini, "Molecular Diffusion and Spectra" (Wiley Interscience 1984).

{16} M. W. Evans, G. J. Evans, W. T. Coffey and P. Grigolini", "Molecular Dynamics and the Theory of Broad Band Spectroscopy (Wiley Interscience 1982).

{17} M. W. Evans, "The Elementary Static Magnetic Field of the Photon", Physica B, 182(3), 227-236 (1992).

{18} M. W. Evans, "The Photon's Magnetic Field: Optical NMR Spectroscopy" (World Scientific 1993).

{19} M. W. Evans, "On the Experimental Measurement of the Photon's Fundamental Static Magnetic Field Operator, B(3): the Optical Zeeman Effect in Atoms", Physica B, 182(3), 237 - 143 (1982).

{20} M. W. Evans, "Molecular Dynamics Simulation of Induced Anisotropy: I Equilibrium Properties", J. Chem. Phys., 76, 5473 - 5479 (1982).

{21} M. W. Evans, "A Generally Covariant Wave Equation for Grand Unified Theory" Found. Phys. Lett., 16, 513 - 547 (2003).

{22} M. W. Evans, P. Grigolini and P. Pastori-Parravicini, Eds., "Memory Function Approaches to Stochastic Problems in Condensed Matter" (Wiley Interscience, reprinted 2009).

{23} M. W. Evans, "New Phenomenon of the Molecular Liquid State: Interaction of Rotation and Translation", Phys. Rev. Lett., 50, 371, (1983).

{24} M .W. Evans, "Optical Phase Conjugation in Nuclear Magnetic Resonance: Laser NMR Spectroscopy", J. Phys. Chem., 95, 2256-2260 (1991).

{25} M. W. Evans, "New Field induced Axial and Circular Birefringence Effects" Phys. Rev. Lett., 64, 2909 (1990).

{26} M. W. Evans, J. - P. Vigier, S. Roy and S. Jeffers, "Non Abelian Electrodynamics", "Enigmatic Photon V olume 5" (Kluwer, 1999)

{27} M. W. Evans, reply to L. D. Barron "Charge Conjugation and the Non Existence of the Photon's Static Magnetic Field", Physica B, 190, 310-313 (1993).

{28} M. W. Evans, "A Generally Covariant Field Equation for Gravitation and Electromagnetism" Found. Phys. Lett., 16, 369 - 378 (2003).

{29} M. W. Evans and D. M. Heyes, "Combined Shear and Elongational Flow by Non Equilibrium Electrodynamics", Mol. Phys., 69, 241 - 263 (1988).

{30} Ref. (22), 1985 printing.

{31} M. W. Evans and D. M. Heyes, "Correlation Functions in Couette Flow from Group Theory and Molecular Dynamics", Mol. Phys., 65, 1441 - 1453 (1988).

{32} M. W. Evans, M. Davies and I. Larkin, Molecular Motion and Molecular Interaction in the Nematic and Isotropic Phases of a Liquid Crystal Compound", J. Chem. Soc. Faraday II, 69, 1011-1022 (1973).

{33} M. W. Evans and H. Eckardt, "Spin Connection Resonance in Magnetic Motors", Physica B., 400, 175 - 179 (2007).

{34} M. W. Evans, "Three Principles of Group Theoretical Statistical Mechanics", Phys. Lett. A, 134, 409 - 412 (1989).

{35} M. W. Evans, "On the Symmetry and Molecular Dynamical Origin of Magneto Chiral Dichroism: "Spin Chiral Dichroism in Absolute Asymmetric Synthesis" Chem. Phys. Lett., 152, 33 - 38 (1988).

{36} M. W. Evans, "Spin Connection Resonance in Gravitational General Relativity", Acta Physica Polonica, 38, 2211 (2007).

{37} M. W. Evans, "Computer Simulation of Liquid Anisotropy, III. Dispersion of the Induced Birefringence with a Strong Alternating Field", J. Chem. Phys., 77, 4632-4635 (1982).

{38} M. W. Evans, "The Objective Laws of Classical Electrodynamics, the Effect of Gravitation on Electromagnetism" J. New Energy Special Issue (2006).

{39} M. W. Evans, G. C. Lie and E. Clementi, "Molecular Dynamics Simulation of Water from 10 K to 1273 K", J. Chem. Phys., 88, 5157 (1988).

{40} M. W. Evans, "The Interaction of Three Fields in ECE Theory: the Inverse Faraday Effect" Physica B, 403, 517 (2008).

{41} M. W. Evans, "Principles of Group Theoretical Statistical Mechanics", Phys. Rev., 39, 6041 (1989).