

İSTANBUL ANALYSIS SEMINARS

IMPROVED ASYMPTOTICS OF THE SPECTRAL GAP FOR THE MATHIEU OPERATOR

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Abstract: This talk is based on recent results obtained in collaboration with Plamen Djakov (see B. Anahtarci and P. Djakov, Improved asymptotics of the spectral gap for the Mathieu operator, arXiv:1202.4623v1 [math.SP]).

The Mathieu operator

$$L(y) = -y'' + 2a \cos(2x)y, \quad a \in \mathbb{C}, \quad a \neq 0,$$

considered with periodic or anti-periodic boundary conditions has, close to n^2 for large enough n , two periodic (if n is even) or antiperiodic (if n is odd) eigenvalues λ_n^- , λ_n^+ . For fixed a , we show that

$$\lambda_n^+ - \lambda_n^- = \pm \frac{8(a/4)^n}{[(n-1)!]^2} \left[1 - \frac{a^2}{4n^3} + O\left(\frac{1}{n^4}\right) \right], \quad n \rightarrow \infty.$$

This result extends the asymptotic formula of Harrell-Avron-Simon, by providing more asymptotic terms.

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