1)

Modifications to Paper 81

Following discussions with Dr. Eckardt we do not make the assumption

$$v = \Omega r \quad -(1)$$

but derive it as follows.

In general:

$$J = \left( r + \frac{eA}{\gamma m \omega} \right) \left( \gamma m v + eA \right) \quad -(2)$$

$$T = \frac{\left( \gamma m v + eA \right)^2 c^2}{mc^2 (1 + \gamma) + e\phi} \quad -(3)$$

So:

$$\Omega = \frac{T}{J} = \frac{\left( \gamma m v + eA \right) c^2}{\left( r + \frac{eA}{\gamma m \omega} \right) \left( mc^2 (1 + \gamma) + e\phi \right)} \quad -(4)$$

Non-relativistic limit

For:

$$\left. \begin{array}{l} eA \ll \gamma m v, \\ eA \ll \gamma m \omega \\ e\phi \ll mc^2 (1 + \gamma) \end{array} \right] \quad -(5a)$$

$$\gamma \to 1 \quad -(5b)$$

then:

$$\boxed{\Omega \to \frac{1}{2} \frac{v}{r}} \quad -(5)$$

ultra-relativistic limit (opposite limit to eq. (5a)):

$$\Omega \to \left( \frac{mc^2}{e\phi} \right) \omega \longrightarrow \omega \quad -(6)$$