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"Quantum Faraday effect in Aharonov-Bohm loops"

Abstract:
I begin by posing an apparent paradox between the two well established concepts in quantum theory: (1) the local phase factor of the wave function in an Aharonov-Bohm (AB) loop depends on the choice of gauge, and therefore is arbitrary; (2) the wave function (or density matrix, in general) of a quantum system can be reconstructed by a technique of the quantum state tomography. On the way to resolve this contradiction, I will show that the law of Faraday's induction plays a major role in determination of the local phase. The properties of this "Faraday's phase" will be discussed with the example of a double-dot AB ring [1].


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