

Quantum Physics

Renormalized quantum tomography

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The core of quantum tomography is the possibility of writing a generally unbounded complex operator in form of an expansion over operators that are generally nonlinear functions of a generally continuous set of spectral densities--the so-called "quorum" of observables. The expansion is generally non unique, the non unicity allowing further optimization for given criteria. The mathematical problem of tomography is thus the classification of all such operator expansions for given (suitably closed) linear spaces of unbounded operators--e.g. Banach spaces of operators with an appropriate norm. Such problem is a difficult one, and remains still open, involving the theory of general basis in Banach spaces, a still unfinished chapter of analysis. In this paper we present new nontrivial operator expansions for the quorum of quadratures of the harmonic oscillator, and introduce a first very preliminary general framework to generate new expansions based on the Kolmogorov construction. The material presented in this paper is intended to be helpful for the solution of the general problem of quantum tomography in infinite dimensions, which corresponds to provide a coherent mathematical framework for operator expansions over functions of a continuous set of spectral densities.

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