SPIN CONNECTION RESONANCE IN THE FARADAY DISK GENERATOR

by

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ABSTRACT

Using Einstein Cartan Evans (ECE) unified field theory the conditions are deduced under which a Faraday disk generator may be used to demonstrate a resonant peak of power due to the spin connection used in ECE theory (spin connection resonance or SCR). The analytical analysis is supported by a Faraday disk design with variable spin speeds which has recently demonstrated the existence of SCR experimentally.

Keywords : ECE theory, spin connection resonance, Faraday disk generator.

107th paper

1. INTRODUCTION

During the course of development {1-10} of ECE theory the phenomenon of spin connection resonance (SCR) has been developed (for example papers 63 and 94 of the ECE series on www.aias.us) and shown to be important in the acquisition of electric power from space-time through the Cartan torsion. This source of electric power is well known experimentally and was demonstrated for example by Tesla {11} in several devices. Other groups have observed such effects {1-10} for over a hundred years, but as in the case of the Faraday disk generator {12} the standard Maxwell Heaviside (MH) theory does not have an explanation for them. Therefore there has been a tendency to under-implement these potentially important devices despite their obvious importance for the generation of electric power. In papers 43 and 44 of the ECE series a straightforward explanation for the Faraday disk generator was given in terms of the spinning of space-time and in Section 2 this explanation is adapted to demonstrate analytically the possibility in the Faraday disk generator of spin connection resonance induced by varying the speed of the spinning disk. In Section 3 such a device is described experimentally and suggestion is made for the improved control and engineering of devices that take electric power from space-time using the Faraday disk design.

2. ANALYTICAL THEORY

The theory of the Faraday disk was first developed with ECE theory in papers 43 and 44. They were based on the fundamental idea of ECE theory:

$$F = A^{(0)} T \qquad -(1)$$

in short-hand index-less notation {1-10}. Here F denotes the electromagnetic field form and T the Cartan torsion form {13, 14}. The quantity $cA^{(0)}$ is a fundamental voltage {1-10}. In the Faraday disk the torsion T is set up by mechanical rotation. So the basic equations of the generator are:

$$F = A^{(0)} T \, (\text{mechanical}) = d \wedge A + \omega \wedge A \quad -(2)$$

where ^ denotes wedge product and d ^ denotes exterior derivative. Here A is the potential form of ECE theory {1-10} and ω is its spin connection form {1-10, 13, 14}. The field equations of the system are based on the Bianchi identity as developed by Cartan and are:

$$d \wedge F + \omega \wedge F = R \wedge A \quad -(3)$$

$$d \wedge \tilde{F} + \omega \wedge \tilde{F} = \tilde{R} \wedge A. \quad -(4)$$

The second equation is the Hodge dual of the Bianchi identity and was developed during the course of development of ECE theory. The field equations can be reduced {1-10} to vector notation as used in standard electrical engineering. They then become the following set of six equations for all practical purposes in the laboratory.

$$\underline{\nabla} \cdot \underline{B} = 0 \quad -(5)$$

$$\underline{\nabla} \times \underline{E} + \frac{\partial \underline{B}}{\partial t} = \underline{0} \quad -(6)$$

$$\underline{\nabla} \cdot \underline{E} = \rho / \epsilon_0 \quad -(7)$$

$$\underline{\nabla} \times \underline{B} - \frac{1}{c^2} \frac{\partial \underline{E}}{\partial t} = \mu_0 \underline{J} \quad -(8)$$

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

$$\underline{E} = -\underline{\nabla} \phi - \frac{\partial \underline{A}}{\partial t} + \phi \underline{\omega} - \omega \underline{A}. \quad -(10)$$

The first four are the Gauss law, the Faraday law of induction, the Coulomb law and the Ampère Maxwell law, the fifth and sixth are the equations expressing fields in terms of the potentials and spin connection scalar and vector. In these vector equations, expressed in S.I. units, $\underline{B}$ is the magnetic flux density, $\underline{E}$ is the electric field strength, ρ is the charge density, ϵ_0 is the vacuum permittivity, $\underline{J}$ is the current density, $\underline{A}$ is the vector potential, ω is the scalar connection, ϕ is the scalar potential and $\underline{\omega}$ is the vector connection. Details of this derivation are given in the ECE series of papers and books (www.aias.us), notably in review paper 100.

The Bianchi identity (3) gives the homogeneous field equation in tensor notation, and the Hodge dual identity (4) gives the inhomogeneous field equation in tensor notation. The tensor equations are then written in the base manifold, which is a four dimensional space-time with torsion and curvature. The latter is expressed in the original field equations through the curvature form R in index-less notation. The link between geometry and the electromagnetic field being expressed by the basic relation (2). The classical field equations of electrodynamics therefore become field equations of general relativity, not field equations of special relativity, in which both torsion and curvature are absent, and in which the space-time is a Minkowski space-time. The MH field theory, in which the electromagnetic field is a nineteenth century concept defined on a Minkowski frame of reference, is one of special relativity. In ECE theory the electromagnetic field is the space-time geometry itself within a factor $A^{(0)}$, where $cA^{(0)}$ is a primordial voltage. Finally the two tensor equations in the base manifold are developed as four vector equations, and the tensor relation between field and potential developed into two further vector equations.

In paper 44 a complex circular basis {1-10} was used to define a rotating potential set up by mechanically rotating the Faraday disk at an angular frequency Ω in radians per second:

$$\underline{A}^{(1)} = \frac{A^{(0)}}{\sqrt{2}} (\underline{i} - i\underline{j}) e^{i\Omega t} \quad - (11)$$

Its complex conjugate is denoted:

$$\underline{A}^{(2)} = \frac{A^{(0)}}{\sqrt{2}} (\underline{i} + i\underline{j}) e^{-i\Omega t} \quad - (12)$$

This is the key concept of the ECE explanation of the Faraday disk generator. The real parts of $\underline{A}^{(1)}$ and $\underline{A}^{(2)}$ are the same and can be worked out with de Moivre's Theorem:

$$e^{i\Omega t} = \cos \Omega t + i \sin \Omega t. \quad - (13)$$

The ECE concept is based on:

$$A = A^{(0)} q \quad - (14)$$

where q is the Cartan tetrad {1-10}. The tetrad relevant to the Faraday disk is:

$$\underline{q}^{(1)} = \underline{q}^{(2)*} = \frac{1}{\sqrt{2}} (\underline{i} - i\underline{j}) e^{i\Omega t}. \quad - (15)$$

This concept is one of rotational general relativity, whereas the Maxwell Heaviside (MH) theory is one of special relativity in a flat or Minkowski space-time. It is well known that MH is unable to explain the Faraday disk generator, whereas ECE explains it straightforwardly. It is clear therefore that electrodynamics is part of ECE theory, a generally covariant unified field theory (www.aias.us). Classical and quantum electrodynamics have been extensively developed within ECE theory, and unified with other fundamental fields, notably gravitation.

In the Faraday disk the mechanical spin sets up a rotational tetrad, which is a rotation of space-time ITSELF.

In paper 44 a special case of Eq. (10) was used:

$$\underline{E} = -\frac{\partial \underline{A}}{\partial t} - \omega \underline{A} \qquad -(16)$$

in which ϕ was assumed to be zero and where $\underline{A}$ is generated by the magnet of the Faraday disk generator, essentially as used by Faraday and reported in his diary on Dec 26th 1831. The scalar spin connection in paper 44 was assumed to be proportional to Ω , so the electric field strength is:

$$\underline{E}^{(2)} = \underline{E}^{(1)*} = -\left(\frac{\partial}{\partial t} + i\Omega\right)\underline{A}^{(2)}. \qquad -(17)$$

The real part of this expression is worked out with Eq. (13) and is:

$$\underline{E} = \frac{2}{\sqrt{2}} A^{(0)} \Omega \left(\underline{i} \sin \Omega t - \underline{j} \cos \Omega t \right). \qquad -(18)$$

This electric field strength (in volts per meter) spins around the rim of the rotating disk. As observed experimentally it is proportional to the product of $A^{(0)}$ and Ω . An electromotive force is set up between the center of the disk and its rim, as first observed by Faraday, and this emf is measured by a voltmeter at rest with respect to the spinning disk.

Recently {15} there have been reports of a Faraday disk generator exhibiting a powerful resonance effect hitherto unknown. The onset of this surge of electric power occurs when the angular frequency of the spinning disk is time dependent. At a sharply defined Ω the apparatus was observed to disintegrate (explode). There is no explanation for this in standard electrical engineering, which is based on the MH theory. In ECE theory it can be explained by spin connection resonance provided that the rate of spin of the disk is time dependent, i.e. its RPM increases so that:

$$\frac{\partial \Omega}{\partial t} \neq 0. \quad -(19)$$

Use Eq. (8) with

$$\underline{\nabla} \times \underline{B} = \underline{0} \quad -(20)$$

because in the Faraday disk generator:

$$\underline{B} = B^{(0)} \underline{k}. \quad -(21)$$

Therefore

$$\frac{\partial \underline{E}}{\partial t} = -\epsilon_0 \underline{J} \quad -(22)$$

where:

$$\underline{E} = \frac{2}{\sqrt{2}} A^{(0)} \Omega \left(\underline{i} \sin \Omega t - \underline{j} \cos \Omega t \right) \quad -(23)$$

and in complex circular notation the electric field strength is:

$$\underline{E}^{(2)} = -\frac{\partial \underline{A}^{(2)}}{\partial t} - i \Omega \underline{A}^{(2)}. \quad -(24)$$

Differentiating this equation with respect to time:

$$\frac{\partial \underline{E}^{(2)}}{\partial t} = -\frac{\partial^2 \underline{A}^{(2)}}{\partial t^2} - i \Omega \frac{\partial \underline{A}^{(2)}}{\partial t} = -\epsilon_0 \underline{J}, \quad -(25)$$

so using Eq. (24) the equation for the potential is:

$$\frac{\partial^2 \underline{A}^{(2)}}{\partial t^2} + i \Omega \frac{\partial \underline{A}^{(2)}}{\partial t} + i \left(\frac{\partial \Omega}{\partial t} \right) \underline{A}^{(2)} = \epsilon_0 \underline{J} \quad -(26)$$

This is an Euler Bernoulli resonance equation {1-10, 16} under the condition:

$$\frac{\partial \Omega}{\partial t} \neq 0 \quad -(27)$$

i.e. that the RPM of the spinning disk increases. Thus:

$$\frac{\partial^2 \underline{A}^{(2)}}{\partial t^2} + i \frac{\partial}{\partial t}\left(\Omega \underline{A}^{(2)}\right) = \epsilon_0 \underline{J}. \quad -(28)$$

This is an undamped resonator equation if J is designed experimentally to be periodic, for example:

$$\underline{J}^{(2)} = J^{(0)} \cos\left(\Omega_0 t\right) \underline{e}^{(2)}. \quad -(29)$$

Finally if the engineering design is such that:

$$\frac{\partial \Omega}{\partial t} \gg \Omega \quad -(30)$$

we obtain the equation:

$$\frac{\partial^2 \underline{A}^{(2)}}{\partial t^2} + i \left(\frac{\partial \Omega}{\partial t}\right) \underline{A}^{(2)} = J^{(0)} \cos\left(\Omega_0 t\right) \underline{e}^{(2)}. \quad -(31)$$

At resonance {1-10, 16}:

$$\underline{A}^{(2)} \rightarrow \infty. \quad -(32)$$

The observed explosion of the Faraday disk generator {15} may be explained in this way, i.e. the design must be a rapidly varying Ω and a periodic current density coming from the emf set up between the center and rim of the rotating disk.

3. DISCUSSION OF DESIGN

(Section by Amador and Eckardt)

ACKNOWLEDGMENTS

The British Government is thanked for a Civil List Pension and the staff of AIAS and the Santilli Galilei Association for many interesting discussions.

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