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Magnetic Potential Equation - II

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$$\frac{dA}{dt} = -\frac{A}{3}\frac{d^2A}{dx^2} + v^2$$

A – magnetic potential; $v^2 =$ electric potential or gravitational potential

$$t = \frac{\sqrt{k + x^2}}{c} \quad ; \quad dt = \frac{x}{c^2 t} dx$$

Free particle: $$c\frac{dA}{dx} = -\frac{cx}{3}\frac{d^2A}{dx^2}$$

Solution:

$$A = A_0 \sin\left(\frac{4\pi^2}{x^2}\left(c^2t^2 - x^2\right)\right) = A_0 \frac{4\pi^2 k}{x^2}$$

With an electric potential:

$$\frac{dA}{dx} = -\frac{x}{3}\frac{d^2A}{dx^2} + \frac{v^2}{c} \quad \text{and} \quad v^2 = \frac{q_e}{4\pi\varepsilon_0 R_B{}^2} = 5.1\times10^{11} m^2 s^{-2}$$

Solution:

$$A = A_0 \frac{4\pi^2 k}{x^2} + \frac{v^2 x}{c}$$

$$A_0 = \frac{Ax^2}{4\pi^2 k} \quad \text{and} \quad A = cx_e \quad \text{, for the electron}$$

$$A_0 = 5.66\times10^5 m^2 s^{-1} \quad \text{or}$$

$$\frac{dA_0}{dx} = B_0 \quad \Leftrightarrow \quad A_0 = B_0 x_e \quad \text{and} \quad B_0 = 2.9353\times10^{17} ms^{-1}$$

$$\Leftrightarrow \quad A_0 = 7.12\times10^5$$

$B_0 =$ Reference magnetic field