SPECTRAL GAP WITHOUT THE PRESSURE CONDITION

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We show that every convex co-compact hyperbolic surface has an essential spectral gap. This means there exists some $\beta > 0$, depending on the surface, such that the Selberg zeta function has only finitely many zeroes with $\Re s > 1/2 - \beta$. This is the first result of this kind that makes no restrictions on the dimension δ of the corresponding limit set. Previously gaps were known under the pressure condition $\delta < 1/2$, due to Patterson and Sullivan, and for $\delta \leq 1/2$, due to Naud. Hyperbolic surfaces are a standard model for more general systems with hyperbolic trapping and applications of spectral gaps to PDE include exponential local energy decay of waves, local smoothing estimates, and Strichartz estimates.

The proof combines techniques from microlocal analysis and harmonic analysis. In particular we use the fractal structure of the limit set to obtain a fractal uncertainty principle. This talk is based on joint works with Joshua Zahl and with Jean Bourgain.