Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Circular Polarization and Quantum Spin: A Unified Real-Space Picture of Photons and Electrons ALAN M. KADIN, Princeton Junction, NJ 08550 — It is generally believed that no simple real-space semiclassical picture can consistently explain both a quantum wave and its spin. However, it is shown here [1] that a rotating vector field carrying angular momentum leads directly to the Einstein-de Broglie relations ($E = h\nu$ and $p = h/\lambda$, the heart of quantum mechanics), assuming only quantization of spin and Lorentz invariance of the phase angle. For electromagnetism, such a circularly polarized wave packet defines the photon. A very similar picture of a massive rotating vector field maps onto a complex wavefunction obeying the time-dependent Schrödinger equation for a particle such as the electron, with $m>0$ and $v<<c$. This real vector field rotates about the spin axis at $mc^2/h \sim 10^{20}$ Hz. This suggests a unified picture whereby all fundamental quantum particles consist of such coherent wave packets of rotating spin fields, with composite particles deriving their quantum properties from the coherent rotations of their fundamental constituents. This represents a consistent interpretation of quantum mechanics, an alternative to the conventional statistical or Copenhagen interpretation. [1] A.M. Kadin, http://arxiv.org/abs/quant-ph/0508064

Alan M. Kadin
Princeton Junction, NJ 08550

Date submitted: 13 Nov 2005 Electronic form version 1.4