CONSERVATION OF ANTISYMMETRY IN ECE2 ELECTROSTATICS AND MAGNETOSTATICS.

by

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ABSTRACT

It is shown that antisymmetry is rigorously conserved in ECE2 electrostatics and magnetostatics. The electric field strength $\underline{E}$ and magnetic flux density $\underline{B}$ are interpreted as having contributions from the material or circuit and from the interaction of the circuit with spacetime, the vacuum or aether. The four current density of spacetime is defined, together with the secondary magnetostatic field of electrostatics and the secondary electrostatic field of magnetostatics. The spin connection four vector is defined for electrostatics and magnetostatics.

Keywords: ECE2 conservation of antisymmetry, electrostatics, magnetostatics.

UFT 387

1. INTRODUCTION

In recent papers of this series {1 - 12} it has been shown that conservation of antisymmetry is a fundamental law of physics, as fundamental as conservation of energy momentum and charge current density for example. It has also been shown that the field equations of electrodynamics, gravitation and fluid dynamics are determined by Cartan geometry within the context of ECE2 generally covariant unified field theory. The same foundational antisymmetry laws apply in all three subject areas, unified into one set of equations based on geometry. Therefore it is concluded that conservation of antisymmetry applies to the whole of physics and is a foundational law of physics.

This paper is a short synopsis of detailed calculations given the notes accompanying UFT387 on www.aias.us. Note 387(1) defines the vacuum four current in terms of the spin connection four vector, Note 387(2) develops electrostatics and magnetostatics and Note 387(3) interprets the electric field strength $\underline{E}$ and magnetic flux density $\underline{B}$ in terms of a materieal or circuit component and a component due ot the interaction of the circuit with spacetime (also given the appellations "vacuum" and "aether").

Section 2 summarizes the main results of the notes, and Section 3 is a numerical and graphical analysis.

2. INTERPRETATION AND CONSERVATION OF ANTISYMMETRY.

Consider the electric field strength $\underline{E}$ and magnetic flux density $\underline{B}$ in ECE2 physics:

$$\underline{E} = -\underline{\nabla}\phi + \underline{\omega}\phi = -\frac{\partial \underline{A}}{\partial t} - \omega_0 \underline{A} \quad -(1)$$

and

$$\underline{B} = \underline{\nabla} \times \underline{A} - \underline{\omega} \times \underline{A}. \quad -(2)$$

Here ϕ is the scalar potential $\underline{A}$ is the vector potential, and:

$$\omega^\mu = \left(\frac{\omega_0}{c}, \underline{\omega} \right) \quad -(3)$$

is the spin connection four vector that maps the vacuum or spacetime. Eqs. (1) and (2) are:

$$\underline{E} := \underline{E}\,(\text{observed}), \quad -(4)$$

$$\underline{B} := \underline{B}\,(\text{observed}). \quad -(5)$$

Eqs. (1) and (2) are interpreted as follows:

$$\underline{E} := \underline{E}\,(\text{observed}) = \underline{E}\,(\text{circuit}) + \underline{E}\,(\text{interaction with vacuum}) \quad -(6)$$

$$\underline{B} := \underline{B}\,(\text{observed}) = \underline{B}\,(\text{circuit}) + \underline{B}\,(\text{interaction with vacuum}) \quad -(7)$$

Here:

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

$$\underline{E}\,(\text{interaction with vacuum}) = \underline{\omega}\,\phi \quad -(9)$$

$$\underline{B}\,(\text{circuit}) = \underline{\nabla} \times \underline{A} \quad -(10)$$

$$\underline{B}\,(\text{interaction with vacuum}) = -\underline{\omega} \times \underline{A}. \quad -(11)$$

The spin connection defines the $\underline{E}$ and $\underline{B}$ fields produced by the interaction with the vacuum.

The electrostatic field equations of ECE2 physics are:

$$\underline{\nabla} \times \underline{E} = \underline{0} \quad -(12)$$

$$\underline{\nabla} \cdot \underline{E} = \rho / \epsilon_0 \quad -(13)$$

$$\partial \underline{E} / \partial t = \underline{0} \quad -(14)$$

where ρ is the charge density and ϵ_0 the vacuum permittivity. In electrostatics and magnetostatics it is assumed that:

$$\frac{\partial \underline{A}}{\partial t} = \underline{0}. \quad -(15)$$

It follows that

$$\underline{E} = -\omega_0 \underline{A} \quad -(16)$$

where $\underline{A}$ is the electrostatic vector potential. This concept does not exist in the standard Maxwell Heaviside (MH) theory. It follows that:

$$\underline{\nabla} \times (\omega_0 \underline{A}) = \underline{0} \quad -(17)$$

$$\underline{\nabla} \cdot (\omega_0 \underline{A}) = -\rho / \epsilon_0. \quad -(18)$$

These are four scalar equations in four unknows: ω_0, A_X, A_Y, A_Z. They can be solved by FEM boundary value methods on a computer. This procedure gives ω_0 and $\underline{A}$. Having found $\underline{A}$ for electrostatics, the spin connection for electrostatics is found by solving the antisymmetry equations:

$$\frac{\partial A_Z}{\partial Y} + \frac{\partial A_Y}{\partial Z} = \omega_Y A_Z + \omega_Z A_Y \quad -(19)$$

$$\frac{\partial A_X}{\partial Z} + \frac{\partial A_Z}{\partial X} = \omega_Z A_X + \omega_X A_Z \quad -(20)$$

$$\frac{\partial A_Y}{\partial X} + \frac{\partial A_X}{\partial Y} = \omega_X A_Y + \omega_Y A_X \quad -(21)$$

This gives the complete spin connection four vector for any situation in electrostatics. The vacuum can be mapped in this way.

The material scalar potential ϕ for electrostatics is found from:

$$\phi(\underline{x}) = \frac{1}{4\pi\epsilon_0}\int \frac{\rho(\underline{x}')}{|\underline{x}-\underline{x}'|} d^3x' \quad -(22)$$

where ρ is the charge density. Eq. (22) can be evaluated by computer for any experimental charge density. Knowing ω_0 and $\underline{A}$, the charge density can also be found from:

$$\underline{\nabla}\cdot\underline{E} = -\underline{\nabla}\cdot(\omega_0\underline{A}) = \rho/\epsilon_0 . \quad -(23)$$

The electrostatic field strength due to interaction with the vacuum can be found from:

$$\underline{E}\,(\text{interaction with vacuum}) = \underline{\omega}\,\phi \quad -(24) .$$

and the material or circuit field strength can be found from:

$$\underline{E}\,(\text{circuit}) = -\underline{\nabla}\phi . \quad -(25)$$

The secondary magnetic flux density $\underline{B}$ of electrostatics is defined by:

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

where $\underline{A}$ is the electrostatic vector potential computed from Eqs. (17) and (18).

Magnetostatics in ECE2 physics is defined by:

$$\underline{\nabla}\cdot\underline{B} = 0 \quad -(27)$$

$$\underline{\nabla}\times\underline{B} = \mu_0\underline{J} \quad -(28)$$

$$\partial\underline{B}/\partial t = \underline{0} \quad -(29)$$

$$\underline{B} = \underline{\nabla}\times\underline{A} - \underline{\omega}\times\underline{A} \quad -(30)$$

where:

$$\underline{A}(\underline{x}) = \frac{1}{4\pi\epsilon_0} \int \frac{\underline{J}(\underline{x}')}{|\underline{x} - \underline{x}'|} d^3x' \quad -(31)$$

is the magnetic vector potential of the material or circuit and $\underline{J}$ is the current density of the material or circuit. This magnetostatic current density defines a magnetostatic charge density through the continuity equation:

$$\frac{\partial \rho}{\partial t} + \underline{\nabla} \cdot \underline{J} = 0. \quad -(32)$$

Using computational methods, the magnetic vector potential $\underline{A}$ of the material or circuit can be found for any experimentally observable current density of the circuit. The continuity equation shows that there cannot be a current density without a moving charge density.

Having computed $\underline{A}$, the spin connection vector for magnetostatics is computed from the antisymmetry equations (19) to (21). The material or circuit magnetic flux density is:

$$\underline{B} = \underline{\nabla} \times \underline{A} \quad -(33)$$

and the magnetic flux density due to the interaction of the circuit with the vacuum is:

$$\underline{B}\,(\text{interaction with vacuum}) = -\underline{\omega} \times \underline{A}. \quad -(34)$$

The secondary electric field strength of ECE2 magnetostatics is:

$$\underline{E} = -\omega_0 \underline{A} \quad -(35)$$

where $\underline{A}$ is defined by Eq. (31). The secondary $\underline{E}$ field obeys the equations:

$$\underline{\nabla} \times \underline{E} = \underline{0} \quad -(36)$$

and

$$\underline{\nabla} \cdot \underline{E} = \rho / \epsilon_0 \quad -(37)$$

where the secondary charge density is defined by the continuity equation (32) and can be computed. Eqs. (36) and (37) can be solved using FEM boundary value methods in a manner that is exactly analogous to solving Eqs. (17) and (18).

Finally the charge current four density generated by the interaction of circuit and vacuum is:

$$J^\mu (\text{interaction with vacuum}) = \frac{1}{\mu_0} \left(\frac{1}{c} \underline{\nabla} \cdot (\underline{\omega} \phi), -\underline{\nabla} \times (\underline{\omega} \times \underline{A}) \right) \quad -(38)$$

where μ_0 is the vacuum permeability.

Section 3 by Horst Eckardt

Conservation of antisymmetry in ECE2 electrostatics and magnetostatics

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3 Computation and graphics

We continue examples of magnetostatics and elctrostatics and analyse the space-time properties resulting from the antisymmetry laws.

3.1 Magnetic dipole field

The magnetic dipole field was already investigated in UFT386, including graphics of the spin connection $\boldsymbol{\omega}$ and magnetic flux density $\mathbf{B}$. Here we complete the example with the secondary electric field arising from the magnetic flux density. According to Eq. (35), the secondary electric field strength is given by

$$\mathbf{E} = -\omega_0 \mathbf{A} \tag{39}$$

with scalar spin connection ω_0 and vector potential $\mathbf{A}$ of the circuit. ω_0 is a quantity being unknown a priori and has to be determined from Eq. (17). From (18) then follows a secondary electric charge density. Since Eq. (17),

$$\boldsymbol{\nabla} \times (\omega_0 \mathbf{A}) = \mathbf{0}, \tag{40}$$

is a vector equation, ω_0 has to be determined in a way so that all three component equations are fulfilled. There is no general procedure for doing this. In the case of the magnetic dipole field, we found three functions ω_0 fulfilling this condition, see Table 1. The three solutions differ in symmetry. Since the dipole is rotationally symmetric around the Z axis, we expect that also the secondary electric field should show up this property. The first example is asymmetric as can be seen from the X and Y dependencies. The second example (graphed in Fig. 1) shows circular field lines but the E field has directional changes on the coordinate axes. The divergence vanishes despite the apparent divergences on these axes. The third example has the desired full rotational geometry (Fig. 2). The spin connection of this case is graphed in Figs. 3 and 4 for the planes $Z = 0$ and $Z = 1$. It has a cone form at the centre. When moving from the

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centre ($Z \neq 0$), a pole builds up at $X = Y = 0$. According to Table 1, there is no secondary charge density.

ω_0	$E_{\text{secondary}}$	$\rho_{\text{secondary}}$
$\frac{b(X^2+Y^2+Z^2)^{3/2}}{\sqrt{X}Y^{3/2}}$	$\frac{Ia^2b\mu_0}{4}\begin{bmatrix}\frac{1}{\sqrt{XY}}\\ -\frac{\sqrt{X}}{Y^{3/2}}\\ 0\end{bmatrix}$	$-\frac{I\,a^2 b\,\mu_0\left(Y^2-3X^2\right)}{8X^{3/2}\,Y^{5/2}}$
$\frac{b(X^2+Y^2+Z^2)^{3/2}}{XY}$	$\frac{Ia^2b\mu_0}{4}\begin{bmatrix}\frac{1}{X}\\ -\frac{1}{Y}\\ 0\end{bmatrix}$	0
$\frac{b(X^2+Y^2+Z^2)^{3/2}}{X^2+Y^2}$	$\frac{Ia^2b\mu_0}{4(X^2+Y^2)}\begin{bmatrix}Y\\ -X\\ 0\end{bmatrix}$	0

Table 1: Combinations of scalar spin connection, secondary electric field and charge density for a magnetic dipole.

3.2 Electrostatic point charge

As a simple electrostatic example we consider the field of a point charge. We can "guess" the vector potential and scalar spin connection so that the well known central electric field comes out from Eq. (39):

$$\mathbf{A} = \frac{a}{X^2+Y^2+Z^2}\begin{bmatrix}X\\ Y\\ Z\end{bmatrix}, \tag{41}$$

$$\omega_0 = \frac{b}{\sqrt{X^2+Y^2+Z^2}}, \tag{42}$$

$$\mathbf{E} = -\frac{ab}{(X^2+Y^2+Z^2)^{3/2}}\begin{bmatrix}X\\ Y\\ Z\end{bmatrix}. \tag{43}$$

Evaluation of Eqs. (19-21) then gives the vector spin connection

$$\boldsymbol{\omega} = -\frac{2}{X^2+Y^2+Z^2}\begin{bmatrix}X\\ Y\\ Z\end{bmatrix}. \tag{44}$$

The fields $\mathbf{A}$, $\mathbf{E}$ and $\boldsymbol{\omega}$ are central fields and look very similar. The vector potential has been graphed in Fig. 5 as an example. From the fields follows

$$\boldsymbol{\nabla} \times \mathbf{A} = \boldsymbol{\omega} \times \mathbf{A} = \mathbf{0} \tag{45}$$

i.e. there is no secondary magnetic field:

$$\mathbf{B}_{\text{secondary}} = \mathbf{0}. \tag{46}$$

The charge density is zero everywhere in space because a point charge represents a δ function with volume zero:

$$\frac{\rho}{\epsilon_0} = \boldsymbol{\nabla} \cdot \mathbf{E} = 0. \tag{47}$$

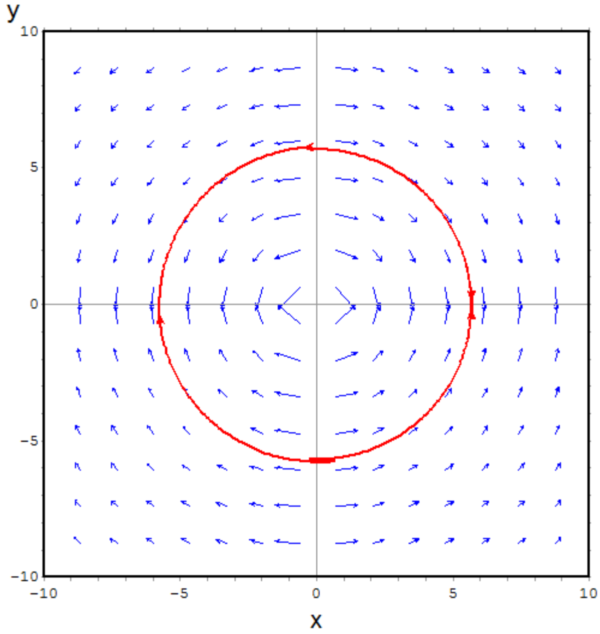

Figure 1: Secondary **E** field of magnetic dipole, case 2 of Table 1.

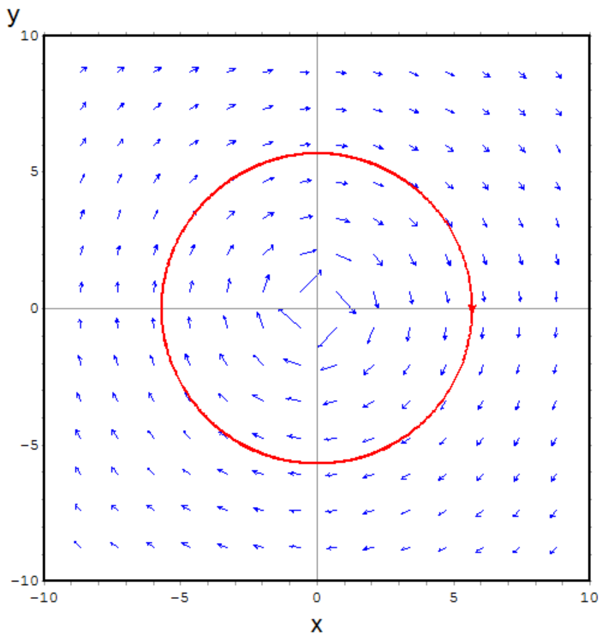

Figure 2: Secondary **E** field of magnetic dipole, case 3 of Table 1.

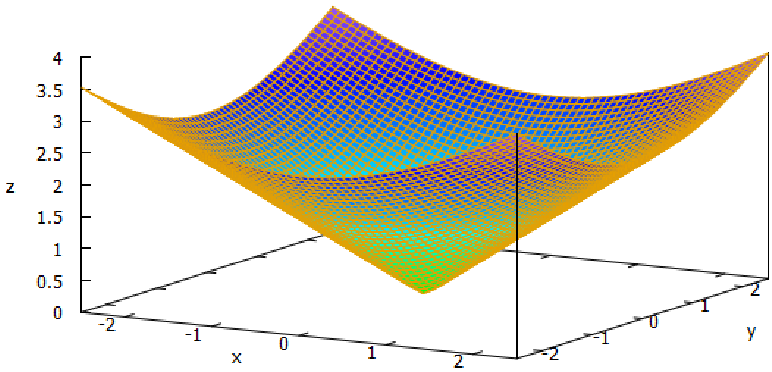

Figure 3: Spin connection ω_0 of magnetic dipole, at plane $Z = 0$.

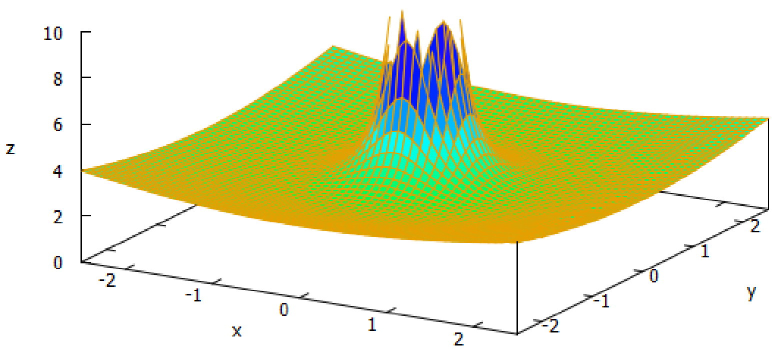

Figure 4: Spin connection ω_0 of magnetic dipole, at plane $Z = 1$.

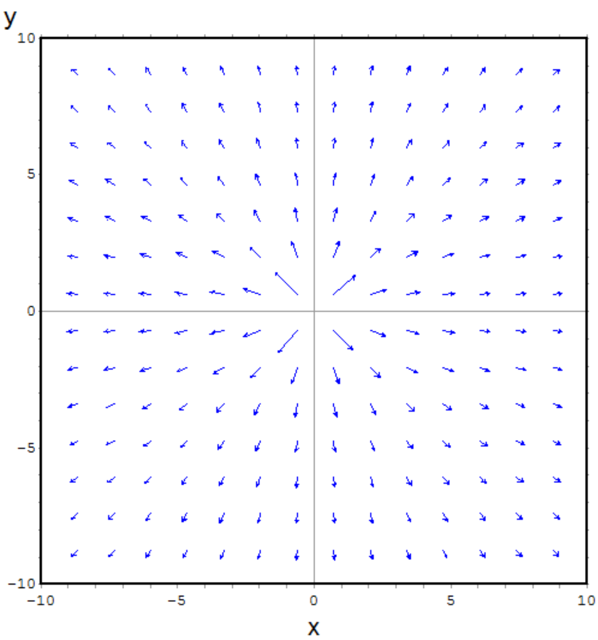

Figure 5: **A** field of a point charge (similar to **E** and $\boldsymbol{\omega}$).

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REFERENCES

{1} M. W. Evans, H. Eckardt, D. W. Lindstrom and S. J. Crothers, "ECE2 : The Second Paradigm Shift" (open access on combined sites www.aias.us and www.upitec.com as UFT366 and ePubli in prep., translation by Alex Hill)

{2} M. W. Evans, H. Eckardt, D. W. Lindstrom and S. J. Crothers, "The Principles of ECE" (open access as UFT350 and Spanish section, ePubli, Berlin 2016, hardback, New Generation, London, softback, translation by Alex Hill, Spanish section).

{3} M. W. Evans, S. J. Crothers, H. Eckardt and K. Pendergast, "Criticisms of the Einstein Field Equation" (open access as UFT301, 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 relevant UFT papers, combined sites).

{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 UFT303, collected equations).

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

{8} M. W. Evans and L. B Crowell, "Classical and Quantum Electrodynamics and the B(3) Field" (World Scientific 2001, Open Access 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, 2001) in two editions and six volumes.

{10} M. W. Evans and J. - P. Vigier, "The Enigmatic Photon", (Kluwer, 1994 to 2002, in five volumes hardback and softback, open access Omnia Opera Section of www.aias.us).

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

{12} M .W. Evans and A. A. Hasanein, "The Photomagneton in Quantum Field Theory" (World Scientific, 1994).