78(1) : Resonance Angle and Spirals of RFR

In paper 78 it will be shown that there is a resonance angle associated with RFR in the limit where gravitation is not considered. We first note that the energy of the relativistic electron of paper 77 is:

$$E_n = \frac{1}{2} \Omega J \quad - (1)$$

where:

$$J = \frac{e^2 c^2}{\omega^2} \frac{B^{(0)2}}{(m^2\omega^2 + e^2 B^{(0)2})^{1/2}} \quad - (2)$$

and

$$\Omega = \left(\omega^2 + \left(\frac{eB^{(0)}}{m} \right)^2 \right)^{1/2} . \quad - (3)$$

Thus:

$$E_n = \frac{1}{2m} (eA)^2 \quad - (4)$$

where

$$A = \frac{cB^{(0)}}{\omega} := \frac{B^{(0)}}{\kappa} . \quad - (5)$$

This is consistent with the fact that the extra momentum imparted to the electron is:

$$p = eA . \quad - (6)$$

This checks that the calculations of paper 77 are internally consistent and correct.

2) In order to consider RFR we need the extra energy:

$$E_n = \frac{1}{2m} i \underline{\sigma} \cdot \underline{A} \times \underline{A}^* \quad -(7)$$

where $\underline{A}^*$ is the complex conjugate of $\underline{A}$ and where $\underline{\sigma}$ is a Pauli spinor. Thus:

$$E_n := \frac{1}{2} \Omega \underline{\sigma} \cdot \underline{J} = \frac{1}{2m} i \underline{\sigma} \cdot \underline{A} \times \underline{A}^* \quad -(8)$$

where:

$$\Omega = \frac{d\theta}{dt} = \frac{v}{r}. \quad -(9)$$

<u>At RFR</u>:

$$\Delta E_n = \hbar \omega_{res} = \Omega J = J \frac{d\theta}{dt} \quad -(10)$$

<u>The resonance angle</u> is:

$$\boxed{\theta_{res} = \frac{\hbar \omega_{res}}{J} \int dt := \frac{\hbar \omega_{res} \tau}{J}} \quad -(11)$$

where J is defined by eq. (2) with:

$$\omega = \frac{V_0}{r}. \quad -(12)$$

Therefore <u>resonance spirals of RFR</u> can be plotted using eqns. (11), (12) and (2). <u>These are plots of θ against r.</u>