SPIN CONNECTION RESONANCE IN THE BEDINI MOTOR

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ABSTRACT

Spin connection resonance (SCR) is used to explain theoretically why devices in electrical engineering can use the properties of space-time to induce voltage. Einstein Cartan Evans (ECE) theory has shown why classical electrodynamics is a theory of general relativity in which covariant derivatives are used with the spin connection playing a central role. These concepts are applied to a device known as the Bedini motor.

Keywords: Spin connection resonance, electrodynamics in general relativity, Einstein Cartan Evans theory, Bedini motor.

96th Paper

1. INTRODUCTION.

Recently {1-10} the Einstein Cartan Evans (ECE) field theory has been generally accepted as the first successful unified field theory on the classical and quantum levels. It shows that classical electrodynamics is a theory of general relativity, not of special relativity. In ECE theory the spin connection plays a central role in the structure of the laws of electrodynamics and in the way the electric and magnetic fields are related to the scalar and vector potentials. The ECE equations of classical electrodynamics allow the existence of resonances in potential which can be used to extract electric power from the structure of space-time. This structure is not the vacuum, the latter in relativity theory is a universe devoid of all curvature and torsion. The resonance phenomenon induced by these equations is known as spin connection resonance (SCR). In this paper it is applied to a device known as the Bedini motor {11}, which has been patented and which has been shown to be experimentally reproducible and repeatable. In section 2 the equations of classical electrodynamics are given in ECE theory. These are given in the vector notation used by engineers, and the reduction of the original differential form equations of ECE theory to the vector equations is given in technical appendices. In Section 3 the occurrence of resonances is identified and graphed using computer algebra to check the derivations.

2. THE EQUATIONS OF CLASSICAL ELECTRODYNAMICS IN GENERAL RELATIVITY.

All electromagnetic devices of engineering are governed by these equations, which are the generally covariant form of classical electrodynamics. Each device must be considered separately, and the general equations applied systematically to each device. The electric field in ECE theory is defined in general by the scalar and vector potentials and by the scalar and vector components of the spin connection:

$$\underline{E} = -\frac{\partial \underline{A}}{\partial t} - c\underline{\nabla}\phi - c\omega^0\underline{A} + c\phi\underline{\omega} \quad -(1)$$

Here ϕ is the scalar potential, $\underline{A}$ is the vector potential, ω^0 is the scalar part of the spin connection and $\underline{\omega}$ is the vector part of the spin connection (see technical appendices). The Coulomb law in ECE theory {1-10} is

$$\underline{\nabla} \cdot \underline{E} = \frac{\rho}{\epsilon_0} := c\mu_0 J^0 \quad -(2)$$

where ϵ_0 is the vacuum permittivity and ρ is the scalar part of the inhomogeneous charge current density of ECE theory. The magnetic field in ECE theory is defined by:

$$\underline{B} = \underline{\nabla} \times \underline{A} - \underline{\omega} \times \underline{A} \quad -(3)$$

and the Gauss law of magnetism is:

$$\underline{\nabla} \cdot \underline{B} = \mu_0 j^0 \quad -(4)$$

where j^0 is the scalar part of the homogeneous charge current density. The Faraday law of induction in ECE theory is:

$$\underline{\nabla} \times \underline{E} + \frac{\partial \underline{B}}{\partial t} = c\mu_0 \underline{j} \quad -(5)$$

where $\underline{j}$ is the vector part of the homogeneous charge current density and the Ampère Maxwell law is:

$$\underline{\nabla} \times \underline{B} - \frac{1}{c^2}\frac{\partial \underline{E}}{\partial t} = \mu_0 \underline{J} \quad -(6)$$

where $\underline{J}$ is the vector part of the inhomogeneous charge current density.

The explanation of various devices that are reproducible and repeatable depends on the systematic application of these general equations. It has been shown {1-10} that they are resonance equations in general, so that a small driving term can produce a very large amplification of space-time effects through the inter-mediacy of the spin connection. Devices which find no explanation in the standard model can be explained in this way. For example, we consider the Bedini device {11} as one in which an electric pulse produced by the rate of change of a magnetic field is induced in a generator. The electric field pulse produces a pulse of electrons in a battery {11} as controlled by Eqs. (1) and (2), from which:

$$\underline{\nabla} \cdot \underline{\nabla} \phi + \frac{1}{c} \frac{\partial}{\partial t} \left(\underline{\nabla} \cdot \underline{A} \right) + \underline{\nabla} \cdot \left(\omega^{\circ} \underline{A} \right) - \underline{\nabla} \cdot \left(\phi \underline{\omega} \right) = -\mu_0 J^{\circ} \quad -(7)$$

This equation produces resonances in two ways, each of which gives a resonance equation.

1) If it is assumed that the origin of $\underline{E}$ is purely due to ϕ, we obtain the basic resonance equations of paper 63 and 92 of the ECE series {1-10}.

2) If it is assumed that the origin of $\underline{E}$ is purely magnetic, and that the scalar potential is zero, we have:

$$\frac{1}{c} \frac{\partial}{\partial t} \left(\underline{\nabla} \cdot \underline{A} \right) + \underline{\nabla} \cdot \left(\omega^{\circ} \underline{A} \right) = -\mu_0 J^{\circ} \quad -(8)$$

i.e.

$$\underline{\nabla} \cdot \left(\frac{1}{c} \frac{\partial \underline{A}}{\partial t} + \omega^{\circ} \underline{A} \right) = -\mu_0 J^{\circ} \quad -(9)$$

which can be integrated to give a resonance equation. It is also possible to produce a time dependent resonance equation from Eqs. (1) and (6). The Ampère Maxwell law (6) is considered to produce a driving term:

$$\frac{\partial \underline{E}}{\partial t} = c^2 \left(\underline{\nabla} \times \underline{B} - \mu_0 \underline{J} \right)_{\text{driving}}$$

$$= -\underline{\nabla} \frac{\partial \phi}{\partial t} - \frac{\partial^2 \underline{A}}{\partial t^2} - \frac{\partial}{\partial t}\left(c\omega^0 \underline{A} \right) + \frac{\partial}{\partial t}\left(c\phi \underline{\omega} \right) \quad -(10)$$

so that the most general resonance equation of time-dependent type is:

$$\frac{\partial^2 \underline{A}}{\partial t^2} + c\left(\frac{\partial \omega^0}{\partial t} \right) \underline{A} + c\omega^0 \frac{\partial \underline{A}}{\partial t}$$

$$= c\left(\frac{\partial \phi}{\partial t} \right) \underline{\omega} + c\phi \left(\frac{\partial \underline{\omega}}{\partial t} \right) + c^2 \mu_0 \underline{J} - \underline{\nabla} \frac{\partial \phi}{\partial t} - c^2 \underline{\nabla} \times \underline{B} . \quad -(11)$$

If there is no charge and current density this equation reduces to:

$$\frac{\partial^2 \underline{A}}{\partial t^2} + c\omega^0 \frac{\partial \underline{A}}{\partial t} + c\left(\frac{\partial \omega_0}{\partial t} \right) \underline{A} = -c^2 \left(\underline{\nabla} \times \underline{B} \right)_{\text{driving}} . \quad -(12)$$

There is resonance in $\underline{A}$ under the following conditions:

1) the scalar part, ω^0, of the spin connection is non-zero,

2) the time derivative, $\partial \omega^0 / \partial t$, is non-zero,

3) the curl $\underline{\nabla} \times \underline{B}$ is non-zero and also time dependent.

When investigating various claims such as the Bedini motor it is necessary to use equations such as this, which show for example that the magnetic field in the design must be both space and time dependent, and produced by a device that satisfies these requirements. That is an example of a design prediction of ECE theory in engineering.

In addition to Eq. (6) there exists the Coulomb law (2), which is the resonance equation {1-10}:

$$\underline{\nabla} \cdot \left(c\phi \underline{\omega} - \underline{\nabla} \phi - \frac{\partial \underline{A}}{\partial t} - c\omega^0 \underline{A} \right) = \frac{\rho}{\epsilon_0} \quad -(13)$$

In the absence of charge this equation reduces to:

$$\underline{\nabla} \cdot \left(\frac{\partial \underline{A}}{\partial t} + c\omega^{\circ} \underline{A} \right) = 0 \quad -(14)$$

so ω° may be eliminated between equations (12) and (14). Eq. (14) is:

$$\underline{\nabla} \cdot \frac{\partial \underline{A}}{\partial t} = -c \left(\underline{A} \cdot \underline{\nabla} \omega^{\circ} + \omega^{\circ} \underline{\nabla} \cdot \underline{A} \right). \quad -(15)$$

Therefore ω° is governed by Eqs. (12) and (15) which must be solved simultaneously. From Eq. (15):

$$\underline{\nabla} \cdot \left(\frac{\partial \underline{A}}{\partial t} + c\omega^{\circ} \underline{A} \right) = -c\, \underline{A} \cdot \underline{\nabla} \omega_{\circ} \quad -(16)$$

which can be integrated with the divergence theorem {12}. For any well behaved vector field $\underline{V}(\underline{r})$ defined with a volume surrounded by a closed surface S:

$$\oint_S \underline{V} \cdot \underline{n}\, da = \int_V \underline{\nabla} \cdot \underline{V}\, d^3 r. \quad -(17)$$

Thus for the Coulomb law {12}:

$$\int_V \left(\underline{\nabla} \cdot \underline{E} - \rho / \epsilon_0 \right) d^3 r = 0 \quad -(18)$$

i.e.

$$\oint_S \underline{E} \cdot \underline{n}\, da = \frac{1}{\epsilon_0} \int_V \rho(r)\, d^3 r. \quad -(19)$$

So the integration of Eq. (16) is:

$$\oint_S \left(\frac{\partial \underline{A}}{\partial t} + c\omega^{\circ} \underline{A} \right) \cdot \underline{n}\, da = -c \int_V \underline{A} \cdot \underline{\nabla} \omega^{\circ} d^3 r \quad -(20)$$

i.e.

$$\oint_S \frac{\partial \underline{A}}{\partial t} \cdot \underline{n} \, da = - \oint_S c\omega^{\circ} \underline{A} \cdot \underline{n} \, da - c \int_V \underline{A} \cdot \underline{\nabla} \omega^{\circ} d^3 r. \quad - (21)$$

Eq. (21) is:

$$\oint_S \frac{\partial \underline{A}}{\partial t} \cdot \underline{n} \, da = - c\omega^{\circ} \oint_S \underline{A} \cdot \underline{n} \, da - c \int_V \underline{A} \cdot \underline{\nabla} \omega_0 \, d^3 r \quad - (22)$$

and is a relation between ω_0 and A. The correct way of solving (12) is simultaneously with (20). This can be carried out numerically for various models of $\underline{\nabla} \times \underline{B}$ produced by various devices. It can seen that ω° can be eliminated and that Eq. (12) reduces to an undamped oscillator {1-10} because $\partial \underline{A} / \partial t$ is eliminated in favour of $\underline{A}$.

So in this example $\underline{A}$ can be amplified to INFINITY for various models of $\underline{\nabla} \times \underline{B}$ acting as a driving force. There is no need to model ω_0 because it can be expressed in terms of $\underline{A}$.

3. SYSTEMATIC EVALUATION OF EQUATIONS FOR THE BEDINI MOTOR.

(Dr Eckardt's section here)

APPENDIX 1 : REDUCTION OF FORM NOTATION TO VECTOR NOTATION

In differential form notation the electromagnetic field in ECE theory is:

$$F^a = d \wedge A^a + \omega^a{}_b \wedge A^b \quad -(A1)$$

which in tensor notation is {1-10}:

$$F^a{}_{\mu\nu} = \partial_\mu A^a{}_\nu - \partial_\nu A^a{}_\mu + \omega^a{}_{\mu b} A^b{}_\nu - \omega^a{}_{\nu b} A^b{}_\mu . \quad -(A2)$$

The electromagnetic potential is:

$$A^a{}_\mu = A^{(0)} q^a{}_\mu \quad -(A3)$$

where $q^a{}_\mu$ is a rank two mixed index tensor defined by:

$$V^a = q^a{}_\mu V^\mu . \quad -(A4)$$

Here V^a and V^μ are four vectors in different frames of reference labeled a and μ in four dimensional space-time.

Consider a particular example of Eq. (A2):

$$F^1{}_{23} = \partial_2 A^1{}_3 - \partial_3 A^1{}_2 + \omega^1{}_{2b} A^b{}_3 - \omega^1{}_{3b} A^b{}_2 . \quad -(A5)$$

Either side of the equation there are rank three tensors whose components must correspond to each other on both sides. Thus:

$$F^1{}_{23} = \left(\partial_2 A_3 - \partial_3 A_2\right)^1 + \left(\omega_{2b} A^b{}_3 - \omega_{3b} A^b{}_2\right)^1 . \quad -(A6)$$

Inside the brackets on the right hand side are anti-symmetric tensor components which correspond to the components of an axial vector (magnetic field) or polar vector (electric field). The magnetic vector components are defied by:

$$B^1_i = \frac{1}{2} \epsilon_{ijk} F^1_{jk} \quad -(A7)$$

thus:

$$B^1_1 = \frac{1}{2} \left(\epsilon_{123} F_{23} + \epsilon_{132} F_{32} \right)^1 = F^1_{23}. \quad -(A8)$$

This is recognized as the X component:

$$B_X = B^1_1 \quad -(A9)$$

of the magnetic field:

$$\underline{B} = B_X \underline{i} + B_Y \underline{j} + B_Z \underline{k}. \quad -(A10)$$

Similarly:

$$B_Y = B^2_2 = F^2_{31}, \quad -(A11)$$

$$B_Z = B^3_3 = F^3_{12}. \quad -(A12)$$

These results were checked by computer in paper 93 of the ECE series {1-10}. So Eq. (A6)

becomes:

$$\underline{B} = \underline{\nabla} \times \underline{A} - \underline{\omega}_b \times \underline{A}^b. \quad -(A13)$$

In this notation:

$$\left(\underline{\omega}_b \times \underline{A}^b \right)_X = \left(\omega_{3b} A^b_2 - \omega_{2b} A^b_3 \right)^1 \quad -(A14)$$

where the minus sign has been introduced following the usage of previous papers.

These results are obtained in the special case:

$$a = \mu \quad -(A15)$$

in Eq. (A4). This means that the vectors V^a and V^μ are written in the same frame of reference. Thus q^a_μ is diagonal in this special case:

$$V^0 = q^0_0 V^0, \quad V^1 = q^1_1 V^1, \qquad -(A16)$$
$$V^2 = q^2_2 V^2, \quad V^3 = q^3_3 V^3,$$

and from Eq. (A3), A^a_μ must be diagonal also. So in Eq. (A14)

$$\left(\underline{\omega}_b \times \underline{A}^b\right)_x = \left(\omega_{32} A^2_2 - \omega_{23} A^3_3\right)^1 \qquad -(A17)$$
$$= \omega^1_{32} A^2_2 - \omega^1_{23} A^3_3 .$$

Similarly:

$$\left(\underline{\omega}_b \times \underline{A}^b\right)_Y = \omega^2_{13} A^3_3 - \omega^2_{31} A^1_1, \qquad -(A18)$$
$$\left(\underline{\omega}_b \times \underline{A}^b\right)_Z = \omega^3_{21} A^1_1 - \omega^3_{12} A^2_2 . \qquad -(A19)$$

Therefore the meaning of the b index is given by Eqs. (A17) to (A19). The final result is:

$$\underline{B} = \underline{\nabla} \times \underline{A} - \underline{\omega} \times \underline{A} \qquad -(A20)$$

as used in previous papers on SCR {1-10}. The spin connection has been reduced here to a vector $\underline{\omega}$. The components of thsi vector in analogy with Eqs. (A9) to (A12) are:

$$\omega_X = \omega^1_1 = \omega^1_{23} = -\omega^1_{23}, \qquad -(A21)$$
$$\omega_Y = \omega^2_2 = \omega^2_{31} = -\omega^2_{13}, \qquad -(A22)$$
$$\omega_Z = \omega^3_3 = \omega^3_{12} = -\omega^3_{21} . \qquad -(A23)$$

So:

$$\underline{\omega} = \omega_X \underline{i} + \omega_Y \underline{j} + \omega_Z \underline{k} . \qquad -(A24)$$

Finally if we adopt the complex circular basis {1-10}:

$$\underline{B}^{(3)*} = \underline{\nabla} \times \underline{A}^{(3)*} - i\underline{\omega}^{(1)} \times \underline{A}^{(2)} \quad -(A25)$$

and if:

$$\underline{\omega}^{(1)} = g\underline{A}^{(1)} \quad -(A26)$$

we obtain the $\underline{B}^{(3)}$ spin field:

$$\underline{B}^{(3)*} = -ig\underline{A}^{(1)} \times \underline{A}^{(2)}. \quad -(A27)$$

APPENDIX 2: DERIVATION OF THE ELECTRIC FIELD IN VECTOR NOTATION.

For the electric field we consider:

$$F^{i}_{\ 0i} = (\partial_0 A_i - \partial_i A_0)^i + \omega^{i}_{\ 0i} A^{i}_{\ i} - \omega^{i}_{\ i0} A^{0}_{\ 0}, \quad -(B1)$$

$$i = 1, 2, 3$$

which is equivalent in vector notation to:

$$\underline{E} = -\underline{\nabla}\phi - \frac{\partial \underline{A}}{\partial t} - c\omega^0 \underline{A} + c\phi\,\underline{\omega}. \quad -(B2)$$

Therefore

$$-\left(\underline{\nabla}\phi + \frac{\partial \underline{A}}{\partial t}\right)_X = (\partial_0 A_1 - \partial_1 A_0)^1, \quad -(B3)$$

$$-\left(\underline{\nabla}\phi + \frac{\partial \underline{A}}{\partial t}\right)_Y = (\partial_0 A_2 - \partial_2 A_0)^2, \quad -(B4)$$

$$-\left(\underline{\nabla}\phi + \frac{\partial \underline{A}}{\partial t}\right)_Z = (\partial_0 A_3 - \partial_3 A_0)^3 \quad -(B5)$$

and

$$-\left(c\omega^0 \underline{A} - c\phi\,\underline{\omega}\right)_x = \omega^1{}_{01} A^1_1 - \omega^1{}_{10} A^0_0 \quad -(B8)$$

$$-\left(c\omega^0 \underline{A} - c\phi\,\underline{\omega}\right)_y = \omega^2{}_{02} A^2_2 - \omega^2{}_{20} A^0_0 \quad -(B9)$$

$$-\left(c\omega^0 \underline{A} - c\phi\,\underline{\omega}\right)_z = \omega^3{}_{03} A^3_3 - \omega^3{}_{30} A^0_0 . \quad -(B10)$$

Thus:

$$\underline{A} = A_x \underline{i} + A_y \underline{j} + A_z \underline{k} \quad -(B11)$$

where

$$A_x = A^1_1, \quad A_y = A^2_2, \quad A_z = A^3_3 \quad -(B12)$$

and

$$\underline{\omega} = \omega_x \underline{i} + \omega_y \underline{j} + \omega_z \underline{k} \quad -(B13)$$

where

$$\omega_x = \omega^1{}_{10}, \quad \omega_y = \omega^2{}_{20}, \quad \omega_z = \omega^3{}_{30} . \quad -(B14)$$

The scalar part of the spin connection is defined by:

$$c\omega^0 = -\omega^1{}_{01} = -\omega^2{}_{02} = -\omega^3{}_{03} \quad -(B15)$$

and the scalar potential is defined by:

$$c\phi = -A^0_0 . \quad -(B16)$$

So the electric and magnetic field in general relativity (ECE theory) are:

$$\underline{E} = -\underline{\nabla}\phi - \frac{\partial \underline{A}}{\partial t} - c\omega^0 \underline{A} + c\,\underline{\omega}\,\phi \quad -(B17)$$

$$\underline{B} = \underline{\nabla} \times \underline{A} - \underline{\omega} \times \underline{A} . \quad -(B18)$$