388(1): Conservation of Antisymmetry in Electrodynamics

In this case:

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

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

and the field equations are:

$$\underline{\nabla} \cdot \underline{B} = 0 \quad -(3)$$

$$\underline{\nabla} \times \underline{E} + \frac{\partial \underline{B}}{\partial t} = \underline{0} \quad -(4)$$

$$\underline{\nabla} \cdot \underline{E} = \rho / \epsilon_0 \quad -(5)$$

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

The vector antisymmetry laws are:

$$\frac{\partial A_Z}{\partial Y} + \frac{\partial A_Y}{\partial Z} = \omega_Y A_Z + \omega_Z A_Y \quad -(7)$$

$$\frac{\partial A_X}{\partial Z} + \frac{\partial A_Z}{\partial X} = \omega_Z A_X + \omega_X A_Z \quad -(8)$$

$$\frac{\partial A_Y}{\partial X} + \frac{\partial A_X}{\partial Y} = \omega_X A_Y + \omega_Y A_X \quad -(9)$$

From eq. (1):

$$2\underline{E} = -\underline{\nabla}\phi + \underline{\omega}\phi - \frac{\partial \underline{A}}{\partial t} - \omega_0 \underline{A} \quad -(10)$$

$$:= -\underline{\nabla}\phi_{sm} + \underline{\omega}\phi_{sm} - \frac{\partial \underline{A}_{sm}}{\partial t} - \omega_0 \underline{A}_{sm}$$

This can be written as:

$$\underline{E} = -\underline{\nabla}\phi + \underline{\omega}\phi - \frac{\partial \underline{A}}{\partial t} - \omega_0 \underline{A} \quad -(11)$$

2) if:

$$\phi = \frac{1}{2}\phi_{sm}, \quad \underline{A} = \frac{1}{2}\underline{A}_{sm} \quad -(12)$$

The subscripts sm refer to standard model. Eq (11) can be rearranged as:

$$\underline{E} = -\underline{\nabla}\phi - \frac{\partial \underline{A}}{\partial t} + \underline{\omega}\phi - \omega_0 \underline{A} \quad -(13)$$

In this expression:

$$\underline{E}_1 = \underline{E}\,(\text{matter}) = -\underline{\nabla}\phi - \frac{\partial \underline{A}}{\partial t} \quad -(14)$$

$$\underline{E}_2 = \underline{E}\,(\text{interaction with vacuum}) = \underline{\omega}\phi - \omega_0 \underline{A} \quad -(15)$$

Similarly:

$$\underline{B}_1 = \underline{B}\,(\text{matter}) = \underline{\nabla}\times\underline{A} \quad -(16)$$

$$\underline{B}_2 = \underline{B}\,(\text{interaction with vacuum}) = -\underline{\omega}\times\underline{A} \quad -(17)$$

Therefore eqs. (3) to (6) are:

$$\underline{\nabla}\cdot(\underline{B}_1 + \underline{B}_2) = 0 \quad -(18)$$

$$\underline{\nabla}\times(\underline{E}_1 + \underline{E}_2) + \frac{\partial}{\partial t}(\underline{B}_1 + \underline{B}_2) = \underline{0} \quad -(19)$$

$$\underline{\nabla}\cdot(\underline{E}_1 + \underline{E}_2) = \frac{1}{\epsilon_0}(\rho_1 + \rho_2) \quad -(20)$$

$$\underline{\nabla}\times(\underline{B}_1 + \underline{B}_2) - \frac{1}{c^2}\frac{\partial}{\partial t}(\underline{E}_1 + \underline{E}_2) = \mu_0(\underline{J}_1 + \underline{J}_2) \quad -(21)$$

where

$$J_2^{\mu} = (c\rho_2, \underline{J}_2) \quad -(22)$$

is the vacuum to matter charge current density.

A possible solution of Eqns. (18) to (21) is:

$$\underline{\nabla} \cdot \underline{B}_1 = \underline{0} \tag{23}$$

$$\underline{\nabla} \times \underline{E}_1 + \frac{\partial \underline{B}_1}{\partial t} = \underline{0} \tag{24}$$

$$\underline{\nabla} \cdot \underline{E}_1 = \rho_1 / \epsilon_0 \tag{25}$$

$$\underline{\nabla} \times \underline{B}_1 - \frac{1}{c^2} \frac{\partial \underline{E}_1}{\partial t} = \mu_0 \underline{J}_1 \tag{26}$$

and

$$\underline{\nabla} \cdot \underline{B}_2 = 0 \tag{27}$$

$$\underline{\nabla} \times \underline{E}_2 + \frac{\partial \underline{B}_2}{\partial t} = \underline{0} \tag{28}$$

$$\underline{\nabla} \cdot \underline{E}_2 = \rho_2 / \epsilon_0 \tag{29}$$

$$\underline{\nabla} \times \underline{B}_2 - \frac{1}{c^2} \frac{\partial \underline{E}_2}{\partial t} = \mu_0 \underline{J}_2 \tag{30}$$

Eqs. (23) to (26) are the field equations for the material or circuit fields, and eqs. (27) to (30) are the field equations for the fields generated by the interaction with the vacuum. Eqs. (23) to (26) have the same structure as the Maxwell Heaviside field equations, but are written in ECE2 space with finite curvature and torsion. Eqs. (27) to (30) do not exist in the standard model.

With the understanding that eqs. (23) to (26) refer to matter or circuit fields, they can be written in the same way as the usual development of Maxwell Heaviside theory:

$$\underline{\nabla} \cdot \underline{B} = 0 \qquad -(31)$$

$$\underline{\nabla} \times \underline{E} + \frac{\partial \underline{B}}{\partial t} = \underline{0} \qquad -(32)$$

$$\underline{\nabla} \cdot \underline{E} = \rho_1 / \epsilon_0 \qquad -(33)$$

$$\underline{\nabla} \times \underline{B} - \frac{1}{c^2}\frac{\partial \underline{E}}{\partial t} = \mu_0 \underline{J} \qquad -(34)$$

with

$$\underline{E} = -\underline{\nabla}\phi - \frac{\partial \underline{A}}{\partial t} \qquad -(35)$$

$$\underline{B} = \underline{\nabla} \times \underline{A} \qquad -(36)$$

Using the Lorenz gauge:

$$\underline{\nabla} \cdot \underline{A} + \frac{1}{c}\frac{\partial \phi}{\partial t} = 0 \qquad -(37)$$

these equations reduce to:

$$\Box A^\mu = \mu_0 J^\mu \qquad -(38)$$

where

$$A^\mu = \left(\frac{\phi}{c}, \underline{A}\right), \quad J^\mu = \left(c\rho, \underline{J}\right) \qquad -(39)$$

and

$$\Box = \frac{1}{c^2}\frac{\partial^2}{\partial t^2} - \nabla^2 \qquad -(40)$$

is the d'Alembertian operator. Eq. (38) means that

$$\Box \phi = \rho / \epsilon_0 \qquad -(41)$$

$$\Box \underline{A} = \mu_0 \underline{J} \qquad -(42)$$

so ϕ and $\underline{A}$ can be found from the charge density ρ and current density $\underline{J}$ in the circuit

) or material. These quantities are measured experimentally.
They are linked by the continuity equation:

$$\frac{\partial \rho}{\partial t} + \underline{\nabla} \cdot \underline{J} = 0 \quad -(43)$$

The Lorenz gauge (37) and continuity equation (43)
e linked by eq. (38).

The ECE wave equation for each index a

is

$$\square A^{\mu} = -R A^{\mu} \quad -(44)$$

where R is a scalar curvature, so

$$\square A^{\mu} = -R A^{\mu} = \mu_0 J^{\mu} \quad -(45)$$

The interaction of the circuit with the vacuum or
ether or spacetime is governed by eqs. (27) to (30)
in which

$$J_2^{\mu} = (\rho_2, \underline{J}_2) \quad -(46)$$

, the charge current density due to the interaction
of the circuit and vacuum. Eqs. (27) to (30) are:

$$\underline{\nabla} \cdot \underline{\omega} \times \underline{A} = 0 \quad -(47)$$

$$\underline{\nabla} \times (\phi \underline{\omega} - \omega_0 \underline{A}) - \frac{\partial}{\partial t}(\underline{\omega} \times \underline{A}) = \underline{0} \quad -(48)$$

$$\underline{\nabla} \cdot (\phi \underline{\omega} - \omega_0 \underline{A}) = \rho_2 / \epsilon_0 \quad -(49)$$

$$\frac{1}{c^2} \frac{\partial}{\partial t}(\phi \underline{\omega} - \omega_0 \underline{A}) - \underline{\nabla} \times (\underline{\omega} \times \underline{A}) = \mu_0 \underline{J}_2 \quad -(50)$$

Therefore J_2^{μ} can be found from eqs. (49) and (50).

6) Define the vector potential $\underline{A}_2$ for the interaction of the circuit and vacuum by:

$$\underline{B}_2 = \underline{\nabla} \times \underline{A}_2 = -\underline{\omega} \times \underline{A} \quad -(51)$$

and eq. (47) follows automatically.

Scheme of Computation

The experimentally measured quantities in the circuit are the total ϕ and total $\underline{A}$, coming from the total ρ and total $\underline{J}$. This is because there is always a contribution from the vacuum. In the standard model this contribution is completely neglected. The total $\underline{E}$ is

$$-(52)$$

$$\underline{E}(\text{observed}) = \underline{E}(\text{total})$$
$$= -\underline{\nabla}\phi + \underline{\omega}\phi = -\frac{\partial \underline{A}}{\partial t} - \omega_0 \underline{A}$$
$$= \frac{1}{2}\left(-\underline{\nabla}\phi - \frac{\partial \underline{A}}{\partial t} + \underline{\omega}\phi - \omega_0\underline{A}\right)$$

The total $\underline{B}$ is:

$$\underline{B}(\text{observed}) = \underline{B}(\text{total}) = \underline{\nabla} \times \underline{A} - \underline{\omega} \times \underline{A} \quad -(53)$$

1) The scalar potential and vector potentials are found experimentally from eqs. (41) and (42).

2) Knowing A_X, A_Y and A_Z the vector spin connection:

$$\underline{\omega} = \omega_X \underline{i} + \omega_Y \underline{j} + \omega_Z \underline{k} \quad -(54)$$

is found from eqs. (7) to (9), an exactly determined set of equations

3) The circuit magnetic flux density is found from:

$$\underline{B}_1 = \underline{\nabla} \times \underline{A} \quad -(55)$$

4) The magnetic flux density due to the interaction of

circuit and vacuum is found from:

$$\underline{B}_2 = - \underline{\omega} \times \underline{A} \quad -(56)$$

5) The electric field strength measured in the circuit is:

$$\underline{E}\,(\text{observed}) = \underline{E}\,(\text{total}) = - \underline{\nabla}\,\phi + \underline{\omega}\,\phi$$

$$= - \frac{\partial \underline{A}}{\partial t} - \omega_0 \underline{A} \quad -(57)$$

So ω_0 may be found from eq. (57).

In this scheme it has been assumed that the charge density ρ and current density $\underline{J}$ in eqs. (41) and (42) are dominated by the contributions from the circuit. It has been assumed that the circuit four current density is much larger than the four current density from the interaction with the vacuum

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