Schedule

	July 31	Aug 1	Aug 2	Aug 3
9:30–10:00	Welcome			
10:00–10:50	Christiansen	Christiansen	Borthwick	Borthwick
10:50–11:10	Coffee	Coffee	Coffee	Coffee
11:10–12:00	Borthwick	Hasler	Hasler	Christiansen
12:00–14:00	Lunch	Lunch	Lunch	
14:00–14:50	Hasler	Borthwick	Christiansen	
14:50–15:10	Coffee	Coffee	Coffee	
15:10–16:00	2 contr. talks	2 contr. talks	Hasler	
16:00–	2 contr. talks (end: 16:50)	3 contr. talks (end: 17:15)		

Contributed talks: each 15min + 5min discussion + 5min break

Contributed talks

Tuesday, August 1

15:10–15:25	Keita Mikami
15:35–15:50	Kouchi Taira
16:00–16:15	Edgar Assing
16:25–16:40	Paul Geniet

Wednesday, August 2

15:10–15:25	Paul Wabnitz
15:35–15:50	Konstantin Schäfer
16:00–16:15	TBA
16:25–16:40	TBA
16:50–17:05	Keivan Mallahi-Karai

Abstracts

Lecture Series.

David Borthwick (Emory University)
Resonances in Geometric Scattering Theory.
Hyperbolic manifolds (i.e., manifolds of constant negative sectional curvature) provide a "laboratory" for conjectures about the distribution of scattering resonances in the complex plane and their relationship with classical dynamics, i.e., geodesic flow. In these lectures we'll discuss the geometric scattering theory of a distinguished class of hyperbolic manifolds, the convex co-compact manifolds. We'll begin by developing scattering theory on convex co-compact surfaces and study the associated Selberg zeta function that encodes the relationship between geodesic flow (the length spectrum of closed orbits) and quantum flow (the scattering resonances of the Laplacian). We'll then discuss higher-dimensional analogues and more detailed questions such as spectral gaps and the relationship between the distribution of resonances and the Hausdorff dimension of the trapped set of geodesics.

Tanya Christiansen (University of Missouri)
Resonances and Schrödinger operators.
This minicourse provides an introduction to the theory of resonances via the particular case of Schrödinger operators on $\mathbb{R}^d$. Physically, resonances may correspond to decaying waves. From a mathematical point of view, resonances can provide a replacement for discrete spectral data for a class of operators with continuous spectrum. When the dimension d is odd, resonances are isolated points in the complex plane. We will explore some of what is known about the distribution of resonances for Schrödinger operators, and outline some proofs. For example, one can show that there are regions of the complex plane which have no resonances. We talk about the problem of bounding, both from above and below, the counting function for the number of resonances in a disk of radius r. Lower bounds in particular are not well-understood in dimension greater than one. The proofs of these results use tools from both functional analysis and complex analysis.

David Hasler (Friedrich Schiller University Jena)
Random Schrödinger Operators.

Contributed Talks.

Edgar Assing (University of Bristol)
Laplace eigenfunctions in towers of arithmetic manifolds.
We will talk about the asymptotic behaviour of Laplace eigenfunctions traversing a tower of arithmetic manifolds. More precisely, we are interested in the size of Maaß forms as the 'complexity' of the underlying manifold increases. We will discover several features that also appear in the large eigenvalue limit.

Paul Geniet (Institut de Mathematiques de Bordeaux)
On a quantum Hamiltonian in a unitary magnetic field with axisymmetric potential.
We study a magnetic Schrödinger Hamiltonian, with axisymmetric potential in any dimension. The associated magnetic field is unitary and non constant. The problem reduces to a 1D family of singular Sturm-Liouville operators on the half-line indexed by a quantum number. We study the associated band functions. They have finite limits that are the Landau levels. These limits play the role of thresholds in the spectrum of the Hamiltonian. We provide an asymptotic expansion of the band functions at infinity. Each Landau level concerns an infinity of band functions and each energy level is intersected by an infinity of band functions. We show that among the band functions that intersect a fixed energy level, the derivative can be arbitrary small. We apply this result to prove that even if they are localized in energy away from the thresholds, quantum states possess a bulk component. A similar result is also true in classical mechanics.

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Keivan Mallahi-Karai (Jacobs University)
Spectral independence and random walks on products of compact groups.
The notion of spectral gap for random walks on locally compact groups has a long history. In this talk I will discuss some recent results about the spectral gap for couplings of random walks on algebraically independent compact groups.
This is a joint work with A. Salehi Golsefidy and Amir Mohammadi.

Keita Mikami (University of Tokyo)
Geometric Scattering for Schrödinger Operators with Asymptotically Homogeneous Potentials of Order Zero.
We introduce the Scattering theory for the Schrödinger operators with potentials of order zero on asymptotically conic manifolds. We prove the existence and the completeness of the wave operators with a naturally defined free Hamiltonian.

Konstantin Schäfer (Universität Bremen)
An adapted version of Lin's criterion for exactness.
Lin's Criterion characterizes exactness (exactness gives ergodicity) of a dynamical system using the transfer operator and integrable functions. Under a few additional conditions, we will be able to improve Lin's criterion such that only a subspace of the integrable functions is needed for the characterization. In particular, we will have a look at concave, strictly increasing functions and discuss an alternate proof for the exactness of the Farey map.

Kouichi Taira (University of Tokyo)
Essential self-adjointness of pseudodifferential operators.
In this talk, we study the essential self-adjointness of real principal type pseudo-differential operators in a Eucliedan space. When the operator is Riemannian Laplacian, it is known that the completeness of the metric is sufficient condition for the essential self-adjointness. However, such a condition for general pseudo-differential operators is not known. We prove the essential self-adjointness under null non-trapping condition. For a proof, we employ microlocal propagation estimates in a interior region and a exterior region respectively.
This is joint work with Shu Nakamura.

Paul Wabnitz (University of Bremen)
Transfer Operator Approach to Selberg Zeta Function.
We outline the construction of a transfer operator family suitable for a thermodynamic formalism approach to Selberg zeta functions for orbifolds arising as orbit spaces of geometrically finite discontinuous group actions with cusps on the hyperbolic plane. Most of the topics presented are work in progress.