Séminaire : Problèmes spectraux en physique mathématique

Les séminaires ont lieu à l'**Institut Henri Poincaré**, 11 rue Pierre et Marie Curie, Paris.

Programme du lundi 11 juin 2018, en **salle 314** (3e étage)

— 11h15 - 12h15 : **Rémy Rhodes** (Paris-Est)
Liouville quantum theory and the DOZZ formula.

This talk will review some recent advances in the study of the Liouville quantum theory. This theory was introduced in physics by Polyakov in 1981 in the context of string theory. This is a conformal field theory based on a path integral à la Feynman and it can be seen as the natural extension of the theory of Riemann surfaces to the probabilistic framework. Solving this theory, namely computing the correlation functions, has been a great challenge in physics. In this direction and in the 90s, Dorn-Otto and the Zamolodchikov brothers conjectured that the 3-point correlation function satisfies a mysterious formula based on number theory, called the DOZZ formula.
The main purpose of this talk is to explain this story and to present the construction of the path integral for the Liouville quantum theory. Then I will explain the DOZZ formula. Time depending, I will finally discuss how computing all other correlation functions reduces to DOZZ and to the spectral problem associated to the Hamiltonian of the Liouville theory.
Based on works with F. David, A. Kupiainen and V. Vargas.

— 14h - 15h : **Alexander Adam** (Jussieu)
Horocycle averages on closed manifolds.

A well-known example of a contact Anosov flow is the geodesic flow on the unit tangent bundle SX of a closed Riemannian manifold X with variable negative sectional curvature. SX is foliated by the stable manifolds, on which one defines the horocycle flow. This flow is uniquely ergodic. What is the speed of convergence to the Birkhoff averages ?
In 2003 Flaminio and Forni investigated this question in the case of constant negative curvature. They found that the speed of convergence is controlled by the existence of distributions which are invariant w.r.to the horocycle flow. These distributions are also eigendistributions of the geodesic flow. The speed of convergence is then determined by a (fractional) power spectrum, with exponents associated to those eigenvalues.
I will report on this phenomenon for contact Anosov flows of sufficient regularity.

— 15h15 - 16h15 : **Maurizia Rossi** (Paris 5)
Asymptotic distribution of nodal intersections for arithmetic random waves.

We focus on the nodal intersection number of random Gaussian toral Laplace eigenfunctions ("arithmetic random waves") against a fixed smooth reference curve. The expected intersection number is proportional to the the square root of the eigenvalue times the length of curve, independently of its geometry. The asymptotic behaviour of the variance was addressed by Rudnick-Wigman ; they found a precise asymptotic law for "generic" curves with nowhere vanishing curvature, depending on both its geometry and the angular distribution of lattice points lying on the circles corresponding to the Laplace eigenvalues. They also discovered that there exist peculiar "static" curves, with variances of smaller order of magnitude, though did not describe the asymptotic behaviourn in this case.
In this talk we investigate the finer aspects of the limit distribution of the nodal intersections number. For generic curves we prove a Central Limit Theorem (for most of the energies). For the aforementioned static curves, we establish a non-Gaussian limit theorem for the distribution of the nodal intersections, and obtain the true asymptotic behaviour of their fluctuations, under a well-separatedness assumption on the corresponding lattice points, satisfied by most of the eigenvalues.
This is a joint work with Igor Wigman (King's College London).