Hu, Meng-Jun; Hu, Xiao-Min; Zhang, Yong-Sheng

Are observables necessarily Hermitian? (English) Zbl 1387.81217

Summary: Observables are believed that they must be Hermitian in quantum theory. Based on the obviously physical fact that only eigenstates of observable and its corresponding probabilities, i.e., spectrum distribution of observable are actually observed, we argue that observables need not necessarily be Hermitian. More generally, observables should be reformulated as normal operators including Hermitian operators as a subclass. This reformulation is consistent with the quantum theory currently used and does not change any physical results. The Clauser-Horne-Shimony-Holt (CHSH) inequality is taken as an example to show that our opinion does not conflict with conventional quantum theory and gives the same physical results. Reformulation of observables as normal operators not only coincides with the physical facts, but also will deepen our understanding of measurement in quantum theory.

MSC:
81Q10 Selfadjoint operator theory in quantum theory, including spectral analysis
81Q12 Nonselfadjoint operator theory in quantum theory including creation and destruction operators
47B15 Hermitian and normal operators (spectral measures, functional calculus, etc.)
81P15 Quantum measurement theory, state operations, state preparations

Keywords:
quantum measurement; non-Hermitian observable; normal operator

Full Text: DOI arXiv

References:


This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.