Quantum Contextuality and Einsteinian Realism BRIAN LA COUR, University of Texas at Austin — Contextuality is a phenomenon predicted to be exhibited by quantum systems and at variance with Einsteinian realism, which is said to be noncontextual. The Kochen-Specker theorem, and its many variants, purports to prove this inconsistency. Recently, the question has been put to experiment [e.g., Hasegawa et al., PRL 97, 230401 (2006)], and the findings are consistent with quantum theoretic predictions. I will argue that, in fact, there is no such inconsistency. Specifically, a proof is offered which demonstrates that quantum mechanics is consistent with a noncontextual hidden variable theory, thus refuting the Kochen-Specker theorem. (For simplicity, the proof is restricted to a four-dimensional Hilbert space but is expected to generalize.) The key to the proof is the recognition of a subtle but fundamentally important assumption regarding the dependence of the hidden variable probability distribution on the particular set of mutually commuting observables chosen for measurement.

Brian La Cour
University of Texas at Austin

Date submitted: 14 Sep 2007   Electronic form version 1.4