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Inference of Schrödinger's Equation from Classical Wave Mechanics[1] P-I. JOHANSSON, Uppsala University, SWE, J.X. ZHENG-JOHANSSON, IOFPR, SWE — A localized oscillatory point charge q generates in a one-dimensional box electromagnetic waves which may be generally described by monochromatic plane waves $\{\varphi_i = C_K e^{i(KX - \Omega T + \alpha_i)}\}$ of angular frequency Ω, wavevector $K = \Omega/c$, velocity (of light) c, and initial phases $\{\alpha_i\}$. q and $\{\varphi_i\}$ as a whole is here taken as a particle, which total energy E and mass M are given by the basic equations $\mathsf{E} = \hbar\Omega = Mc^2$, $2\pi\hbar$ being Planck constant. (For example, $q = -e$ and $M = 511$ keV give an electron.) $\{\varphi_i\}$ as incident and reflected and those from the charge as reflected in the box superimpose into a total wave $\psi = \sum \varphi_i$ that, as with φ_i, obeys the classical wave equation (CWE): $c^2 \frac{d^2\psi}{dX^2} = \frac{d^2\psi}{dT^2}$. If now the particle is traveling at velocity v, in a potential field $V = 0$ here (see Ref. 2004b for $V \neq 0$), then $\{\varphi_i'\}$ are Doppler effected and form a total wave $\psi' = \Phi\Psi$, with $\Psi = C\sin(K_d X)e^{i\Omega_d T}$ being the envelope about a beat wave and identifiable as de Broglie wave of angular frequency $\Omega_d = \Omega(v/c)^2$, and Φ an undisplaced monochromatic wave. Using ψ' in CWE gives upon decomposition a separate equation describing the particle dynamics, $-\frac{\hbar^2}{2M}\frac{\partial^2\Psi(X,T)}{\partial X^2} = i\hbar\frac{\partial\Psi(X,T)}{\partial T}$, which is equivalent to Schrödinger's equation.

[1] J. X. Zheng-Johansson and P-I. Johansson, arXiv:Physics/0411134 (2004a); "Unification of Classical, Quantum and Relativistic Mechanics and the Four Forces" (in printing, 2004b).

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