Note 352(5): Computation Scheme

Step 1

Calculate and animate the turbulent $\underline{v}$ with:

$$\frac{\partial \underline{v}}{\partial t} + \underline{w} \times \underline{v} = -\frac{1}{R}\underline{\nabla} \times \underline{w} \quad -(1)$$

Step 2

Calculate the turbulent:

$$\rho_F = \underline{\nabla} \cdot ((\underline{v} \cdot \underline{\nabla})\underline{v}) \quad -(2)$$

from the $\underline{v}$ found in eq. (1).

Step 3

Calculate:

$$\underline{J}_F = \frac{\partial^2 \underline{v}}{\partial t^2} + \underline{\nabla}\left(\frac{\partial h}{\partial t}\right) + a_0^2 \underline{\nabla} \times \underline{w} \quad -(3)$$

where

$$\underline{w} = \underline{\nabla} \times \underline{v} \quad -(4)$$

from the turbulent $\underline{v}$ of eq. (1)

The inhomogeneous field equations of Kambe are:

$$\underline{\nabla} \cdot \underline{E}_F = \rho_F \quad -(5)$$

and

$$a_0^2 \underline{\nabla} \times \underline{w} - \frac{\partial \underline{E}_F}{\partial t} = \underline{J}_F \quad -(6)$$

where

$$\underline{E}_F = -\frac{\partial \underline{v}}{\partial t} - \underline{\nabla} h, \quad -(7)$$

so

$$\underline{\nabla}\left(\frac{\partial h}{\partial t}\right) = \frac{\partial}{\partial t}(\underline{\nabla} h) = -\frac{\partial \underline{E}_F}{\partial t} - \frac{\partial^2 \underline{v}}{\partial t^2} \quad -(8)$$

so

$$\underline{J}_F = -\frac{\partial \underline{E}_F}{\partial t} + a_0^2 \underline{\nabla} \times (\underline{\nabla} \times \underline{v}) \quad -(9)$$

2) The relevant form of $\mathbf{J}_F$ is:

$$\mathbf{J}_F = -\frac{\partial}{\partial t}\left((\mathbf{v}\cdot\nabla)\mathbf{v}\right) + a_0^2\, \nabla \times (\nabla \times \mathbf{v}) \quad -(10)$$

calculated from the turbulent $\mathbf{v}$ of eq. (1).

Now assume that the vacuum charge and current densities are defined in fluid electrodynamics by

$$\rho(\text{vac}) = \epsilon_0 \frac{\rho_m}{\rho} q_F \quad -(11)$$

and

$$\mathbf{J}(\text{vac}) = \epsilon_0 \frac{\rho_m}{\rho} \mathbf{J}_F \quad -(12)$$

So the vacuum can become turbulent.

Note that eqs. (2) and (3) imply the continuity equation:

$$\frac{\partial q_F}{\partial t} + \nabla \cdot \mathbf{J}_F = 0 \quad -(13)$$

because:

$$\nabla \cdot \nabla \times (\nabla \times \mathbf{v}) = 0 \quad -(14)$$

Step 4

The vacuum charge and current densities create an electric and magnetic field in matter through the Coulomb and Ampère Maxwell laws of fluid electrodynamics as follows.

3)

$$\underline{\nabla} \cdot \left(\left(\frac{f}{\rho_m} \right)_{circuit} \underline{E} \right) = \frac{1}{\epsilon_0} \frac{f^2}{\rho_m} \quad (vacuum) \quad -(15)$$

and

$$a_0^2 \, \underline{\nabla} \times \left(\left(\frac{f}{\rho_m} \right)_{circuit} \underline{B} \right) - \frac{\partial}{\partial t} \left(\left(\frac{f}{\rho_m} \right)_{circuit} \underline{E} \right) = \frac{1}{\epsilon_0} \left(\frac{f}{\rho_m} \underline{J} \right) (vacuum) \quad -(16)$$

Finally adopt eqs. (15) and (16) for circuit design by Osamu Ide.