392(6): Final Version of Scheme of Computation and Order of Calculation

1) Find ϕ and $\underline{A}$ from the ECE wave equations:

$$\Box \phi = \rho / \epsilon_0 \quad -(1)$$

$$\Box \underline{A} = \mu_0 \underline{J} \quad -(2)$$

The general solutions for ϕ and $\underline{A}$ are the Lienard-Wiechert potentials. From considerations of the anomalous g of the electron, both ρ and $\underline{J}$ contain vacuum contributions. So both ϕ and $\underline{A}$ contain vacuum contributions. The charge density ρ and current density $\underline{J}$ are related by the continuity equation:

$$\frac{\partial \rho}{\partial t} + \underline{\nabla} \cdot \underline{J} = 0 \quad -(3)$$

2) Consider the homogeneous field equations:

$$\underline{\nabla} \cdot \underline{B} = 0 \quad -(4)$$

$$\underline{\nabla} \times \underline{E} + \frac{\partial \underline{B}}{\partial t} = \underline{0} \quad -(5)$$

These are obeyed automatically by defining:

$$\underline{E} = -\underline{\nabla}\phi + \underline{\omega}\phi = -\underline{\nabla}\phi - \frac{\partial \underline{A}}{\partial t}(\text{total}) \quad -(6)$$

and

$$\underline{B} = \underline{\nabla} \times \underline{A} - \underline{\omega} \times \underline{A} = \underline{\nabla} \times (\underline{A} + \underline{A}_1)$$

$$= \underline{\nabla} \times \underline{A}(\text{total}) \quad -(7)$$

So:

$$-\frac{\partial \underline{A}_1}{\partial t} := \underline{\omega}\phi \quad -(8)$$

$$\underline{\nabla} \times \underline{A}_1 := -\underline{\omega} \times \underline{A} \quad -(9)$$

) Therefore A_1 is the shadow or doppelgänger potential that defines the interaction with the vacuum

) Find $\underline{\omega}$ from $\underline{A}$ using vector anisymmetry:

$$\frac{\partial A_Z}{\partial Y} + \frac{\partial A_Y}{\partial Z} = \omega_Y A_Z + \omega_Z A_Y \quad -(10)$$

$$\frac{\partial A_X}{\partial Z} + \frac{\partial A_Z}{\partial X} = \omega_Z A_X + \omega_X A_Z \quad -(11)$$

$$\frac{\partial A_Y}{\partial X} + \frac{\partial A_X}{\partial Y} = \omega_X A_Y + \omega_Y A_X \quad -(12)$$

where $\underline{A}$ is the Lienard Wiechert vector potential defined by eq. (2)

4) Find:

$$\frac{1}{c^2}\frac{\partial^2 \phi}{\partial t^2} = \underline{\nabla} \cdot (\underline{\omega}\phi) \quad -(13)$$

where ϕ is the Lienard Wiechert scalar potential from eq. (1), and where $\underline{\omega}$ is found from eqs. (10) to (12).

5) Find $\nabla^2 \phi$ from eqs. (1) and (13):

$$\frac{1}{c^2}\frac{\partial^2 \phi}{\partial t^2} - \nabla^2 \phi = \frac{\rho}{\epsilon_0}. \quad -(14)$$

The charge density ρ is measured in a material or circuit and always contains contributions from the vacuum.

6) From eq. (13), find:

6) $$\frac{1}{c^2}\frac{\partial \phi}{\partial t} = \int \underline{\nabla} \cdot (\underline{\omega}\,\phi)\, dt \quad -(15)$$

7) Find ω_0 from trace antisymmetry conservation:

$$\frac{1}{c^2}\left(\frac{\partial}{\partial t} + \omega_0\right)\phi = (\underline{\nabla} - \underline{\omega})\cdot \underline{A} \quad -(16)$$

8) Find $-\partial \underline{A}/\partial t$ from scalar antisymmetry conservation:

$$\underline{E} = -\underline{\nabla}\phi + \underline{\omega}\,\phi = -\frac{\partial \underline{A}}{\partial t} - \omega_0 \underline{A} \quad -(17)$$

9) Find $\partial^2 \underline{A}/\partial t^2$ from $\partial \underline{A}/\partial t$ and find $\nabla^2 \underline{A}$ from:

$$\frac{1}{c^2}\frac{\partial^2 \underline{A}}{\partial t^2} - \nabla^2 \underline{A} = \mu_0 \underline{J} \quad -(18)$$

10) Compute:

$$\underline{E} = -\underline{\nabla}\phi + \underline{\omega}\,\phi = -\frac{\partial \underline{A}}{\partial t} - \omega_0 \underline{A} \quad -(19)$$

11) Compute the shadow fields:

$$\underline{E}_1 = \underline{\omega}\,\phi \quad -(20)$$

and

$$\underline{E}_2 = -\omega_0 \underline{A} \quad -(21)$$

These are maps of the vacuum.

12) Compute: $\underline{B} = \underline{\nabla} \times \underline{A} - \underline{\omega} \times \underline{A} \quad -(22)$

and the shadow magnetic field:

3) $$\underline{B}_1 = -\underline{\omega} \times \underline{A} \quad - (23)$$

This is another map of the vacuum.

14) Compute the standard model fields:

$$\underline{E}_s = -\underline{\nabla}\phi - \frac{\partial \underline{A}}{\partial t} \quad - (24)$$

$$\underline{B}_s = \underline{\nabla} \times \underline{A} \quad - (25)$$

in order to provide a comparison with eqs. (6) and (7).

Discussion

This is a standard scheme of computation for electrodynamics. It gives a completely self consistent scheme of computation while avoiding iterative computation. It can also be used for electrostatics and magnetostatics, and for gravitation and fluid dynamics