A theorem on the multiplicity of the singular spectrum of a general Anderson-type Hamiltonian.

Summary: In this work, we study the multiplicity of the singular spectrum for operators of the form
\[ A^\omega = A + \sum_n \omega_n C_n \]
on a separable Hilbert space \( H \), where \( A \) is a self-adjoint operator and \( \{ C_n \} \) is a countable collection of non-negative finite-rank operators. When \( \{ \omega_n \} \) are independent real random variables with absolutely continuous distributions, we show that the multiplicity of the singular spectrum is almost surely bounded above by the maximum algebraic multiplicity of the eigenvalues of the operator
\[ \sqrt{C_n}(A^\omega - z)^{-1}\sqrt{C_n} \]
for all \( n \) and almost all \( (z, \omega) \). The result is optimal in the sense that there are operators for which the bound is achieved. We also provide an effective bound on the multiplicity of the singular spectrum for some special cases.

MSC:

81Q10 Selfadjoint operator theory in quantum theory, including spectral analysis
47A10 Spectrum, resolvent
47A55 Perturbation theory of linear operators
47B39 Linear difference operators
46N50 Applications of functional analysis in quantum physics
81Q15 Perturbation theories for operators and differential equations in quantum theory

Keywords:
spectral theory; Anderson model; perturbation theory

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References:


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