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Quantum stochastic approach to the description of quantum measurements. (English)

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The operational approach to quantum measurements is a generalization of the von Neumann approach (quantum measurements with discrete outcomes) to the complete statistical description of generalized quantum measurements with arbitrary measurable space of outcomes. This approach is based on the notion of quantum instrument, i.e. a σ -additive measure on a probability space of outcomes with values in a space of normal completely positive bounded linear maps on the Banach space $L(H)$ of all bounded linear operators on a complex Hilbert space H . This paper presents new results on the notion of instrument, and introduces a quantum stochastic generalization of the operational approach which gives the complete description of the stochastic behaviour of a quantum system under a generalized direct measurement. Notions of stochastic realization of an instrument and of a class of unitarily and phase equivalent separable statistical realizations of an instrument are introduced. A one-to-one correspondence between the class of unitarily and phase equivalent statistical realizations and the equivalence class of stochastic realizations is established.

Reviewer: [Nicolas Privault \(La Rochelle\)](#)

MSC:

[81P15](#) Quantum measurement theory, state operations, state preparations
[81S25](#) Quantum stochastic calculus
[28B05](#) Vector-valued set functions, measures and integrals
[46B10](#) Duality and reflexivity in normed linear and Banach spaces

Cited in **2** Documents

Keywords:

quantum measurement; operational approach; instrument valued measures on arbitrary measurable space; quantum stochastics

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