Lifschitz tails on the Bethe lattice

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Abstract

It is well known that the integrated density of states (the normalized eigenvalue counting function) of models of disordered media (defined on $\mathbb{R}^d$ or $\mathbb{Z}^d$) exhibits an exponential decay near the band edges. This phenomenon is known as Lifschitz tails and it is a hallmark of Anderson localization (the absence of diffusion of waves). In this talk we will discuss the decay of the integrated density of states of the Anderson model whose underlying physical space is a Bethe lattice (the Cayley graph of a free group). In a joint work with C. Schumacher (Chemnitz) we recently proved the conjectured double-exponential behavior with exponent $-1/2$. A crucial step of the proof consists in understanding the behavior (with good probability) of the ground state energy of the operator restricted to finite but large, symmetric rooted tree. The analysis makes use of a discrete IMS localization formula, the spectral theory of the free Laplacian on finite rooted trees, an epsilon-net argument, the usual concentration inequalities and an unusual "discrete unique continuation principle" for low-energy states.