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Dmitry Jakobson* (jakobson@math.mcgill.ca), **I Polterevich, M. Levitin, N.**

Nadirashvili and N. Nigam. *How large can the first eigenvalue be on a surface of genus two?*

We look for a fixed area metric on a surface of genus two which has the largest first eigenvalue of the Laplacian. We conjecture that the upper bound for λ_1 of Yang and Yau is sharp in genus 2, and is attained on a singular surface which is realized as a double branched covering over a round sphere. The six ramification points are chosen in such a way that this surface has a complex structure of the Bolza surface. We prove that our conjecture follows from a lower bound on the first eigenvalue of a certain mixed Dirichlet-Neumann boundary value problem on a half-disk. The latter can be studied numerically, and we present conclusive evidence supporting the conjecture. This is joint work with I. Polterovich, M. Levitin, N. Nadirashvili and N. Nigam. (Received February 11, 2006)