Abstract Submitted
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Effective localization potential of quantum states in disordered media[1] FILOCHE MARCEL, Ecole Polytechnique, DOUGLAS N. ARNOLD, University of Minnesota, GUY DAVID, Universit Paris-Sud, DAVID JERISON, Massachusetts Institute of Technology, SVITLANA MAYBORODA, University of Minnesota — The amplitude of localized quantum states in random or disordered media may exhibit long range exponential decay. We present here a theory that unveils the existence of a localization landscape that controls the amplitude of the eigenstates in any quantum system. For second order operators such as the Schrdinger operator, this localization landscape is simply the solution of a Dirichlet problem with uniform right-hand side [1]. Moreover, we show that the reciprocal of this landscape plays the role of an effective potential which finely governs the confinement of the quantum states. In this picture, the boundaries of the localization subregions for low energy eigenfunctions correspond to the barriers of this effective potential, and the long range exponential decay characteristic of Anderson localization is explained as the consequence of multiple tunneling in the dense network of barriers created by this effective potential. Finally, we show that the Weyl's formula based on this potential turns out to be a remarkable approximation of the density of states for a large variety of systems, periodic or random, 1D, 2D, or 3D. [1] M. Filoche and S. Mayboroda, Proceedings of the National Academy of Sciences of the USA 109, 14761 (2012).

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