Dans le cadre de la chaire d'excellence attribuée à Maciej Zworski durant l'année 2011, le LAGA organise un colloque intitulé :

Ondes en limite semi-classique

Université Paris 13, Villetaneuse, 5-7 Avril 2011

Titres des exposés

N. Anantharaman (Université Paris-Sud) – *Mesures semi-classiques pour l'équation de Schrödinger sur le tore*
Résumé : Soit (u_n) une suite bornée de fonctions L^2 sur le tore plat $\mathbb{T}^d$. Notons Δ le laplacien euclidien, et considérons la suite de mesures $\int_0^1 |e^{it\Delta}u_n(x)|^2\,dt$ sur $\mathbb{T}^d$. On montre que toute limite faible de cette suite de mesures est absolument continue, ce qui traduit certaines propriétés dispersives de l'équation de Schrödinger sur $\mathbb{T}^d$ (l'énonce analogue est faux sur la sphère ou sur les surfaces de Zoll, et c'est une question ouverte en courbure négative). Ce résultat généralise un théorème de Bourgain et Jakobson, qui concernait le cas où les u_n sont des fonctions propres du laplacien. La technique que nous utilisons est différente de la leur, on utilise ici de l'analyse microlocale et des propriétés du flot géodésique sur $\mathbb{T}^d$. Il s'agit d'un travail en commun avec Fabricio Macia.

J.-F. Bony (CNRS et Université de Bordeaux 1) – *Décroissance de l'énergie locale à basses fréquences*

N. Burq (Université Paris-Sud) – *Probabilistic Sobolev embeddings and applications*
Abstract: The purpose of this talk is to show that the behaviour of randomly chosen functions can be much better that predicted by the deterministic approach. We will show that in particular Sobolev embeddings can be greatly improved when accepting small probability residual sets. We will also show some applications to linear and nonlinear PDE's. This is a joint work with G. Lebeau (Université de Nice).

K. Datchev (Massachussets Intitute of Technology) – *Wave decay on asymptotically hyperbolic manifolds*
Abstract: In joint work with Andras Vasy, we use semiclassical propagation of singularities to give a general method for gluing together resolvent estimates. Applications include resonance free regions and wave decay for manifolds with asymptotically hyperbolic ends.

S. Dyatlov (University of California, Berkeley) – *Quasi-normal modes for Kerr-de Sitter black holes*
Abstract: Quasinormal modes of black holes are supposed to describe oscillations and decay of gravitational waves produced by the black hole interacting with another object. They have been extensively studied by physicists, most recently in the context of string theory.

We provide a rigorous definition of quasinormal modes of slowly rotating Kerr-de Sitter black holes, resonance expansions of linear waves in terms of these modes (and in particular exponential decay), and a semiclassical description of quasinormal modes, which matches numerical results already at low energies.

P. Gérard (Université Paris-Sud) – *Integrable effective dynamics for some non dispersive wave equation*
Abstract: We consider the following wave equation on the one dimensional torus,

$$i\partial_t u - |D|u = |u|^2 u.$$

We prove that, if the Cauchy data are small and have only non negative Fourier modes, the solution u can be approximated on a large time interval by the solution of the cubic Szegö equation,

$$i(\partial_t + \partial_x)v = \Pi(|v|^2)v$$

with the same Cauchy data. Applications to large time behavior of high Sobolev norms are infered.

C. Guillarmou (CNRS et École normale supérieure) – *Équidistribution de séries d'Eisenstein*
Résumé : On montre une équidistribution à haute fréquence de fonctions propres généralisées sur certaines variétés hyperboliques non-compactes (travail avec F. Naud).

J. Holmer (Brown University) – *Phase driven interaction of well-separated solitons (joint work with Quanhui Lin)*
Abstract: We prove that, for the nonlinear Schrödinger equation, two well-separated solitons impart motion on each other due to their small overlapping tails. We show that the relative phase of the two solitons determines whether the interaction force pulls the solitons together or pushes them apart. Our results apply in nonintegrable cases such as the cubic-quintic combined nonlinearity. We will place this result in the context of earlier joint work with Maciej Zworski and Galina Perelman on the dynamics of solitons in a slowly-varying potential. In particular, the same "symplectic restriction" procedure we adopted in these earlier works applies here.

S. Nonnenmacher (CEA) – *Chaotic scattering and quantum monodromy operators*
Abstract: We investigate the resonance spectrum of semiclassical Schrödinger operators, in situations where, around some positive energy, the set of classical trapped trajectories (for the associated Hamiltonian flow) is a compact fractal set carrying a hyperbolic flow. We are especially interested in the distribution of quantum resonances near this energy, and the accompanying resolvent estimates. For this aim, we develop a new method, which consists in replacing the original Schrödinger operator by an quantum monodromy operator, which is a finite rank operator depending nonlinearly of the spectral parameter. This operator effectively quantizes the Poincaré map associated with a given Poincaré section of the flow near the trapped set. Using this method, we recover previously known criteria for a resonance free strip, as well as fractal upper bounds for resonance counting; this formalism also allows to treat obstacle problems with similar classical dynamics. This is a joint work with J. Sjöstrand and M. Zworski.

G. Perelman (Université Paris 12) – *Construction of blow up solutions for the critical Schrödinger map equation*

Abstract: We consider the Schrödinger map equation on $\mathbb{R}^2$, with values in $\mathbb{S}^2$. We prove the existence of equivariant finite time blow up solutions with initial data arbitrarily close to the lowest energy harmonic map.

G. Rivière (Université de Lille 1) – *Grandes déviations semi-classiques (Semiclassical large deviations)*

Abstract: I will explain how large deviations results due to Kifer allow to get a refinement of Shnirelman's theorem in the case of Anosov geodesic flows. I will also describe how one can state such a theorem for non stationary solutions of the Schrödinger equation. This is based on a joint work with Nalini Anantharaman (arXiv:1007.4343).

J. Sjöstrand (Université de Bourgogne) – *Tunnel effect and symmetries for Kramers Fokker-Planck type operators (Joint work with F. Hérau and M. Hitrik.)*

Abstract: We study operators of Kramers-Fokker-Planck type in the semiclassical limit, assuming that the exponent of the associated Maxwellian is a Morse function with a finite number n_0 of local minima. Under suitable additional assumptions, we show that the first n_0 eigenvalues are real and exponentially small, and establish the complete semiclassical asymptotics for these eigenvalues.

G. Uhlmann (University of Washington) – *30 Years of Calderon's Problem*

Abstract: We will survey some of the most important developments in Calderon's inverse problem which consists in determining the electrical conductivity of a medium by making voltage and current measurements at the boundary of the medium.