64(7) : Resonance in the Gauss Law of Magnetism, Checking for Self Consistency.

The fundamental structure in this case is:

$$\underline{A}^{b} \cdot \underline{\nabla} \times \underline{\omega}^{a}{}_{b} = -\mu_0 \tilde{j}^{0a} \quad -(1)$$

The ~~curr~~ charge density $\tilde{j}^{0a}$ is non zero if and only if the dynamics involve the interaction of rotation and translation. It vanishes when there is pure rotational motion. As in paper 56, pp. 11 ff., pure rotation implies:

$$\begin{aligned}
\omega^{0}{}_{1} &= -\frac{\kappa}{2}\left(q^{2}+q^{3}\right) \\
\omega^{0}{}_{2} &= -\frac{\kappa}{2}\left(q^{3}-q^{1}\right) \\
\omega^{0}{}_{3} &= -\frac{\kappa}{2}\left(-q^{1}-q^{2}\right) \\
\omega^{1}{}_{2} &= \frac{\kappa}{2}\left(q^{0}+q^{3}\right) \\
\omega^{1}{}_{3} &= \frac{\kappa}{2}\left(-q^{2}+q^{0}\right) \\
\omega^{2}{}_{3} &= \frac{\kappa}{2}\left(q^{1}+q_{0}\right)
\end{aligned} \quad -(2)$$

The space part is defined as:

$$\boxed{\underline{\omega} := \omega^{2}{}_{3}\,\underline{i} + \omega^{1}{}_{3}\,\underline{j} + \omega^{1}{}_{2}\,\underline{k}} \quad -(3)$$

Therefore:

$$\underline{\omega}^{1}{}_{2} = \omega^{1}{}_{2}\,\underline{k}, \quad \underline{\omega}^{2}{}_{3} = \omega^{2}{}_{3}\,\underline{i}, \quad \underline{\omega}^{1}{}_{3} = \omega^{1}{}_{3}\,\underline{j} \quad -(4)$$

The vector curls are therefore:

$$\underline{\nabla} \times \underline{\omega}'_2 = \begin{vmatrix} \underline{i} & \underline{j} & \underline{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ 0 & 0 & \omega'_2 \end{vmatrix} = \frac{\partial \omega'_2}{\partial y}\underline{i} - \frac{\partial \omega'_2}{\partial x}\underline{j}$$

$$:= \Omega^1_{x2}\,\underline{i} - \Omega^1_{y2}\,\underline{j} \qquad -(5)$$

$$\underline{\nabla} \times \underline{\omega}^2_3 = \begin{vmatrix} \underline{i} & \underline{j} & \underline{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ \omega^2_3 & 0 & 0 \end{vmatrix} = \frac{\partial \omega^2_3}{\partial z}\underline{j} - \frac{\partial \omega^2_3}{\partial y}\underline{k}$$

$$:= \Omega^2_{y3}\,\underline{j} - \Omega^2_{z3}\,\underline{k} \qquad -(6)$$

$$\underline{\nabla} \times \underline{\omega}'_3 = \begin{vmatrix} \underline{i} & \underline{j} & \underline{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ 0 & \omega'_3 & 0 \end{vmatrix} = -\frac{\partial \omega'_3}{\partial z}\underline{i} + \frac{\partial \omega'_3}{\partial x}\underline{k}$$

$$:= -\Omega^1_{x3}\,\underline{i} + \Omega^1_{y3}\,\underline{k}$$

Therefore we obtain results such as:

$$\underline{A}^2 \cdot \underline{\nabla} \times \underline{\omega}'_2 = A^2 \underline{j} \cdot (\Omega^1_{x2}\underline{i} - \Omega^1_{y2}\underline{j})$$

$$= -A^2 \frac{\partial \omega'_2}{\partial x} \qquad -(7)$$

$$\underline{A}^3 \cdot \underline{\nabla} \times \underline{\omega}'_3 = A^3 \frac{\partial \omega'_3}{\partial x} \qquad -(8)$$

$$\underline{A}^3 \cdot \underline{\nabla} \times \underline{\omega}^2_3 = -A^3 \frac{\partial \omega^2_3}{\partial y}. \qquad -(9)$$

From eqns (2) and (7) to (9) these quantities all vanish for pure rotational motion because of

3)

the following reasoning. If eq (7) is considered for example, then from eq. (3) it is seen that ω'_2 is the Z component of $\underline{\omega}$ for pure rotational motion defined by eqs. (2). As such it does not have a Z dependence, so:

$$\frac{\partial \omega'_2}{\partial X} = 0. \quad -(10)$$

Similarly:

$$\frac{\partial \omega'_3}{\partial X} = \frac{\partial \omega^2_3}{\partial Y} = 0. \quad -(11)$$

Therefore for pure rotational motion:

$$\underline{A}^b \cdot \underline{\nabla} \times \underline{\omega}^a{}_b = \underline{0} \quad -(12)$$

Q.E.D.

If the motion is not purely rotational:

$$\underline{\omega} = \omega_X \underline{i} + \omega_Y \underline{j} + \omega_Z \underline{k} \quad -(13)$$

$$= \omega_X(X,Y,Z)\underline{i} + \omega_Y(X,Y,Z)\underline{j} + \omega_Z(X,Y,Z)\underline{k} \quad -(14)$$

in general.

In this case, proceeding as in notes 64 (1):

$$\boxed{\frac{d^2 A_Z}{dZ^2} + f_1(Z)\frac{dA_Z}{dA_Z} + f_2(Z)A_Z = f(Z)} \quad -(15)$$

where:

$$f_1(z) = \frac{2\Omega_z'}{\Omega_z}, \quad f_2(z) = \frac{\Omega_z''}{\Omega_z} \quad -(16)$$

and where:

$$f(z) = -\frac{\mu_0}{\Omega_z}\,\tilde{j}^{\,\circ\,''} \quad -(17)$$

A numerical search must be made to find which functions f_1, f_2 and f in eq. (15) give resonance. Such resonances may exist in general relativity (ECE theory).