258(7): Testing the Rodrigues Vaz Solution

This is:

$$\underline{\nabla} \times \underline{W} = \Omega \underline{W} \quad -(1)$$

where

$$\underline{W} = -c\left[\left(\frac{\alpha\Omega y}{r^3} - \beta\frac{xz}{r^5}\right)\underline{i}\right. \quad -(1)$$

$$-\left(\frac{\alpha\Omega x}{r^3} + \frac{\beta yz}{r^5}\right)\underline{j}$$

$$\left.+\left(\frac{\beta(x^2+y^2)}{r^5} - \frac{2\alpha}{r^3}\right)\underline{k}\right]$$

where:

$$\alpha = \Omega r\cos(\Omega r) - \sin(\Omega r) \quad -(2)$$

$$\beta = 3\alpha + \Omega^2 r^2 \sin(\Omega r) \quad -(3)$$

and

$$r = (x^2 + y^2 + z^2)^{1/2} \quad -(4)$$

The electric field is:

$$\underline{E} = \underline{W}\sin(\Omega t) \quad -(5)$$

and the magnetic field is:

$$\underline{B} = \underline{W}\cos(\Omega t) \quad -(6)$$

It is claimed that:

2)

$$\underline{\nabla} \cdot \underline{W} = 0 \quad -(7)$$

$$\underline{\nabla} \cdot \underline{E} = 0 \quad -(8)$$

$$\underline{\nabla} \times \underline{E} + \frac{\partial \underline{B}}{\partial t} = \underline{0} \quad -(9)$$

$$\underline{\nabla} \times \underline{B} - \frac{\partial \underline{E}}{\partial t} = \underline{0} \quad -(10)$$

$$\underline{\nabla} \cdot \underline{B} = 0 \quad -(11)$$

Note that eq. (10) is not in S.I. Units.

Reference

D. Reed, in M.W. Evans, Ed., "Modern Nonlinear Optics" (Wiley 2001), second edition, third volume, vol 119 (3) of "Advances in Chemical Physics", p. 559, eqs. (88) to (91)