ON NON PERTURBATIVE ANDERSON LOCALIZATION FOR RANDOM POTENTIALS WITH FAST DECAYING CORRELATIONS

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Abstract. In this paper we study the Anderson localization

$$[H(v)\psi](n) := -\psi(n+1) - \psi(n-1) + v_n\psi(n),\ n \in \mathbb{N} \tag{0.1}$$

with the Dirichlet boundary condition $\psi(0) = 0$, with $v_1, v_2, \dots$ being stationary distributed asymptotically independent random variables. In particular, we consider the sequences generated by the doubling map $x \to 2x \pmod 1$, $Ev_n = V(2^n x)$, where $V(x)$ is a 1-periodic function. We prove that there exists a set $\mathcal{S} \subset \mathbb{R}$ with $\operatorname{mes} \mathcal{S} = 0$ such that for almost all realizations $v = (v_1, \dots, v_n, \dots)$ the generalized eigenvalues of $H(v)$ corresponding to the generalized eigenvalues outside of $\mathcal{S}$, decay exponentially. If $V(x)$ is a 1-periodic, real analytic function and

$$\sigma^2 = \langle V^2(.)\rangle + 2\sum_{n\geq 1}\langle V(.)V(2^n,)\rangle \neq 0,$$

then we show that $\operatorname{mes}\operatorname{sp} H(x) \geq \mu_0 > 0$ for almost all $x \in [0,1]$; where $H(x) := H(\{V(2^n x)\})$, $\langle F(.)\rangle := \int_0^1 F(x)dx$.

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