Meeting: 999, Nashville, Tennessee, SS 9A, Special Session on Inverse Problems

999-35-125 **Almut Burchard** and **Jochen Denzler*** (denzler@math.utk.edu), Dept of Mathematics, University of Tennessee, Knoxville, TN 37996-1300. *On the Geometry of Optimal Windows.*

For the Laplace operator with mixed (Dirichlet and Neumann) boundary conditions, the part of the boundary carrying Dirichlet conditions is called a window. An optimal window is one that minimizes the principal eigenvalue among all competitors of the same area.

We prove monotonicity of the eigenvalue as a window in a square is shifted towards a corner, and give numerical evidence as well as rigorous partial results toward the conjecture that optimal windows in a square are segments centered at either a corner or the midpoint of a side; in particular we prove a symmetry breaking effect. We also construct a starshaped domain whose optimal window(s) must be disconnected.

Finally we give, for general domains in $\mathbf{R}^d$, continuity results for the eigenvalue as a function of the window, and examples of discontinuity when crucial hypotheses are violated. We also give a variation formula that relates the eigenvalue to the singularities of the eigenfunction (stress intensity coefficient) near the boundary of the window.

Methods are based on the variational problem and include rearrangement, Dirichlet Neumann Bracketing, capacity estimates, and deformation under a flow. (Received August 18, 2004)