Summary: A local interpretation of quantum mechanics is presented. Its main ingredients are: first, a label attached to one of the “virtual” paths in the path integral formalism, determining the output for measurement of position or momentum; second, a mathematical model for spin states, equivalent to the path integral formalism for point particles in space time, with the corresponding label. The mathematical machinery of orthodox quantum mechanics is maintained, in particular amplitudes of probability and Born’s rule; therefore, Bell’s type inequalities theorems do not apply. It is shown that statistical correlations for pairs of particles with entangled spins have a description completely equivalent to the two slit experiment, that is, interference (wave like behaviour) instead of non locality gives account of the process. The interpretation is grounded in the experimental evidence of a point like character of electrons, and in the hypothetical existence of a wave like, the de Broglie, companion system. A correspondence between the extended Hilbert spaces of hidden physical states and the orthodox quantum mechanical Hilbert space shows the mathematical equivalence of both theories. Paradoxical behaviour with respect to the action reaction principle is analysed, and an experimental set up, modified two slit experiment, proposed to look for the companion system.

MSC:
81P05 General and philosophical questions in quantum theory
81Q65 Alternative quantum mechanics (including hidden variables, etc.)
81P15 Quantum measurement theory, state operations, state preparations
81P40 Quantum coherence, entanglement, quantum correlations
81S40 Path integrals in quantum mechanics

Keywords:
alternative interpretations of QM; measurement problem; non locality; de Broglie wave

Full Text: DOI

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