RESONANCE SOLUTIONS OF THE ECE FIELD EQUATIONS.

by

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ABSTRACT

Resonance solutions of the Einstein Cartan Evans (ECE) field equations are obtained by developing them in terms of the electromagnetic potential to give linear inhomogeneous differential equations whose solutions were first discovered by the Jacobi's and Euler (1739 - 1743). There are four such resonance equations, and in a well defined approximation it is shown that resonance absorption from ECE space-time occurs. The net result is that electric power from space-time is available in copious quantities given the circuit or material design to take resonant energy from ECE space-time.

Kewords: Einstein Cartan Evans (ECE) unified field theory; resonant absorption from ECE space-time, energy from ECE space-time.

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1. INTRODUCTION

The mathematical structure of Einstein Cartan Evans (ECE) unified field theory is that of standard differential geometry {1-35} within a scalar valued factor $A^{(0)}$, a vector potential magnitude. Thus, for example, the relation between the electromagnetic field form (F) and electromagnetic potential form (A) is given by the first Cartan structure equation, and the field equations for F and its Hodge dual $\tilde{F}$ are given by the first Bianchi identity. The Cartan structure equations and the Bianchi identities are standard equations of Cartan geometry. We use for clarity of mathematical structure a "barebones" or index suppressed notation {1-35} to give these equations as follows:

$$F = d \wedge A + \omega \wedge A, \qquad (1)$$

$$d \wedge F = \mu_0 j, \qquad (2)$$

$$d \wedge \tilde{F} = \mu_0 J. \qquad (3)$$

Here j is the homogeneous current and J the inhomogeneous current, and μ_0 is the S.I. permeability in vacuo. The symbol ^ is the wedge product, d^ is the exterior derivative and ω is the spin connection. These quantities and notation are fully defined elsewhere {1-35}.

The Hodge dual of Eq. (1) is denoted:

$$\tilde{F} = d \,\tilde{\wedge}\, A + \omega \,\tilde{\wedge}\, A \qquad (4)$$

$$= d \wedge B + \omega \wedge B. \qquad (5)$$

From Eqs. (1) and (2):

$$d \wedge (d \wedge A + \omega \wedge A) = \mu_0 j \qquad (6)$$

and from Eqs. (3) and (5):

$$d \wedge (d \wedge B + \omega \wedge B) = \mu_0 J. \qquad (7)$$

Eq. (6) is the fundamental resonance equation of ECE field theory and Eq. (7) is its

Hodge dual. Eq. (6) is a development of the well known linear inhomogeneous equation whose resonance solutions {36} were first given by the Bernoulli's and Euler (1739 - 1743). In general such equations give amplitude resonance, potential and kinetic energy resonance, Q factors, transient and equilibrium solutions, phase lags and other features of interest in many aspects of physics and electrical engineering, notably circuit theory {36}. In Eq. (6):

$$j = \frac{A^{(0)}}{\mu_0} \left(R \wedge q - \omega \wedge T \right) \quad - (8)$$

where

$$T = d \wedge q + \omega \wedge q \quad - (9)$$

is the torsion form {1-35} and where

$$R = d \wedge \omega + \omega \wedge \omega. \quad - (10)$$

R is the Riemann form of standard differential geometry. Eqs. (9) and (10) are the first and second Cartan structure equations, sometimes known as the master equations of differential geometry. Therefore Eq. (6) is in general:

$$j = \frac{1}{\mu_0} d \wedge \left(d \wedge A + \omega \wedge A \right) - (11)$$

where

$$A = A^{(0)} q . \quad - (12)$$

Thus, the current j is a source of resonance absorption from ECE spacetime. A similar conclusion can be reached for the Hodge dual resonance equation (7). The potential A also obeys the ECE Lemma {1-35}:

$$\Box A = RA \qquad -(13)$$

where

$$R = -kT \qquad -(14)$$

is a well defined scalar curvature, T is the index contracted canonical energy-momentum tensor, and k is Einstein's constant. Therefore the ECE Lemma is the subsidiary proposition of the ECE wave equation {1-35}:

$$(\Box + kT)A = 0. \qquad -(15)$$

Therefore the fundamental mathematical structure of standard differential geometry gives three equations, (6), (7) and (15) with which to investigate resonant absorption of energy from ECE space-time.

In the standard model:

$$F = d \wedge A, \qquad -(16)$$

$$d \wedge F = 0, \qquad -(17)$$

$$d \wedge \tilde{F} = \mu_0 J. \qquad -(18)$$

Eqs. (16) and (17) give the Poincaré Lemma {37}:

$$d \wedge (d \wedge A) = 0 \qquad -(19)$$

and the current j is missing. The current J in the standard model is introduced empirically and is not recognized to originate in Cartan geometry. Therefore many key resonance features are missing from the standard model, notably the ability of ECE theory to take electric power from space-time in the shape of the currents j and J. Within the factor $A^{(0)}/\mu_0$ these currents are defined completely by the structure or geometry of space-time itself. In the standard model of classical electrodynamics (the Maxwell Heaviside field equations) space-time has no structure, it is the flat or Minkowski space-time and in consequence classical electrodynamics in the standard model cannot be unified with gravitation, in which space-time is structured. Therefore electric power cannot be taken from space-time in the standard model. This is contrary to the reproducible and repeatable experiments {38} of the Mexican Group, which has observed amplification of power levels in excess of one hundred thousand in given circuit designs, and amplification that is due to resonant absorption from ECE space-time. This paper is the first to offer a detailed explanation of this important phenomenon.

In Section 2 the fundamental resonance equation:

$$d \wedge (d \wedge A + \omega \wedge A) = \mu_0 j \quad -(20)$$

is developed into four resonance equations in the vector notation used in electrical engineering and circuit theory. One of these vector equations is solved analytically using appropriate approximations. The result is resonance from a driven undamped inhomogeneous structure. This simple analytical exercise achieves our aim of showing that resonant absorption is possible from ECE space-time, as observed experimentally {38}. Driven undamped resonance produces an infinite Q factor and infinite amplitude resonance at the fundamental frequency {36}. More generally {36} the solutions of the linear inhomogeneous equation give finite Q factors and phase factors, transient and steady state effects, and various types of resonances. These are briefly reviewed in Section 3 for the simplest type of linear inhomogeneous second order differential equation {36}. Eq. (20) is expected to have all these features in general, and several more, and numerical methods will reveal all of them straightforwardly given initial and boundary conditions. Most generally resonance from ECE space-time is described by solving Eqs. (6), (7) and (15) simultaneously with given initial and boundary conditions. However the simplest type of linear inhomogeneous structure (Section 3) is sufficient to give the features expected, most importantly the ability of a circuit or material of given design to absorb j and J from ECE spacetime and amplify them greatly.