

Energy distribution of harmonic 1-forms on thick and thin parts

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We estimate the energy distribution of a harmonic 1-form on a compact hyperbolic surface with respect to its thick and thin decomposition. Suppose the surface looks like a dumbbell: two thick parts connected by a thin tube. If on one of the thick parts a harmonic 1-form has all its cycles equal to zero, intuition says that the form “lives on the other side, mainly so because energy diffusion through thin tubes is difficult. We prove this quantitatively with only elementary tools: explicit formulas for cylinders and gradient estimates. It turns out that energy decays extremely rapidly along the tube when it is thin. The results apply to the Jacobian variety of a Riemann surface.

This is joint work with Eran Makover, Bjoern Muetzel and Robert Silhol.