Quantum Physics

Quantum computation of multifractal exponents through the quantum wavelet transform

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We study the use of the quantum wavelet transform to extract efficiently information about the multifractal exponents for multifractal quantum states. We show that, combined with quantum simulation algorithms, it enables to build quantum algorithms for multifractal exponents with a polynomial gain compared to classical simulations. Numerical results indicate that a rough estimate of fractality could be obtained exponentially fast. Our findings are relevant e.g. for quantum simulations of multifractal quantum maps and of the Anderson model at the metal-insulator transition.

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