355(2): Conservation of Energy via Wave Equations

Energy is trapped in a circuit through the wave equation:

$$\square W^\mu = \mu_0 J^\mu(vac) \quad -(1)$$

where W^μ is the ECE2 four potential of the circuit, and $J^\mu(vac)$ is the four current of the aether. Here μ_0 is the aether permeability. Here:

$$W^\mu = \left(\frac{\phi_W}{c}, \underline{W} \right) \quad -(2)$$

where ϕ_W is the scalar potential of the circuit and $\underline{W}$ its vector potential.

As in previous work:

$$J^\mu(vac) = \epsilon_0 \left(\frac{\rho_m}{\rho} \right)_{vac} J^\mu_F(vac) \quad -(3)$$

where $\left(\frac{\rho_m}{\rho} \right)_{vac}$ is the ratio of vacuum mass density to current density and $J^\mu_F(vac)$ is the four current of fluid dynamics, defined in UFT 353 by:

$$\square v^\mu(vac) = \frac{1}{a_0^2} J^\mu_F(vac) \quad -(4)$$

where

$$v^\mu(vac) = \left(\frac{\Phi(vac)}{a_0}, \underline{v}(vac) \right) \quad -(5)$$

From eqs. (1), (3) and (4):

$$\square W^\mu = \mu_0 \epsilon_0 \left(\frac{\rho_m}{\rho} \right)_{vac} J^\mu_F(vac) \quad -(6)$$

i.e

$$\square W^\mu = \frac{1}{c^2}\left(\frac{\rho_m}{\rho}\right)_{vac} J_F^\mu(vac) \quad -(7)$$

$$= \frac{a_0^2}{c^2}\left(\frac{\rho_m}{\rho}\right)_{vac} \square V^\mu(vac)$$

A possible solution is:

$$\boxed{W^\mu(\text{circuit}) = \left(\frac{a_0}{c}\right)^2\left(\frac{\rho_m}{\rho}\right)_{vac} V^\mu(vac)} \quad -(8)$$

This is the minimal prescription with the factor $(a_0/c)^2$.

Write the minimal prescription for the circuit as:

$$p^\mu(\text{circuit}) = \rho W^\mu(\text{circuit}) \quad -(9)$$

where

$$p^\mu = \left(\frac{E_n}{c}, \underline{p}\right) \quad -(10)$$

is the energy momentum of the circuit.

So:

$$p^\mu(\text{circuit}) = \left(\frac{a_0}{c}\right)^2(\rho_m V^\mu)(\text{vacuum})$$

$$= \left(\frac{a_0}{c}\right)^2 p^\mu(\text{vacuum}) \quad -(11)$$

where

$$p^\mu(\text{vacuum}) = (\rho_m V^\mu)(\text{vacuum}) \quad -(12)$$

Therefore:

$$p^\mu(\text{vacuum}) = \rho_m(\text{vacuum})\, V^\mu(\text{vacuum}) \quad -(13)$$

So conservation of energy momentum is expressed as:

$$\boxed{p^\mu(\text{circuit}) = \left(\frac{a_0}{c}\right)^2 p^\mu(\text{vacuum})} \quad -(14)$$

It is clear that energy momentum is transferred from the vacuum to the circuit; total energy momentum is conserved:

$$p^\mu(\text{total}) = p^\mu(\text{circuit}) + p^\mu(\text{vacuum}) \quad -(15)$$
$$= \text{constant}$$

The vacuum velocity and potential $\Phi(\text{vac})$ can be calculated most easily as follows.

1) Use the Lorenz gauge to calculate $\Phi(\text{vac})$:

$$\frac{1}{a_0^2}\frac{\partial \Phi(\text{vac})}{\partial t} = -\underline{\nabla} \cdot \underline{v}(\text{vac}) \quad -(16)$$

where:

$$\Phi(\text{vac}) = \left(\lambda + \phi - (\mu + \mu')\underline{\nabla} \cdot \underline{v} - \phi_1\right)_{\text{vac}} \quad -(17)$$

as defined in UFT 353.

The circuit scalar potential is then calculated from eq. (8):

$$\frac{\phi_W(\text{circuit})}{c} = \left(\frac{a_0}{c}\right)^2 \left(\frac{f_m}{\rho}\right)_{\text{vac}} \frac{\Phi(\text{vac})}{a_0} \quad -(18)$$

4) So

$$\boxed{\phi_w(\text{circuit}) = \left(\frac{a_0}{c}\right)\left(\frac{\rho_m}{\rho}\right)_{vac} \Phi(vac)} \quad -(19)$$

As in previous work the velocity $\underline{v}(vac)$ is calculated from the most general vorticity equation of the vacuum:

$$\frac{\partial \underline{w}}{\partial t} = \underline{\nabla} \times (\underline{v} \times \underline{w}) + \frac{1}{\rho^2} \underline{\nabla} \rho \times \underline{\nabla} P + \frac{\mu}{\rho} \nabla^2 \underline{w} \quad -(20)$$

Using:

$$\underline{w} = \underline{\nabla} \times \underline{v} \quad -(21)$$

it is found that:

$$\frac{\partial \underline{v}}{\partial t} = \underline{v} \times \underline{w} + \frac{\mu}{\rho} \nabla^2 \underline{v} \quad -(21)$$

$$= \underline{v} \times (\underline{\nabla} \times \underline{v}) + \frac{1}{R} \nabla^2 \underline{v}$$

where

$$R \sim \rho / \mu \quad -(22)$$

$$-(23)$$

is the Reynolds number. Therefore:

1) $$\frac{\partial \underline{v}(vac)}{\partial t} = \underline{v}(vac) \times (\underline{\nabla} \times \underline{v}(vac)) + \frac{1}{R} \nabla^2 (vac)$$

2) From eq. (23) calculate $\Phi(vac)$:

$$\frac{1}{a_0^2}\frac{\partial \underline{\Phi}(vac)}{\partial t} = -\underline{\nabla}\cdot\underline{v}(vac) \quad -(24)$$

3) From eq. (19) calculate $\phi_W(circuit)$:

$$\phi_W(circuit) = \left(\frac{a_0}{c}\right)\left(\frac{\rho_m}{\rho}\right)_{vac}\underline{\Phi}(vac) \quad -(25)$$

In the absence of magnetic fields calculate the electric field strength in the circuit from:

$$\underline{E}(circuit) = -\underline{\nabla}\,\underline{\Phi}_W(circuit) \quad -(26)$$
