

Workshop on Spectrum and Dynamics
Atelier sur la dynamique et théorie spectrale
07–11 April/*Avril*, 2008

Nodal lines of eigenfunctions, geodesics and complex analysis

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Abstract

Nodal line patterns have intrigued mathematicians and physicists since Chladni in 1800. They are the zero sets of the eigenfunctions representing modes of vibration. My talk is about two relatively recent results describing nodal patterns on real analytic Riemannian manifolds. The main idea of the results is to analytically continue eigenfunctions to the complexification of the manifold and to study the complex zeros. When the geodesic flow is ergodic, we obtain an exact limit formula for the distribution of complex zeros for ‘almost all eigenfunctions’. It is also possible to determine limit formulae when the geodesic flow is integrable. For a real analytic plane domain with boundary, we obtain an upper bound on the number of nodal components which touch the boundary.

Joint work with John Tot.