

Microlocal Day

24 / 25 June 2010

Imperial Analysis Group

Organisers:

Claudia Garetto, c.garetto@imperial.ac.uk

Michael Ruzhansky, m.ruzhansky@imperial.ac.uk

Jens Wirth, j.wirth@imperial.ac.uk

We kindly acknowledge the support of the Department of Mathematics, Imperial College.

1 Programme

THURSDAY, 24/06/10

Room 130

12:50	<i>Opening</i>
13:00 – 13:50	Ari Laptev (Imperial College) <i>On some spectral inequalities for non-elliptic partial differential operators</i>
14:00 – 14:50	Niels Jacob (Swansea University) <i>Markov semi-groups generated by pseudo-differential operators. An introduction</i>
15:00 – 16:00 ¹	Cesare Parenti (University of Bologna) <i>The Cauchy problem for linear hyperbolic operators with double characteristics</i>
<i>Coffee Break</i>	<i>(Mathematics Common Room, Level 5)</i>
16:30 – 17:30 ¹	Michael Oberguggenberger (University of Innsbruck) <i>Regularity theory for solutions to PDEs in algebras of generalized functions</i>
18:00	<i>Dinner</i>

FRIDAY, 25/06/10

Room 130

11:00 – 11:30	Christiane Böhme (Freiberg University) <i>Energy estimates for Klein-Gordon type models with time-dependent potential</i>
11:40 – 12:10	Donal Connolly (Imperial College) <i>Some questions related to pseudo-differential operators on spheres</i>
12:20 – 12:50	Jens Wirth (Imperial College) <i>On singular hyperbolic Cauchy problems</i>

¹jointly as London Analysis and Probability Seminar

2 Abstracts

Energy estimates for Klein-Gordon type models with time-dependent potential

CHRISTIANE BÖHME
TU Bergakademie Freiberg
boehme@math.tu-freiberg.de

In this talk we investigate Klein-Gordon type models whose mass term is essentially described by a decreasing function and an oscillating perturbation. In dependence on the interplay between the decay and the oscillations of the coefficient we are interested in statements about generalized energy conservation. Therefore, we take advantage of a refined diagonalization procedure.

Some questions related to pseudo-differential operators on spheres

DONAL CONNOLLY
Imperial College
d.connolly09@imperial.ac.uk

We will examine harmonic analysis on homogeneous spaces and discuss difference operators on S^n with a view towards applications in the theory of pseudo-differential operators.

Markov semi-groups generated by pseudo-differential operators. An introduction

NIELS JACOB
Swansea University
n.jacob@swansea.ac.uk

In our lecture we will discuss how pseudo-differential operators arise naturally in the context of Feller semi-groups and their generators. However the symbol class needed does not belong to a standard class. Symbols of generators of Feller semi-groups must be continuous negative definite functions with respect to the co-variable. These functions allow a Levy-Khinchin representation, and hence in general they are not differentiable. Nonetheless a rich theory for such operators exists and provides an important tool in the theory of Markov processes.

On some spectral inequalities for non-elliptic partial differential operators

ARI LAPTEV
Imperial College London
a.laptev@imperial.ac.uk

I will give a proof of some spectral inequalities for the moments of the eigenvalues for a class of non-elliptic partial differential operators for which phase volume type estimates do not exist.

Regularity theory for solutions to PDEs in algebras of generalized functions

MICHAEL OBERGUGGENBERGER
University of Innsbruck
Michael.Oberguggenberger@uibk.ac.at

This talk addresses regularity and propagation of singularities of solutions to partial differential and pseudo-differential equations with non-smooth coefficients. The equations will be studied in the framework of Colombeau algebras of generalized functions. Various notions of regularity in this setting will be introduced, motivated and related to classical notions from distribution theory. The issues range from linear to nonlinear equations and from elliptic regularity to the propagation of wave front sets.

The Cauchy problem (CP) for linear hyperbolic operators with double characteristics

CESARE PARENTI
University of Bologna
parenti@cs.unibo.it

I will give a survey lecture on some recent results concerning two main problems which do not have received much attention in the last years:

- 1) Well posedness of the CP in case of transition in the spectrum of the Hamiltonian map at different points of the double manifold.
- 2) To what extent the usual Ivrii-Petkov-Hörmander necessary conditions on the lower order terms of the operator are also sufficient for the well posedness of the CP.

On singular hyperbolic Cauchy problems

JENS WIRTH
Imperial College
j.wirth@imperial.ac.uk

Within this talk we consider the question of well-posedness of the Cauchy problem

$$u_{tt} - a^2(t)u_{xx} = 0, \quad u(0, \cdot) = u_0, \quad u_t(0, \cdot) = u_1$$

under weak regularity assumptions on the coefficient function $a(t)$. It is well-known that problems of this type are Sobolev well-posed if $a(t)$ is Lipschitz, but fails to be C^∞ well-posed if coefficients are just Hölder continuous. For weaker regularity of coefficients the appropriate framework are Gevrey classes. We will review some results in that direction and discuss some new diagonalisation-based approaches using additional stabilisation-type assumptions on coefficients.