Michele Ancona: Metric and spectral aspects of random plane curves

A (complex) plane curve is the zero locus in CP2 of a homogeneous complex polynomial in three variables. Any plane curve is endowed with a Riemannian metric induced by the ambient Fubini-Study metric of the complex projective plane. We give probabilistic lower bounds on some metric and spectral quantities (such as the systole or the spectral gap) of the plane curves when these are chosen randomly in the Fubini-Study ensemble. This is a joint work with Damien Gayet.

Frédéric Faure : Wave packet transforms and microlocal analysis for Anosov geodesic flow

Alba Garcia-Ruiz: High-energy eigenfunctions and inverse localization

A well-known link between solutions to the Helmholtz equation $\Delta h + h = 0$ and eigenfunctions of the Laplacian on a closed Riemannian manifold is that the local behaviour of a sequence of high-energy eigenfunctions (say, $\lambda \longrightarrow \infty$) defines a bounded Helmholtz solution, after a suitable rescaling. Conversely, every solution to Helmholtz can be locally realized by an approximate eigenfunction of any large enough energy, on scales determined by this energy.

A powerful refinement of the latter fact is what we call the inverse localization principle: if, roughly speaking, the degeneracy of the high-energy eigenvalues is large enough, one can replace the quasimodes by bona fide eigenfunctions.

In this talk, we will introduce the notion of inverse localization, present some examples and establish a relation between this property and the Random Wave Conjecture of M. V. Berry.

Damien Gayet: TBA

Cyril Letrouit: Maximal multiplicity of Laplacian eigenvalues in negatively curved surfaces

I will present a joint work with Simon Machado (IAS) in which we obtain a bound on the maximal multiplicity of first Laplacian eigenvalues for negatively curved surfaces, which is sublinear in the genus. Our method is robust enough to also yield an upper bound on the "approximate multiplicity" of eigenvalues, i.e., the number of eigenvalues in small spectral windows. This work provides new insights on a conjecture by Colin de Verdière and new ways to transfer spectral results from graphs to surfaces.

Antoine Prouff: Observability of the Schrödinger equation with confining potential

We consider the Schrödinger equation with a subquadratic confining potential V, in the Euclidean space. The question of observability consists in investigating the localisation properties of solutions in an open set U, over some time interval $[0, T]$. We will give an (almost-)characterization of the open sets U that "observe" the Schrödinger equation. The observability condition that we find is the result of some form of quantum-classical correspondence: any trajectory of the Hamiltonian flow has to spend a sufficient time in the open set U. In this setting, the Hamiltonian flow describes the trajectory of a point mass trapped in the potential V, evolving according to Newton's second law. In particular, it is very sensitive to the profile of the potential. In two dimensions, we shall take a closer look at the example of harmonic oscillators, where the potential V is quadratic, and see why the arithmetic properties of the oscillator's characteristic frequencies matter in this problem.

Radomyra Shevchenko: Level sets of random spherical needlets

The study of geometric functionals of monochromatic Gaussian random waves, particularly of the random spherical harmonics, has moved into the spotlight in the last decades. One reason are the recent technical developments in the Malliavin-Stein method used to deal with Gaussian functionals, another is the groundbreaking idea to model the cosmic microwave background with spherical random fields and the statistical challenges it entails. In the context of this application, a useful object to consider are the so-called random spherical needlets, a type of spherical wavelets with good localisation properties in both the physical and the spectral domain. The main purpose of this talk is to study the asymptotics of the level sets of such functionals on the sphere in the high-energy regime, starting with an overview over the existing results and some important techniques. This talk is based on joint work with Anna Paola Todino.