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Quantum unsharpness, potentiality, and reality. (English) Zbl 1447.81008

Summary: Paul Busch argued that the positive operator (valued) measure, a generalization of the standard quantum observable, enables a consistent notion of unsharp reality based on a quantifiable degree of reality whereby systems can possess generalized properties jointly, whereas related sharp properties cannot be so possessed [P. Busch and the author, ibid. 40, No. 9/10, 1341–1367 (2010; Zbl 1215.81006)]. Here, the work leading up to the formalization of this notion to which he made great contributions is reviewed and explicated in relation to Heisenberg’s notions of potentiality and actuality. The notion of unsharp reality is then extended further by the introduction of a distinction between actual and actualizable elements of reality based on these mathematical innovations.

MSC:
81P05 General and philosophical questions in quantum theory
81P15 Quantum measurement theory, state operations, state preparations
46G10 Vector-valued measures and integration
60K40 Other physical applications of random processes
62J10 Analysis of variance and covariance (ANOVA)

Keywords: unsharp observables; indeterminacy; potentiality; reality

Full Text: DOI Link

References:
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