Séminaire commun

Large-size Behavior of the Entanglement Entropy of Free Disordered Fermions

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Résumé

We consider the macroscopic system of free lattice fermions and we are interested in the entanglement entropy (EE) of a large block of size L of the system viewing the rest of the system as the macroscopic environment of the block. The entropy is a widely used quantifier of quantum correlations between the block and its environment. We begin with the known results on the large -L asymptotic of the EE for various translation invariant systems, where there exist basically two asymptotics, known as the area law and the enhanced (violated) area law. We then show that in the disordered case and for the Fermi energy belonging to the localized spectrum of the one-body Hamiltonian the EE follows the area law for all typical realization of the disorder and any dimension. As for the enhanced area law, it proves to be possible for certain special values of the Fermi energy in the one-dimensional case.