4th Itinerant Workshop on PDE's

TITLES AND ABSTRACTS

Short Courses (3 hours each)

1. **Sigmund Selberg** (Norwegian University of Science and Technology)
   "The Cauchy problem for the Chern-Simons-Higgs system"

   Abstract: The Chern-Simons-Higgs (CSH) system describes electromagnetic phenomena in planar domains, such as the Quantum Hall Effect. In these lectures I will present recent work on the well-posedness of the Cauchy problem for CSH with initial data with finite energy. Key concepts that will be discussed include gauge invariance, null structure and bilinear space-time estimates.

2. **Nikolay Tzvetkov** (Université Cergy-Pontoise)
   "*On the statistical description of the flow of dispersive PDE's*"

3. **Ana Vargas** (Universidad Autónoma de Madrid)
   "A. e. Pointwise Convergence to the Initial Data for the Schrödinger Equation"

Seminars

1. **Pieter Blue** (University of Edinburgh)
   "Decay for fields outside black holes"

   Abstract: The Einstein equation from general relativity is a quasilinear hyperbolic, geometric PDE (when viewed in an appropriate coordinate system) for a manifold. A particularly interesting set of known, exact solutions describe black holes. The wave and Maxwell equations on these manifolds are models for perturbations of the known solutions and have attracted a significant amount of attention in the last decade. Key estimates are conservation of energy and Morawetz (or integrated local energy) estimates. These can be proved using both Fourier analytic methods and more geometric methods. The main focus of the talk will be on decay estimates for solutions of the Maxwell equation outside a slowly rotating Kerr black hole.

2. **Fabricio Macià** (Universidad Politécnica de Madrid)
   "*Dispersion and unique continuation for the periodic Schrödinger Equation*"

   Abstract: We present a unified framework to deal simultaneously with dispersive, (Strichartz-type) estimates and quantitative unique continuation (observability) estimates for the linear Schrödinger equation on a manifold. Our approach is based on phase-space harmonic analysis techniques, namely on a precise analysis of the structure of semiclassical measures associated to solutions to Schrödinger-type equations. In this talk we focus on the Schrödinger flow (and some of its generalisations) on flat tori. We describe results obtained in collaboration with N. Anantharaman and C. Fermanian-Kammerer and show how they can be used to extend some of the results on dispersion and observability that can be found in the literature.

3. **Benoît Pausader** (Université Paris 13)
   "The Euler-Maxwell System in dimension 3"

Abstract: This is a joint work with A. Ionescu and Y. Guo. We prove global existence for small, smooth, localized, irrotational and neutral perturbations of a constant (flat) equilibrium for the general Euler-Maxwell system in dimension 3. This is done by reformulating the system into a quasilinear dispersive system and using a combination of the energy method (to keep smoothness) and of semilinear analysis (to obtain decay). The general framework is that of the ``space-time resonance method'' of Germain-Masmoudi-Shatah but the key ingredient is a robust bilinear stationary phase analysis. This builds on previous works about the different reduced systems by Ionescu, Germain, Guo, Masmoudi and Pausader.

4. **Mario Pulvirenti** (SAPIENZA Università di Roma)
   "From particle systems to the Landau equation: a consistency result"

   Abstract: We consider a system of identical particles, whose time evolution is given by the Newton equations. Under a sutable scaling (weak-coupling limit), the one-particle distribution function is expected to satisfy the Landau equation, which is a diffusion in the velocity variable. Obviously the transition from a reversible equation to a diffusion, is a challenging and delicate step. We discuss a very preliminary step (work in collaboration with A. Bobylev and C. Saffirio), namely the consistency of the two pictures at time zero.

5. **Nicola Visciglia** (Università di Pisa)
   "*Remarks on the construction of invariant measures for KdV*"

   Abstract: This talk can be considered as an introduction to the lectures by N. Tzvetkov, which are devoted to the construction of invariant measures for the Benjamin-Ono equation. The method used in our joint paper with N. Tzvetkov is very general and in particular works also for the KdV equation. We shall present a simpler proof, compared with the original one by P. Zhidkov, of the existence of invariant measures for KdV. Along the talk we shall underline the main extra difficulties that appear in order to extend our argument to the Benjamin-Ono case.